



# Discrete semiconductors selection guide 2016

Bipolar transistors, diodes, ESD protection, TVS,  
filtering and signal conditioning, and MOSFETs



# Our extensive package range provides maximum flexibility

|          | Miniaturization  | >> | Medium Power |
|----------|--|----|--------------|
| 2 Pins   | DSN0402 (SOD992) 0.4 x 0.2 x 0.12<br>DSN0603-2 (SOD962) 0.6 x 0.3 x 0.3<br>DSN1006-2 (SOD993) 1.0 x 0.6 x 0.3<br>DSN1006U-2 (SOD995) 1.0 x 0.6 x 0.3<br>DFN1006D-2 (SOD882D) 1.0 x 0.6 x 0.37<br>DFN1006-2 (SOD882) 1.0 x 0.6 x 0.48<br>SOD523 1.2 x 0.8 x 0.6<br>DFN1608D-2 (SOD1608) 1.6 x 0.8 x 0.37<br>DSN1608-2 (SOD963/SOD964) 1.6 x 0.8 x 0.25/0.29<br>SOD323F 1.7 x 1.25 x 0.7<br>SOD323 1.7 x 1.25 x 0.95<br>SOD123F 2.6 x 1.6 x 1.1<br>CFP3 (SOD123W) 2.6 x 1.7 x 1.0<br>CFP5 (SOD128) 3.8 x 2.6 x 1.0<br>CFP15 (SOT1289) 5.8 x 4.3 x 0.78<br>D2PAK (SOT404) 11.0 x 10.0 x 4.3 |    |              |
| 3 Pins   | DFN1006B-3 (SOT883B) 1.0 x 0.6 x 0.37<br>DFN1006-3 (SOT883) 1.0 x 0.6 x 0.48<br>DFN1010D-3 (SOT1215) 1.1 x 1.0 x 0.37<br>SOT663 1.6 x 1.2 x 0.55<br>SOT323 2.0 x 1.25 x 0.95<br>SOT23 2.9 x 1.3 x 1.0<br>DFN2020-3 (SOT1061) 2.0 x 2.0 x 0.62<br>DFN2020D-3 (SOT1061D) 2.0 x 2.0 x 0.62<br>SOT89 4.5 x 2.5 x 1.5<br>DPAK (SOT428) 6.6 x 6.1 x 2.3  |    |              |
| 4/5 Pins | WLCSP4* 0.8 x 0.8 x 0.35<br>WLCSP5* 1.51 x 1.14 x 0.65<br>SOT665 1.6 x 1.2 x 0.55<br>SOT353 2.0 x 1.25 x 0.95<br>SOT143B 2.9 x 1.3 x 1.0<br>LPAK56 (SOT669) 5.0 x 6.0 x 1.0<br>SOT223 6.5 x 3.5 x 1.65   |    |              |
| 6 Pins   | DFN1010B-6 (SOT1216) 1.1 x 1.0 x 0.37<br>DFN1010-6 (SOT891) 1.0 x 1.0 x 0.48<br>DFN1410-6 (SOT886) 1.45 x 1.0 x 0.48<br>WLCSP6 1.48 x 0.98 x 0.35<br>SOT666 1.6 x 1.2 x 0.55<br>SOT363 2.0 x 1.25 x 0.95<br>DFN2020-6 (SOT1118) 2.0 x 2.0 x 0.62<br>DFN2020D-6 (SOT1118D) 2.0 x 2.0 x 0.62<br>DFN2020MD-6 (SOT1220) 2.0 x 2.0 x 0.62<br>SOT457 2.9 x 1.5 x 1.0   |    |              |
| ≥ 7 Pins | DFN2110-9 (SOT1178) 2.1 x 1.0 x 0.48<br>DFN2111-7 (SOT1358) 2.1 x 1.1 x 0.5<br>DFN2510A-10 (SOT1176) 2.5 x 1.0 x 0.48<br>DFN2520-9 (SOT1333) 2.5 x 2.0 x 0.48<br>DFN2521-12 (SOT1156-1) 2.5 x 2.1 x 0.5<br>LPAK33 (SOT1210) 3.3 x 3.3 x 0.85<br>DFN4020-14 (SOT1334) 4.0 x 2.0 x 0.48<br>DFN4040-32 (SOT1318-1) 4.0 x 4.0 x 0.5<br>DFN5050-32 (SOT617-3) 5.0 x 5.0 x 0.85<br>LPAK56D (SOT1205) 5.0 x 6.0 x 1.0   |    |              |

\* The exact position of the balls and package dimensions vary.

Your global partner for discretes



# Discretes semiconductors selection guide 2016

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# Our commitment: quality and reliability

## AEC-Q101

- ▶ We qualify our products according to the automotive AEC-Q101 standard and even exceed it's requirements, for instance when doing extended lifetime testing.



- ▶ All our processes and manufacturing plants are subject to regular international and internal audits, including the following:
  - ▶ ISO9001
  - ▶ ISO/TS 16949 for automotive sites
  - ▶ ISO14001
  - ▶ OHSAS18001



- ▶ NXP's Design for Excellence (DfX) program ensures that each new development builds on past learning and that best practices are always employed. The result is continual product improvement.



- ▶ Zero defect is our goal. To ensure continuous improvement failure analysis and the determination to find root causes is performed at all stages of development and production by adoption of quality-analysis tools and methods (e.g. Six-Sigma, Safe-Launch).

Rigorous attention to detail and commitment to quality have yielded a very low product failure rate of a single-digit part per billion (ppb).



## Bipolar transistors

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# Bipolar transistors portfolio

What you get when you choose NXP for bipolar transistors

## A comprehensive portfolio for all applications

Best in class performing transistors from general-purpose to low  $V_{CEsat}$  transistors

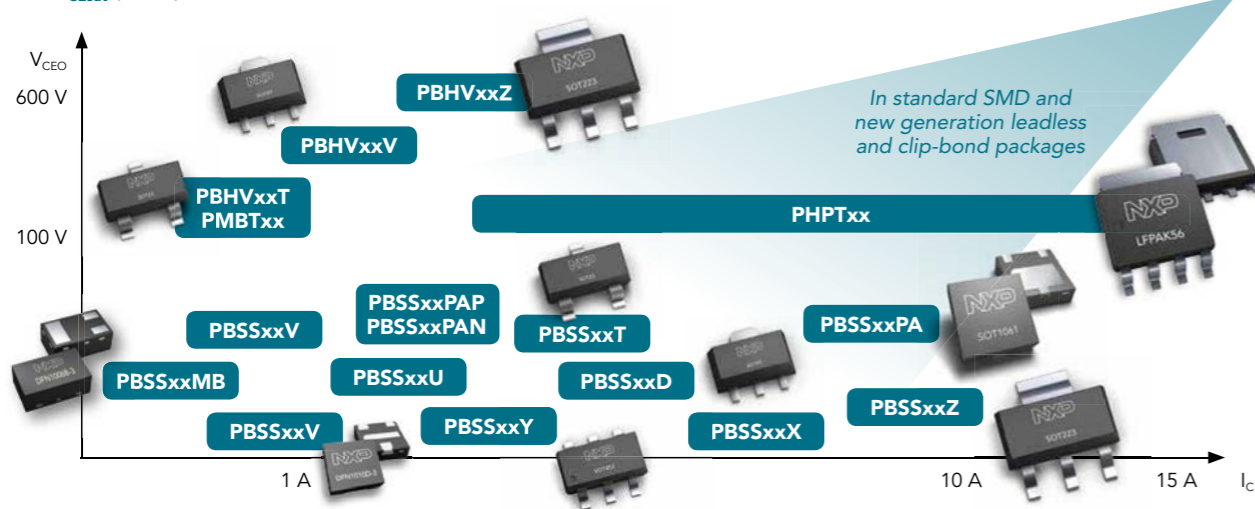
## A broad range of packages

Many options for leaded SMD, medium-power clip-bond and ultra-small leadless packages.

## A quality product from an experienced, high volume supplier

- ▶ NXP is strongly committed to automotive quality standards
- ▶ NXP has a track record of more than 60 years in developing and producing transistors
- ▶ NXP is the #1 in small-signal discretes with a high production capacity

### Low $V_{CEsat}$ (BISS) transistors



# Medium-power Bipolar transistors in LFPAK56



**LFPAK56 (SOT669)**  
Single package  
5 x 6 x 1.1 mm



**LFPAK56D (SOT1205)**  
Dual package  
5 x 6 x 1.1 mm

### Applications

- ▶ Power management
- ▶ Loadswitch
- ▶ Linear-mode voltage regulator
- ▶ Backlight units
- ▶ Motor drive
- ▶ LED lighting
- ▶ Relay replacement
- ▶ IGBT drive

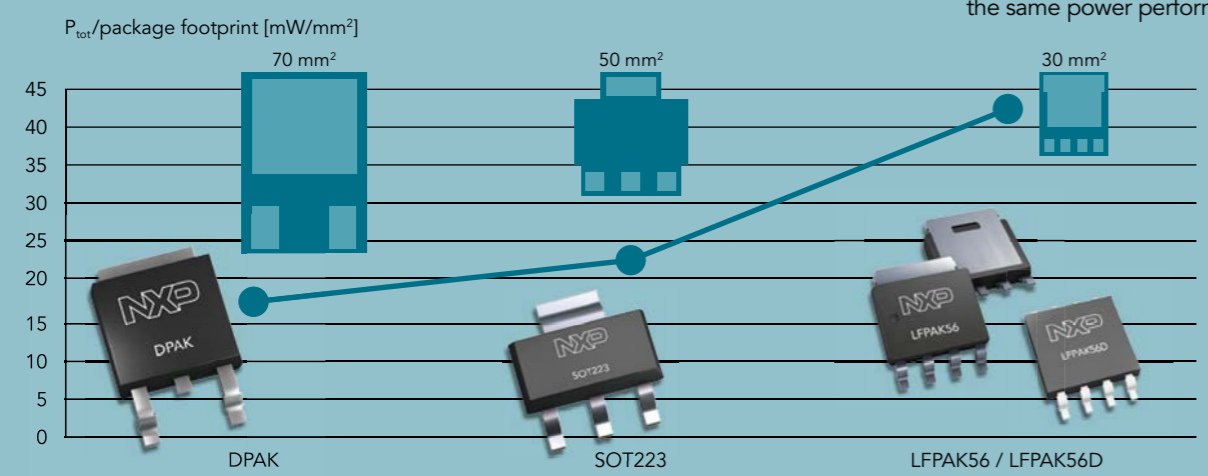
### In the spotlight

#### Bipolar transistors in LFPAK56 and LFPAK56D power packages

- High thermal power dissipation up to 3.7 W,  $V_{ce0}$  up to 100 V
- Most types AECQ-101 qualified ( $I_C = 3$  A up to 15 A)
- 2 types in LFPAK56D with current gain matching of 5% and 10%
- Reduced PCB area requirements compared to transistors in DPAK
- Suitable for high-temperature applications up to 175 °C

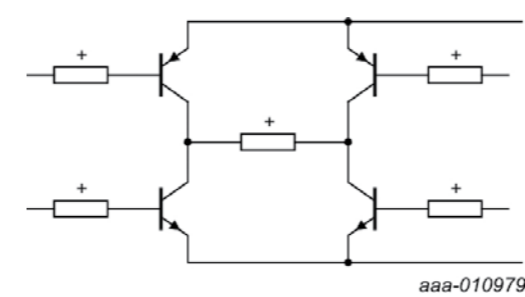
### LFPAK: Same power dissipation but half the size

55% package size reduction while retaining the same power performance

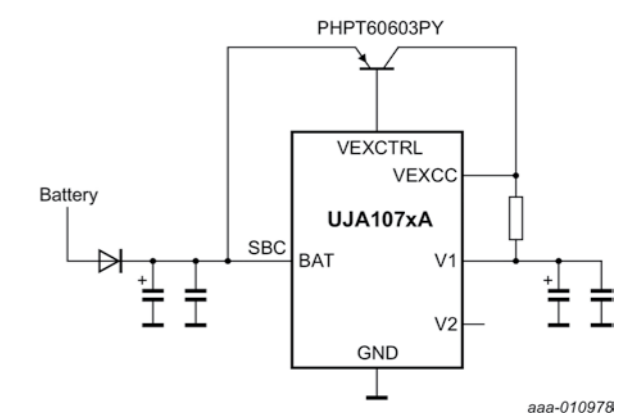


Reduced PCB area requirements comparison of DPAK, SOT223 and LFPAK


### Motor drive (2x PHPT60603NY/PY) or a double LFPAK56D (PHPT610030NK/PK)




### IVN – System Basis Chip (PHPT60603PY) External pass transistor, linear regulator




### High-power transistors (single)

| Package   |                    |                     |                         |                      |                       |  |                             |                      |                      |          | LFPAK56<br>(SOT669) |
|---|--------------------|---------------------|-------------------------|----------------------|-----------------------|--|-----------------------------|----------------------|----------------------|----------|---------------------|
|  |                    |                     |                         |                      |                       |  |                             |                      |                      |          |                     |
| Size (mm)   |                    |                     |                         |                      |                       |  |                             |                      |                      |          | 5 x 6 x 1.1         |
| V <sub>CEO</sub> (V)  | I <sub>C</sub> (A) | I <sub>CM</sub> (A) | h <sub>FE</sub> min/typ | @ I <sub>C</sub> (A) | @ V <sub>CE</sub> (V) | V <sub>CEsat</sub> typ (mV);<br>I <sub>C</sub> = 0.5 A;<br>I <sub>B</sub> = 0.05 A | V <sub>CEsat</sub> max (mV) | @ I <sub>C</sub> (A) | @ I <sub>B</sub> (A) | Polarity |                     |
| 60  | 3                  | 8                   | 200 / 400               | 0.5                  | 2                     | 50   | 270                         | 3                    | 0.3                  | NPN      | PHPT60603NY         |
|   |                    |                     | 200 / 400               | 0.5                  | 2                     | 70   | 360                         | 3                    | 0.3                  | PNP      | PHPT60603PY         |
| 150 / 250   | 0.5                |                     | 10                      | 50                   | 330                   | 3  | 0.3                         | NPN                  | PHPT61003NY          |          |                     |
| 150 / 220   | 0.5                |                     | 10                      | 70                   | 360                   | 2  | 0.2                         | PNP                  | PHPT61003PY          |          |                     |
| 100   | 3                  | 6                   | 150 / 250               | 0.5                  | 10                    | 50   | 300                         | 2                    | 0.2                  | NPN      | PHPT61002NYC        |
|   |                    |                     | 150 / 220               | 0.5                  | 10                    | 70   | 400                         | 2                    | 0.2                  | PNP      | PHPT61002PYC        |

### High-current, high-power transistors






| Package   |                    |                         |                      |                       |          | LFPAK56<br>(SOT669) |
|---|--------------------|-------------------------|----------------------|-----------------------|----------|---------------------|
|  |                    |                         |                      |                       |          |                     |
| Size (mm)   |                    |                         |                      |                       |          | 5 x 6 x 1.1         |
| V <sub>CEO</sub> (V)  | I <sub>C</sub> (A) | h <sub>FE</sub> min/typ | @ I <sub>C</sub> (A) | @ V <sub>CE</sub> (V) | Polarity |                     |
| 40  | 6                  | 200/400                 | 0.5                  | 2                     | NPN      | PHPT60406NY         |
| 40  | 6                  | 200/400                 | 0.5                  | 2                     | PNP      | PHPT60406PY         |
| 40  | 10                 | 200/400                 | 0.5                  | 2                     | NPN      | PHPT60410NY         |
| 40  | 10                 | 200/400                 | 0.5                  | 2                     | PNP      | PHPT60410PY         |
| 40  | 15                 | 200/400                 | 0.5                  | 2                     | NPN      | PHPT60415NY         |
| 40  | 15                 | 200/400                 | 0.5                  | 2                     | PNP      | PHPT60415PY         |
| 60  | 6                  | 200/400                 | 0.5                  | 2                     | NPN      | PHPT60606NY         |
| 60  | 6                  | 150/250                 | 0.5                  | 2                     | PNP      | PHPT60606PY         |
| 60  | 10                 | 200/400                 | 0.5                  | 2                     | NPN      | PHPT60610NY         |
| 60  | 10                 | 150/250                 | 0.5                  | 2                     | PNP      | PHPT60610PY         |
| 100   | 6                  | 150/250                 | 0.5                  | 10                    | NPN      | PHPT61006NY         |
| 100   | 6                  | 150/220                 | 0.5                  | 10                    | PNP      | PHPT61006PY         |
| 100   | 10                 | 150/250                 | 0.5                  | 10                    | NPN      | PHPT61010NY         |
| 100   | 10                 | 150/220                 | 0.5                  | 10                    | PNP      | PHPT61010PY         |

### High-power transistors (double)

| Package   |                    |                     |                     |                      |                       |  |                             |                      |                      |          |  | LFPAK56D<br>(SOT1205) |
|---|--------------------|---------------------|---------------------|----------------------|-----------------------|--|-----------------------------|----------------------|----------------------|----------|--|-----------------------|
|  |                    |                     |                     |                      |                       |  |                             |                      |                      |          |  |                       |
| Size (mm)   |                    |                     |                     |                      |                       |  |                             |                      |                      |          |  | 5 x 6 x 1.1           |
| V <sub>CEO</sub> (V)  | I <sub>C</sub> (A) | I <sub>CM</sub> (A) | h <sub>FE</sub> typ | @ I <sub>C</sub> (A) | @ V <sub>CE</sub> (V) | V <sub>CEsat</sub> typ (mV);<br>I <sub>C</sub> = 0.5 A;<br>I <sub>B</sub> = 0.05 A | V <sub>CEsat</sub> max (mV) | @ I <sub>C</sub> (A) | @ I <sub>B</sub> (A) | Polarity | h <sub>FE1</sub> /<br>h <sub>FE2</sub> |                       |
| 100   | 3                  | 6                   | 150                 | 0.5                  | 10                    | 50   | 300                         | 3                    | 0.2                  | 2XNPN    | -                                      | PHPT610030NK          |
|   |                    |                     |                     |                      |                       | 70   | 400                         | 3                    | 0.2                  | 2XPNP    | -                                      | PHPT610030PK          |
|   |                    |                     |                     |                      |                       | 50 / 70  | 300 / 400                   | 3                    | 0.2                  | NPN/PNP  | -                                      | PHPT610030NPK         |
|   |                    |                     |                     |                      |                       | 50   | 300                         | 3                    | 0.2                  | 2XNPN    | 0.95                                   | PHPT610035NK          |
|   |                    |                     |                     |                      |                       | 70   | 400                         | 3                    | 0.2                  | 2XPNP    | 0.9                                    | PHPT610035PK          |

### Low V<sub>CEsat</sub> (BISS) transistors single NPN

types in **bold** represent new products

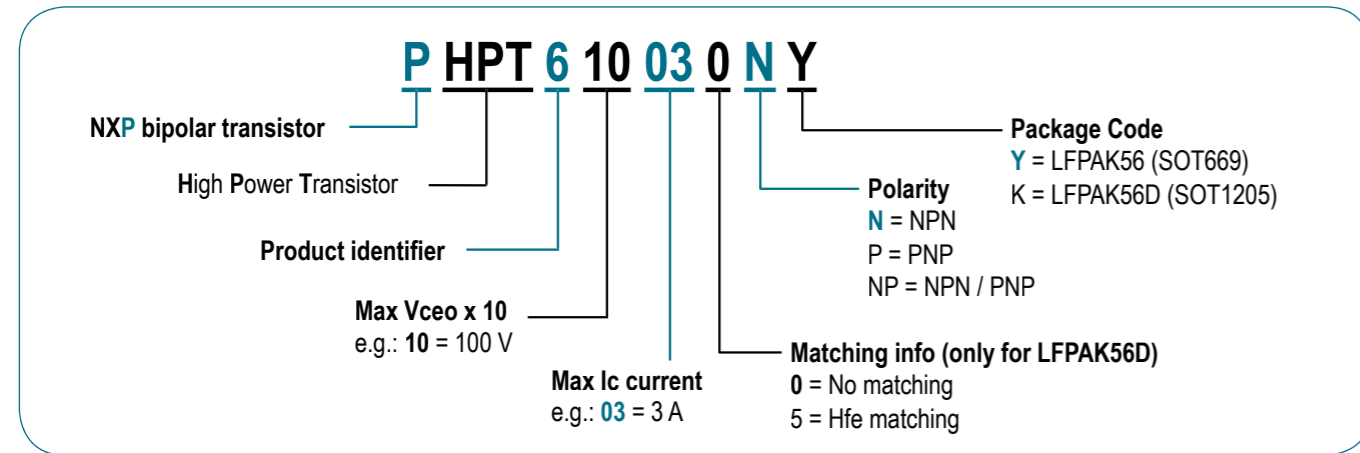
| Package   |                    |                     |                         |                      |                       |   | SOT223<br>(SC-73)   | SOT89<br>(SC-62)  | SOT457<br>(SC-74)   | DFN2020-3<br>(SOT1061)  | DFN2020D-3<br>(SOT1061D) |  |
|---|--------------------|---------------------|-------------------------|----------------------|-----------------------|---|---|---|---|---|--------------------------|--|
|  |                    |                     |                         |                      |                       |   |  |  |  |  |                          |  |
| Size (mm)   |                    |                     |                         |                      |                       |   | 6.5 x 3.5 x 1.65  | 4.5 x 2.5 x 1.5   | 2.9 x 1.5 x 1.0   | 2.0 x 2.0 x 0.62  | 2.0 x 2.0 x 0.62         |  |
| P <sub>tot</sub> (mW)   |                    |                     |                         |                      |                       |   | 1700  | 1650  | 750   | 1300  | 1300                     |  |
| V <sub>CEO</sub> (V)  | I <sub>C</sub> (A) | I <sub>CM</sub> (A) | h <sub>FE</sub> min/typ | @ I <sub>C</sub> (A) | @ V <sub>CE</sub> (V) | V <sub>CEsat</sub> typ (mV);<br>I <sub>C</sub> = 0.5 A; I <sub>B</sub> = 0.05 A |   |   |   |   |                          |  |
| 12  | 5.3                | 10.6                | 300 / 530               | 0.5                  | 2                     | 18  |   |   |   |   |                          |  |
|   | 5.8                | 11.6                | 300 / 530               | 0.5                  | 2                     | 18  | PBSS301NZ   |   |   |   |                          |  |
|   | 6                  | 7                   | 280 / 440               | 0.5                  | 2                     | 20  |   |   |   | PBSS4612PA  |                          |  |
| 20  | 3                  | 5                   | 220 / 390               | 0.5                  | 2                     | 40  |   |   | PBSS4320X   |   |                          |  |
|   | 4                  | 15                  | 300 / 450               | 0.5                  | 2                     | 30  |   |   |   | PBSS301ND   |                          |  |
|   | 5                  | 10                  | 300 / 450               | 0.5                  | 2                     | 35  |   |   | PBSS4520X   |   |                          |  |
|   | 5.3                | 10.6                | 300 / 570               | 0.5                  | 2                     | 20  |   |   | PBSS302NX   |   |                          |  |
|   | 5.8                | 10.2                | 300 / 570               | 0.5                  | 2                     | 20  | PBSS302NZ   |   |   |   |                          |  |
|   | 6                  | 7                   | 280 / 440               | 0.5                  | 2                     | 20  |   |   |   |   | PBSS4620PA               |  |
|   | 7                  | 15                  | 300 / 550               | 0.5                  | 2                     | 12  |   |   | PBSS4021NX  |   |                          |  |
|   | 8                  | 20                  | 300 / 550               | 0.5                  | 2                     | 9   | PBSS4021NZ  |   |   |   |                          |  |
|   | 3                  | 5                   | 300 / 490               | 0.5                  | 2                     | 45  |   |   | PBSS4330X   |   |                          |  |
|   | 3                  | 5                   | 300 / 465               | 0.5                  | 2                     | 40  |   |   |   |   | PBSS4330PA               |  |
| 3.5   | 6                  | 300 / 500           | 0.5                     | 2                    | 70                    |   |   |   | PBSS4032ND <sup>3)</sup>  |   |                          |  |
| 4.7   | 10                 | 300 / 500           | 0.5                     | 2                    | 57                    |   |   |   | PBSS4032NX <sup>3)</sup>  |   |                          |  |
| 5.1   | 10.2               | 300 / 480           | 0.5                     | 2                    | 20                    |   |   |   | PBSS303NX   |   |                          |  |
| 5.4   | 10                 | 300 / 500           | 0.5                     | 2                    | 57                    | PBSS4032NZ <sup>3)</sup>  |   |   |   |   |                          |  |
| 5.5   | 11                 | 300 / 480           | 0.5                     | 2                    | 20                    | PBSS303NZ   |   |   |   |   |                          |  |
| 6   | 7                  | 280 / 450           | 0.5                     | 2                    | 21                    |   |   |   |   | PBSS4630PA  |                          |  |
| 2.0   | 3.0                | 300 / -             | 0.5                     | 5                    | 140                   |   |   |   | PBSS4240X   |   |                          |  |
| 40  | 4                  | 15                  | 300 / 520               | 0.5                  | 2                     | 35  |   |   |   | PBSS302ND   |                          |  |
|   |                    | 10                  | 300 / 500               | 0.5                  | 2                     | 21  |   |   | PBSS4540X   |   |                          |  |
|   | 5                  | 10                  | 300 / 500               | 0.5                  | 2                     | 25  | PBSS4540Z   |   |   |   |                          |  |
| 50  | 2                  | 5                   | 300 / -                 | 0.5                  | 2                     | 90 <sup>2)</sup>  |   |   | PBSS4250X   |   |                          |  |
|   |                    | 3.0                 | 5.0                     | 200 / 280            | 0.5                   | 2   | 65  |   |   | PBSS4350D   |                          |  |
|   |                    | 300 / 460           | 0.5                     | 2                    | 50                    |   |   | PBSS4350X   |   |   |                          |  |
|   |                    | 200 / 280           | 0.5                     | 2                    | 60 <sup>1)</sup>      | PBSS4350Z   |   |   |   |   |                          |  |
| 60  | 3                  | 6                   | 200 / 360               | 0.5                  | 5                     | 45  |   |   |   |   | PBSS4360PAS              |  |
|   |                    |                     | 200 / -                 | 0.5                  | 5                     | 45  | <b>PBSS4360Z</b>  |   |   |   |                          |  |
|   | 345 / 570          | 0.5                 | 2                       | 40                   |                       |   |   |   | PBSS303ND   |   |                          |  |
|   | 4.7                | 9.4                 | 300 / 520               | 0.5                  | 2                     | 25  |   |   | PBSS304NX   |   |                          |  |
|   | 5.2                | 10.4                | 300 / 520               | 0.5                  | 2                     | 25  | PBSS304NZ   |   |   |   |                          |  |
|   | 6                  | 7                   | 280 / 440               | 0.5                  | 2                     | 22  |   |   |   |   | PBSS4560PA               |  |
| 80  | 3                  | 6                   | 240 / 360               | 0.5                  | 2                     | 40  |   |   |   | PBSS304ND   |                          |  |
|   |                    |                     | 250 / 400               | 0.5                  | 2                     | 25  |   |   | PBSS4480X   |   |                          |  |
|   | 4.6                | 9.2                 | 300 / 470               | 0.5                  | 2                     | 25  |   |   | PBSS305NX   |   |                          |  |
|   | 5.1                | 10.2                | 300 / 470               | 0.5                  | 2                     | 25  | PBSS305NZ   |   |   |   |                          |  |
| 5.6   | 7                  | 270 / 425           | 0.5                     | 2                    | 25                    |   |   |   |   | PBSS4580PA  |                          |  |
| 100   |                    |                     | 150 / 290               | 0.25                 | 10                    | 75  |   |   |   | PBSS8110D   |                          |  |
|   |                    |                     | 150 / 290               | 0.25                 | 10                    | 73  |   |   |   | PBSS8110X   |                          |  |
|   |                    |                     | 150 / 290               | 0.25                 | 10                    | 73  | PBSS8110Z   |   |   |   |                          |  |
|   | 3                  | 4                   | 170 / 275               | 0.5                  | 2                     | 45  |   |   |   | PBSS305ND   |                          |  |
|   | 4.5                | 9                   | 200 / 330               | 0.5                  | 2                     | 27  |   |   | PBSS306NX   |   |                          |  |
| 5.1   | 10.2               | 200 / 330           | 0.5                     | 2                    | 27                    | PBSS306NZ   |   |   |   |   |                          |  |
| 5.2   | 6                  | 180 / 285           | 0.5                     | 2                    | 30                    |   |   |   |   | PBSS8510PA  |                          |  |

<sup>1)</sup> I<sub>C</sub> / I<sub>B</sub> = 20 <sup>2)</sup> V<sub>CEsat</sub> (max) <sup>3)</sup> Optimized for high-speed switching





### Nomenclature for high-power transistors



### Low $V_{CEsat}$ (BISS) transistors single NPN

| Package        |           | SOT23           | SOT323 (SC-70)    | SOT363 (SC-88)    | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B)                                   | DFN1010D-3 (SOT1215)     |
|----------------|-----------|-----------------|-------------------|-------------------|--------------------|--|--------------------------|
| Size (mm)      |           | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.0 x 0.6 x 0.48   | 1.0 x 0.6 x 0.37                                       | 1.1 x 1.0 x 0.37         |
| $P_{tot}$ (mW) |           | 480             | 350               | 430               | 250                | 250  | 750                      |
| $V_{CE0}$ (V)  | $I_c$ (A) | $I_{CM}$ (A)    | $h_{FE}$ min/typ  | @ $I_c$ (A)       | @ $V_{CE}$ (V)     | $V_{CEsat}$ typ (mV);<br>$I_c = 0.5$ A; $I_B = 0.05$ A |                          |
| 15             | 0.5       | 1               | 200 / 325         | 0.01              | 2                  | -  | PBSS2515M PBSS2515MB     |
| 20             | 1         | 3               | 350 / 470         | 0.1               | 2                  | 110 <sup>2)</sup>                                      | PBSS4120T                |
|                | 2         | 5               | 220 / 330         | 0.1               | 2                  | 45   | PBSS4320T                |
|                | 4.3       | 8               | 300 / 550         | 0.5               | 2                  | 21   | PBSS4021NT               |
| 30             | 1         | 1.5             | 230 / 380         | 0.5               | 2                  | 90   | PBSS4130QA               |
|                |           | 3               | 300 / 450         | 0.5               | 2                  | 120 <sup>2)</sup>                                      | PBSS4130T                |
|                | 2         | 3               | 300 / 450         | 0.5               | 2                  | 70   | PBSS4230T                |
|                |           |                 | 230 / 380         | 0.5               | 2                  | 75   | PBSS4230QA               |
|                | 2.6       | 5               | 300 / 500         | 0.5               | 2                  | 80   | PBSS4032NT <sup>3)</sup> |
| 40             | 0.5       | 1               | 200 / 550         | 0.01              | 2                  | 200 <sup>2)</sup>                                      | PBSS2540M PBSS2540MB     |
|                |           |                 | 300 / 440         | 0.5               | 5                  | 130  | PBSS4140U                |
|                | 2.0       |                 | 300 / 510         | 0.5               | 5                  | 120  | PMMT491A                 |
|                |           |                 | 300 / 420         | 0.5               | 5                  | 130  | PBSS4140T                |
|                | 3.0       |                 | 350 / 470         | 0.1               | 2                  | 70   | PBSS4240Y                |
|                |           |                 | 300 / 450         | 0.5               | 2                  | 70   | PBSS4240T                |
| 50             | 2         | 5               | 300 / 495         | 0.5               | 2                  | 60   | PBSS4350T                |
| 60             | 1.0       | 1.5             | 150 / 240         | 0.5               | 2                  | 90   | PBSS4160QA               |
|                |           |                 | 200 / 420         | 0.5               | 5                  | 120  | PBSS4160U                |
|                |           |                 | 200 / 350         | 0.5               | 5                  | 110  | PBSS4160T                |
|                | 2         | 3               | 150 / 240         | 0.5               | 2                  | 75   | PBSS4260QA               |
|                | 3.8       | 8               | 300 / 500         | 0.5               | 2                  | 29   | PBSS4041NT               |
| 100            | 1.0       | 3.0             | 150 / 400         | 0.25              | 10                 | 80   | PBSS8110Y                |
|                |           |                 | 150 / 300         | 0.25              | 10                 | 70   | PBSS8110T                |

<sup>1)</sup>  $I_c / I_B = 20$  <sup>2)</sup>  $V_{CEsat}$  (max) <sup>3)</sup> Optimized for high-speed switching

### Low $V_{CEsat}$ (BISS) transistors single PNP

| Package        |           | SOT23           | SOT323 (SC-70)    | SOT363 (SC-88)    | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B)                                   | DFN1010D-3 (SOT1215)     |
|----------------|-----------|-----------------|-------------------|-------------------|--------------------|--|--------------------------|
| Size (mm)      |           | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.0 x 0.6 x 0.48   | 1.0 x 0.6 x 0.37                                       | 1.1 x 1.0 x 0.37         |
| $P_{tot}$ (mW) |           | 480             | 350               | 430               | 250                | 250  | 750                      |
| $V_{CE0}$ (V)  | $I_c$ (A) | $I_{CM}$ (A)    | $h_{FE}$ min/typ  | @ $I_c$ (A)       | @ $V_{CE}$ (V)     | $V_{CEsat}$ typ (mV);<br>$I_c = 0.5$ A; $I_B = 0.05$ A |                          |
| 15             | 0.5       | 1               | 200 / 260         | 0.01              | 2                  | 150  | PBSS3515M PBSS3515MB     |
| 20             | 1         | 2               | 300 / 450         | 0.1               | 2                  | 125 <sup>2)</sup>                                      | PBSS5120T                |
|                |           | 3               | 225 / -           | 0.5               | 2                  | 80 <sup>2)</sup>                                       | PBSS5220T                |
|                |           | 5               | 220 / 420         | 0.5               | 2                  | 50   | PBSS5320T                |
|                | 3.5       | 8               | 250 / 400         | 0.5               | 2                  | 35   | PBSS4021PT               |
| 30             | 1         | 1.5             | 180 / 295         | 0.5               | 2                  | 85   | PBSS5130QA               |
|                |           |                 | 260 / 350         | 0.5               | 2                  | 110  | PBSS5130T                |
|                | 2         | 3               | 300 / 450         | 0.1               | 2                  | 70   | PBSS5230T                |
|                |           |                 | 180 / 295         | 0.5               | 2                  | 70   | PBSS5230QA               |
|                | 2.4       | 5               | 200 / 320         | 0.5               | 2                  | 95   | PBSS4032PT <sup>3)</sup> |
| 40             | 0.5       | 1               | 200 / 380         | 0.01              | 2                  | 220  | PBSS3540M PBSS3540MB     |
|                |           |                 | 300 / 520         | 0.1               | 5                  | 130  | PBSS5140U                |
|                | 1.0       | 2.0             | 300 / 800         | 0.1               | 5                  | 130  | PMMT591A                 |
|                |           |                 | 300 / 510         | 0.1               | 5                  | 130  | PBSS5140T                |
|                |           |                 | 300 / -           | 0.1               | 2                  | 110 <sup>2)</sup>                                      | PBSS5240Y                |
|                |           |                 | 300 / 450         | 0.1               | 2                  | 70   | PBSS5240T                |
| 50             | 2.0       | 3               | 200 / -           | 0.5               | 2                  | 90 <sup>2)</sup>                                       | PBSS5250T                |
|                |           |                 | 200 / 360         | 0.5               | 2                  | 55   | PBSS5350T                |
| 60             | 1.0       | 1.5             | 120 / 185         | 0.5               | 2                  | 125  | PBSS5160QA               |
|                |           |                 | 150 / 250         | 0.5               | 5                  | 135  | PBSS5160U                |
|                |           |                 | 150 / 250         | 0.5               | 5                  | 120  | PBSS5160T                |
|                | 1.7       | 2.5             | 120 / 185         | 0.5               | 2                  | 105  | PBSS5260QA               |
|                | 2.7       | 8               | 200 / 300         | 0.5               | 2                  | 49   | PBSS4041PT               |
| 100            | 1.0       | 3.0             | 150 / -           | 0.25              | 5                  | 93   | PBSS9110Y                |
|                |           |                 | 150 / 350         | 0.5               | 5                  | 95   | PBSS9110T                |

<sup>1)</sup>  $I_c / I_B = 20$  <sup>2)</sup>  $V_{CEsat}$  (max) <sup>3)</sup> Optimized for high-speed switching

#### In the spotlight

##### Low $V_{CEsat}$ transistors in DFN1010D-3: 2 A on 1.1 mm<sup>2</sup> footprint

High  $I_c$  performance on ultra-small footprint

$V_{CE}$  30 V and 60 V

Leadless DFN1010D-3 (SOT1215) SMD package with solderable sidepads (1.1 x 1.0 x 0.37)

AEC-Q101 qualified



## Low $V_{CEsat}$ (BISS) load switches

| Package        |           |   |                      | SOT457 (SC-74)    | SOT363 (SC-88)    |
|----------------|-----------|---|----------------------|-------------------|-------------------|
| Size (mm)      |           |   |                      | 2.9 x 1.5 x 1.0   | 2.0 x 1.25 x 0.95 |
| $P_{tot}$ (mW) |           |   |                      | 750 <sup>1)</sup> | 600 <sup>1)</sup> |
| $V_{CEO}$ (V)  | $I_C$ (A) | $V_{CEsat}$ max (mV); $I_C = 0.5$ A; $I_B = 0.05$ A | R1, R2 (k $\Omega$ ) |                   |                   |
| 15             | 0.5       | 250   | 2.2                  |                   | PBLS1501Y         |
|                |           |   | 4.7                  |                   | PBLS1502Y         |
|                |           |   | 10                   |                   | PBLS1503Y         |
|                |           |   | 22                   |                   | PBLS1504Y         |
| 20             | 1         | 150   | 2.2                  |                   | PBLS2001D         |
|                |           |   | 4.7                  |                   | PBLS2002D         |
|                |           |   | 10                   |                   | PBLS2003D         |
|                |           |   | 22                   |                   | PBLS2004D         |
|                | 1.8       | 70  | 2.2                  | PBLS2021D         |                   |
|                |           |   | 4.7                  | PBLS2022D         |                   |
|                |           |   | 10                   | PBLS2023D         |                   |
|                |           |   | 22                   | PBLS2024D         |                   |
| 40             | 0.5       | 350   | 2.2                  |                   | PBLS4001Y         |
|                |           |   | 4.7                  |                   | PBLS4002Y         |
|                |           |   | 10                   |                   | PBLS4003Y         |
|                |           |   | 22                   |                   | PBLS4004Y         |
|                |           |   | 47                   |                   | PBLS4005Y         |
|                | 1         | 170   | 2.2                  |                   | PBLS4001D         |
|                |           |   | 4.7                  |                   | PBLS4002D         |
|                |           |   | 10                   |                   | PBLS4003D         |
|                |           |   | 22                   |                   | PBLS4004D         |
|                |           |   | 47                   |                   | PBLS4005D         |
| 60             | 1         | 180   | 2.2                  |                   | PBLS6001D         |
|                |           |   | 4.7                  |                   | PBLS6002D         |
|                |           |   | 10                   |                   | PBLS6003D         |
|                |           |   | 22                   |                   | PBLS6004D         |
|                |           |   | 47                   |                   | PBLS6005D         |
|                | 1.5       | 100   | 2.2                  | PBLS6021D         |                   |
|                |           |   | 4.7                  | PBLS6022D         |                   |
|                |           |   | 10                   | PBLS6023D         |                   |
|                |           |   | 22                   | PBLS6024D         |                   |

<sup>1)</sup> Device mounted on a ceramic PCB, Al<sub>2</sub>O<sub>3</sub>, standard footprint

<sup>2)</sup> Device mounted on an FR4 PCB, single-sided copper, tin-plated, and standard footprint

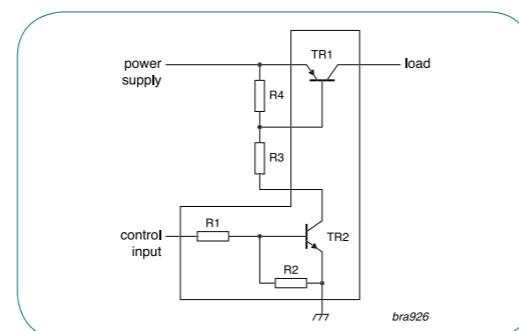
### Key features and benefits

- ▶ Very small input current drives high load current
- ▶ High efficiency and low-voltage drop due to low  $V_{CEsat}$  (BISS) pass transistor
- ▶ Replaces expensive P-MOSFETs
- ▶ Inherent reverse-current blocking
- ▶ Automotive qualified according to AEC-Q101

### Key applications

- ▶ Fan driver
- ▶ Battery-charge switch
- ▶ Supply-line switch
- ▶ High-side load

### Low $V_{CEsat}$ (BISS) load switch – the optimal choice for supply-line and high-side switches

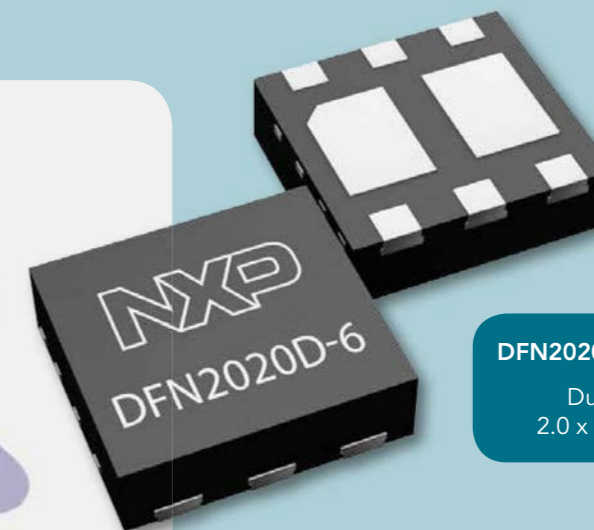
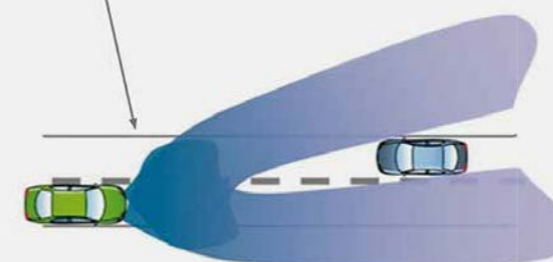


## DFN2020D-6 with solderable sidepads

Application example: LED lighting in automotive

### Matrix light sketch

LEDs can be selectively controlled to shape the front beam



DFN2020D-6 (SOT1118D)

Dual package  
2.0 x 2.0 x 0.62 mm

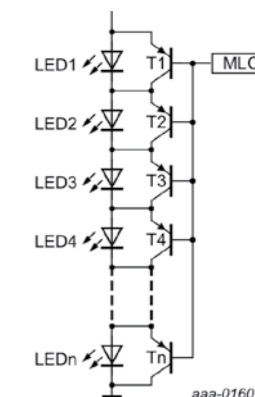
### PBSS5160PAPS in DFN2020D-6

- ▶ Industry's first low  $V_{CEsat}$  transistor in DFN2020 with 100% solderable sidepads, AOI suitable
- ▶ Enables individual dimming in the LED front light matrix solution
- ▶ Saves PCB space by replacing two DFN2020D-3 or two SOT89 packages
- ▶ Ideal solution for multilayer PCB designs

### Key package benefits

- ▶ AEC-Q101 qualified
- ▶ Suitable for AOI of solder joints
- ▶ Exposed heat sink for excellent thermal and electrical conductivity
- ▶ Package size of only 2 x 2 mm and a height of only 0.62 mm
- ▶ Single version available in DFN2020D-3
- ▶ DFN2020 is an approved and widely available package platform

### Dimming transistor application



### Low $V_{CEsat}$ double transistors portfolio on DFN2020D-6

types in **bold** represent new products

| $V_{CEO}$ (V) | $I_C$ (A) | Polarity  | $h_{FE}$ min | @ $I_C$ (A) | @ $V_{CE}$ (V) | $V_{CEsat}$ typ (mV); $I_C = 0.5$ A; $I_B = 0.05$ A | Product              |
|---------------|-----------|-----------|--------------|-------------|----------------|---|----------------------|
| 20            | 2         | NPN / NPN | 230          | 0.5         | 2              | 60  | PBSS4220PANS         |
|               |           | PNP / PNP | 210          | 0.5         | 2              | 70  | <b>PBSS5220PAPS</b>  |
| 60            | 1         | NPN / NPN | 150          | 0.5         | 2              | 90  | PBSS4160PANS         |
|               |           | PNP / PNP | 120          | 0.5         | 2              | 125   | PBSS5160PAPS         |
| 60            | 2         | NPN / NPN | 150 / 120    | 0.5         | 2              | 90 / 125  | PBSS4160PANPS        |
|               |           | PNP / PNP | 210          | 0.5         | 2              | 70  | <b>PBSS4260PANS</b>  |
| 60            | 2         | PNP / PNP | 140          | 0.5         | 2              | 100   | <b>PBSS5260PAPS</b>  |
|               |           | NPN / PNP | 210 / 140    | 0.5         | 2              | 70 / 100  | <b>PBSS4260PANPS</b> |

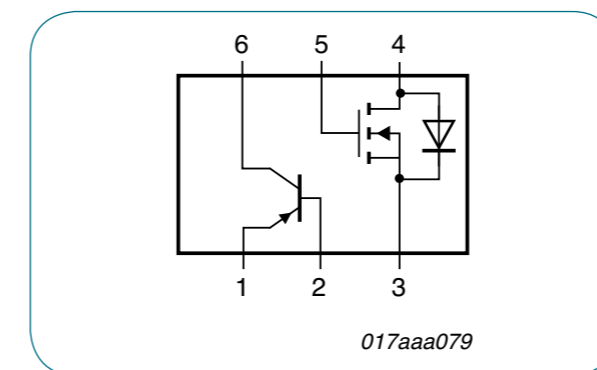
### High-voltage low $V_{CEsat}$ (BISS) transistors

types in **bold** represent new products

| Package               |                      |                    | SOT223 (SC-73)   | SOT89 (SC-62)   | SOT1215           | SOT23           |
|-----------------------|----------------------|--------------------|------------------|-----------------|-------------------|-----------------|
| Size (mm)             |                      |                    | 6.5 x 3.5 x 1.65 | 4.5 x 2.5 x 1.5 | 1.1 x 1.0 x 0.37  | 2.9 x 1.3 x 1.0 |
| P <sub>tot</sub> (mW) |                      |                    | 1700             | 1300            | 750               | 250             |
| Polarity              | V <sub>CEO</sub> (V) | I <sub>C</sub> (A) |                  |                 |                   |                 |
| NPN                   | 150                  | 0.5                |                  |                 | <b>PBHV8115QA</b> |                 |
|                       |                      | 1                  | PBHV8115Z        | PBHV8115X       |                   | PBHV8115T       |
|                       |                      | 2                  | PBHV8215Z        |                 |                   |                 |
|                       | 180                  | 1                  |                  |                 |                   | PBHV8118T       |
|                       |                      | 400                | 0.5              | PBHV8540Z       | PBHV8540X         |                 |
|                       | 500                  | 1                  | PBHV8140Z        |                 |                   |                 |
| PNP                   | 140                  | 0.5                |                  |                 | <b>PBHV9115QA</b> |                 |
|                       |                      | 1                  | PBHV9115Z        | PBHV9115X       |                   | PBHV9115T       |
|                       | 150                  | 2                  | PBHV9215Z        |                 |                   |                 |
|                       |                      | 0.5                | PBHV9560Z        |                 |                   |                 |
|                       | 600                  | 0.1                | PBHV3160Z        |                 |                   |                 |
|                       |                      | 0.25               | PBHV9040Z        | PBHV9040X       |                   | PBHV9040T       |
|                       | 400                  | 0.5                | PBHV9540Z        |                 |                   |                 |
|                       |                      | 0.15               | PBHV3160Z        |                 |                   | PBHV9050T       |
|                       | 500                  | 0.25               | PBHV9050Z        |                 |                   |                 |
|                       |                      |                    |                  |                 |                   |                 |

### Low $V_{CEsat}$ (BISS) transistor PNP – N-channel MOSFET combination

| Package               |                    |                     |                     |                       |                       |                             |                     |                     |                    |                            | DFN2020-6 (SOT1118) |
|-----------------------|--------------------|---------------------|---------------------|-----------------------|-----------------------|-----------------------------|---------------------|---------------------|--------------------|----------------------------|---------------------|
| Size (mm)             |                    |                     |                     |                       |                       |                             |                     |                     |                    |                            | 2.0 x 2.0 x 0.62    |
| P <sub>tot</sub> (mW) |                    |                     |                     |                       |                       |                             |                     |                     |                    |                            | 1300                |
| V <sub>CEO</sub> (V)  | I <sub>C</sub> (A) | h <sub>FE min</sub> | h <sub>FE max</sub> | @ I <sub>C</sub> (mA) | @ V <sub>CE</sub> (V) | R <sub>CEsat</sub> typ (mΩ) | V <sub>DS</sub> (V) | V <sub>GS</sub> (V) | I <sub>D</sub> (A) | R <sub>Dson</sub> typ (mΩ) |                     |
| 40                    | 2                  | 300                 | 800                 | 100                   | 5                     | 240                         | 30                  | 0.7                 | 0.66               | 390                        | PBSM5240PF          |
|                       |                    | 100                 | -                   | 100                   | 5                     | 240                         | 30                  | 0.7                 | 0.66               | 390                        | PBSM5240PFH         |



Combination of low  $V_{CEsat}$  transistor with N-channel MOSFET in the very small and ultrathin leadless package DFN2020-6 (SOT1118)

In the spotlight

#### High-voltage low $V_{CEsat}$ (BISS) transistors in SOT223, SOT23 & SOT89

- Voltage V<sub>CEO</sub> up to 600 V
- Current I<sub>C</sub> up to 4 A (continuous), 10 A (peak)
- V<sub>CEsat</sub> down to 33 mV
- AEC-Q101 qualified
- New high-voltage low V<sub>CEsat</sub> (BISS) in DFN1010D-3



### Low $V_{CEsat}$ (BISS) RETs

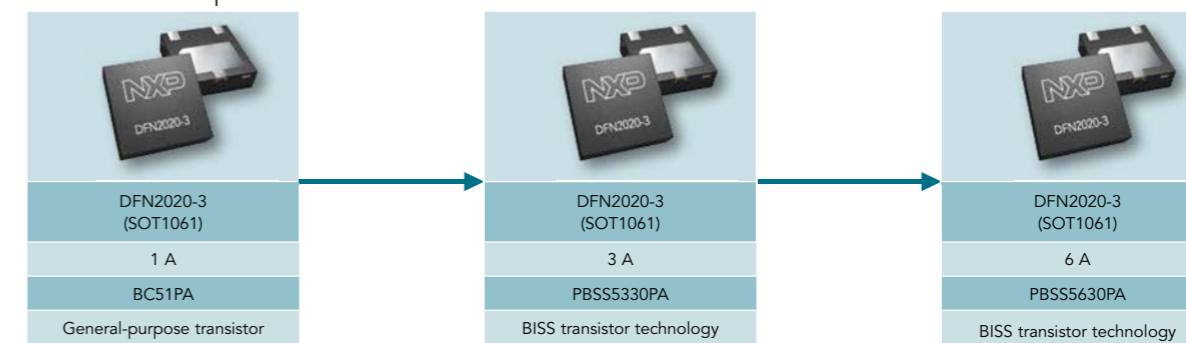
| Package               |                     |         |         |         |           | SOT23           |  |
|-----------------------|---------------------|---------|---------|---------|-----------|-----------------|--|
| Size (mm)             |                     |         |         |         |           | 2.9 x 1.3 x 1.0 |  |
| P <sub>tot</sub> (mW) |                     |         |         |         |           | 250             |  |
| V <sub>CEO</sub> (V)  | I <sub>C</sub> (mA) | R1 = R2 | R1 (kΩ) | R2 (kΩ) | NPN       | PNP             |  |
| 40                    | 600                 | R1 = R2 | 1       | 1       | PBRN113ET | PBRP113ET       |  |
|                       |                     |         | 2.2     | 2.2     | PBRN123ET | PBRP123ET       |  |
|                       |                     | R1 ≠ R2 | 1       | 10      | PBRN113ZT | PBRP113ZT       |  |
|                       |                     |         | 2.2     | 10      | PBRN123YT | PBRP123YT       |  |

### Advantages of low $V_{CEsat}$ (BISS) technology

Our BISS (Breakthrough In Small-Signal) transistors show lowest  $V_{CEsat}$  values due to an innovative mesh-emitter technology and further technology improvement. They also reduce board space due to improved collector-current capabilities as shown below.

#### Improved collector-current capabilities

▶ 17.87 mm<sup>2</sup> footprint



Resistor-equipped transistors (RETs)

RETs 100 mA single - Part 1

Table with columns: Package, Size (mm), Ptot (mW), VCE0 (V), IC (mA), Configuration, R1 (kΩ), R2 (kΩ), NPN, PNP, NPN, PNP. Rows list various transistor models like PDTC123ET, PDTC143ET, etc.

Resistor-equipped transistors (RETs)

RETs 100 mA double

types in bold represent new products

Table with columns: Package, Size (mm), Ptot (mW), VCE0 (V), IC (mA), Configuration, R1 (kΩ), R2 (kΩ), NPN / NPN, NPN / PNP, PNP / PNP, PNP / PNP, PNP / PNP, PNP / PNP, PNP / PNP. Rows list double-transistor models like PQMH11, PQMD3, etc.

RETs 100 mA single - Part 2

types in bold represent new products

Table with columns: Package, Size (mm), Ptot (mW), VCE0 (V), IC (mA), Configuration, R1 (kΩ), R2 (kΩ), NPN, PNP, NPN, PNP, NPN, PNP. Rows list various transistor models like PDTC123EM, PDTC143EM, etc.

RETs 500 mA

types in bold represent new products

Table with columns: Package, Size (mm), Ptot (mW), VCE0 (V), IC (mA), Configuration, R1 (kΩ), R2 (kΩ), NPN / NPN, NPN / PNP, NPN, PNP, NPN, PNP, NPN, PNP. Rows list high-current transistor models like PDTD113ET, PDTD123ET, etc.



### Medium-power general-purpose transistors

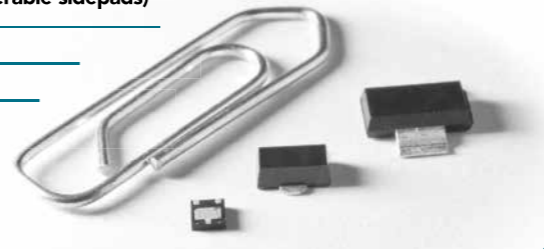
| Package               |                      |                    |                     |                     |                                       | SOT223 (SC-73)    | SOT89 (SC-62)     | DFN2020-3 (SOT1061)            | DFN2020D-3 (SOT1061D)              |
|-----------------------|----------------------|--------------------|---------------------|---------------------|---------------------------------------|-------------------|-------------------|--------------------------------|------------------------------------|
| Size (mm)             |                      |                    |                     |                     |                                       | 6.5 x 3.5 x 1.65  | 4.5 x 2.5 x 1.5   | 2.0 x 2.0 x 0.62               | 2.0 x 2.0 x 0.62                   |
| P <sub>tot</sub> (mW) |                      |                    |                     |                     |                                       | 1700              | 1300              | 1300                           | 1300                               |
| Polarity              | V <sub>CEO</sub> (V) | I <sub>C</sub> (A) | h <sub>FE</sub> min | h <sub>FE</sub> max | f <sub>T</sub> min (MHz)              |                   |                   |                                |                                    |
| NPN                   | 20                   | 2                  | 85 - 160            | 375                 | 40                                    | BCP68 / -25       | BC868 / -25       | BC68PA / BC68-25PA             | BC68PAS / BC68-25PAS               |
|                       | 45                   | 1                  | 63 - 100            | 160 - 250           | 100                                   | BCP54 / -10 / -16 | BCX54 / -10 / -16 | BC54PA / BC54-10PA / BC54-16PA | BC54PAS / BC54-10PAS / BC54-16PAS  |
|                       | 60                   | 1                  | 63 - 100            | 160 - 250           | 100                                   | BCP55 / -10 / -16 | BCX55 / -10 / -16 | BC55PA / BC55-10PA / BC55-16PA | BC55PAS / BC55-10PAS / BC55-16PAS  |
|                       | 80                   | 1                  | 63 - 100            | 160 - 250           | 100                                   | BSP41             | BSR41             |                                |                                    |
| PNP                   | 20                   | 2                  | 85 - 160            | 250 - 375           | 40                                    | BCP69 / -16 / -25 | BC869 / -16 / -25 | BC69PA / BC69-16PA / BC69-25PA | BC69PAS / BC569-16PAS / BC69-25PAS |
|                       | 45                   | 1                  | 63 - 100            | 160 - 250           | 115 <sup>1)</sup> - 145 <sup>1)</sup> | BCP51 / -10 / -16 | BCX51 / -10 / -16 | BC51PA / BC51-10PA / BC51-16PA | BC51PAS / BC51-10PAS / BC51-16PAS  |
|                       | 60                   | 1                  | 63 - 100            | 160 - 250           | 100                                   | BCP52 / -10 / -16 | BCX52 / -10 / -16 | BC52PA / BC52-10PA / BC52-16PA | BC52PAS / BC52-10PAS / BC52-16PAS  |
|                       | 80                   | 1                  | 63 - 100            | 160 - 250           | 115 <sup>1)</sup> - 145 <sup>1)</sup> | BCP53 / -10 / -16 | BCX53 / -10 / -16 | BC53PA / BC53-10PA / BC53-16PA | BC53PAS / BC53-10PAS / BC53-16PAS  |

<sup>1)</sup> Typical value

In the spotlight

#### Medium-power transistors in DFN2020-3 and DFN2020D-3 (with solderable sidepads)

- Excellent electrical performance on a small 2 x 2 mm footprint
- 80% board space reduction (DFN2020 vs. SOT89)
- 100% solderable sidepads (DFN2020D-3)
- V<sub>CEO</sub> ranging from 20 V to 80 V
- High collector-current capability I<sub>C</sub> up to 2 A
- AEC-Q101 qualified



### High-voltage transistors

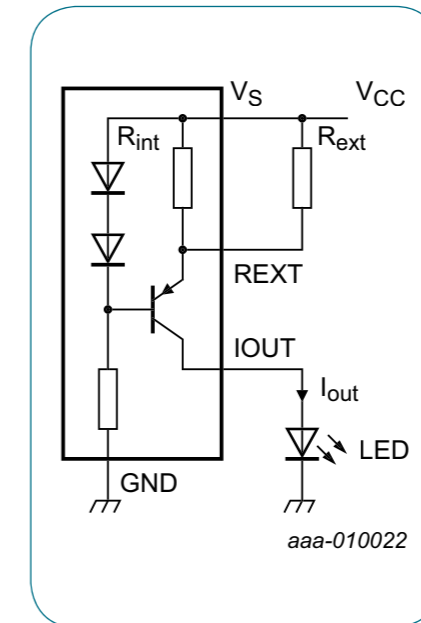
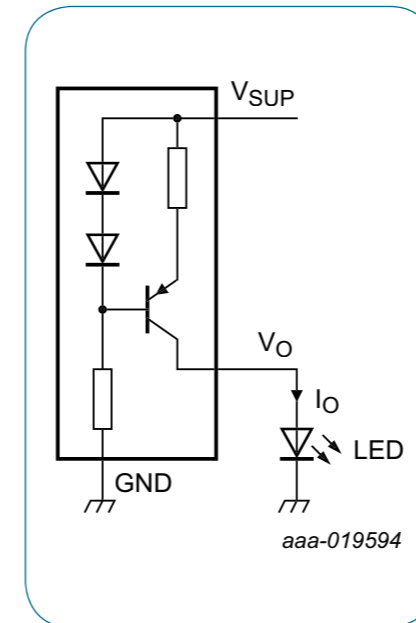
| Package               |                      |                     |                     |                     |                          | SOT223 (SC-73)   | SOT89 (SC-62)   | SOT457 (SC-74)  | SOT23             | SOT323 (SC-70)    |
|-----------------------|----------------------|---------------------|---------------------|---------------------|--------------------------|------------------|-----------------|-----------------|-------------------|-------------------|
| Size (mm)             |                      |                     |                     |                     |                          | 6.5 x 3.5 x 1.65 | 4.5 x 2.5 x 1.5 | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0   | 2.0 x 1.25 x 0.95 |
| P <sub>tot</sub> (mW) |                      |                     |                     |                     |                          | 1700             | 1300            | 750             | 250               | 200               |
| Polarity              | V <sub>CEO</sub> (V) | I <sub>C</sub> (mA) | h <sub>FE</sub> min | h <sub>FE</sub> max | f <sub>T</sub> min (MHz) |                  |                 |                 |                   |                   |
| NPN                   | 80                   | 100                 | 20                  | -                   | 60                       |                  |                 |                 | BSS64             |                   |
|                       | 140                  | 300                 | 60                  | 250                 | 100                      |                  |                 |                 | PMBT5550          | PMST5550          |
|                       | 160                  | 300                 | 80                  | 250                 | 100                      |                  |                 |                 | PMBT5551 / BSR19A | PMST5551          |
|                       | 250                  | 100                 | 50                  | -                   | 60                       | BF722            | BF622           |                 | BF822             |                   |
|                       | 300                  | 100                 | 50                  | -                   | 60                       | BF720            | BF620           |                 | BF820             | BF820W            |
|                       | 350                  | 100                 | 40                  | -                   | 70                       | PZTA42           | PXTA42          |                 | PMBTA42           | PMSTA42           |
| PNP                   | 400                  | 300                 | 50                  | 200                 | 20                       | BSP19            | BST39           |                 |                   |                   |
|                       | 100                  | 100                 | 30                  | -                   | 50                       | PZTA44           |                 |                 | PMBTA44           |                   |
|                       | 250                  | 100                 | 50                  | -                   | 60                       | BF723            |                 |                 | BSS63             |                   |
|                       | 300                  | 100                 | 50                  | -                   | 60                       |                  | BF623           |                 | BF823             |                   |
| 2 x NPN               | 40                   | 100                 | 40                  | -                   | 50                       |                  |                 |                 | BF821             |                   |
|                       |                      |                     |                     |                     |                          | PZTA92           | PXTA92          |                 | PMBTA92           | PMSTA92           |
|                       |                      |                     |                     |                     |                          |                  |                 | PMBTA42DS       |                   |                   |

For high-voltage transistors with increased performance please refer to our high-voltage low V<sub>CEsat</sub> (BISS) transistor portfolio on page 18.

### LED driver

| Package                           |  | SOT457                                       | SOT23           |
|-----------------------------------|--|--|-----------------|
| Size (mm)                         |  | 2.9 x 1.5 x 1.0                              | 2.9 x 1.3 x 1.0 |
| P <sub>tot</sub> (mW)             |  | 750  | 480             |
| V <sub>s</sub> supply voltage [V] |  | LED drive current [mA] @ V <sub>s</sub> =10V |                 |
| 18                                |  | 10   | NCR401T         |
|                                   |  | 20   | NCR402T         |
| 40                                |  | 10   | NCR401U         |
|                                   |  | 20   | NCR402U         |
|                                   |  | 50   | NCR405U         |

#### Voltage reference for SOT457



#### Key features and benefits

- ▶ Single-chip constant-current source with reduced component count
- ▶ Very small footprint for smaller designs

#### Key applications

- ▶ Constant-current LED driver
- ▶ Generic constant-current source
- ▶ Active bias control for audio amplifiers

### Constant-current source

| Package               |                        |                         |                                   |                                   |                                   | SOT353 (SC-88A)   |
|-----------------------|------------------------|-------------------------|-----------------------------------|-----------------------------------|-----------------------------------|-------------------|
| Size (mm)             |                        |                         |                                   |                                   |                                   | 2.0 x 1.25 x 0.95 |
| P <sub>tot</sub> (mW) |                        |                         |                                   |                                   |                                   | 335               |
| Type                  |                        |                         |                                   |                                   |                                   | PSS12021SAY       |
| Description           | maximum supply voltage | maximum supply current  | typical stabilized output current | minimum stabilized output current | maximum stabilized output current |                   |
| Parameter             | V <sub>s</sub> max (V) | I <sub>s</sub> max (mA) | I <sub>out</sub> typ (µA)         | I <sub>out</sub> min (mA)         | I <sub>out</sub> max (mA)         |                   |
| Value                 | 75                     | 2.2                     | 15                                | 0.015                             | 50                                |                   |

### Darlington transistors

| Package               |                      |                     |                     |                          | SOT223 (SC-73)   | SOT89 (SC-62)   | SOT23           |       |
|-----------------------|----------------------|---------------------|---------------------|--------------------------|------------------|-----------------|-----------------|-------|
| Size (mm)             |                      |                     |                     |                          | 6.5 x 3.5 x 1.65 | 4.5 x 2.5 x 1.5 | 2.9 x 1.3 x 1.0 |       |
| P <sub>tot</sub> (mW) |                      |                     |                     |                          | 1700             | 1300            | 250             |       |
| Polarity              | V <sub>CE0</sub> (V) | I <sub>C</sub> (mA) | h <sub>FE</sub> min | f <sub>T</sub> min (MHz) |                  |                 |                 |       |
| NPN                   | 30                   | 500                 | 10000               | 125                      |                  |                 | PMBTA13         |       |
|                       |                      |                     | 20000               |                          | PZTA14           | PXTA14          | PMBTA14         |       |
|                       |                      |                     | 220                 |                          | BCV29            | BCV27           |                 |       |
|                       | 45                   | 1000                | 2000                | 200                      |                  | BSP50           | BST50           |       |
|                       |                      |                     | 10000               | 220                      |                  |                 | BCV49           | BCV47 |
|                       |                      |                     | 2000                | 200                      |                  | BSP51           | BST51           |       |
| 60                    | 500                  | 10000               | 220                 |                          |                  |                 |                 |       |
|                       |                      | 2000                | 200                 |                          | BSP52            | BST52           |                 |       |
| PNP                   | 30                   | 500                 | 20000               | 125                      |                  |                 | PMBTA64         |       |
|                       |                      |                     | 220                 |                          |                  |                 | BCV28           | BCV26 |
|                       |                      |                     | 200                 | 200                      |                  | BSP60           | BST60           |       |
|                       | 45                   | 1000                | 2000                | 200                      |                  |                 |                 |       |
|                       |                      |                     | 10000               | 220                      |                  |                 | BCV48           | BCV46 |
|                       |                      |                     | 2000                | 200                      |                  | BSP61           | BST61           |       |
| 60                    | 500                  | 10000               | 220                 |                          |                  |                 |                 |       |
|                       |                      | 2000                | 200                 |                          | BSP62            | BST62           |                 |       |

### Schmitt triggers

| Package               |                          |                          |                     |                     |                     |                             | SOT143B         |
|-----------------------|--------------------------|--------------------------|---------------------|---------------------|---------------------|-----------------------------|-----------------|
| Size (mm)             |                          |                          |                     |                     |                     |                             | 2.9 x 1.3 x 1.0 |
| P <sub>tot</sub> (mW) |                          |                          |                     |                     |                     |                             | 250             |
| Polarity              | V <sub>CE0</sub> (V) TR1 | V <sub>CE0</sub> (V) TR2 | I <sub>C</sub> (mA) | h <sub>FE</sub> min | h <sub>FE</sub> max | V <sub>CEsat</sub> typ (mV) |                 |
| NPN                   | 30                       | 6                        | 100                 | 110                 | 800                 | 250                         | BCV63 / B       |
| PNP                   | 30                       | 6                        | 100                 | 220                 | 475                 | 250                         | BCV64B          |

### Low-noise transistors

| Package               |                      |                     |                       |                     |                     |                          | SOT23           | SOT323 (SC-70)    |
|-----------------------|----------------------|---------------------|-----------------------|---------------------|---------------------|--------------------------|-----------------|-------------------|
| Size (mm)             |                      |                     |                       |                     |                     |                          | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 |
| P <sub>tot</sub> (mW) |                      |                     |                       |                     |                     |                          | 250             | 200               |
| Polarity              | V <sub>CE0</sub> (V) | I <sub>C</sub> (mA) | Noise figure max (dB) | h <sub>FE</sub> min | h <sub>FE</sub> max | f <sub>T</sub> min (MHz) |                 |                   |
| NPN                   | 30                   | 100                 | 4                     | 200                 | 450                 | 100                      | BC849B          | BC849BW           |
|                       |                      |                     |                       | 420                 | 800                 | 100                      | BC849C          | BC849CW           |
|                       | 45                   | 100                 | 4                     | 200                 | 450                 | 100                      | BC850B          | BC850BW           |
|                       |                      |                     |                       | 420                 | 800                 | 100                      | BC850C          | BC850CW           |
| PNP                   | 30                   | 100                 | 4                     | 220                 | 475                 | 100                      | BC859B          | BC859BW           |
|                       |                      |                     |                       | 420                 | 800                 | 100                      | BC859C          | BC859CW           |
|                       | 45                   | 100                 | 4                     | 220                 | 475                 | 100                      | BC860B          | BC860BW           |
|                       |                      |                     |                       | 420                 | 800                 | 100                      | BC860C          | BC860CW           |

### Matched-pair transistors

types in **bold** represent new products

| Package               |                      |                     |                     |                     |                                    |  |                           | SOT143B         | SOT457 (SC-74)  | SOT353 (SC-88A)   | SOT363 (SC-88)    | SOT666           | LFPK56D (SOT1205) |              |
|-----------------------|----------------------|---------------------|---------------------|---------------------|------------------------------------|--|---------------------------|-----------------|-----------------|-------------------|-------------------|------------------|-------------------|--------------|
| Size (mm)             |                      |                     |                     |                     |                                    |  |                           | 2.9 x 1.3 x 1.0 | 2.9 x 1.5 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.6 x 1.2 x 0.55 | 5 x 6 x 1.1       |              |
| P <sub>tot</sub> (mW) |                      |                     |                     |                     |                                    |  |                           | 250             | 750             | 300               | 300               | 300              | 1250              |              |
| Polarity              | V <sub>CE0</sub> (V) | I <sub>C</sub> (mA) | h <sub>FE</sub> min | h <sub>FE</sub> max | h <sub>FE1</sub> /h <sub>FE2</sub> | V <sub>BE1</sub> - V <sub>BE2</sub> (mV) |                           |                 |                 |                   |                   |                  |                   |              |
| NPN                   | 30                   | 100                 | 110                 | 800                 | 0.7 <sup>1)</sup>                  | n.a.                                     | BCV61/A/B/C <sup>1)</sup> |                 |                 |                   |                   |                  |                   |              |
|                       |                      |                     |                     |                     |                                    | n.a.                                     | BCM61B <sup>1)</sup>      |                 |                 |                   |                   |                  |                   |              |
|                       |                      |                     |                     |                     |                                    | 2  |                           | BCM847DS        |                 | BCM847BS          |                   | BCM847BV         |                   |              |
|                       | 45                   | 100                 | 200                 | 450                 | 0.9 <sup>1)</sup>                  | 2  |                           |                 |                 |                   |                   |                  |                   |              |
|                       |                      |                     |                     |                     |                                    | 0.95                                     |                           |                 | PMP4501G        |                   | PMP4501Y          |                  | PMP4501V          |              |
|                       |                      |                     |                     |                     |                                    | 0.98                                     | 2                         |                 | PMP4201G        |                   | PMP4201Y          |                  | PMP4201V          |              |
| 65                    | 100                  | 200                 | 450                 | 0.9                 | 2                                  |  |                           |                 | BCM846BS        |                   |                   |                  |                   |              |
|                       |                      |                     |                     |                     | 0.95                               | n.a.                                     |                           |                 |                 |                   |                   |                  | PHPT610035NK      |              |
| Configuration         |                      |                     |                     |                     |                                    |  |                           |                 |                 |                   |                   |                  |                   |              |
| PNP                   | 30                   | 100                 | 100                 | 800                 | 0.7 <sup>1)</sup>                  | n.a.                                     | BCV62/A/B/C <sup>1)</sup> |                 |                 |                   |                   |                  |                   |              |
|                       |                      |                     |                     |                     |                                    | n.a.                                     | BCM62B <sup>1)</sup>      |                 |                 |                   |                   |                  |                   |              |
|                       |                      |                     |                     |                     |                                    | 2  |                           | BCM857DS        |                 | BCM857BS          |                   | BCM857BV         |                   |              |
|                       | 45                   | 100                 | 200                 | 450                 | 0.95                               | 2  |                           |                 |                 |                   |                   |                  |                   |              |
|                       |                      |                     |                     |                     |                                    | 0.98                                     | 2                         |                 |                 | PMP5501G          |                   | PMP5501Y         |                   | PMP5501V     |
|                       |                      |                     |                     |                     |                                    | 0.9                                      | 2                         |                 |                 | PMP5201G          |                   | PMP5201Y         |                   | PMP5201V     |
| 65                    | 100                  | 200                 | 450                 | 0.9                 | 2                                  |  |                           |                 | BCM856DS        |                   | BCM856BS          |                  |                   |              |
|                       |                      |                     |                     |                     | 0.9                                | n.a.                                     |                           |                 |                 |                   |                   |                  |                   | PHPT610035PK |
| Configuration         |                      |                     |                     |                     |                                    |  |                           |                 |                 |                   |                   |                  |                   |              |

<sup>1)</sup> I<sub>C1</sub> / I<sub>E2</sub>

#### In the spotlight

#### New transistors in LFPK56D (SOT1205) power package

- High thermal power dissipation up to 3 W
- V<sub>ce0</sub> up to 100 V
- All types AECQ-101 qualified
- 2 types with current gain matching of 5% and 10%
- Reduced PCB size requirements
- High-temperature applications up to 175 °C
- For LED lighting, motor drive, linear regulators, backlight units, PowerMOS, and IGBT drive



#### Key features

- ▶ Current gain matching to 2, 5, or 10%
- ▶ Base-emitter voltage matching to 2 mV
- ▶ Choice of standard double transistor pinout or application-optimized pinout
- ▶ Common-emitter configuration for 5-pin type
- ▶ Range of small, very small, and ultra-small packages

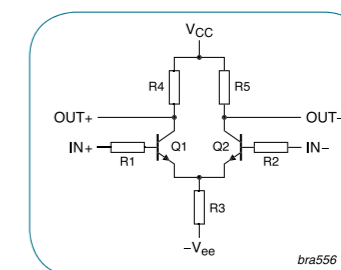
#### Key benefits

- ▶ Improved performance of current mirror and differential amplifier circuits
- ▶ Drop-in replacement for standard double transistors (BCM series)
- ▶ Simplified board layout (PMP series)
- ▶ Eliminates the need for costly additional trimming

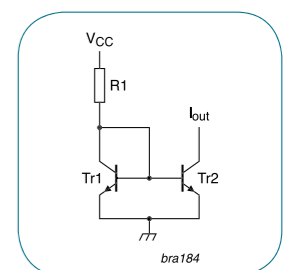
#### Key applications

- ▶ Current mirrors
- ▶ Differential and instrumentation amplifiers
- ▶ Logarithmic amplifiers
- ▶ Comparators


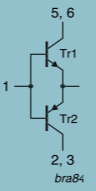

#### Differential amplifier



#### Current mirror



## MOSFET driver

| $V_{CE0}$ (V) | $I_c$ (A) | $I_{cm}$ [A] | Type     | Package  | Remark  | Configuration   |
|---------------|-----------|--------------|----------|--|---|---|
| 30            | 0.1       | 0.2          | BCV65    | SOT143B<br> | General-purpose transistors                     |  |
| 40            | 0.6       | 1            | PMD2001D | SOT457<br>  | Switching transistors with reduced storage time |   |
|               | 1         | 2            | PMD3001D |  | Low $V_{CEsat}$                                 |   |

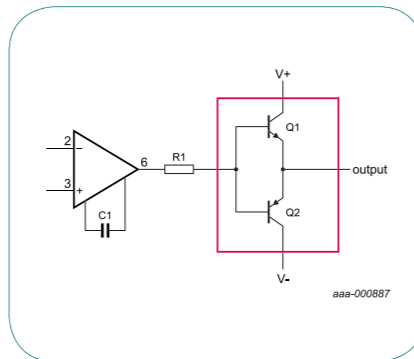
### Key features and benefits

- ▶ Three different configurations
- ▶ Types available with standard, switching, and low  $V_{CEsat}$  (BISS) transistors
- ▶ Small footprint

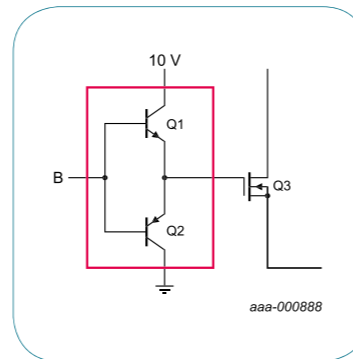
### Key applications

- ▶ Power management
  - (Half) bridge push-pull driver
  - Isolated DC/DC converters
  - Secondary synchronous rectification
- ▶ Peripheral driver
  - (Half) bridge push-pull driver
  - Motor driver
  - Brushless DC motor driver
  - Op-amp output current booster



#### Op-amp booster



#### MOSFET driver for faster switching, lower losses



## Medium-frequency transistors

|                |               |            |              |              |                 | SOT23   | SOT323 (SC-70)  |
|----------------|---------------|------------|--------------|--------------|-----------------|---|---|
| Package        |               |            |              |              |                 |  |  |
| Size (mm)      |               |            |              |              |                 | 2.9 x 1.3 x 1.0   | 2.0 x 1.25 x 0.95   |
| $P_{tot}$ (mW) |               |            |              |              |                 | 250   | 200   |
| Polarity       | $V_{CE0}$ (V) | $I_c$ (mA) | $h_{FE}$ min | $h_{FE}$ max | $f_T$ typ (MHz) |   |   |
| NPN            | 15            | 100        | 40           | -            | 500             | BF570   |   |
|                | 20            | 25         |              | 85           | >275            | BF520   | BFS20W  |
|                |               | 30         | 65           | 225          | 260             | BF519   |   |
|                |               | 40         | 25           | 67           | 220             | 380   | BF840   |
| PNP            | 30            | 25         | 25           | 50           | 250             | BF824   | BF824W  |
|                | 40            |            | 50           | -            | >325            | BF550   |   |



## Diodes

### Schottky barrier diodes and rectifiers

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# What you get when you choose NXP for diodes and rectifiers

## A comprehensive portfolio for all kind of applications

NXP is continually innovating parts by reducing power consumption and size while boosting performance and reliability

## A broad range of packages

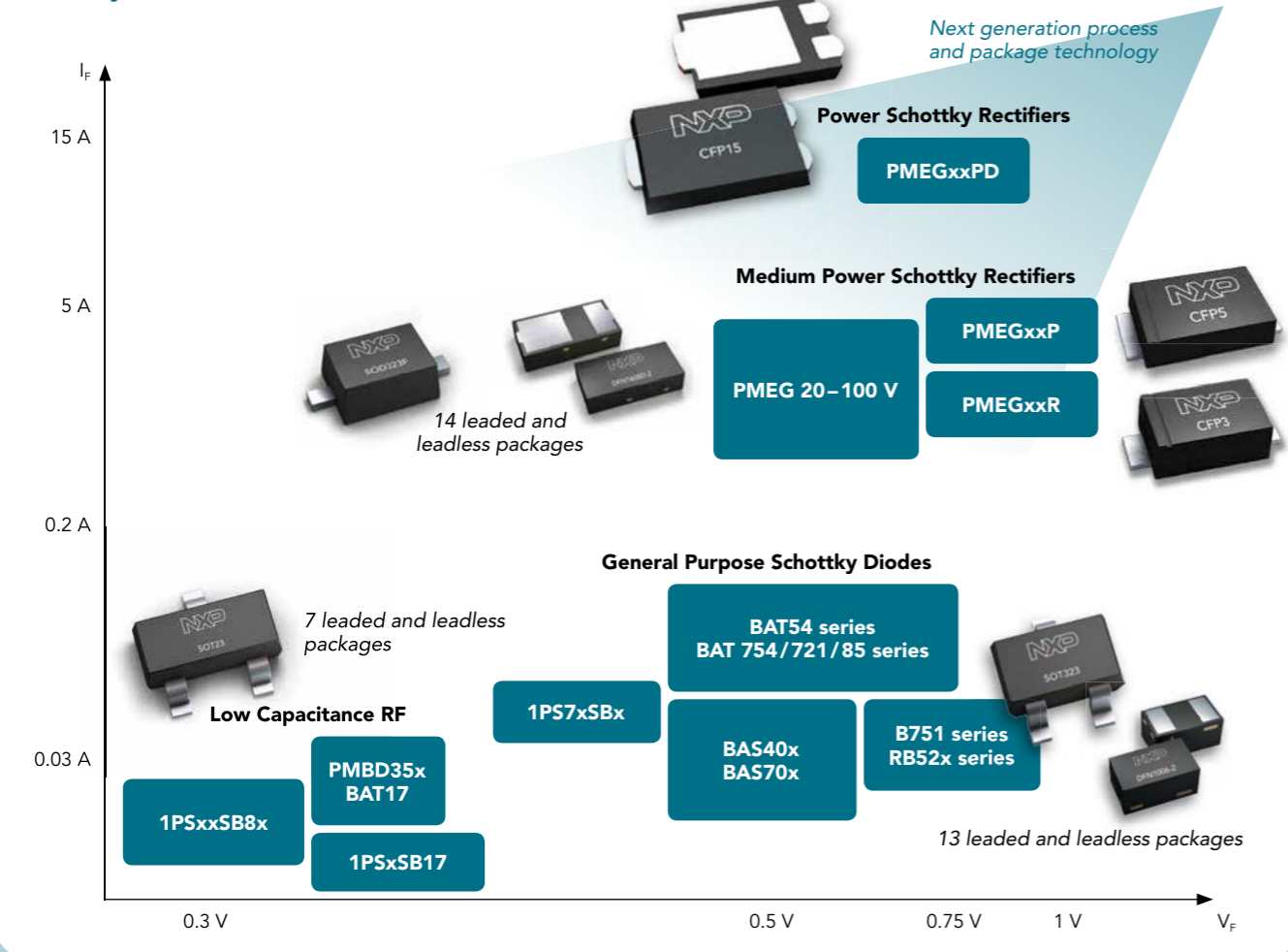
Including standard leaded SMD, medium-power clip-bond and ultra-small leadless packages with dimensions down to 0.6 x 0.3 x 0.3 mm

## A quality product from an experienced, high volume supplier

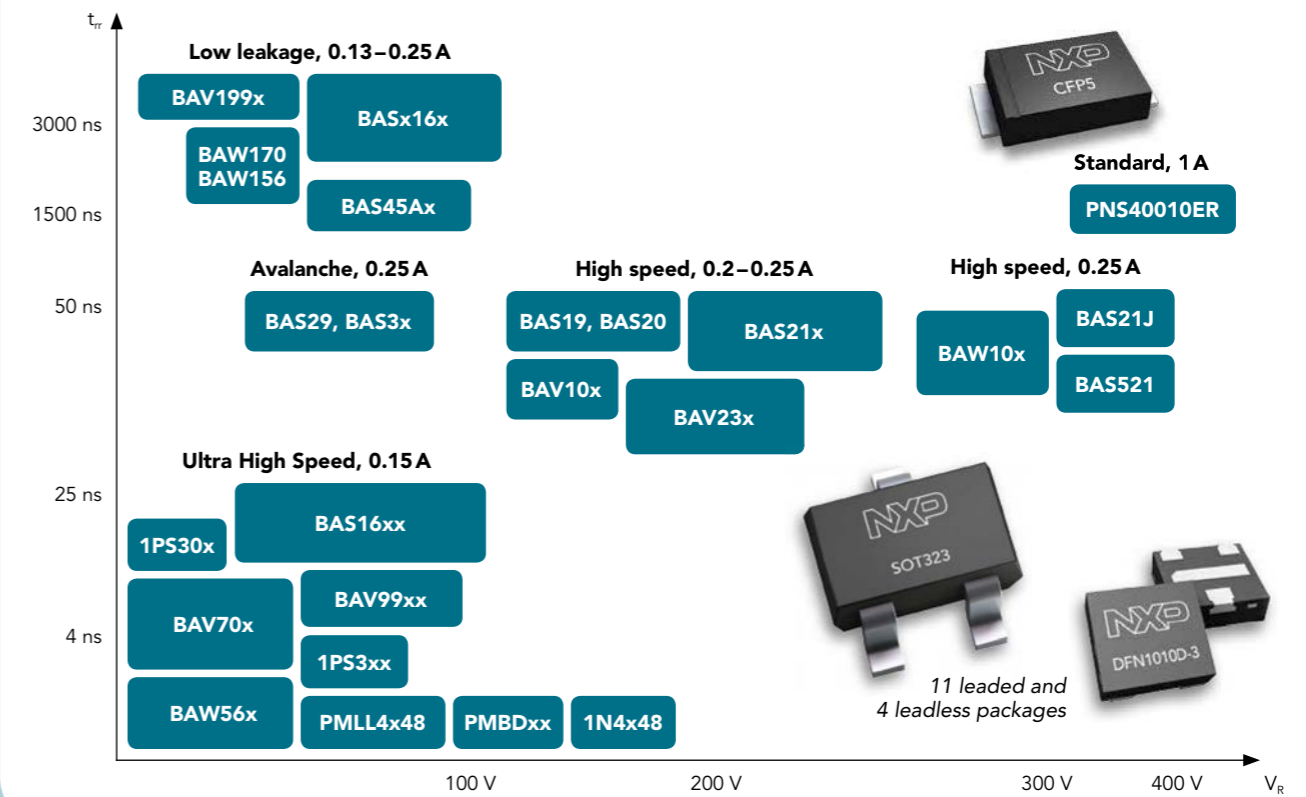
- ▶ NXP is strongly committed to automotive quality standards
- ▶ NXP has a track record of more than 60 years in developing and producing diodes
- ▶ NXP is the #1 in small-signal discretes with a high production capacity

## Portfolio Overview Diodes

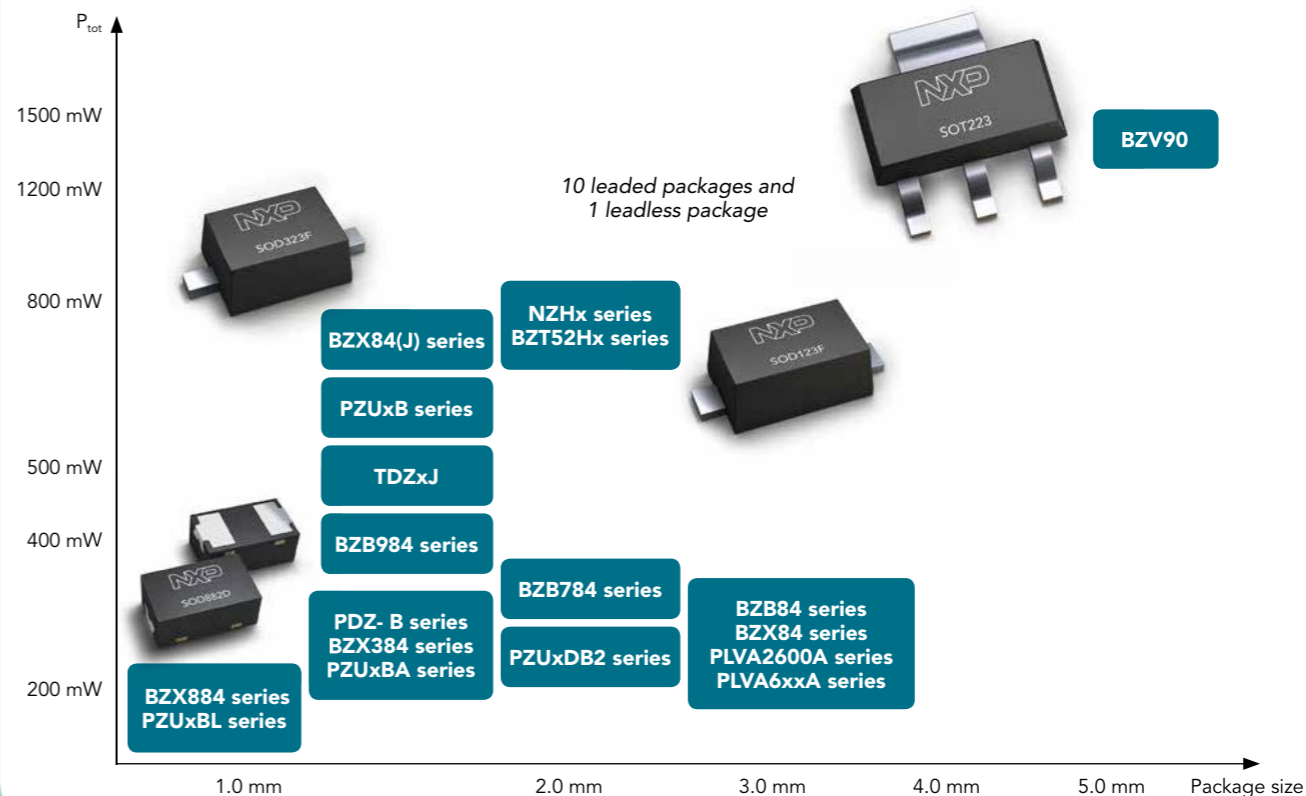
### Schottky Diodes



### Switching Diodes



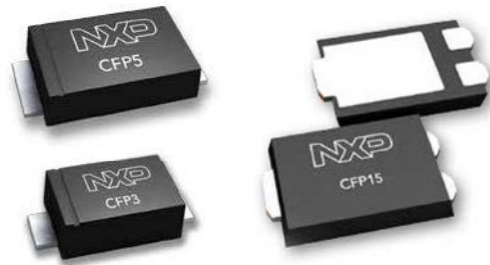
### Zener Diodes



# NXP's FlatPower packages CFP3, CFP5, and CFP15

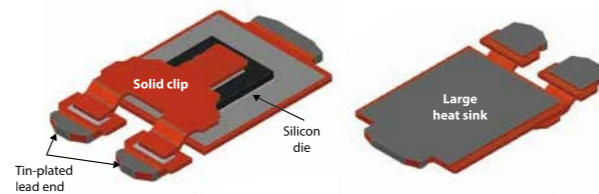
The medium-power solution for shrinking designs

## Small SMD FlatPower packages in three different versions



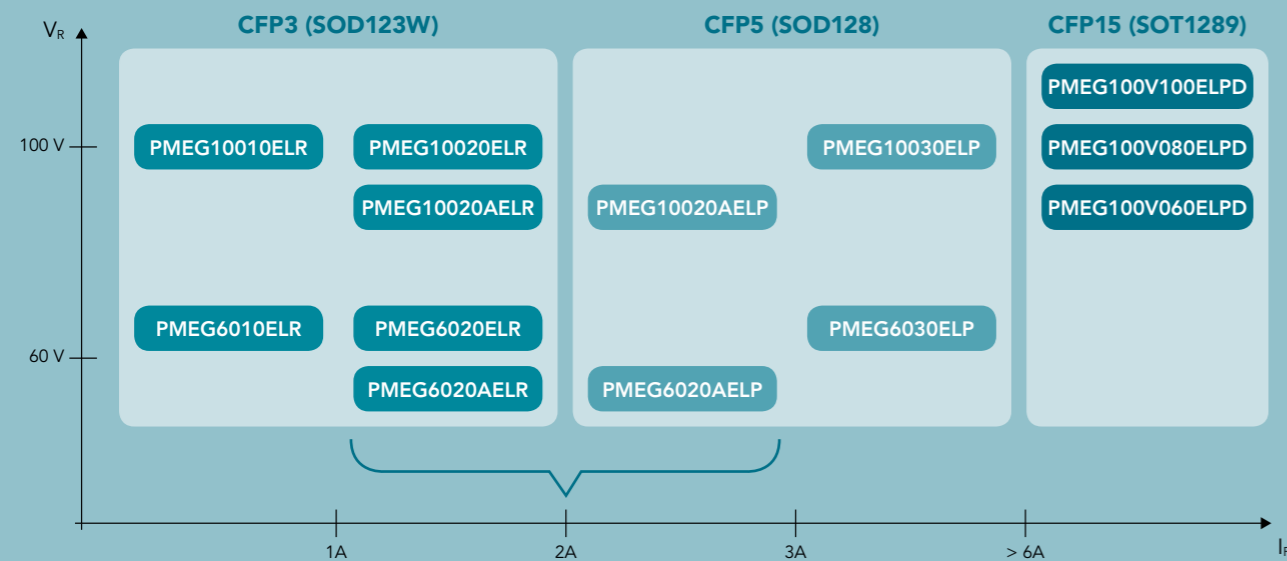
- ▶ Flat geometry, of down to 0.78 mm height
- ▶ Halogen-free mold compound
- ▶ AEC-Q101 qualified

## Robust design



- ▶ High-power capability due to wire-free clip-bond technology and heatsink
- ▶ Automatic optical inspection of solder joint due to tin-plated lead ends
- ▶ Benchmark flat design of only 0.7 mm height

## Low $I_R$ Schottky Portfolio, AEC-Q101



NXP offers more than 200 products in FlatPower packages, to support a wide range of applications for medium-power rectification and surge protection.

Schottky barrier diodes and rectifiers

## Medium-power low $V_F$ Schottky rectifiers single $\geq 1$ A - FlatPower packages

types in **bold** represent new products

| $I_F$ max (A) | $V_R$ max (V) | $V_F$ max (mV) @ $I_F$ max | $I_R$ max (mA) @ $V_R$ max | Package                            | CFP15 (SOT1289)  | CFP5 (SOD128)   | CFP3 (SOD123W)  |
|---------------|---------------|----------------------------|----------------------------|------------------------------------|------------------|-----------------|-----------------|
|               |               |                            |                            |                                    |                  |                 |                 |
|               |               |                            |                            | Size (mm)                          | 5.8 x 4.3 x 0.78 | 3.8 x 2.5 x 1.0 | 2.6 x 1.7 x 1.0 |
|               |               |                            |                            | $P_{tot}$ (mW) @ 1 cm <sup>2</sup> | 2150             | 1050            | 950             |
|               |               |                            |                            | Optimization                       |                  |                 |                 |
| 1             | 20            | 340                        | 1                          | Low $V_F$                          |                  |                 | PMEG2010ER      |
|               |               | 450                        | 0.05                       | Low $I_R$                          |                  |                 | PMEG2010BER     |
|               | 30            | 360                        | 1.5                        | Low $V_F$                          |                  | PMEG3010EP      | PMEG3010ER      |
|               |               | 450                        |                            | Low $I_R$                          |                  | PMEG3010BEP     | PMEG3010BER     |
|               | 40            | 490                        | 0.05                       | Low $V_F$                          |                  | PMEG4010EP      | PMEG4010ER      |
|               |               |                            |                            | Low $V_F$                          |                  | PMEG4010ETP     | PMEG4010ETR     |
|               | 60            | 530                        | 0.06                       | Low $V_F$                          |                  | PMEG6010EP      | PMEG6010ER      |
|               |               | 530                        |                            | Low $V_F$                          |                  |                 | PMEG6010ETR     |
|               | 100           | 660                        | 0.0003                     | Low $I_R$                          |                  |                 | PMEG6010ELR     |
|               |               | 770                        |                            | 0.00015                            | Low $I_R$        |                 |                 |
| 2             | 30            | 360                        | 3                          | Low $V_F$                          |                  | PMEG3020EP      |                 |
|               |               | 420                        | 1.5                        | Low $V_F$                          |                  | PMEG3020CEP     | PMEG3020ER      |
|               |               | 450                        | 0.1                        | Low $I_R$                          |                  | PMEG3020BEP     |                 |
|               |               | 520                        | 0.05                       | Low $I_R$                          |                  | PMEG3020DEP     | PMEG3020BER     |
|               | 40            | 490                        | 0.1                        | Low $V_F$                          |                  | PMEG4020EP      | PMEG4020ER      |
|               |               |                            |                            | Low $V_F$                          |                  | PMEG4020ETP     | PMEG4020ETR     |
|               | 60            | 530                        | 0.2                        | Low $V_F$                          |                  | PMEG6020EP      | PMEG6020ER      |
|               |               | 530                        |                            | Low $V_F$                          |                  | PMEG6020ETP     | PMEG6020ETR     |
|               |               | 680                        | 0.0007                     | Low $I_R$                          |                  | PMEG6020AELP    | PMEG6020AELR    |
|               |               | 760                        |                            | Low $I_R$                          |                  |                 | PMEG6020ELR     |
| 100           | 770           | 0.0003                     | Low $I_R$                  |                                    |                  | PMEG10020AELR   |                 |
|               | 830           |                            | 0.00015                    | Low $I_R$                          |                  | PMEG10020AELP   | PMEG10020ELR    |
| 3             | 30            | 360                        | 5                          | Low $V_F$                          |                  | PMEG3030EP      |                 |
|               |               | 450                        | 0.15                       | Low $I_R$                          |                  | PMEG3030BEP     |                 |
|               | 40            | 490                        | 0.2                        | Low $V_F$                          |                  | PMEG4030EP      |                 |
|               |               |                            |                            | Low $V_F$                          |                  | PMEG4030ETP     |                 |
|               | 60            | 540                        | 0.1                        | Low $I_R$                          |                  |                 | PMEG4030ER      |
|               |               | 530                        |                            | 0.2                                | Low $V_F$        |                 | PMEG6030EP      |
|               |               | 475                        | 0.4                        | Low $V_F$                          |                  | PMEG6030EVP     |                 |
|               |               | 530                        | 0.2                        | Low $V_F$                          |                  | PMEG6030ETP     |                 |
|               | 100           | 690                        | 0.001                      | Low $I_R$                          |                  | PMEG6030ELP     |                 |
|               |               | 770                        |                            | 0.00045                            | Low $I_R$        |                 | PMEG10030ELP    |
| 4.5           | 60            | 530                        | 0.4                        | Low $V_F$                          |                  | PMEG6045ETP     |                 |
|               |               | 360                        | 8                          | Low $V_F$                          |                  | PMEG3050EP      |                 |
| 5             | 30            | 450                        | 0.25                       | Low $I_R$                          |                  | PMEG3050BEP     |                 |
|               |               |                            |                            | Low $V_F$                          |                  | PMEG4050EP      |                 |
|               | 490           | 0.3                        | Low $V_F$                  |                                    | PMEG4050ETP      |                 |                 |
| 45            | 490           | 0.3                        | Low $V_F$                  |                                    | PMEG045V050EPD   |                 |                 |
|               |               |                            | Low $V_F$                  |                                    | PMEG060V050EPD   |                 |                 |
| 60            | 560           | 0.4                        | Low $V_F$                  |                                    | PMEG060V050EPD   |                 |                 |
|               | 560           |                            | 0.7                        | Low $V_F$                          |                  | PMEG100V060ELPD |                 |
| 100           | 850           | 0.001                      | Low $I_R$                  |                                    | PMEG100V080ELPD  |                 |                 |
|               | 850           |                            | 0.001                      | Low $I_R$                          |                  | PMEG100V080ELPD |                 |
| 10            | 45            | 490                        | 0.6                        | Low $V_F$                          |                  | PMEG045V100EPD  |                 |
|               |               | 540                        | 0.5                        | Low $I_R$                          |                  | PMEG45U10EPD    |                 |
|               | 60            | 560                        | 0.7                        | Low $V_F$                          |                  | PMEG060V100EPD  |                 |
|               | 100           | 850                        |                            | 0.001                              | Low $I_R$        |                 | PMEG100V100ELPD |
| 45            | 550           | 0.1                        | Low $I_R$                  |                                    | PMEG045T150EPD   |                 |                 |
|               | 580           |                            | Low $I_R$                  |                                    | PMEG45T15EPD     |                 |                 |
| 15            | 490           | 1                          | Low $V_F$                  |                                    | PMEG045V150EPD   |                 |                 |
|               |               | 550                        | 0.1                        | Low $I_R$                          |                  | PMEG050T150EPD  |                 |
|               | 500           | 1                          | Low $V_F$                  |                                    | PMEG050V150EPD   |                 |                 |

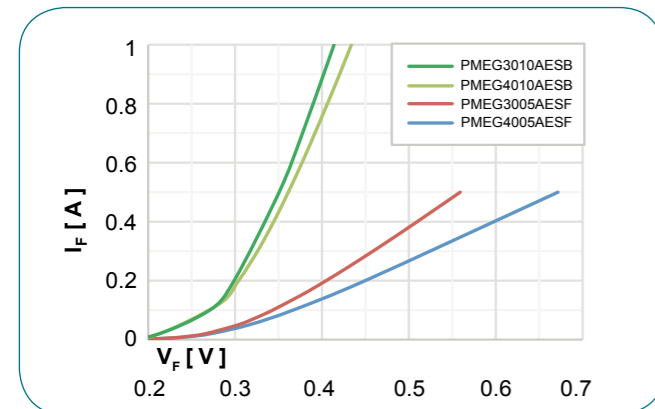
Medium-power low  $V_F$  Schottky rectifiers single  $\geq 200$  mA - Leadless DSN packages types in bold represent new products

| $I_F$ max (A) | $V_F$ max (V) | $V_F$ max (mV) @ $I_F$ max | $I_R$ max (mA) @ $V_F$ max | Package                            | DSN0603-2 (SOD962)  | DSN1006-2 (SOD993)  | DSN1006U-2 (SOD995) |
|---------------|---------------|----------------------------|----------------------------|------------------------------------|---------------------|---------------------|---------------------|
|               |               |                            |                            |                                    |                     |                     |                     |
|               |               |                            |                            | Size (mm)                          | 0.6 x 0.3 x 0.3     | 1.0 x 0.6 x 0.28    | 1.0 x 0.6 x 0.28    |
|               |               |                            |                            | $P_{tot}$ (mW) @ 1 cm <sup>2</sup> | 525                 | 1.000               | 1.190               |
| Optimization  |               |                            |                            |                                    |                     |                     |                     |
| 0.2           | 20            | 420                        | 0.045                      | Low $V_F$                          | <b>PMEG2002AESF</b> |                     |                     |
|               |               | 490                        | 0.0035                     | Low $I_R$                          | PMEG2002ESF         |                     |                     |
|               | 30            | 470                        | 0.08                       | Low $V_F$                          | <b>PMEG3002AESF</b> |                     |                     |
|               |               | 535                        | 0.009                      | Low $I_R$                          | PMEG3002ESF         |                     |                     |
| 40            | 525           | 0.08                       | Low $V_F$                  | <b>PMEG4002AESF</b>                |                     |                     |                     |
|               | 600           | 0.0065                     | Low $I_R$                  | PMEG4002ESF                        |                     |                     |                     |
| 0.5           | 20            | 550                        | 0.045                      | Low $V_F$                          | <b>PMEG2005AESF</b> |                     |                     |
|               |               | 620                        | 0.0035                     | Low $I_R$                          | PMEG2005ESF         |                     |                     |
|               | 30            | 630                        | 0.08                       | Low $V_F$                          | <b>PMEG3005AESF</b> |                     |                     |
|               |               | 720                        | 0.009                      | Low $I_R$                          | PMEG3005ESF         |                     |                     |
| 40            | 820           | 0.08                       | Low $V_F$                  | <b>PMEG4005AESF</b>                |                     |                     |                     |
|               | 880           | 0.0065                     | Low $I_R$                  | PMEG4005ESF                        |                     |                     |                     |
| 1             | 30            | 480                        | 1.25                       | Low $V_F$                          |                     | <b>PMEG3010AESB</b> | <b>PMEG3010AESA</b> |
|               |               | 565                        | 0.045                      | Low $I_R$                          |                     | PMEG3010ESF         |                     |
|               | 40            | 505                        | 0.115                      | Low $V_F$                          |                     | <b>PMEG4010AESB</b> |                     |
|               |               | 610                        | 0.04                       | Low $I_R$                          |                     | PMEG4010ESB         |                     |
|               | 60            | 625                        | 0.65                       | Low $V_F$                          |                     | <b>PMEG6010AESB</b> |                     |
|               |               | 730                        | 0.03                       | Low $I_R$                          |                     | PMEG6010ESB         |                     |

Forward characteristic survey of Schottkys in DSN1006-2

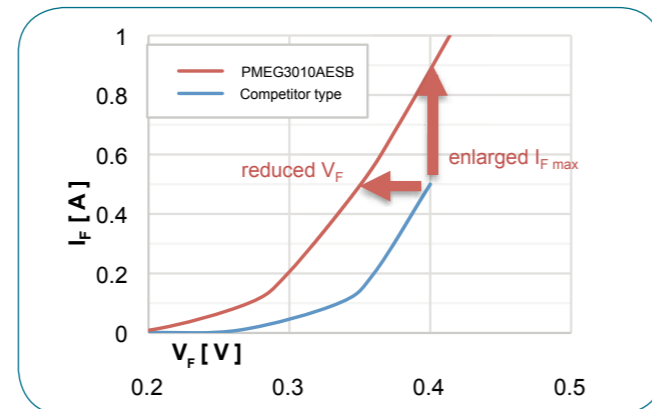
$V_R: 30V, I_F: I_A$  (typical data)

Selected DSN Schottky rectifier



This diagram shows the broad variety of the DSN portfolio

PMEG3010AESB versus competitor type



NXP type has higher forward current specified and has benchmark low  $V_F$

In the spotlight

**PMEG3010AESB, PMEG6010ESB, low  $V_F$  Schottky Rectifier**

30 / 40 / 60 V, 1A Schottky rectifier in DSN1006-2 (SOD993) package

Low forward voltage,  $V_F$  max = 480 mV @ 1 A (PMEG3010AESB)

Low leakage current,  $I_R$  max = 30  $\mu$ A @ 60 V (PMEG6010ESB)

High surge capability up to  $I_{FSM} = 10$  A

Ideal for LED backlighting in mobile applications



Medium-power low  $V_F$  Schottky rectifiers single  $\geq 200$  mA - Leadless DFN packages types in bold represent new products

| $I_F$ max (A) | $V_F$ max (V) | $V_F$ max (mV) @ $I_F$ max | $I_R$ max (mA) @ $V_F$ max | Package                            | DFN2020-3 (SOT1061) | DFN2020D-3 (SOT1061D) | DFN1608D-2 (SOD1608) | DFN1006-2 (SOD882) | DFN1006D-2 (SOD882D) |
|---------------|---------------|----------------------------|----------------------------|------------------------------------|---------------------|-----------------------|----------------------|--------------------|----------------------|
|               |               |                            |                            |                                    |                     |                       |                      |                    |                      |
|               |               |                            |                            | Size (mm)                          | 2.0 x 2.0 x 0.62    | 2.0 x 2.0 x 0.62      | 1.6 x 0.8 x 0.37     | 1.0 x 0.6 x 0.48   | 1.0 x 0.6 x 0.37     |
|               |               |                            |                            | $P_{tot}$ (mW) @ 1 cm <sup>2</sup> | 960                 | 960                   | 780                  | 565                | 660                  |
| Optimization  |               |                            |                            |                                    |                     |                       |                      |                    |                      |
| 0.2           | 30            | 480                        | 0.05                       | low $V_F$                          |                     |                       |                      | PMEG3002AEL        | PMEG3002AELD         |
|               | 40            | 600                        | 0.01                       | low $I_R$                          |                     |                       |                      | PMEG4002EL         | PMEG4002ELD          |
|               | 60            | 600                        | 0.1                        | low $V_F$                          |                     |                       |                      |                    | PMEG6002ELD          |
| 0.5           | 20            | 390                        | 0.2                        | low $V_F$                          |                     |                       |                      |                    | PMEG2005BELD         |
|               |               | 410                        | 0.3                        | low $V_F$                          |                     |                       | PMEG2005EPK          |                    |                      |
|               | 440           | 1.5                        | low $V_F$                  |                                    |                     |                       | PMEG2005AEL          | PMEG2005AELD       |                      |
|               | 500           | 0.03                       | low $I_R$                  |                                    |                     |                       | PMEG2005EL           | PMEG2005ELD        |                      |
|               | 30            | 500                        | 0.5                        | low $V_F$                          |                     |                       |                      | PMEG3005EL         | PMEG3005ELD          |
| 1             | 20            | 375                        | 1.9                        | low $V_F$                          | PMEG2010EPA         | <b>PMEG2010EPAS</b>   |                      |                    |                      |
|               |               | 415                        | 0.6                        | low $V_F$                          |                     |                       | PMEG2010EPK          |                    |                      |
|               | 490           | 0.2                        | low $V_F$                  |                                    |                     |                       |                      | PMEG2010BELD       |                      |
|               | 40            | 600                        | 0.02                       | low $I_R$                          |                     |                       | PMEG4010EPK          |                    |                      |
| 1.5           | 20            | 420                        | 0.9                        | low $V_F$                          |                     |                       | PMEG2015EPK          |                    |                      |
|               | 40            | 610                        | 0.03                       | low $I_R$                          |                     |                       | PMEG4015EPK          |                    |                      |
| 2             | 20            | 420                        | 1.9                        | low $V_F$                          | PMEG2020EPA         | <b>PMEG2020EPAS</b>   |                      |                    |                      |
|               |               | 450                        | 0.9                        | low $V_F$                          |                     |                       | PMEG2020EPK          |                    |                      |
|               | 30            | 470                        | 2.5                        | low $V_F$                          | PMEG3020EPA         | <b>PMEG3020EPAS</b>   |                      |                    |                      |
|               | 40            | 535                        | 0.1                        | low $V_F$                          | PMEG4020EPA         | <b>PMEG4020EPAS</b>   |                      |                    |                      |
|               | 530           | 0.2                        | low $V_F$                  |                                    |                     | PMEG4020EPK           |                      |                    |                      |
|               | 60            | 575                        | 0.25                       | low $V_F$                          | PMEG6020EPA         | <b>PMEG6020EPAS</b>   |                      |                    |                      |

**Features and benefits**

- ▶ 33% lower  $V_F$  on same footprint
- ▶ Low profile of 0.37 mm
- ▶ Solderable side pads
- ▶ Visual solder inspection

**Applications**

- ▶ Handheld equipment
- ▶ Smartphone backlight units
- ▶ Battery chargers
- ▶ Shrunk PCB designs

Differentiated portfolio

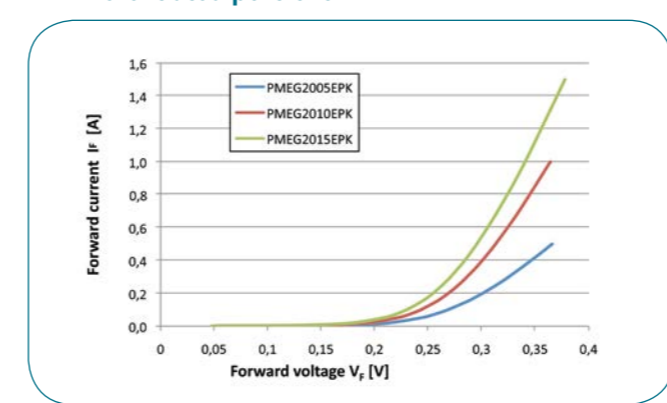
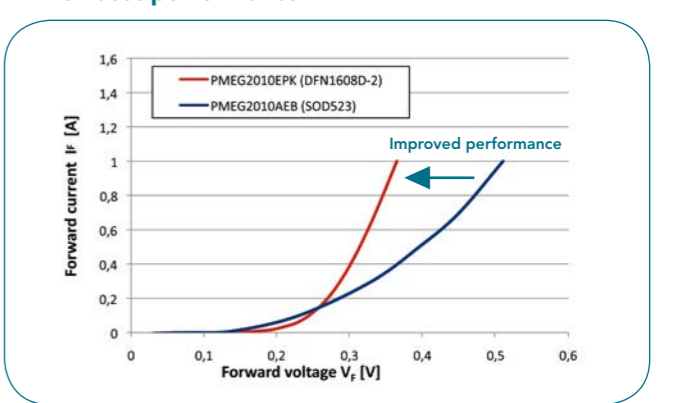


Diagram shows the variety of characteristics in DFN1608D-2 (SOD1608)

with best performance



PMEG2010EPK shows significant  $V_F$  improvement compared to the SOD523 device

### Medium-power low $V_F$ Schottky rectifiers single $\geq 200$ mA - Leaded packages

| $I_F$ max (A) | $V_F$ max (V) | $V_F$ max (mV) @ $I_F$ max | $I_R$ max (mA) @ $V_R$ max | Package      | SOT457 (SC-74) | SOT23           | SOD123F         | SOT323 (SC-70)  | SOD323F (SC-90)   | SOD323 (SC-76)       | SOT666               | SOD523 (SC-79)   |                 |
|---------------|---------------|----------------------------|----------------------------|--------------|----------------|-----------------|-----------------|-----------------|-------------------|----------------------|----------------------|------------------|-----------------|
|               |               |                            |                            |              | Size (mm)      | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0 | 2.6 x 1.6 x 1.1 | 2.0 x 1.25 x 0.95 | 1.7 x 1.25 x 0.7     | 1.7 x 1.25 x 0.95    | 1.6 x 1.2 x 0.55 | 1.2 x 0.8 x 0.6 |
|               |               |                            |                            |              | 540            | 420             | 830             | 400             | 830               | 570                  | 570                  | 500              |                 |
|               |               |                            |                            | Optimization |                |                 |                 |                 |                   |                      |                      |                  |                 |
| 0.2           | 30            | 480                        | 0.05                       | low $V_F$    |                |                 |                 |                 | PMEG3002EJ        |                      |                      | PMEG3002AEB      |                 |
|               | 40            | 600                        | 0.01                       | low $I_R$    |                |                 |                 |                 | PMEG4002EJ        |                      |                      | PMEG4002EB       |                 |
|               | 60            | 600                        | 0.1                        | low $V_F$    |                |                 |                 |                 | PMEG6002EJ        |                      |                      | PMEG6002EB       |                 |
| 0.5           | 20            | 390                        | 0.2                        | low $V_F$    |                | PMEG2005ET      | PMEG2005EH      |                 | PMEG2005EJ        | PMEG2005AEA          | PMEG2005AEV          |                  |                 |
|               |               | 480                        | 0.03                       | low $I_R$    |                |                 |                 |                 |                   |                      |                      | PMEG2005EB       |                 |
|               | 30            | 430                        | 0.15                       | low $V_F$    |                | PMEG3005ET      | PMEG3005EH      |                 | PMEG3005EJ        | PMEG3005AEA          | PMEG3005AEV          |                  |                 |
|               |               | 500                        | 0.5                        | low $V_F$    |                |                 |                 |                 |                   |                      |                      | PMEG3005EB       |                 |
|               |               | 470                        | 0.1                        | low $V_F$    |                | PMEG4005ET      | PMEG4005EH      |                 | PMEG4005EJ        | PMEG4005AEA          | PMEG4005AEV          |                  |                 |
| 40            | 550           | 1.1                        | low $V_F$                  |              | BAT720         |                 | 1PS70SB20       |                 |                   |                      |                      |                  |                 |
| 1             | 20            | 430                        | 0.2                        | low $V_F$    |                | PMEG2010AET     | PMEG2010AEH     |                 |                   |                      |                      |                  |                 |
|               |               | 500                        | 0.2                        | low $V_F$    |                | PMEG2010ET      | PMEG2010EH      |                 | PMEG2010EJ        | PMEG2010BEA          | PMEG2010BEV          |                  |                 |
|               |               | 550                        | 0.07                       | low $I_R$    |                |                 |                 |                 | PMEG2010AEJ       | PMEG2010EA<br>BAT760 | PMEG2010EV<br>BAT960 |                  |                 |
|               |               | 620                        | 1.5                        | low $V_F$    |                |                 |                 |                 |                   |                      |                      | PMEG2010AEB      |                 |
|               | 30            | 450                        | 1                          | low $V_F$    | 1PS74SB23      |                 |                 |                 |                   |                      |                      |                  |                 |
|               |               | 520                        | 0.1                        | low $I_R$    |                |                 | PMEG3010CEH     |                 | PMEG3010CEJ       |                      |                      |                  |                 |
|               |               | 560                        | 0.15                       | low $V_F$    |                |                 | PMEG3010ET      | PMEG3010EH      |                   | PMEG3010EJ           | PMEG3010BEA          | PMEG3010BEV      |                 |
|               |               | 680                        | 0.5                        | low $V_F$    |                |                 |                 |                 |                   |                      |                      | PMEG3010EB       |                 |
|               |               | 570                        | 0.05                       | low $I_R$    |                |                 |                 | PMEG4010CEH     |                   | PMEG4010CEJ          |                      |                  |                 |
|               |               | 600                        | 0.02                       | low $I_R$    |                |                 |                 |                 |                   |                      |                      |                  |                 |
| 40            | 640           | 0.05                       | low $V_F$                  |              |                | PMEG4010ET      | PMEG4010EH      |                 | PMEG4010EJ        | PMEG4010BEA          | PMEG4010BEV          |                  |                 |
|               | 60            | 650                        | 0.35                       | low $V_F$    | PMEG6010AED    |                 |                 |                 |                   |                      |                      |                  |                 |
|               |               | 660                        | 0.05                       | low $I_R$    |                |                 | PMEG6010CEH     |                 | PMEG6010CEJ       |                      |                      |                  |                 |
| 1.5           | 20            | 660                        | 0.2                        | low $I_R$    |                |                 | PMEG2015EH      |                 | PMEG2015EJ        | PMEG2015EA           | PMEG2015EV           |                  |                 |
|               | 30            | 500                        | 1                          | low $V_F$    |                |                 | PMEG3015EH      |                 | PMEG3015EJ        |                      | PMEG3015EV           |                  |                 |
| 2             | 10            | 460                        | 3                          | low $V_F$    |                |                 | PMEG1020EH      |                 | PMEG1020EJ        | PMEG1020EA           | PMEG1020EV           |                  |                 |
|               | 20            | 525                        | 0.2                        | low $V_F$    |                |                 | PMEG2020EH      |                 | PMEG2020EJ        | PMEG2020AEA          |                      |                  |                 |
|               |               | 30                         | 620                        | 1            | low $V_F$      |                 |                 | PMEG3020EH      |                   | PMEG3020EJ           |                      |                  |                 |
| 3             | 10            | 530                        | 3                          | low $V_F$    |                |                 | PMEG1030EH      |                 | PMEG1030EJ        |                      |                      |                  |                 |

### Medium-power low $V_F$ Schottky rectifiers dual $\geq 200$ mA

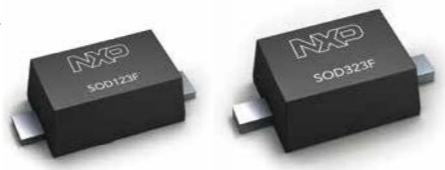
types in **bold** represent new products

| $I_F$ max (A) | $V_F$ max (V) | $V_F$ max (mV) @ $I_F$ max | $I_R$ max (mA) @ $V_R$ max | Optimization | Package                            | SOT223 (SC-73) | SOT23            | DFN2020-3 (SOT1061) | DFN2020D-3 (SOT1061D) | SOT666           |
|---------------|---------------|----------------------------|----------------------------|--------------|------------------------------------|----------------|------------------|---------------------|-----------------------|------------------|
|               |               |                            |                            |              |                                    | Size (mm)      | 6.5 x 3.5 x 1.65 | 2.9 x 1.3 x 1.0     | 2.0 x 2.0 x 0.62      | 2.0 x 2.0 x 0.63 |
|               |               |                            |                            |              |                                    | 1500           | 250              | 1000                | 1000                  | 300              |
|               |               |                            |                            |              | $P_{tot}$ (mW) @ 1 cm <sup>2</sup> |                |                  |                     |                       |                  |
| 0.2           | 30            | 480                        | 0.03                       | low $V_F$    |                                    |                |                  |                     |                       | PMEG3002TV       |
|               | 60            | 600                        | 0.1                        | low $V_F$    |                                    |                |                  |                     |                       | PMEG6002TV       |
| 0.5           | 20            | 390                        | 0.2                        | low $V_F$    |                                    |                |                  |                     |                       | PMEG2005CT       |
|               |               | 30                         | 430                        | 0.15         | low $V_F$                          |                |                  |                     |                       | PMEG3005CT       |
|               | 40            | 470                        | 0.1                        | low $V_F$    |                                    |                |                  |                     |                       | PMEG4005CT       |
| 1.0           | 25            | 450                        | 1.0                        | low $V_F$    |                                    | BAT120S        |                  |                     |                       |                  |
|               |               |                            |                            | low $V_F$    |                                    | BAT120C        |                  |                     |                       |                  |
|               |               |                            |                            | low $V_F$    |                                    | BAT120A        |                  |                     |                       |                  |
|               | 40            | 500                        | 0.05                       | low $V_F$    |                                    |                |                  | PMEG4010CPA         | <b>PMEG4010CPAS</b>   |                  |
|               |               |                            |                            | low $V_F$    |                                    |                |                  | PMEG6010CPA         | <b>PMEG6010CPAS</b>   |                  |
|               |               |                            |                            | low $V_F$    |                                    | BAT160S        |                  |                     |                       |                  |
| 60            | 650           | 0.35                       | low $V_F$                  |              | BAT160C                            |                |                  |                     |                       |                  |
|               |               |                            | low $V_F$                  |              | BAT160A                            |                |                  |                     |                       |                  |
|               |               |                            | low $V_F$                  |              |                                    |                |                  |                     |                       |                  |
| 2.0           | 20            | 420                        | 1.0                        | low $V_F$    |                                    |                |                  | PMEG2020CPA         | <b>PMEG2020CPAS</b>   |                  |
|               | 30            | 440                        | 2.0                        | low $V_F$    |                                    |                |                  | PMEG3020CPA         | <b>PMEG3020CPAS</b>   |                  |

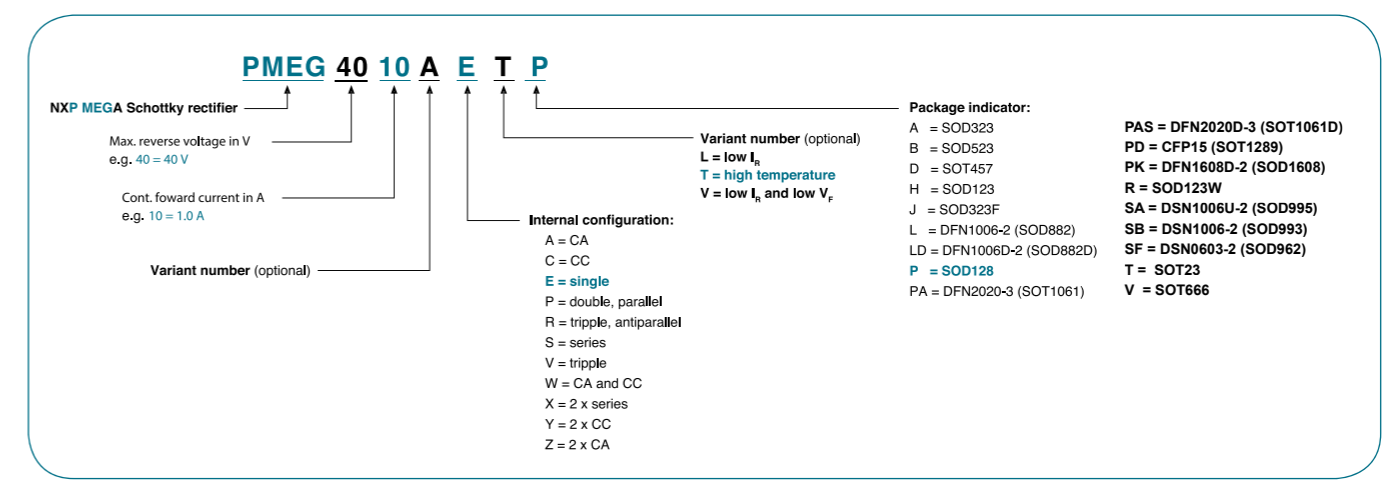
In the spotlight

Schottky Rectifier in SOD123F and SOD323F

- Broad portfolio base of 36 types, 20 / 60 V, 0.2 - 3 A
- Optimized either for low  $V_F$  or low  $I_R$
- High surge capability up to 10 A
- High thermal capability due to flat-lead design
- AEC-Q101 qualified
- Ideal for DC/DC conversion, free-wheeling, reverse polarity protection

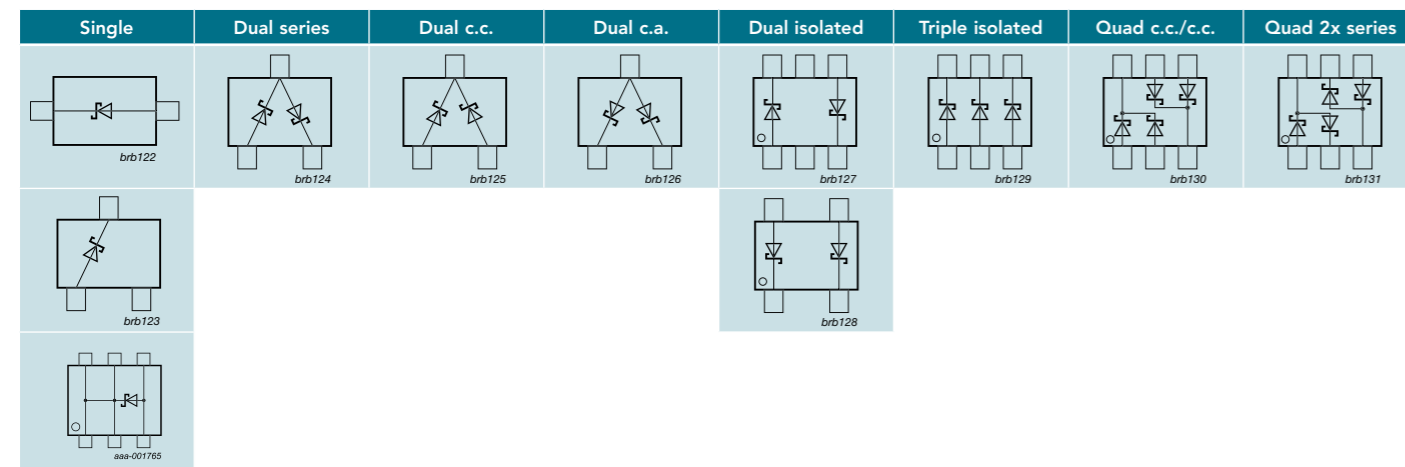


Low  $V_F$  (MEGA) Schottky rectifier nomenclature



General-purpose Schottky diodes ≤ 250 mA

| I <sub>F</sub> max (mA) | V <sub>R</sub> max (V) | V <sub>F</sub> max (mV) | @ I <sub>F</sub> (mA) | I <sub>F</sub> max (μA) | @ V <sub>R</sub> (V) | Package               | SOD80C (MiniMelf) | SOD68 (DO-34)     | SOT23           | SOT143B         | SOD123F         | SOT323 (SC-70)    | SOT363 (SC-88)    | SOD323F (SC-90)  | SOD323 (SC-76)    | SOT666           | SOD523 (SC-79)  | DFN1006-2 (SOD882)/DFN1006-3 (SOT883) |        |           |  |  |         |
|-------------------------|------------------------|-------------------------|-----------------------|-------------------------|----------------------|-----------------------|-------------------|-------------------|-----------------|-----------------|-----------------|-------------------|-------------------|------------------|-------------------|------------------|-----------------|---------------------------------------|--------|-----------|--|--|---------|
|                         |                        |                         |                       |                         |                      | Size (mm)             | 3.5 x 1.5 x 1.5   | 3.04 x 1.6 x 0.55 | 2.9 x 1.3 x 1.0 | 2.9 x 1.3 x 1.0 | 2.6 x 1.6 x 1.1 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.7 x 1.25 x 0.7 | 1.7 x 1.25 x 0.95 | 1.6 x 1.2 x 0.55 | 1.2 x 0.8 x 0.6 | 1.0 x 0.6 x 0.48                      |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      | P <sub>tot</sub> (mW) | 300               | 500               | 250             | 250             | 830             | 250               | 300               | 550              | 400               | 300              | 500             | 250                                   |        |           |  |  |         |
| 70                      | 70                     | 750                     | 10                    | 0.1                     | 50                   | single                |                   |                   | BAS70           |                 | BAS70H          | BAS70W            |                   |                  | 1PS76SB70         |                  | 1PS79SB70       | BAS70L                                |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      | dual series           |                   |                   | BAS70-04        |                 |                 | BAS70-04W         |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      | dual c.c.             |                   |                   | BAS70-05        |                 |                 | BAS70-05W         |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      | dual c.a.             |                   |                   | BAS70-06        |                 |                 | BAS70-06W         |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      | dual isolated         |                   |                   |                 | BAS70-07        |                 |                   |                   |                  | BAS70-07S         |                  |                 |                                       |        | BAS70-07V |  |  |         |
|                         |                        |                         |                       |                         |                      | triple isolated       |                   |                   |                 |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        | BAS70VV   |  |  |         |
| 120                     | 40                     | 500                     | 10                    | 1                       | 30                   | single                |                   |                   | BAS40           |                 | BAS40H          | BAS40W            |                   |                  | 1PS76SB40         |                  | RB751S40        | RB751CS40                             |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      | dual series           |                   |                   | BAS40-04        |                 |                 | BAS40-04W         |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      | dual c.c.             |                   |                   | BAS40-05        |                 |                 | BAS40-05W         |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      | dual c.a.             |                   |                   | BAS40-06        |                 |                 | BAS40-06W         |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      | dual isolated         |                   |                   |                 | BAS40-07        |                 |                   |                   |                  |                   |                  |                 |                                       |        | BAS40-07V |  |  |         |
|                         |                        |                         |                       |                         |                      | quad c.c./c.c.        |                   |                   |                 |                 |                 |                   |                   |                  |                   |                  |                 | 1PS88SB48                             |        | BAS40-05V |  |  |         |
| 200                     | 30                     | 300                     | 10                    | 30                      | 10                   | single                |                   |                   |                 |                 |                 |                   |                   |                  |                   |                  |                 | 1PS79SB31                             |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      | single                |                   |                   | BAT754          |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      | dual series           |                   |                   | BAT754S         |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        | dual c.c.               |                       |                         | BAT754C              |                       |                   |                   |                 |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        | dual c.a.               |                       |                         | BAT754A              |                       |                   |                   |                 |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        | triple isolated         |                       |                         |                      |                       |                   |                   |                 |                 |                 |                   | BAT754L           |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         | 40                     | 30                      | 300                   | 10                      | 15                   | 30                    | single            | BAS85             | BAT85           | BAT54           |                 | BAT54H            | BAT54W            |                  | BAT54J            | 1PS76SB10        |                 | 1PS79SB10                             | BAT54L |           |  |  |         |
|                         |                        |                         |                       |                         |                      |                       | dual series       |                   |                 | BAT54S          |                 |                   | BAT54SW           |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      |                       | dual c.c.         |                   |                 | BAT54C          |                 |                   | BAT54CW           |                  |                   |                  |                 |                                       |        |           |  |  | BAT54CM |
|                         |                        |                         | dual c.a.             |                         |                      | BAT54A                |                   |                   | BAT54AW         |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         | dual isolated         |                         |                      |                       | BAT74             |                   |                 |                 |                 |                   | BAT74S            |                  |                   |                  | BAT74V          |                                       |        |           |  |  |         |
|                         |                        |                         | triple isolated       |                         |                      |                       |                   |                   |                 |                 |                 |                   |                   |                  |                   |                  | BAT54VV         |                                       |        |           |  |  |         |
|                         | 40                     | 25                      | 420                   | 30                      | 0.5                  | 25                    | quad c.c./c.c.    |                   |                 |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      |                       | quad 2x series    |                   |                 |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         |                       |                         |                      |                       | single            |                   |                 |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         | single                |                         |                      |                       |                   |                   |                 |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         | dual series           |                         |                      |                       |                   |                   |                 |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
|                         |                        |                         | dual c.c.             |                         |                      |                       |                   |                   |                 |                 |                 |                   |                   |                  |                   |                  |                 |                                       |        |           |  |  |         |
| 250                     | 100                    | 850                     | 250                   | 4                       | 75                   | single                | BAS86             | BAT86             |                 |                 | BAT46WH         |                   |                   |                  | BAT46WJ           |                  |                 |                                       |        |           |  |  |         |



Low-capacitance Schottky diodes

| I <sub>F</sub> max (mA) | V <sub>R</sub> max (V) | V <sub>F</sub> max (mV) | @ I <sub>F</sub> (mA) | C <sub>d</sub> max (pF) | @ V <sub>R</sub> = 0 V | Package                          | SOT23           | SOT323 (SC-70)    | SOT363 (SC-88)    | SOD323 (SC-76)    | SOT666           | SOD523 (SC-79)  | DFN1006-2 (SOD882) |
|-------------------------|------------------------|-------------------------|-----------------------|-------------------------|------------------------|----------------------------------|-----------------|-------------------|-------------------|-------------------|------------------|-----------------|--------------------|
|                         |                        |                         |                       |                         |                        | Size (mm)                        | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.7 x 1.25 x 0.95 | 1.6 x 1.2 x 0.55 | 1.2 x 0.8 x 0.6 | 1.0 x 0.6 x 0.48   |
|                         |                        |                         |                       |                         |                        | P <sub>tot</sub> (mW)            | 250             | 250               | 300               | 400               | 300              | 500             | 250                |
| 30                      | 4                      | 450                     | 1                     | 1                       | single                 | BAT17                            |                 |                   |                   | 1PS76SB17         |                  | 1PS79SB17       |                    |
|                         |                        |                         |                       |                         | triple isolated        |                                  |                 |                   |                   | 1PS66SB17         |                  |                 |                    |
|                         |                        |                         |                       |                         | dual series            | PMBD353<br>PMBD354 <sup>1)</sup> |                 |                   |                   |                   |                  |                 |                    |
|                         | 15                     | 340                     | 1                     | 1                       | single                 |                                  | 1PS70SB82       |                   |                   |                   |                  |                 | 1PS10SB82          |
|                         |                        |                         |                       |                         | triple isolated        |                                  |                 | 1PS88SB82         |                   | 1PS66SB82         |                  |                 |                    |
|                         |                        |                         |                       |                         | dual series            |                                  | 1PS70SB84       |                   |                   |                   |                  |                 |                    |
|                         |                        |                         |                       |                         | dual c.c.              |                                  | 1PS70SB85       |                   |                   |                   |                  |                 |                    |
|                         |                        |                         |                       |                         | dual c.a.              |                                  | 1PS70SB86       |                   |                   |                   |                  |                 |                    |

<sup>1)</sup>Diodes have matched capacitance

General-purpose Zener diodes

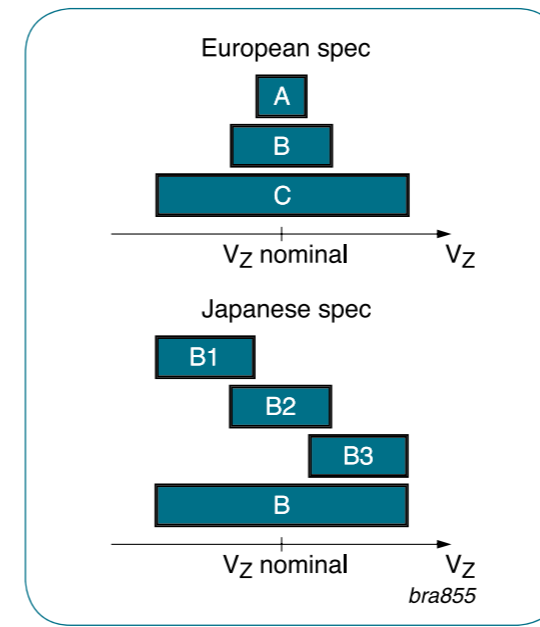
| $I_f$ max (mA) | $P_{ZSM}$ (W) | $V_z$ nom (V) | $V_z$ tolerance | Note    | Configuration | Series          | Package            | Size (mm)          | $P_{tot}$ (mW) |
|----------------|---------------|---------------|-----------------|---------|---------------|-----------------|--------------------|--------------------|----------------|
| 500            | -             | 3.3-24        | C               | Europe  | Single        | 1N47xxA series  | SOD66 (DO-41)      | 4.8 x 2.6 x 0.81   | 1000           |
|                | 60            | 3.6-75        |                 |         |               | BZV85 series    |                    |                    |                |
| 250            | -             | 2.1-36        | About 2%        | Special | Single        | NZX series      | SOD27 (DO-35)      | 4.25 x 1.85 x 0.56 | 400            |
|                | 40            | 2.4-75        | B, C            | Europe  |               | BZX79 series    |                    |                    |                |
| 400            | 40            | 2.4-75        | C               | Europe  | Single        | BZV90 series    | SOT223 (SC-73)     | 6.5 x 3.5 x 1.65   | 1500           |
| 250            | 40            | 2.4-75        | C               | Europe  | Single        | BZV49 series    | SOT89 (SC-62)      | 4.5 x 2.5 x 1.5    | 1000           |
| 250            | 40            | 2.4-75        | B, C            | Europe  | Single        | BZV55 series    | SOD80C (MiniMelf)  | 3.5 x 1.5 x 1.5    | 400            |
| 200            | 40            | 2.4-75        | B, C            | Europe  | Dual c.a.     | BZB84 series    | SOT23              | 2.9 x 1.3 x 1.0    | 250            |
|                |               |               | A, B, C         |         | BZX84 series  |                 |                    |                    |                |
| 250            | 30            | 5-6.8         | 0.2 V           | Ave     | Single        | PLVA600A series |                    |                    |                |
| 250            | -             | 3.0-30        | About 2.5%      | Special | Single        | NZH series      | SOD123F            | 2.6 x 1.6 x 1.1    | 830            |
|                | 40            | 2.4-75        | B, C            | Europe  |               | BZT52H series   |                    |                    |                |
| 200            | 40            | 10            | B2              | Japan   | Dual isolated | PZU10DB2 series | SOT353 (SC-88A)    | 2.0 x 1.25 x 0.95  | 300            |
| 200            | 40            | 2.4-15        | C               | Europe  | Dual c.a.     | BZB784 series   | SOT323 (SC-70)     | 2.0 x 1.25 x 0.95  | 350            |
| 200            | 30            | 100           | C               | Europe  | Back-to-back  | BZB100A         | SOD323 (SC-76)     | 1.7 x 1.25 x 0.95  | 300            |
|                | 40            | 2.4-36        | B2              | Japan   | Single        | PDZ-B series    |                    |                    |                |
| 250            | 40            | 2.4-75        | B, C            | Europe  | Single        | BZX384 series   |                    |                    |                |
| 200            | 40            | 2.4-36        | B, B1, B2, B3   | Japan   | Single        | PZUxBA series   |                    |                    |                |
| 200            | 60            | 100           | C               | Europe  | Single        | BZX100A         | SOD323F (SC-90)    | 1.7 x 1.25 x 0.7   | 550            |
| 200            | 40            | 2.4-36        | B, B1, B2, B3   | Japan   | Single        | PZUxB series    |                    |                    |                |
| 250            | 40            | 2.4-75        | B, C            | Europe  | Single        | BZX84J series   |                    |                    |                |
| 200            | 40            | 2.4-15        | C               | Europe  | Dual c.a.     | BZB984 series   | SOT663             | 1.6 x 1.2 x 0.55   | 350            |
| 200            | 40            | 2.4-75        | B, C            | Europe  | Single        | BZX585 series   | SOD523 (SC-79)     | 1.2 x 0.8 x 0.6    | 300            |
| 200            | 40            | 2.4-75        | B, C            | Europe  | Single        | BZX884 series   | DFN1006-2 (SOD882) | 1.0 x 0.6 x 0.48   | 250            |
|                |               | 2.4-36        | B, B2           | Japan   |               | PZUxBL series   |                    |                    |                |
| 250            | 40            | 2.4-30        | B               | Europe  | Single        | TDZxJ series    | SOD323F            | 1.7 x 1.25 x 0.7   | 500            |

Notes:  
 Japan: B selection: app. 5%  $V_z$  tolerance, B1, B2, B3 selections: app. 2%  $V_z$  tolerance in sequential intervals  
 Europe: A selection: app. 1%  $V_z$  tolerance, B selection: app. 2%  $V_z$  tolerance, C selection: app. 5%  $V_z$  tolerance;  
 the selections are in overlapping intervals

Ave: low-voltage avalanche regulator diodes  
 Dual c.a.: dual common anode

Zener diodes specifications

Differences in Zener specifications



European spec (BZV, BZX, BZB, 1N47)

| $y =$      | C-series<br>$\pm 5\%$ | B-series<br>$\pm 2\%$ | A-series<br>$\pm 1\%$ |
|------------|-----------------------|-----------------------|-----------------------|
| $V_z$ (V)  | $V_z$ (V)             | $V_z$ (V)             | $V_z$ (V)             |
| BZX84-y2V4 | 2.2 - 2.6             | 2.35 - 2.45           | 2.37 - 2.43           |
| BZX84-y2V7 | 2.5 - 2.9             | 2.65 - 2.75           | 2.67 - 2.73           |
| BZX84-y3V0 | 2.8 - 3.2             | 2.94 - 3.06           | 2.97 - 3.03           |
| BZX84-y3V3 | 3.1 - 3.5             | 3.23 - 3.37           | 3.26 - 3.34           |
| BZX84-y3V6 | 3.4 - 3.8             | 3.53 - 3.67           | 3.56 - 3.64           |
| BZX84-y3V9 | 3.7 - 4.1             | 3.82 - 3.98           | 3.86 - 3.94           |
| BZX84-y4V3 | 4 - 4.6               | 4.21 - 4.39           | 4.25 - 4.35           |
| BZX84-y4V7 | 4.4 - 5               | 4.61 - 4.79           | 4.65 - 4.75           |
| BZX84-y5V1 | 4.8 - 5.4             | 5 - 5.2               | 5.04 - 5.16           |
| BZX84-y5V6 | 5.2 - 6               | 5.49 - 5.71           | 5.54 - 5.66           |
| BZX84-y6V2 | 5.8 - 6.6             | 6.08 - 6.32           | 6.13 - 6.27           |
| BZX84-y6V8 | 6.4 - 7.2             | 6.66 - 6.94           | 6.73 - 6.87           |
| BZX84-y7V5 | 7 - 7.9               | 7.35 - 7.65           | 7.42 - 7.58           |
| BZX84-y8V2 | 7.7 - 8.7             | 8.04 - 8.36           | 8.11 - 8.29           |
| BZX84-y9V1 | 8.5 - 9.6             | 8.92 - 9.28           | 9 - 9.2               |
| BZX84-y10  | 9.4 - 10.6            | 9.8 - 10.2            | 9.9 - 10.1            |
| BZX84-y11  | 10.4 - 11.6           | 10.8 - 11.2           | 10.8 - 11.11          |
| BZX84-y12  | 11.4 - 12.7           | 11.8 - 12.2           | 11.88 - 12.12         |
| BZX84-y13  | 12.4 - 14.1           | 12.7 - 13.3           | 12.87 - 13.13         |
| BZX84-y15  | 13.8 - 15.6           | 14.7 - 15.3           | 14.85 - 15.15         |
| BZX84-y16  | 15.3 - 17.1           | 15.7 - 16.3           | 15.84 - 16.16         |
| BZX84-y18  | 16.8 - 19.1           | 17.6 - 18.4           | 17.82 - 18.18         |
| BZX84-y20  | 18.8 - 21.2           | 19.6 - 20.4           | 19.8 - 20.2           |
| BZX84-y22  | 20.8 - 23.3           | 21.6 - 22.4           | 21.78 - 22.22         |
| BZX84-y24  | 22.8 - 25.6           | 23.5 - 24.5           | 23.76 - 24.24         |
| BZX84-y27  | 25.1 - 28.9           | 26.5 - 27.5           | 26.73 - 27.27         |
| BZX84-y30  | 28 - 32               | 29.4 - 30.6           | 29.70 - 30.30         |
| BZX84-y33  | 31 - 35               | 32.3 - 33.7           | 32.67 - 33.33         |
| BZX84-y36  | 34 - 38               | 35.3 - 36.7           | 35.64 - 36.36         |
| BZX84-y39  | 37 - 41               | 38.2 - 39.8           | 38.61 - 39.39         |
| BZX84-y43  | 40 - 46               | 42.1 - 43.9           | 42.57 - 43.43         |
| BZX84-y47  | 44 - 50               | 46.1 - 47.9           | -                     |
| BZX84-y51  | 48 - 54               | 50 - 52               | 50.49 - 51.51         |
| BZX84-y56  | 52 - 60               | 54.9 - 57.1           | -                     |
| BZX84-y62  | 58 - 66               | 60.8 - 63.2           | -                     |
| BZX84-y68  | 64 - 72               | 66.6 - 69.4           | -                     |
| BZX84-y75  | 70 - 79               | 73.5 - 76.5           | 74.25 - 75.75         |

Japanese spec (PZU, PDZ)

| $y =$     | B-series<br>$\pm 5\%$ | B1-series<br>$\pm 2\%$ | B2-series<br>$\pm 2\%$ | B3-series<br>$\pm 2\%$ |
|-----------|-----------------------|------------------------|------------------------|------------------------|
| $V_z$ (V) | $V_z$ (V)             | $V_z$ (V)              | $V_z$ (V)              | $V_z$ (V)              |
| PZU2.4y   | 2.3 - 2.6             | -                      | -                      | -                      |
| PZU2.7y   | 2.5 - 2.9             | 2.5 - 2.75             | 2.65 - 2.9             | -                      |
| PZU3.0y   | 2.8 - 3.2             | 2.8 - 3.05             | 2.95 - 3.2             | -                      |
| PZU3.3y   | 3.1 - 3.5             | 3.1 - 3.35             | 3.25 - 3.5             | -                      |
| PZU3.6y   | 3.4 - 3.8             | 3.4 - 3.65             | 3.55 - 3.8             | -                      |
| PZU3.9y   | 3.7 - 4.1             | 3.7 - 3.97             | 3.87 - 4.1             | -                      |
| PZU4.3y   | 4.01 - 4.48           | 4.01 - 4.21            | 4.15 - 4.34            | 4.28 - 4.48            |
| PZU4.7y   | 4.42 - 4.9            | 4.42 - 4.61            | 4.55 - 4.75            | 4.69 - 4.9             |
| PZU5.1y   | 4.84 - 5.37           | 4.84 - 5.04            | 4.98 - 5.2             | 5.14 - 5.37            |
| PZU5.6y   | 5.31 - 5.92           | 5.31 - 5.55            | 5.49 - 5.73            | 5.67 - 5.92            |
| PZU6.2y   | 5.86 - 6.53           | 5.86 - 6.12            | 6.06 - 6.33            | 6.26 - 6.53            |
| PZU6.8y   | 6.47 - 7.14           | 6.47 - 6.73            | 6.65 - 6.93            | 6.86 - 7.14            |
| PZU7.5y   | 7.06 - 7.84           | 7.06 - 7.36            | 7.28 - 7.6             | 7.52 - 7.84            |
| PZU8.2y   | 7.76 - 8.64           | 7.76 - 8.1             | 8.02 - 8.36            | 8.28 - 8.64            |
| PZU9.1y   | 8.56 - 9.55           | 8.56 - 8.93            | 8.85 - 9.23            | 9.15 - 9.55            |
| PZU10y    | 9.45 - 10.55          | 9.45 - 9.87            | 9.77 - 10.21           | 10.11 - 10.55          |
| PZU11y    | 10.44 - 11.56         | 10.44 - 10.88          | 10.76 - 11.22          | 11.1 - 11.56           |
| PZU12y    | 11.42 - 12.6          | 11.42 - 11.9           | 11.74 - 12.24          | 12.08 - 12.6           |
| PZU13y    | 12.47 - 13.96         | 12.47 - 13.03          | 12.91 - 13.49          | 13.37 - 13.96          |
| PZU14y    | -                     | -                      | 13.7 - 14.3            | -                      |
| PZU15y    | 13.84 - 15.52         | 13.84 - 14.46          | 14.34 - 14.98          | 14.85 - 15.52          |
| PZU16y    | 15.37 - 17.09         | 15.37 - 16.01          | 15.85 - 16.51          | 16.35 - 17.09          |
| PZU18y    | 16.94 - 19.03         | 16.94 - 17.7           | 17.56 - 18.35          | 18.21 - 19.03          |
| PZU20y    | 18.86 - 21.08         | 18.86 - 19.7           | 19.52 - 20.39          | 20.21 - 21.08          |
| PZU22y    | 20.88 - 23.17         | 20.88 - 21.77          | 21.54 - 22.47          | 22.23 - 23.17          |
| PZU24y    | 22.93 - 25.57         | 22.93 - 23.96          | 23.72 - 24.78          | 24.54 - 25.57          |
| PZU27y    | 25.1 - 28.9           | -                      | -                      | -                      |
| PZU30y    | 28 - 32               | -                      | -                      | -                      |
| PZU33y    | 31 - 35               | -                      | -                      | -                      |
| PZU36y    | 34 - 38               | -                      | -                      | -                      |

NZX-series in SOD27

|         | $V_z$ (V) |         | $V_z$ (V)     |        | $V_z$ (V)     |
|---------|-----------|---------|---------------|--------|---------------|
| NZX2V1B | 2.0 - 2.2 | NZX6V2D | 6.1 - 6.4     | NZX14C | 13.8 - 14.3   |
| NZX2V4A | 2.3 - 2.5 | NZX6V2E | 6.3 - 6.6     | NZX15A | 14.1 - 14.7   |
| NZX2V4B | 2.4 - 2.6 | NZX6V8A | 6.4 - 6.7     | NZX15B | 14.5 - 15.1   |
| NZX2V7A | 2.5 - 2.7 | NZX6V8B | 6.6 - 6.9     | NZX15C | 14.9 - 15.5   |
| NZX2V7B | 2.6 - 2.8 | NZX6V8C | 6.7 - 7       | NZX15X | 14.35 - 15.09 |
| NZX2V7C | 2.7 - 2.9 | NZX6V8D | 6.9 - 7.2     | NZX16A | 15.3 - 15.9   |
| NZX3V0A | 2.8 - 3   | NZX7V5A | 7 - 7.3       | NZX16B | 15.7 - 16.5   |
| NZX3V0B | 2.9 - 3.1 | NZX7V5B | 7.2 - 7.6     | NZX16C | 16.3 - 17.1   |
| NZX3V0C | 3 - 3.2   | NZX7V5C | 7.3 - 7.7     | NZX18A | 16.9 - 17.7   |
| NZX3V3A | 3.1 - 3.3 | NZX7V5D | 7.5 - 7.9     | NZX18B | 17.5 - 18.3   |
| NZX3V3B | 3.2 - 3.4 | NZX7V5X | 7.07 - 7.45   | NZX18C | 18.1 - 19     |
| NZX3V3C | 3.3 - 3.5 | NZX8V2A | 7.7 - 8.1     | NZX20A | 18.8 - 19.7   |
| NZX3V6A | 3.4 - 3.6 | NZX8V2B | 7.9 - 8.3     | NZX20B | 19.5 - 20.4   |
| NZX3V6B | 3.5 - 3.7 | NZX8V2C | 8.1 - 8.5     | NZX20C | 20.2 - 21.2   |
| NZX3V6C | 3.6 - 3.8 | NZX8V2D | 8.3 - 8.7     | NZX22A | 20.9 - 21.9   |
| NZX3V9A | 3.7 - 3.9 | NZX9V1A | 8.5 - 8.9     | NZX22B | 21.6 - 22.6   |
| NZX3V9B | 3.8 - 4   | NZX9V1B | 8.7 - 9.1     | NZX22C | 22.3 - 23.3   |
| NZX3V9C | 3.9 - 4.1 | NZX9V1C | 8.9 - 9.3     | NZX24A | 22.9 - 24     |
| NZX4V3A | 4 - 4.2   | NZX9V1D | 9.1 - 9.5     | NZX24B | 23.6 - 24.7   |
| NZX4V3B | 4.1 - 4.3 | NZX9V1E | 9.3 - 9.7     | NZX24C | 24.3 - 25.5   |
| NZX4V3C | 4.2 - 4.4 | NZX10A  | 9.5 - 9.9     | NZX24X | 22.61 - 23.77 |
| NZX4V3D | 4.3 - 4.5 | NZX10B  | 9.7 - 10.1    | NZX27A | 25.2 - 26.6   |
| NZX4V7A | 4.4 - 4.6 | NZX10C  | 9.9 - 10.3    | NZX27B | 26.2 - 27.6   |
| NZX4V7B | 4.5 - 4.7 | NZX10D  | 10.2 - 10.6   | NZX27C | 27.2 - 28.6   |
| NZX4V7C | 4.6 - 4.8 | NZX11A  | 10.4 - 10.8   | NZX27X | 26.99 - 28.39 |
| NZX4V7D | 4.7 - 4.9 | NZX11B  | 10.7 - 11.1   | NZX30A | 28.2 - 29.6   |
| NZX5V1A | 4.8 - 5   | NZX11C  | 10.9 - 11.3   | NZX30B | 29.2 - 30.6   |
| NZX5V1B | 4.9 - 5.1 | NZX11D  | 11.1 - 11.6   | NZX30C | 30.2 - 31.6   |
| NZX5V1C | 5 - 5.2   | NZX12A  | 11.4 - 11.9   | NZX30X | 29.02 - 30.51 |
| NZX5V1D | 5.1 - 5.3 | NZX12B  | 11.6 - 12.1   | NZX33A | 31.2 - 32.6   |
| NZX5V6A | 5.2 - 5.5 | NZX12C  | 11.9 - 12.4   | NZX33B | 32.2 - 33.6   |
| NZX5V6B | 5.3 - 5.6 | NZX12D  | 12.2 - 12.7   | NZX33C | 33.2 - 34.5   |
| NZX5V6C | 5.4 - 5.7 | NZX12X  | 11.44 - 12.03 | NZX36A | 34.2 - 35.7   |
| NZX5V6D | 5.5 - 5.8 | NZX13A  | 12.4 - 12.9   | NZX36B | 35.3 - 36.8   |
| NZX5V6E | 5.6 - 5.9 | NZX13B  | 12.6 - 13.1   | NZX36C | 36.4 - 38     |
| NZX6V2A | 5.7 - 6   | NZX13C  | 12.9 - 13.4   | NZX36X | 35.36 - 37.19 |
| NZX6V2B | 5.8 - 6.1 | NZX14A  | 13.2 - 13.7   |        |               |
| NZX6V2C | 6 - 6.3   | NZX14B  | 13.5 - 14     |        |               |

### General-purpose high-speed switching diodes < 90V

types in **bold** represent new products

| V <sub>R</sub> max (V) | V <sub>F</sub> max (V) | @ I <sub>F</sub> (mA) | I <sub>R</sub> max (nA) | @ V <sub>R</sub> (V) | t <sub>tr</sub> max (ns) | Package               | SOD80C (MiniMelf) | SOT23           | SOT143B         | SOT323 (SC-70)  | SOT363 (SC-88)    | DFN1010D-3 (SOT1215) | DFN1006-3 (SOT883) |                  |
|------------------------|------------------------|-----------------------|-------------------------|----------------------|--------------------------|-----------------------|-------------------|-----------------|-----------------|-----------------|-------------------|----------------------|--------------------|------------------|
|                        |                        |                       |                         |                      |                          |                       | Size (mm)         | 3.5 x 1.5 x 1.5 | 2.9 x 1.3 x 1.0 | 2.9 x 1.3 x 1.0 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95    | 1.1 x 1.0 x 0.37   | 1.0 x 0.6 x 0.48 |
|                        |                        |                       |                         |                      |                          | P <sub>tot</sub> (mW) | 500               | 250             | 250             | 200             | 300               | 540                  | 250                |                  |
| 50                     | 1                      | 50                    | 100                     | 50                   | 4                        |                       |                   | BAL74           |                 |                 |                   |                      |                    |                  |
|                        |                        |                       |                         |                      |                          |                       |                   | BAV74           |                 |                 |                   |                      |                    |                  |
| 70                     | 1                      | 50                    | 1000                    | 70                   | 4                        |                       |                   | BAL99           |                 |                 |                   |                      |                    |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 | BAS28           |                 |                   |                      |                    |                  |
| 75                     | 1                      | 50                    | 1000                    | 75                   | 4                        |                       |                   |                 |                 |                 |                   |                      |                    |                  |
|                        |                        | 100                   | 5000                    | 75                   | 4                        |                       | BAS32L            |                 |                 |                 |                   |                      |                    |                  |
| 80                     | 1                      | 50                    | 500                     | 80                   | 4                        |                       |                   |                 |                 | 1PS300          |                   |                      |                    |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 | 1PS301          |                   |                      |                    |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 | 1PS302          |                   |                      |                    |                  |
| 90                     | 1                      | 50                    | 500                     | 80                   | 4                        |                       |                   | BAW56           |                 | BAW56W          |                   | <b>BAW56QA</b>       | BAW56M             |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 |                 | BAW56S            |                      |                    |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 |                 | BAW756S           |                      |                    |                  |

### General-purpose, high-speed switching diodes 100V

types in **bold** represent new products

| V <sub>R</sub> max (V) | V <sub>F</sub> max (V) | @ I <sub>F</sub> (mA) | I <sub>R</sub> max (nA) | @ V <sub>R</sub> (V) | t <sub>tr</sub> max (ns) | Package               | SOT23     | SOD123F         | SOT323 (SC-70)  | SOT363 (SC-88)    | SOD323 (SC-76)    | SOD323F (SC-90)   | SOT666           | SOD523 (SC-79)   | DFN1010D-3 (SOT1215) | DFN1006-2 (SOD882) | DFN1006-3 (SOT883) | DFN1006D-2 (SOD882D) |
|------------------------|------------------------|-----------------------|-------------------------|----------------------|--------------------------|-----------------------|-----------|-----------------|-----------------|-------------------|-------------------|-------------------|------------------|------------------|----------------------|--------------------|--------------------|----------------------|
|                        |                        |                       |                         |                      |                          |                       | Size (mm) | 2.9 x 1.3 x 1.0 | 2.6 x 1.6 x 1.1 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.7 x 1.25 x 0.95 | 1.7 x 1.25 x 0.7 | 1.6 x 1.2 x 0.55 | 1.2 x 0.8 x 0.6      | 1.1 x 1.0 x 0.37   | 1.0 x 0.6 x 0.48   | 1.0 x 0.6 x 0.48     |
|                        |                        |                       |                         |                      |                          | P <sub>tot</sub> (mW) | 250       | 830             | 200             | 300               | 400               | 550               | 180              | 500              | 540                  | 250                | 250                | 250                  |
| 100                    | 1                      | 50                    | 500                     | 80                   | 4                        |                       |           | BAS16H          |                 |                   | BAS316            | BAS16J            |                  | BAS516           |                      | BAS16L             |                    | BAS16LD              |
|                        |                        |                       |                         |                      |                          |                       | BAS16     |                 | BAS16W          |                   |                   | <b>BAS16QA</b>    |                  |                  |                      |                    |                    |                      |
|                        |                        |                       |                         |                      |                          |                       |           |                 | BAS16VY         |                   |                   | BAS16VV           |                  |                  |                      |                    |                    |                      |
|                        |                        |                       |                         |                      |                          |                       | BAV70     |                 | BAV70W          |                   |                   |                   | <b>BAV70QA</b>   |                  | BAV70M               |                    |                    |                      |
|                        |                        |                       |                         |                      |                          |                       |           |                 | BAS16VY         |                   |                   |                   |                  |                  |                      |                    |                    |                      |
|                        |                        |                       |                         |                      |                          |                       | BAV99     |                 | BAV99W          |                   |                   |                   | <b>BAV99QA</b>   |                  |                      |                    |                    |                      |
|                        |                        |                       |                         |                      |                          |                       |           |                 | BAS16VY         |                   |                   |                   |                  |                  |                      |                    |                    |                      |

### General-purpose switching diodes ≥ 100V

types in **bold** represent new products

| V <sub>R</sub> max (V) | V <sub>F</sub> max (V) | @ I <sub>F</sub> (mA) | I <sub>R</sub> max (nA) | @ V <sub>R</sub> (V) | t <sub>tr</sub> max (ns) | Package               | SOD80C (MiniMelf) | SOT457 (SC-74)  | SOT23           | SOT143B         | SOD123F         | SOT323 (SC-70)  | SOT353 (SC-88A)   | SOT363 (SC-88)    | SOD323 (SC-76)    | SOD323F (SC-90)   | SOD523 (SC-79)   |
|------------------------|------------------------|-----------------------|-------------------------|----------------------|--------------------------|-----------------------|-------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------|-------------------|-------------------|-------------------|------------------|
|                        |                        |                       |                         |                      |                          |                       | Size (mm)         | 3.5 x 1.5 x 1.5 | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0 | 2.9 x 1.3 x 1.0 | 2.6 x 1.6 x 1.1 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 2.0 x 1.25 x 0.95 | 1.7 x 1.25 x 0.95 | 1.7 x 1.25 x 0.7 |
|                        |                        |                       |                         |                      |                          | P <sub>tot</sub> (mW) | 300               | 500             | 250             | 250             | 830             | 350             |                   | 300               | 400               | 550               | 500              |
| 100                    | 1                      | 100                   | 100                     | 100                  | 50                       |                       |                   |                 | BAS19           |                 |                 |                 |                   |                   |                   |                   |                  |
| 150                    | 1                      | 100                   | 100                     | 150                  | 50                       |                       | BAS102            |                 |                 |                 |                 |                 |                   |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 | BAS20           |                 |                 |                 |                   |                   |                   |                   |                  |
| ≥200                   | 1                      | 100                   | 100                     | 200                  | 50                       |                       | BAS103            |                 |                 |                 | BAS21H          |                 |                   |                   | BAS321            |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 | BAS21           |                 | BAS21W          |                 |                   |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 | BAS21           |                 |                 |                   |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 | BAV23           |                 |                 |                   |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 |                 |                 |                 |                   | <b>BAS21PG</b>    |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 | BAV23A          |                 |                 | BAS21AW           |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 | BAV23C          |                 |                 |                   |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 | BAV23S          |                 |                 | BAS21SW           |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 | BAS21AVD        |                 |                 |                   |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 | BAS21VD         |                 |                 |                   |                   |                   |                   |                  |
| 300                    | 1.1                    | 100                   | 150                     | 250                  | 50                       |                       |                   |                 |                 |                 |                 |                 |                   |                   |                   | BAS21J            | BAS521           |
|                        |                        |                       |                         |                      |                          |                       |                   |                 | BAS101          |                 |                 |                 |                   |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 | BAS101S         |                 |                 |                 |                   |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 | BAS101S         |                 |                 |                 |                   |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 | BAS101          |                 |                 |                   |                   |                   |                   |                  |
|                        |                        |                       |                         |                      |                          |                       |                   |                 |                 |                 |                 |                 |                   |                   |                   | BAS101S           |                  |

### PN-rectifier







| V <sub>R</sub> max (V) | V <sub>F</sub> max (V) | @ I <sub>F</sub> (A) | I <sub>R</sub> max (μA) | @ V <sub>R</sub> (V) | t <sub>tr</sub> max (ns) | Package               | CFP3 SOD123W |
|------------------------|------------------------|----------------------|-------------------------|----------------------|--------------------------|-----------------------|--------------|
|                        |                        |                      |                         |                      |                          |                       | Size (mm)    |
|                        |                        |                      |                         |                      |                          | P <sub>tot</sub> (mW) | 950          |
| 400                    | 1.1                    | 1                    | 1                       | 400                  | 1800                     |                       | PNS40010ER   |

**In the spotlight**

**Dual high-speed switching diode BAS21PG in SOT353 (SC-88A)**

- V<sub>R</sub> max = 250 V, I<sub>F</sub> max = 225 mA, dual isolated configuration
- Low leakage current: I<sub>R</sub> max = 100 nA
- High-speed switching: t<sub>tr</sub> max = 50 ns
- Low capacitance: C<sub>d</sub> max = 2 pF
- AEC-Q101 qualified

Controlled-avalanche switching diodes

















| V <sub>R</sub> max (V) | V <sub>F</sub> max (V) | I <sub>F</sub> (mA) | I <sub>R</sub> max (nA)<br>@ V <sub>R</sub> max | I <sub>FSM</sub> max (A) | I <sub>FRM</sub> max (mA) | C <sub>d</sub> max (pF) | t <sub>rr</sub> max (ns) | Package   | SOT23   | SOT143B   |
|------------------------|------------------------|---------------------|---|--------------------------|---------------------------|-------------------------|--------------------------|---|---|---|
|                        |                        |                     |   |                          |                           |                         |                          |   |  |  |
|                        |                        |                     |   |                          |                           |                         |                          |   | Size (mm)   | Size (mm)   |
| 60                     | 1                      | 200                 | 100   | 9                        | 600                       | 2.5                     | 6                        |  |   | BAS56   |
| 90                     | 1                      | 200                 | 100   | 10                       | 600                       | 35                      | 50                       |   | BAS29   |   |
|                        |                        |                     |   |                          |                           |                         |                          |   | BAS31   |   |
|                        |                        |                     |   |                          |                           |                         |                          |   | BAS35   |   |



# ESD protection, TVS, filtering and signal conditioning

Low-leakage current-switching diodes

types in **bold** represent new products

| V <sub>R</sub> max (V) | V <sub>F</sub> max (V) | I <sub>F</sub> (mA) | I <sub>R</sub> max (nA)<br>@ V <sub>R</sub> max | t <sub>rr</sub> max (μs) | Package   | SOD80C (MiniMelf)  | SOD68 (DO-34)  | SOT23  | SOD123F  | SOT323 (SC-70)   | SOD323 (SC-76)   | SOD523 (SC-79)  | DFN1010D-3 (SOT1215)   | DFN1006-3 (SOT883)   | DFN1006-2 (SOD882)   |
|------------------------|------------------------|---------------------|---|--------------------------|---|--|--|--|--|--|--|---|--|--|--|
|                        |                        |                     |   |                          |   |  |  |  |  |  |  |  |  |  |  |
|                        |                        |                     |   |                          |   | Size (mm)  | Size (mm)  | Size (mm)  | Size (mm)  | Size (mm)  | Size (mm)  | Size (mm)   | Size (mm)  | Size (mm)  | Size (mm)  |
|                        |                        |                     |   |                          |   | 300  | 500  | 250  | 830  | 250  | 400  | 500   | 540  | 250  | 250  |
| 75                     | 1                      | 10                  | 5   | 3                        |  |  |  |  | BAS116H  |  | BAS416   | BAS716  |  |  | <b>BAS116L</b>   |
|                        |                        |                     |   |                          |  |  |  | BAS116   |  |  |  |   | <b>BAS116QA</b>  |  |  |
|                        |                        |                     |   |                          |  |  |  | BAV199   |  | BAV199W  |  |   |  |  |  |
|                        |                        |                     |   |                          |  |  |  | BAW156   |  |  |  |   |  |  |  |
|                        |                        |                     |   |                          |  |  |  | BAV170   |  |  |  |   | <b>BAV170QA</b>  | <b>BAV170M</b>   |  |
| 125                    | 1                      | 100                 | 1   | 1.5 typ                  |  | BAS45AL  | BAS45A   |  |  |  |  |   |  |  |  |

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# ESD protection, TVS devices, and EMI filtering

## What you get when you choose NXP

### Solutions for wide application fields

- ▶ High-speed data lines
- ▶ General interfaces
- ▶ Automotive protection
- ▶ Supply lines

### A broad range of packages that simplify PCB design

### A quality product from an experienced, high volume supplier

- ▶ NXP is strongly committed to automotive quality standards
- ▶ NXP has a track record of more than 12 years in developing and producing ESD / TVS devices
- ▶ NXP is the #1 in ESD protection with a high production capacity

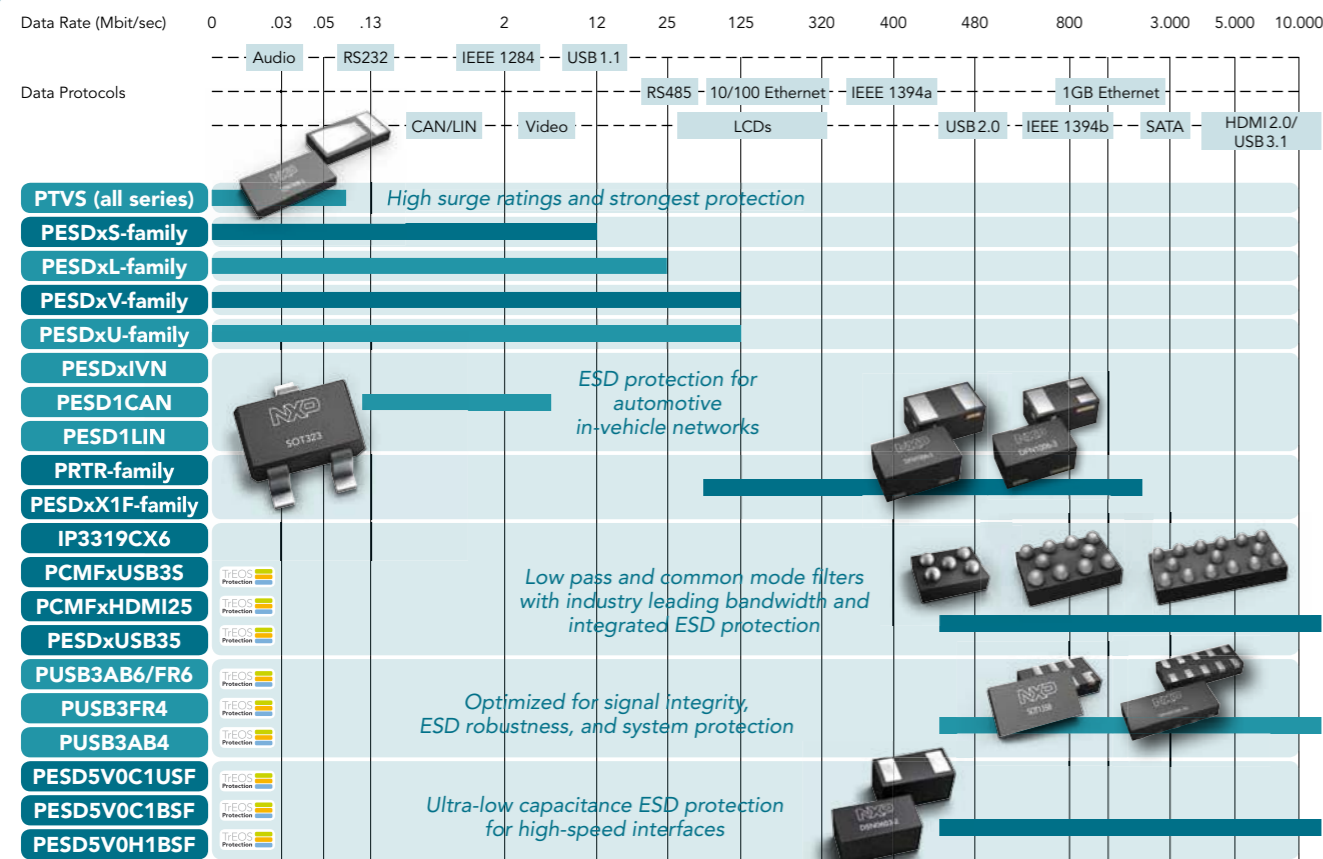
USB3 / Type C  
 USB2 / Type C  
 USB Vbus / charger port / Type C  
 NFC antenna  
 Wireless charging  
 Audio speaker  
 Battery contact, Vbat  
 Keys / buttons  
 SIM, SD3  
 Audio



CAN, LIN  
 FlexRay  
 BroadR-Reach  
 SENT  
 LVDS



### Portfolio Overview Diodes



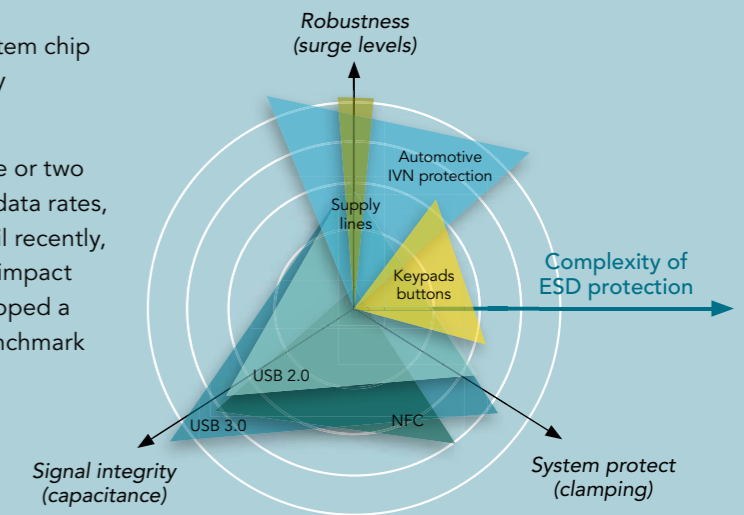
## The best system-chip protection for high-speed data lines (USB 3.1, Type-C connector)

### ESD protection characteristics that count

There are three key parameters for a perfect ESD protection device:

- ▶ High robustness against ESD pulses
- ▶ Low clamping / dynamic resistance – to protect the system chip
- ▶ Low capacitance – to maintain excellent signal integrity in high-speed interfaces

Some applications require good performance in only one or two of these areas. For the latest interfaces with the highest data rates, optimum performance in all three parameters is key. Until recently, improving one of these key parameters had a negative impact on the others. Addressing this challenge, NXP has developed a new ESD technology (TrEOS Protection) that delivers benchmark performance in all three key parameters.



**Extremely low clamping voltage**

Absorbing highest ESD pulses THE key for reliable system protection



▶ Low capacitance down to 0.1 pF

▶ High robustness up to 9A, 8/20 μs

▶ Packages optimized for communications interfaces

### TrEOS Protection devices

| Type         | device                                 | VRWM (V) | Uni- or bidirectional | Cd typ (pF) | ESD rating max (kV) (Ω) | Rdyn TLP (Ω) | Number of protected lines | Package     | Size (mm)        |
|--------------|--|----------|-----------------------|-------------|-------------------------|--------------|---------------------------|-------------|------------------|
| PUSB3FR4     | ESD protection                         | 3.3      | uni                   | 0.29        | 15                      | 0.27         | 4                         | DFN2510A-10 | 2.5 x 1.0 x 0.48 |
| PUSB3FR6     | ESD protection                         | 3.3      | uni                   | 0.35        | 15                      | 0.29         | 6                         | DFN2111-7   | 2.1 x 1.1 x 0.48 |
| PUSB3AB4     | ESD protection                         | 3.3      | bi                    | 0.17        | 15                      | 0.4          | 4                         | DFN2510A-10 | 2.5 x 1.0 x 0.48 |
| PUSB3AB6     | ESD protection                         | 3.3      | bi                    | 0.15        | 15                      | 0.4          | 6                         | DFN2111-7   | 2.1 x 1.1 x 0.48 |
| PCMF1USB3S   | Common Mode Filter with ESD protection | 5        | uni                   | 0.3         | 15                      | 0.14         | 2                         | WLCSP5      | 0.8 x 1.2 x 0.5  |
| PCMF2USB3S   | Common Mode Filter with ESD protection | 5        | uni                   | 0.3         | 15                      | 0.14         | 4                         | WLCSP10     | 1.6 x 1.2 x 0.5  |
| PCMF3USB3S   | Common Mode Filter with ESD protection | 5        | uni                   | 0.3         | 15                      | 0.14         | 6                         | WLCSP15     | 2.4 x 1.2 x 0.5  |
| PESD3V3C1BSF | ESD protection                         | 3.3      | bi                    | 0.2         | 20                      | 0.23         | 1                         | DSN0603-2   | 0.6 x 0.3 x 0.3  |
| PESD5V0R1BSF | ESD protection                         | 5        | bi                    | 0.1         | 10                      | 0.45         | 1                         | DSN0603-2   | 0.6 x 0.3 x 0.3  |
| PESD5V0H1BSF | ESD protection                         | 5        | bi                    | 0.15        | 15                      | 0.25         | 1                         | DSN0603-2   | 0.6 x 0.3 x 0.3  |
| PESD5V0C1BSF | ESD protection                         | 5        | bi                    | 0.2         | 20                      | 0.23         | 1                         | DSN0603-2   | 0.6 x 0.3 x 0.3  |
| PESD5V0C1USF | ESD protection                         | 5        | uni                   | 0.45        | 20                      | 0.1          | 1                         | DSN0603-2   | 0.6 x 0.3 x 0.3  |

ESD protection, TVS, filtering and signal conditioning

# Tiny but mighty – DSN0402

## Reliable ESD protection on minimal space

### DSN0402-2 (SOD992) features and benefits

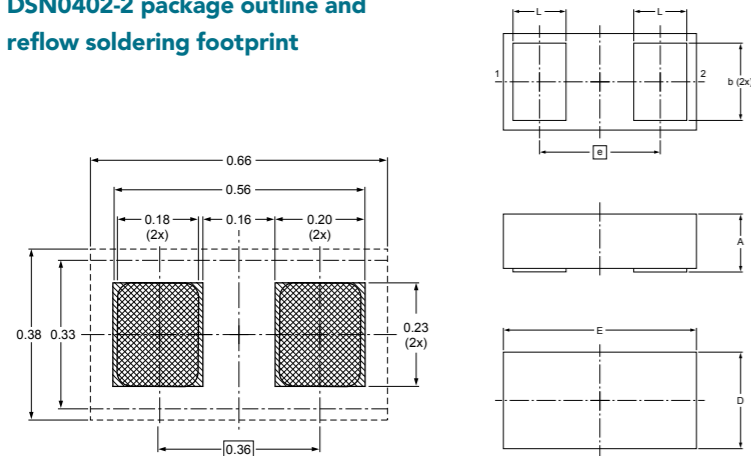
- ▶ Ultra-small dimensions: 0.4 x 0.2 mm (01005 inch)
- ▶ 45% less package area compared to DSN0603-2
- ▶ Only 120 μm in height
- ▶ Coated sidewalls enable easier soldering
- ▶ Polarity marking
- ▶ Halogen and antimony free; RoHS compliant



DSN0402-2 (SOD992)

Single package  
0.4 x 0.2 x 0.12 mm

### DSN0402-2 package outline and reflow soldering footprint



Dimensions (mm are the original dimensions)

| Unit | A    | E    | D    | L    | b    | e    |
|------|------|------|------|------|------|------|
| max  | 0.14 | 0.42 | 0.22 | 0.12 | 0.17 |      |
| nom  | 0.12 | 0.40 | 0.20 | 0.11 | 0.16 | 0.25 |
| min  | 0.10 | 0.38 | 0.18 | 0.10 | 0.15 |      |

### Ultra-low capacitance in DSN0402

| Type         | V <sub>rwM</sub> (V) | Config | C <sub>d</sub> typ (pF) | C <sub>d</sub> max (pF) | V <sub>esd</sub> (kV) |
|--------------|----------------------|--------|-------------------------|-------------------------|-----------------------|
| PESD5V0F1BSH | 5 V                  | Bi     | 0.25 pF                 | 0.3 pF                  | 8 kV                  |

## Ultra low-capacitance ESD protection devices

### Ultra low-capacitance ESD protection devices – Part I

types in **bold** represent new products

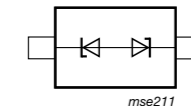
| Unidirectional | Bidirectional | V <sub>rwM</sub> (V) | C <sub>d</sub> typ (pF) | C <sub>d</sub> max (pF) | ESD rating <sup>[1]</sup> max (kV) | Configuration | Type                 | Package              | Size (mm)         |
|----------------|---------------|----------------------|-------------------------|-------------------------|------------------------------------|---------------|----------------------|----------------------|-------------------|
|                |               |                      |                         |                         |                                    |               |                      |                      |                   |
|                |               | 5                    | 0.45                    | 0.5                     | 20                                 |               | <b>PESD5V0C1USF</b>  | DSN0603-2 (SOD962)   | 0.6 x 0.3 x 0.3   |
|                |               | 5                    | 0.6                     | 0.75                    | 10                                 |               | PESD5V0F1USF         |                      |                   |
|                |               | 5                    | 0.95                    | 1.15                    | 8                                  |               | PESD5V0X1ULD         | DFN1006D-2 (SOD882D) | 1.0 x 0.6 x 0.37  |
|                |               |                      | 1.55                    | 1.75                    | 15                                 |               | PESD5V0X1UALD        |                      |                   |
|                |               | 16                   | 0.83                    | 0.98                    | 8                                  |               | PESD16VX1UL          | DFN1006-2 (SOD882)   | 1.0 x 0.6 x 0.48  |
|                |               | 5                    | 0.95                    | 1.15                    | 8                                  |               | PESD5V0X1UB          | SOD523 (SC-79)       | 1.2 x 0.8 x 0.6   |
|                |               |                      | 1.55                    | 1.75                    | 15                                 |               | PESD5V0X1UAB         |                      |                   |
|                |               | 80                   | 0.6                     | 0.75                    | 30                                 |               | NUP1301U             | SOT323               | 2.0 x 1.25 x 0.95 |
|                |               |                      |                         |                         |                                    |               | NUP1301              | SOT23                | 2.9 x 1.3 x 1.0   |
| 0              | 1             | 5                    | 0.3                     | 0.4                     | 8                                  |               | <b>PESD5V0F1BSH</b>  | DSN0402-2 (SOD992)   | 0.4 x 0.2 x 0.12  |
|                |               | 3.3                  | 0.2                     | 0.25                    | 20                                 |               | <b>PESD3V3C1BSF</b>  | DSN0603-2 (SOD962)   | 0.6 x 0.3 x 0.3   |
|                |               | 5                    | 0.1                     | 0.15                    | 10                                 |               | <b>PESD5V0R1BSF</b>  |                      |                   |
|                |               |                      | 0.15                    | 0.2                     | 15                                 |               | <b>PESD5V0H1BSF</b>  |                      |                   |
|                |               | 5.5                  | 0.25                    | 0.3                     | 10                                 |               | <b>PESD5V0C1BSF</b>  |                      |                   |
|                |               |                      |                         |                         |                                    |               | PESD5V0F1BSF         |                      |                   |
|                |               | 3.3                  | –                       | 1.1                     | 20                                 |               | <b>PESD3V3X1BCSF</b> |                      |                   |
|                |               | 5.0                  | –                       | 1.1                     |                                    |               | <b>PESD5V0X1BCSF</b> |                      |                   |
|                |               | 18                   | 0.28                    | 0.45                    | 10                                 |               | <b>PESD18VF1BSF</b>  |                      |                   |
|                |               | 24                   | 0.25                    | 0.4                     | 10                                 |               | <b>PESD24VF1BSF</b>  |                      |                   |
|                |               | 5                    | 0.4                     | 0.55                    | 10                                 |               | PESD5V0F1BLD         |                      |                   |
|                |               | 3.3                  | 1.3                     | 1.6                     | 9                                  |               | PESD5V0F1BRD         | DFN1006-2 (SOD882)   | 1.0 x 0.6 x 0.48  |
|                |               | 5.5                  | 0.4                     | 0.55                    | 10                                 |               | PESD3V3X1BL          |                      |                   |
|                |               | 5                    | 0.49                    | 0.6                     | 8                                  |               | PESD5V0F1BL          |                      |                   |
|                |               |                      | 0.85                    | 0.95                    | 15                                 |               | PESD5V0X1BCL         |                      |                   |
|                |               | 18                   | 0.9                     | 1.3                     | 9                                  |               | PESD5V0X1BCAL        |                      |                   |
|                |               |                      | 0.35                    | 0.5                     | 10                                 |               | PESD5V0X1BL          |                      |                   |
|                |               | 24                   | 0.3                     | 0.45                    | 10                                 | PESD18VF1BL   |                      |                      |                   |
|                |               |                      |                         |                         |                                    | PESD24VF1BL   |                      |                      |                   |

<sup>[1]</sup> according to IEC 61000-4-2 (contact discharge)

### In the spotlight

#### Ultra low-capacitance ESD protection in DSN0603-2: PESD5V0H1BSF

- Bidirectional protection for one data line in DSN0603-2
- Ultra-low line capacitance of 0.15 pF
- Ultra-low clamping
- Minimized capacitance variation over voltage
- High ESD robustness = 15 kV
- Ultra-small package DSN0603-2 (0.6 x 0.3 x 0.3 mm)



## Ultra low-capacitance ESD protection devices – Part 2

types in **bold** represent new products

| Number of protected lines |               | V <sub>RWM</sub> (V) | C <sub>line typ</sub> (pF) | C <sub>line max</sub> (pF) | ESD rating <sup>(1)</sup> max (kV) | Configuration | Type          | Package              | Size (mm)        |
|---------------------------|---------------|----------------------|----------------------------|----------------------------|------------------------------------|---------------|---------------|----------------------|------------------|
| Unidirectional            | Bidirectional |                      |                            |                            |                                    |               |               |                      |                  |
| 2                         | 1             | 5                    | 0.5                        | 0.65                       | 10                                 |               | PESD5V0X2UMB  | DFN1006B-3 (SOT883B) | 1.0 x 0.6 x 0.37 |
|                           |               |                      |                            |                            |                                    |               | PESD5V0X2UM   | DFN1006-3 (SOT883)   | 1.0 x 0.6 x 0.48 |
|                           |               |                      |                            |                            |                                    |               | PESD5V0X2UAMB | DFN1006B-3 (SOT883B) | 1.0 x 0.6 x 0.37 |
|                           |               |                      |                            |                            |                                    |               | PESD5V0X2UAM  | DFN1006-3 (SOT883)   | 1.0 x 0.6 x 0.48 |
|                           | 0             | 5.5                  | 1                          | 1.5                        | 8                                  |               | PESD5V0X1BQ   | SOT663               | 1.6 x 1.2 x 0.55 |
|                           |               |                      |                            |                            |                                    |               | PESD5V0X1BT   | SOT23                | 2.9 x 1.3 x 1.0  |
|                           | 0             | 5.5                  | 1.8                        | -                          | 12                                 |               | PRTR5V0U2X    | SOT143B              | 2.9 x 1.3 x 1.0  |
|                           |               |                      |                            |                            |                                    |               | PRTR5V0U2AX   |                      |                  |
|                           |               |                      |                            |                            |                                    |               | 1             | 1.5                  | 8                |

<sup>(1)</sup> according to IEC 61000-4-5 (contact discharge)

### In the spotlight

#### Lowest capacitance ESD protection in DFN1006B-3: PESD5V0X2UAMB

Unidirectional double protection for two signal lines

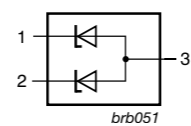
Ultra-low line capacitance of 0.8 pF

Very low package height of 0.37 mm typ

High ESD robustness of 15 kV

AEC-Q101 qualified

Ideal for high-speed data lines, portable electronics, and communication systems



brb051



## Ultra low-capacitance ESD protection devices – Part 3

types in **bold** represent new products

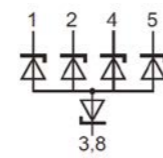
| Number of protected lines |               | V <sub>RWM</sub> (V) | C <sub>line typ</sub> (pF) | C <sub>line max</sub> (pF) | ESD rating <sup>(1)</sup> max (kV) | Configuration | Type           | Package               | Size (mm)         |
|---------------------------|---------------|----------------------|----------------------------|----------------------------|------------------------------------|---------------|----------------|-----------------------|-------------------|
| Unidirectional            | Bidirectional |                      |                            |                            |                                    |               |                |                       |                   |
| 4                         | 0             | 5.5                  | 1                          | -                          | 8                                  |               | IP4220CZ6      | SOT457 (SC-74)        | 2.9 x 1.5 x 1.0   |
|                           |               |                      |                            |                            |                                    |               | IP4221CZ6-S    | DFN1410-6 (SOT886)    | 1.45 x 1.0 x 0.48 |
|                           |               |                      |                            |                            |                                    |               | IP4221CZ6-XS   | DFN1010-6 (SOT891)    | 1.0 x 1.0 x 0.48  |
|                           |               |                      |                            |                            |                                    |               | PRTR5V0U4D     | SOT457 (SC-74)        | 2.9 x 1.5 x 1.0   |
|                           | 0             | 5.5                  | 1.8                        | -                          | 12                                 |               | IP4285CZ9-TBB  | DFN2110-9 (SOT1178)   | 2.1 x 1.0 x 0.48  |
|                           |               |                      |                            |                            |                                    |               | PUSB2X4D       | SOT457 (SC-74)        | 2.9 x 1.5 x 1.0   |
|                           |               |                      |                            |                            |                                    |               | PUSB2X4Y       | SOT363 (SC-88)        | 2.0 x 1.25 x 0.95 |
|                           | 0             | 5.5                  | 0.6                        | -                          | 8                                  |               | IP4283CZ10-TBR | DFN2510A-10 (SOT1176) | 2.5 x 1.0 x 0.48  |

<sup>(1)</sup> according to IEC 61000-4-5 (contact discharge)

In the spotlight

**PUSB3AB4 - ESD protection in very small DFN2510A-10 package for USB3.1 @ 10 Gbps and Thunderbolt**

- Protects four very fast data lines of sensitive system chips
- Lowest clamping in the 0.2 pF class
- Very small DFN2510A-10 package (2.5 x 1.0 x 0.48 mm)
- Capacitance < 0.2 pF



Ultra low-capacitance ESD protection devices – Part 4

types in **bold** represent new products

| Number of protected lines |               | V <sub>RWM</sub> (V) | C <sub>line typ</sub> (pF) | C <sub>line max</sub> (pF) | ESD rating <sup>[1]</sup> max (kV) | I <sub>R</sub> max (μA) @ V <sub>RWM</sub> | Configuration | Type           | Package               | Size (mm)         |
|---------------------------|---------------|----------------------|----------------------------|----------------------------|------------------------------------|--|---------------|----------------|-----------------------|-------------------|
| Unidirectional            | Bidirectional |                      |                            |                            |                                    |  |               |                |                       |                   |
| 4                         | 0             | 5.5                  | 0.5                        | -                          | 10                                 | -  |               | IP4294CZ10-TBR | DFN2510A-10 (SOT1176) | 2.5 x 1.0 x 0.48  |
|                           |               |                      |                            |                            |                                    |  |               | PUSB3F96       |                       |                   |
|                           |               | 3.3                  | 0.27                       | -                          | 15                                 | 0.1  |               | PUSB3FR4       |                       |                   |
| 0                         | 3             | 3.3                  | 0.17                       | 0.2                        |                                    |  |               | PUSB3AB4       |                       |                   |
| 5                         | 4             | 5                    | 0.55                       | 0.7                        | 8                                  | 0.1  |               | PESD5V0F5UF    | DFN1410-6 (SOT886)    | 1.45 x 1.0 x 0.48 |
|                           |               |                      |                            |                            |                                    |  |               | PESD5V0F5UV    | SOT666                | 1.6 x 1.2 x 0.55  |
| 0                         | 6             | 5.5                  | 0.27                       | 0.35                       | 10                                 |  |               | PUSB3TB6       | DFN2111-7 (SOT1358)   | 2.1 x 1.1 x 0.48  |
| 6                         | 0             | 3.3                  | 0.25                       | -                          | 15                                 | 0.1  |               | PUSB3FR6       |                       |                   |
| 0                         | 6             | 3.3                  | 0.15                       | 0.2                        | 15                                 |  |               | PUSB3AB6       |                       |                   |

<sup>[1]</sup> according to IEC 61000-4-2 (contact discharge)

Low-capacitance ESD protection devices – Part I

types in **bold** represent new products

| Number of protected lines |               | V <sub>RWM</sub> (V) | C <sub>line typ</sub> (pF) | C <sub>line max</sub> (pF) | P <sub>PP</sub> <sup>[1]</sup> max (W) | ESD rating <sup>[2]</sup> max (kV) | I <sub>R</sub> max (μA) @ V <sub>RWM</sub> | Configuration | Type         | Package              | Size (mm)         |              |                    |                   |
|---------------------------|---------------|----------------------|----------------------------|----------------------------|--|------------------------------------|--|---------------|--------------|----------------------|-------------------|--------------|--------------------|-------------------|
| Unidirectional            | Bidirectional |                      |                            |                            |  |                                    |  |               |              |                      |                   |              |                    |                   |
| 1                         | 0             | 3.3                  | 34                         | 40                         | 45                                     | 30                                 | 0.3  |               | PESD3V3L1UL  | DFN1006-2 (SOD882)   | 1.0 x 0.6 x 0.48  |              |                    |                   |
|                           |               | 5                    | 25                         | 30                         | 42                                     | 26                                 | 0.1  |               | PESD5V0L1UL  |                      |                   |              |                    |                   |
|                           |               | 5                    | 25                         | 30                         | 42                                     | 26                                 | 0.1  |               | PESD5V0L1ULD | DFN1006D-2 (SOD882D) | 1.0 x 0.6 x 0.37  |              |                    |                   |
|                           |               | 3.3                  | 34                         | 40                         | 45                                     | 30                                 | 0.3  |               | PESD3V3L1UB  | SOD523 (SC-79)       | 1.2 x 0.8 x 0.6   |              |                    |                   |
|                           |               | 5                    | 25                         | 30                         | 42                                     | 26                                 | 0.1  |               | PESD5V0L1UB  |                      |                   |              |                    |                   |
|                           |               | 5                    | 25                         | 30                         | 42                                     | 26                                 | 0.1  |               | PESD5V0L1UA  | SOD323 (SC-76)       | 1.7 x 1.25 x 0.95 |              |                    |                   |
|                           |               | 5                    | 12                         | 15                         | 10                                     | 30                                 | 0.1  |               | PESD5V0L1USF | DSN0603-2 (SOD962)   | 0.6 x 0.3 x 0.3   |              |                    |                   |
|                           |               | 3.3                  | 2.6                        | 3.1                        | -                                      | 9                                  | 0.1 (@ 3 V)                                |               | PESD3V3U1UL  | DFN1006-2 (SOD882)   | 1.0 x 0.6 x 0.48  |              |                    |                   |
|                           |               | 5                    | 2                          | 2.6                        | -                                      | 9                                  | 0.1  |               | PESD5V0U1UL  |                      |                   |              |                    |                   |
|                           |               | 3.3                  | 2.6                        | 3.1                        | -                                      | 9                                  | 0.1 (@ 3 V)                                |               | PESD3V3U1UB  | SOD523 (SC-79)       | 1.2 x 0.8 x 0.6   |              |                    |                   |
|                           |               | 5                    | 2                          | 2.6                        | -                                      | 9                                  | 0.1  |               | PESD5V0U1UB  |                      |                   |              |                    |                   |
|                           |               | 3.3                  | 2.6                        | 3.1                        | -                                      | 9                                  | 0.1 (@ 3 V)                                |               | PESD3V3U1UA  | SOD323 (SC-76)       | 1.7 x 1.25 x 0.95 |              |                    |                   |
|                           |               | 5                    | 2                          | 2.6                        | -                                      | 9                                  | 0.1  |               | PESD5V0U1UA  |                      |                   |              |                    |                   |
|                           |               | 0                    | 1                          | 5.5                        | 12                                     | 15.4                               | 35   |               | 30           | 0.1                  |                   | PESD5V0L1BSF | DSN0603-2 (SOD962) | 0.6 x 0.3 x 0.3   |
|                           |               |                      |                            | 3.3                        | 101                                    | -                                  | 500  |               | 30           | 2                    |                   | PESD3V3L1BA  | SOD323 (SC-76)     | 1.7 x 1.25 x 0.95 |
| 5                         | 75            |                      |                            | -                          | 500                                    | 30                                 | 1  | PESD5V0L1BA   |              |                      |                   |              |                    |                   |
| 12                        | 19            |                      |                            | -                          | 200                                    | 30                                 | 0.05                                       | PESD12VL1BA   |              |                      |                   |              |                    |                   |
| 15                        | 16            |                      |                            | -                          | 200                                    | 30                                 | 0.05                                       | PESD15VL1BA   |              |                      |                   |              |                    |                   |
| 24                        | 11            |                      |                            | -                          | 200                                    | 23                                 | 0.05                                       | PESD24VL1BA   |              |                      |                   |              |                    |                   |

<sup>[1]</sup> 8 / 20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

<sup>[2]</sup> according to IEC 61000-4-2 (contact discharge)

ESD protection, TVS, filtering and signal conditioning

## Low-capacitance ESD protection devices – Part 2

types in **bold** represent new products

| Number of protected lines |                      | V <sub>RWM</sub> (V) | C <sub>line</sub> typ (pF) | C <sub>line</sub> max (pF) | P <sub>PP</sub> <sup>[1]</sup> max (W) | ESD rating <sup>[2]</sup> max (kV) | I <sub>R</sub> max (μA) @ V <sub>RWM</sub> | Configuration     | Type           | Package              | Size (mm)         |              |                      |                  |
|---------------------------|----------------------|----------------------|----------------------------|----------------------------|--|------------------------------------|--|-------------------|----------------|----------------------|-------------------|--------------|----------------------|------------------|
| Unidirectional            | Bidirectional        |                      |                            |                            |  |                                    |  |                   |                |                      |                   |              |                      |                  |
| 0                         | 1                    | 5                    | 11                         | 13                         | 45                                     | 30                                 | 0.01                                       |                   | PESD5V0V1BL    | DFN1006-2 (SOD882)   | 1.0 x 0.6 x 0.48  |              |                      |                  |
|                           |                      | 5                    | 11                         | 13                         | 45                                     | 30                                 | 0.01                                       |                   | PESD5V0V1BLD   | DFN1006D-2 (SOD882D) | 1.0 x 0.6 x 0.37  |              |                      |                  |
|                           |                      | 5                    | 11                         | 13                         | 45                                     | 30                                 | 0.01                                       |                   | PESD5V0V1BB    | SOD523 (SC-79)       | 1.2 x 0.8 x 0.6   |              |                      |                  |
|                           |                      | 5                    | 11                         | 13                         | 45                                     | 30                                 | 0.01                                       |                   | PESD5V0V1BA    | SOD323 (SC-76)       | 1.7 x 1.25 x 0.95 |              |                      |                  |
|                           |                      | 5                    | 5.3                        | 6                          | 10                                     | 20                                 | 0.1  |                   | PESD5V0V1BCSF  | DSN0603-2 (SOD962)   | 0.6 x 0.3 x 0.3   |              |                      |                  |
|                           |                      | 5                    | 5.3                        | 6                          | 20                                     | 25                                 | 0.1  |                   | PESD5V0V1BDSF  |                      |                   |              |                      |                  |
|                           |                      | 5.5                  | 3.5                        | 4.5                        | 8                                      | 15                                 | 0.1  |                   | PESD5V0V1BSF   |                      |                   |              |                      |                  |
|                           |                      | 12                   | 17                         | 25                         | 290                                    | 30                                 | 0.01                                       |                   | PESD12VV1BL    | DFN1006-2 (SOD882)   | 1.0 x 0.6 x 0.48  |              |                      |                  |
|                           |                      | 15                   | 8                          | 10                         | -                                      | 15                                 | 0.1  |                   | IP4302CX2/A    | WLCSP2               | 0.7 x 0.52 x 0.40 |              |                      |                  |
|                           |                      | 2                    | 1                          | 5                          | 2.9                                    | 3.5                                | -  |                   | 10             | 0.1                  |                   | PESD5V0U1BL  | DFN1006-2 (SOD882)   | 1.0 x 0.6 x 0.48 |
|                           |                      |                      |                            |                            |  |                                    |  |                   |                |                      |                   | PESD5V0U1BLD | DFN1006D-2 (SOD882D) | 1.0 x 0.6 x 0.37 |
|                           |                      |                      |                            |                            |  |                                    |  |                   |                |                      |                   | PESD5V0U1BB  | SOD523 (SC-79)       | 1.2 x 0.8 x 0.6  |
| PESD5V0U1BA               | SOD323 (SC-76)       |                      |                            |                            |  |                                    |  | 1.7 x 1.25 x 0.95 |                |                      |                   |              |                      |                  |
| PESD3V3L2UM               | DFN1006-3 (SOT883)   |                      |                            |                            |  |                                    |  | 1.0 x 0.6 x 0.48  |                |                      |                   |              |                      |                  |
| PESD5V0L2UM               | DFN1006B-3 (SOT883B) |                      |                            |                            |  |                                    |  | 1.0 x 0.6 x 0.37  |                |                      |                   |              |                      |                  |
| 6                         | 34                   | 40                   | 60                         | 30                         | 0.018 (@ 4.3 V)                        | 0.09 (@ 4 V)                       |  | PESD5V0L2UU       | SOT323 (SC-70) | 2.0 x 1.25 x 0.95    |                   |              |                      |                  |
|                           |                      |                      |                            |                            |  |                                    |  | PESD6V0L2UU       |                |                      |                   |              |                      |                  |

<sup>[1]</sup> 8 / 20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

<sup>[2]</sup> according to IEC 61000-4-5 (contact discharge)

In the spotlight

### PESD12VV1BL: Lowest capacitance ESD protection in DFN1006-2

Bidirectional protection for one data line

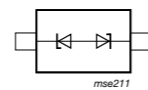
Very low line capacitance of 17 pF

High ESD robustness of 30 kV

AEC-Q101 qualified

Ultra-small package DFN1006-2 (SOD882) with a height of only 0.48 mm typ

Ideal for portable electronics, communication systems, or audio and video equipment



## Low-capacitance ESD protection devices – Part 3

types in **bold** represent new products

| Number of protected lines |               | V <sub>RWM</sub> (V) | C <sub>line</sub> typ (pF) | C <sub>line</sub> max (pF) | P <sub>PP</sub> <sup>[1]</sup> max (W) | ESD rating <sup>[2]</sup> max (kV) | I <sub>R</sub> max (μA) @ V <sub>RWM</sub> | Configuration | Type        | Package            | Size (mm)         |                      |                   |
|---------------------------|---------------|----------------------|----------------------------|----------------------------|--|------------------------------------|--|---------------|-------------|--------------------|-------------------|----------------------|-------------------|
| Unidirectional            | Bidirectional |                      |                            |                            |  |                                    |  |               |             |                    |                   |                      |                   |
| 0                         | 2             | 3.3                  | 101                        | -                          | 350                                    | 30                                 | 2  |               | PESD3V3L2BT | SOT23              | 2.9 x 1.3 x 1.0   |                      |                   |
|                           |               | 5                    | 75                         |                            |  | 30                                 | 1  |               | PESD5V0L2BT |                    |                   |                      |                   |
|                           |               | 12                   | 19                         |                            |  | 30                                 | 0.05                                       |               | PESD12VL2BT |                    |                   |                      |                   |
|                           |               | 15                   | 16                         | 30                         | 0.05                                   | PESD15VL2BT                        |  |               |             |                    |                   |                      |                   |
|                           |               | 24                   | 11                         | 23                         | 0.05                                   | PESD24VL2BT                        |  |               |             |                    |                   |                      |                   |
|                           |               | 35                   | 45                         | 130                        | 0.1                                    | PESD5V0S2BT                        |  |               |             |                    |                   |                      |                   |
|                           |               | 5                    | 2.9                        | 3.5                        | -                                      | 10                                 | 0.1  |               | -           |                    | PESD5V0U2BT       | DFN1006-3 (SOT883)   | 1.0 x 0.6 x 0.48  |
|                           |               |                      |                            |                            |  |                                    |  |               |             |                    | PESD5V0U2BM       | DFN1006B-3 (SOT883B) | 1.0 x 0.6 x 0.37  |
|                           |               |                      |                            |                            |  |                                    |  |               |             |                    | PESD5V0U2BMB      | DFN1006-3 (SOT883)   | 1.0 x 0.6 x 0.37  |
|                           |               |                      |                            |                            |  |                                    |  |               |             |                    | PESD5V0V2BM       | DFN1006B-3 (SOT883B) | 1.0 x 0.6 x 0.37  |
|                           |               |                      |                            |                            |  |                                    |  |               |             |                    | PESD5V0V2BMB      | DFN1006B-3 (SOT883B) | 1.0 x 0.6 x 0.37  |
|                           |               |                      |                            |                            |  |                                    |  |               |             |                    | PESD3V3L4UF       | DFN1410-6 (SOT886)   | 1.45 x 1.0 x 0.48 |
| 4                         | 3             | 3.3                  | 22                         | 28                         | 30                                     | 20                                 | 0.3  |               | PESD3V3L4UF | DFN1410-6 (SOT886) | 1.45 x 1.0 x 0.48 |                      |                   |
|                           |               | 5                    | 16                         | 19                         | 30                                     | 20                                 | 0.025                                      |               | PESD5V0L4UF |                    |                   |                      |                   |
|                           |               | 3.3                  | 22                         | 28                         | 30                                     | 20                                 | 0.3  |               | PESD3V3L4UW | SOT665             | 1.6 x 1.2 x 0.55  |                      |                   |
|                           |               | 5                    | 16                         | 19                         | 30                                     | 20                                 | 0.025                                      |               | PESD5V0L4UW |                    |                   |                      |                   |
|                           |               | 3.3                  | 22                         | 28                         | 30                                     | 20                                 | 0.3  |               | PESD3V3L4UG | SOT353 (SC-88A)    | 2.0 x 1.25 x 0.95 |                      |                   |
|                           |               | 5                    | 16                         | 19                         | 30                                     | 20                                 | 0.025                                      |               | PESD5V0L4UG |                    |                   |                      |                   |
|                           |               | 3.3                  | 13                         | 17                         | 25                                     | 10                                 | 1  |               | PESD3V3V4UK | DFN1010-6 (SOT891) | 1.0 x 1.0 x 0.48  |                      |                   |
|                           |               | 5                    | 12                         | 15                         | 25                                     | 15                                 | 0.3  |               | PESD5V0V4UK |                    |                   |                      |                   |
|                           |               | 9                    | 6.5                        | 10                         | 28                                     | 8                                  | 0.1  |               | PESD9V0V4UK |                    |                   |                      |                   |
|                           |               | 3.3                  | 15                         | 18                         | 16                                     | 12                                 | 0.3  |               | PESD3V3V4UW | SOT665             | 1.6 x 1.2 x 0.55  |                      |                   |
|                           |               | 5                    | 12                         | 15                         | 16                                     | 12                                 | 0.025                                      |               | PESD5V0V4UW |                    |                   |                      |                   |

<sup>[1]</sup> 8 / 20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

<sup>[2]</sup> according to IEC 61000-4-5 (contact discharge)

ESD protection, TVS, filtering and signal conditioning

Low-capacitance ESD protection devices – Part 4

| Number of protected lines |               | V <sub>RWM</sub> (V) | C <sub>line typ</sub> (pF) | C <sub>line max</sub> (pF) | P <sub>PP</sub> <sup>[1]</sup> max (W) | ESD rating <sup>[2]</sup> max (kV) | I <sub>R</sub> max (μA) @ V <sub>RWM</sub> | Configuration | Type        | Package            | Size (mm)         |
|---------------------------|---------------|----------------------|----------------------------|----------------------------|--|------------------------------------|--|---------------|-------------|--------------------|-------------------|
| Unidirectional            | Bidirectional |                      |                            |                            |  |                                    |  |               |             |                    |                   |
| 0                         | 4             | 5                    | 2.9                        | 3.5                        | -                                      | 10                                 | 0.1  |               | PESD5V0U4BF | DFN1410-6 (SOT886) | 1.45 x 1.0 x 0.48 |
|                           |               | 5                    | 2.9                        | 3.5                        | -                                      | 10                                 | 0.1  |               | PESD5V0U4BW | SOT665             | 1.6 x 1.2 x 0.55  |
| 5                         | 4             | 3.3                  | 20                         | 24                         | 28                                     | 15                                 | 2  |               | PESD3V3LSUK | DFN1010-6 (SOT891) | 1.0 x 1.0 x 0.48  |
|                           |               | 5                    | 18.5                       | 22                         | 30                                     | 20                                 | 0.5  |               | PESD5V0LSUK |                    |                   |
|                           |               | 3.3                  | 22                         | 28                         | 25                                     | 20                                 | 0.3  |               | PESD3V3LSUF | DFN1410-6 (SOT886) | 1.45 x 1.0 x 0.48 |
|                           |               | 5                    | 16                         | 19                         | 25                                     | 20                                 | 0.025                                      |               | PESD5V0LSUF |                    |                   |
|                           |               | 3.3                  | 22                         | 28                         | 25                                     | 20                                 | 0.3  |               | PESD3V3LSUV | SOT666             | 1.6 x 1.2 x 0.55  |
|                           |               | 5                    | 16                         | 19                         | 25                                     | 20                                 | 0.025                                      |               | PESD5V0LSUV |                    |                   |
|                           |               | 3.3                  | 22                         | 28                         | 25                                     | 20                                 | 0.3  |               | PESD3V3LSUY | SOT363 (SC-88)     | 2.0 x 1.25 x 0.95 |
|                           |               | 5                    | 16                         | 19                         | 25                                     | 20                                 | 0.025                                      |               | PESD5V0LSUY |                    |                   |
| 0                         | 5             | 5                    | 2.9                        | 3.5                        | -                                      | 10                                 | 0.1  |               | PESD5V0U5BF | DFN1410-6 (SOT886) | 1.45 x 1.0 x 0.48 |
|                           |               | 5                    | 2.9                        | 3.5                        | -                                      | 10                                 | 0.1  |               | PESD5V0U5BV | SOT666             | 1.6 x 1.2 x 0.55  |

<sup>[1]</sup> 8 / 20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

<sup>[2]</sup> according to IEC 61000-4-5 (contact discharge)

Standard ESD protection devices – Part 1

| Number of protected lines |               | V <sub>RWM</sub> (V) | C <sub>line typ</sub> (pF) | C <sub>line max</sub> (pF) | P <sub>PP</sub> <sup>[1]</sup> max (W) | ESD rating <sup>[2]</sup> max (kV) | I <sub>R</sub> max (μA) @ V <sub>RWM</sub> | Configuration | Type         | Package              | Size (mm)         |                |                 |
|---------------------------|---------------|----------------------|----------------------------|----------------------------|--|------------------------------------|--|---------------|--------------|----------------------|-------------------|----------------|-----------------|
| Unidirectional            | Bidirectional |                      |                            |                            |  |                                    |  |               |              |                      |                   |                |                 |
| 1                         | 0             | 5                    | 35                         | 42                         | 40                                     | 30                                 | 0.1  |               | PESD5V0S1USF | DSN0603-2 (SOD962)   | 0.6 x 0.3 x 0.3   |                |                 |
|                           |               | 3.3                  | 207                        | 300                        | 150                                    | 30                                 | 2  |               | PESD3V3S1UL  | DFN1006-2 (SOD882)   | 1.0 x 0.6 x 0.48  |                |                 |
|                           |               | 5                    | 152                        | 200                        | 150                                    | 30                                 | 1  |               | PESD5V0S1UL  |                      |                   |                |                 |
|                           |               | 12                   | 38                         | 75                         | 150                                    | 30                                 | 0.05                                       |               | PESD12VS1UL  |                      |                   |                |                 |
|                           |               | 15                   | 32                         | 70                         | 150                                    | 30                                 | 0.05                                       |               | PESD15VS1UL  |                      |                   |                |                 |
|                           |               | 24                   | 23                         | 50                         | 150                                    | 23                                 | 0.05                                       |               | PESD24VS1UL  |                      |                   |                |                 |
|                           |               | 36                   | 18                         | 30                         | 150                                    | 30                                 | 0.01                                       |               | PESD36VS1UL  |                      |                   |                |                 |
|                           |               | 5                    | 152                        | 200                        | 150                                    | 30                                 | 1  |               | PESD5V0S1ULD | DFN1006D-2 (SOD882D) | 1.0 x 0.6 x 0.37  |                |                 |
|                           |               | 12                   | 38                         | 75                         | 150                                    | 30                                 | 0.05                                       |               | PESD12VS1ULD |                      |                   |                |                 |
|                           |               | 15                   | 32                         | 70                         | 150                                    | 30                                 | 0.05                                       |               | PESD15VS1ULD |                      |                   |                |                 |
|                           |               | 24                   | 23                         | 50                         | 150                                    | 23                                 | 0.05                                       |               | PESD24VS1ULD |                      |                   |                |                 |
|                           |               | 3.3                  | 207                        | 300                        | 330                                    | 30                                 | 2  |               | PESD3V3S1UB  |                      |                   | SOD523 (SC-79) | 1.2 x 0.8 x 0.6 |
|                           |               | 5                    | 152                        | 200                        | 260                                    | 30                                 | 1  |               | PESD5V0S1UB  |                      |                   |                |                 |
|                           |               | 12                   | 38                         | 75                         | 180                                    | 30                                 | 0.05                                       |               | PESD12VS1UB  | SOD323 (SC-76)       | 1.7 x 1.25 x 0.95 |                |                 |
|                           |               | 15                   | 32                         | 70                         | 160                                    | 30                                 | 0.05                                       |               | PESD15VS1UB  |                      |                   |                |                 |
|                           |               | 24                   | 23                         | 50                         | 160                                    | 23                                 | 0.05                                       |               | PESD24VS1UB  | SOD323 (SC-76)       | 1.7 x 1.25 x 0.95 |                |                 |
|                           |               | 5                    | 480                        | 530                        | 890                                    | 30                                 | 4  |               | PESD5V0S1UA  |                      |                   |                |                 |
|                           |               | 12                   | 160                        | 180                        | 600                                    | 30                                 | 0.1  |               | PESD12VS1UA  | SOD323F (SC-90)      | 1.7 x 1.25 x 0.7  |                |                 |
|                           |               | 24                   | 23                         | 50                         | 160                                    | 23                                 | 0.05                                       |               | PESD24VS1UA  |                      |                   |                |                 |
|                           |               | 5                    | 480                        | 530                        | 890                                    | 30                                 | 4  |               | PESD5V0S1UJ  | SOD523 (SC-79)       | 1.2 x 0.8 x 0.6   |                |                 |
|                           |               | 12                   | 160                        | 180                        | 600                                    | 30                                 | 0.1  |               | PESD12VS1UJ  |                      |                   |                |                 |
|                           |               | 2.5                  | 229                        | 300                        | 260                                    | 30                                 | 6  |               | PESD5Z2.5    | SOD523 (SC-79)       | 1.2 x 0.8 x 0.6   |                |                 |
|                           |               | 3.3                  | 172                        | 200                        | 260                                    | 30                                 | 0.05                                       |               | PESD5Z3.3    |                      |                   |                |                 |
|                           |               | 5                    | 89                         | 150                        | 180                                    | 30                                 | 0.05                                       |               | PESD5Z5.0    |                      |                   |                |                 |
| 6                         | 78            | 150                  | 180                        | 30                         | 0.01                                   | PESD5Z6.0                          |  |               |              |                      |                   |                |                 |
| 7                         | 69            | 150                  | 180                        | 30                         | 0.01                                   | PESD5Z7.0                          |  |               |              |                      |                   |                |                 |
| 12                        | 35            | 75                   | 200                        | 30                         | 0.01                                   | PESD5Z12                           |  |               |              |                      |                   |                |                 |
| 0                         | 1             | 5.5                  | 35                         | 45                         | 100                                    | 30                                 | 0.1  |               | PESD5V0S1BSF | DSN0603-2 (SOD962)   | 0.6 x 0.3 x 0.3   |                |                 |
|                           |               | 5                    | 35                         | 45                         | 130                                    | 30                                 | 0.1  |               | PESD5V0S1BL  | DFN1006-2 (SOD882)   | 1.0 x 0.6 x 0.48  |                |                 |
|                           |               | 5                    | 35                         | 45                         | 130                                    | 30                                 | 0.1  |               | PESD5V0S1BLD | DFN1006D-2 (SOD882D) | 1.0 x 0.6 x 0.37  |                |                 |
|                           |               | 5                    | 35                         | 45                         | 130                                    | 30                                 | 0.1  |               | PESD5V0S1BB  | SOD523 (SC-79)       | 1.2 x 0.8 x 0.6   |                |                 |
|                           |               | 5                    | 35                         | 45                         | 130                                    | 30                                 | 0.1  |               | PESD5V0S1BA  | SOD323 (SC-76)       | 1.7 x 1.25 x 0.95 |                |                 |

<sup>[1]</sup> 8 / 20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

<sup>[2]</sup> according to IEC 61000-4-2 (contact discharge)

### Standard ESD protection devices – Part 2

types in **bold** represent new products

| Number of protected lines |               | V <sub>RWM</sub> (V) | C <sub>line typ</sub> (pF) | C <sub>line max</sub> (pF) | P <sub>PP</sub> <sup>[1]</sup> max (W) | ESD rating <sup>[2]</sup> max (kV) | I <sub>pk</sub> max (μA) @ V <sub>RWM</sub> | Configuration | Type        | Package            | Size (mm)           |                   |
|---------------------------|---------------|----------------------|----------------------------|----------------------------|--|------------------------------------|---|---------------|-------------|--------------------|---------------------|-------------------|
| Unidirectional            | Bidirectional |                      |                            |                            |  |                                    |   |               |             |                    |                     |                   |
| 2                         | 1             | 3.3                  | 200                        | 275                        | 150                                    | 23                                 | 3   |               | PESD3V3S2UQ | SOT663             | 1.6 x 1.2 x 0.55    |                   |
|                           |               | 5                    | 150                        | 215                        | 150                                    | 30                                 | 0.3   |               | PESD5V0S2UQ |                    |                     |                   |
|                           |               | 12                   | 38                         | 100                        | 150                                    | 30                                 | 0.03  |               | PESD12VS2UQ |                    |                     |                   |
|                           |               | 15                   | 32                         | 70                         | 150                                    | 30                                 | 0.05  |               | PESD15VS2UQ |                    |                     |                   |
|                           |               | 24                   | 23                         | 50                         | 150                                    | 23                                 | 0.05  |               | PESD24VS2UQ |                    |                     |                   |
|                           |               | 3.3                  | 207                        | 300                        | 330                                    | 30                                 | 2   |               | PESD3V3S2UT |                    |                     |                   |
|                           |               | 5.2                  | 152                        | 200                        | 260                                    | 30                                 | 1   | PESD5V2S2UT   |             |                    |                     |                   |
|                           |               | 12                   | 38                         | 75                         | 180                                    | 30                                 | 1   | PESD12VS2UT   |             |                    |                     |                   |
|                           |               | 15                   | 32                         | 70                         | 160                                    | 30                                 | 1   | PESD15VS2UT   |             |                    |                     |                   |
|                           |               | 24                   | 23                         | 50                         | 160                                    | 23                                 | 1   | PESD24VS2UT   |             |                    |                     |                   |
|                           |               | 36                   | 17                         | 35                         | 160                                    | 30                                 | 1 (@ 30 V)                                  | PESD36VS2UT   |             |                    |                     |                   |
|                           |               | 3.3                  | 207                        | 300                        | 330                                    | 30                                 | 2   | PESD3V3S2UAT  |             | PESD3V3S2UAT       | SOT23               | 2.9 x 1.3 x 1.0   |
|                           |               | 5                    | 152                        | 200                        | 260                                    | 30                                 | 1   | PESD5V0S2UAT  |             |                    |                     |                   |
|                           |               | 15                   | 32                         | 70                         | 160                                    | 30                                 | 0.05  | PESD15VS2UAT  |             |                    |                     |                   |
|                           |               | 24                   | 23                         | 50                         | 160                                    | 23                                 | 0.05  | PESD24VS2UAT  |             |                    |                     |                   |
|                           |               | 0                    | 2                          | 5                          | 35                                     | 45                                 | 130   | 30            | 0.1         |                    | <b>PESD5V0S2BQA</b> | SOT1215           |
| 4                         | 3             | 3.3                  | 110                        | 300                        | 110                                    | 30                                 | 1 (@ 3 V)                                   |               | PESD3V3S4UF | DFN1410-6 (SOT886) | 1.45 x 1.0 x 0.48   |                   |
|                           |               | 5                    | 85                         | 220                        | 110                                    | 30                                 | 0.1 (@ 4.3 V)                               |               | PESD5V0S4UF |                    |                     |                   |
|                           |               | 3                    | 107                        | 125                        | -                                      | 8                                  | 1   |               | BZA956A     | SOT665             | 1.6 x 1.2 x 0.55    |                   |
|                           |               | 4                    | 90                         | 105                        | -                                      | 8                                  | 0.5   |               | BZA962A     |                    |                     |                   |
|                           |               | 4.3                  | 78                         | 90                         | -                                      | 8                                  | 0.1   |               | BZA968A     |                    |                     |                   |
|                           |               | 3                    | 200                        | 240                        | -                                      | 8                                  | 2   |               | BZA856A     |                    |                     |                   |
|                           |               | 3                    | 200                        | 240                        | -                                      | 8                                  | 2   |               | BZA456A     |                    |                     |                   |
|                           |               | 4                    | 165                        | 200                        | -                                      | 15                                 | 0.7   | BZA462A       |             | BZA420A            | SOT353 (SC-88A)     | 2.0 x 1.25 x 0.95 |
|                           |               | 15                   | 37                         | 48                         | -                                      | 8                                  | 0.1   | PESD3V3S4UD   |             |                    |                     |                   |
|                           |               | 3.3                  | 215                        | 300                        | 200                                    | 30                                 | 0.8   | PESD5V0S4UD   |             |                    |                     |                   |
|                           |               | 5                    | 165                        | 220                        | 200                                    | 30                                 | 0.2   | PESD24VS4UD   |             |                    |                     |                   |
|                           |               | 24                   | 40                         | 70                         | 200                                    | 23                                 | 0.015                                       | PESD3V3S5UD   |             | PESD3V3S5UD        | SOT457 (SC-74)      | 2.9 x 1.5 x 1.0   |
|                           |               | 5                    | 165                        | 220                        | 200                                    | 30                                 | 0.2   | PESD5V0S5UD   |             |                    |                     |                   |
| 12                        | 73            | 100                  | 200                        | 30                         | 0.015                                  | PESD12VS5UD                        |   |               |             |                    |                     |                   |
| 15                        | 60            | 90                   | 200                        | 30                         | 0.015                                  | PESD15VS5UD                        |   |               |             |                    |                     |                   |
| 24                        | 45            | 70                   | 200                        | 23                         | 0.015                                  | PESD24VS5UD                        |   |               |             |                    |                     |                   |
| 0                         | 4             | 5                    | 45                         | 75                         | -                                      | 15                                 | 0.1   |               | BZA408B     |                    |                     |                   |

<sup>[1]</sup> 8 / 20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321

<sup>[2]</sup> according to IEC 61000-4-2 (contact discharge)

### USB 2.0 protection and filtering

types in **bold** represent new products

| Baseband interface       | Number of protected lines | R <sub>line</sub> | C <sub>line</sub> (pF) | Remark  | Type  | Package         | Size (mm)           |                   |
|--------------------------|---------------------------|-------------------|------------------------|---|---|-----------------|---------------------|-------------------|
| USB2.0 (Plastic package) | 2                         |                   | 1.0                    | ESD protection for up to 2 ultra high-speed datalines                           | PRTR5V0U2X  | SOT143B         | 2.9 x 1.3 x 1.0     |                   |
|                          |                           |                   | 1.8                    | ESD protection for up to 2 ultra high-speed datalines with 12 kV ESD robustness | PRTR5V0U2AX   |                 |                     |                   |
|                          | 3 + 1                     |                   |                        |   | ESD protection for up to 2 ultra high-speed datalines                             | PRTR5V0U2F      | DFN1410-6 (SOT886)  | 1.45 x 1.0 x 0.48 |
|                          |                           |                   |                        |   | USB protection for USB OTG with 5.5 V Vbat protection                             | PUSBM5V5X4-TL   | DFN1616-6 (SOT1189) |                   |
|                          |                           |                   |                        |   | USB protection for USB OTG with 12 V Vbat protection                              | PUSBM12VX4-TL   |                     |                   |
|                          |                           |                   |                        |   | USB protection for USB OTG with 30 V Vbat protection                              | PUSBM30VX4-TL   |                     |                   |
|                          | 4                         |                   |                        | 0.8   | Very low clamp ESD protection for USB2.0 high-speed with 12 kV IEC ESD protection | <b>PUSB2X4Y</b> | SOT363 (SC-88)      | 2.0 x 1.25 x 0.95 |
|                          |                           |                   |                        |   | Very low clamp ESD protection for USB2.0 high-speed with 12 kV IEC ESD protection | <b>PUSB2X4D</b> | SOT457 (SC-74)      |                   |
|                          |                           |                   |                        |   | Dual ESD protection for USB2.0 high-speed, SD-card, SIM card                      | IP4220CZ6       | DFN1410-6 (SOT886)  | 1.45 x 1.0 x 0.48 |
|                          |                           |                   |                        |   | Dual ESD protection for USB2.0 high-speed, SD-card, SIM card                      | PRTR5V0U4D      |                     |                   |
|                          |                           |                   |                        |   | ESD protection for USB2.0 high-speed, SD-card, SIM card                           | IP4221CZ6-S     | DFN1010-6 (SOT891)  | 1.0 x 1.0 x 0.48  |
|                          |                           |                   |                        |   | Dual ESD protection for USB2.0 high-speed, SD-card, SIM-card                      | IP4221CZ6-XS    |                     |                   |

ESD protection, TVS, filtering and signal conditioning

### Common Mode Filter for USB 2.0

types in **bold** represent new products

| Baseband interface | Number of protected lines | C <sub>line</sub> (pF) | ESD rating <sup>[1]</sup> max (kV) | Remark   | Type             | Package | Size (mm)          |
|--------------------|---------------------------|------------------------|------------------------------------|--|------------------|---------|--------------------|
| USB2.0             | 2                         | 1.5                    | 15                                 | Common Mode filter with ESD protection for high-speed interfaces such as USB 2.0 | <b>IP3319CX6</b> | WLCSP6  | 1.34 x 0.95 x 0.57 |

<sup>[1]</sup> according to IEC 61000-4-2 (contact discharge)

In the spotlight

**IP3319CX6 - Common Mode Filter for USB2.0**

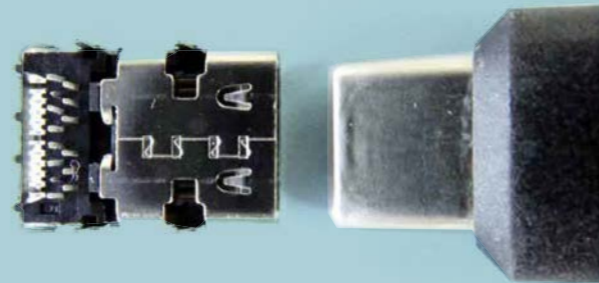
- Very wide differential pass band >1 GHz
- Very broadband Common Mode attenuation
- Very low clamping ESD protection, excellent SoC protection
- Very small WLCSP6 package (footprint area 1.34 x 0.95 mm)

# NXP paves the way for USB Type-C connector

## USB 3.x protection and filtering



USB Type-C evaluation board with NXP protection solutions



USB Type-C receptacle

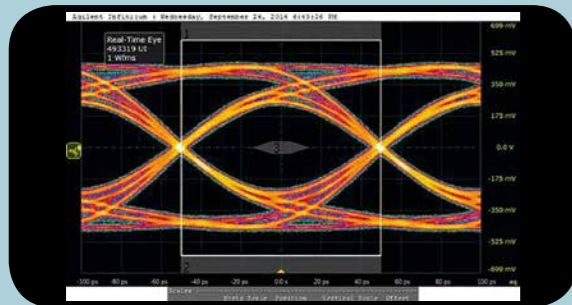
USB Type-C plug

### PUSB3FR4 and the new Type-C connector

The perfect match. PUSB3FR4 supports protection for the new Type-C connector, in order to enable direction-agnostic connection, faster charging and the smallest solution to support SuperSpeed USB.

### USB 3.1 introduces data rates up to 10 Gbps

As shown in the eye diagram, NXP offers protection, which supports data rates up to 10 Gbps with low capacitance and optimized package layouts.



PUSB3FR4 on standard FR4 testboard

# Common Mode Filter for USB 3.x



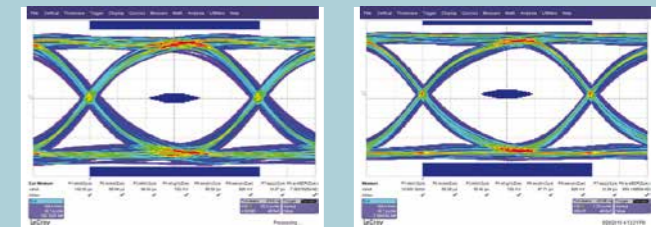
### NXP's Common Mode Filter offer:

- ▶ Best in class system-level protection due to deep snap-back and very low dynamic resistance
- ▶ Very wide-band Common Mode rejection to cover all critical frequencies
- ▶ Improved RF performance and small footprint compared to separate ESD/CMF solutions
- ▶ Protection for MIPI CSI, DSI, USB3.x, and HDMI 2.0

### Key Features of PCMFxUSB3S

- ▶ ESD protection is available in the same footprint, allowing last-minute changes between Common Mode Filter with ESD (PCMF) and ESD protection only (PESD)
- ▶ No ferrite saturation, widest differential pass-band compared to other Si-based solutions and Ferrite-based solutions with additional 15GHz ESD protection
- ▶ Lowest ESD-clamping compared to all other Common Mode Filters: provides high system-level robustness even for the most sensitive USB3.1 transceiver
- ▶ Strongest Common Mode rejection for the USB3.1 fundamentals at 2.5 and 5 GHz of all USB3 Common Mode Filters
- ▶ Smallest footprint
- ▶ PCMF1USB3S allows very easy RF-routing together with the new USB Type-C connector

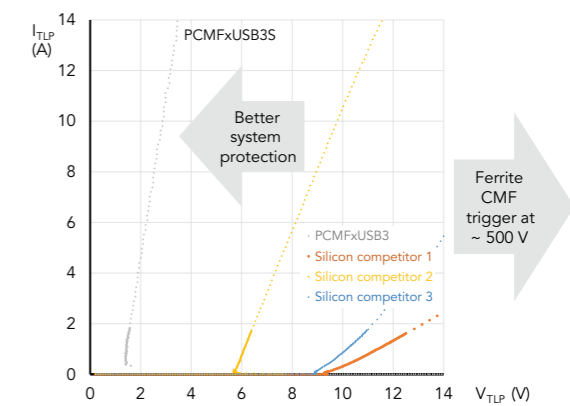
### USB 3.x 10 Gbps eye diagrams



PCMFxUSB3S

Only test board

### Clamping performance of PCMFxUSB3S compared to other silicon Common Mode Filter



The superior system-level protection is shown in the lower TLP clamping voltage

ESD protection, TVS, filtering and signal conditioning

## USB 3.x and eSATA protection and filtering for high-speed and super-speed lines

types in **bold** represent new products

| Baseband interface | Number of protected lines | C <sub>d</sub> (pF) | ESD rating max (kV) | R <sub>dyn</sub> (Ω) | Remark                                   | Type           | Package               | Size (mm)        |              |
|--------------------|---------------------------|---------------------|---------------------|----------------------|--|----------------|-----------------------|------------------|--------------|
| USB3.0 - 5 Gbps    | 4                         | 0.55                | 8                   | 0.3 / 0.4            | ESD Protection for high-speed interfaces | IP4292CZ10-TBR | DFN2510A-10 (SOT1176) | 2.5 x 1.0 x 0.48 |              |
|                    |                           | 0.5                 | 10                  |                      |  | PUSB3F96       |                       |                  |              |
| USB3.1 - 10 Gbps   | 4                         | 0.17                | 15                  | 0.4                  | TrEOS Protection                         | PUSB3AB4       | DFN2111-7 (SOT1358)   | 2.1 x 1.1 x 0.48 |              |
|                    |                           | 0.29                | 15                  |                      |  | PUSB3FR6       |                       |                  |              |
|                    |                           | 0.27                | 15                  |                      |  | PUSB3TB6       |                       |                  |              |
|                    | 6                         | 0.15                | 15                  | 0.4                  |  | PUSB3AB6       | DFN2510A-10 (SOT1176) | 2.5 x 1.0 x 0.48 |              |
|                    |                           |                     | 0.29                |                      |  | 15             |                       |                  | PUSB3FR4     |
|                    |                           |                     | 0.1                 |                      |  | 10             |                       |                  | PESD5V0R1BSF |
|                    | 1                         | 0.25                | 15                  | 0.25                 |  | PESD5V0H1BSF   | DSN0603-2 (SOD962)    | 0.6 x 0.3 x 0.3  |              |
|                    |                           |                     | 0.2                 |                      |  | 20             |                       |                  | PESD5V0C1BSF |
|                    |                           |                     | 0.2                 |                      |  | 20             |                       |                  | PESD3V3CIBSF |
|                    |                           |                     | 0.45                |                      |  | 20             |                       |                  | PESD5V0C1USF |
|                    |                           |                     | 0.25                |                      |  | 15             |                       |                  | PESD1USB3S   |
|                    |                           |                     | 0.25                |                      |  | 15             |                       |                  | 0.14         |

[http://www.nxp.com/products/discretes-and-logic/esd-protection-tvs-filtering-and-signal-conditioning/usb-type-c-protection-family:GRP\\_13811](http://www.nxp.com/products/discretes-and-logic/esd-protection-tvs-filtering-and-signal-conditioning/usb-type-c-protection-family:GRP_13811)

## Common Mode Filter for USB 3.x

types in **bold** represent new products

| Baseband interface | Number of protected line pairs | Type       | Differential Mode 3dB frequency | Common Mode rejection 800 MHz - 10 GHz | C <sub>d</sub> typical | V <sub>RFWM</sub> | ESD rating | Channel series resistance | Package | Size (mm)       |
|--------------------|--------------------------------|------------|---------------------------------|--|------------------------|-------------------|------------|---------------------------|---------|-----------------|
| USB3.x             | 1                              | PCMF1USB3S | 6 GHz                           | >12                                    | 0.3                    | 5                 | 15         | 3                         | WLCSP5  | 0.8 x 1.2 x 0.5 |
|                    | 2                              | PCMF2USB3S |                                 |  |                        |                   |            |                           | WLCSP10 | 1.6 x 1.2 x 0.5 |
|                    | 3                              | PCMF3USB3S |                                 |  |                        |                   |            |                           | WLCSP15 | 2.4 x 1.2 x 0.5 |
|                    | 1                              | PESD1USB3S | WLCSP5                          | 0.8 x 1.2 x 0.5                        |                        |                   |            |                           |         |                 |
|                    | 2                              | PESD2USB3S | WLCSP10                         | 1.6 x 1.2 x 0.5                        |                        |                   |            |                           |         |                 |
|                    | 3                              | PESD3USB3S | WLCSP15                         | 2.4 x 1.2 x 0.5                        |                        |                   |            |                           |         |                 |

<sup>1</sup> according to IEC 61000-4-2 (contact discharge)



## Common Mode Filter for video interfaces

types in **bold** represent new products

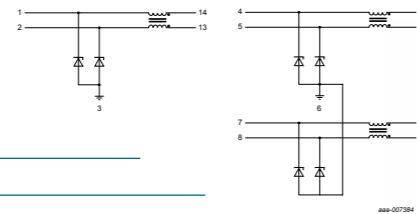
| Baseband interface | Number of protected line pairs unidirectional | Number of protected line pairs bidirectional | Type               | Differential Mode 3 dB frequency (typ.) | $C_{line}$ pF typical | $V_{RWM}$ | ESD rating <sup>(1)</sup> max (kV) | Channel series resistance | Package              | Size (mm)        |
|--------------------|---|--|--------------------|---|-----------------------|-----------|------------------------------------|---------------------------|----------------------|------------------|
| MIPI D-PHY         | 2   |  | PCMF2DFN1          | >2 GHz                                  | 0.8                   |           |                                    | 5 $\Omega$                | DFN2520-9 (SOT1333)  | 2.5 x 2.0 x 0.48 |
|                    | 3   |  | PCMF3DFN1          | >2 GHz                                  |                       |           |                                    | 5 $\Omega$                | DFN4020-14 (SOT1334) | 4.0 x 2.0 x 0.48 |
| HDMI2.0            | 1   | 0  | <b>PCMF1HDMI2S</b> | >6 GHz                                  | 0.3                   | 5         | 15                                 | 3 $\Omega$                | WLCSP5               | 0.8 x 1.2 x 0.5  |
|                    | 2   | <b>PCMF2HDMI2S</b>                           | 3 $\Omega$         |   |                       |           |                                    | WLCSP10                   | 1.6 x 1.2 x 0.5      |                  |
|                    | 3   | <b>PCMF3HDMI2S</b>                           | 3 $\Omega$         |   |                       |           |                                    | WLCSP15                   | 2.4 x 1.2 x 0.5      |                  |

<sup>(1)</sup> according to IEC 61000-4-2 (contact discharge)

### In the spotlight

#### PCMFxHDMI2S series: 1, 2 and 3 line pair Common Mode Filters with ESD protection for HDMI 1.4 and 2.0

- Very wide differential pass band >6 GHz
- Very broadband Common Mode attenuation
- Very low clamping ESD protection, excellent SoC protection
- Smallest footprint



## Ethernet protection

types in **bold** represent new products

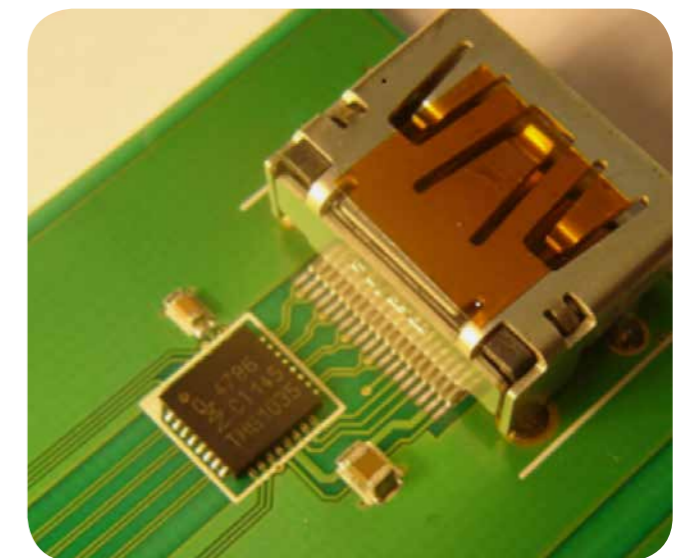
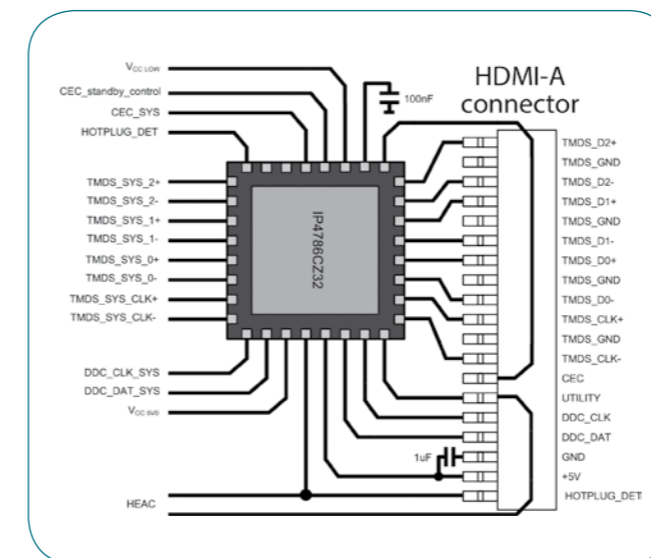
| Baseband interface | Number of protected lines                | $C_{line}$ (pF) | Remark                                    | Type        | Package        | Size (mm)       |
|--------------------|--|-----------------|---|-------------|----------------|-----------------|
| LAN                | 1  | 0.6             | Ethernet ESD protection $V_{RWM} = 3.3$ V | PESD3V3U1UT | SOT23          | 2.9 x 1.3 x 1.0 |
|                    |  |                 | Ethernet ESD protection $V_{RWM} = 5.0$ V | PESD5V0U1UT |                |                 |
|                    |  |                 | Ethernet ESD protection $V_{RWM} = 12$ V  | PESD12VU1UT |                |                 |
|                    |  |                 | Ethernet ESD protection $V_{RWM} = 15$ V  | PESD15VU1UT |                |                 |
|                    | Ethernet ESD protection $V_{RWM} = 24$ V | PESD24VU1UT     |   |             |                |                 |
|                    | 4  | 1               | Ethernet ESD protection                   | IP4220CZ6   | SOT457 (SC-74) | 2.9 x 1.5 x 1.0 |

## HDMI and memory-card signal conditioning

types in **bold** represent new products

| Interface | Number of protected lines | Buffer | Level shifter | $C_{line}$ (pF)                     | Resistor ( $\Omega$ ) | LDO              | Remark  | Type                | Package                | Size (mm)        |
|-----------|---------------------------|--------|---------------|-------------------------------------|-----------------------|------------------|---|---------------------|------------------------|------------------|
| HDMI tx   | 5                         |        |               | -                                   |                       | -                | Fully integrated for HDMI control lines including buffer for DDC, CEC, and Hot Plug module  | IP4791CZ12          | DFN2521-12 (SOT1156)   | 2.5 x 2.1 x 0.48 |
|           | 13                        | yes    | yes           | 100 $\Omega$ differential impedance | internal              | CEC LDO, 5 V LDO | Fully integrated HDMI source solution with current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug                          | IP4786CZ32          | DFN5050-32 (SOT617)    | 5.0 x 5.0 x 0.85 |
|           |                           |        |               |                                     |                       |                  | Fully integrated HDMI sink solution with buffer, and level shifter for DDC, CEC, and Hot Plug   |                     |                        |                  |
|           |                           |        |               |                                     |                       |                  | Fully integrated HDMI source solution with enhanced ESD protection, current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug |                     |                        |                  |
| HDMI2.0   | 13                        | yes    | yes           | 100 $\Omega$ differential impedance | integrated            | -                | Fully integrated HDMI source solution with small package, current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug           | IP4786CZ32S         | DFN4040-32 (SOT1318-1) | 4.0 x 4.0 x 0.50 |
|           |                           |        |               |                                     |                       |                  | Fully integrated HDMI source solution with current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug                          | <b>IP4786CZ32</b>   |                        | 5.0 x 5.0 x 0.85 |
|           |                           |        |               |                                     |                       |                  | Fully integrated HDMI source solution with enhanced ESD protection, current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug | <b>IP4787CZ32</b>   | DFN5050-32 (SOT617)    | 5.0 x 5.0 x 0.85 |
|           |                           |        |               |                                     |                       |                  | Fully integrated HDMI source solution with enhanced ESD protection, current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug | <b>IP4788CZ32</b>   |                        | 5.0 x 5.0 x 0.85 |
|           |                           |        |               |                                     |                       |                  | Fully integrated HDMI source solution in a small package with current limiter, buffer, and level shifter for DDC, CEC, and Hot Plug       | <b>IP4786CZ32S</b>  | DFN4040-32 (SOT1318-1) | 4.0 x 4.0 x 0.5  |
| SD3.0     | 6                         | yes    | yes           | -                                   | internal              | 1.8 V LDO        | SD 3.0-compliant memory card with integrated dual voltage-level translator with EMI filter and ESD protection                             | <b>IP4856CX25/C</b> | WLCSP25                | 2.4 x 2.4 x 0.4  |
|           |                           |        |               |                                     |                       |                  | Fully integrated SD 3.0 card level shifter with buffer technology, LDO, and EMI filter  | IP4855CX25          | WLCSP25                | 2.4 x 2.4 x 0.4  |

### The IP478x-series offers a complete HDMI-interface in one package.

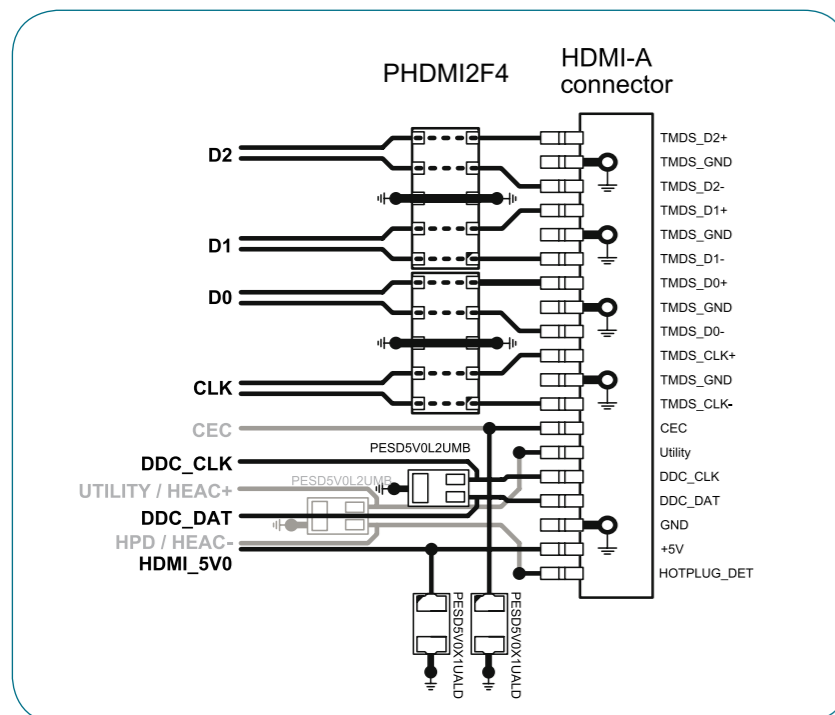


## Video interface protection

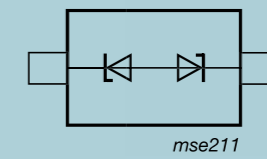
types in **bold** represent new products

| Baseband interface | Number of protected lines | C <sub>line</sub> (pF) | Remark  | Type            | Package               | Size (mm)         |
|--------------------|---------------------------|------------------------|---|-----------------|-----------------------|-------------------|
| Display port       | 4                         | 0.6                    | ESD protection for ultra high-speed interfaces          | IP4283CZ10-TBR  | DFN2510A-10 (SOT1176) | 2.5 x 1.0 x 0.48  |
|                    |                           | 0.55                   | ESD protection for ultra high-speed interfaces          | IP4292CZ10-TBR  |                       |                   |
|                    |                           | 0.5                    | ESD protection for ultra high-speed interfaces          | IP4294CZ10-TBR  |                       |                   |
|                    |                           |                        | ESD protection for ultra high-speed interfaces          | <b>PHDMI2F4</b> |                       |                   |
|                    |                           | 0.8                    | ESD protection for ultra high-speed interfaces          | IP4285CZ9-TBB   | DFN2110-9 (SOT1178)   | 2.1 x 1.0 x 0.48  |
| HDMI               | 4                         | 0.6                    | ESD protection for ultra high-speed interfaces          | IP4283CZ10-TBR  | DFN2510A-10 (SOT1176) | 2.5 x 1.0 x 0.48  |
|                    |                           | 0.8                    | ESD protection for ultra high-speed interfaces          | IP4285CZ9-TBB   | DFN2110-9 (SOT1178)   | 2.1 x 1.0 x 0.48  |
|                    |                           | 0.55                   | ESD protection for ultra high-speed interfaces          | IP4292CZ10-TBR  | DFN2510A-10 (SOT1176) | 2.5 x 1.0 x 0.48  |
|                    |                           | 0.5                    | ESD protection for HDMI 2.0                             | <b>PHDMI2F4</b> |                       |                   |
|                    |                           |                        | ESD protection for ultra high-speed interfaces          | IP4294CZ10-TBR  |                       |                   |
| LVDS               | 4                         | 0.8                    | Very low clamp ESD protection with 12 kV IEC ruggedness | <b>PUSB2X4D</b> | SOT457 (SC-74)        | 2.9 x 1.5 x 1.0   |
|                    |                           | 0.8                    | Very low clamp ESD protection with 12 kV IEC ruggedness | <b>PUSB2X4Y</b> | SOT363 (SC-88)        | 2.0 x 1.25 x 0.95 |

### PHDMI2F4 PESD HDMI application schematic



## NFC antenna protection



mse211

### DSN0603-2 (SOD962)

Single package  
0.6 x 0.3 x 0.3 mm



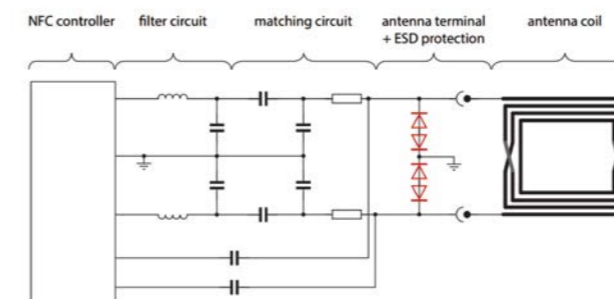
### Features

- ▶ Bidirectional configuration, allowing operating voltages up to 18 or 24 V
- ▶ Very low capacitance, enabling easy design of the antenna-matching circuit
- ▶ Very small voltage dependency of the diode capacitance, avoiding intermodulation distortion
- ▶ Small form-factor packages of 1006 (0402 inch) and 0603 (0201 inch) standard size

### Benefits

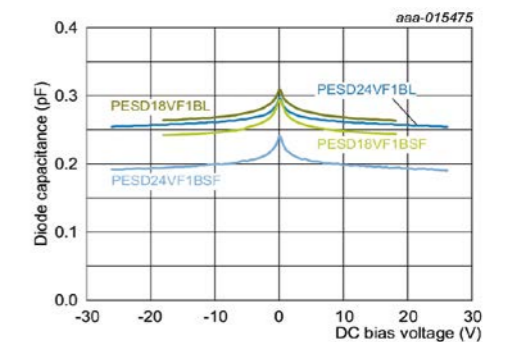
The phone's NFC antenna is often integrated into the battery cover or the battery itself and is connected to the NFC tags via small contacts on the phone, creating an entry point for ESD strikes that are potentially hazardous to the NFC IC. These new NXP devices are optimized for the requirements of the NFC system and ensure the best-possible protection of the NFC IC.

### Circuit diagram



Using tiny packages makes PCB design more flexible

### Diode capacitance versus bias voltage

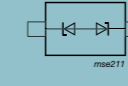


The highly linear diode capacitance, with very small variation, minimizes signal degradation

ESD protection, TVS, filtering and signal conditioning






## NFC antenna protection

types in **bold** represent new products




| Interface   | Number of protected lines (Bidirectional) | V <sub>RWM</sub> [V] | C <sub>line, typ</sub> [pF] | C <sub>line, max</sub> [pF] | ESD rating <sup>[1]</sup> max [kV] | Configuration   | Type                | Package            | Size            |
|-------------|---|----------------------|-----------------------------|-----------------------------|------------------------------------|---|---------------------|--------------------|-----------------|
| NFC Antenna | 1   | 18                   | 0.28                        | 0.45                        | 10                                 |  | <b>PESD18VF1BSF</b> | DSN0603-2 (SOD962) | 0.6 x 0.3 x 0.3 |
|             |   |                      |                             |                             |                                    |   | <b>PESD1NFC-SF</b>  |                    | 0.6 x 0.3 x 0.3 |
|             |   |                      | PESD18VF1BL                 | DFN1006-2 (SOD882)          | 1.0 x 0.6 x 0.48                   |   |                     |                    |                 |
|             |   |                      | <b>PESD1NFC-L</b>           |                             | 1.0 x 0.6 x 0.48                   |   |                     |                    |                 |
|             |   | 24                   | 0.25                        | 0.4                         | 10                                 |   | <b>PESD24VF1BSF</b> | DSN0603-2 (SOD962) | 0.6 x 0.3 x 0.3 |
|             |   |                      |                             |                             |                                    |   | <b>PESD2NFC-SF</b>  |                    | 0.6 x 0.3 x 0.3 |
|             |   |                      | PESD24VF1BL                 | DFN1006-2 (SOD882)          | 1.0 x 0.6 x 0.48                   |   |                     |                    |                 |
|             |   |                      | <b>PESD2NFC-L</b>           |                             | 1.0 x 0.6 x 0.48                   |   |                     |                    |                 |

<sup>[1]</sup> according to IEC 61000-4-2 (contact discharge)

### LCD/camera protection and filtering







| Baseband interface | Number of protected lines | Line small-signal equivalents |                        |                        | Digital interface clock speed (MHz) | Insertion loss S21 ~ -3 dB (MHz)   | Type   | Package   | Size (mm)   |                   |
|--------------------|---------------------------|-------------------------------|------------------------|------------------------|-------------------------------------|--|--|---|---|-------------------|
|                    |                           | R <sub>line</sub> (Ω)         | C <sub>line</sub> (pF) | L <sub>line</sub> (nH) |                                     |  |  |   |   |                   |
|                    | 4                         | 40                            | 18                     | -                      | ~100                                | 300  | IP4252CZ8-4 -TTL   | DFN1714-8 (SOT1166)<br>    | 1.7 x 1.35 x 0.52   |                   |
|                    |                           | 100                           | 45                     | -                      | ~40                                 | 130  | IP4254CZ8-4-TTL  |   |   |                   |
|                    |                           |                               | 15                     | -                      | ~110                                | 330  | IP4251CZ8-4-TTL  |   |   |                   |
|                    |                           | 200                           | 45                     | -                      | ~35                                 | 110  | IP4253CZ8-4-TTL  |   |   |                   |
|                    | 6                         | 40                            | 18                     | -                      | ~100                                | 300  | IP4252CZ12-6-TTL   | DFN2514-12 (SOT1167)<br> | 2.5 x 1.35 x 0.53   |                   |
|                    |                           | 100                           | 45                     | -                      | ~40                                 | 130  | IP4254CZ12-6-TTL   |   |   |                   |
|                    |                           |                               | 15                     | -                      | ~110                                | 330  | IP4251CZ12-6-TTL   |   |   |                   |
|                    |                           | 200                           | 45                     | -                      | ~35                                 | 110  | IP4253CZ12-6-TTL   |   |   |                   |
|                    | 100                       | 54                            | -                      | ~35                    | 98                                  | PEMI6CSP/RW  | WLCSP15<br> | 2.36 x 1.05 x 0.61  |   |                   |
|                    |                           | 8                             | 40                     | 18                     | -                                   | ~100   | 300  | IP4252CZ16-8-TTL  | DFN3314-16 (SOT1168)<br> | 3.3 x 1.35 x 0.53 |
|                    |                           |                               | 100                    | 45                     | -                                   | ~40  | 130  | IP4254CZ16-8-TTL  |   |                   |
|                    |                           |                               |                        | 15                     | -                                   | ~110   | 330  | IP4251CZ16-8-TTL  |   |                   |
| 200                | 45                        | -                             | ~35                    | 110                    | IP4253CZ16-8-TTL                    |  |  |   |   |                   |
| 100                | 54                        | -                             | ~35                    | 98                     | PEMI8CSP/RW/P                       | WLCSP20<br> | 3.16 x 1.05 x 0.61   |   |   |                   |

### Audio interface protection and filtering

| Baseband interface | Number of protected lines | Line small-signal equivalents |                        | Remark   | Type         | Package  | Size (mm)          |
|--------------------|---------------------------|-------------------------------|------------------------|--|--------------|--|--------------------|
|                    |                           | R <sub>line</sub>             | C <sub>line</sub> (pF) |  |              |  |                    |
| Audio              | 2                         | -                             | 18                     | 2 line bidirectional with I <sub>ppm</sub> =9A | PESD5V0V2BM  | SOT883<br>  | 1.0 x 0.6 x 0.48   |
|                    |                           | -                             | -                      | -  | PESD5V0V2BMB | SOT883B<br> | 1.0 x 0.6 x 0.37   |
|                    |                           | 68 Ω                          | 110                    | Single-ended or differential microphone        | IP4049CX5/LF | WLCSP5<br>  | 0.91 x 1.28 x 0.65 |

### Memory- and SIM-card protection and filtering

types in **bold** represent new products

| Baseband interface | Number of protected lines | Line small-signal equivalents |                        | Digital interface clock speed (MHz) | Remark  | Type                    | Package   | Size (mm)         |
|--------------------|---------------------------|-------------------------------|------------------------|-------------------------------------|---|-------------------------|---|-------------------|
|                    |                           | R <sub>line</sub>             | C <sub>line</sub> (pF) |                                     |   |                         |   |                   |
| SIM card           | 3                         | 47 Ω / 100 Ω                  | 20                     | ~20                                 | Integrated SIM-card EMI filter and ESD protection                   | IP4264CZ8-20-TTL        | DFN1714-8 (SOT1166)<br>  | 1.7 x 1.35 x 0.52 |
|                    | 4                         | -                             | 1                      | ~240                                | Quad-channel, low-capacitance ESD protection                        | IP4221CZ6-S             | DFN1410-6 (SOT886)<br>   | 1.0 x 1.0 x 0.48  |
|                    |                           |                               |                        |                                     | Quad-channel, low-capacitance ESD protection                        | IP4221CZ6-XS            | DFN1010-6 (SOT891)<br>   | 1.0 x 1.0 x 0.48  |
| SD-card / MMC      | 6                         | 40 Ω                          | 12                     | >52                                 | (Mini) SD card/trans flash ESD protection, EMI filter               | <b>IP4252CZ12-6-TTL</b> | DFN2514-12 (SOT1167)<br> | 2.5 x 1.35 x 0.53 |
|                    |                           | 40 Ω / 100 Ω                  | 11                     | -                                   | 6-channel Micro-SD memory-card interface ESD protection filter      | IP4340CX15              | WLCSP15<br>              | 1.56 x 1.56 x 0.5 |
| SD 3.0             | 6                         | -                             | 0.27                   | 5000                                | 6-line bidirectional ESD protection for ultra high-speed interfaces | <b>PUSB3TB6</b>         | DFN2111-7 (SOT1358)<br>  | 2.1 x 1.1 x 0.5   |
|                    |                           |                               | 0.35                   |                                     |   | <b>PUSB3FR6</b>         |   |                   |
|                    |                           |                               | 0.15                   |                                     |   | <b>PUSB3AB6</b>         |   |                   |

## Automotive high-speed network protection

types in **bold** represent new products

| Number of protected lines | V <sub>RWM</sub> (V) | C <sub>line</sub> typ (pF) | I <sub>RM</sub> max @3V (μA) | ESD rating <sup>(1)</sup> max (kV) | Configuration | Type             | Package               | Size (mm)        |
|---------------------------|----------------------|----------------------------|------------------------------|------------------------------------|---------------|------------------|-----------------------|------------------|
| 4                         | 5.5                  | 0.5                        | 1                            | 10                                 |               | <b>PESD2LVDS</b> | DFN2510A-10 (SOT1176) | 2.5 x 1.0 x 0.5  |
|                           | 5.5                  | 0.6                        | 1                            | 8                                  |               | PESD1LVDS        | DFN2510-10 (SOT1165)  | 2.5 x 1.0 x 0.48 |
|                           | 5.5                  | 0.6                        | 1                            | 8                                  |               | PRTR5V0U4D       | SOT457                | 2.9 x 1.5 x 1.0  |

<sup>(1)</sup> according to IEC 61000-4-2 (contact discharge)

## Automotive in-vehicle network bus line protection

types in **bold** represent new products

| Number of protected lines bidirectional | V <sub>RWM</sub> (V)         | C <sub>line</sub> typ (pF) | C <sub>line</sub> max (pF) | P <sub>PP</sub> <sup>(1)</sup> max (W) | ESD rating <sup>(2)</sup> max (kV) | I <sub>r</sub> max [μA] @ V <sub>RWM</sub> | Configuration | Type       | Package        | Size (mm)         |
|---|------------------------------|----------------------------|----------------------------|--|------------------------------------|--|---------------|------------|----------------|-------------------|
| 1                                       | 15 (diode 1)<br>24 (diode 2) | 13                         | 17                         | 160                                    | 23                                 | 0.05                                       |               | PESD1LIN   | SOD323 (SC-76) | 1.7 x 1.25 x 0.95 |
| 2                                       | 24                           | 11                         | 17                         | 200                                    | 23                                 | 0.05                                       |               | PESD1CAN   | SOT23          | 2.9 x 1.3 x 1.0   |
|   |                              | 25                         | 30                         | 230                                    | 30                                 | 0.01                                       |               | PESD2CAN   |                |                   |
|   |                              | 11                         | 17                         | 200                                    | 23                                 | 0.05                                       |               | PESD1FLEX  |                |                   |
|   |                              | 9.3                        | 12                         | 150                                    | 23                                 | 0.05                                       |               | PESD1CAN-U | SOT323         | 2.0 x 1.25 x 0.95 |
| 1                                       | 26.5                         | 9.3                        | 11                         | 150                                    | 23                                 | 0.05                                       |               | PESD1IVN-U | SOT323         | 2.0 x 1.25 x 0.95 |
| 2                                       |                              |                            |                            |  |                                    |  |               | PESD2IVN-U |                |                   |

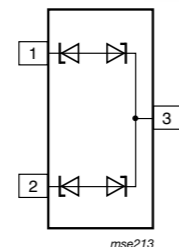
<sup>(1)</sup> 8 / 20 μs surge pulse according to IEC 61000-4-5

<sup>(2)</sup> according to IEC 61000-4-2 (contact discharge)

### In the spotlight

#### PESD2IVN-U: CAN bus protection in very small SOT323 package

- Protection for 2 in-vehicle network BUS lines
- High reverse standoff voltage V<sub>RWM</sub> = 26.5 V
- Very small SOT323 package (2.0 x 1.25 x 0.95 mm)
- AEC-Q101 compliant
- ESD robustness of up to 23 kV (contact)
- Very good capacitance matching



## Surge protection for charger ports in mobile devices

A new powerful surge protection device in a 1.6 x 0.8 mm small, and 0.25 mm low package for slim mobiles



DSN1608-2 (SOD963)

Single package  
1.6 x 0.8 x 0.25 mm

Surge pulses from the power supply, e.g. via a car charger, are a severe threat for the charger port VBUS line of smart phones and other portables. Supply voltages of these chargers often exceed the 5 V level – requiring high reverse standoff voltages.

NXP's PTVSxZ1USK series is ideally suited to protect the charger port and offers

- Superior electrical performance
- High PCB design flexibility
- Easy routing

#### Features and benefits

- 7 types from V<sub>RWM</sub> = 5 to 26 V
- High surge rating
- Very compact and thin package
- Low leakage current: down to 1 nA, reduces power consumption
- Dynamic resistance down to 0.06 Ohm
- High ESD robustness: V<sub>ESD</sub> = 30 kV (IEC61000-4-2)

### TVS diodes for mobile applications in DSN1608-2

| Type         | Package                    | Type          | Package                    | V <sub>RWM</sub> (V) | V <sub>br</sub> min (V) | V <sub>br</sub> max (V) | V <sub>ci</sub> @ I <sub>ppm</sub> 8/20μs (V) | I <sub>ppm</sub> 8/20μs (A) | P <sub>ppm</sub> 8/20μs (W) | V <sub>ci</sub> @ I <sub>ppm</sub> 10/1000μs (V) | I <sub>ppm</sub> 10/1000μs (A) | P <sub>ppm</sub> 10/1000μs (W) | I <sub>rm</sub> typ @ V <sub>RWM</sub> (nA) | I <sub>rm</sub> max @ V <sub>RWM</sub> (nA) | Rdyn (TLF) - 8/20μs |
|--------------|----------------------------|---------------|----------------------------|----------------------|-------------------------|-------------------------|---|-----------------------------|-----------------------------|--|--------------------------------|--------------------------------|---|---|---------------------|
| PTVS5V0Z1USK | SOD964<br>1.6 x 0.8 x 0.37 | PTVS5V0Z1USKN | SOD963<br>1.6 x 0.8 x 0.25 | 5                    | 6.4                     | 7.80                    | 18  | 80                          | 1200                        | 12   | 20                             | 200                            | 1   | 1000  | 0.06                |
| PTVS7V5Z1USK |                            | PTVS7V5Z1USKN |                            | 7.5                  | 8.33                    | 9.65                    | 24  | 92                          | 2000                        | 13.9   | 17.5                           | 200                            | 0.1   | 200   | 0.08                |
| PTVS10VZ1USK |                            | PTVS10VZ1USKN |                            | 10                   | 11.1                    | 12.9                    | 27.5  | 73                          | 2000                        | 17.8   | 11.1                           | 170                            | 0.1   | 200   | 0.1                 |
| PTVS12VZ1USK |                            | PTVS12VZ1USKN |                            | 12                   | 13.3                    | 15.4                    | 29  | 65                          | 2100                        | 19.9   | 10.1                           | 180                            | 0.1   | 200   | 0.1                 |
| PTVS15VZ1USK |                            | PTVS15VZ1USKN |                            | 15                   | 16.7                    | 19.4                    | 35.4  | 52                          | 1700                        | 27.6   | 7.5                            | 175                            | 0.1   | 200   | 0.1                 |
| PTVS18VZ1USK |                            | PTVS18VZ1USKN |                            | 18                   | 20                      | 23.2                    | 40.5  | 41                          | 1700                        | 30.2   | 6.9                            | 190                            | 0.1   | 200   | 0.17                |
| PTVS20VZ1USK |                            | PTVS20VZ1USKN |                            | 20                   | 22.2                    | 25.4                    | 47  | 38                          | 1800                        | 36.0   | 6                              | 175                            | 0.1   | 200   | 0.16                |
| PTVS26VZ1USK |                            | PTVS26VZ1USKN |                            | 26                   | 28.9                    | 33.4                    | 61  | 30                          | 1600                        | 48.0   | 3.76                           | 150                            | 0.1   | 200   | 0.16                |

### Battery and charger port protection – PESD devices

| Baseband interface           | Number of protected lines | C <sub>line</sub> (pF) | V <sub>RWM</sub> (V) | I <sub>ppm</sub> 8/20μs (A) | Type         | Package         | Size (mm)         |
|------------------------------|---------------------------|------------------------|----------------------|-----------------------------|--------------|-----------------|-------------------|
| Battery & charger protection | 1 x uni                   | 160                    | 12                   | 22.5                        | PESD12VS1UJ  | SOD323F (SC-90) | 1.7 x 1.25 x 0.7  |
|                              |                           | 480                    | 5                    | 22.5                        | PESD5V0S1UJ  |                 |                   |
|                              |                           | 160                    | 12                   | 47                          | PESD12VS1UA  | SOD323 (SC-76)  | 1.7 x 1.25 x 0.95 |
|                              |                           | 480                    | 5                    | 47                          | PESD5V0S1UA  |                 |                   |
| Battery & charger protection | 2 x bi                    | 18                     | 5                    | 9                           | PESD5V0V2BM  | SOT883          | 1.0 x 0.6 x 0.48  |
|                              |                           | 18                     | 5                    | 9                           | PESD5V0V2BMB | SOT883B         | 1.0 x 0.6 x 0.37  |
|                              |                           | 35                     | 5                    | 15                          | PESD5V0S2BQA | SOT1215         | 1.1 x 1.0 x 0.37  |

### TVS diodes for mobile applications

| Power (W) / 1000 $\mu$ s waveform <sup>(1)</sup> | V <sub>RWM</sub> (V) | V <sub>BR</sub> min (V) @ I <sub>r</sub> | V <sub>BR</sub> typ (V) @ I <sub>r</sub> | V <sub>BR</sub> max (V) @ I <sub>r</sub> | I <sub>r</sub> (mA) | V <sub>CL</sub> max <sup>(1)</sup> (V) @ I <sub>PP</sub> | I <sub>PP</sub> <sup>(1)</sup> (A) | I <sub>RM</sub> typ ( $\mu$ A) @ V <sub>RWM</sub> | I <sub>RM</sub> max ( $\mu$ A) @ V <sub>RWM</sub> | Type         | Package             | Size (mm)        |
|--|----------------------|--|--|--|---------------------|--|------------------------------------|---|---|--------------|---------------------|------------------|
| 300  | 7.5                  | 8.33                                     | 8.77                                     | 9.21                                     | 1                   | 12.9   | 23.3                               | 0.3   | 50  | PTVS7V5U1UPA | DFN2020-3 (SOT1061) | 2.0 x 2.0 x 0.62 |
|  | 10                   | 11.1                                     | 11.7                                     | 12.3                                     | 1                   | 17   | 17.6                               | 0.008   | 2.5   | PTVS10VU1UPA |                     |                  |
|  | 12                   | 13.3                                     | 14                                       | 14.7                                     | 1                   | 19.9   | 15.1                               | 0.005   | 2.5   | PTVS12VU1UPA |                     |                  |
|  | 15                   | 16.7                                     | 17.6                                     | 18.5                                     | 1                   | 24.4   | 12.3                               | 0.001   | 0.1   | PTVS15VU1UPA |                     |                  |
|  | 18                   | 20                                       | 21                                       | 22.1                                     | 1                   | 29.2   | 10.3                               | 0.001   | 0.1   | PTVS18VU1UPA |                     |                  |
|  | 26                   | 28.9                                     | 30.4                                     | 31.9                                     | 1                   | 42.1   | 7                                  | 0.001   | 0.1   | PTVS26VU1UPA |                     |                  |

<sup>(1)</sup> 10 / 1000  $\mu$ s according to IEC 61643-321

### TVS diodes, 24/40 W

| Power (W) / 1000 $\mu$ s waveform <sup>(1)</sup> | V <sub>RWM</sub> (V) | V <sub>BR</sub> min (V) @ I <sub>r</sub> | V <sub>BR</sub> typ (V) @ I <sub>r</sub> | V <sub>BR</sub> max (V) @ I <sub>r</sub> | I <sub>r</sub> (mA) | ESD rating <sup>(1)</sup> max (kV) | C <sub>lim</sub> typ (pF) | V <sub>CL</sub> max <sup>(1)</sup> (V) @ I <sub>PP</sub> | I <sub>PP</sub> <sup>(1)</sup> (A) | I <sub>RM</sub> max ( $\mu$ A) @ V <sub>RWM</sub> | Configuration | Type      | Package | Size (mm)       |
|--|----------------------|--|--|--|---------------------|------------------------------------|---------------------------|--|------------------------------------|---|---------------|-----------|---------|-----------------|
| 24   | 3                    | 5.32                                     | 5.6                                      | 5.88                                     | 20                  | 30                                 | 210                       | 8  | 3                                  | 5   |               | MMBZ5V6AL | SOT23   | 2.9 x 1.3 x 1.0 |
|  | 3                    | 5.89                                     | 6.2                                      | 6.51                                     | 1                   | 30                                 | 175                       | 8.7  | 2.76                               | 0.2   |               | MMBZ6V2AL |         |                 |
|  | 4.5                  | 6.48                                     | 6.8                                      | 7.14                                     | 1                   | 30                                 | 150                       | 9.6  | 2.5                                | 0.3   |               | MMBZ6V8AL |         |                 |
|  | 6                    | 8.65                                     | 9.1                                      | 9.56                                     | 1                   | 30                                 | 155                       | 14   | 1.7                                | 0.1   |               | MMBZ9V1AL |         |                 |
|  | 6.5                  | 9.5                                      | 10                                       | 10.5                                     | 1                   | 30                                 | 130                       | 14.2   | 1.7                                | 0.02  |               | MMBZ10VAL |         |                 |
| 40   | 8.5                  | 11.4                                     | 12                                       | 12.6                                     | 1                   | 30                                 | 110                       | 17   | 2.35                               | 0.005   | MMBZ12VAL     |           |         |                 |
|  | 12                   | 14.25                                    | 15                                       | 15.75                                    | 1                   | 30                                 | 85                        | 21   | 1.9                                | 0.005   | MMBZ15VAL     |           |         |                 |
|  | 14.5                 | 17.1                                     | 18                                       | 18.9                                     | 1                   | 30                                 | 70                        | 25   | 1.6                                | 0.005   | MMBZ18VAL     |           |         |                 |
|  | 17                   | 19                                       | 20                                       | 21                                       | 1                   | 30                                 | 65                        | 28   | 1.4                                | 0.005   | MMBZ20VAL     |           |         |                 |
|  | 22                   | 25.65                                    | 27                                       | 28.35                                    | 1                   | 30                                 | 48                        | 40   | 1                                  | 0.005   | MMBZ27VAL     |           |         |                 |
|  | 26                   | 31.35                                    | 33                                       | 34.65                                    | 1                   | 30                                 | 45                        | 46   | 0.87                               | 0.005   | MMBZ33VAL     |           |         |                 |
|  | 8.5                  | 11.4                                     | 12                                       | 12.6                                     | 1                   | 30                                 | 110                       | 17   | 2.35                               | 0.005   |               | MMBZ12VDL |         |                 |
|  | 12.8                 | 14.3                                     | 15                                       | 15.8                                     | 1                   | 30                                 | 85                        | 21.2   | 1.9                                | 0.005   |               | MMBZ15VDL |         |                 |
|  | 14.5                 | 17.1                                     | 18                                       | 18.9                                     | 1                   | 30                                 | 70                        | 25   | 1.6                                | 0.005   |               | MMBZ18VCL |         |                 |
|  | 17                   | 19                                       | 20                                       | 21                                       | 1                   | 30                                 | 65                        | 28   | 1.4                                | 0.005   |               | MMBZ20VCL |         |                 |
| 22   | 25.65                | 27                                       | 28.35                                    | 1  | 30                  | 48                                 | 38                        | 1  | 0.005                              | MMBZ27VCL   |               |           |         |                 |
| 26   | 31.35                | 33                                       | 34.65                                    | 1  | 30                  | 45                                 | 46                        | 0.87   | 0.005                              | MMBZ33VCL   |               |           |         |                 |

<sup>(1)</sup> 10 / 1000  $\mu$ s according to IEC 61643-321 <sup>(2)</sup> according to IEC 61000-4-2 (contact discharge)

### TVS diodes, 400 W

| Power (W) / 10/1000 $\mu$ s waveform <sup>(1)</sup> | V <sub>RWM</sub> (V) | V <sub>BR</sub> min (V) @ I <sub>r</sub> | V <sub>BR</sub> typ (V) @ I <sub>r</sub> | V <sub>BR</sub> max (V) @ I <sub>r</sub> | I <sub>r</sub> (mA) | V <sub>CL</sub> max <sup>(1)</sup> (V) @ I <sub>PP</sub> | I <sub>PP</sub> <sup>(1)</sup> (A) | I <sub>RM</sub> typ ( $\mu$ A) @ V <sub>RWM</sub> | I <sub>RM</sub> max ( $\mu$ A) @ V <sub>RWM</sub> | Type (T <sub>j</sub> max = 150 °C) | Type (T <sub>j</sub> max = 185 °C) | Package | Size (mm)       |
|---|----------------------|--|--|--|---------------------|--|------------------------------------|---|---|------------------------------------|------------------------------------|---------|-----------------|
| 400   | 3.5                  | 5.20                                     | 5.60                                     | 6.00                                     | 10                  | 8.0  | 43.8                               | 5   | 600   | PTVS3V3S1UR                        | PTVS3V3S1UTR                       | SOD123W | 2.6 x 1.7 x 1.0 |
|   | 5.0                  | 6.40                                     | 6.70                                     | 7.00                                     | 10                  | 9.2  | 43.5                               | 5   | 400   | PTVS5V0S1UR                        | PTVS5V0S1UTR                       |         |                 |
|   | 6.0                  | 6.67                                     | 7.02                                     | 7.37                                     | 10                  | 10.3   | 38.8                               | 5   | 400   | PTVS6V0S1UR                        | PTVS6V0S1UTR                       |         |                 |
|   | 6.5                  | 7.22                                     | 7.60                                     | 7.98                                     | 10                  | 11.2   | 35.7                               | 5   | 250   | PTVS6V5S1UR                        | PTVS6V5S1UTR                       |         |                 |
|   | 7.0                  | 7.78                                     | 8.20                                     | 8.60                                     | 10                  | 12.0   | 33.3                               | 3   | 100   | PTVS7V0S1UR                        | PTVS7V0S1UTR                       |         |                 |
|   | 7.5                  | 8.33                                     | 8.77                                     | 9.21                                     | 1                   | 12.9   | 31.0                               | 0.2   | 50  | PTVS7V5S1UR                        | PTVS7V5S1UTR                       |         |                 |
|   | 8.0                  | 8.89                                     | 9.36                                     | 9.83                                     | 1                   | 13.6   | 29.4                               | 0.03  | 25  | PTVS8V0S1UR                        | PTVS8V0S1UTR                       |         |                 |
|   | 8.5                  | 9.44                                     | 9.92                                     | 10.40                                    | 1                   | 14.4   | 27.8                               | 0.01  | 10  | PTVS8V5S1UR                        | PTVS8V5S1UTR                       |         |                 |
|   | 9.0                  | 10.00                                    | 10.55                                    | 11.10                                    | 1                   | 15.4   | 26.0                               | 0.005   | 5   | PTVS9V0S1UR                        | PTVS9V0S1UTR                       |         |                 |
|   | 10                   | 11.10                                    | 11.70                                    | 12.30                                    | 1                   | 17.0   | 23.5                               | 0.005   | 2.5   | PTVS10VS1UR                        | PTVS10VS1UTR                       |         |                 |
|   | 11                   | 12.20                                    | 12.85                                    | 13.50                                    | 1                   | 18.2   | 22.0                               | 0.005   | 2.5   | PTVS11VS1UR                        | PTVS11VS1UTR                       |         |                 |
|   | 12                   | 13.30                                    | 14.00                                    | 14.70                                    | 1                   | 19.9   | 20.1                               | 0.005   | 2.5   | PTVS12VS1UR                        | PTVS12VS1UTR                       |         |                 |
|   | 13                   | 14.40                                    | 15.15                                    | 15.90                                    | 1                   | 21.5   | 18.6                               | 0.001   | 0.1   | PTVS13VS1UR                        | PTVS13VS1UTR                       |         |                 |
|   | 14                   | 15.60                                    | 16.40                                    | 17.20                                    | 1                   | 23.2   | 17.2                               | 0.001   | 0.1   | PTVS14VS1UR                        | PTVS14VS1UTR                       |         |                 |
|   | 15                   | 16.70                                    | 17.60                                    | 18.50                                    | 1                   | 24.4   | 16.4                               | 0.001   | 0.1   | PTVS15VS1UR                        | PTVS15VS1UTR                       |         |                 |
|   | 16                   | 17.80                                    | 18.75                                    | 19.70                                    | 1                   | 26.0   | 15.4                               | 0.001   | 0.1   | PTVS16VS1UR                        | PTVS16VS1UTR                       |         |                 |
|   | 17                   | 18.90                                    | 19.90                                    | 20.90                                    | 1                   | 27.6   | 14.5                               | 0.001   | 0.1   | PTVS17VS1UR                        | PTVS17VS1UTR                       |         |                 |
|   | 18                   | 20.00                                    | 21.00                                    | 22.10                                    | 1                   | 29.2   | 13.7                               | 0.001   | 0.1   | PTVS18VS1UR                        | PTVS18VS1UTR                       |         |                 |
|   | 20                   | 22.20                                    | 23.35                                    | 24.50                                    | 1                   | 32.4   | 12.3                               | 0.001   | 0.1   | PTVS20VS1UR                        | PTVS20VS1UTR                       |         |                 |
|   | 22                   | 24.40                                    | 25.60                                    | 26.90                                    | 1                   | 35.5   | 11.3                               | 0.001   | 0.1   | PTVS22VS1UR                        | PTVS22VS1UTR                       |         |                 |
|   | 24                   | 26.70                                    | 28.10                                    | 29.50                                    | 1                   | 38.9   | 10.3                               | 0.001   | 0.1   | PTVS24VS1UR                        | PTVS24VS1UTR                       |         |                 |
|   | 26                   | 28.90                                    | 30.40                                    | 31.90                                    | 1                   | 42.1   | 9.5                                | 0.001   | 0.1   | PTVS26VS1UR                        | PTVS26VS1UTR                       |         |                 |
|   | 28                   | 31.10                                    | 32.80                                    | 34.40                                    | 1                   | 45.4   | 8.8                                | 0.001   | 0.1   | PTVS28VS1UR                        | PTVS28VS1UTR                       |         |                 |
|   | 30                   | 33.30                                    | 35.10                                    | 36.80                                    | 1                   | 48.4   | 8.3                                | 0.001   | 0.1   | PTVS30VS1UR                        | PTVS30VS1UTR                       |         |                 |
|   | 33                   | 36.70                                    | 38.70                                    | 40.60                                    | 1                   | 53.3   | 7.5                                | 0.001   | 0.1   | PTVS33VS1UR                        | PTVS33VS1UTR                       |         |                 |
|   | 36                   | 40.00                                    | 42.10                                    | 44.20                                    | 1                   | 58.1   | 6.9                                | 0.001   | 0.1   | PTVS36VS1UR                        | PTVS36VS1UTR                       |         |                 |
|   | 40                   | 44.40                                    | 46.80                                    | 49.10                                    | 1                   | 64.5   | 6.2                                | 0.001   | 0.1   | PTVS40VS1UR                        | PTVS40VS1UTR                       |         |                 |
|   | 43                   | 47.80                                    | 50.30                                    | 52.80                                    | 1                   | 69.4   | 5.8                                | 0.001   | 0.1   | PTVS43VS1UR                        | PTVS43VS1UTR                       |         |                 |
|   | 45                   | 50.00                                    | 52.65                                    | 55.30                                    | 1                   | 72.7   | 5.5                                | 0.001   | 0.1   | PTVS45VS1UR                        | PTVS45VS1UTR                       |         |                 |
|   | 48                   | 53.30                                    | 56.10                                    | 58.90                                    | 1                   | 77.4   | 5.2                                | 0.001   | 0.1   | PTVS48VS1UR                        | PTVS48VS1UTR                       |         |                 |
|   | 51                   | 56.70                                    | 59.70                                    | 62.70                                    | 1                   | 82.4   | 4.9                                | 0.001   | 0.1   | PTVS51VS1UR                        | PTVS51VS1UTR                       |         |                 |
|   | 54                   | 60.00                                    | 63.15                                    | 66.30                                    | 1                   | 87.1   | 4.6                                | 0.001   | 0.1   | PTVS54VS1UR                        | PTVS54VS1UTR                       |         |                 |
|   | 58                   | 64.40                                    | 67.80                                    | 71.20                                    | 1                   | 93.6   | 4.3                                | 0.001   | 0.1   | PTVS58VS1UR                        | PTVS58VS1UTR                       |         |                 |
|   | 60                   | 66.70                                    | 70.20                                    | 73.70                                    | 1                   | 96.8   | 4.1                                | 0.001   | 0.1   | PTVS60VS1UR                        | PTVS60VS1UTR                       |         |                 |
| 64  | 71.10                | 74.85                                    | 78.60                                    | 1  | 103.0               | 3.9  | 0.001                              | 0.1   | PTVS64VS1UR                                       | PTVS64VS1UTR                       |                                    |         |                 |

ESD protection, TVS, filtering and signal conditioning

TVS diodes, 600 W

| Power (W)<br>(10 / 1000<br>µs waveform) <sup>(1)</sup> | V <sub>RWM</sub> (V) | V <sub>BR</sub> min (V) @ I <sub>R</sub> | V <sub>BR</sub> typ (V) @ I <sub>R</sub> | V <sub>BR</sub> max (V) @ I <sub>R</sub> | I <sub>R</sub> (mA) | V <sub>CL</sub> max <sup>(1)</sup> (V) @ I <sub>PP</sub> | I <sub>PP</sub> <sup>(1)</sup> (A) | I <sub>RM</sub> typ (µA) @ V <sub>RWM</sub> | I <sub>RM</sub> max (µA) @ V <sub>RWM</sub> | Type<br>(T <sub>J</sub> max = 150 °C) | Type<br>(T <sub>J</sub> max = 185 °C) | Package | Size (mm) |
|--|----------------------|--|--|--|---------------------|--|------------------------------------|---|---|---------------------------------------|---------------------------------------|---------|-----------|
| 3.5  | 5.20                 | 5.60                                     | 6.00                                     | 10                                       | 8                   | 75   | 5                                  | 600   | PTVS3V3P1UP                                 | PTVS3V3P1UTP                          |                                       |         |           |
| 5  | 6.40                 | 6.70                                     | 7.00                                     | 10                                       | 9.2                 | 65.2   | 5                                  | 400   | PTVS5V0P1UP                                 | PTVS5V0P1UTP                          |                                       |         |           |
| 6  | 6.67                 | 7.02                                     | 7.37                                     | 10                                       | 10.3                | 58.3   | 5                                  | 400   | PTVS6V0P1UP                                 | PTVS6V0P1UTP                          |                                       |         |           |
| 6.5  | 7.22                 | 7.60                                     | 7.98                                     | 10                                       | 11.2                | 53.6   | 5                                  | 250   | PTVS6V5P1UP                                 | PTVS6V5P1UTP                          |                                       |         |           |
| 7  | 7.78                 | 8.20                                     | 8.60                                     | 10                                       | 12                  | 50   | 3                                  | 100   | PTVS7V0P1UP                                 | PTVS7V0P1UTP                          |                                       |         |           |
| 7.5  | 8.33                 | 8.77                                     | 9.21                                     | 1  | 12.9                | 46.5   | 0.2                                | 50  | PTVS7V5P1UP                                 | PTVS7V5P1UTP                          |                                       |         |           |
| 8  | 8.89                 | 9.36                                     | 9.83                                     | 1  | 13.6                | 44.1   | 0.03                               | 25  | PTVS8V0P1UP                                 | PTVS8V0P1UTP                          |                                       |         |           |
| 8.5  | 9.44                 | 9.92                                     | 10.40                                    | 1  | 14.4                | 41.7   | 0.01                               | 10  | PTVS8V5P1UP                                 | PTVS8V5P1UTP                          |                                       |         |           |
| 9  | 10.00                | 10.55                                    | 11.10                                    | 1  | 15.4                | 39   | 0.005                              | 5   | PTVS9V0P1UP                                 | PTVS9V0P1UTP                          |                                       |         |           |
| 10   | 11.10                | 11.70                                    | 12.30                                    | 1  | 17                  | 35.3   | 0.005                              | 2.5   | PTVS10VP1UP                                 | PTVS10VP1UTP                          |                                       |         |           |
| 11   | 12.20                | 12.85                                    | 13.50                                    | 1  | 18.2                | 33   | 0.005                              | 2.5   | PTVS11VP1UP                                 | PTVS11VP1UTP                          |                                       |         |           |
| 12   | 13.30                | 14.00                                    | 14.70                                    | 1  | 19.9                | 30.2   | 0.005                              | 2.5   | PTVS12VP1UP                                 | PTVS12VP1UTP                          |                                       |         |           |
| 13   | 14.40                | 15.15                                    | 15.90                                    | 1  | 21.5                | 27.9   | 0.001                              | 0.1   | PTVS13VP1UP                                 | PTVS13VP1UTP                          |                                       |         |           |
| 14   | 15.60                | 16.40                                    | 17.20                                    | 1  | 23.2                | 25.9   | 0.001                              | 0.1   | PTVS14VP1UP                                 | PTVS14VP1UTP                          |                                       |         |           |
| 15   | 16.70                | 17.60                                    | 18.50                                    | 1  | 24.4                | 24.6   | 0.001                              | 0.1   | PTVS15VP1UP                                 | PTVS15VP1UTP                          |                                       |         |           |
| 16   | 17.80                | 18.75                                    | 19.70                                    | 1  | 26                  | 23.1   | 0.001                              | 0.1   | PTVS16VP1UP                                 | PTVS16VP1UTP                          |                                       |         |           |
| 17   | 18.90                | 19.90                                    | 20.90                                    | 1  | 27.6                | 21.7   | 0.001                              | 0.1   | PTVS17VP1UP                                 | PTVS17VP1UTP                          |                                       |         |           |
| 18   | 20.00                | 21.00                                    | 22.10                                    | 1  | 29.2                | 20.5   | 0.001                              | 0.1   | PTVS18VP1UP                                 | PTVS18VP1UTP                          |                                       |         |           |
| 20   | 22.20                | 23.35                                    | 24.50                                    | 1  | 32.4                | 18.5   | 0.001                              | 0.1   | PTVS20VP1UP                                 | PTVS20VP1UTP                          |                                       |         |           |
| 22   | 24.40                | 25.60                                    | 26.90                                    | 1  | 35.5                | 16.9   | 0.001                              | 0.1   | PTVS22VP1UP                                 | PTVS22VP1UTP                          |                                       |         |           |
| 24   | 26.70                | 28.10                                    | 29.50                                    | 1  | 38.9                | 15.4   | 0.001                              | 0.1   | PTVS24VP1UP                                 | PTVS24VP1UTP                          |                                       |         |           |
| 26   | 28.90                | 30.40                                    | 31.90                                    | 1  | 42.1                | 14.2   | 0.001                              | 0.1   | PTVS26VP1UP                                 | PTVS26VP1UTP                          |                                       |         |           |
| 28   | 31.10                | 32.80                                    | 34.40                                    | 1  | 45.4                | 13.2   | 0.001                              | 0.1   | PTVS28VP1UP                                 | PTVS28VP1UTP                          |                                       |         |           |
| 30   | 33.30                | 35.10                                    | 36.80                                    | 1  | 48.4                | 12.4   | 0.001                              | 0.1   | PTVS30VP1UP                                 | PTVS30VP1UTP                          |                                       |         |           |
| 33   | 36.70                | 38.70                                    | 40.60                                    | 1  | 53.3                | 11.3   | 0.001                              | 0.1   | PTVS33VP1UP                                 | PTVS33VP1UTP                          |                                       |         |           |
| 36   | 40.00                | 42.10                                    | 44.20                                    | 1  | 58.1                | 10.3   | 0.001                              | 0.1   | PTVS36VP1UP                                 | PTVS36VP1UTP                          |                                       |         |           |
| 40   | 44.40                | 46.80                                    | 49.10                                    | 1  | 64.5                | 9.3  | 0.001                              | 0.1   | PTVS40VP1UP                                 | PTVS40VP1UTP                          |                                       |         |           |
| 43   | 47.80                | 50.30                                    | 52.80                                    | 1  | 69.4                | 8.6  | 0.001                              | 0.1   | PTVS43VP1UP                                 | PTVS43VP1UTP                          |                                       |         |           |
| 45   | 50.00                | 52.65                                    | 55.30                                    | 1  | 72.7                | 8.3  | 0.001                              | 0.1   | PTVS45VP1UP                                 | PTVS45VP1UTP                          |                                       |         |           |
| 48   | 53.30                | 56.10                                    | 58.90                                    | 1  | 77.4                | 7.8  | 0.001                              | 0.1   | PTVS48VP1UP                                 | PTVS48VP1UTP                          |                                       |         |           |
| 51   | 56.70                | 59.70                                    | 62.70                                    | 1  | 82.4                | 7.3  | 0.001                              | 0.1   | PTVS51VP1UP                                 | PTVS51VP1UTP                          |                                       |         |           |
| 54   | 60.00                | 63.15                                    | 66.30                                    | 1  | 87.1                | 6.9  | 0.001                              | 0.1   | PTVS54VP1UP                                 | PTVS54VP1UTP                          |                                       |         |           |
| 58   | 64.40                | 67.80                                    | 71.20                                    | 1  | 93.6                | 6.4  | 0.001                              | 0.1   | PTVS58VP1UP                                 | PTVS58VP1UTP                          |                                       |         |           |
| 60   | 66.70                | 70.20                                    | 73.70                                    | 1  | 96.8                | 6.2  | 0.001                              | 0.1   | PTVS60VP1UP                                 | PTVS60VP1UTP                          |                                       |         |           |
| 64   | 71.10                | 74.85                                    | 78.60                                    | 1  | 103                 | 5.8  | 0.001                              | 0.1   | PTVS64VP1UP                                 | PTVS64VP1UTP                          |                                       |         |           |

<sup>(1)</sup> 10 / 1000 µs according to IEC 61643-321

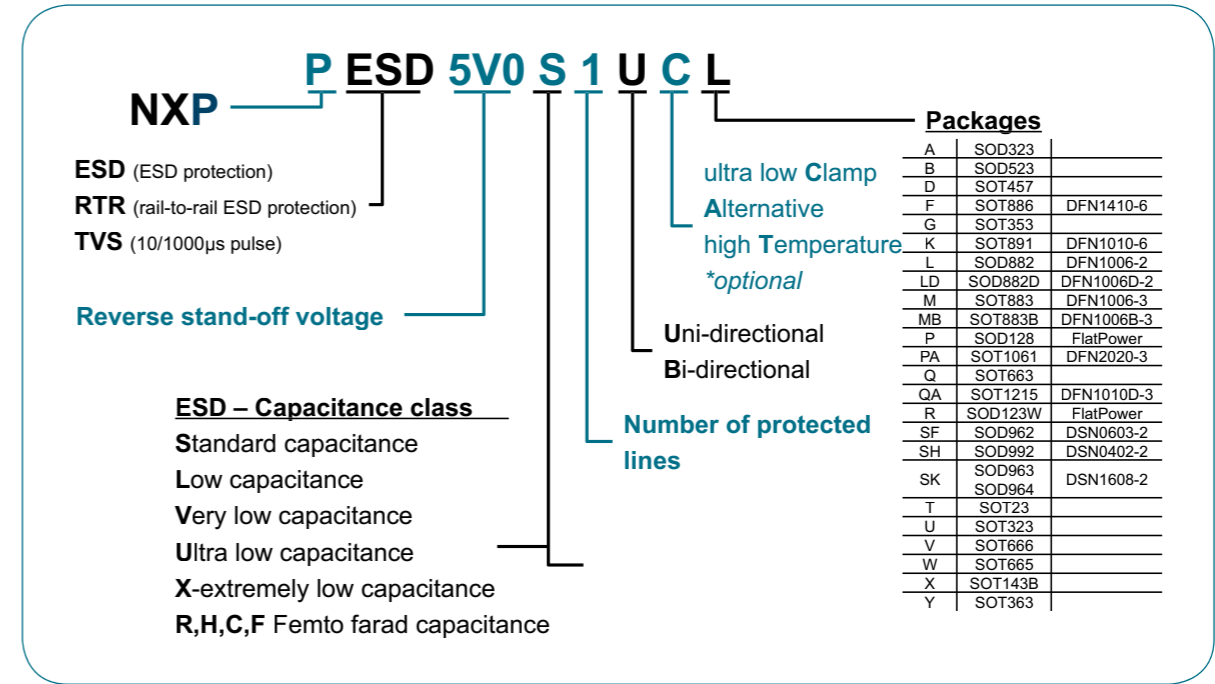
In the spotlight

**High-temperature TVS series in FlatPower package**

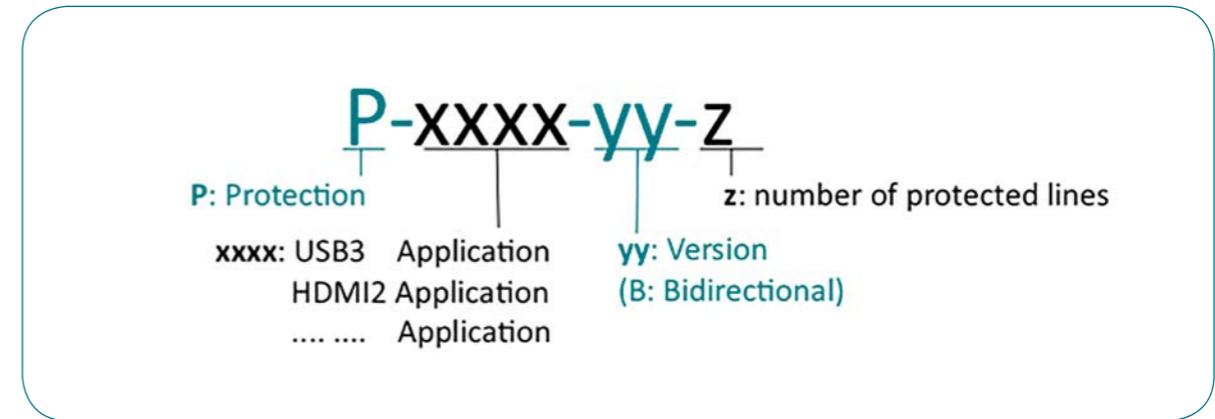
Available in 400 W (PTVSxS1UTR) and 600 W (PTVSxP1UTP) power classes with 35 devices each  
 Very high maximal junction temperature of 185 °C  
 Reverse standoff voltages from 3.3 to 64 V  
 Low height, high performance - save board space by replacing SMA & SMB packages with low-profile SOD123W and SOD128 packages  
 AEC-Q101 qualified



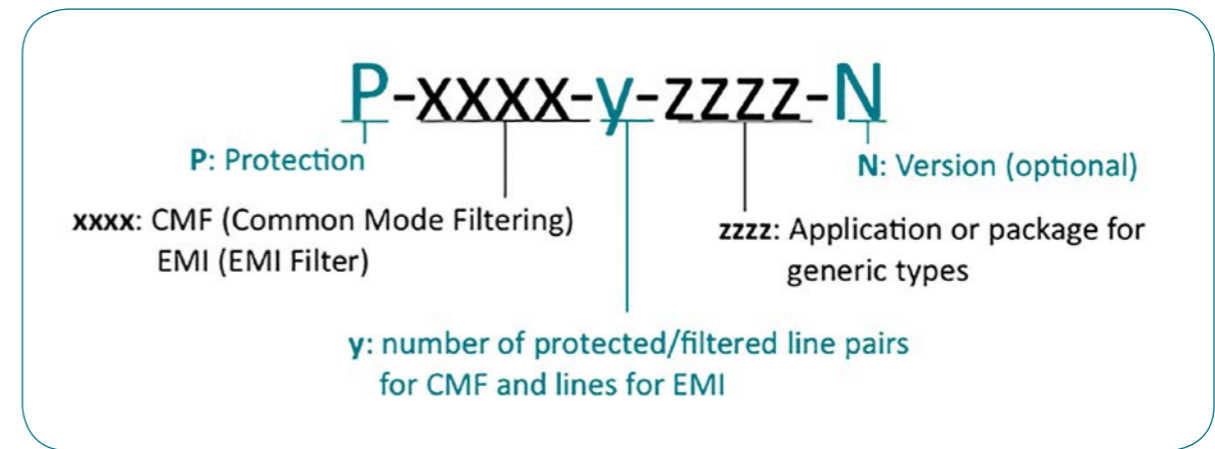
Protection and signal-conditioning nomenclature



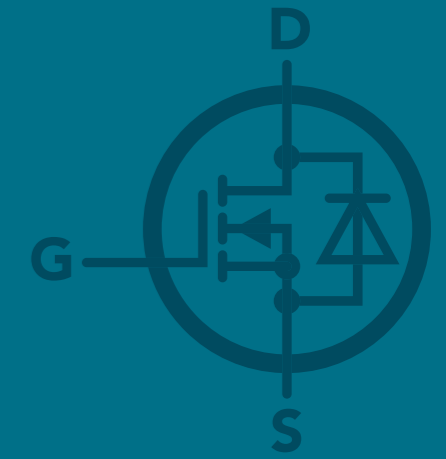
Application specific protection nomenclature



Application specific filtering nomenclature



ESD protection, TVS, filtering and signal conditioning



## MOSFETs

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| Small-signal MOSFETs in ultra-small DFN1006 and DFN1006B packages      | 78 |
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# Small-signal MOSFET portfolio

What you get when you choose NXP for small-signal MOSFETs

## A comprehensive portfolio for all applications

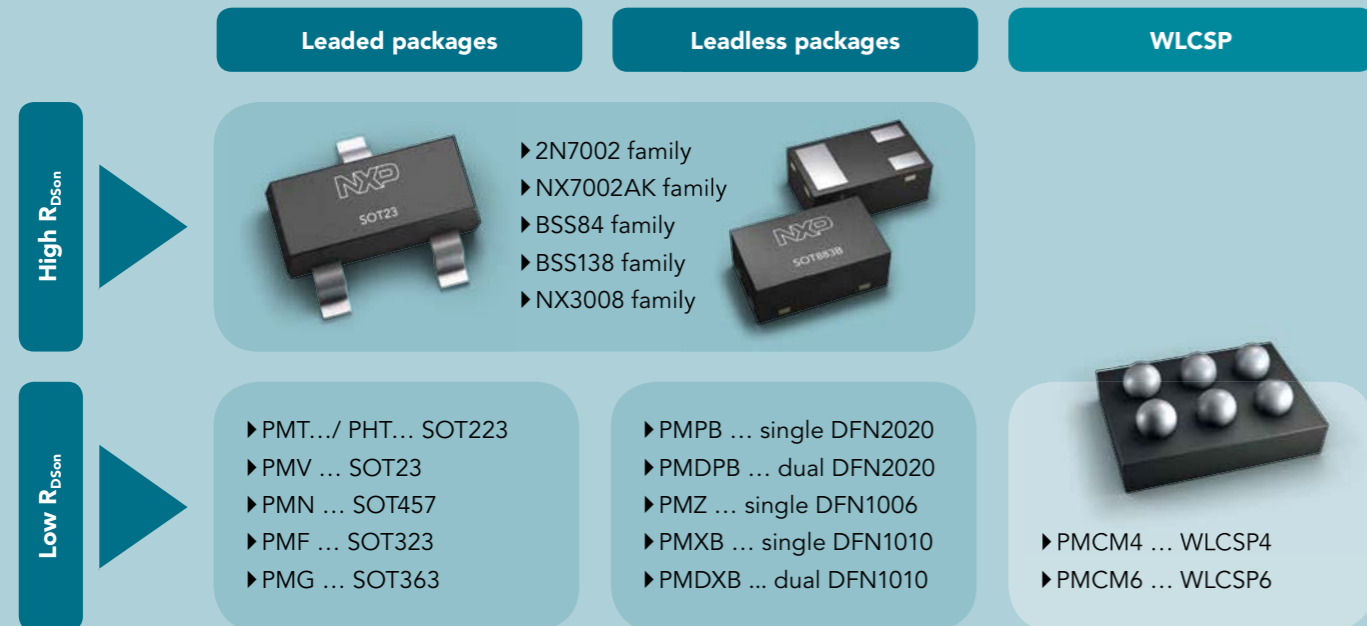
Best in class performing transistors from commodity to low R<sub>DSon</sub> MOSFETs

## A broad range of packages

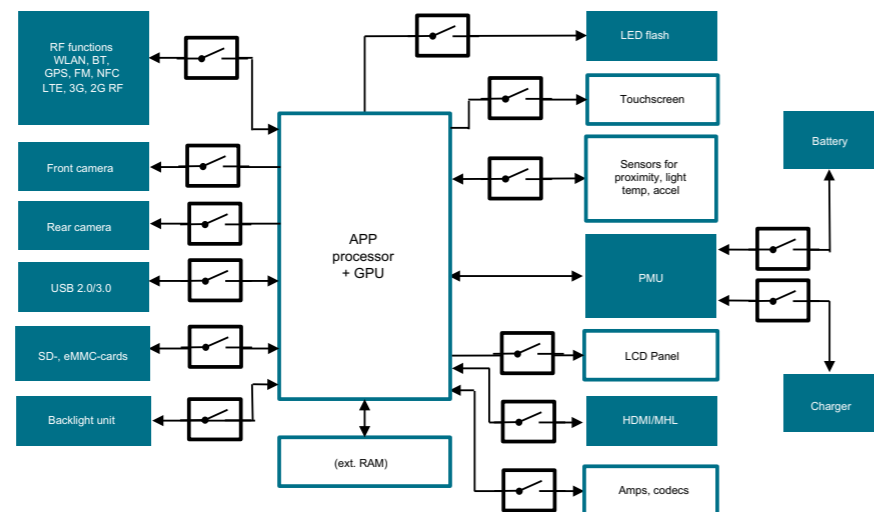
Many options for WLCSP, leaded SMD and ultra-small leadless packages.

## A quality product from an experienced, high volume supplier

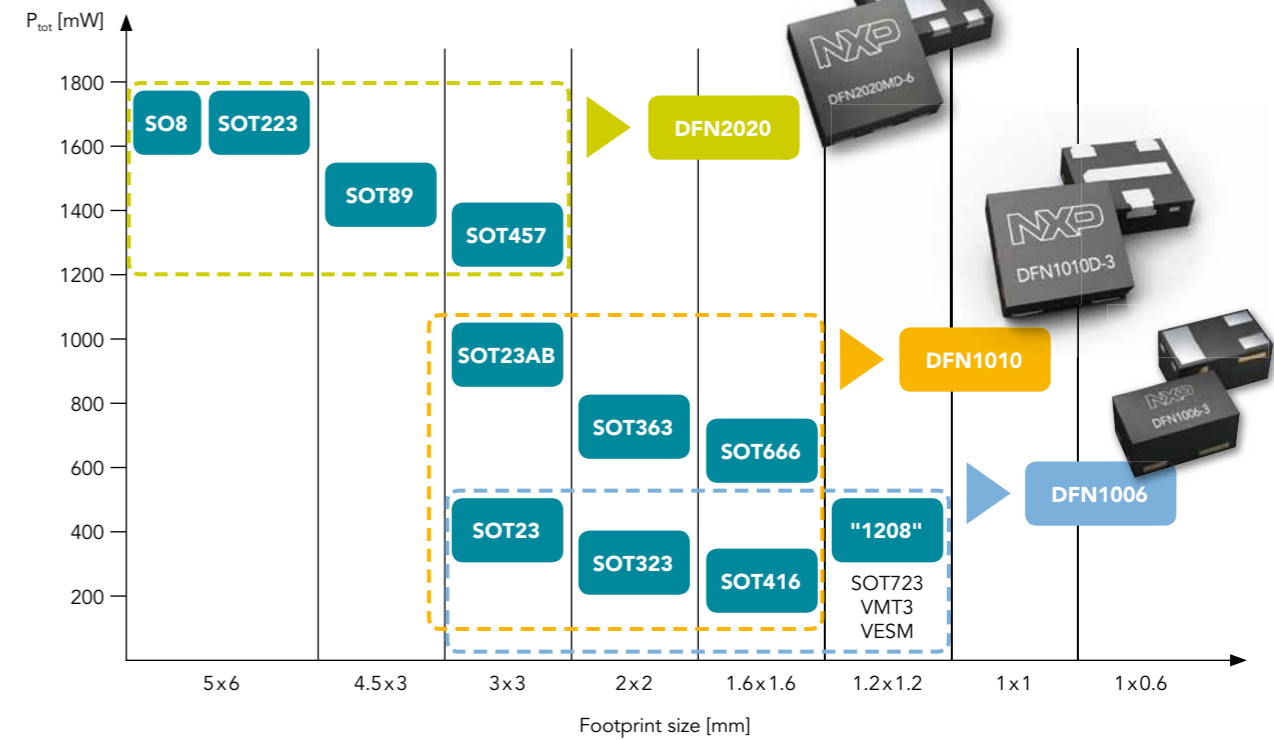
- ▶ NXP is strongly committed to automotive quality standards
- ▶ NXP has a track record of more than 60 years in developing and producing discretes
- ▶ NXP is the #1 in small-signal discretes with a high production capacity



## Block diagram for typical MOSFET application

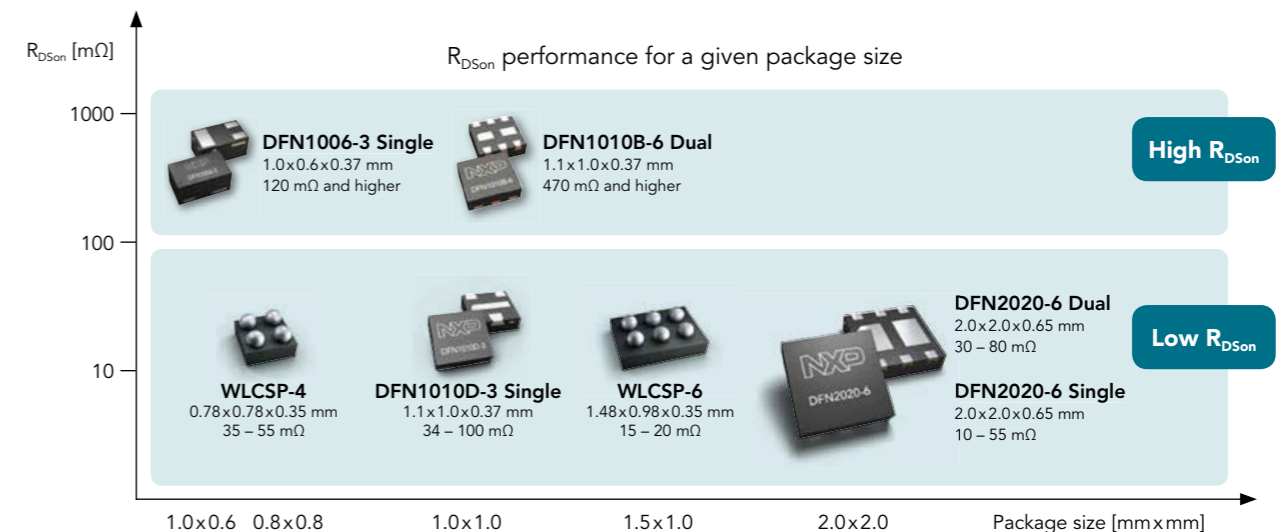


## Leadless DFN packages replace leaded packages



Leadless packages provide the same power capability compared to larger packages on a smaller size or provide a better thermal performance on the same footprint size. For that reason they replace established leaded packages in many applications.

## Leadless DFN and WLCSP packages – dedicated solutions for your application





Small-signal MOSFETs in ultra-small DFN1006 and DFN1006B packages

types in **bold** represent new products

| Package               |                     |                     |                    |                             |                             |                          |                           |                         |                     |  | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B) |       |          |                   |                    |                    |                  |                   |
|-----------------------|---------------------|---------------------|--------------------|-----------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|---------------------|--|--------------------|----------------------|-------|----------|-------------------|--------------------|--------------------|------------------|-------------------|
| Size (mm)             |                     |                     |                    |                             |                             |                          |                           |                         |                     |  | 1.0 x 0.6 x 0.48   | 1.0 x 0.6 x 0.37     |       |          |                   |                    |                    |                  |                   |
| P <sub>tot</sub> (mW) |                     |                     |                    |                             |                             |                          |                           |                         |                     |  | 250                | 250                  |       |          |                   |                    |                    |                  |                   |
| Polarity              | V <sub>DS</sub> (V) | V <sub>GS</sub> (V) | I <sub>D</sub> (A) | V <sub>GS(th) min</sub> (V) | V <sub>GS(th) max</sub> (V) | t <sub>on</sub> typ (ns) | t <sub>off</sub> typ (ns) | Q <sub>G</sub> typ (nC) | ESD protection (kV) | R <sub>DSon</sub> typ (mΩ) @ V <sub>GS</sub> = |                    |                      |       |          |                   |                    |                    |                  |                   |
|                       |                     |                     |                    |                             |                             |                          |                           |                         |                     | 10 V   | 4.5 V              | 2.5 V                | 1.8 V | 1.5 V    | 1.2 V             |                    |                    |                  |                   |
| N-channel             | 20                  | 8                   | 1.9                | 0.45                        | 0.95                        | 5.3                      | 16                        | 1.6                     | 2                   | -  | 120                | 160                  | 210   | 270      | -                 | <b>PMZ130UNE</b>   |                    |                  |                   |
|                       |                     |                     | 1.6                | 0.45                        | 0.95                        | 5.3                      | 16                        | 1.6                     | 2                   | -  | 170                | 200                  | 240   | 300      | -                 |                    | <b>PMZB150UNE</b>  |                  |                   |
|                       |                     |                     | 1                  | 0.5                         | 0.95                        | 6                        | 86                        | 0.45                    | 2                   | -  | 270                | 360                  | 470   | 600      | -                 | <b>PMZ290UNE2</b>  | <b>PMZB290UNE2</b> |                  |                   |
|                       |                     |                     | 0.6                | 0.45                        | 0.95                        | 5.6                      | 19                        | 0.4                     | 1                   | -  | 470                | 620                  | 845   | 1125     | 2210              |                    | PMZ600UNE          | PMZB600UNE       |                   |
|                       |                     |                     | 1.5                | 0.45                        | 0.95                        | 5                        | 17                        | 1.6                     | 2                   | -  | 210                | 240                  | 270   | 300      | -                 | <b>PMZ200UNE</b>   | <b>PMZB200UNE</b>  |                  |                   |
|                       |                     |                     | 1                  | 0.45                        | 0.95                        | 4                        | 12                        | 0.8                     | 2                   | -  | 390                | 460                  | 30    | 610      | -                 | <b>PMZ390UNE</b>   | <b>PMZB390UNE</b>  |                  |                   |
|                       | 30                  | 8                   | 0.59               | 0.45                        | 0.95                        | 4                        | 12                        | 0.6                     | 2                   | -  | 550                | 660                  | 770   | 890      | -                 | <b>PMZ550UNE</b>   | <b>PMZB550UNE</b>  |                  |                   |
|                       |                     |                     | 0.45               | 1.1                         | 2.1                         | 5                        | 12                        | 0.5                     | 2                   | 1000   | 1300               | -                    | -     | -        | 2N700BKM          | 2N7002BKMB         |                    |                  |                   |
|                       |                     |                     | 0.35               | 1.1                         | 2.1                         | 4.7                      | 6.9                       | 1                       | 2                   | 2200   | 2500               | -                    | -     | -        | NX7002BKM         | NX7002BKMB         |                    |                  |                   |
|                       |                     |                     | 60                 | 20                          | 1.4                         | 0.45                     | 0.95                      | 4                       | 26                  | 1.3  | 1.8                | -                    | 330   | 420      | 520               | -                  | -                  | PMZ350UPE        | PMZB350UPE        |
|                       |                     |                     |                    |                             | 0.5                         | 0.45                     | 0.95                      | 2.3                     | 13.5                | 1.19   | 1                  | -                    | 1020  | 1270     | 1700              | 2300               | 3500               | PMZ950UPE        | PMZB950UPE        |
|                       |                     |                     |                    |                             | 1                           | 0.45                     | 0.95                      | 2.9                     | 22                  | 1.45   | 2                  | -                    | 430   | 470      | 750               | 950                | -                  | <b>PMZ320UPE</b> | <b>PMZB320UPE</b> |
| 50                    | 20                  | 0.41                | 0.45               | 0.95                        | 3                           | 14                       | 0.7                       | 2                       | -                   | 1200   | 1700               | 2100                 | 3000  | -        | <b>PMZ1200UNE</b> | <b>PMZB1200UPE</b> |                    |                  |                   |
|                       |                     | 0.23                | 1.1                | 2.1                         | 13                          | 48                       | 0.26                      | 1                       | 4500                | 5700   | -                  | -                    | -     | BSS84AKM | BSS84AKMB         |                    |                    |                  |                   |

**Key features**

- ▶ N- and P-channel
- ▶ Low R<sub>DSon</sub> down to 120 mΩ
- ▶ I<sub>D</sub> up to 1.9 A
- ▶ Low voltage drive (V<sub>GS(th)</sub> = 0.65 V typ)
- ▶ Voltage range of 20 to 60 V
- ▶ ESD protection of up to 2 kV

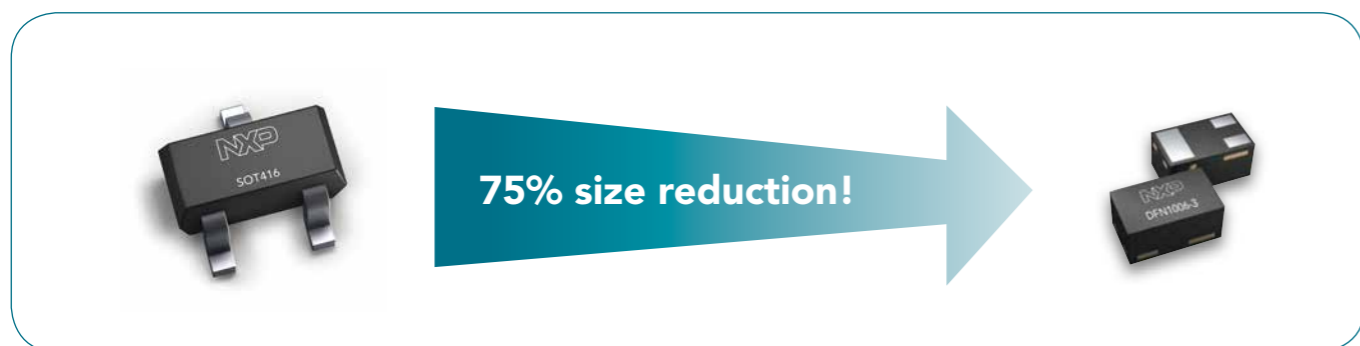
**Package**

- ▶ 1.0 x 0.6 mm footprint
- ▶ Single package with different heights:
  - 0.5 mm for DFN1006 (SOT883)
  - 0.37 mm for DFN1006B (SOT883B)
- ▶ Power dissipation (P<sub>tot</sub>) of 360 mW

**Key applications**

- ▶ Smartphones
- ▶ Wearables
- ▶ Tablets

DFN1006 – The ideal replacement for SOT416



Small-signal MOSFETs in DFN1010D-3 single and DFN1010B-3 dual packages

types in **bold** represent new products

| Package               |           |                     |                     |                    |                             |                             |                          |                           |                         |                     | DFN1010D-3 (SOT1215)                           | DFN1010B-6 (SOT1216) |       |       |       |       |            |           |              |             |
|-----------------------|-----------|---------------------|---------------------|--------------------|-----------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|---------------------|--|----------------------|-------|-------|-------|-------|------------|-----------|--------------|-------------|
| Size (mm)             |           |                     |                     |                    |                             |                             |                          |                           |                         |                     | 1.1 x 1.0 x 0.37                               | 1.1 x 1.0 x 0.37     |       |       |       |       |            |           |              |             |
| P <sub>tot</sub> (mW) |           |                     |                     |                    |                             |                             |                          |                           |                         |                     | 1000   | 350                  |       |       |       |       |            |           |              |             |
| Configuration         | Polarity  | V <sub>DS</sub> (V) | V <sub>GS</sub> (V) | I <sub>D</sub> (A) | V <sub>GS(th) min</sub> (V) | V <sub>GS(th) max</sub> (V) | t <sub>on</sub> typ (ns) | t <sub>off</sub> typ (ns) | Q <sub>G</sub> typ (nC) | ESD protection (kV) | R <sub>DSon</sub> typ (mΩ) @ V <sub>GS</sub> = |                      |       |       |       |       |            |           |              |             |
|                       |           |                     |                     |                    |                             |                             |                          |                           |                         |                     | 10 V   | 4.5 V                | 2.5 V | 1.8 V | 1.5 V | 1.2 V |            |           |              |             |
| Single                | N-channel | 12                  | 8                   | 3.2                | 0.4                         | 0.9                         | 6                        | 18                        | 6.6                     | 1                   | -  | 34                   | 39    | 46    | 50    | 121   | PMXB40UNE  |           |              |             |
|                       |           | 20                  | 8                   | 3.2                | 0.5                         | 0.9                         | 6                        | 17                        | 5.7                     | 1                   | -  | 42                   | 48    | 56    | 64    | -     | PMXB43UNE  |           |              |             |
|                       |           | 30                  | 20                  | 3.2                | 1                           | 2                           | 3                        | 11                        | 3.6                     | -                   | 49   | 56                   | -     | -     | -     | -     | PMXB56EN   |           |              |             |
|                       |           |                     |                     | 3.2                | 1                           | 2.5                         | 3                        | 11                        | 6                       | 1                   | 44   | 56                   | -     | -     | -     | -     | PMXB65ENE  |           |              |             |
|                       |           | 80                  | 20                  | 1.1                | 1.3                         | 2.7                         | 2                        | 9                         | 3                       | 2                   | 345  | 390                  | -     | -     | -     | -     | PMXB60ENE  |           |              |             |
|                       |           | P-channel           | 12                  | 8                  | 3.2                         | 0.4                         | 1                        | 6.2                       | 27                      | 6.7                 | 1.5  | -                    | 59    | 78    | 120   | 198   | 880        | PMXB65UPE |              |             |
|                       | 20        |                     | 8                   | 2.9                | 0.4                         | 1                           | 6                        | 29                        | 6.8                     | 1                   | -  | 69                   | 86    | 130   | 205   | 950   | PMXB75UPE  |           |              |             |
|                       |           |                     |                     | 1.2                | 0.45                        | 0.95                        | 3                        | 18                        | 1.25                    | 1.5                 | -  | 350                  | 450   | 600   | 760   | 1200  | PMXB350UPE |           |              |             |
|                       | 30        |                     | 20                  | 2.4                | 1                           | 2.5                         | 4                        | 16                        | 6.2                     | 1                   | 100  | 125                  | -     | -     | -     | -     | PMXB120EPE |           |              |             |
|                       | Dual      |                     | N-ch                | 20                 | 8                           | 0.6                         | 0.45                     | 0.95                      | 5.6                     | 19                  | 0.4  | 1                    | -     | 470   | 620   | 845   | 1125       | 2210      |              | PMDXB600UNE |
|                       |           |                     |                     | 30                 | 8                           | 0.59                        | 0.45                     | 0.95                      | 4                       | 12                  | 0.6  | 2                    | -     | 550   | 660   | 770   | 890        | -         |              | PMDXB550UNE |
|                       |           | 60                  |                     | 20                 | 0.26                        | 1.1                         | 2.1                      | 4.7                       | 6.9                     | 1                   | 2  | 2200                 | 2500  | -     | -     | -     | -          |           | NX7002BKXB   |             |
| P-ch                  |           | 20                  | 8                   | 0.5                | 0.45                        | 0.95                        | 2.3                      | 13.5                      | 1.19                    | 1                   | -  | 1020                 | 1270  | 1700  | 2300  | 3500  |            |           | PMDXB950UPE  |             |
|                       |           | 30                  | 8                   | 0.41               | 0.45                        | 0.95                        | 3                        | 14                        | 0.7                     | 2                   | -  | 1200                 | 1700  | 2100  | 3000  | -     |            |           | PMDXB1200UPE |             |
|                       |           | 30                  | 8                   | 0.41               | 0.45                        | 0.95                        | 3                        | 14                        | 0.7                     | 2                   | -  | 1200                 | 1700  | 2100  | 3000  | -     |            |           | PMCB900UE    |             |
| Complementary         | N         | 20                  | 8                   | 0.6                | 0.45                        | 0.95                        | 5.6                      | 19                        | 0.4                     | 1                   | -  | 470                  | 620   | 845   | 1125  | 2210  |            |           |              |             |
|                       | P         | 20                  | 8                   | 0.5                | 0.45                        | 0.95                        | 2.3                      | 13.5                      | 1.19                    | 1                   | -  | 1020                 | 1270  | 1700  | 2300  | 3500  |            |           |              |             |
|                       | N         | 30                  | 8                   | 0.59               | 0.45                        | 0.95                        | 4                        | 12                        | 0.6                     | 2                   | -  | 550                  | 660   | 770   | 890   | -     |            |           |              |             |
|                       | P         | 30                  | 8                   | 0.41               | 0.45                        | 0.95                        | 3                        | 14                        | 0.7                     | 2                   | -  | 1200                 | 1700  | 2100  | 3000  | -     |            |           |              |             |

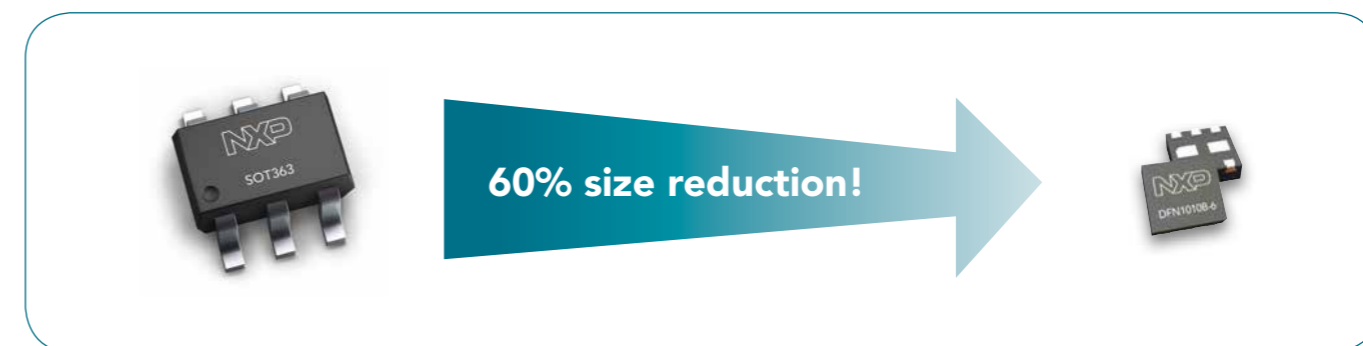
**Key features**

- ▶ N- and P-channel
- ▶ Low R<sub>DSon</sub> to 34 mΩ
- ▶ I<sub>D</sub> to 3.2 A
- ▶ Low voltage drive (V<sub>GS(th)</sub> = 0.65 V typ)
- ▶ Voltage range of 12 to 80 V
- ▶ ESD protection to more than 1 kV

**Package**

- ▶ 1.1 x 1.0 x 0.37 mm package size
- ▶ Single and dual packages
- ▶ High power dissipation (P<sub>tot</sub>) of 1000 mW single and 350 mW for dual package
- ▶ Single package with tin-plated, solderable side pads for improved mounting and automotive conformity

DFN1010B-6 dual – The ideal replacement for SOT363

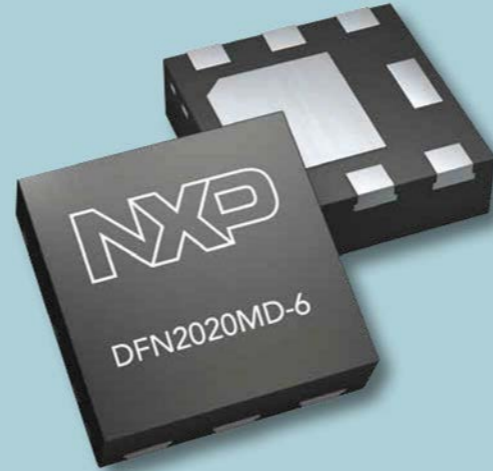


# DFN2020 – The low $R_{DSon}$ choice for values $> 10\text{ m}\Omega$

In the spotlight

## PMPB15XP – Low $R_{DSon}$ P-channel MOSFET in DFN2020

- 12 V P-channel with  $R_{DSon}$  of 15 m $\Omega$  @  $V_{GS} = 4.5\text{ V}$  (typ)
- $I_D$  max of 11.8 A for medium current load switch
- Small and leadless ultrathin SMD plastic package: 2.0 x 2.0 x 0.65 mm
- Exposed drain pad for excellent thermal conduction
- $R_{DSon}$  specified to 1.8 V for low drive voltages



DFN2020MD-6 (SOT1220)

Single package 2 x 2 x 0.65 mm

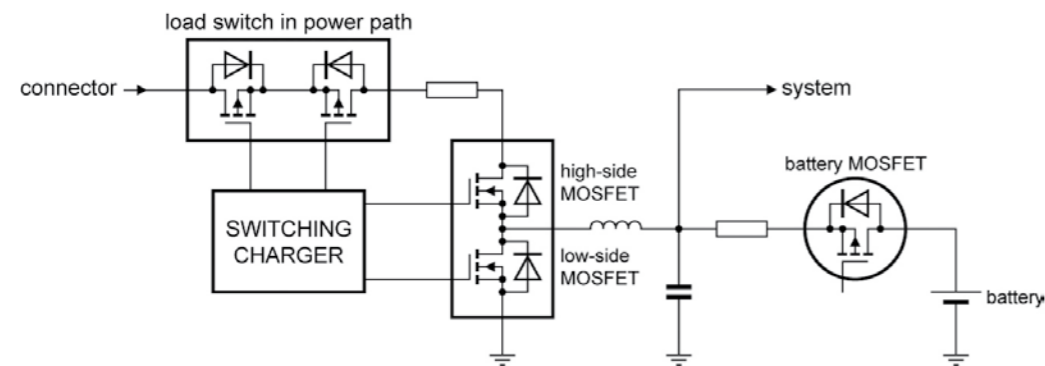
### Key features

- ▶ N- and P-channel
- ▶ Low  $R_{DSon}$  down to 10 m $\Omega$
- ▶  $I_D$  up to 13 A
- ▶ Low voltage drive ( $V_{GS(th)} = 0.65\text{ V}$  typ)
- ▶ Voltage range of 12 to 100 V
- ▶ ESD protection of 3 kV

### Package

- ▶ 2.0 x 2.0 x 0.65 mm package size
- ▶ Single and dual packages
- ▶ High power dissipation ( $P_{tot}$ ) of 1250 mW for single and dual packages
- ▶ Single package with tin-plated, solderable side pads for improved mounting and automotive conformity

### Generic charging path application



### Products for charging path application

| Type      | Package     | $V_{DS}/V_{GS}$ (V) | $I_D$ (A) | ESD protection (kV) | $R_{DSon}$ typ (m $\Omega$ ) @ $V_{GS} =$ |       |       |       | Application                 |
|-----------|-------------|---------------------|-----------|---------------------|---|-------|-------|-------|-----------------------------|
|           |             |                     |           |                     | 10 V                                      | 4.5 V | 2.5 V | 1.8 V |                             |
| PMPB15XP  | DFN2020MD-6 | 12 / 12             | 11.8      | 1.5                 | -   | 15    | 17    | 21    | Charger Switch, Battery FET |
| PMPB20EN  | DFN2020MD-6 | 30 / 20             | 10.4      | -                   | 16.5                                      | 20.5  | -     | -     | Buck Converter              |
| PMPB10XNE | DFN2020MD-6 | 20 / 18             | 12.9      | 2.2                 | -   | 10    | 12    | 16    | Battery Pack                |

## Small-signal MOSFETs

### Small-signal MOSFETs in DFN2020MD-6 single and DFN2020-6 dual packages

types in **bold** represent new products

| Package         |           | DFN2020MD-6 (SOT1220) | DFN2020-6 (SOT1118) |           |                      |                      |                   |                    |                |                     |   |       |       |                    |                    |                  |
|-----------------|-----------|-----------------------|---------------------|-----------|----------------------|----------------------|-------------------|--------------------|----------------|---------------------|---|-------|-------|--------------------|--------------------|------------------|
| Size (mm)       |           | 2.0 x 2.0 x 0.65      | 2.0 x 2.0 x 0.65    |           |                      |                      |                   |                    |                |                     |   |       |       |                    |                    |                  |
| $P_{tot}$ (mW)  |           | 1250                  | 1250                |           |                      |                      |                   |                    |                |                     |   |       |       |                    |                    |                  |
| Configuration   | Polarity  | $V_{DS}$ (V)          | $V_{GS}$ (V)        | $I_D$ (A) | $V_{GS(th)}$ min (V) | $V_{GS(th)}$ max (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_g$ typ (nC) | ESD protection (kV) | $R_{DSon}$ typ (m $\Omega$ ) @ $V_{GS} =$ |       |       |                    |                    |                  |
|                 |           |                       |                     |           |                      |                      |                   |                    |                |                     | 10 V                                      | 4.5 V | 2.5 V | 1.8 V              |                    |                  |
| Single          | N-channel | 20                    | 12                  | 8         | 11.3                 | 0.4                  | 1                 | 9                  | 26             | 8.8                 | 2   | -     | 14    | 17                 | 21                 | <b>PMPB12UNE</b> |
|                 |           |                       |                     | 12.9      | 0.4                  | 0.9                  | 13                | 54                 | 23             | 2.2                 | -   | 10    | 12    | 16                 | PMPB10XNE          |                  |
|                 |           |                       |                     | 5.9       | 0.75                 | 1.25                 | 16                | 49                 | 31             | 2                   | -   | 14    | 20    | -                  | <b>PMPB20XNEA</b>  |                  |
|                 |           |                       |                     | 10.4      | 0.4                  | 0.9                  | 9                 | 31                 | 13.4           | -                   | -   | 18    | 21    | 23                 | PMPB15XN           |                  |
|                 |           |                       |                     | 10.1      | 0.4                  | 0.9                  | 9                 | 31                 | 11.6           | 2.1                 | -   | 19    | 23    | 31                 | PMPB23XNE          |                  |
|                 |           | 30                    | 12                  | 11.3      | 0.4                  | 0.9                  | 12                | 54                 | 24             | 2.2                 | -   | 13    | 14    | 17                 | PMPB13XNE          |                  |
|                 |           |                       |                     | 5         | 0.4                  | 0.9                  | 8                 | 33                 | 12.4           | 2.1                 | -   | 28    | 32    | 37                 | PMPB29XNE          |                  |
|                 |           |                       | 5.5                 | 0.45      | 1.2                  | 6                    | 21                | 5.1                | -              | -                   | 37  | 55    | -     | PMPB33XN           |                    |                  |
|                 |           |                       | 20                  | 13        | 1                    | 2                    | 9                 | 17                 | 13.7           | -                   | 12  | 14    | -     | -                  | PMPB11EN           |                  |
|                 |           |                       |                     | 10.4      | 1                    | 2                    | 9                 | 9                  | 7.2            | -                   | 16.5                                      | 20.5  | -     | -                  | PMPB20EN           |                  |
|                 | 60        | 20                    | 4                   | 1.3       | 2.7                  | 4.5                  | 13.5              | 7.5                | 1              | 42                  | 48  | -     | -     | <b>PMPB55ENEAE</b> |                    |                  |
|                 |           |                       | 3                   | 1.3       | 2.7                  | 4                    | 10.5              | 6.2                | 2.7            | 72                  | 85  | -     | -     | PMPB85ENEAE        |                    |                  |
|                 |           | 80                    | 2.8                 | 1.3       | 2.7                  | 5                    | 15                | 9.9                | 2.8            | 80                  | 92  | -     | -     | PMPB95ENEAE        |                    |                  |
|                 |           |                       | 1.9                 | 1.3       | 2.7                  | 3.5                  | 9.5               | 4.8                | 2              | 175                 | 195                                       | -     | -     | PMPB215ENEAE       |                    |                  |
|                 | P-channel | 12                    | 12                  | 11.8      | 0.47                 | 0.9                  | 18                | 85                 | 67             | -                   | -   | 15    | 17    | 21                 | PMPB15XP           |                  |
|                 |           |                       |                     | 10.3      | 0.47                 | 0.9                  | 16                | 43                 | 28.8           | -                   | -   | 19    | 21    | 27                 | PMPB19XP           |                  |
|                 |           |                       |                     | 10.3      | 0.47                 | 0.9                  | 13                | 92                 | 30             | 2.4                 | -   | 19    | 22    | 28                 | PMPB20XPE          |                  |
|                 |           |                       |                     | 5         | 0.47                 | 0.9                  | 12                | 91                 | 30             | 2.3                 | -   | 28    | 31    | 36                 | PMPB29XPE          |                  |
|                 |           |                       |                     | 7.9       | 0.47                 | 0.9                  | 12                | 62                 | 15             | -                   | -   | 30    | 35    | 45                 | PMPB33XP           |                  |
|                 |           | 30                    | 12                  | 5         | 0.47                 | 0.9                  | 15                | 28                 | 14             | -                   | -   | 47    | 54    | 74                 | PMPB47XP           |                  |
| 8.8             |           |                       |                     | 1         | 2.5                  | 10                   | 28                | 30                 | -              | 24                  | 32  | -     | -     | PMPB27EP           |                    |                  |
| 20              |           |                       | 6.8                 | 1         | 2.5                  | 7.4                  | 27                | 17                 | -              | 40                  | 55  | -     | -     | PMPB48EP           |                    |                  |
|                 |           |                       | 5                   | 0.47      | 0.9                  | 9                    | 57                | 15.6               | 2.3            | -                   | 39  | 45    | 56    | PMPB43XPE          |                    |                  |
|                 |           |                       | 5                   | 0.47      | 0.9                  | 9                    | 57                | 15.6               | 2.3            | -                   | 39  | 45    | 56    | PMPB43XPE          |                    |                  |
| Dual            | N-ch      | 20                    | 12                  | 5.3       | 0.4                  | 0.9                  | 4                 | 40                 | 14.4           | -                   | -   | 32    | 40    | 60                 | PMDPB30XN          |                  |
|                 |           |                       |                     | 3.1       | 0.75                 | 1.25                 | 9                 | 19                 | 2.9            | 2                   | -   | 55    | 72    | -                  | <b>PMDPB56XNEA</b> |                  |
|                 | 30        | 12                    | 3.1                 | 0.5       | 1.5                  | 6                    | 18                | 1.65               | 1.8            | -                   | 95  | 130   | -     | <b>PMDPB95XNE2</b> |                    |                  |
|                 |           |                       | 4.5                 | 0.45      | 0.95                 | 7                    | 41                | 6.3                | 2              | -                   | 58  | 74    | 97    | PMDPB58UPE         |                    |                  |
|                 | P-channel | 20                    | 8                   | 3.7       | 0.45                 | 0.95                 | 6                 | 47                 | 5.4            | 2                   | -   | 82    | 107   | 142                | PMDPB85UPE         |                  |
|                 |           |                       |                     | 4.5       | 0.47                 | 0.9                  | 4                 | 135                | 16.5           | -                   | -   | 55    | 75    | 110                | PMDPB55XP          |                  |
|                 |           | 12                    | 4.2                 | 0.75      | 1.25                 | 7                    | 33                | 5                  | 2              | -                   | 66  | 98    | -     | PMDPB70XPE         |                    |                  |
|                 |           |                       | 3.7                 | 0.4       | 1                    | 6                    | 120               | 5.7                | -              | -                   | 80  | 95    | 120   | PMDPB80XP          |                    |                  |
|                 |           | 30                    | 12                  | 3.8       | 0.45                 | 1                    | 3                 | 112                | 5.2            | -                   | -   | 70    | 89    | -                  | PMDPB70XP          |                  |
|                 |           |                       |                     | 3.7       | 0.4                  | 1                    | 6                 | 120                | 5.7            | -                   | -   | 80    | 95    | 120                | PMFPB8032XP        |                  |
| MOSFET-Schottky | P         | 20                    | 12                  | 3.7       | 0.4                  | 1                    | 6                 | 120                | 5.7            | -                   | -   | 80    | 95    | 120                | PMFPB8040XP        |                  |
|                 |           |                       |                     | 3.7       | 0.4                  | 1                    | 6                 | 120                | 5.7            | -                   | -   | 80    | 95    | 120                | PMFPB8040XP        |                  |
| Pre-biased NPN  | P         | 30                    | 12                  | 3.4       | 0.45                 | 1                    | 3                 | 112                | 5.2            | -                   | -   | 85    | 105   | -                  | PMC85XP            |                  |
| Complementary   | N         | 20                    | 12                  | 5.3       | 0.4                  | 0.9                  | 4                 | 40                 | 14.4           | -                   | -   | 26    | 33    | 50                 |                    |                  |
|                 | P         | 20                    | 12                  | 4.5       | 0.4                  | 0.9                  | 4                 | 40                 | 8.1            | -                   | -   | 55    | 75    | 110                | PMCPB5530X         |                  |

MOSFETs

# Small-signal MOSFETs in WLCSP4 and WLCSP6 packages

## Key features

- ▶ N- and P-channel
- ▶ Low  $R_{DSon}$  down to 15 mΩ
- ▶  $I_D$  up to 9.6 A
- ▶ Low voltage drive ( $V_{GSth} = 0.6 V$  typ)
- ▶  $V_{DS}$  voltage of 12V
- ▶ ESD protection of 2 kV

## Package

- ▶ Two package outlines
  - WLCSP4: 0.78x0.78 mm package size
  - WLCSP6: 1.48x0.98 mm package size
- ▶ Ultra-low height of 0.35 mm
- ▶ High power dissipation ( $P_{tot}$ ) of 1300 mW

### WLCSP6

Single package  
1.48 x 0.98 x 0.35 mm



### In the spotlight

#### PMCM6501VPE - Ultra-low $R_{DSon}$ P-ch MOSFET in WLCSP6

12 V P-ch with  $R_{DSon}$  of typ. 19 mΩ @  $V_{GS} = 4.5 V$

$I_D$  max of 8.2 A for high current load switch

Ultra-small footprint: 1.48 x 0.98 x 0.35 mm

Low voltage gate drive with  $V_{GSth}$  typ. 0.6V

$R_{DSon}$  specified down to 1.8 V for low drive voltages

# Small-signal MOSFETs for automotive



### DFN2020MD-6 (SOT1220)

Single package  
2 x 2 x 0.65 mm

- ▶ Broad portfolio of standard leaded packages in SOT23 and SOT457 and innovative leadless DFN packages with solderable side pads
- ▶ Low  $R_{DSon}$  MOSFETs with  $R_{DSon}$  down to 14 mΩ
- ▶ Standard high  $R_{DSon}$  MOSFETs in different packages with 2 kV ESD protection
- ▶ Broad portfolio of 60 V low  $R_{DSon}$  MOSFETs

### In the spotlight

#### PMPB85ENEA - Automotive-compliant 60 V N-channel MOSFET with $I_D$ max of 4.4 A in DFN2020MD-6 (SOT1220)

60 V N-channel with  $R_{DSon}$  of typ. 72mΩ @  $V_{GS} = 10 V$

Small and leadless ultrathin SMD plastic package: 2.0 x 2.0 x 0.65 mm

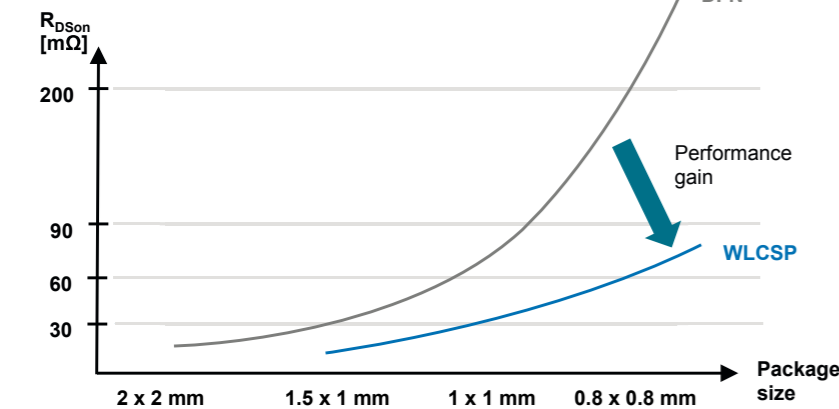
Exposed drain pad for excellent thermal conduction

ESD protection to 2 kV HBM

AEC-Q101 qualified

types in **bold** represent new products

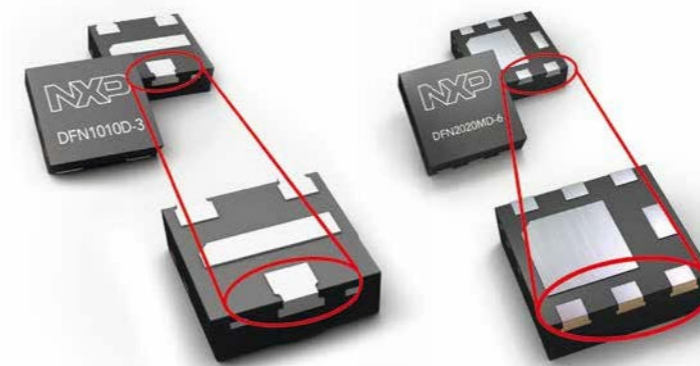
| Package        |              |              |           |                     |                     |                   |                    |                |                     |                                  | WLCSP4             | WLCSP6             |       |             |             |
|----------------|--------------|--------------|-----------|---------------------|---------------------|-------------------|--------------------|----------------|---------------------|----------------------------------|--------------------|--------------------|-------|-------------|-------------|
| Size (mm)      |              |              |           |                     |                     |                   |                    |                |                     |                                  | 0.78 x 0.78 x 0.35 | 1.48 x 0.98 x 0.35 |       |             |             |
| $P_{tot}$ (mW) |              |              |           |                     |                     |                   |                    |                |                     |                                  | 1300               | 1300               |       |             |             |
| Polarity       | $V_{DS}$ (V) | $V_{GS}$ (V) | $I_D$ (A) | $V_{GS(th)min}$ (V) | $V_{GS(th)max}$ (V) | $t_{on}$ typ (ns) | $t_{off}$ typ (ns) | $Q_G$ typ (nC) | ESD protection (kV) | $R_{DSon}$ typ (mΩ) @ $V_{GS} =$ |                    |                    |       |             |             |
|                |              |              |           |                     |                     |                   |                    |                |                     | 4.5 V                            | 2.5 V              | 1.8 V              | 1.5 V |             |             |
| N              | 12           | 8            | 5         | 0.4                 | 0.9                 | 6.3               | 27                 | 5.5            | 2                   | 57                               | 66                 | 77                 | 90    | PMCM440VNE  |             |
|                |              |              | 6         | 0.4                 | 0.9                 | 6.3               | 30                 | 6              | 2                   | 36                               | 46                 | 60                 | 86    | PMCM4401VNE |             |
|                |              |              | 8.4       | 0.4                 | 0.9                 | 11                | 80                 | 15.4           | 2                   | 21                               | 24                 | 28                 | 33    |             | PMCM650VNE  |
|                |              |              | 9.6       | 0.4                 | 0.9                 | 10.8              | 97.5               | 16.1           | 2                   | 15                               | 18                 | 22                 | 30    |             | PMCM6501VNE |
| P              | 12           | 8            | 4.9       | 0.4                 | 0.9                 | 4.8               | 25.1               | 6.8            | 2                   | 55                               | 77                 | 110                | -     | PMCM4401VPE |             |
|                |              |              | 8.2       | 0.4                 | 0.9                 | 8                 | 72                 | 19.6           | 2                   | 19                               | 25                 | 37                 | -     |             | PMCM6501VPE |



### MOSFETs in WLCSP

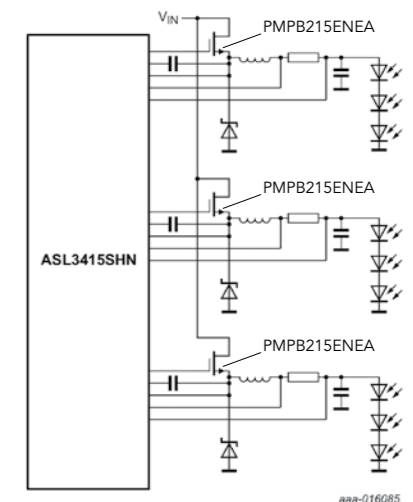
- ▶ Improved  $R_{DSon}$  performance compared to DFN packages
- ▶ Smallest footprint
- ▶ High power capability of 1300 mW
- ▶ Ideal for mobile and space-constrained applications

### DFN1010 and DFN2020 with solderable side pads



Tin plated solderable side pads enable automatic optical inspection (AOI)

### Reference design for LED lighting





Small-signal MOSFETs single (N-channel)





types in **bold** represent new products

| Package               |                     |                    |                             |                             |                          |                           |                         |                     |  |       |       |       | SOT223           | SOT457 (SC-74)  | SOT23             | SOT323 (SC-70)    | DFN1006-3 (SOT883) | DFN1006B-3 (SOT883B) |                    |
|-----------------------|---------------------|--------------------|-----------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|---------------------|--|-------|-------|-------|------------------|-----------------|-------------------|-------------------|--------------------|----------------------|--------------------|
| Size (mm)             |                     |                    |                             |                             |                          |                           |                         |                     |  |       |       |       | 6.5 x 3.5 x 1.65 | 2.9 x 1.5 x 1.0 | 2.9 x 1.3 x 1.0   | 2.0 x 1.25 x 0.95 | 1.0 x 0.6 x 0.48   | 1.0 x 0.6 x 0.37     |                    |
| P <sub>tot</sub> (mW) |                     |                    |                             |                             |                          |                           |                         |                     |  |       |       |       | 1700             | 600             | 250               | 200               | 250                | 250                  |                    |
| V <sub>DS</sub> (V)   | V <sub>GS</sub> (V) | I <sub>D</sub> (A) | V <sub>GS(th) min</sub> (V) | V <sub>GS(th) max</sub> (V) | t <sub>on</sub> typ (ns) | t <sub>off</sub> typ (ns) | Q <sub>G</sub> typ (nC) | ESD protection (kV) | R <sub>DSon</sub> typ (mΩ) @ V <sub>GS</sub> = |       |       |       |                  |                 |                   |                   |                    |                      |                    |
|                       |                     |                    |                             |                             |                          |                           |                         |                     | 10 V   | 4.5 V | 2.5 V | 1.8 V |                  |                 |                   |                   |                    |                      |                    |
| 20                    | 8                   | 4.7                | 0.45                        | 1                           | 8.2                      | 39.5                      | 6.2                     | 2                   | -  | 24    | 29    | 40    |                  |                 | <b>PMN28UNEA</b>  | <b>PMV28UNEA</b>  |                    |                      |                    |
|                       |                     | 1.9                | 0.4                         | 1                           | 8                        | 31                        | 2.2                     | 2                   | -  | 63    | 77    | 114   |                  |                 |                   | <b>PMF63UNE</b>   |                    |                      |                    |
|                       |                     | 2.2                | 0.4                         | 1                           | 6                        | 21                        | 2.6                     | 2                   | -  | 64    | 78    | 110   |                  |                 |                   | <b>PMV65UNE</b>   |                    |                      |                    |
|                       |                     | 1.9                | 0.45                        | 0.95                        | 5.3                      | 16                        | 1.6                     | 2                   | -  | 120   | 155   | 195   |                  |                 |                   |                   | <b>PMZ130UNE</b>   |                      |                    |
|                       |                     | 1.6                | 0.45                        | 0.95                        | 5.3                      | 16                        | 1.6                     | 2                   | -  | 155   | 190   | 235   |                  |                 |                   |                   |                    | <b>PMZB150UNE</b>    |                    |
|                       |                     | 1                  | 0.5                         | 0.95                        | 6                        | 86                        | 0.45                    | 2                   | -  | 270   | 360   | 470   |                  |                 |                   |                   |                    | <b>PMZ290UNE2</b>    | <b>PMZB290UNE2</b> |
|                       | 0.6                 | 0.45               | 0.95                        | 5.6                         | 19                       | 0.4                       | 1                       | -                   | 470  | 620   | 845   |       |                  |                 |                   | PMZ600UNE         | PMZB600UNE         |                      |                    |
|                       | 12                  | 6.3                | 0.75                        | 1.25                        | 16                       | 44                        | 9.9                     | 2                   | -  | 16    | 24    | -     |                  |                 |                   | <b>PMV20XNEA</b>  |                    |                      |                    |
|                       |                     | 8.6                | 0.47                        | 0.9                         | 7                        | 135                       | 7.7                     | -                   | -  | 15    | 18    | 22    |                  |                 |                   | PMV16XN           |                    |                      |                    |
|                       |                     | 9.1                | 0.4                         | 0.9                         | 9                        | 31                        | 12                      | 1                   | -  | 15    | 19    | 22    |                  |                 | <b>PMN16XNE</b>   |                   |                    |                      |                    |
| 5.4                   |                     | 0.4                | 0.9                         | 7                           | 35                       | 6.2                       | -                       | -                   | 24   | 30    | 40    |       |                  |                 | PMV30UN2          |                   |                    |                      |                    |
| 30                    | 8                   | 1.5                | 0.45                        | 0.95                        | 5                        | 17                        | 1.6                     | 2                   | -  | 210   | 240   | 270   |                  |                 |                   |                   |                    | <b>PMZ200UNE</b>     | <b>PMZB200UNE</b>  |
|                       |                     | 1                  | 0.45                        | 0.95                        | 4                        | 12                        | 0.8                     | 2                   | -  | 390   | 460   | 530   |                  |                 |                   |                   |                    | <b>PMZ390UNE</b>     | <b>PMZB390UNE</b>  |
|                       |                     | 0.59               | 0.45                        | 0.95                        | 4                        | 12                        | 0.6                     | 2                   | -  | 550   | 660   | 770   |                  |                 |                   |                   |                    | <b>PMZ550UNE</b>     | <b>PMZB550UNE</b>  |
|                       | 12                  | 0.4                | 0.6                         | 1.1                         | 26                       | 88                        | 0.52                    | 2                   | -  | 1000  | 1400  | 2000  |                  |                 |                   | NX3008NBK         | NX3008NBKW         |                      |                    |
|                       |                     | 7.2                | 0.4                         | 0.9                         | 8                        | 33                        | 12.4                    | 2                   | -  | 19    | 22    | 17    |                  |                 |                   | PMV20XNE          |                    |                      |                    |
|                       |                     | 5.7                | 0.4                         | 0.9                         | 9                        | 34                        | 7                       | -                   | -  | 33    | 42    | 54    |                  |                 | <b>PMN30UN</b>    |                   |                    |                      |                    |
|                       |                     | 4.4                | 0.4                         | 0.9                         | 9                        | 34                        | 7                       | -                   | -  | 36    | 43    | 56    |                  |                 |                   | PMV40UN2          |                    |                      |                    |
|                       | 20                  | 0.9                | 0.5                         | 1.5                         | 8                        | 11                        | 0.74                    | 2                   | -  | 234   | 324   | -     |                  |                 |                   |                   | <b>PMF250XNE</b>   |                      |                    |
|                       |                     | 7.6                | 1                           | 2                           | 9                        | 9                         | 7.2                     | -                   | 17   | 21    | -     | -     |                  |                 |                   | PMV20EN           |                    |                      |                    |
|                       |                     | 5.5                | 1                           | 2.5                         | 8                        | 33                        | 12.6                    | 2                   | 17   | 22    | -     | -     |                  |                 | <b>PMN25ENEA</b>  | <b>PMV25ENEA</b>  |                    |                      |                    |
| 3.9                   |                     | 1                  | 2.5                         | 6.3                         | 14.1                     | 6                         | 2                       | 30                  | 39   | -     | -     |       |                  |                 | <b>PMV50ENEA</b>  |                   |                    |                      |                    |
| 3.1                   |                     | 1                  | 2.5                         | 18                          | 78                       | 6.5                       | -                       | 28                  | 37   | -     | -     |       |                  |                 | PMV37EN2          |                   |                    |                      |                    |
| 4.5                   |                     | 1                  | 2.5                         | 3                           | 11                       | 6                         | 1                       | 30                  | 44   | -     | -     |       |                  | <b>PMN40ENE</b> |                   |                   |                    |                      |                    |
| 5.1                   |                     | 1                  | 2                           | 3                           | 11                       | 3.6                       | -                       | 35                  | 43   | -     | -     |       |                  |                 | PMV45EN2          |                   |                    |                      |                    |
| 40                    | 20                  | 2.1                | 1                           | 2.5                         | 3                        | 15                        | 2.6                     | 2                   | 70   | 90    | -     | -     |                  |                 |                   | <b>PMV90ENE</b>   |                    |                      |                    |
|                       |                     | 0.18               | 0.8                         | 1.5                         | 10                       | 51                        | 0.34                    | -                   | 2700   | 3000  | 4000  | -     |                  |                 |                   | NX3020NAK         | NX3020NAKW         |                      |                    |
| 55                    | 10                  | 3.1                | 1                           | 2.5                         | -                        | -                         | -                       | 1                   | 65   | 88    | -     | -     |                  |                 |                   | <b>PMV65ENEA</b>  |                    |                      |                    |
|                       |                     | 2.5                | 1                           | 2.5                         | 14                       | 14                        | 2.4                     | 1                   | 95   | 120   | -     | -     |                  |                 |                   | PMV130ENEA        |                    |                      |                    |
| 60                    | 20                  | 0.3                | 0.4                         | 1.3                         | 4                        | 11                        | 1                       | 3                   | -  | 2300  | 2400  | 3100  |                  |                 |                   | B5H11BK           |                    |                      |                    |
|                       |                     | 3.1                | 1.3                         | 2.7                         | 9                        | 33                        | 12.7                    | 2                   | 46   | 52    | -     | -     |                  |                 | <b>PMN55ENEA</b>  | <b>PMV55ENEA</b>  |                    |                      |                    |
|                       |                     | 2.1                | 1.3                         | 2.7                         | 6.4                      | 15.9                      | 5.9                     | 2                   | 96   | 108   | -     | -     |                  |                 | <b>PMN120ENEA</b> | <b>PMV120ENEA</b> |                    |                      |                    |
|                       |                     | 1.5                | 1.3                         | 2.7                         | 6.3                      | 13                        | 3.9                     | 2                   | 176  | 196   | -     | -     |                  |                 | <b>PMN230ENEA</b> | <b>PMV230ENEA</b> |                    |                      |                    |
|                       |                     | 0.8                | 1.3                         | 2.7                         | 5.3                      | 10.2                      | 2.4                     | 2                   | 300  | 332   | -     | -     |                  |                 |                   | <b>PMV450ENEA</b> |                    |                      |                    |
|                       |                     | 0.19               | 0.8                         | 1.5                         | 6                        | 11                        | 0.33                    | yes                 | 2800   | 3500  | 4500  | -     | -                |                 |                   |                   | <b>NX138AK</b>     | <b>NX138AKW</b>      |                    |
|                       |                     | 0.27               | 0.5                         | 1.5                         | 7.9                      | 12.5                      | 0.49                    | 2                   | 2100   | 2200  | 2600  | -     | -                |                 |                   |                   | <b>NX138BK</b>     | <b>NX138BKW</b>      |                    |
|                       |                     | 0.1                | 0.6                         | 1.4                         | 2                        | 5                         | -                       | 2                   | 2800   | 3800  | -     | -     |                  |                 |                   | BSN20BK           |                    |                      |                    |
|                       |                     | 0.19               | 1.1                         | 2.1                         | 12                       | 34                        | 0.33                    | yes                 | 3000   | 3700  | -     | -     |                  |                 |                   | NX7002AK          | NX7002AKW          |                      |                    |
| 100                   | 20                  | 0.27               | 1.1                         | 2.1                         | 4.7                      | 6.9                       | 1                       | 2                   | 2200   | 2500  | -     | -     |                  |                 |                   | NX7002BK          | NX7002BKW          | NX7002BKM            | NX7002BKMB         |
|                       |                     | 1.5                | 1.3                         | 2.7                         | 4.8                      | 9.3                       | 4.5                     | 1                   | 285  | 300   | -     | -     |                  |                 | <b>PMT280ENEA</b> |                   |                    |                      |                    |
|                       |                     | 1.1                | 1.3                         | 2.7                         | 5.7                      | 10.2                      | 2.9                     | 1                   | 527  | 555   | -     | -     |                  |                 | <b>PMT560ENEA</b> |                   |                    |                      |                    |







### Small-signal MOSFETs dual

types in **bold** represent new products

|                       |                     |                     |                    |                             |                             |                          |                           |                         |                     |     | SOT363 (SC-88)  | SOT666  | DFN2020-6 (SOT1118)   | DFN1010B-6 (SOT1216)  |   |                   |                 |                     |            |
|-----------------------|---------------------|---------------------|--------------------|-----------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|---------------------|-----|---|---|---|---|---|-------------------|-----------------|---------------------|------------|
| Package               |                     |                     |                    |                             |                             |                          |                           |                         |                     |     |  |  |  |  |   |                   |                 |                     |            |
| Size (mm)             |                     |                     |                    |                             |                             |                          |                           |                         |                     |     | 2.0 x 1.25 x 0.95   | 1.6 x 1.2 x 0.55  | 2.0 x 2.0 x 0.65  | 1.0 x 1.0 x 0.37  |   |                   |                 |                     |            |
| P <sub>tot</sub> (mW) |                     |                     |                    |                             |                             |                          |                           |                         |                     |     | 300   | 300   | 1250  | 350   |   |                   |                 |                     |            |
| Polarity              | V <sub>DS</sub> (V) | V <sub>GS</sub> (V) | I <sub>D</sub> (A) | V <sub>GS(th)</sub> min (V) | V <sub>GS(th)</sub> max (V) | t <sub>on</sub> typ (ns) | t <sub>off</sub> typ (ns) | Q <sub>G</sub> typ (nC) | ESD protection (kV) |     | R <sub>DS(on)</sub> typ (mΩ) @ V <sub>GS</sub> =                                    |   |   |   |   |                   |                 |                     |            |
|                       |                     |                     |                    |                             |                             |                          |                           |                         |                     |     | 10 V  | 4.5 V   | 2.5 V   | 1.8 V   |   |                   |                 |                     |            |
| N-channel             | 20                  | 8                   | 0.8                | 0.5                         | 0.95                        | 10                       | 117                       | 0.45                    | 2                   |     | -   | 290   | 420   | 600   |   | PMDT290UNE        |                 |                     |            |
|                       |                     |                     | 0.6                | 0.45                        | 0.95                        | 5.6                      | 19                        | 0.4                     | 1                   |     | -   | 470   | 620   | 845   |   |                   |                 | PMDXB600UNE         |            |
|                       | 30                  | 8                   | 5.3                | 0.4                         | 0.9                         | 4                        | 40                        | 14.4                    | -                   |     | -   | 32  | 40  | 60  |   |                   | PMDPB30XN       |                     |            |
|                       |                     |                     | 0.59               | 0.45                        | 0.95                        | 4                        | 12                        | 0.6                     | 2                   |     | -   | 550   | 660   | 770   |   |                   |                 | <b>PMDXB550UNE</b>  |            |
|                       | 60                  | 12                  | 0.35               | 0.6                         | 1.1                         | 26                       | 88                        | 0.52                    | 2                   |     | -   | 1000  | 1400  | 2000  |   | NX3008NBKS        | NX3008NBKV      |                     |            |
|                       |                     |                     | 3.1                | 0.75                        | 1.25                        | 9                        | 19                        | 2.9                     | 2                   |     | -   | 55  | 72  | -   |   |                   |                 | <b>PMDPB56XNEA</b>  |            |
|                       |                     |                     | 3.1                | 0.5                         | 1.5                         | 6                        | 18                        | 1.65                    | 1.8                 |     | -   | 95  | 130   | -   |   |                   |                 | <b>PMDPB95XNE2</b>  |            |
|                       |                     | 20                  | 1                  | 0.5                         | 1.5                         | 6.5                      | 14                        | 0.7                     | 2                   |     | -   | 170   | 240   | -   |   | <b>PMGD175XNE</b> |                 |                     |            |
|                       |                     |                     | 0.18               | 0.8                         | 1.5                         | 10                       | 51                        | 0.34                    | yes                 |     | 2700  | 3000  | 4000  | -   |   | NX3020NAKS        | NX3020NAKV      |                     |            |
|                       |                     |                     | 0.18               | 0.8                         | 1.5                         | 6                        | 11                        | 0.33                    | yes                 |     | 2800  | 3500  | 4500  | -   |   | <b>NX138AKS</b>   |                 |                     |            |
|                       | P-channel           | 20                  | 20                 | 0.26                        | 0.5                         | 1.5                      | 7.9                       | 12.5                    | 0.49                | 2   |   | 2100  | 2200  | 2600  | - |                   | <b>NX138BKS</b> |                     |            |
|                       |                     |                     |                    | 0.17                        | 1.1                         | 2.1                      | 12                        | 34                      | 0.33                | yes |   | 3000  | 3700  | -   | - |                   | NX7002AKS       |                     |            |
| 0.26                  |                     |                     |                    | 1.1                         | 2.1                         | 4.7                      | 6.9                       | 1                       | 2                   |     | 2200  | 2500  | -   | -   |   | NX7002BKS         |                 |                     | NX7002BKXB |
| 0.55                  |                     |                     |                    | 0.5                         | 1.3                         | 48                       | 152                       | 0.76                    | 2                   |     | -   | 670   | 1200  | 1800  |   |                   | PMDT670UPE      |                     |            |
| 4.5                   |                     |                     |                    | 0.45                        | 0.95                        | 7                        | 41                        | 6.3                     | 2                   |     | -   | 58  | 74  | 97  |   |                   |                 | PMDPB58UPE          |            |
| 0.5                   |                     |                     |                    | 0.45                        | 0.95                        | 2.3                      | 13.5                      | 1.19                    | 1                   |     | -   | 1020  | 1270  | 1700  |   |                   |                 | PMDXB950UPE         |            |
| P-channel             | 30                  | 8                   | 3.7                | 0.45                        | 0.95                        | 6                        | 47                        | 5.4                     | 2                   |     | -   | 82  | 107   | 142   |   |                   |                 | PMDPB85UPE          |            |
|                       |                     |                     | 4.5                | 0.47                        | 0.9                         | 4                        | 135                       | 16.5                    | -                   |     | -   | 55  | 75  | 110   |   |                   |                 | PMDPB55XP           |            |
|                       |                     |                     | 4.2                | 0.75                        | 1                           | 7                        | 33                        | 5                       | 2                   |     | -   | 66  | 98  | -   |   |                   |                 | PMDPB70XPE          |            |
|                       |                     |                     | 3.7                | 0.4                         | 1                           | 6                        | 120                       | 5.7                     | -                   |     | -   | 80  | 95  | 120   |   |                   |                 | PMDPB80XP           |            |
|                       |                     |                     | 0.41               | 0.45                        | 0.95                        | 3                        | 14                        | 0.7                     | 2                   |     | -   | 1200  | 1700  | 2100  |   |                   |                 | <b>PMDXB1200UPE</b> |            |
|                       | 50                  | 20                  | 0.2                | 0.6                         | 1.1                         | 49                       | 103                       | 0.55                    | 2                   |     | -   | 2800  | 5300  | -   |   | NX3008PBKS        | NX3008PBKV      |                     |            |
|                       |                     |                     | 3.8                | 0.45                        | 1                           | 3                        | 112                       | 5.2                     | -                   |     | -   | 70  | 89  | -   |   |                   |                 | PMDPB70XP           |            |
|                       |                     |                     | 0.16               | 1.1                         | 2.1                         | 24                       | 73                        | 0.26                    | 1                   |     | 4500  | 5700  | -   | -   |   | BSS84AKS          | BSS84AKV        |                     |            |

### Small-signal MOSFETs complementary

types in **bold** represent new products

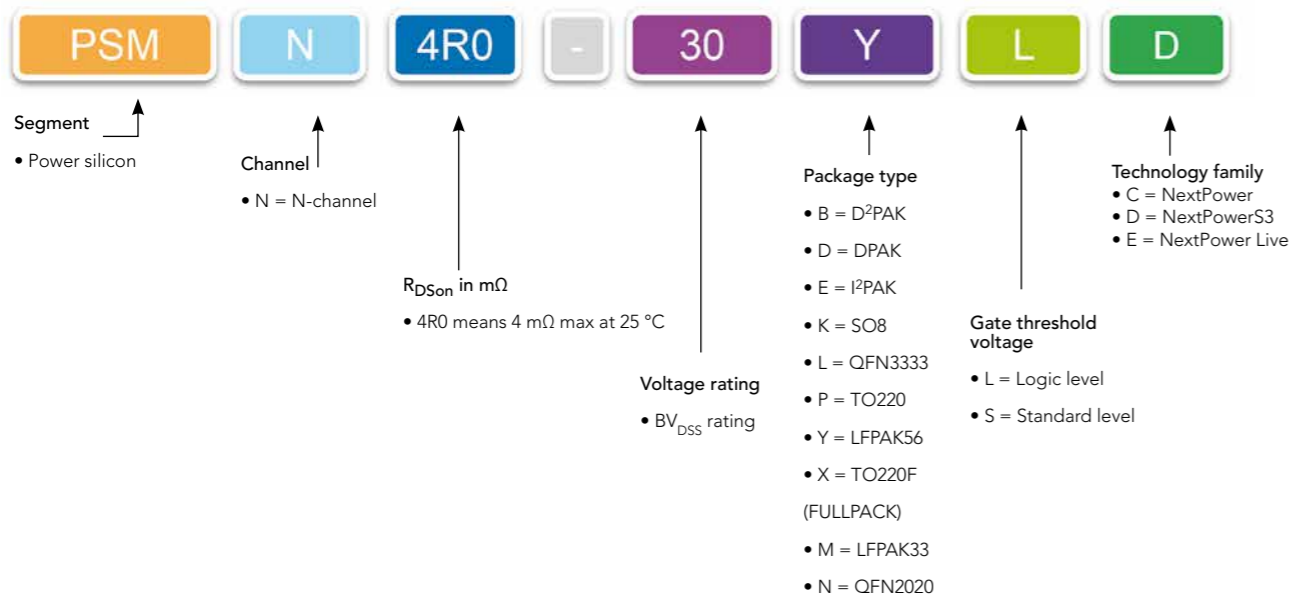
| Package   | Type              | Polarity | V <sub>DS</sub> (V) | V <sub>GS</sub> (V) | I <sub>D</sub> (A) | V <sub>GS(th)</sub> min (V) | V <sub>GS(th)</sub> max (V) |    | t <sub>on</sub> typ (ns) | t <sub>off</sub> typ (ns) | Q <sub>G</sub> typ (nC) | ESD protection (kV) | R <sub>DS(on)</sub> typ (mΩ) @ V <sub>GS</sub> = |       |       |       |       |       |
|---|-------------------|----------|---------------------|---------------------|--------------------|-----------------------------|-----------------------------|----|--------------------------|---------------------------|-------------------------|---------------------|--|-------|-------|-------|-------|-------|
|   |                   |          |                     |                     |                    |                             |                             |    |                          |                           |                         |                     | 10 V   | 4.5 V | 2.5 V | 1.8 V | 1.5 V | 1.2 V |
| <br>SOT666 (1.6 x 1.2 x 0.55)          | NX1029X           | N        | 60                  | 20                  | 0.33               | 1.1                         | 2.1                         |    | 11                       | 19                        | 0.5                     | 2                   | 1000   | 1300  | -     | -     | -     | -     |
|   |                   | P        | 50                  | 20                  | 0.17               | 1.1                         | 2.1                         |    | 24                       | 73                        | 0.26                    | 1                   | 4500   | 5100  | -     | -     | -     | -     |
|   | NX3008CBKV        | N        | 30                  | 8                   | 0.4                | 0.6                         | 1.1                         |    | 26                       | 88                        | 0.52                    | 2                   | -  | 1000  | 1400  | 2000  | -     | -     |
|   |                   | P        | 30                  | 8                   | 0.22               | 0.6                         | 1.1                         |    | 49                       | 103                       | 0.55                    | 2                   | -  | 2800  | 5300  | -     | -     | -     |
| PMDT290UCE  | N                 | 20       | 8                   | 0.8                 | 0.5                | 0.95                        |                             | 10 | 117                      | 0.45                      | 2                       | -                   | 290  | 420   | 600   | -     | -     |       |
|   | P                 | 20       | 8                   | 0.55                | 0.5                | 1.3                         |                             | 48 | 152                      | 0.76                      | 2                       | -                   | 670  | 1200  | 1800  | -     | -     |       |
| <br>SOT363 (SC-88) (2.0 x 1.25 x 0.95) | NX3008CBKS        | N        | 30                  | 8                   | 0.35               | 0.6                         | 1.1                         |    | 26                       | 88                        | 0.52                    | 2                   | -  | 1000  | 1400  | 2000  | -     | -     |
|   |                   | P        | 30                  | 8                   | 0.2                | 0.6                         | 1.1                         |    | 49                       | 103                       | 0.55                    | 2                   | -  | 2800  | 5300  | -     | -     | -     |
| <br>DFN1010B-6 (1.1 x 1.0 x 0.37)      | PMCB900UE         | N        | 20                  | 8                   | 0.6                | 0.45                        | 0.95                        |    | 5.6                      | 19                        | 0.4                     | 1                   | -  | 470   | 620   | 845   | 1125  | 2210  |
|   |                   | P        | 20                  | 8                   | 0.5                | 0.45                        | 0.95                        |    | 2.3                      | 13.5                      | 1.19                    | 1                   | -  | 1020  | 1270  | 1700  | 2300  | 3500  |
|   | <b>PMCB1000UE</b> | N        | 30                  | 8                   | 0.59               | 0.45                        | 0.95                        |    | 4                        | 12                        | 0.6                     | 2                   | -  | 550   | 660   | 770   | 890   | -     |
| P   |                   | 30       | 8                   | 0.41                | 0.45               | 0.95                        |                             | 3  | 14                       | 0.7                       | 2                       | -                   | 1200   | 1700  | 2100  | 3000  | -     |       |
| <br>DFN2020-6 (2.0 x 2.0 x 0.65)       | PMCPB5530X        | N        | 20                  | 12                  | 5.3                | 0.4                         | 0.9                         |    | 19                       | 56                        | 14.4                    | -                   | -  | 26    | 33    | 50    | -     | -     |
|   |                   | P        | 20                  | 12                  | 4.5                | 0.47                        | 0.9                         |    | 18                       | 56                        | 16.5                    | -                   | -  | 55    | 75    | 110   | -     | -     |

MOSFETs

# 4 steps select a power MOSFET

- 1 Select a voltage, e.g. 40 V
- 2 Select a package, e.g. LFPAK56
- 3 Choose an  $R_{DSon}$  from our extensive range
- 4 Select a type and visit [www.nxp.com/mosfets](http://www.nxp.com/mosfets) to download datasheets and models, and order samples

## PSMN part numbering



# High-performance power MOSFETs

## MOSFET package selection

### Through-hole

### Surface-mount

- TO220
- ▶ Industry standard
- ▶ Up to 150 A



- LFPAK56
- ▶ Power SO8
- ▶ Up to 100 A



- TO220F
- ▶ Industry standard
- ▶ Up to 75 A



- LFPAK33
- ▶ QFN/DFN3333 compatible
- ▶ Up to 70 A



- I<sup>2</sup>PAK
- ▶ Industry standard
- ▶ Up to 120 A



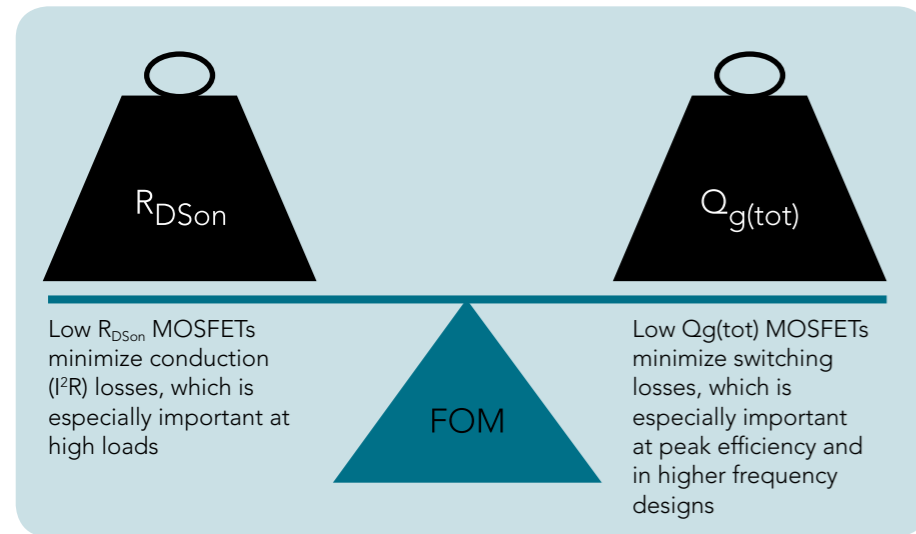
- D<sup>2</sup>PAK
- ▶ Industry standard
- ▶ Up to 120 A





# Featured product: NextPowerS3

NextPowerS3 – perfectly balanced for DC/DC switching applications



## The challenge

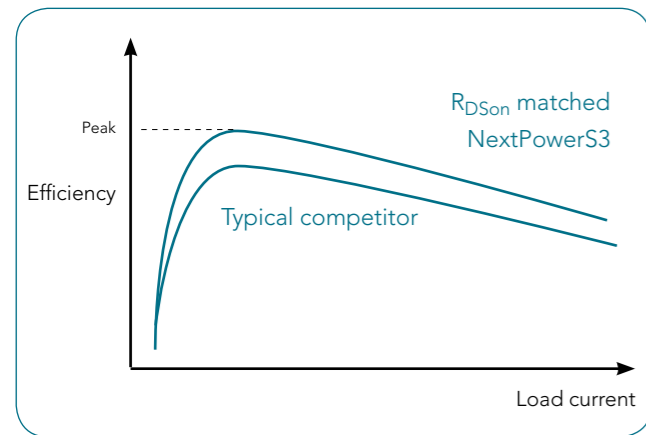
Low  $R_{DS(on)}$  MOSFETs typically need a big die.

Low  $Q_{g(tot)}$  MOSFETs typically need a small die.

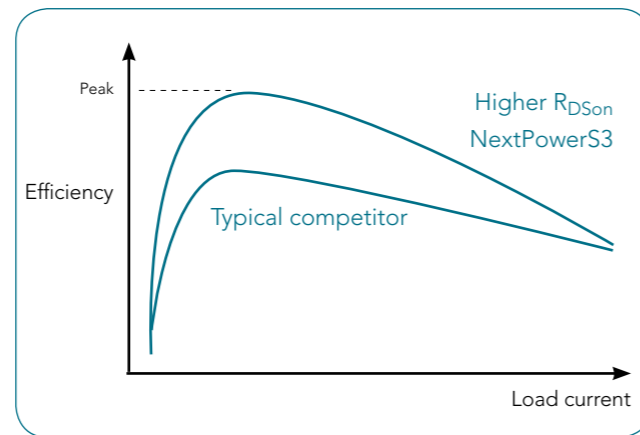
The challenge for manufacturers is to create optimized power MOSFETs that have both low  $R_{DS(on)}$  and low  $Q_{g(tot)}$ .

Welcome to NextPowerS3.

The Figure of Merit (FOM) of a MOSFET is calculated as the product of the  $R_{DS(on)}$  and  $Q_{g(tot)}$ . A low FOM indicates good MOSFET performance in switching applications.



Comparing the performance of a NextPowerS3 MOSFET with a competitor of similar  $R_{DS(on)}$  typically shows an efficiency performance advantage across the load range. Since conduction losses are the same for both devices, the advantage is more noticeable at lower loads where switching losses contribute proportionally more.



Using a NextPowerS3 MOSFET, with a higher  $R_{DS(on)}$  than a competitor device, reduces the  $Q_{g(tot)}$  still further, resulting in an improved peak efficiency. At higher loads, increased conduction losses cancel out the switching advantages and the two parts show similar performance.

# Featured product: NextPowerS3

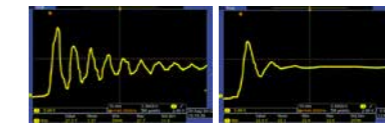
## High switching frequencies



Increasing switching frequency from 300 KHz to 1 MHz allows a 70 - 80% reduction in inductor size. NextPowerS3's excellent switching performance enables such design choices with minimal loss of efficiency.

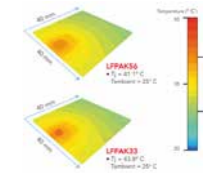
## Low spiking

Typical competitor NextPowerS3



Thanks to optimised output capacitance, body diode and channel structure, NextPowerS3 MOSFETs exhibit "soft-recovery" switching behaviour, resulting in lower voltage spikes, faster decays and virtually no gate glitches.

## Thermal efficiency



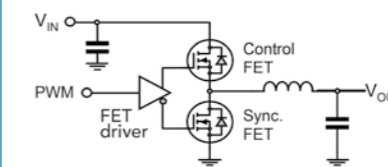
Packaged in the copper-clip based LFPACK package, NextPowerS3 features excellent thermal performance. As  $R_{DS(on)}$  rises with temperature, keeping MOSFETs cool helps efficiency as well as reliability.

## Low leakage



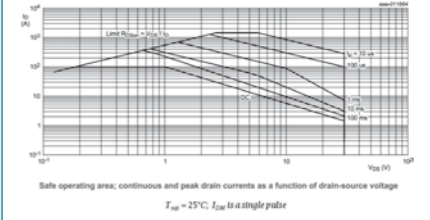
Unique SchottkyPlus technology offers the benefits of an integrated Schottky diode without the problems associated with leakage current.

## Specialist high sides



The NextPowerS3 portfolio contains devices with multiple busbars and low  $R_g$  optimized for use as control FETs, further improving system efficiencies.

## Improved SOA

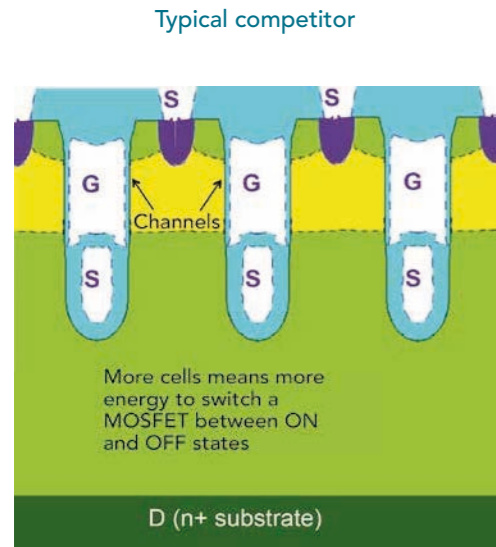


A wide cell pitch makes NextPowerS3 an excellent choice for hot-swap, e-Fuse, and power OR-ing applications.

| Package             | Type number   | $V_{DS}$ [max] (V) | $R_{DS(on)}$ [max] @ $V_{GS} = 10$ V (mΩ) | $R_{DS(on)}$ [max] @ $V_{GS} = 4.5$ V (mΩ) | $I_D$ [max] (A) | $Q_{g(tot)}$ [typ] (nC) |
|---------------------|---------------|--------------------|---|--|-----------------|-------------------------|
| LFPACK33 (SOT1210)  | PSMN2R4-30MLD | 30                 | 2.4                                       | 3.2  | 70              | 16                      |
|                     | PSMN4R2-30MLD | 30                 | 4.3                                       | 5.7  | 70              | 9.2                     |
|                     | PSMN7R5-30MLD | 30                 | 7.6                                       | 10.3                                       | 57              | 5.8                     |
| Power-SO (LFPACK56) | PSMN0R9-30YLD | 30                 | 0.87                                      | 1.09                                       | 100             | 51                      |
|                     | PSMN1R0-30YLD | 30                 | 1.02                                      | 1.3  | 100             | 38                      |
|                     | PSMN1R2-30YLD | 30                 | 1.24                                      | 1.6  | 100             | 32                      |
|                     | PSMN1R4-30YLD | 30                 | 1.42                                      | 1.85                                       | 100             | 27.6                    |
|                     | PSMN2R4-30YLD | 30                 | 2.4                                       | 3.1  | 100             | 18                      |
|                     | PSMN3R0-30YLD | 30                 | 3.1                                       | 4  | 100             | 14.5                    |
|                     | PSMN4R0-30YLD | 30                 | 4   | 5.5  | 95              | 9.6                     |
|                     | PSMN6R0-30YLD | 30                 | 6   | 8.35                                       | 66              | 6.7                     |
|                     | PSMN6R1-30YLD | 30                 | 6   | 8.35                                       | 66              | 6.8                     |
|                     | PSMN7R5-30YLD | 30                 | 7.5                                       | 10.2                                       | 51              | 5.8                     |
|                     | PSMN1R0-40YLD | 40                 | 1.1                                       |  | 100             | 54                      |
| PSMN1R4-40YLD       | 40            | 1.4                |   | 100  | 45              |                         |

# Featured product: NextPowerS3 – the technology

**NextPower Live! MOSFETs**  
**for a non-stop world**  
 Reliable linear-mode performance  
 AND low  $R_{DSon}$  efficiency  
 in *hot-swap* and *soft-start* applications



### The importance of cell design

The outstanding performance of NextPowerS3 is largely attributable to NXP's unique "Super-junction" technology and optimization of cell structures.

Most manufacturers of low-voltage MOSFETs use "Split Gate" technology to achieve low  $R_{DSon}$ .

NextPowerS3 uses a different approach to its cell design.

### The drive for $R_{DSon}$

A MOSFET's  $R_{DSon}$  is given by the formula:

$$R_{DSon} = R_{channel} + R_{drift} + R_{substrate} + (R_{package})$$

Many manufacturers focus on reducing  $R_{channel}$  to drive  $R_{DSon}$  down.

NXP's Super-junction allows for an optimization of all three components for reduction in  $R_{DSon}$ , while also enhancing switching performance and Safe Operating Area (SOA).

### Maximizing switching performance

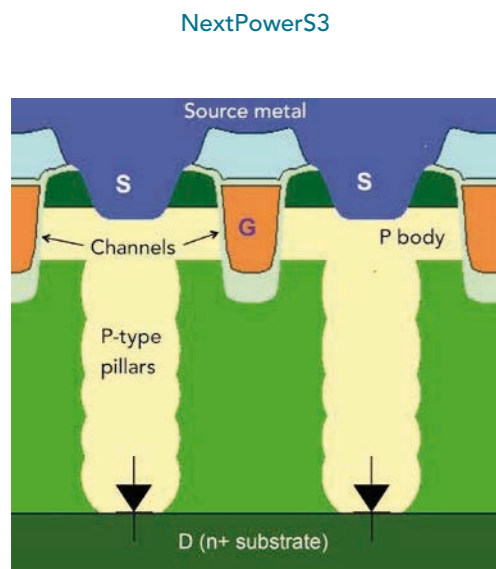
Switching losses result from the energy required to charge / discharge all the cell capacitances across the device. The total charge required is referred to as  $Q_{g(tot)}$ .

With NextPower S3,  $Q_{g(tot)}$  is lower and switching losses are kept to a minimum. This is especially beneficial at peak efficiency and in higher-frequency designs, which have a higher number of switching events.

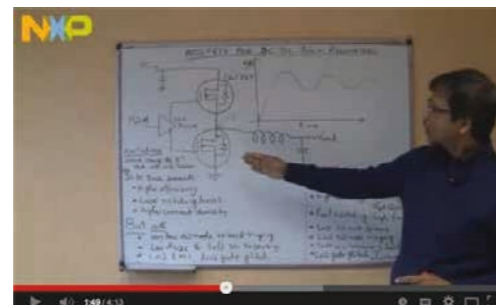
### SOA and other benefits

When a device is operating in its linear mode, the channel current generates localized heating effects, which can cause failure.

NXP has optimized the cell structure to keep this heating effect under control. As a result, NextPowerS3 enjoys a particularly strong SOA, which is important in hot-swap, e-Fuse, and power OR-ing designs.



Reverse recovery and diode leakage in SMPS  
[www.nxp.com/quicklearning33](http://www.nxp.com/quicklearning33)



NextPowerS3 MOSFETs for DC/DC buck regulators  
[www.nxp.com/quicklearning32](http://www.nxp.com/quicklearning32)



MOSFETs

### Non-stop applications

- ▶ Cloud computing
- ▶ Network storage
- ▶ Communications infrastructure
- ▶ Industrial process control
- ▶ Transaction processing
- ▶ Traffic monitoring & signaling
- ▶ CCTV security

### Non-stop equipment

- ▶ Blade and rack servers
- ▶ Routers, switches & base stations
- ▶ RAID arrays
- ▶ Industrial PCs
- ▶ Programmable Logic Controllers (PLCs)
- ▶ CCTV digital video recorders
- ▶ "Hot-swap" & "soft-start" systems

## Featured product: NextPower Live

Mobile phones, ATMs, the internet, traffic signals – so much of our daily life depends on 24/7/365 computers, communications, and storage, made possible by rack-based systems that can be maintained with the power on. NextPower Live MOSFETs are designed specifically for such applications:

- ▶ When a replacement board is plugged into a live system, it is important that the in-rush current is carefully controlled, so as to protect the components on the board and ensure that other parts of the system experience no power disruption. This application requires MOSFETs with strong linear mode performance and a wide safe operating area (SOA) to manage current effectively and reliably.
- ▶ Once the replacement board is safely installed, the MOSFET is turned fully ON. In this mode of operation, a low  $R_{DS(on)}$  is of primary importance, helping to keep temperatures low while maximizing system efficiency.
- ▶ Only NextPower Live MOSFETs offer reliable linear mode performance **AND** low  $R_{DS(on)}$  efficiency.

### NextPower Live portfolio

| Package                     | 30 V<br>for 12 V supplies used in computing applications | 100 V<br>for 48 V supplies used in computing telecommunications         |
|-----------------------------|--|---|
| D <sup>2</sup> PAK (SOT404) | PSMN1R5-30BLE<br>PSMN3R4-30BLE                           | PSMN4R8-100BSE<br>PSMN7R6-100BSE  |
| TO220                       |  | PSMN4R8-100PSE<br>PSMN7R8-100PSE  |
| LFPAK56 (Power-SO8)         | PSMN2R0-30YLE  | PSMN013-100YSE  |
| LFPAK33                     |  | (specifically for PoE applications)<br>PSMN040-100MSE<br>PSMN075-100MSE |



Power MOSFET operation in linear mode  
[www.nxp.com/quicklearning34](http://www.nxp.com/quicklearning34)



MOSFETs for Power-over-Ethernet (PoE) PSE applications  
[www.nxp.com/quicklearning36](http://www.nxp.com/quicklearning36)



Next Power Live! MOSFETs for HOT SWAP and Power over Ethernet  
[www.nxp.com/quicklearning29](http://www.nxp.com/quicklearning29)

## Featured product: NextPower Cordless

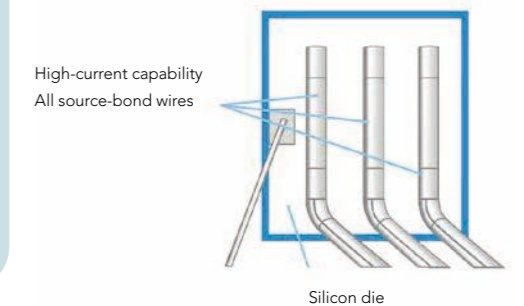
▶ Battery-powered tools, including everything from small engraving devices and screwdrivers to heavy-duty saws and agricultural tools, present a wide variety of requirements for driving the motor. The MOSFETs used in these systems have to perform at demanding levels and must have:

- ▶ Low on-resistance for optimum battery life
- ▶ Low thermal resistance for reduced junction temperature (for greater reliability)
- ▶ High current capability (when the motor stalls, for example)
- ▶ Choice of logic- and standard-level gate drives, depending on battery voltage
- ▶ Excellent avalanche ruggedness to withstand high-load conditions
- ▶ Environmental robustness (wide operating/storage temperatures, harsh vibrations)
- ▶ Competitive cost

Overall, the motor-control MOSFET needs to deliver automotive-grade performance at a commercially competitive price



Typical Power Tools MOSFET internal construction



NXP has developed a range of MOSFETs specifically aimed at motor-control applications. These are based on our highly reliable, automotive-qualified silicon, with specific package enhancements such as thicker wires and multiple bond points (“stitch bonding”) to spread the current evenly over the die surface.

NXP’s long history in automotive MOSFETs means we have the know-how to produce devices with excellent avalanche ruggedness. The same expertise deployed in power steering and ABS systems worldwide is put to use in our devices for motor control and that means performance you can count on.

Max current ( $I_D(max)$ ) depends largely on the number and diameter of the aluminium bond wires. The NXP Power Tools portfolio is typically based on a standard of three 500  $\mu m$  wires, allowing for an  $I_D(max)$  rating of up to 150 A in a TO220 package.

Some low  $R_{DS(on)}$  devices, based on NXP’s LFPAK56 (Power-SO8 compatible) package, can support an  $I_D(max)$  of 300A, perfect for power tool applications where the motor control MOSFETs must be able to support high torque levels, even during “locked-rotor” events.



Single-shot avalanche ruggedness  
[www.nxp.com/quicklearning35](http://www.nxp.com/quicklearning35)



NextPower Cordless MOSFETs for battery-powered tools  
[www.nxp.com/quicklearning28](http://www.nxp.com/quicklearning28)

### NextPower Cordless portfolio

| Type number   | V <sub>DS</sub> [max] (V) | R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ) | I <sub>D</sub> [max] (A) | EAS at rated current [mJ] | Package       | Gate threshold |
|---------------|---------------------------|---|--|--------------------------|---------------------------|---------------|----------------|
| PSMN0R9-30YLD | 30                        | 0.87  | 1.09   | 300                      | -                         |               | Logic Level    |
| PSMN1R0-30YLD | 30                        | 1.02  | 1.3  | 300                      | -                         |               | Logic Level    |
| PSMN2R0-30YL  | 30                        | 2   | 2.63   | 100                      | 151                       | LFPAK56       | Logic Level    |
| PSMN2R0-30YLE | 30                        | 2   | 3.5  | 100                      | 370                       | LFPAK56       | Logic Level    |
| PSMN2R5-30YL  | 30                        | 2.4   | 3.16   | 100                      | 103                       | LFPAK56       | Logic Level    |
| PSMN2R6-30YLC | 30                        | 2.8   | 3.65   | 100                      | 50                        | LFPAK56       | Logic Level    |
| PSMN1R9-40PL  | 40                        | 1.7   | 1.94   | 150                      | 1008                      | TO220 (SOT78) | Logic Level    |
| PSMN2R1-40PL  | 40                        | 2.2   | 2.6  | 150                      | 622                       | TO220 (SOT78) | Logic Level    |
| PSMN1R5-40PS  | 40                        | 1.6   | -  | 120                      | 1400                      | TO220 (SOT78) | Standard Level |
| PSMN2R2-40PS  | 40                        | 2.1   | -  | 100                      | 1240                      | TO220 (SOT78) | Standard Level |
| PSMN2R5-60PL  | 60                        | 2.6   | 3.15   | 150                      | 655                       | TO220 (SOT78) | Logic Level    |
| PSMN2R6-60PS  | 60                        | 2.9   | -  | 150                      | 519                       | TO220 (SOT78) | Standard Level |
| PSMN3R3-60PL  | 60                        | 3.4   | 3.8  | 130                      | 404                       | TO220 (SOT78) | Logic Level    |
| PSMN3R9-60PS  | 60                        | 3.9   | -  | 130                      | 372                       | TO220 (SOT78) | Standard Level |
| PSMN4R2-60PL  | 60                        | 4.3   | 4.3  | 130                      | 372                       | TO220 (SOT78) | Logic Level    |
| PSMN7R6-60PS  | 60                        | 7.8   | -  | 92                       | 110                       | TO220 (SOT78) | Standard Level |

For the most current product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)



Heavy-duty tools with large batteries require MOSFETs that withstand higher currents. NXP's TO-220 NextPower Cordless devices handle up to 150A. The high-reliability LFPAK56 is ideal for smaller tools and space-constrained applications.

### Power MOSFETs 20 - 25 V

| Package                     | Type number       | V <sub>DS</sub> [max] (V) | R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ) | I <sub>D</sub> [max] (A) | Q <sub>G(tot)</sub> [typ] (nC) |
|-----------------------------|-------------------|---------------------------|---|--|--------------------------|--------------------------------|
| LFPAK56; Power-SO8 (SOT669) | PH3120L           | 20                        | 2.65  | 3.7  | 100                      | 48.5                           |
|                             | PH2520U           | 20                        |   | 2.7  | 100                      | 78                             |
|                             | PSMN0R9-25YLC     | 25                        | 0.99  | 1.25   | 100                      | 51                             |
|                             | PSMN1R1-25YLC     | 25                        | 1.15  | 1.5  | 100                      | 39                             |
|                             | PSMN1R2-25YL      | 25                        | 1.2   | 1.85   | 100                      | 50.6                           |
|                             | PSMN1R2-25YLC     | 25                        | 1.3   | 1.7  | 100                      | 31                             |
|                             | PSMN1R5-25YL      | 25                        | 1.5   | 2.2  | 100                      | 36                             |
|                             | PSMN2R2-25YLC     | 25                        | 2.4   | 3.15   | 100                      | 18                             |
|                             | PSMN2R9-25YLC     | 25                        | 3.15  | 4.1  | 100                      | 16                             |
|                             | PSMN4R0-25YLC     | 25                        | 4.5   | 5.8  | 84                       | 10.9                           |
|                             | PSMN6R0-25YLB     | 25                        | 6.1   | 7.9  | 73                       | 9                              |
|                             | PSMN6R5-25YLC     | 25                        | 6.5   | 8.5  | 64                       | 8.4                            |
|                             | PH2925U           | 25                        |   | 3  | 100                      | 92                             |
|                             | LFPAK33 (SOT1210) | PSMN2R8-25MLC             | 25  | 2.8  | 3.75                     | 70                             |
| PSMN3R9-25MLC               |                   | 25                        | 4.15  | 5.55   | 70                       | 9.7                            |
| PSMN9R0-25MLC               |                   | 25                        | 8.65  | 11.3   | 55                       | 5.4                            |
| D <sup>2</sup> PAK (SOT404) | PHB66NQ03LT       | 25                        | 10.5  |  | 66                       | 12                             |
| DPAK (SOT428)               | PHD38N02LT        | 20                        |   |  | 44.7                     | 15.1                           |
|                             | PHD97NQ03LT       | 25                        | 6.3   | 10.6   | 75                       | 11.7                           |
| SO8 (SOT96-1)               | PSMN006-20K       | 20                        |   | 5  | 32                       | 32                             |

For the most current product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

Power MOSFETs 30V – Part 1

| Package                     | Type number   | V <sub>DS</sub> [max] (V) | R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ) | I <sub>D</sub> [max] (A) | Q <sub>G(tot)</sub> [typ] (nC) |
|-----------------------------|---------------|---------------------------|---|--|--------------------------|--------------------------------|
| LFPAK56; Power-SO8 (SOT669) | PSMN0R9-30YLD | 30                        | 0.87  | 1.09   | 300                      | 51                             |
|                             | PSMN1R0-30YLD | 30                        | 1.02  | 1.3  | 300                      | 38.2                           |
|                             | PSMN1R0-30YLC | 30                        | 1.15  | 1.4  | 100                      | 50                             |
|                             | PSMN1R2-30YLD | 30                        | 1.24  | 1.6  | 100                      | 32                             |
|                             | PSMN1R2-30YLC | 30                        | 1.25  | 1.65   | 100                      | 38                             |
|                             | PSMN1R3-30YL  | 30                        | 1.3   | 1.95   | 100                      | 46.6                           |
|                             | PSMN1R4-30YLD | 30                        | 1.42  | 1.85   | 100                      | 27.6                           |
|                             | PSMN1R5-30YL  | 30                        | 1.5   | 1.9  | 100                      | 36.2                           |
|                             | PSMN1R5-30YLC | 30                        | 1.55  | 2.05   | 100                      | 30                             |
|                             | PSMN1R7-30YL  | 30                        | 1.7   | 2.1  | 100                      | 36.2                           |
|                             | PSMN2R0-30YL  | 30                        | 2   | 2.63   | 100                      | 30                             |
|                             | PSMN2R0-30YLE | 30                        | 2   | 3.5  | 100                      | 87                             |
|                             | PSMN2R2-30YLC | 30                        | 2.15  | 2.8  | 100                      | 26                             |
|                             | PSMN2R4-30YLD | 30                        | 2.4   | 3.1  | 100                      | 18                             |
|                             | PSMN2R5-30YL  | 30                        | 2.4   | 3.16   | 100                      | 27                             |
|                             | PSMN2R6-30YLC | 30                        | 2.8   | 3.65   | 100                      | 18                             |
|                             | PSMN3R0-30YL  | 30                        | 3   | 4.04   | 100                      | 21                             |
|                             | PSMN3R0-30YLD | 30                        | 3.1   | 4  | 100                      | 14.5                           |
|                             | PSMN3R2-30YLC | 30                        | 3.5   | 4.55   | 100                      | 14.2                           |
|                             | PSMN3R5-30YL  | 30                        | 3.5   | 4.61   | 100                      | 19                             |
|                             | PSMN4R0-30YL  | 30                        | 4   | 5.25   | 100                      | 17.6                           |
|                             | PSMN4R0-30YLD | 30                        | 4   | 5.5  | 95                       | 9.6                            |
|                             | PSMN4R1-30YLC | 30                        | 4.35  | 5.7  | 92                       | 11                             |
|                             | PSMN4R5-30YLC | 30                        | 4.8   | 6.1  | 84                       | 9.6                            |
|                             | PSMN5R0-30YL  | 30                        | 5   | 6.7  | 91                       | 14.1                           |
|                             | PSMN6R0-30YL  | 30                        | 6   | 7.87   | 79                       | 11                             |
|                             | PSMN6R0-30YLD | 30                        | 6   | 8.35   | 66                       | 6.7                            |
|                             | PSMN6R1-30YLD | 30                        | 6   | 8.35   | 66                       | 6.4                            |
|                             | PSMN6R0-30YLB | 30                        | 6.5   | 8.1  | 71                       | 9                              |
|                             | PSMN7R0-30YL  | 30                        | 7   | 9.1  | 76                       | 10                             |
|                             | PSMN7R0-30YLC | 30                        | 7.1   | 8.9  | 61                       | 7.9                            |
|                             | PSMN7R5-30YLD | 30                        | 7.5   | 10.2   | 51                       | 5.8                            |
|                             | PSMN9R1-30YL  | 30                        | 9.1   | 13.6   | 57                       | 8.4                            |
|                             | PSMN9R5-30YLC | 30                        | 9.8   | 12.1   | 44                       | 5                              |
|                             | PSMN011-30YLC | 30                        | 11.6  | 14.5   | 37                       | 4.9                            |
| PSMN013-30YLC               | 30            | 13.6                      | 16.9  | 32   | 4                        |                                |
| LFPAK33 (SOT1210)           | PSMN2R4-30MLD | 30                        | 2.4   | 3.2  | 70                       | 16                             |
|                             | PSMN2R9-30MLC | 30                        | 2.95  | 3.8  | 70                       | 16.7                           |
|                             | PSMN3R0-30MLC | 30                        | 3.15  | 4.05   | 70                       | 16.1                           |
|                             | PSMN4R2-30MLD | 30                        | 4.3   | 5.7  | 70                       | 9.2                            |
|                             | PSMN4R4-30MLC | 30                        | 4.65  | 6  | 70                       | 10.6                           |
|                             | PSMN7R0-30MLC | 30                        | 7   | 9  | 67                       | 8.2                            |
|                             | PSMN7R5-30MLD | 30                        | 7.6   | 10.3   | 57                       | 5.8                            |
|                             | PSMN9R8-30MLC | 30                        | 9.8   | 12.4   | 50                       | 5                              |
|                             | PSMN013-30MLC | 30                        | 13.6  | 16.9   | 39                       | 3.7                            |
|                             | PSMN020-30MLC | 30                        | 18.1  | 27   | 31.8                     | 4.6                            |
| D <sup>2</sup> PAK (SOT404) | PSMNR90-30BL  | 30                        | 1   | 1.4  | 120                      | 118                            |
|                             | PSMN1R5-30BLE | 30                        | 1.5   | 1.85   | 120                      | 228                            |
|                             | PSMN1R8-30BL  | 30                        | 1.8   | 2.1  | 100                      | 83                             |
|                             | PSMN1R6-30BL  | 30                        | 1.9   | 2.2  | 100                      | 101                            |
|                             | PSMN2R0-30BL  | 30                        | 2.1   | 2.9  | 100                      | 55                             |
|                             | PSMN2R7-30BL  | 30                        | 3   | 3.7  | 100                      | 32                             |
|                             | PSMN3R4-30BL  | 30                        | 3.3   | 3.8  | 100                      | 31                             |
|                             | PSMN3R4-30BLE | 30                        | 3.4   | 5  | 120                      | 81                             |
|                             | PSMN4R3-30BL  | 30                        | 4.1   | 5.2  | 100                      | 19                             |
|                             | PSMN017-30BL  | 30                        | 17  | 23.3   | 32                       | 5.1                            |
|                             | PSMN022-30BL  | 30                        | 22.6  | 29.6   | 30                       | 4.4                            |

For the most current product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

Power MOSFETs 30V – Part 2

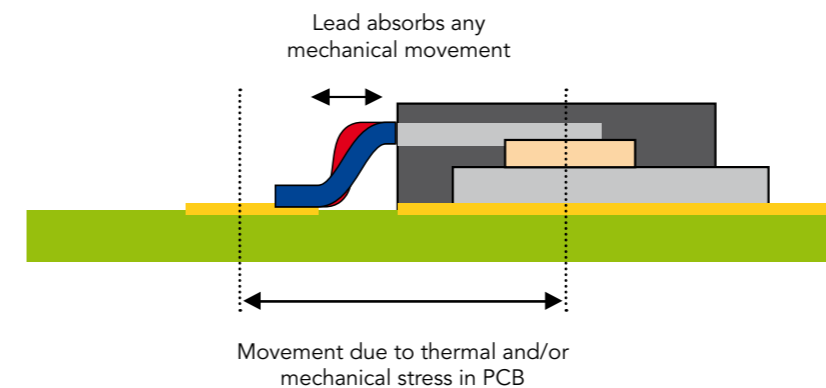
types in **bold** represent new products

| Package                     | Type number  | V <sub>DS</sub> [max] (V) | R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ) | I <sub>D</sub> [max] (A) | Q <sub>G(tot)</sub> [typ] (nC) |
|-----------------------------|--------------|---------------------------|---|--|--------------------------|--------------------------------|
| DPAK (SOT428)               | PHD101NQ03LT | 30                        | 5.5   |  | 75                       | 23                             |
|                             | PHD71NQ03LT  | 30                        | 10  |  | 75                       | 13.2                           |
| TO-220AB (SOT78)            | PSMN1R1-30PL | 30                        | 1.3   | 1.6  | 120                      | 118                            |
|                             | PSMN1R6-30PL | 30                        | 1.7   | 2.1  | 100                      | 101                            |
|                             | PSMN1R8-30PL | 30                        | 1.8   | 2.3  | 100                      | 83                             |
|                             | PSMN2R0-30PL | 30                        | 2.1   | 2.8  | 100                      | 55                             |
|                             | PSMN2R7-30PL | 30                        | 2.7   | 3.6  | 100                      | 32                             |
|                             | PSMN3R4-30PL | 30                        | 3.4   | 4.1  | 100                      | 31                             |
|                             | PSMN4R3-30PL | 30                        | 4.3   | 6.2  | 100                      | 19                             |
|                             | PHP36N03LT   | 30                        | 17  | 22   | 43.4                     | 18.5                           |
|                             | PSMN017-30PL | 30                        | 17  | 23.4   | 32                       | 5.1                            |
|                             | PSMN022-30PL | 30                        | 22  | 34   | 30                       | 4.4                            |
| I <sup>2</sup> PAK (SOT226) | PSMN1R1-30EL | 30                        | 1.3   | 1.6  | 120                      | 118                            |
|                             | PSMN017-30EL | 30                        | 17  | 23.4   | 32                       | 5.1                            |
| SO8 (SOT96-1)               | PHK31NQ03LT  | 30                        | 4.4   | 5.6  | 30.4                     | 33                             |
|                             | PSMN005-30K  | 30                        | 5.5   | 8  |                          | 34                             |
|                             | PHK18NQ03LT  | 30                        | 8.9   | 12.5   | 20.3                     | 10.6                           |
|                             | PHK13N03LT   | 30                        | 20  | 26   | 13.8                     | 10.7                           |
|                             | PHK12NQ03LT  | 30                        |   | 14   | 11.8                     |                                |

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LFPAK for mechanical and thermal ruggedness

NXP LFPAK



LFPAK pins provide compliance while allowing for thermal expansion due to temperature differences between the MOSFET and the PCB, and allowing for mechanical strain due to PCB bending and flexing

### Power MOSFETs 40V

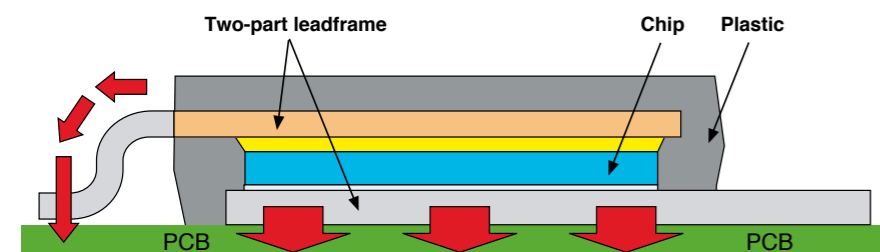
types in **bold** represent new products

| Package                     | Type number                 | V <sub>DS</sub> [max] (V) | R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ) | I <sub>D</sub> [max] (A) | Q <sub>G(tot)</sub> [typ] (nC) |     |
|-----------------------------|-----------------------------|---------------------------|---|--|--------------------------|--------------------------------|-----|
| LFPAK56; Power-SO8 (SOT669) | PSMN1R0-40YLD               | 40                        | 1.1   | 1.4  | 100                      | 59                             |     |
|                             | PSMN1R4-40YLD               | 40                        | 1.4   | 1.85   | 100                      | 45                             |     |
|                             | PSMN1R6-40YLC               | 40                        | 1.55  | 1.8  | 100                      | 59                             |     |
|                             | PSMN1R8-40YLC               | 40                        | 1.8   | 2.1  | 100                      | 45                             |     |
|                             | PSMN2R6-40YS                | 40                        | 2.8   |  | 100                      | 63                             |     |
|                             | PSMN3R3-40YS                | 40                        | 3.3   |  | 100                      | 49                             |     |
|                             | PH4840S                     | 40                        | 4.1   |  | 94.5                     | 67                             |     |
|                             | PSMN4R0-40YS                | 40                        | 4.2   |  | 100                      | 38                             |     |
|                             | PSMN5R8-40YS                | 40                        | 5.7   |  | 90                       | 28.8                           |     |
|                             | PSMN8R3-40YS                | 40                        | 8.6   |  | 70                       | 20                             |     |
|                             | PSMN014-40YS                | 40                        | 14  |  | 46                       | 12                             |     |
|                             | D <sup>2</sup> PAK (SOT404) | PSMN1R1-40BS              | 40  | 1.3  |                          | 120                            | 136 |
|                             |                             | PSMN2R2-40BS              | 40  | 2.2  |                          | 100                            | 130 |
| PSMN2R8-40BS                |                             | 40                        | 2.9   |  | 100                      | 71                             |     |
| PSMN4R5-40BS                |                             | 40                        | 4.5   |  | 100                      | 35                             |     |
| TO-220AB (SOT78)            | PSMN1R5-40PS                | 40                        | 1.6   |  | 150                      | 136                            |     |
|                             | PSMN1R9-40PL                | 40                        | 1.7   | 1.94   | 150                      | 230                            |     |
|                             | PSMN2R1-40PL                | 40                        | 2.2   | 2.6  | 150                      | 168.9                          |     |
|                             | PSMN2R2-40PS                | 40                        | 2.1   |  | 100                      | 110                            |     |
|                             | PSMN2R8-40PS                | 40                        | 2.8   |  | 100                      | 71                             |     |
|                             | PSMN4R5-40PS                | 40                        | 4.6   |  | 100                      | 35                             |     |
|                             | PSMN8R0-40PS                | 40                        | 7.6   |  | 77                       | 17                             |     |
| I <sup>2</sup> PAK (SOT226) | PSMN1R5-40ES                | 40                        | 1.6   |  | 120                      | 136                            |     |

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### Power-SO8 (LFPAK) Design

- ▶ Low thermal resistance
- ▶ Low electrical resistance
- ▶ Low inductance



### Power MOSFETs 55 - 60V

types in **bold** represent new products

| Package                     | Type number                 | V <sub>DS</sub> [max] (V) | R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | I <sub>D</sub> [max] (A) | Q <sub>G(tot)</sub> [typ] (nC) |      |
|-----------------------------|-----------------------------|---------------------------|---|--------------------------|--------------------------------|------|
| LFPAK56; Power-SO8 (SOT669) | PH955L                      | 55                        | 8.3   | 62.5                     | 42                             |      |
|                             | <b>PSMN4R0-60YS</b>         | <b>60</b>                 | <b>4</b>  | <b>100</b>               | <b>56</b>                      |      |
|                             | <b>PSMN4R1-60YL</b>         | <b>60</b>                 | <b>4.1</b>  | <b>100</b>               | <b>103</b>                     |      |
|                             | <b>PSMN5R2-60YL</b>         | <b>60</b>                 | <b>5.2</b>  | <b>100</b>               | <b>78.4</b>                    |      |
|                             | PSMN5R5-60YS                | 60                        | 5.2   | 100                      | 56                             |      |
|                             | <b>PSMN5R6-60YL</b>         | <b>60</b>                 | <b>5.6</b>  | <b>100</b>               | <b>66.8</b>                    |      |
|                             | PSMN7R0-60YS                | 60                        | 6.4   | 89                       | 45                             |      |
|                             | <b>PSMN7R5-60YL</b>         | <b>60</b>                 | <b>7.5</b>  | <b>86</b>                | <b>60.6</b>                    |      |
|                             | PSMN8R5-60YS                | 60                        | 8   | 76                       | 39                             |      |
|                             | PSMN012-60YS                | 60                        | 11.1  | 59                       | 28.4                           |      |
|                             | <b>PSMN013-60YL</b>         | <b>60</b>                 | <b>13</b>   | <b>53</b>                | <b>33.2</b>                    |      |
|                             | PSMN017-60YS                | 60                        | 15.7  | 44                       | 20                             |      |
|                             | PSMN030-60YS                | 60                        | 24.7  | 29                       | 13                             |      |
|                             | LFPAK33 (SOT1210)           | PSMN011-60ML              | 60  | 11.3                     | 61                             | 37.2 |
|                             |                             | PSMN011-60MS              | 60  | 11.3                     | 61                             | 23   |
| D2PAK (SOT404)              | PHB191N06LT                 | 55                        | 3.7   | 75                       | 95.6                           |      |
|                             | PHB21N06LT                  | 55                        | 70  | 19                       |                                |      |
|                             | PHB20N06T                   | 55                        | 75  | 20.3                     | 11                             |      |
|                             | PSMN1R7-60BS                | 60                        | 2   | 120                      | 137                            |      |
|                             | PSMN3R0-60BS                | 60                        | 3.2   | 100                      | 130                            |      |
|                             | PSMN004-60B                 | 60                        | 3.6   | 75                       | 168                            |      |
|                             | PSMN4R6-60BS                | 60                        | 4.4   | 100                      | 70.8                           |      |
|                             | PSMN7R6-60BS                | 60                        | 7.8   | 92                       | 38.7                           |      |
|                             | PSMN015-60BS                | 60                        | 14.8  | 50                       | 20.9                           |      |
|                             | PHB32N06LT                  | 60                        | 37  | 34                       | 17                             |      |
| DPAK (SOT428)               | PHD20N06T                   | 55                        | 77  | 18                       | 11                             |      |
|                             | PHP191N06LT                 | 55                        | 3.7   | 75                       | 95.6                           |      |
| TO-220AB (SOT78)            | PHP20N06T                   | 55                        | 75  | 20.3                     | 11                             |      |
|                             | PSMN2R0-60PS                | 60                        | 2.2   | 120                      | 137                            |      |
|                             | PSMN2R5-60PL                | 60                        | 2.6   | 150                      | 223                            |      |
|                             | PSMN2R6-60PS                | 60                        | 2.6   | 150                      | 140                            |      |
|                             | PSMN3R0-60PS                | 60                        | 3   | 100                      | 130                            |      |
|                             | PSMN3R3-60PL                | 60                        | 3.4   | 130                      | 175                            |      |
|                             | PSMN3R9-60PS                | 60                        | 3.9   | 130                      | 103                            |      |
|                             | PSMN4R2-60PL                | 60                        | 3.9   | 130                      | 151                            |      |
|                             | PSMN4R6-60PS                | 60                        | 4.6   | 100                      | 70.8                           |      |
|                             | PSMN7R6-60PS                | 60                        | 7.8   | 92                       | 38.7                           |      |
|                             | PSMN015-60PS                | 60                        | 14.8  | 50                       | 20.9                           |      |
|                             | I <sup>2</sup> PAK (SOT226) | PSMN2R0-60ES              | 60  | 2.2                      | 120                            | 137  |
|                             |                             | PSMN3R0-60ES              | 60  | 3                        | 100                            | 130  |

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### Power MOSFETs 75 - 80 V

types in **bold** represent new products

| Package                     | Type number         | V <sub>DS</sub> [max] (V) | R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | I <sub>D</sub> [max] (A) | Q <sub>G(tot)</sub> [typ] (nC) |       |
|-----------------------------|---------------------|---------------------------|---|--------------------------|--------------------------------|-------|
| LFPAK56; Power-SO8 (SOT669) | <b>PSMN8R0-80YL</b> | <b>80</b>                 | <b>8</b>  | <b>100</b>               | <b>104</b>                     |       |
|                             | PSMN8R2-80YS        | 80                        | 8.5   | 82                       | 55                             |       |
|                             | <b>PSMN010-80YL</b> | <b>80</b>                 | <b>10</b>   | <b>84</b>                | <b>84.7</b>                    |       |
|                             | PSMN011-80YS        | 80                        | 11  | 67                       | 45                             |       |
|                             | PSMN013-80YS        | 80                        | 12.9  | 60                       | 37                             |       |
|                             | <b>PSMN014-80YL</b> | <b>80</b>                 | <b>14</b>   | <b>62</b>                | <b>56.9</b>                    |       |
|                             | PSMN018-80YS        | 80                        | 18  | 45                       | 26                             |       |
|                             | <b>PSMN025-80YL</b> | <b>80</b>                 | <b>25</b>   | <b>37</b>                | <b>34.3</b>                    |       |
|                             | PSMN026-80YS        | 80                        | 27.5  | 34                       | 20                             |       |
|                             | PSMN041-80YL        | 80                        | 41  | 25                       | 21.9                           |       |
|                             | PSMN045-80YS        | 80                        | 45  | 24                       | 12.5                           |       |
|                             | D2PAK (SOT404)      | PSMN005-75B               | 75  | 5                        | 75                             | 165   |
|                             |                     | PSMN008-75B               | 75  | 8.5                      | 75                             | 122.8 |
| PHB110NQ08T                 |                     | 75                        | 9   | 75                       | 113.1                          |       |
| PHB29N08T                   |                     | 75                        |   | 27                       | 19                             |       |
| PSMN2R8-80BS                |                     | 80                        | 3   | 120                      | 139                            |       |
| PSMN3R3-80BS                |                     | 80                        | 3.5   | 120                      | 111                            |       |
| PSMN4R4-80BS                |                     | 80                        | 4.5   | 100                      | 125                            |       |
| PSMN5R0-80BS                |                     | 80                        | 5.1   | 100                      | 101                            |       |
| PSMN6R5-80BS                |                     | 80                        | 6.9   | 100                      | 71                             |       |
| PSMN8R7-80BS                |                     | 80                        | 8.7   | 90                       | 52                             |       |
| PSMN012-80BS                |                     | 80                        | 11  | 74                       | 36                             |       |
| PSMN017-80BS                |                     | 80                        | 17  | 50                       | 26                             |       |
| PSMN050-80BS                |                     | 80                        | 46  | 22                       | 11                             |       |
| TO-220AB (SOT78)            |                     | PSMN005-75P               | 75  | 5                        | 75                             | 165   |
|                             | PHP79NQ08LT         | 75                        | 16  | 73                       | 30                             |       |
|                             | PHP29N08T           | 75                        |   | 27                       | 19                             |       |
|                             | PSMN3R3-80PS        | 80                        | 3.3   | 120                      | 139                            |       |
|                             | PSMN3R5-80PS        | 80                        | 3.5   | 120                      | 139                            |       |
|                             | PSMN4R4-80PS        | 80                        | 4.1   | 100                      | 112                            |       |
|                             | PSMN4R3-80PS        | 80                        | 4.3   | 120                      | 111                            |       |
|                             | PSMN5R0-80PS        | 80                        | 4.7   | 100                      | 87                             |       |
|                             | PSMN6R5-80PS        | 80                        | 6.9   | 100                      | 71                             |       |
|                             | PSMN8R7-80PS        | 80                        | 8.7   | 90                       | 52                             |       |
|                             | PSMN012-80PS        | 80                        | 11  | 74                       | 36                             |       |
|                             | PSMN017-80PS        | 80                        | 17  | 50                       | 26                             |       |
|                             | I2PAK (SOT226)      | PSMN3R3-80ES              | 80  | 3.3                      | 120                            | 139   |
| PSMN3R5-80ES                |                     | 80                        | 3.5   | 120                      | 139                            |       |
| PSMN4R3-80ES                |                     | 80                        | 4.3   | 120                      | 111                            |       |

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### Power MOSFETs 100 V

types in **bold** represent new products

| Package                     | Type number           | V <sub>DS</sub> [max] (V) | R <sub>DS(on)</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | I <sub>D</sub> [max] (A) | Q <sub>G(tot)</sub> [typ] (nC) |
|-----------------------------|-----------------------|---------------------------|---|--------------------------|--------------------------------|
| LFPAK56; Power-SO8 (SOT669) | <b>PSMN012-100YL</b>  | <b>100</b>                | <b>11.9</b>   | <b>85</b>                | <b>118</b>                     |
|                             | PSMN012-100YS         | 100                       | 12  | 60                       | 64                             |
|                             | PSMN013-100YSE        | 100                       | 13  | 82                       | 75                             |
|                             | <b>PSMN015-100YL</b>  | <b>100</b>                | <b>14.7</b>   | <b>69</b>                | <b>86.3</b>                    |
|                             | PSMN016-100YS         | 100                       | 16.3  | 51                       | 54                             |
|                             | <b>PSMN019-100YL</b>  | <b>100</b>                | <b>18</b>   | <b>56</b>                | <b>72.4</b>                    |
|                             | PSMN020-100YS         | 100                       | 20.5  | 43                       | 41                             |
|                             | <b>PSMN021-100YL</b>  | <b>100</b>                | <b>21.5</b>   | <b>49</b>                | <b>65.6</b>                    |
|                             | PH20100S              | 100                       | 23  | 34.3                     | 39                             |
|                             | PSMN028-100YS         | 100                       | 27.5  | 42                       | 33                             |
|                             | PSMN038-100YL         | 100                       | 37.5  | 30                       | 21.6                           |
|                             | PSMN039-100YS         | 100                       | 39.5  | 28.1                     | 23                             |
|                             | PSMN069-100YS         | 100                       | 72.4  | 17                       | 14                             |
| LFPAK33 (SOT1210)           | PSMN040-100MSE        | 100                       | 36.6  | 30                       | 30                             |
|                             | PSMN075-100MSE        | 100                       | 71  | 18                       | 16.4                           |
| D2PAK (SOT404)              | PSMN3R8-100BS         | 100                       | 3.9   | 120                      | 170                            |
|                             | PSMN4R8-100BSE        | 100                       | 4.8   | 120                      | 196                            |
|                             | PSMN5R6-100BS         | 100                       | 5.6   | 100                      | 141                            |
|                             | PSMN7R0-100BS         | 100                       | 6.8   | 100                      | 125                            |
|                             | PSMN7R6-100BSE        | 100                       | 7.6   | 75                       | 128                            |
|                             | PSMN009-100B          | 100                       | 8.8   | 75                       | 156                            |
|                             | PSMN9R5-100BS         | 100                       | 9.6   | 89                       | 82                             |
|                             | PSMN013-100BS         | 100                       | 13.9  | 68                       | 59                             |
|                             | PSMN015-100B          | 100                       | 15  | 75                       | 90                             |
|                             | PSMN016-100BS         | 100                       | 16  | 57                       | 49                             |
|                             | PHB45NQ10T            | 100                       | 25  | 47                       | 61                             |
|                             | PSMN027-100BS         | 100                       | 26.8  | 37                       | 30                             |
|                             | PHB47NQ10T            | 100                       | 28  | 47                       | 66                             |
|                             | PSMN034-100BS         | 100                       | 34.5  | 32                       | 23.8                           |
| PHB27NQ10T                  | 100                   | 50                        | 28  | 30                       |                                |
| PHB18NQ10T                  | 100                   | 90                        | 18  | 21                       |                                |
| DPAK (SOT428)               | PSMN025-100D          | 100                       | 25  | 47                       | 61                             |
| TO-220AB (SOT78)            | PSMN4R3-100PS         | 100                       | 4.3   | 120                      | 170                            |
|                             | <b>PSMN4R8-100PSE</b> | <b>100</b>                | <b>5</b>  | <b>120</b>               | <b>196</b>                     |
|                             | PSMN5R0-100PS         | 100                       | 5   | 120                      | 170                            |
|                             | PSMN5R6-100PS         | 100                       | 5.6   | 100                      | 141                            |
|                             | PSMN7R0-100PS         | 100                       | 6.8   | 100                      | 125                            |
|                             | <b>PSMN7R8-100PSE</b> | <b>100</b>                | <b>7.8</b>  | <b>83</b>                | <b>128</b>                     |
|                             | PSMN8R5-100PS         | 100                       | 8.5   | 100                      | 111                            |
|                             | PSMN009-100P          | 100                       | 8.8   | 75                       | 156                            |
|                             | PSMN9R5-100PS         | 100                       | 9.6   | 89                       | 82                             |
|                             | PSMN013-100PS         | 100                       | 13.9  | 68                       | 59                             |
|                             | PSMN015-100P          | 100                       | 15  | 75                       | 90                             |
|                             | PSMN016-100PS         | 100                       | 16  | 57                       | 49                             |
|                             | PHP45NQ10T            | 100                       | 25  | 47                       | 61                             |
| PSMN027-100PS               | 100                   | 26.8                      | 37  | 30                       |                                |
| PSMN034-100PS               | 100                   | 34.5                      | 32  | 23.8                     |                                |
| PHP18NQ10T                  | 100                   | 90                        | 18  | 21                       |                                |
| I2PAK (SOT226)              | PSMN4R3-100ES         | 100                       | 4.3   | 120                      | 170                            |
|                             | PSMN5R0-100ES         | 100                       | 5   | 120                      | 170                            |
|                             | PSMN7R0-100ES         | 100                       | 6.8   | 100                      | 125                            |
|                             | PSMN8R5-100ES         | 100                       | 8.5   | 100                      | 111                            |
|                             | PSMN013-100ES         | 100                       | 13.9  | 68                       | 59                             |
| SC-73 (SOT223)              | PHT6NQ10T             | 100                       | 90  | 6.5                      | 21                             |
|                             | PHT4NQ10T             | 100                       | 250   | 3.5                      | 7.4                            |
| SO8 (SOT96-1)               | PSMN038-100K          | 100                       | 38  |                          | 43                             |
|                             | PHKD3NQ10T            | 100                       | 90  | 3                        | 21                             |

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### Power MOSFETs 105 - 150V

| Package                     | Type number                 | V <sub>DS</sub> [max] (V) | R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | I <sub>D</sub> [max] (A) | Q <sub>G(tot)</sub> [typ] (nC) |       |
|-----------------------------|-----------------------------|---------------------------|---|--------------------------|--------------------------------|-------|
| LFPAK56; Power-SO8 (SOT669) | PSMN059-150Y                | 150                       | 59  | 43                       | 27.9                           |       |
|                             | PSMN030-150B                | 150                       | 30  | 55.5                     | 98                             |       |
| D <sup>2</sup> PAK (SOT404) | PSMN035-150B                | 150                       | 35  | 50                       | 79                             |       |
|                             | PHB45NQ15T                  | 150                       | 42  | 45.1                     | 32                             |       |
|                             | PSMN063-150D                | 150                       | 63  | 29                       | 55                             |       |
| TO-220AB (SOT78)            | PHP45NQ11T                  | 105                       | 25  | 47                       | 60                             |       |
|                             | PSMN015-110P                | 110                       | 15  | 75                       | 90                             |       |
|                             | PHP27NQ11T                  | 110                       | 50  | 27.6                     | 30                             |       |
|                             | PHP23NQ11T                  | 110                       | 70  | 23                       | 22                             |       |
|                             | PHP18NQ11T                  | 110                       | 90  | 18                       | 21                             |       |
|                             | PSMN6R3-120PS               | 120                       | 6.7   | 70                       | 207.1                          |       |
|                             | PSMN7R8-120PS               | 120                       | 7.9   | 70                       | 167                            |       |
|                             | PSMN030-150P                | 150                       | 30  | 55.5                     | 98                             |       |
|                             | PSMN035-150P                | 150                       | 35  | 50                       | 79                             |       |
|                             | PHP30NQ15T                  | 150                       | 63  | 29                       | 55                             |       |
|                             | PHP28NQ15T                  | 150                       | 65  | 28.5                     | 24                             |       |
|                             | I <sup>2</sup> PAK (SOT226) | PSMN6R3-120ES             | 120   | 6.7                      | 70                             | 207.1 |
|                             |                             | PSMN7R8-120ES             | 120   | 7.9                      | 70                             | 167   |
| SO8 (SOT96-1)               | PHK5NQ15T                   | 150                       | 75  | 5                        | 29                             |       |
|                             | PSMN085-150K                | 150                       | 85  | -                        | 40                             |       |

For the most current product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

### P-channel

| Package       | Type number | V <sub>DS</sub> [max] (V) | R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 4.5 V (mΩ) | I <sub>D</sub> [max] (A) | Q <sub>G(tot)</sub> [typ] (nC) |
|---------------|-------------|---------------------------|---|--|--------------------------|--------------------------------|
| SO8 (SOT96-1) | PMK30EP     | -30                       | 19  | 30   | -14.9                    | 50                             |
|               | PMK35EP     | -30                       | 19  | 35   | -14.9                    | 42                             |
|               | PHP225      | -30                       | 250   | 400  | -                        | 10                             |
|               | PMK50XP     | -20                       | -   | 50   | -7.9                     | 10                             |
|               | PHK04P02T   | -16                       | -   | 120  | -4.66                    | 7.2                            |

For the most current product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

### Multi-chip

| Package       | Type number | Channel type | V <sub>DS</sub> [max] (V) | R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | I <sub>D</sub> [max] (A) | Q <sub>G(tot)</sub> [typ] (nC) |
|---------------|-------------|--------------|---------------------------|---|--------------------------|--------------------------------|
| SO8 (SOT96-1) | PHP225      | P            | -30                       | 250   | -                        | 10                             |
|               | PHKD6N02LT  | N            | 20                        | -   | 10.9                     | 15.3                           |
|               | PHKD13N03LT | N            | 30                        | 20  | 10.4                     | 10.7                           |
|               | PHN203      | N            | 30                        | 30  | 6.3                      | 14.6                           |
|               | PHN210T     | N            | 30                        | 100   | 3.4                      | 6                              |
|               | PHC21025    | N/P          | 30                        | 250   | -                        | 10                             |
|               | PHKD3NQ10T  | N            | 100                       | 90  | 3                        | 21                             |
|               | PHC2300     | N/P          | 300                       | 6000  | -                        | 6.24                           |

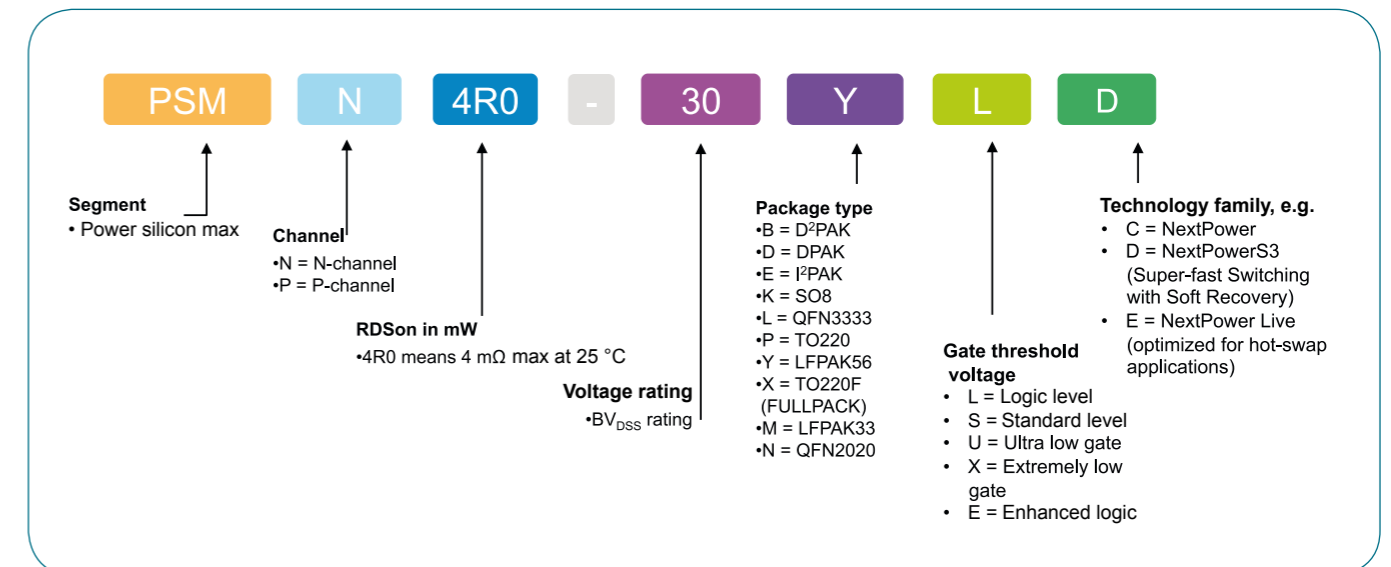
For the most current product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

### Power MOSFETs 200V

| Package                     | Type number   | V <sub>DS</sub> [max] (V) | R <sub>DSon</sub> [max] @ V <sub>GS</sub> = 10 V (mΩ) | I <sub>D</sub> [max] (A) | Q <sub>G(tot)</sub> [typ] (nC) |    |
|-----------------------------|---------------|---------------------------|---|--------------------------|--------------------------------|----|
| LFPAK56; Power-SO8 (SOT669) | PSMN102-200Y  | 200                       | 102   | 21.5                     | 30.7                           |    |
|                             | PSMN057-200B  | 200                       | 57  | 39                       | 96                             |    |
| D <sup>2</sup> PAK (SOT404) | PSMN070-200B  | 200                       | 70  | 35                       | 77                             |    |
|                             | PHB33NQ20T    | 200                       | 77  | 32.7                     | 32.2                           |    |
|                             | PHB20NQ20T    | 200                       | 130   | 20                       | 65                             |    |
|                             | PSMN130-200D  | 200                       | 130   | 20                       | 65                             |    |
| DPAK (SOT428)               | PHD9NQ20T     | 200                       | 400   | 8.7                      | 24                             |    |
|                             | PSMN057-200P  | 200                       | 57  | 39                       | 96                             |    |
| TO-220AB (SOT78)            | PSMN070-200P  | 200                       | 70  | 35                       | 77                             |    |
|                             | PHP33NQ20T    | 200                       | 77  | 32.7                     | 32.2                           |    |
|                             | PHP20NQ20T    | 200                       | 130   | 20                       | 65                             |    |
|                             | PHP9NQ20T     | 200                       | 400   | 8.7                      | 24                             |    |
|                             | SO8 (SOT96-1) | PSMN165-200K              | 200   | 165                      | -                              | 40 |

For the most current product information go to [www.nxp.com/mosfets](http://www.nxp.com/mosfets) (updated daily!)

### PSMN part numbering

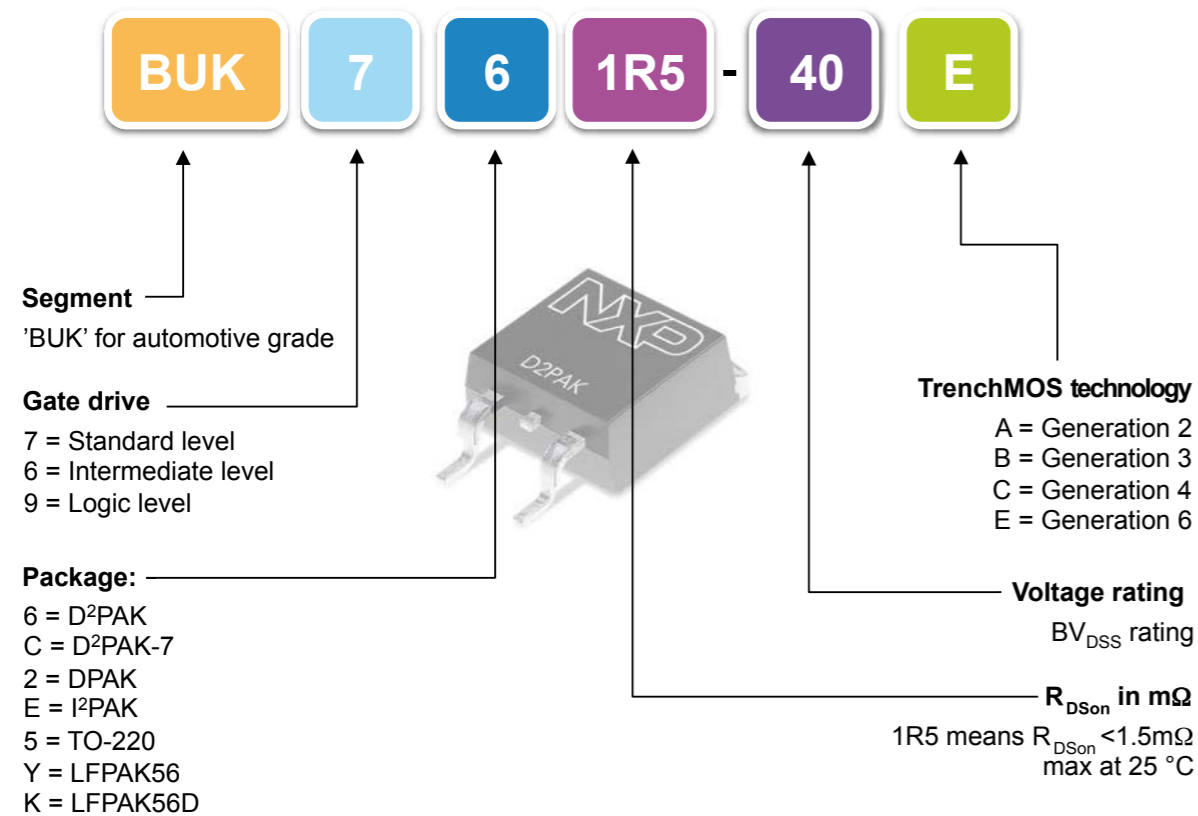




# 4 steps to select an automotive MOSFET

- 1 Select a voltage, e.g. 40 V
- 2 Select a package, e.g D<sup>2</sup>PAK
- 3 Choose an  $R_{DSon}$  from our extensive range
- 4 Select a 'BUK' type and visit [www.nxp.com/automotivemosfets](http://www.nxp.com/automotivemosfets) to download datasheets and models, and order samples

## Automotive-grade MOSFET product numbering



# High-performance automotive MOSFETs

## MOSFET package selection

### Through-hole

#### TO220

- ▶ Industry standard
- ▶ 120 A



#### I<sup>2</sup>PAK

- ▶ Industry standard
- ▶ 120 A

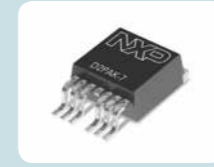


### Surface-mount

### Premium performance

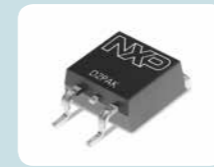
#### D<sup>2</sup>PAK-7

- ▶ Highest performance
- ▶ 190 A



#### D<sup>2</sup>PAK

- ▶ Industry standard
- ▶ 120 A



### Space saving

#### LFPAK56

- ▶ PowerSO8
- ▶ 100 A



#### LFPAK56D

- ▶ Dual Power-SO8
- ▶ 40 A per channel



#### DPAK

- ▶ Industry standard
- ▶ Proven reliability
- ▶ 100 A



#### SOT223

- ▶ Industry standard
- ▶ Proven reliability

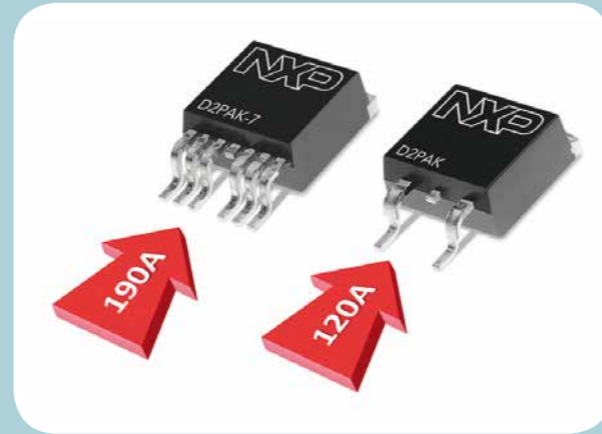


All packages are automotive AEC-Q101 qualified to 175 °C and RoHs compliant

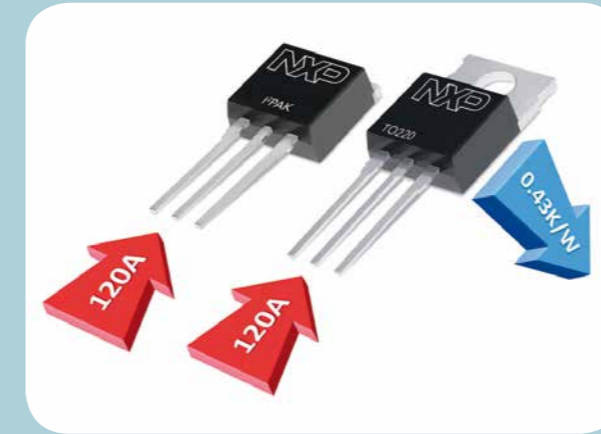
# D<sup>2</sup>PAK Family

## D<sup>2</sup>PAK Family - Premium performance SMD products

The NXP D<sup>2</sup>PAK portfolio is ideally suited for high power automotive application areas such as powertrain and chassis & safety. Combining advanced TrenchMOS technology with high current packaging enables a product that delivers ultra low on-state resistance and thermal performance within an industry standard footprint. NXP offers the broadest range of automotive grade D<sup>2</sup>PAK across  $V_{DS}$  30V-100V.



Fully AEC-Q101 qualified to 175 °C

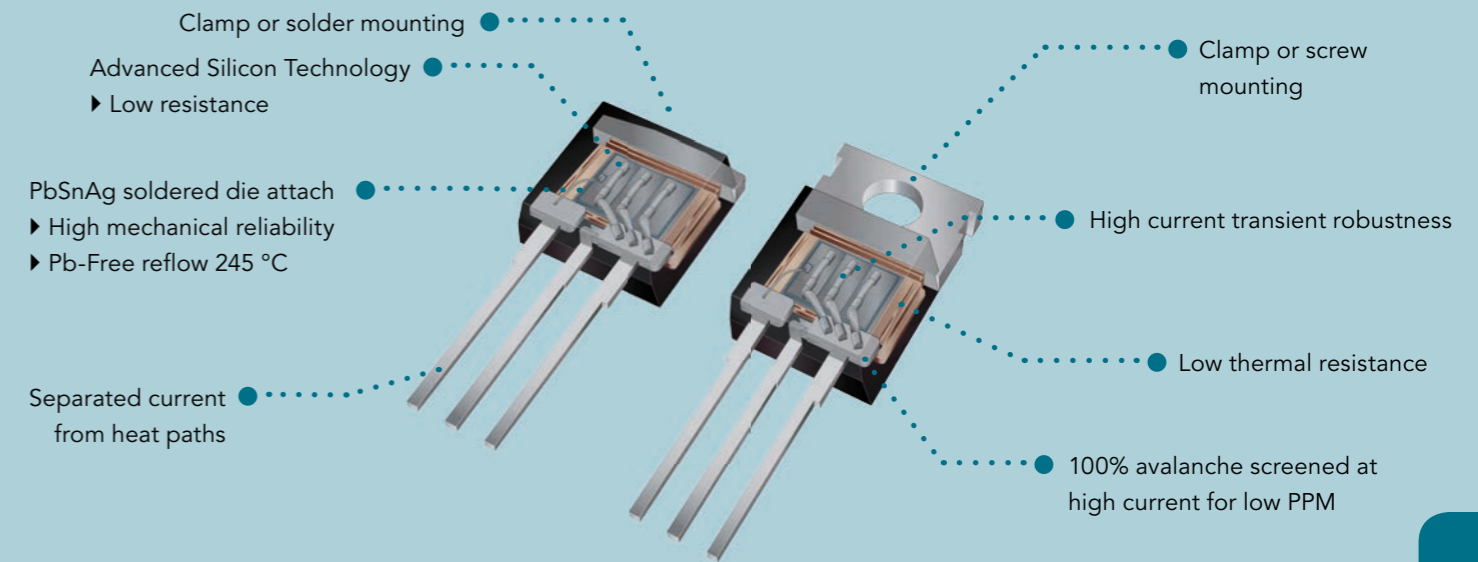
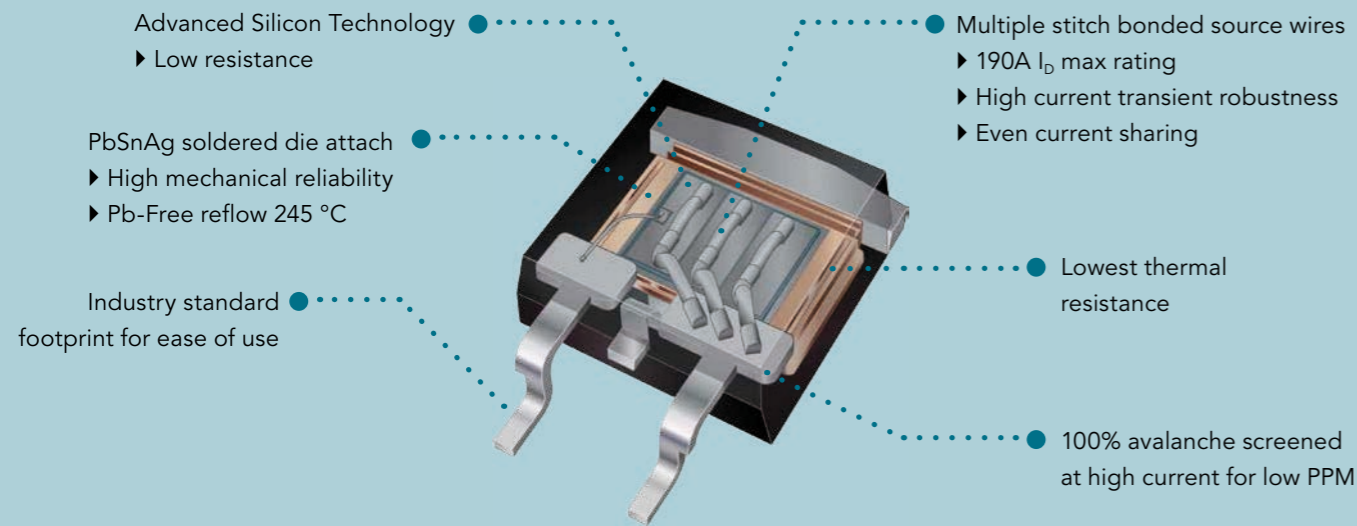


Fully AEC-Q101 qualified to 175 °C

# I<sup>2</sup>PAK/TO-220

## I<sup>2</sup>PAK/TO-220 - High performance through-hole products

Providing industry leading performance for through hole products NXP's I<sup>2</sup>PAK/TO-220 portfolio enables the separation of the electrical and thermal pathways to optimise module performance. The convenience of the tab for screw mounting on the TO-220 is complemented by industry standard footprint and excellent current handling performance. Similarly the I<sup>2</sup>PAK can be readily soldered down to form a low resistance path.



### POWERTRAIN

- ▶ Engine Control
- ▶ Gearbox/Clutch
- ▶ Engine Fan
- ▶ Electric Vehicle
- ▶ Micro-Hybrid drive
- ▶ DCDC converters



### CHASSIS & SAFETY

- ▶ Electric Power Steering (EPS)
- ▶ Vehicle Stability (ESP)
- ▶ Braking Systems (ABS)
- ▶ Electric Parking Brake (EPB)



### BODY & SECURITY

- ▶ Climate control (HVAC)
- ▶ Wiper Systems



### POWERTRAIN

- ▶ Engine Control
- ▶ Engine Fan
- ▶ Electric Vehicle
- ▶ Micro-Hybrid drive
- ▶ DCDC converters



### CHASSIS & SAFETY

- ▶ Electric Power Steering (EPS)
- ▶ Braking Systems (ABS)
- ▶ Electric Parking Brake (EPB)



### BODY & SECURITY

- ▶ Climate Control (HVAC)
- ▶ Wiper Systems
- ▶ Electric Horn

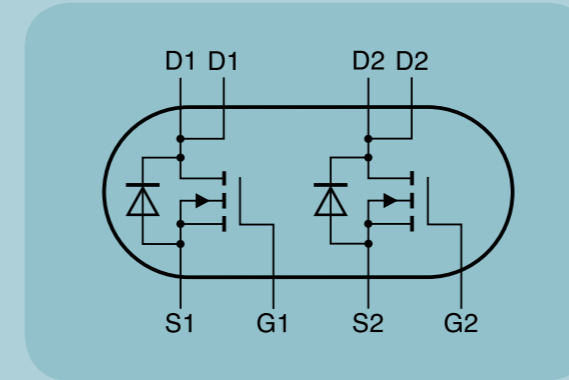
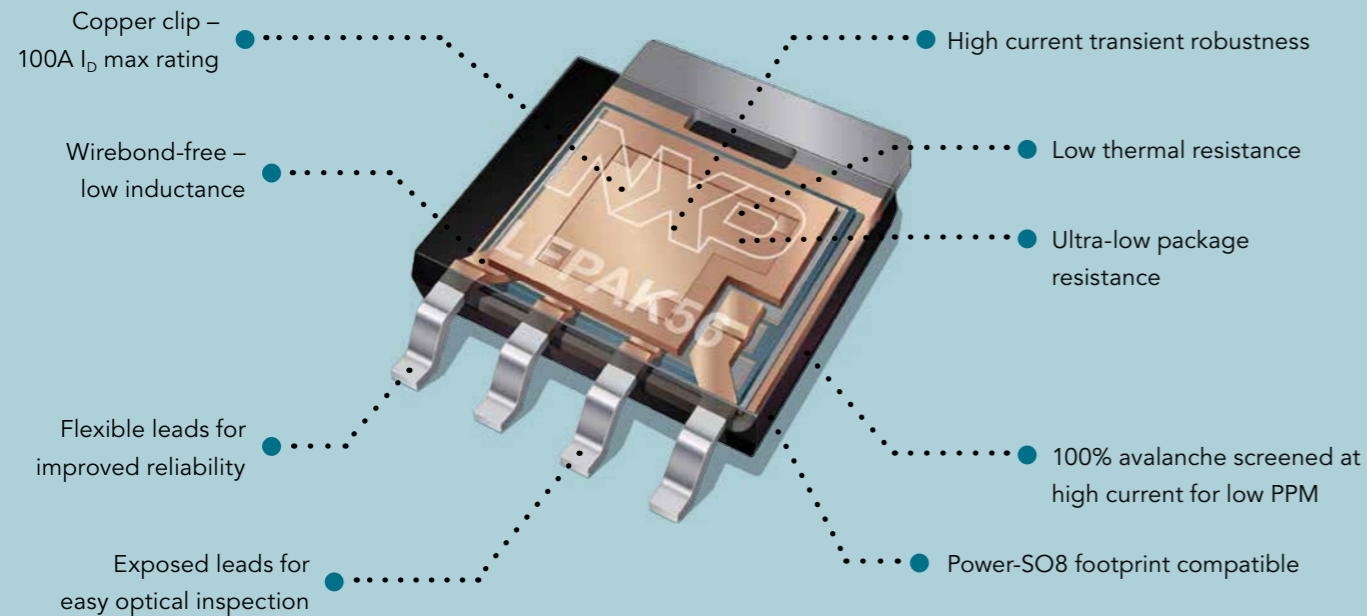
# LFPAK56

## The Power-SO8 that packs a punch

Providing a true alternative to DPAK, NXP's LFPAK56 portfolio gives industry-leading performance in a truly innovative, automotive-grade package. Saving a considerable amount of space compared to traditional DPAK solutions, the LFPAK56 offers designers flexibility and reliability without compromising thermal performance.



Fully AEC-Q101 qualified to 175 °C

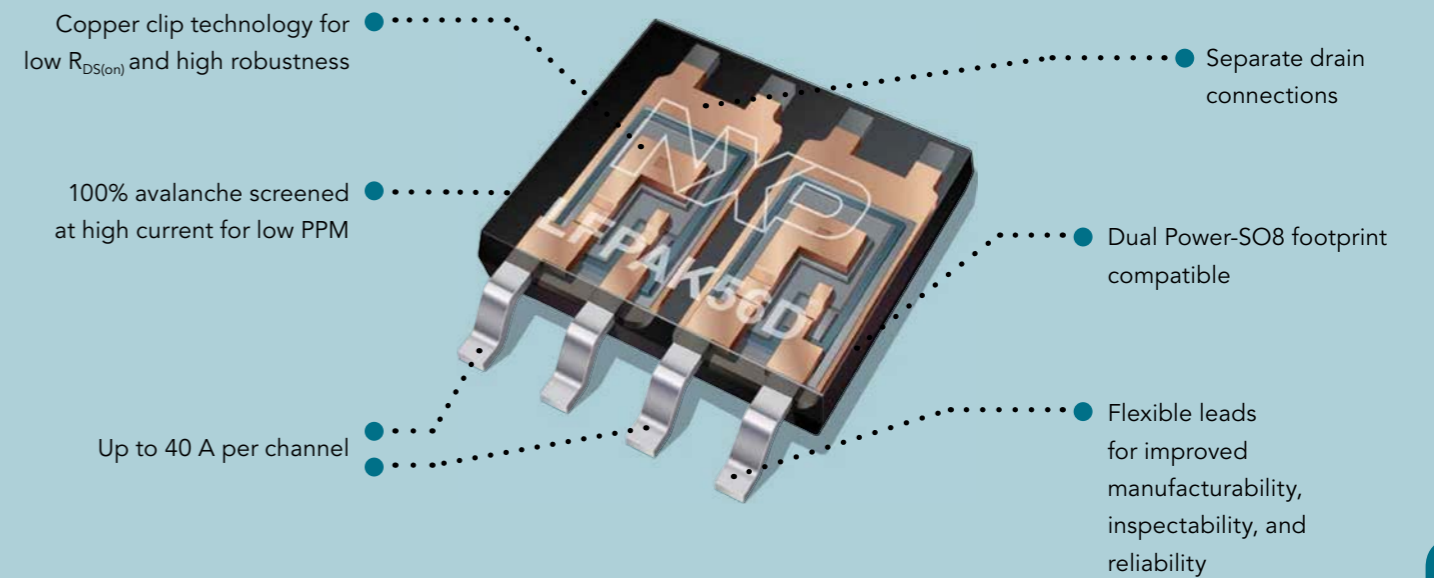


Fully AEC-Q101 qualified to 175 °C

# LFPAK56D

## The ultimate dual MOSFET

Packing even more into the Power-SO8 footprint, the LFPAK56D fits two MOSFETs into one robust package without compromising on performance. NXP's cutting-edge copper-clip technology allows for exceptional current handling, ultra-low package resistance, and supreme robustness and reliability. Perfect for situations where space is at a premium, the LFPAK56D offers power performance.



### POWERTRAIN

- ▶ Engine management
- ▶ Gearbox / clutch
- ▶ Engine fan
- ▶ Fuel / water pump
- ▶ Auxiliary valves



### CHASSIS & SAFETY

- ▶ Vertical stability (ESP)
- ▶ Braking systems (ABS)
- ▶ Airbag
- ▶ Electric Parking Brake (EPB)



### BODY & SECURITY

- ▶ Body control module
- ▶ Climate control (HVAC)
- ▶ Wiper systems
- ▶ Electric windows
- ▶ Electric mirrors
- ▶ Electric seats
- ▶ Sunroof
- ▶ Lighting

### LFPAK56D footprint comparison

| Product | Pad layout | Footprint area      |
|---------|------------|---------------------|
|         |            | 31 mm <sup>2</sup>  |
|         |            | 62 mm <sup>2</sup>  |
|         |            | 140 mm <sup>2</sup> |

Automotive-compliant small-signal MOSFETs

types in **bold** represent new products

| Package               |               | SOT223              | SOT457 (SC-74)      | SOT23              | SOT363 (SC-88)              | SOT323 (SC-70)              | SOT666                   | DFN-2020MD-6 (SOT1220)    | DFN2020-6 (SOT1118)     | DFN1010D-3 (SOT1215) | DFN1006-3 (SOT883)                               |       |       |       |      |                   |                    |                   |                   |                    |                    |                   |  |  |
|-----------------------|---------------|---------------------|---------------------|--------------------|-----------------------------|-----------------------------|--------------------------|---------------------------|-------------------------|----------------------|--|-------|-------|-------|------|-------------------|--------------------|-------------------|-------------------|--------------------|--------------------|-------------------|--|--|
| Size (mm)             |               | 6.5 x 3.5 x 1.65    | 2.9 x 1.5 x 1.0     | 2.9 x 1.3 x 1.0    | 2.0 x 1.25 x 0.95           | 2.0 x 1.25 x 0.95           | 1.6 x 1.2 x 0.55         | 2.0 x 2.0 x 0.65          | 2.0 x 2.0 x 0.65        | 1.1 x 1.0 x 0.37     | 1.0 x 0.6 x 0.5                                  |       |       |       |      |                   |                    |                   |                   |                    |                    |                   |  |  |
| P <sub>tot</sub> (mW) |               | 1700                | 600                 | 250                | 300                         | 200                         | 300                      | 1250                      | 1250                    | 1000                 | 250  |       |       |       |      |                   |                    |                   |                   |                    |                    |                   |  |  |
| Polarity              | Configuration | V <sub>DS</sub> (V) | V <sub>GS</sub> (V) | I <sub>D</sub> (A) | V <sub>GS(th)</sub> min (V) | V <sub>GS(th)</sub> max (V) | t <sub>on</sub> typ (ns) | t <sub>off</sub> typ (ns) | Q <sub>s</sub> typ (nC) | ESD protection (kV)  | R <sub>DS(on)</sub> typ (mΩ) @ V <sub>GS</sub> = |       |       |       |      |                   |                    |                   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     |                    |                             |                             |                          |                           |                         |                      | 10 V   | 4.5 V | 2.5 V | 1.8 V |      |                   |                    |                   |                   |                    |                    |                   |  |  |
| N-channel             | single        | 20                  | 8                   | 4.7                | 0.45                        | 1                           | 8.2                      | 39.5                      | 6.2                     | 2                    | -  | 24    | 29    | 40    |      | <b>PMN28UNEA</b>  | <b>PMV28UNEA</b>   |                   |                   |                    |                    |                   |  |  |
|                       |               |                     | 12                  | 6.3                | 0.75                        | 1.25                        | 16                       | 44                        | 9.9                     | 2                    | -  | 16    | 24    | -     |      | <b>PMV20XNEA</b>  |                    | <b>PMPB20XNEA</b> |                   |                    |                    |                   |  |  |
|                       |               | 30                  | 8                   | 0.4                | 0.6                         | 1.1                         | 26                       | 88                        | 0.52                    | 2                    | -  | 1000  | 1400  | 2000  |      |                   | <b>NX3008NBK</b>   |                   | <b>NX3008NBKW</b> |                    |                    |                   |  |  |
|                       |               |                     | 12                  | 3.1                | 0.75                        | 1.25                        | 9                        | 19                        | 2.9                     | 2                    | -  | 55    | 72    | -     |      |                   |                    |                   |                   | <b>PMDPB56XNEA</b> |                    |                   |  |  |
|                       |               | 40                  | 20                  | 5.5                | 1                           | 2.5                         | 8                        | 33                        | 12.6                    | 2                    | 17   | 22    | -     | -     |      | <b>PMN25ENEA</b>  | <b>PMV25ENEA</b>   |                   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 3.9                | 1                           | 2.5                         | 6.3                      | 14.1                      | 6                       | 2                    | 30   | 39    | -     | -     |      |                   | <b>PMV50ENEA</b>   |                   |                   |                    |                    |                   |  |  |
|                       |               | 60                  | 20                  | 3                  | 1                           | 2.5                         | 6                        | 11                        | 3.6                     | 2                    | 54   | 70    | -     | -     |      |                   | <b>PMV100ENEA</b>  |                   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 3.1                | 1                           | 2.5                         | -                        | -                         | -                       | 1                    | 65   | 88    | -     | -     |      |                   | <b>PMV65ENEA</b>   |                   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 2.5                | 1                           | 2.5                         | 14                       | 14                        | 2.4                     | 1                    | 95   | 120   | -     | -     |      |                   | <b>PMV130ENEA</b>  |                   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 4                  | 1.3                         | 2.7                         | 4.5                      | 13.5                      | 7.5                     | 1                    | 42   | 48    | -     | -     |      |                   |                    |                   | <b>PMPB55ENEA</b> |                    |                    |                   |  |  |
|                       |               |                     |                     | 3.1                | 1.3                         | 2.7                         | 9                        | 33                        | 12.7                    | 2                    | 46   | 52    | -     | -     |      |                   | <b>PMN55ENEA</b>   | <b>PMV55ENEA</b>  |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 4                  | 1.3                         | 2.7                         | 4                        | 10.5                      | 6.2                     | 2.7                  | 72   | 85    | -     | -     |      |                   |                    |                   |                   | <b>PMPB85ENEA</b>  |                    |                   |  |  |
|                       |               |                     |                     | 2.1                | 1.3                         | 2.7                         | 6.4                      | 15.9                      | 5.9                     | 2                    | 96   | 108   | -     | -     |      |                   | <b>PMN120ENEA</b>  | <b>PMV120ENEA</b> |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 1.5                | 1.3                         | 2.7                         | 6.3                      | 13                        | 3.9                     | 2                    | 176  | 196   | -     | -     |      |                   | <b>PMN230ENEA</b>  | <b>PMV230ENEA</b> |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 0.8                | 1.3                         | 2.7                         | 5.3                      | 10.2                      | 2.4                     | 2                    | 300  | 332   | -     | -     |      |                   |                    | <b>PMV450ENEA</b> |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 0.36               | 0.9                         | 1.5                         | 5                        | 13                        | 0.72                    | -                    | 900  | 1000  | -     | -     |      |                   |                    | <b>BSS138P</b>    |                   | <b>BSS138PW</b>    |                    |                   |  |  |
|                       |               |                     |                     | 0.36               | 0.48                        | 1.6                         | 10                       | 58                        | 0.6                     | 1.5                  | 1000   | 1100  | 1400  | -     |      |                   |                    | <b>BSS138BK</b>   |                   | <b>BSS138BKW</b>   |                    |                   |  |  |
|                       |               | 0.3                 | 1                   | 2.5                | 11                          | 19                          | 0.5                      | 2                         | 1000                    | 1300                 | -  | -     |       |       |      | <b>2N7002BK</b>   |                    | <b>2N7002BKW</b>  |                   |                    |                    | <b>2N7002BKM</b>  |  |  |
|                       |               | 0.3                 | 1                   | 2.5                | 16                          | 60                          | 1.09                     | 3                         | 1100                    | 1300                 | -  | -     |       |       |      | <b>2N7002CK</b>   |                    |                   |                   |                    |                    |                   |  |  |
|                       |               | 0.2                 | 0.8                 | 1.5                | 5                           | 36                          | 0.39                     | yes                       | 2700                    | 3000                 | 4000   | -     |       |       |      | <b>BSS138AKA</b>  |                    |                   |                   |                    |                    |                   |  |  |
|                       |               | 80                  | 20                  | 1.9                | 1.3                         | 2.7                         | 3.5                      | 9.5                       | 4.8                     | 2                    | 175  | 195   | -     | -     |      |                   |                    |                   |                   | <b>PMPB215ENEA</b> |                    |                   |  |  |
|                       |               |                     |                     | 2.8                | 1.3                         | 2.7                         | 5                        | 15                        | 9.9                     | 2.8                  | 80   | 92    | -     | -     |      |                   |                    |                   | <b>PMPB95ENEA</b> |                    |                    |                   |  |  |
|                       |               |                     |                     | 1.1                | 1.3                         | 2.7                         | 2                        | 9                         | 3                       | 2                    | 345  | 390   | -     | -     |      |                   |                    |                   |                   |                    | <b>PMXB360ENEA</b> |                   |  |  |
|                       |               | 100                 | 20                  | 1.5                | 1.3                         | 2.7                         | 4.8                      | 9.3                       | 4.5                     | 1                    | 285  | 300   | -     | -     |      | <b>PMT280ENEA</b> |                    |                   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 1.1                | 1.3                         | 2.7                         | 5.7                      | 10.2                      | 2.9                     | 1                    | 527  | 555   | -     | -     |      | <b>PMT560ENEA</b> |                    |                   |                   |                    |                    |                   |  |  |
|                       |               | dual                | 20                  | 8                  | 0.8                         | 0.5                         | 0.95                     | 10                        | 117                     | 0.45                 | 2  | -     | 380   | 620   | 1100 |                   |                    |                   |                   | <b>PMDT290UNE</b>  |                    |                   |  |  |
|                       |               |                     |                     | 30                 | 8                           | 0.4                         | 0.6                      | 1.1                       | 26                      | 88                   | 0.52   | 2     | -     | 1000  | 1400 | 2000              |                    |                   |                   | <b>NX3008NBKS</b>  |                    | <b>NX3008NBKV</b> |  |  |
|                       |               |                     |                     | 60                 | 20                          | 0.3                         | 1                        | 2.5                       | 11                      | 19                   | 0.5  | 2     | 1000  | 1300  | -    | -                 |                    |                   |                   | <b>2N7002BKS</b>   |                    |                   |  |  |
|                       |               |                     |                     |                    |                             | 0.36                        | 0.48                     | 1.6                       | 10                      | 58                   | 0.6  | 1.5   | 1000  | 1100  | 1400 | -                 |                    |                   | <b>BSS138BKS</b>  |                    |                    |                   |  |  |
|                       |               |                     |                     | 70                 | 20                          | 0.36                        | 0.9                      | 1.5                       | 5                       | 13                   | 0.72   | -     | 900   | 1000  | -    | -                 |                    |                   |                   | <b>BSS138PS</b>    |                    |                   |  |  |
|                       |               |                     |                     |                    |                             | 0.3                         | 1                        | 2.5                       | 16                      | 60                   | 1.09   | 3     | 1100  | 1300  | -    | -                 |                    |                   |                   |                    |                    |                   |  |  |
| P-channel             | single        | 8                   | 6                   | 0.45               | 0.95                        | 8                           | 50                       | 15.6                      | 4                       | -                    | 37   | 45    | 59    |       |      | <b>PMN40UPEA</b>  |                    |                   |                   |                    |                    |                   |  |  |
|                       |               |                     | 2                   | 0.5                | 1.1                         | 7                           | 50                       | 6                         | -                       | -                    | 100  | 155   | 210   |       |      |                   | <b>NX2301P</b>     |                   |                   |                    |                    |                   |  |  |
|                       |               | 20                  | 12                  | 4.5                | 0.45                        | 0.95                        | 11                       | 83                        | 14.7                    | 2                    | -  | 27    | 38    | 50    |      |                   |                    | <b>PMV27UPEA</b>  |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 5.7                | 0.75                        | 1.25                        | 15                       | 37                        | 15                      | 2                    | -  | 27    | 39    | -     |      |                   | <b>PMN27XPEA</b>   |                   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 5.7                | 0.75                        | 1.25                        | 17                       | 33                        | 11.5                    | 2                    | -  | 41    | 56    | -     |      |                   | <b>PMN42XPEA</b>   |                   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 4.5                | 0.75                        | 1.25                        | 7.9                      | 59                        | 11                      | 2                    | -  | 28    | 42    | -     |      |                   | <b>PMN30XPEA</b>   | <b>PMV30XPEA</b>  |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 3.5                | 0.75                        | 1.25                        | 11                       | 61                        | 8.5                     | -                    | -  | 48    | 71    | -     |      |                   | <b>PMN48XPA</b>    | <b>PMV48XPA</b>   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 4.1                | 0.75                        | 1.25                        | 15                       | 51                        | 8.7                     | -                    | -  | 48    | 72    | -     |      |                   |                    | <b>PMV65XPEA</b>  |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 2.8                | 0.75                        | 1.25                        | 7                        | 36                        | 5                       | 2                    | -  | 67    | 99    | -     |      |                   |                    |                   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 4.1                | 0.75                        | 1.25                        | 7                        | 40                        | 5.2                     | 2                    | -  | 70    | 101   | -     |      |                   | <b>PMN70XPEA</b>   |                   |                   |                    |                    |                   |  |  |
|                       |               | 2.3                 | 0.7                 | 1.3                | 5.3                         | 36                          | 3.4                      | 2                         | -                       | 100                  | 155  | -     |       |       |      | <b>PMV100XPEA</b> |                    |                   |                   |                    |                    |                   |  |  |
|                       |               | 30                  | 20                  | 0.23               | 0.6                         | 1.1                         | 49                       | 103                       | 0.55                    | 2                    | -  | 2800  | 5300  | -     |      |                   |                    | <b>NX3008PBK</b>  |                   | <b>NX3008PBKW</b>  |                    |                   |  |  |
|                       |               |                     |                     | 4.2                | 1                           | 3                           | 6.1                      | 3.7                       | 12.8                    | 2                    | 35   | 47    | -     | -     |      |                   | <b>PMN50EPEA</b>   | <b>PMV50EPEA</b>  |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 1.5                | 1                           | 2.5                         | 4                        | 26                        | 4.7                     | 1                    | 180  | 220   | -     | -     |      |                   | <b>PMV250EPEA</b>  |                   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 0.2                | 1.1                         | 2.1                         | 24                       | 73                        | 0.26                    | 1                    | 5300   | 6000  | -     | -     |      |                   | <b>BSS84AK</b>     |                   | <b>BSS84AKW</b>   |                    | <b>BSS84AKM</b>    |                   |  |  |
|                       |               | 60                  | 20                  | 2.2                | 1                           | 3                           | -                        | -                         | -                       | 2                    | 99   | 110   | -     | -     |      |                   | <b>PMN100EPEA</b>  | <b>PMV100EPEA</b> |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 0.9                | 1                           | 3                           | -                        | -                         | -                       | -                    | 2  | 217   | 241   | -     | -    |                   | <b>PMN240EPEA</b>  | <b>PMV240EPEA</b> |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 2.3                | 1                           | 3                           | -                        | -                         | -                       | -                    | 2  | 156   | 177   | -     | -    |                   | <b>PMT200EPEA</b>  |                   |                   |                    |                    |                   |  |  |
|                       |               |                     |                     | 20                 | 8                           | 0.55                        | 0.5                      | 1.3                       | 48                      | 152                  | 0.76   | 2     | -     | 670   | 1200 | 1800              |                    |                   |                   |                    | <b>PMDT670UPE</b>  |                   |  |  |
|                       |               | dual                | 20                  | 30                 | 8                           | 0.2                         | 0.6                      | 1.1                       | 49                      | 103                  | 0.55   | 2     | -     | 2800  | 5300 | -                 |                    |                   | <b>NX3008PBKS</b> |                    | <b>NX3008PBKV</b>  |                   |  |  |
| 50                    | 20            |                     |                     | 0.16               | 1.1                         | 2.1                         | 24                       | 73                        | 0.26                    | 1                    | 5300   | 6000  | -     | -     |      | <b>BSS84AKS</b>   |                    | <b>BSS84AKV</b>   |                   |                    |                    |                   |  |  |
| 20                    | 8             |                     |                     | 0.73               | 0.5                         | 0.95                        | 10                       | 117                       | 0.45                    | 2                    | -  | 290   | 420   | 600   |      |                   | <b>PMGD290UCEA</b> |                   |                   |                    |                    |                   |  |  |
| P                     | Compl         | 20                  | 8                   | 0.5                | 0.5                         | 1.3                         | 48                       | 152                       | 0.76                    | 2                    | -  | 670   | 1200  | 1800  |      |                   |                    |                   |                   |                    |                    |                   |  |  |

MOSFETs

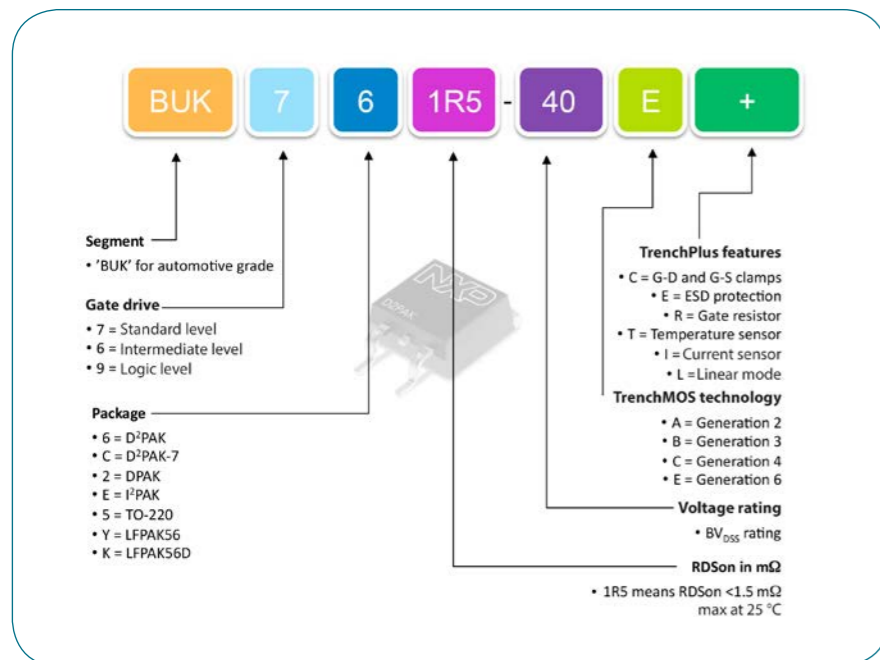
### 30 V N-channel automotive TrenchMOS

types in **bold** represent new products

| Package name                | Type number         | V <sub>DS</sub> [max] [V] | R <sub>DSon</sub> [max] @ 10 V [mΩ] | R <sub>DSon</sub> [max] @ 5 V [mΩ] | I <sub>D</sub> [max] @ 25 °C [A] | R <sub>th(j-mb)</sub> [max] [K/W] |
|-----------------------------|---------------------|---------------------------|-------------------------------------|------------------------------------|----------------------------------|-----------------------------------|
| LFPAK56; Power-SO8 (SOT669) | BUK9Y07-30B         | 30                        | 6                                   | 7                                  | 75                               | 1.42                              |
|                             | BUK7Y07-30B         | 30                        | 7                                   |                                    | 75                               | 1.42                              |
|                             | BUK9Y11-30B         | 30                        | 9                                   | 11                                 | 59                               | 2                                 |
|                             | BUK7Y10-30B         | 30                        | 10                                  |                                    | 67                               | 1.76                              |
|                             | BUK9Y22-30B         | 30                        | 19                                  | 22                                 | 37.7                             | 2.53                              |
|                             | BUK7Y20-30B         | 30                        | 20                                  |                                    | 39.5                             | 2.53                              |
| LFPAK56D (SOT1205)          | BUK7K5R1-30E        | 30                        | 5.1                                 |                                    | 40                               | 2.21                              |
|                             | BUK7K5R6-30E        | 30                        | 5.6                                 |                                    | 40                               | 2.36                              |
|                             | <b>BUK9K5R1-30E</b> | <b>30</b>                 | <b>4.4</b>                          | <b>5.3</b>                         | <b>40</b>                        | <b>2.21</b>                       |
|                             | <b>BUK9K5R6-30E</b> | <b>30</b>                 | <b>4.7</b>                          | <b>5.8</b>                         | <b>40</b>                        | <b>2.36</b>                       |
| D <sup>2</sup> PAK (SOT404) | BUK962R8-30B        | 30                        | 2.4                                 | 2.8                                | 75                               | 0.5                               |
|                             | BUK762R7-30B        | 30                        | 2.7                                 |                                    | 75                               | 0.5                               |
|                             | BUK763R4-30B        | 30                        | 3.4                                 |                                    | 75                               | 0.59                              |
|                             | BUK9605-30A         | 30                        | 4.6                                 | 5                                  | 75                               | 0.65                              |
|                             | BUK9607-30B         | 30                        | 5                                   | 7                                  | 75                               | 0.95                              |
|                             | BUK7607-30B         | 30                        | 7                                   |                                    | 75                               | 0.95                              |
| DPAK (SOT428)               | BUK9214-30A         | 30                        | 12                                  | 14                                 | 63                               | 1.4                               |
|                             | BUK6213-30A         | 30                        | 13                                  |                                    | 55                               | 1.4                               |
| TO-220AB (SOT78A)           | BUK952R8-30B        | 30                        | 2.4                                 | 2.8                                | 75                               | 0.5                               |
|                             | BUK9507-30B         | 30                        | 5                                   | 7                                  | 75                               | 0.95                              |
|                             | BUK7507-30B         | 30                        | 7                                   |                                    | 75                               | 0.95                              |

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#### Automotive TrenchMOS part numbering



### 40 V N-channel automotive TrenchMOS – Part I

| Package name                | Type number        | V <sub>DS</sub> [max] [V] | R <sub>DSon</sub> [max] @ 10 V [mΩ] | R <sub>DSon</sub> [max] @ 5 V [mΩ] | I <sub>D</sub> [max] @ 25 °C [A] | R <sub>th(j-mb)</sub> [max] [K/W] |      |
|-----------------------------|--------------------|---------------------------|-------------------------------------|------------------------------------|----------------------------------|-----------------------------------|------|
| LFPAK56; Power-SO8 (SOT669) | BUK9Y3R0-40E       | 40                        | 2.5                                 | 3                                  | 100                              | 0.77                              |      |
|                             | BUK7Y3R5-40E       | 40                        | 3.5                                 |                                    | 100                              | 0.9                               |      |
|                             | BUK9Y3R5-40E       | 40                        | 3.6                                 | 3.8                                | 100                              | 0.9                               |      |
|                             | BUK9Y4R4-40E       | 40                        | 3.7                                 | 4.4                                | 100                              | 1.02                              |      |
|                             | BUK7Y4R4-40E       | 40                        | 4.4                                 |                                    | 100                              | 1.02                              |      |
|                             | BUK9Y7R6-40E       | 40                        | 6                                   | 7.6                                | 79                               | 1.58                              |      |
|                             | BUK7Y7R6-40E       | 40                        | 7.6                                 |                                    | 79                               | 1.58                              |      |
|                             | BUK9Y09-40B        | 40                        | 8                                   | 9                                  | 75                               | 1.42                              |      |
|                             | BUK7Y08-40B        | 40                        | 8                                   |                                    | 75                               | 1.42                              |      |
|                             | BUK9Y12-40E        | 40                        | 10                                  | 12                                 | 52                               | 2.31                              |      |
|                             | BUK9Y14-40B        | 40                        | 11                                  | 14                                 | 56                               | 1.8                               |      |
|                             | BUK7Y12-40E        | 40                        | 12                                  |                                    | 52                               | 2.31                              |      |
|                             | BUK7Y13-40B        | 40                        | 13                                  |                                    | 58                               | 1.8                               |      |
|                             | BUK9Y21-40E        | 40                        | 17                                  | 21                                 | 33                               | 3.33                              |      |
|                             | BUK7Y21-40E        | 40                        | 21                                  |                                    | 33                               | 3.33                              |      |
|                             | BUK9Y27-40B        | 40                        | 24                                  | 27                                 | 34                               | 2.53                              |      |
|                             | BUK9Y29-40E        | 40                        | 25                                  | 29                                 | 25                               | 4.03                              |      |
|                             | BUK7Y25-40B        | 40                        | 25                                  |                                    | 35.3                             | 2.53                              |      |
|                             | LFPAK56D (SOT1205) | BUK7Y29-40E               | 40                                  | 29                                 |                                  | 26                                | 4.03 |
|                             |                    | BUK7K6R2-40E              | 40                                  | 5.8                                |                                  |                                   | 2.21 |
| BUK9K6R2-40E                |                    | 40                        | 6                                   | 6.2                                | 40                               | 2.21                              |      |
| BUK9K6R8-40E                |                    | 40                        | 6.1                                 | 7.2                                | 40                               | 2.36                              |      |
| BUK7K6R8-40E                |                    | 40                        | 6.8                                 |                                    |                                  | 2.36                              |      |
| BUK9K8R7-40E                |                    | 40                        | 8                                   | 9.4                                | 30                               | 2.84                              |      |
| BUK7K8R7-40E                |                    | 40                        | 8.5                                 |                                    |                                  | 2.84                              |      |
| BUK9K18-40E                 |                    | 40                        | 16                                  | 19.5                               | 30                               | 3.96                              |      |
| BUK7K18-40E                 |                    | 40                        | 19                                  |                                    | 24.2                             | 3.96                              |      |
| BUK9K25-40E                 |                    | 40                        | 24                                  | 29                                 | 18.2                             | 4.68                              |      |
| BUK7K25-40E                 |                    | 40                        | 25                                  |                                    |                                  | 4.68                              |      |
| D <sup>2</sup> PAK (SOT404) |                    | BUK961R6-40E              | 40                                  | 1.4                                | 1.6                              | 120                               | 0.43 |
|                             | BUK762R0-40E       | 40                        | 2                                   |                                    | 120                              | 0.51                              |      |
|                             | BUK962R6-40E       | 40                        | 2.4                                 | 2.8                                | 100                              | 0.57                              |      |
|                             | BUK762R6-40E       | 40                        | 2.6                                 |                                    | 100                              | 0.57                              |      |
|                             | BUK963R1-40E       | 40                        | 2.7                                 | 3.1                                | 100                              | 0.64                              |      |
|                             | BUK963R2-40B       | 40                        | 2.8                                 | 3.2                                | 100                              | 0.5                               |      |
|                             | BUK762R9-40E       | 40                        | 2.9                                 |                                    | 100                              | 0.64                              |      |
|                             | BUK763R1-40B       | 40                        | 3.1                                 |                                    | 75                               | 0.5                               |      |
|                             | BUK964R1-40E       | 40                        | 3.5                                 | 4.1                                | 75                               | 0.82                              |      |
|                             | BUK9604-40A        | 40                        | 4                                   | 4.4                                | 75                               | 0.5                               |      |
|                             | BUK964R4-40B       | 40                        | 4                                   | 4.4                                | 75                               | 0.59                              |      |

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## 40V N-channel automotive TrenchMOS – Part 2

| Package name                   | Type number  | V <sub>DS</sub><br>[max] [V] | R <sub>DSon</sub><br>[max]<br>@ 10 V<br>[mΩ] | R <sub>DSon</sub><br>[max]<br>@ 5 V<br>[mΩ] | I <sub>D</sub><br>[max]<br>@ 25 °C<br>[A] | R <sub>th(j-mb)</sub><br>[max]<br>[K/W] |
|--------------------------------|--------------|------------------------------|--|---|---|---|
| D <sup>2</sup> PAK<br>(SOT404) | BUK764R0-40E | 40                           | 4  |   | 75  | 0.82                                    |
|                                | BUK965R4-40E | 40                           | 4.4  | 5.4   | 75  | 1.09                                    |
|                                | BUK7604-40A  | 40                           | 4.5  |   | 75  | 0.5                                     |
|                                | BUK765R3-40E | 40                           | 4.9  |   | 75  | 1.09                                    |
|                                | BUK9606-40B  | 40                           | 5  | 6.4   | 75  | 0.74                                    |
|                                | BUK765R2-40B | 40                           | 5.2  |   | 75  | 0.74                                    |
|                                | BUK9609-40B  | 40                           | 7  | 9   | 75  | 0.95                                    |
|                                | BUK768R1-40E | 40                           | 7.2  |   | 75  | 1.56                                    |
|                                | BUK7608-40B  | 40                           | 8  |   | 75  | 0.95                                    |
|                                | BUK761R6-40E | 40                           | 1.57   |   | 120                                       | 0.43                                    |
|                                | BUK761R7-40E | 40                           | 1.6  |   | 120                                       | 0.46                                    |
| DPAK<br>(SOT428)               | BUK9209-40B  | 40                           | 7  | 9   | 75  | 0.95                                    |
|                                | BUK7208-40B  | 40                           | 8  |   | 75  | 0.95                                    |
| TO-220AB<br>(SOT78A)           | BUK751R8-40E | 40                           | 1.8  |   | 120                                       | 0.43                                    |
|                                | BUK752R3-40E | 40                           | 2.3  |   | 120                                       | 0.51                                    |
|                                | BUK953R2-40B | 40                           | 2.8  | 3.2   | 100                                       | 0.5                                     |
|                                | BUK753R1-40E | 40                           | 3.1  |   | 100                                       | 0.64                                    |
|                                | BUK9504-40A  | 40                           | 4  | 4.4   | 75  | 0.5                                     |
|                                | BUK954R4-40B | 40                           | 4  | 4.4   | 75  | 0.59                                    |
|                                | BUK9506-40B  | 40                           | 5  | 6.4   | 75  | 0.74                                    |
|                                | BUK755R2-40B | 40                           | 5.2  |   | 75  | 0.74                                    |
|                                | BUK9509-40B  | 40                           | 7  | 9   | 75  | 0.95                                    |
|                                | BUK758R3-40E | 40                           | 7.4  |   | 75  | 1.56                                    |
| FPAK<br>(SOT226)               | BUK7508-40B  | 40                           | 8  |   | 75  | 0.95                                    |
|                                | BUK7E1R8-40E | 40                           | 1.8  |   | 120                                       | 0.43                                    |
|                                | BUK7E1R9-40E | 40                           | 1.9  |   | 120                                       | 0.46                                    |
|                                | BUK7E2R3-40E | 40                           | 2.3  |   | 120                                       | 0.51                                    |
|                                | BUK7E3R1-40E | 40                           | 3.1  |   | 100                                       | 0.64                                    |
|                                | BUK9E04-40A  | 40                           | 4  | 4.4   | 75  | 0.5                                     |
|                                | BUK7E04-40A  | 40                           | 4.5  |   | 75  | 0.5                                     |
| BUK7E8R3-40E                   | 40           | 7.4                          |  | 75  | 1.56                                      |   |

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## 55 - 60V N-channel automotive TrenchMOS – Part I

| Package name                      | Type number           | V <sub>DS</sub><br>[max] [V] | R <sub>DSon</sub><br>[max]<br>@ 10 V<br>[mΩ] | R <sub>DSon</sub><br>[max]<br>@ 5 V<br>[mΩ] | I <sub>D</sub><br>[max]<br>@ 25 °C<br>[A] | R <sub>th(j-mb)</sub><br>[max]<br>[K/W] |
|-----------------------------------|-----------------------|------------------------------|--|---|---|---|
| LFPAK56;<br>Power-SO8<br>(SOT669) | BUK9Y12-55B           | 55                           | 11   | 12  | 61.8                                      | 1.42                                    |
|                                   | BUK7Y12-55B           | 55                           | 12   |   | 61.8                                      | 1.42                                    |
|                                   | BUK9Y19-55B           | 55                           | 17.3   | 19  | 46  | 1.8                                     |
|                                   | BUK7Y18-55B           | 55                           | 18   |   | 47.4                                      | 1.76                                    |
|                                   | BUK9Y40-55B           | 55                           | 36   | 40  | 26  | 2.5                                     |
|                                   | BUK9Y4R8-60E          | 60                           | 4.1  | 4.8   | 100                                       | 0.63                                    |
|                                   | BUK7Y4R8-60E          | 60                           | 4.8  |   | 100                                       | 0.63                                    |
|                                   | BUK9Y6R0-60E          | 60                           | 5.2  | 6   | 100                                       | 0.77                                    |
|                                   | BUK9Y7R2-60E          | 60                           | 5.6  | 7.2   | 100                                       | 0.9                                     |
|                                   | BUK7Y6R0-60E          | 60                           | 6  |   | 100                                       | 0.77                                    |
|                                   | BUK7Y7R2-60E          | 60                           | 7.2  |   | 100                                       | 0.9                                     |
|                                   | BUK9Y8R7-60E          | 60                           | 7.5  | 8.7   | 86  | 1.02                                    |
|                                   | BUK7Y8R7-60E          | 60                           | 8.7  |   | 87  | 1.02                                    |
|                                   | BUK9Y15-60E           | 60                           | 13   | 15  | 53  | 1.58                                    |
|                                   | BUK7Y15-60E           | 60                           | 15   |   | 53  | 1.59                                    |
|                                   | BUK9Y25-60E           | 60                           | 21.5   | 25  | 34  | 2.31                                    |
|                                   | BUK7Y25-60E           | 60                           | 25   |   | 34  | 2.31                                    |
|                                   | BUK9Y43-60E           | 60                           | 38   | 43  | 22  | 3.33                                    |
|                                   | BUK7Y43-60E           | 60                           | 43   |   | 22  | 3.33                                    |
|                                   | LFPAK56D<br>(SOT1205) | BUK9Y59-60E                  | 60   | 52  | 59  | 16.7                                    |
| BUK7Y59-60E                       |                       | 60                           | 59   |   | 17  | 4.03                                    |
| BUK7K12-60E                       |                       | 60                           | 9.3  |   |   | 2.21                                    |
| BUK9K12-60E                       |                       | 60                           | 10.7   | 11.5  | 35  | 2.21                                    |
| BUK7K13-60E                       |                       | 60                           | 10   |   | 40  | 2.36                                    |
| BUK9K13-60E                       |                       | 60                           | 11.2   | 12.5  | 40  | 2.36                                    |
| BUK7K17-60E                       |                       | 60                           | 14   |   |   | 2.84                                    |
| BUK9K17-60E                       |                       | 60                           | 15.6   | 17  | 26  | 2.84                                    |
| BUK7K35-60E                       |                       | 60                           | 30   |   | 20.7                                      | 3.96                                    |
| BUK9K35-60E                       |                       | 60                           | 32   | 35  | 22  | 3.96                                    |
| D <sup>2</sup> PAK<br>(SOT404)    | BUK7K52-60E           | 60                           | 45   |   | 15.4                                      | 4.68                                    |
|                                   | BUK9K52-60E           | 60                           | 49   | 55  | 16  | 4.68                                    |
|                                   | BUK964R2-55B          | 55                           | 3.7  | 4.2   | 75  | 0.5                                     |
|                                   | BUK764R0-55B          | 55                           | 4  |   | 75  | 0.5                                     |
|                                   | BUK9606-55B           | 55                           | 5.4  | 6   | 75  | 0.58                                    |
|                                   | BUK9606-55A           | 55                           | 5.8  | 6.3   | 75  | 0.5                                     |
|                                   | BUK7606-55B           | 55                           | 6  |   | 75  | 0.59                                    |
|                                   | BUK7606-55A           | 55                           | 6.3  |   | 75  | 0.5                                     |
|                                   | BUK9608-55B           | 55                           | 7  | 8.4   | 75  | 0.74                                    |
|                                   | BUK7607-55B           | 55                           | 7.1  |   | 75  | 0.74                                    |
| BUK9608-55A                       | 55                    | 7.5                          | 8  | 75  | 0.59                                      |   |

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## 55 - 60 V N-channel automotive TrenchMOS – Part 2

| Package name                     | Type number   | V <sub>DS</sub><br>[max] [V] | R <sub>DSon</sub><br>[max]<br>@ 10 V<br>[mΩ] | R <sub>DSon</sub><br>[max]<br>@ 5 V<br>[mΩ] | I <sub>D</sub><br>[max]<br>@ 25 °C<br>[A] | R <sub>th(j-mb)</sub><br>[max]<br>[K/W] |
|----------------------------------|---------------|------------------------------|--|---|---|---|
| D <sup>2</sup> PAK<br>(SOT404)   | BUK7608-55A   | 55                           | 8  |   | 75  | 0.59                                    |
|                                  | BUK9612-55B   | 55                           | 10   | 12  | 75  | 0.95                                    |
|                                  | BUK7610-55AL  | 55                           | 10   |   | 75  | 0.5                                     |
|                                  | BUK7611-55A   | 55                           | 11   |   | 75  | 0.9                                     |
|                                  | BUK7611-55B   | 55                           | 11   |   | 75  | 0.95                                    |
|                                  | BUK9614-55A   | 55                           | 13   | 14  | 73  | 1                                       |
|                                  | BUK9616-55A   | 55                           | 15   | 16  | 66  |   |
|                                  | BUK9620-55A   | 55                           | 18   | 20  | 54  | 1.2                                     |
|                                  | BUK7620-55A   | 55                           | 20   |   | 54  | 1.2                                     |
|                                  | BUK9624-55A   | 55                           | 21.7   | 24  | 46  | 1.4                                     |
|                                  | BUK7624-55A   | 55                           | 24   |   | 47  |   |
|                                  | BUK9628-55A   | 55                           | 25   | 28  | 42  | 1.5                                     |
|                                  | BUK7628-55A   | 55                           | 28   |   | 42  |   |
|                                  | BUK9635-55A   | 55                           | 32   | 35  | 34  | 1.8                                     |
|                                  | BUK7635-55A   | 55                           | 35   |   | 35  | 1.7                                     |
|                                  | BUK9675-55A   | 55                           | 68   | 75  | 20  | 2.4                                     |
|                                  | BUK7675-55A   | 55                           | 75   |   | 20.3                                      | 2.4                                     |
|                                  | BUK962R5-60E  | 60                           | 2.3  | 2.5   | 120                                       | 0.43                                    |
|                                  | BUK762R4-60E  | 60                           | 2.4  |   | 120                                       | 0.43                                    |
|                                  | BUK962R8-60E  | 60                           | 2.5  | 2.8   | 120                                       | 0.46                                    |
|                                  | BUK762R6-60E  | 60                           | 2.6  |   | 120                                       | 0.46                                    |
|                                  | BUK963R3-60E  | 60                           | 3  | 3.3   | 120                                       | 0.51                                    |
|                                  | BUK763R1-60E  | 60                           | 3.1  |   | 120                                       | 0.51                                    |
|                                  | BUK964R2-60E  | 60                           | 3.9  | 4.2   | 100                                       | 0.57                                    |
|                                  | BUK763R9-60E  | 60                           | 3.9  |   | 100                                       | 0.57                                    |
|                                  | BUK964R8-60E  | 60                           | 4.4  | 4.8   | 100                                       | 0.64                                    |
|                                  | BUK764R4-60E  | 60                           | 4.5  |   | 100                                       | 0.64                                    |
|                                  | BUK966R5-60E  | 60                           | 5.9  | 6.5   | 75  | 0.82                                    |
|                                  | BUK766R0-60E  | 60                           | 6  |   | 75  | 0.82                                    |
|                                  | BUK969R0-60E  | 60                           | 8  | 9   | 75  | 1.09                                    |
|                                  | BUK768R3-60E  | 60                           | 8.3  |   | 75  | 1.09                                    |
|                                  | BUK9614-60E   | 60                           | 12.8   | 14  | 56  | 1.56                                    |
|                                  | BUK7613-60E   | 60                           | 13   |   | 58  | 1.56                                    |
| D <sup>2</sup> PAK-7<br>(SOT427) | BUK9C10-55BIT | 55                           | 9  | 10  | 75  | 0.78                                    |
| DPAK<br>(SOT428)                 | BUK9212-55B   | 55                           | 10   | 12  | 75  | 0.95                                    |
|                                  | BUK7210-55B   | 55                           | 10   |   | 75  | 0.95                                    |
|                                  | BUK7212-55B   | 55                           | 12   |   | 75  | 0.95                                    |
|                                  | BUK9215-55A   | 55                           | 13.6   | 15  | 62  | 1.3                                     |
|                                  | BUK7215-55A   | 55                           | 15   |   | 62  | 1.3                                     |
|                                  | BUK9219-55A   | 55                           | 17.6   | 19  | 55  | 1.3                                     |

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## 55 - 60 V N-channel automotive TrenchMOS – Part 3

| Package name                   | Type number          | V <sub>DS</sub><br>[max] [V] | R <sub>DSon</sub><br>[max]<br>@ 10 V<br>[mΩ] | R <sub>DSon</sub><br>[max]<br>@ 5 V<br>[mΩ] | I <sub>D</sub><br>[max]<br>@ 25 °C<br>[A] | R <sub>th(j-mb)</sub><br>[max]<br>[K/W] |      |
|--------------------------------|----------------------|------------------------------|--|---|---|---|------|
| DPAK<br>(SOT428)               | BUK7219-55A          | 55                           | 19   |   | 55  | 1.3                                     |      |
|                                | BUK9222-55A          | 55                           | 20   | 22  | 48  | 1.5                                     |      |
|                                | BUK9225-55A          | 55                           | 22   | 25  | 43  | 1.6                                     |      |
|                                | BUK7222-55A          | 55                           | 22   |   | 48  | 1.5                                     |      |
|                                | BUK7230-55A          | 55                           | 30   |   | 38  | 1.7                                     |      |
|                                | BUK9237-55A          | 55                           | 33   | 37  | 32  | 1.94                                    |      |
|                                | BUK7237-55A          | 55                           | 37   |   | 32.3                                      | 1.9                                     |      |
|                                | BUK9245-55A          | 55                           | 40   | 45  | 28  | 2.1                                     |      |
|                                | BUK9277-55A          | 55                           | 69   | 77  | 18  | 2.93                                    |      |
|                                | BUK7277-55A          | 55                           | 77   |   | 18  | 2.9                                     |      |
|                                | BUK92150-55A         | 55                           | 125  | 140   | 11  | 4.1                                     |      |
|                                | BUK72150-55A         | 55                           | 150  |   | 11  | 4.1                                     |      |
|                                | TO-220AB<br>(SOT78A) | BUK954R2-55B                 | 55   | 3.7   | 4.2                                       | 75                                      | 0.5  |
|                                |                      | BUK754R0-55B                 | 55   | 4   |   | 75                                      | 0.5  |
| BUK7506-55A                    |                      | 55                           | 6.3  |   | 75  | 0.5                                     |      |
| BUK9508-55B                    |                      | 55                           | 7  | 8.4   | 75  | 0.74                                    |      |
| BUK7507-55B                    |                      | 55                           | 7.1  |   | 75  | 0.74                                    |      |
| BUK7508-55A                    |                      | 55                           | 8  |   | 75  | 0.59                                    |      |
| BUK7509-55A                    |                      | 55                           | 9  |   | 75  | 0.71                                    |      |
| BUK9511-55A                    |                      | 55                           | 10   | 11  | 75  | 0.9                                     |      |
| BUK9512-55B                    |                      | 55                           | 10   | 12  | 75  | 0.95                                    |      |
| BUK7511-55B                    |                      | 55                           | 11   |   | 75  | 0.95                                    |      |
| BUK9514-55A                    |                      | 55                           | 13   | 14  | 73  | 1                                       |      |
| BUK9518-55A                    |                      | 55                           | 16   | 18  | 61  | 1.1                                     |      |
| BUK7516-55A                    |                      | 55                           | 16   |   | 65.7                                      | 1.1                                     |      |
| BUK7520-55A                    |                      | 55                           | 20   |   | 54  | 1.2                                     |      |
| BUK7528-55A                    |                      | 55                           | 28   |   | 42  | 1.5                                     |      |
| BUK9535-55A                    |                      | 55                           | 32   | 35  | 34  | 1.8                                     |      |
| BUK7535-55A                    |                      | 55                           | 35   |   | 35  | 1.7                                     |      |
| BUK9575-55A                    |                      | 55                           | 68   | 75  | 20  | 2.4                                     |      |
| BUK7575-55A                    |                      | 55                           | 75   |   | 20.3                                      | 2.4                                     |      |
| BUK953R5-60E                   |                      | 60                           | 3.4  | 3.7   | 120                                       | 0.51                                    |      |
| BUK954R8-60E                   |                      | 60                           | 4.5  | 4.9   | 100                                       | 0.64                                    |      |
| I <sup>2</sup> PAK<br>(SOT226) |                      | BUK9E06-55B                  | 55   | 5.4   | 6   | 75                                      | 0.58 |
|                                |                      | BUK9E06-55A                  | 55   | 5.8   | 6.3                                       | 75                                      | 0.5  |
|                                |                      | BUK9E08-55B                  | 55   | 7   | 8.4                                       | 75                                      | 0.74 |
|                                |                      | BUK7E2R6-60E                 | 60   | 2.6   |   | 120                                     | 0.43 |
|                                |                      | BUK7E3R5-60E                 | 60   | 3.5   |   | 120                                     | 0.51 |
|                                | BUK7E4R6-60E         | 60                           | 4.6  |   | 100                                       | 0.64                                    |      |
|                                | BUK7E13-60E          | 60                           | 13   |   | 58  | 1.56                                    |      |

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## 75 - 80 V N-channel automotive TrenchMOS

| Package name                      | Type number  | V <sub>DS</sub><br>[max] [V] | R <sub>DSon</sub><br>[max]<br>@ 10 V<br>[mΩ] | R <sub>DSon</sub><br>[max]<br>@ 5 V<br>[mΩ] | I <sub>D</sub><br>[max]<br>@ 25 °C<br>[A] | R <sub>th(j-mb)</sub><br>[max]<br>[K/W] |
|-----------------------------------|--------------|------------------------------|--|---|---|---|
| LFPAK56;<br>Power-SO8<br>(SOT669) | BUK9Y19-75B  | 75                           | 18   | 19  | 48.2                                      | 1.42                                    |
|                                   | BUK7Y18-75B  | 75                           | 18   |   | 49  | 1.42                                    |
|                                   | BUK9Y30-75B  | 75                           | 28   | 30  | 34  | 1.8                                     |
|                                   | BUK7Y28-75B  | 75                           | 28   |   | 35.5                                      | 1.76                                    |
|                                   | BUK9Y58-75B  | 75                           | 53   | 58  | 20.73                                     | 2.53                                    |
|                                   | BUK7Y7R8-80E | 80                           | 7.8  |   | 100                                       | 0.63                                    |
|                                   | BUK9Y8R5-80E | 80                           | 8  | 8.5   | 100                                       | 0.63                                    |
|                                   | BUK7Y9R9-80E | 80                           | 9.9  |   | 89  | 0.77                                    |
|                                   | BUK9Y11-80E  | 80                           | 10   | 11  | 84  | 0.77                                    |
|                                   | BUK9Y14-80E  | 80                           | 14   | 15  | 62  | 1.02                                    |
|                                   | BUK7Y14-80E  | 80                           | 14   |   | 65  | 1.02                                    |
|                                   | BUK9Y25-80E  | 80                           | 25   | 27  | 37  | 1.58                                    |
|                                   | BUK7Y25-80E  | 80                           | 25   |   | 39  | 1.58                                    |
|                                   | BUK9Y41-80E  | 80                           | 41   | 45  | 24  | 2.33                                    |
|                                   | BUK7Y41-80E  | 80                           | 41   |   | 25  | 2.31                                    |
|                                   | BUK9Y72-80E  | 80                           | 72   | 78  | 15  | 3.33                                    |
|                                   | BUK7Y72-80E  | 80                           | 72   |   | 16  | 3.33                                    |
|                                   | BUK9Y107-80E | 80                           | 98   | 107   | 11.8                                      | 4.03                                    |
| BUK7Y98-80E                       | 80           | 98                           |  | 12.3  | 4.03                                      |   |
| D <sup>2</sup> PAK<br>(SOT404)    | BUK9606-75B  | 75                           | 5.5  | 6.1   | 75  | 0.5                                     |
|                                   | BUK7606-75B  | 75                           | 5.6  |   | 75  | 0.5                                     |
|                                   | BUK9609-75A  | 75                           | 8.5  | 9   | 75  | 0.65                                    |
|                                   | BUK7609-75A  | 75                           | 9  |   | 75  | 0.65                                    |
|                                   | BUK7613-75B  | 75                           | 13   |   | 75  | 0.95                                    |
|                                   | BUK9616-75B  | 75                           | 14   | 16.4  | 67  | 0.95                                    |
|                                   | BUK7623-75A  | 75                           | 23   |   | 53  | 1.1                                     |
|                                   | BUK763R8-80E | 80                           | 3.8  |   | 120                                       | 0.43                                    |
|                                   | BUK964R2-80E | 80                           | 4  | 4.2   | 120                                       | 0.43                                    |
|                                   | BUK764R2-80E | 80                           | 4.2  |   | 120                                       | 0.46                                    |
|                                   | BUK964R7-80E | 80                           | 4.5  | 4.7   | 120                                       | 0.46                                    |
|                                   | BUK769R6-80E | 80                           | 9.6  |   | 75  | 0.82                                    |
|                                   | BUK9611-80E  | 80                           | 10   | 11  | 75  | 0.82                                    |
| DPAK<br>(SOT428)                  | BUK7214-75B  | 75                           | 14   |   | 69  | 0.95                                    |
|                                   | BUK9217-75B  | 75                           | 15   | 17  | 64  | 0.95                                    |
|                                   | BUK9226-75A  | 75                           | 24.6   | 26  | 45  | 1.3                                     |
|                                   | BUK7226-75A  | 75                           | 26   |   | 45  | 1                                       |
| TO-220AB<br>(SOT78A)              | BUK9506-75B  | 75                           | 5.5  | 6.1   | 75  | 0.5                                     |
|                                   | BUK7509-75A  | 75                           | 9  |   | 75  | 0.65                                    |
|                                   | BUK7513-75B  | 75                           | 13   |   | 75  | 0.95                                    |
|                                   | BUK753R8-80E | 80                           | 4  |   | 120                                       | 0.43                                    |

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## 100 V N-channel automotive TrenchMOS – Part I

types in **bold** represent new products

| Package name                      | Type number                    | V <sub>DS</sub><br>[max] [V] | R <sub>DSon</sub><br>[max]<br>@ 10 V<br>[mΩ] | R <sub>DSon</sub><br>[max]<br>@ 5 V<br>[mΩ] | I <sub>D</sub><br>[max]<br>@ 25 °C<br>[A] | R <sub>th(j-mb)</sub><br>[max]<br>[K/W] |      |
|-----------------------------------|--------------------------------|------------------------------|--|---|---|---|------|
| LFPAK56;<br>Power-SO8<br>(SOT669) | BUK9Y12-100E                   | 100                          | 11.9   | 12  | 85  | 0.63                                    |      |
|                                   | BUK7Y12-100E                   | 100                          | 12   |   | 85  | 0.63                                    |      |
|                                   | BUK9Y15-100E                   | 100                          | 14.7   | 15  | 69  | 0.77                                    |      |
|                                   | BUK7Y15-100E                   | 100                          | 15   |   | 68  | 0.77                                    |      |
|                                   | BUK9Y19-100E                   | 100                          | 18   | 19  | 56  | 0.9                                     |      |
|                                   | BUK7Y19-100E                   | 100                          | 19   |   | 56  | 0.9                                     |      |
|                                   | BUK9Y22-100E                   | 100                          | 21.5   | 22  | 49  | 1.02                                    |      |
|                                   | BUK7Y22-100E                   | 100                          | 22   |   | 49  | 1.02                                    |      |
|                                   | BUK9Y38-100E                   | 100                          | 37.5   | 38  | 30  | 1.58                                    |      |
|                                   | BUK7Y38-100E                   | 100                          | 38   |   | 30  | 1.58                                    |      |
|                                   | BUK9Y53-100B                   | 100                          | 49   | 53  | 23  | 2                                       |      |
|                                   | BUK7Y53-100B                   | 100                          | 53   |   | 24.8                                      | 1.76                                    |      |
|                                   | BUK9Y65-100E                   | 100                          | 63.3   | 65  | 19  | 2.31                                    |      |
|                                   | BUK7Y65-100E                   | 100                          | 65   |   | 19  | 2.31                                    |      |
|                                   | BUK9Y104-100B                  | 100                          | 99   | 104   | 14.8                                      | 2.53                                    |      |
|                                   | BUK7Y102-100B                  | 100                          | 102  |   | 15  | 2.53                                    |      |
|                                   | BUK9Y113-100E                  | 100                          | 110  | 113   | 12  | 3.33                                    |      |
|                                   | BUK7Y113-100E                  | 100                          | 113  |   | 12  | 3.33                                    |      |
|                                   | BUK9Y153-100E                  | 100                          | 146  | 153   | 9.4                                       | 4.03                                    |      |
|                                   | BUK7Y153-100E                  | 100                          | 153  |   | 9.4                                       | 4.03                                    |      |
| LFPAK56D<br>(SOT1205)             | <b>BUK7K29-100E</b>            | <b>100</b>                   | <b>24.5</b>                                  |   | <b>29.5</b>                               | <b>2.21</b>                             |      |
|                                   | BUK9K29-100E                   | 100                          | 27   | 29  | 30  | 2.21                                    |      |
|                                   | <b>BUK7K32-100E</b>            | <b>100</b>                   | <b>27.5</b>                                  |   | <b>29</b>                                 | <b>2.36</b>                             |      |
|                                   | BUK9K32-100E                   | 100                          | 31   | 33  | 26  | 2.36                                    |      |
|                                   | <b>BUK7K45-100E</b>            | <b>100</b>                   | <b>37.6</b>                                  |   | <b>21.4</b>                               | <b>2.84</b>                             |      |
|                                   | BUK9K45-100E                   | 100                          | 42   | 45  | 21  | 2.84                                    |      |
|                                   | <b>BUK7K89-100E</b>            | <b>100</b>                   | <b>82.5</b>                                  |   | <b>13</b>                                 | <b>3.96</b>                             |      |
|                                   | BUK9K89-100E                   | 100                          | 85   | 89  | 12.5                                      | 3.96                                    |      |
|                                   | <b>BUK7K134-100E</b>           | <b>100</b>                   | <b>121</b>                                   |   | <b>9.8</b>                                | <b>4.68</b>                             |      |
|                                   | BUK9K134-100E                  | 100                          | 154  | 159   | 8.5                                       | 4.68                                    |      |
|                                   | D <sup>2</sup> PAK<br>(SOT404) | BUK765R0-100E                | 100  | 5   |   | 120                                     | 0.43 |
|                                   |                                | BUK965R8-100E                | 100  | 5.6   | 5.8                                       | 120                                     | 0.43 |
| BUK768R1-100E                     |                                | 100                          | 8.1  |   | 100                                       | 0.57                                    |      |
| BUK969R3-100E                     |                                | 100                          | 8.9  | 9.3   | 100                                       | 0.57                                    |      |
| BUK9610-100B                      |                                | 100                          | 9.7  | 10  | 75  | 0.5                                     |      |
| BUK7610-100B                      |                                | 100                          | 10   |   | 75  | 0.5                                     |      |
| BUK7613-100E                      |                                | 100                          | 13   |   | 72  | 0.82                                    |      |
| BUK9615-100E                      |                                | 100                          | 14   | 15  | 66  | 0.82                                    |      |
| BUK9615-100A                      |                                | 100                          | 14.4   | 15  | 75  | 0.65                                    |      |
| BUK9620-100B                      |                                | 100                          | 18.5   | 20  | 63  | 0.75                                    |      |

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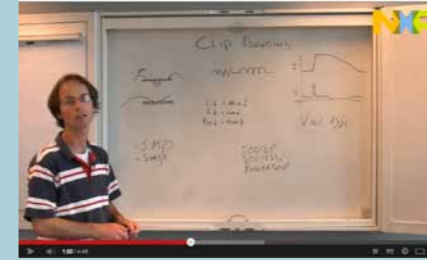
## 100V N-channel automotive TrenchMOS – Part 2

types in **bold** represent new products

| Package name                   | Type number   | V <sub>DS</sub><br>[max] [V] | R <sub>DSon</sub><br>[max]<br>@ 10 V<br>[mΩ] | R <sub>DSon</sub><br>[max]<br>@ 5 V<br>[mΩ] | I <sub>D</sub><br>[max]<br>@ 25 °C<br>[A] | R <sub>th(j-mb)</sub><br>[max]<br>[K/W] |
|--------------------------------|---------------|------------------------------|--|---|---|---|
| D <sup>2</sup> PAK<br>(SOT404) | BUK7620-100A  | 100                          | 20   |   | 63  | 0.75                                    |
|                                | BUK7626-100B  | 100                          | 26   |   | 49  | 0.95                                    |
|                                | BUK9628-100A  | 100                          | 27   | 28  | 49  | 0.9                                     |
|                                | BUK9629-100B  | 100                          | 27   | 29  | 46  | 0.95                                    |
|                                | BUK7628-100A  | 100                          | 28   |   | 47  | 0.9                                     |
|                                | BUK7631-100E  | 100                          | 31   |   | 34  | 1.56                                    |
|                                | BUK7635-100A  | 100                          | 35   |   | 41  | 1                                       |
|                                | BUK9637-100E  | 100                          | 36   | 37  | 31  | 1.56                                    |
|                                | BUK9640-100A  | 100                          | 39   | 40  | 39  | 0.95                                    |
|                                | BUK7640-100A  | 100                          | 40   |   | 37  | 1.1                                     |
|                                | BUK9660-100A  | 100                          | 58   | 60  | 26  | 1.4                                     |
|                                | BUK7660-100A  | 100                          | 60   |   | 26  | 1.4                                     |
|                                | BUK9675-100A  | 100                          | 72   | 75  | 23  | 1.5                                     |
|                                | BUK7675-100A  | 100                          | 75   |   | 23  | 1.5                                     |
|                                | BUK96180-100A | 100                          | 173  | 180   | 11  | 2.8                                     |
| DPAK<br>(SOT428)               | BUK7227-100B  | 100                          | 27   |   | 48  | 0.95                                    |
|                                | BUK9230-100B  | 100                          | 28   | 30  | 47  | 0.95                                    |
|                                | BUK9240-100A  | 100                          | 38.6   | 40  | 33  | 1.3                                     |
|                                | BUK7240-100A  | 100                          | 40   |   | 34  | 1.3                                     |
|                                | BUK9275-100A  | 100                          | 72   | 75  | 21.7                                      | 1.7                                     |
| TO-220AB<br>(SOT78A)           | BUK755R4-100E | 100                          | 5.2  |   | 120                                       | 0.43                                    |
|                                | BUK9510-100B  | 100                          | 9.7  | 10  | 75  | 0.5                                     |
|                                | BUK7510-100B  | 100                          | 10   |   | 75  | 0.5                                     |
|                                | BUK9515-100A  | 100                          | 14.4   | 15  | 75  | 0.65                                    |
|                                | BUK7515-100A  | 100                          | 15   |   | 75  | 0.5                                     |
|                                | BUK9520-100B  | 100                          | 18.5   | 20  | 63  | 0.75                                    |
|                                | BUK9520-100A  | 100                          | 19   | 20  | 63  | 0.75                                    |
|                                | BUK7520-100A  | 100                          | 20   |   | 63  | 0.75                                    |
|                                | BUK7526-100B  | 100                          | 26   |   | 49  | 0.95                                    |
|                                | BUK9529-100B  | 100                          | 27   | 29  | 46  | 0.95                                    |
|                                | BUK7528-100A  | 100                          | 28   |   | 47  | 0.9                                     |
|                                | BUK9535-100A  | 100                          | 34   | 35  | 41  | 1                                       |
|                                | BUK7535-100A  | 100                          | 35   |   | 41  | 1                                       |
|                                | BUK9575-100A  | 100                          | 72   | 75  | 23  | 1.5                                     |
|                                | BUK7575-100A  | 100                          | 75   |   | 23  | 1.5                                     |
| FPAK<br>(SOT226)               | BUK7E5R2-100E | 100                          | 5.2  |   | 120                                       | 0.43                                    |

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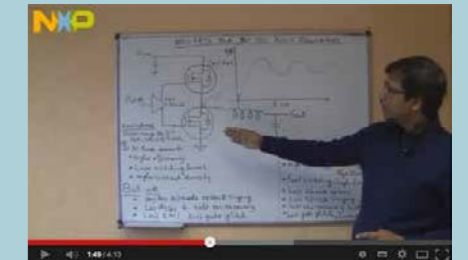
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Next Power Live! MOSFETs for HOT SWAP and Power over Ethernet  
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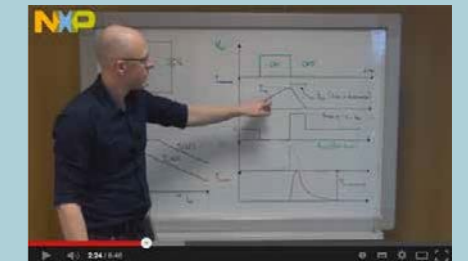
NextPowerS3 MOSFETs for DC/DC buck regulators  
[www.nxp.com/quicklearning32](http://www.nxp.com/quicklearning32)



Reverse recovery and diode leakage in SMPS  
[www.nxp.com/quicklearning33](http://www.nxp.com/quicklearning33)



Power MOSFET operation in Linear Mode  
[www.nxp.com/quicklearning34](http://www.nxp.com/quicklearning34)



Single-shot avalanche ruggedness  
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Power MOSFETs and thermal modelling  
[www.nxp.com/quicklearning43](http://www.nxp.com/quicklearning43)



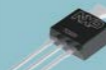
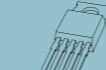


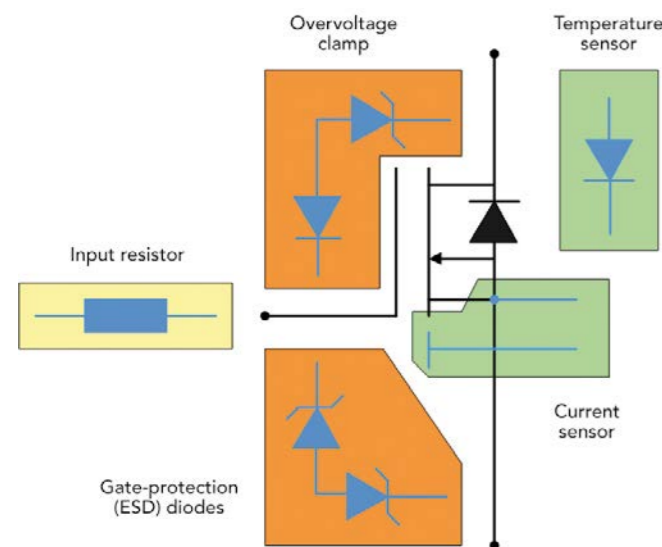
MOSFETs for Power-over-Ethernet (PoE) PSE applications  
[www.nxp.com/quicklearning36](http://www.nxp.com/quicklearning36)

## TrenchPLUS MOSFETs

TrenchPLUS is a range of standard MOSFETs with additional protection features, such as current and temperature sensing components, overvoltage clamps, and gate-protection (ESD) diodes. The system microcontroller can use data gathered from these

sensors to implement cost-effective protection features, thus eliminating the need to design with protected power devices. All the standard products listed below offer one or more "PLUS" features. Custom versions can be developed for high-volume applications.

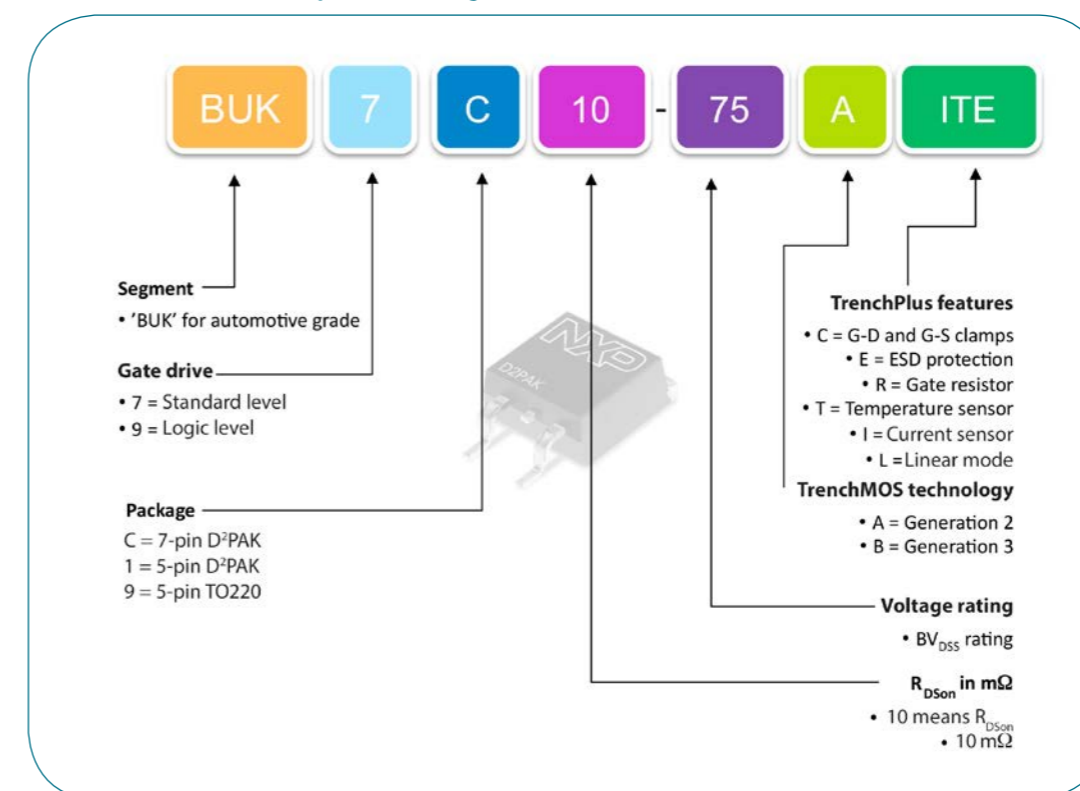
| $V_{DS}$ (V) | $R_{DS(on)}$ (max) @ 10 V (m $\Omega$ ) | $R_{DS(on)}$ (max) @ 5 V (m $\Omega$ ) | $I_D$ (max) @ 25 °C (A) | Temperature sensing | Current sensing | Gate source clamps | Gate drain clamps | Gate resistor | Surface-mount package   |  | Leaded package  |   |
|--------------|---|--|-------------------------|---------------------|-----------------|--------------------|-------------------|---------------|---|--|---|---|
|              |   |  |                         |                     |                 |                    |                   |               | 7-pin D <sup>2</sup> PAK (SOT427)   | 5-pin D <sup>2</sup> PAK (SOT426)  | TO220AB (SOT78C)  | 5-pin TO220 (SOT263B-01)  |
|              |   |  |                         |                     |                 |                    |                   |               |  |  |  |  |
| 34           | 6                                       |  | 75                      |                     |                 | •                  | •                 | •             |   |  | BUK7L06-34ARC   |   |
| 34           | 11                                      |  | 75                      |                     |                 | •                  | •                 | •             |   |  | BUK7L11-34ARC   |   |
| 40           | 4.1                                     |  | 75                      | •                   |                 |                    |                   |               |   |  | BUK714R1-40BT   |   |
| 40           | 5                                       |  | 75                      |                     | •               | •                  |                   |               |   |  | BUK7105-40AIE   | BUK7905-40AIE   |
| 40           | 5                                       |  | 75                      | •                   |                 | •                  |                   |               |   |  | BUK7105-40ATE   | BUK7905-40ATE   |
| 40           | 5                                       |  | 75                      |                     |                 |                    |                   |               |   |  |   | BUK7905-40AI  |
| 40           | 6                                       |  | 75                      | •                   | •               | •                  |                   |               | BUK7C06-40AITE  |  |   |   |



## TrenchPLUS MOSFETs

| $V_{DS}$ (V) | $R_{DS(on)}$ (max) @ 10 V (m $\Omega$ ) | $R_{DS(on)}$ (max) @ 5 V (m $\Omega$ ) | $I_D$ (max) @ 25 °C (A) | Temperature sensing | Current sensing | Gate source clamps | Gate drain clamps | Gate resistor | Surface-mount package   |   | Leaded package  |   |
|--------------|---|--|-------------------------|---------------------|-----------------|--------------------|-------------------|---------------|---|---|---|---|
|              |   |  |                         |                     |                 |                    |                   |               | 7-pin D <sup>2</sup> PAK (SOT427)   | 5-pin D <sup>2</sup> PAK (SOT426)   | TO220AB (SOT78C)  | 5-pin TO220 (SOT263B-01)  |
|              |   |  |                         |                     |                 |                    |                   |               |  |  |  |  |
| 40           | 6.6                                     | 7                                      | 75                      | •                   |                 | •                  | •                 |               |   |   | BUK9107-40ATC   | BUK9907-40ATC   |
| 40           | 8                                       |  | 75                      | •                   |                 | •                  | •                 |               |   |   | BUK7107-40ATC   | BUK7907-40ATC   |
| 40           | 8                                       |  | 75                      |                     | •               | •                  |                   |               |   |   | BUK7108-40AIE   | BUK7908-40AIE   |
| 55           | 6.6                                     | 7                                      | 75                      | •                   |                 | •                  |                   |               |   |   | BUK9107-55ATE   |   |
| 55           | 7                                       |  | 75                      |                     | •               | •                  |                   |               |   |   | BUK7107-55AIE   | BUK7907-55AIE   |
| 55           | 7                                       |  | 75                      | •                   |                 | •                  |                   |               |   |   | BUK7107-55ATE   | BUK7907-55ATE   |
| 55           | 8                                       |  | 75                      | •                   | •               | •                  |                   |               | BUK7C08-55AITE  |   |   |   |
| 55           | 9                                       | 10                                     | 75                      | •                   | •               |                    |                   |               |   |   | BUK9C10-55BIT   |   |
| 75           | 9                                       |  | 75                      |                     | •               | •                  |                   |               |   |   | BUK7109-75AIE   | BUK7909-75AIE   |
| 75           | 9                                       |  | 75                      | •                   |                 | •                  |                   |               |   |   | BUK7109-75ATE   | BUK7909-75ATE   |
| 75           | 10                                      |  | 75                      | •                   | •               | •                  |                   |               |   |   | BUK7C10-75AITE  |   |

### Automotive TrenchPLUS part numbering



# The next generation of packaging

DFN / DSN packages – high performance on a smaller footprint

**100% solderable side pads**

- ▶ Improved electro-thermal behaviour
- ▶ For visual solder inspection

**Heat sink at die pad**

- ▶ For high power on a small footprint
- ▶ Enabling smaller designs

**Smallest packages**

- ▶ Outline down to 0.4 x 0.2 mm
- ▶ Height down to 0.12 mm
- ▶ For ultra-compact and slim designs

True power packages for smart efficiency – with solid wireless-clip design

**The miniaturization of power**

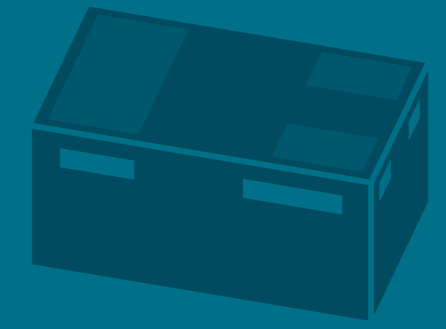
- ▶ Only 1 mm in height
- ▶ Excellent electro-thermal behavior
- ▶ For high-temperature use (175 °C)

**FlatPower: CFP15 (SOT1289) / CFP5 (SOD128) / CFP3 (SOD123W)**

- ▶ Same performance as SMA / SMB on a much smaller footprint

**LFPACK56/56D (SOT669 / SOT1205)**

- ▶ Same performance as DPAK, on a much smaller footprint










## Packages

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### Packing details glass diodes, single ended and through hole packages

| Pins/leads | Package | Packing method and tape/reel/tube dimensions | Package   | Ordering code (12 NC ending)  | Packing quantity |                   |
|------------|---------|--|---|---|------------------|-------------------|
| 2          | SOD27   | 26 mm tape ammo pack, axial                  |    | -143  | 5000 pcs         |                   |
|            |         | 52 mm tape ammo pack, axial                  |   | -133  | 10000 pcs        |                   |
|            |         | 52 mm reel pack, axial                       |   | -113  | 10000 pcs        |                   |
|            | SOD66   | 52 mm tape ammo pack, axial                  |    | -133  | 10000 pcs        |                   |
|            |         | 52 mm reel pack, axial                       |   | -113  | 10000 pcs        |                   |
|            | SOD68   | 26 mm tape ammo pack, axial                  |  | -143  | 5000 pcs         |                   |
|            |         | 52 mm reel pack, axial                       |   | -113  | 10000 pcs        |                   |
|            |         | 52 mm tape ammo pack, axial                  |   | -133  | 10000 pcs        |                   |
|            | 3       | SOT78 (TO-220)                               | Rail packing, 50 pcs/tube, tube length = 520 mm                                     |  | -127             | 20 tubes x 50 pcs |
|            |         | SOT186A (TO-220F)                            | Rail packing, 50 pcs/tube, tube length = 520 mm                                     |  | -127             | 20 tubes x 50 pcs |
|            |         | I2PAK (SOT226)                               | Rail packing, 50 pcs/tube, tube length = 520 mm                                     |  | -127             | 20 tubes x 50 pcs |
|            | 5       | SOT263B-1                                    | Rail packing  |  | -127             | 20 tubes x 50 pcs |

### Package cross reference list – Part I

| Type                 | Competitor  | NXP                         | Pins/Leads | Type                  | Competitor        | NXP                         | Pins/Leads |
|----------------------|-------------|-----------------------------|------------|-----------------------|-------------------|-----------------------------|------------|
| μQFN-10L             | ST          | DFN2510A-10 (SOT1176)       | 10         | FM8                   | Toshiba           | SOT96                       | 8          |
| μQFN-10L             | ST          | DFN2520-9 (SOT1333)         | 9          | FS6*                  | Toshiba           | DFN1010B-6 (SOT1216)        | 6          |
| μQFN-2L              | ST          | DFN1006-2 (SOD882)          | 2          | GMD2                  | Rohm              | DSN0603-2 (SOD962)          | 2          |
| 6 Lead DFN           | ON Semi     | DFN2020-6 (SOT1118)         | 6          | HUML2020L8 (Dual)     | Rohm              | DFN2020-6 (SOT1118)         | 6          |
| CL2                  | Toshiba     | DSN0402-2 (SOD992)          | 2          | HUML2020L8 (Single)   | Rohm              | DFN2020MD-6 (SOT1220)       | 6          |
| CLP0603              | Vishay      | DSN0603-2 (SOD962)          | 2          | KMD2                  | Rohm              | DFN1608D-2 (SOD1608)        | 2          |
| CMAK/ CMPAK          | Renesas     | SOT323                      | 3          | LDPAK(S)-(1)          | Renesas           | D <sup>2</sup> PAK (SOT404) | 3          |
| CMPAK/ CMAK          | Renesas     | SOT323                      | 3          | LFAK                  | Renesas           | LFAK (SOT669)               | 5          |
| CMPAK-5(T)           | Renesas     | SOT353                      | 5          | LG A 1.0 x 0.6mm      | Texas Instruments | DFN1006B-3 (SOT883B)        | 3          |
| CMPAK-6              | Renesas     | SOT363                      | 6          | LLD                   | Renesas           | SOD80C                      | 2          |
| CP4                  | Toshiba     | SOT143B                     | 4          | LLDS                  | Rohm              | SOD80C                      | 2          |
| CS6                  | Toshiba     | DFN1010-6 (SOT891)          | 6          | LLP1006-2L            | Vishay            | DFN1006-2 (SOD882)          | 2          |
| CST3                 | Toshiba     | DFN1006-3 (SOT883)          | 3          | LLP1006-2L            | Vishay            | DFN1006D-2 (SOD882D)        | 2          |
| CST3                 | Toshiba     | DFN1006B-3 (SOT883B)        | 3          | LLP1006-2M            | Vishay            | DFN1006-2 (SOD882)          | 2          |
| CTS2 (fsc)           | Toshiba     | DFN1006-2 (SOD882)          | 2          | LLP1006-2M            | Vishay            | DFN1006D-2 (SOD882D)        | 2          |
| CTS2 (fsc)           | Toshiba     | DFN1006D-2 (SOD882D)        | 2          | LLP75-7L              | Vishay            | DFN1616-6 (SOT1189)         | 6          |
| D <sup>2</sup> PAK   | ON Semi     | D <sup>2</sup> PAK (SOT404) | 3          | LPDS/LPTS             | Rohm              | D <sup>2</sup> PAK (SOT404) | 3          |
| D <sup>2</sup> PAK   | Vishay      | D <sup>2</sup> PAK (SOT404) | 3          | LPTS/LPDS             | Rohm              | D <sup>2</sup> PAK (SOT404) | 3          |
| D <sup>2</sup> PAK 3 | ON Semi     | D <sup>2</sup> PAK (SOT404) | 3          | M-Flat                | Toshiba           | SOD128                      | 2          |
| D <sup>2</sup> PAK*  | Diodes Inc. | D <sup>2</sup> PAK (SOT404) | 3          | Micro 3               | Int. Rectifier    | SOT23                       | 3          |
| DFN1006-3            | Diodes Inc. | DFN1006-3 (SOT883)          | 3          | Micro 6               | Int. Rectifier    | SOT457                      | 6          |
| DFN1006H4-3          | Diodes Inc. | DFN1006-3 (SOT883)          | 3          | Micro FOOT 0.8 x 0.8* | Vishay            | DFN1010D-3 (SOT1215)        | 3          |
| DFN1411*             | Diodes Inc. | DFN1010D-3 (SOT1215)        | 3          | Micro FOOT 1 x 1.2*   | Vishay            | DFN1010D-3 (SOT1215)        | 3          |
| DFN2                 | ST          | DSN0603-2 (SOD962)          | 2          | Micro FOOT 1 x 1.5*   | Vishay            | DFN1010D-3 (SOT1215)        | 3          |
| DPK                  | ON Semi     | DPK (SOT428)                | 3          | Micro FOOT 1.6 x 1.6* | Vishay            | DFN2020MD-6 (SOT1220)       | 6          |
| DS014                | Infineon    | SOT 108                     | 14         | Micro FOOT 1 x 1*     | Vishay            | DFN1010D-3 (SOT1215)        | 3          |
| DSN2, 0.6 x 0.3      | ON Semi     | DSN0603-2 (SOD962)          | 2          | Micro FOOT*           | Vishay            | DFN2020MD-6 (SOT1220)       | 6          |
| DSN2, 0.4 x 0.2      | ON Semi     | DSN0402-2 (SOD992)          | 2          | MicroFET              | Fairchild         | DFN2020MD-6 (SOT1220)       | 6          |
| DSN2, 1.0 x 0.6      | ON Semi     | DSN1006-2 (SOD993)          | 2          | MicroFET 1.6 x 1.6*   | Fairchild         | DFN2020MD-6 (SOT1220)       | 6          |
| DSN2, 1.6 x 0.8      | ON Semi     | DFN1608D-2 (SOD1608)        | 2          | MiniMelf              | Diodes Inc.       | SOD80C                      | 2          |
| DSN2, 1.0 x 0.6      | ON Semi     | DFN1006D-2 (SOD882D)        | 2          | MiniMelf              | ST                | SOD80C                      | 2          |
| DSN2, 1.6 x 0.8      | ON Semi     | DFN1608D-2 (SOD1608)        | 2          | MiniMelf              | Vishay            | SOD80C                      | 2          |
| EMD2                 | Rohm        | SOD523                      | 2          | MP6                   | Renesas           | DSN0603-2 (SOD962)          | 2          |
| EMD3/EMT3            | Rohm        | DFN1006-3 (SOT883)          | 3          | MPAK                  | Renesas           | SOT23                       | 3          |
| EMD5/EMT5            | Rohm        | SOT665                      | 5          | MPAK                  | Renesas           | SOT23                       | 3          |
| EMD6/EMT6/WEMT6      | Rohm        | SOT666                      | 6          | MPAK-4R               | Renesas           | SOT143B                     | 4          |
| EMT3                 | Rohm        | DFN1006-3 (SOT883)          | 3          | MPT3                  | Rohm              | SOT89                       | 3          |
| EMT3/EMD3            | Rohm        | DFN1006-3 (SOT883)          | 3          | PG-TD SON-8           | Infineon          | LFAK (SOT669)               | 5          |
| EMT3F*               | Rohm        | DFN1006-3 (SOT883)          | 3          | PMDT                  | Rohm              | SOD128                      | 2          |
| EMT5*                | Rohm        | SOT666                      | 6          | PMDU                  | Rohm              | SOD123W                     | 2          |
| EMT5/EMD5            | Rohm        | SOT665                      | 5          | PowerDI123            | Diodes Inc.       | SOD123F                     | 2          |
| EMT6                 | Rohm        | SOT666                      | 6          | PowerDI123            | Diodes Inc.       | SOD123W                     | 2          |
| EMT6/EMD6/WEMT6      | Rohm        | SOT666                      | 6          | PowerDI323            | Diodes Inc.       | SOD323F                     | 2          |
| ES6                  | Toshiba     | SOT666                      | 6          | PowerDi5              | Diodes Inc.       | CFP15 (SOT1289)             | 3          |
| ES6 ESV              | Toshiba     | SOT666                      | 6          | PowerFLAT (6 x 5)     | ST                | LFAK (SOT669)               | 5          |
| ESC/TESC             | Toshiba     | SOD523                      | 2          | PowerFLAT (6 x 5)     | ST                | LFAK56D (SOT1205)           | 5          |
| ESM                  | Toshiba     | DFN1006-3 (SOT883)          | 3          | PowerPAK SC-70        | Vishay            | DFN2020-6 (SOT1118)         | 6          |
| ESV                  | Toshiba     | SOT665                      | 5          | PowerPAK SC-70        | Vishay            | DFN2020MD-6 (SOT1220)       | 6          |
| ESV                  | Toshiba     | SOT666                      | 6          | PowerPAK SC-70        | Vishay            | DFN2020MD-6 (SOT1220)       | 6          |

Types with \* show footprint compability only

Package cross reference list – Part 2

| Type                         | Competitor  | NXP                   | Pins/Leads | Type         | Competitor        | NXP                   | Pins/Leads |
|------------------------------|-------------|-----------------------|------------|--------------|-------------------|-----------------------|------------|
| PowerPAK SC706L              | Vishay      | DFN2020-3 (SOT1061)   | 3          | SLP1610N2    | Semtech           | DFN1608D-2 (SOD1608)  | 2          |
| PowerPak SC-70-6L            | Vishay      | DFN2020-6 (SOT1118)   | 6          | SLP1610P4    | Semtech           | DFN2510A-10 (SOT1176) | 10         |
| PowerPAK SC-75*              | Vishay      | DFN2020MD-6 (SOT1220) | 6          | SLP1610P4    | Semtech           | DFN2520-9 (SOT1333)   | 9          |
| PowerPak SC-75-6L*           | Vishay      | DFN2020MD-6 (SOT1220) | 6          | SLP1616P6    | Semtech           | DFN1616-6 (SOT1189)   | 6          |
| PowerPAK SO-8                | Vishay      | LPAK (SOT669)         | 5          | SLP1713P8    | Semtech           | DFN1714-8 (SOT1166)   | 8          |
| PW-Mini                      | Toshiba     | SOT89                 | 3          | SLP1713P8    | Semtech           | DFN1714U-8 (SOT983)   | 8          |
| S08                          | Vishay      | SOT96                 | 8          | SLP2010P8T   | Semtech           | DFN2110-9 (SOT1178)   | 9          |
| SC2                          | Toshiba     | DSN0603-2 (SOD962)    | 2          | SLP2513P12   | Semtech           | DFN2514-12 (SOT1167)  | 12         |
| SC59                         | Diodes Inc. | SOT23                 | 3          | SLP3313P16   | Semtech           | DFN3314-16 (SOT1168)  | 16         |
| SC70                         | ON Semi     | SOT323                | 3          | SM6 VS-6     | Toshiba           | SOT457                | 6          |
| SC-70                        | ON Semi     | SOT323                | 3          | SMA flat     | ST                | SOD128                | 2          |
| SC-70, 3 leads               | Vishay      | SOT323                | 3          | SMD TO-263   | Renesas           | D*PAK (SOT404)        | 3          |
| SC70-3                       | Vishay      | SOT323                | 3          | SMD0402      | Rohm              | DSN0402-2 (SOD992)    | 2          |
| SC70-3                       | AOS         | SOT323                | 3          | SMD6/SMT6    | Rohm              | SOT457                | 6          |
| SC70-5L                      | Semtech     | SOT353                | 5          | SMD6/SMZ6    | Rohm              | SOT457                | 6          |
| SC70-6                       | Vishay      | SOT363                | 6          | SMFPAK-6     | Renesas           | SOT666                | 6          |
| SC70-6                       | AOS         | SOT363                | 6          | S-Mini       | Toshiba           | SOT23                 | 3          |
| SC70-6                       | Fairchild   | SOT363                | 6          | S-Mini TSM   | Toshiba           | SOT23                 | 3          |
| SC70-6L                      | Semtech     | SOT363                | 6          | SMPAK        | Renesas           | DFN1006-3 (SOT883)    | 3          |
| SC74 TSOP6                   | Infineon    | SOT457                | 6          | SMPC TO-277A | Vishay            | CFP15 (SOT1289)       | 3          |
| SC-74 TSOP-6                 | ON Semi     | SOT457                | 6          | SMT3         | Rohm              | SOT23                 | 3          |
| SC75                         | Infineon    | DFN1006-3 (SOT883)    | 3          | SMT5*        | Rohm              | SOT457                | 6          |
| SC75                         | ON Semi     | DFN1006-3 (SOT883)    | 3          | SMT6         | Rohm              | SOT457                | 6          |
| SC-75                        | ON Semi     | DFN1006-3 (SOT883)    | 3          | SMZ6/SMD6    | Rohm              | SOT457                | 6          |
| SC-75                        | Semtech     | DFN1006-3 (SOT883)    | 3          | SO-8 FL      | ON Semi           | LPAK (SOT669)         | 5          |
| SC75A                        | Vishay      | DFN1006-3 (SOT883)    | 3          | SOD-123      | ST                | SOD123F               | 2          |
| SC-75A                       | Vishay      | DFN1006-3 (SOT883)    | 3          | SOD-123-FL   | ON Semi           | SOD123F               | 2          |
| SC79                         | Infineon    | SOD523                | 2          | SOD-123-FL   | ON Semi           | SOD123W               | 2          |
| SC-88                        | ON Semi     | SOT363                | 6          | SOD323       | Infineon          | SOD323                | 2          |
| SC88/SC 7 0-6/SOT 363 6 LEAD | ON Semi     | SOT363                | 6          | SOD323       | Vishay            | SOD323                | 2          |
| SC-88A                       | ON Semi     | SOT353                | 5          | SOD323       | Semtech           | SOD323                | 2          |
| SC89                         | Fairchild   | SOT666                | 6          | SOD-323      | ON Semi           | SOD323                | 2          |
| SC-89                        | Semtech     | SOT666                | 6          | SOD-323      | Diodes Inc.       | SOD323                | 2          |
| SC89-3                       | Vishay      | DFN1006-3 (SOT883)    | 3          | SOD-323      | ST                | SOD323                | 2          |
| SC89-3                       | ON Semi     | DFN1006-3 (SOT883)    | 3          | SOD523       | Diodes Inc.       | SOD523                | 2          |
| SC89-3                       | Fairchild   | DFN1006-3 (SOT883)    | 3          | SOD523       | Vishay            | SOD523                | 2          |
| SC89-6                       | Vishay      | SOT666                | 6          | SOD523       | Semtech           | SOD523                | 2          |
| SC89-6                       | AOS         | SOT666                | 6          | SOD-523      | ON Semi           | SOD523                | 2          |
| SC89-6                       | Fairchild   | SOT666                | 6          | SOD-523      | ST                | SOD523                | 2          |
| SC89-6lead                   | Vishay      | SOT666                | 6          | SOD882       | ST                | DFN1006-2 (SOD882)    | 2          |
| S-Flat                       | Toshiba     | SOD123F               | 2          | SOD882T      | ST                | DFN1006D-2 (SOD882D)  | 2          |
| S-Flat                       | Toshiba     | SOD123W               | 2          | SOD923-2*    | ON Semi           | DFN1006-2 (SOD882)    | 2          |
| SLP0402P2X3                  | Semtech     | DSN0402-2 (SOD992)    | 2          | SOIC-8 NB    | ON Semi           | SOT96                 | 8          |
| SLP1006P2                    | Semtech     | DFN1006-2 (SOD882)    | 2          | SON 2x2      | Texas Instruments | DFN2020MD-6 (SOT1220) | 6          |
| SLP1006P2T                   | Semtech     | DFN1006D-2 (SOD882D)  | 2          | SON 3x3*     | Texas Instruments | DFN2020MD-6 (SOT1220) | 6          |
| SLP1006P3                    | Semtech     | DFN1006-3 (SOT883)    | 3          | SOP8         | Rohm              | SOT96                 | 8          |
| SLP1006P3T                   | Semtech     | DFN1006B-3 (SOT883B)  | 3          | SOP-8        | Renesas           | SOT96                 | 8          |
| SLP1510N6                    | Semtech     | DFN1410-6 (SOT886)    | 6          | SOPH         | Rohm              | SOT 108               | 14         |
|                              |             |                       |            | SOT 143      | Infineon          | SOT143B               | 4          |

Types with \* show footprint compability only

Package cross reference list – Part 3

| Type     | Competitor  | NXP                   | Pins/Leads | Type                   | Competitor  | NXP                    | Pins/Leads |
|----------|-------------|-----------------------|------------|------------------------|-------------|------------------------|------------|
| SOT063*  | ON Semi     | DFN101 OB-6 (SOT1216) | 6          | SOT666                 | Infineon    | SOT666                 | 6          |
| SOT-143  | Semtech     | SOT143B               | 4          | SOT723*                | ON Semi     | DFN1010D-3 (SOT1215)   | 3          |
| SOT-143  | Diodes Inc. | SOT143B               | 4          | SOT723-3*              | ON Semi     | DFN1010D-3 (SOT1215)   | 3          |
| SOT223   | Vishay      | SOT223                | 4          | SOT89                  | Infineon    | SOT89                  | 3          |
| SOT223   | Infineon    | SOT223                | 4          | SOT89                  | Diodes Inc. | SOT89                  | 3          |
| SOT223   | Fairchild   | SOT223                | 4          | SOT-89                 | ON Semi     | SOT89                  | 3          |
| SOT223   | ON Semi     | SOT223                | 4          | SOT89-3L               | Diodes Inc. | SOT89                  | 3          |
| SOT223   | Diodes Inc. | SOT223                | 4          | SOT963                 | ON Semi     | DFN1010-6 (SOT891)     | 6          |
| SOT-223  | ON Semi     | SOT223                | 4          | SOT963*                | Diodes Inc. | DFN1010B-6 (SOT1216)   | 6          |
| SOT-223  | Diodes Inc. | SOT223                | 4          | SRP-F                  | Renesas     | SOD123W                | 2          |
| SOT23    | Infineon    | SOT23                 | 3          | SS CSP2                | Toshiba     | DFN1006-3 (SOT883)     | 3          |
| SOT23    | ST          | SOT23                 | 3          | SSD3/SST3              | Rohm        | SOT23                  | 3          |
| SOT23    | Vishay      | SOT23                 | 3          | SSM                    | Toshiba     | DFN1006-3 (SOT883)     | 3          |
| SOT23    | Semtech     | SOT23                 | 3          | SSOT3                  | Fairchild   | SOT23                  | 3          |
| SOT23    | Diodes Inc. | SOT23                 | 3          | SSOT6                  | Fairchild   | SOT457                 | 6          |
| SOT23    | AOS         | SOT23                 | 3          | SSOT6 FLMP             | Fairchild   | SOT457                 | 6          |
| SOT23    | ON Semi     | SOT23                 | 3          | SST3                   | Rohm        | SOT23                  | 3          |
| SOT-23   | ON Semi     | SOT23                 | 3          | SST3/SSD3              | Rohm        | SOT23                  | 3          |
| SOT-23   | Diodes Inc. | SOT23                 | 3          | ST01005                | STM         | DSN0402-2 (SOD992)     | 2          |
| SOT23-3  | Diodes Inc. | SOT23                 | 3          | Stmite flat            | ST          | SOD123W                | 2          |
| SOT23-3  | AOS         | SOT23                 | 3          | T0263                  | Diodes Inc. | D*PAK(SOT404)          | 3          |
| SOT23-3  | ON Semi     | SOT23                 | 3          | T0263-3                | Infineon    | D*PAK (SOT404)         | 3          |
| SOT23-5  | AOS         | SOT457                | 6          | Thin PowerPAK SC70     | Vishay      | DFN2020MD-6 (SOT1220)  | 6          |
| SOT23-5  | Diodes Inc. | SOT457                | 6          | Thin PowerPAK SC-70    | Vishay      | DFN2020-6 (SOT1118)    | 6          |
| SOT23-6  | Diodes Inc. | SOT457                | 6          | Thin PowerPAK SC-70    | Vishay      | DFN2020MD-6 (SOT1220)  | 6          |
| SOT23-6  | ST          | SOT457                | 6          | Thin PowerPAK SC75*    | Vishay      | DFN2020MD-6 (SOT1220)  | 6          |
| SOT23-6  | Diodes Inc. | SOT457                | 6          | TO-220S                | Renesas     | D*PAK (SOT404)         | 3          |
| SOT23-6L | Semtech     | SOT457                | 6          | TO-220SM               | Toshiba     | D*PAK (SOT404)         | 3          |
| SOT23F   | Toshiba     | SOT23                 | 3          | TO-252 (MP-3ZK)        | Renesas     | DPAK (SOT428)          | 3          |
| SOT23F   | Diodes Inc. | SOT23                 | 3          | TO-252 reverse, TO-252 | Vishay      | DPAK (SOT428)          | 3          |
| SOT26    | Diodes Inc. | SOT457                | 6          | TO-252, TO-252 reverse | Vishay      | DPAK (SOT428)          | 3          |
| SOT323   | Infineon    | SOT323                | 3          | TO-252-3/-3-23         | Infineon    | DPAK (SOT428)          | 3          |
| SOT323   | Diodes Inc. | SOT323                | 3          | TO-263 3-lead          | Vishay      | D*PAK (SOT404)         | 3          |
| SOT323   | Fairchild   | SOT323                | 3          | TO-263AB               | Vishay      | D*PAK (SOT404)         | 3          |
| SOT-323  | Diodes Inc. | SOT323                | 3          | TSLP-2-1               | Infineon    | DFN1006-2 (SOD882)     | 2          |
| SOT-323  | ST          | SOT323                | 3          | TSLP-2-7/-17           | Infineon    | DFN1006D-2 (SOD882D)   | 2          |
| SOT353   | Diodes Inc. | SOT353                | 5          | TSLP-3-1, -15          | Infineon    | DFN1006B-3 (SOT883B)   | 3          |
| SOT353   | Vishay      | SOT353                | 5          | TSLP-3-4               | Infineon    | DFN1006-3 (SOT883)     | 3          |
| SOT353   | Diodes Inc. | SOT363                | 6          | TSLP-9-1               | Infineon    | DFN2510A-10 (SOT 1176) | 10         |
| SOT363   | Infineon    | SOT363                | 6          | TSLP-9-1               | Infineon    | DFN2520-9 (SOT1333)    | 9          |
| SOT363   | Diodes Inc. | SOT363                | 6          | TSMT5*                 | Rohm        | SOT457                 | 6          |
| SOT-363  | Diodes Inc. | SOT363                | 6          | TSMT6                  | Rohm        | SOT457                 | 6          |
| SOTS23   | Diodes Inc. | DFN1006-3 (SOT883)    | 3          | TSNP-2-2               | Infineon    | DFN1608D-2 (SOD 1608)  | 2          |
| SOTS23F  | Fairchild   | DFN1006-3 (SOT883)    | 3          | TSOP6                  | Vishay      | SOT457                 | 6          |
| SOT-553  | ON Semi     | SOT665                | 5          | TSOP6                  | AOS         | SOT457                 | 6          |
| SOT563   | Diodes Inc. | SOT666                | 6          | TSOP6                  | ON Semi     | SOT457                 | 6          |
| SOT-563  | ON Semi     | SOT666                | 6          | TSOP-6                 | Renesas     | SOT457                 | 6          |
| SOTS63-6 | ON Semi     | SOT666                | 6          | TSOP-6/ TSOP6          | Vishay      | SOT457                 | 6          |
| SOTS63F  | Fairchild   | SOT666                | 6          | TSSLP-2-1              | Infineon    | DSN0603-2 (SOD962)     | 2          |

Types with \* show footprint compability only

Package cross reference list – Part 4

| Type                               | Competitor  | NXP                   | Pins/Leads |
|------------------------------------|-------------|-----------------------|------------|
| TSSOP20                            | Toshiba     | SOT360                | 20         |
| TSSOP20                            | Renesas     | SOT360                | 20         |
| TSST8*                             | Rohm        | DFN2020MD-6 (SOT1220) | 6          |
| TUMT3                              | Rohm        | SOT323                | 3          |
| TUMT5*                             | Rohm        | DFN2020-6 (SOT1118)   | 6          |
| TUMT6*                             | Rohm        | DFN2020-6 (SOT1118)   | 6          |
| UDFN 1.6 x 1.6                     | ON Semi     | DFN1616-6 (SOT1189)   | 6          |
| UDFN 1.7 x 1.35, 0.4P              | ON Semi     | DFN1714U-8 (SOT983)   | 8          |
| UDFN 10 2.5 x 1, 0.5P              | ON Semi     | DFN2520-9 (SOT1333)   | 9          |
| UDFN 10 2.5 x 2                    | ON Semi     | DFN2520-9 (SOT1333)   | 9          |
| UDFN10 2.5 x 1, 0.5P               | ON Semi     | DFN2510A-10 (SOT1176) | 10         |
| UDFN12, 2.5 x 1.35, 0.4P           | ON Semi     | DFN2514-12 (SOT1167)  | 12         |
| U-DFN2020-3 Type B 2.0 x 2.0 x 0.6 | Diodes Inc. | DFN2020-3 (SOT1061)   | 3          |
| U-DFN2020-6                        | Diodes Inc. | DFN2020MD-6 (SOT1220) | 6          |
| UDFN2020-6 Type B                  | Diodes Inc. | DFN2020-6 (SOT1118)   | 6          |
| UDFN2020-6 Type E                  | Diodes Inc. | DFN2020MD-6 (SOT1220) | 6          |
| U-DFN2523-6*                       | Diodes Inc. | DFN2020MD-6 (SOT1220) | 6          |
| UDFN6                              | Toshiba     | DFN2020-6 (SOT1118)   | 6          |
| UDFN6                              | ON Semi     | DFN2020MD-6 (SOT1220) | 6          |
| UDFN-6 WDFN6                       | ON Semi     | DFN2020MD-6 (SOT1220) | 6          |
| UDFN6B                             | Toshiba     | DFN2020MD-6 (SOT1220) | 6          |
| UDRN 16 4 x 2                      | ON Semi     | DFN4020-14 (SOT1334)  | 14         |
| UF6                                | Toshiba     | SOT363                | 6          |
| UF6/ USV/ US6                      | Toshiba     | SOT363                | 6          |
| UFP                                | Renesas     | SOD523                | 2          |
| UMD2                               | Rohm        | SOD323F               | 2          |
| UMD3/UMT3                          | Rohm        | SOT323                | 3          |
| UMD5/UMT5                          | Rohm        | SOT353                | 5          |
| UMD6/ UMT6                         | Rohm        | SOT363                | 6          |
| UMLP 1.6 x 1.6*                    | Fairchild   | DFN2020MD-6 (SOT1220) | 6          |
| UMT3                               | Rohm        | SOT323                | 3          |
| UMT3F*                             | Rohm        | SOT323                | 3          |
| UMT5/ UMD5                         | Rohm        | SOT353                | 5          |
| UMT6                               | Rohm        | SOT363                | 6          |
| UMT6/ UMD6                         | Rohm        | SOT363                | 6          |
| UPAK (SOT89)                       | Renesas     | SOT89                 | 3          |
| URP                                | Renesas     | SOD323                | 2          |
| US6                                | Toshiba     | SOT363                | 6          |
| US6/ UF6/ USV                      | Toshiba     | SOT363                | 6          |
| use                                | Toshiba     | SOD323                | 2          |
| US-Flat                            | Toshiba     | SOD323F               | 2          |
| USM                                | Toshiba     | SOT323                | 3          |
| USV                                | Toshiba     | SOT353                | 5          |
| USV                                | Toshiba     | SOT363                | 6          |
| USV/ US6/ UF6/                     | Toshiba     | SOT363                | 6          |
| VESM*                              | Toshiba     | DFN1010D-3 (SOT1215)  | 3          |
| VML0806*                           | Rohm        | DFN1006B-3 (SOT883B)  | 3          |
| VML1006                            | Rohm        | DFN1006-3 (SOT883)    | 3          |

Types with \* show footprint compability only

Package cross reference matrix – Part I

| Pins/Leads     | NXP                  | Industry standard names | Size (l x w x h) (mm) | P <sub>tot</sub> (mW) | Package          | Competitor synonyms |            |                      |                                    |                 |                 |                                    |                                |                 |        |
|----------------|----------------------|-------------------------|-----------------------|-----------------------|------------------|---------------------|------------|----------------------|------------------------------------|-----------------|-----------------|------------------------------------|--------------------------------|-----------------|--------|
|                |                      |                         |                       |                       |                  | Rohm                | Toshiba    | ON Semi              | Renesas                            | Infineon        | Diodes Inc      | ST                                 | Vishay                         | Semtech         |        |
| 2              | DSN0402-2 (SOD992)   |                         | 0.4 x 0.2 x 0.12      |                       |                  | SMD0402             | CL2        | DSN2 0.4 x 0.2       |                                    | WLL-2-2         |                 | ST01005                            |                                | SLP0402P2X3     |        |
|                | DSN1006-2 (SOD993)   |                         | 1.0 x 0.6 x 0.3       |                       |                  |                     |            | DSN2 1.0 x 0.6       |                                    |                 |                 |                                    |                                |                 |        |
|                | DSN1006U-2 (SOD995)  |                         | 1.0 x 0.6 x 0.3       |                       |                  |                     |            | DSN2 1.0 x 0.6       |                                    |                 |                 |                                    |                                |                 |        |
|                | DFN1006-2 (SOD882)   |                         | 1.0 x 0.6 x 0.48      | 250                   |                  | (VMN2)              | CTS2 (fSC) | (SOD923-2)           |                                    | TSLP-2-1        | XI-DFN1006-2    | SOD 882 uQFN-2L                    | LLP1006-2M LLP1006-2L          | SLP1006P2       |        |
|                | DFN1006D-2 (SOD882D) |                         | 1.0 x 0.6 x 0.37      | 250                   |                  | (VMN2)              | CTS2 (fSC) | DSN2 1.0 x 0.6       |                                    | TSLP-2-7/ -17   | X2-DFN1006-2    | SOD882T                            | LLP1006-2L LLP1006-2M          | SLP1006P2T      |        |
|                | DFN1608D-2 (SOD1608) |                         | 1.6 x 0.8 x 0.37      | 780                   |                  | KMD2                |            | DSN2 1.6 x 0.8       |                                    | TSNP-2-2        |                 |                                    |                                | SLP1610N2       |        |
|                | DSN0603-2 (SOD962)   |                         | 0.6 x 0.3 x 0.3       | 525                   |                  | GMD2                | SC2        | DSN2, X3DFN-2 WLCSP2 | MP6                                | TSS-LP-2-1      | X3-DFN0603-2    | DFN2                               | CLP0603                        | SLP0603P2X3     |        |
|                | SOD80C               | Mini-Melf               |                       | 3.5 x 1.5 x 1.5       | 300              |                     | LLDS       |                      | LLD                                |                 | MiniMelf        | MiniMelf                           | MiniMelf                       |                 |        |
|                | SOD123F              |                         |                       | 2.6 x 1.6 x 1.1       | 830              |                     |            | S-Flat               | SOD-123-FL                         |                 | PowerDI123      | SOD-123                            |                                |                 |        |
|                | SOD123W              |                         |                       | 2.6 x 1.7 x 1.0       | 900              |                     | PMDU       | S-Flat               | SOD-123-FL                         | SRP-F           | PowerDI123      | Stmite flat                        |                                |                 |        |
|                | SOD128               |                         |                       | 3.8 x 2.5 x 1.0       | 1000             |                     | PMDT       | M-Flat               |                                    |                 |                 | SMA flat                           |                                |                 |        |
|                | SOD323               | SC-76                   |                       | 1.7 x 1.25 x 0.95     | 400              |                     |            | USC                  | SOD-323                            | URP             | SOD323          | SOD-323                            | SOD-323                        | SOD323          | SOD323 |
|                | SOD323F              | SC-90                   |                       | 1.7 x 1.25 x 0.7      | 830              |                     | UMD2       | US-Flat              |                                    |                 | PowerDI323      |                                    |                                |                 |        |
|                | SOD523               | SC-79                   |                       | 1.2 x 0.8 x 0.6       | 500              |                     | EMD2       | ESC/ TESC            | SOD-523                            | UFP             | SC79            | SOD523                             | SOD-523                        | SOD523          | SOD523 |
|                | 3                    | CFP15 (SOT1289)         |                       | 5.8 x 4.3 x 0.78      | 1200             |                     |            |                      |                                    |                 | PowerDi5        |                                    | SMPC TO-277A                   |                 |        |
|                |                      | DFN1006-3 (SOT883)      | SC-101                | 1.0 x 0.6 x 0.48      | 250              |                     | VML1006    | SS CSP2              | XDFN3                              |                 | TSLP-3-4        | X1 -DFN 1006-3                     |                                | SLP1006P3       |        |
|                |                      | DFN1006B-3 (SOT883B)    |                       | 1.0 x 0.6 x 0.37      | 250              |                     | VML1006    | CST3                 | XDFN3                              |                 | TSLP-3-1, -15   | X2-DFN1006-3                       |                                | SLP1006P3T      |        |
|                |                      | DFN1010D-3 (SOT1215)    |                       | 1.1 x 1.0 x 0.37      | 325              |                     | (VMT3)     | (VESM)               | (SOT723)                           |                 |                 | X2-DFN1010-3                       |                                |                 |        |
|                |                      | DFN2020-3 (SOT1061)     | HU-SON3               | 2.0 x 2.0 x 0.62      | 1300             |                     |            |                      |                                    | WDFN3           |                 | U-DFN2020-3 Type B 2.0 x 2.0 x 0.6 |                                | PowerPAK SC706L |        |
|                |                      | DFN2020D-3 (SOT1061D)   |                       | 2.0 x 2.0 x 0.62      | 1300             |                     |            |                      |                                    | WDFN3           |                 | U-DFN2020-3 Type B 2.0 x 2.0 x 0.6 |                                | PowerPAK SC706L |        |
| DPAK (SOT428)  |                      |                         | 6.6 x 6.1 x 2.3       |                       |                  |                     |            |                      | DPAK                               | TO-252 (MP-3ZK) | TO-252-3/-3-2 3 |                                    | TO-252, TO-252 reverse         |                 |        |
| D2PAK (SOT404) |                      |                         | 11.0 x 11.0 x 4.3     |                       |                  | LPDS/ LPTS          | TO-220SM   | D2PAK D2PAK 3        | TO-220S / SMD TO-263 LDKPAK(S)-(1) | T0263-3         | T0263 (D2PAK)   |                                    | TO-263 3-lead TO-263AB / D2PAK |                 |        |
| SOT23          |                      |                         | 2.9 x 1.3 x 1.0       | 250                   |                  | SSD3/ SST3          | S-Mini TSM | SOT-23               | MPAK                               | SOT23           | SOT-23          | SOT23                              | SOT23                          | SOT23           |        |
| SOT89          |                      | SC-62                   | 4.5 x 2.5 x 1.5       | 1300                  |                  | MPT3                | PW-Mini    | SOT-89               | UPAK (SOT89)                       | SOT89           | SOT89           |                                    |                                |                 |        |
| SOT323         | SC-70                | 2.0 x 1.25 x 0.95       | 200                   |                       | UMD3/ UMT3 TUMT3 | USM                 | SC-70      | CMAK/ CMPAK          | SOT323                             | SOT-323         | SOT-323         | SC-70 3 leads                      | SOT-323                        |                 |        |

Types in brackets (...) show footprint compability only



Package cross reference matrix – Part 2

| Pins/leads | NXP                   | Industry standard names | Size (l x w x h) (mm) | P <sub>tot</sub> (mW) | Package | Competitor synonyms  |             |                                |           |             |                   |                 |                                    |            |
|------------|-----------------------|-------------------------|-----------------------|-----------------------|---------|----------------------|-------------|--------------------------------|-----------|-------------|-------------------|-----------------|------------------------------------|------------|
|            |                       |                         |                       |                       |         | Rohm                 | Toshiba     | ON Semi                        | Renesas   | Infineon    | Diodes Inc        | ST              | Vishay                             | Semtech    |
| 4          | LFPAK56 (SOT669)      | Power-S08               | 4.9 x 4.45 x 1.0      | 3000                  |         |                      |             | SO-8 FL                        | LFPAK     | PG-TD-SON-8 | Power-DI5060-8    | PowerFLAT (6x5) | PowerPAK SO-8                      |            |
|            | SOT143B               |                         | 2.9 x 1.3 x 1.0       | 250                   |         |                      | CP4         |                                | MPAK-4R   | SOT143      | SOT-143           |                 |                                    | SOT-143    |
|            | SOT223                | SC-73                   | 6.5 x 3.5 x 1.65      | 1700                  |         |                      |             | SOT-223                        |           | SOT223      | SOT-223           |                 | SOT223                             |            |
| 5          | SOT353                | SC-88 A                 | 2.0 x 1.25 x 0.95     | 300                   |         | UMD5/UMT5            | USV         | SC-88 A                        | CMPAK-5C0 |             | SOT353            |                 | SOT353                             | SC70-5L    |
|            | SOT665                |                         | 1.6 x 1.2 x 0.55      | 300                   |         | EMD5/EMT5            | ESV         | SOT-553                        | VSON-5    |             |                   |                 |                                    |            |
| 6          | DFN1010-6 (SOT891)    | x SON6                  | 1.0 x 1.0 x 0.48      |                       |         |                      | CS6         | SOT963                         |           |             |                   |                 |                                    |            |
|            | DFN1010B-6 (SOT1216)  |                         | 1.1 x 1.0 x 0.37      | 350                   |         | VMT6)                | (FS6)       | (SOT063)                       |           |             | (SOT963)          |                 |                                    |            |
|            | DFN1410-6 (SOT886)    | x SON6                  | 1.45 x 1.0 x 0.48     | 250                   |         |                      |             |                                |           |             |                   |                 |                                    | SLP1510N6  |
|            | DFN1616-6 (SOT1189)   | H x SON6                | 1.6 x 1.6 x 0.48      |                       |         |                      |             | UDFN 1.6 x 1.6                 |           |             |                   |                 | LLP75-/L                           | SLP1616P6  |
|            | DFN2020-6 (SOT1118)   |                         | 2.0 x 2.0 x 0.62      | 1300                  |         | HU-ML2020L8 (Dual)   | UDFN6       | 6 Lead DFN WDFN6               |           |             | UDFN2020-6 Type B |                 | PowerPAK SC-70 Thin PowerPAK SC-70 |            |
|            | DFN2020D-6 (SOT1118D) |                         | 2.0 x 2.0 x 0.62      | 1300                  |         | HU-ML2020L8 (Dual)   | UDFN6       | 6 Lead DFN WDFN6               |           |             | UDFN2020-6 Type B |                 | PowerPAK SC-70 Thin PowerPAK SC-70 |            |
| 8          | DFN2020MD-6 (SOT1220) |                         | 2.0 x 2.0 x 0.62      | 1250                  |         | HU-ML2020L8 (Single) | UDFN6B      | UDFN-6 WDFN6                   |           |             | UDFN2020-6 Type E |                 | PowerPAK SC-70 Thin PowerPAK SC-70 |            |
|            | SOT363                | SC-88                   | 2.0 x 1.25 x 0.95     | 300                   |         | UMD6/UMT6            | US6 UF6 USV | SC-88                          | CMPAK-6   | SOT363      | SOT-363           |                 | SC70-6                             | SC70-6L    |
|            | SOT457                | SC-74                   | 2.9 x 1.5 x 1.0       | 750                   |         | SMD6/SMT6            | SM6 VS-6    | SC-74 TSOP-6                   | TSOP-6    | SC74 TSOP6  | SOT23-6 SOT26     |                 | TSOP6 TSOP-6                       | SOT23-6L   |
|            | SOT666                |                         | 1.6 x 1.2 x 0.55      | 300                   |         | EMD6/EMT6 WEMT6      | ES6 ESV     | SOT-563                        | SMFPAK-6  | SOT666      | SOT563            |                 | SC89-6lead                         | SC-89      |
| 8          | LFPAK56D (SOT1205)    |                         | 4.9 x 4.45 x 1.0      | 3000                  |         |                      |             |                                |           |             |                   | PowerFLAT (6x5) |                                    |            |
|            | SOT96                 | S08                     | 4.9 x 3.9 x 1.75      | 1500                  |         |                      | SOP8        | FM8                            | SOIC-8 NB | SOP-8       |                   |                 | S08                                |            |
|            | DFN1714-8 (SOT1166)   | HUSON8                  | 1.7 x 1.35 x 0.52     |                       |         |                      |             |                                |           |             |                   |                 |                                    | SLP1713P8  |
| 9          | DFN1714U-8 (SOT983)   | H x SON8                | 1.7 x 1.35 x 0.48     |                       |         |                      |             | UDFN 1.7 x 1.35, 0.4P          |           |             |                   |                 |                                    | SLP1713P8  |
|            | DFN2110-9 (SOT1178)   | x SON9                  | 2.1 x 1.0 x 0.48      |                       |         |                      |             |                                |           |             |                   |                 |                                    | SLP2010P8T |
| 10         | DFN2520-9 (SOT1333)   |                         |                       |                       |         |                      |             | WDFN 10 2.5 x 2 UDFN10 2.5 x 2 |           |             |                   |                 |                                    |            |
|            | DFN2510-10 (SOT1165)  | x SON10                 | 2.5 x 1.0 x 0.48      |                       |         |                      |             | UDFN10 2.5 x 1, 0.5P           |           | TSLP-9-1    |                   | pQFN-10L        |                                    | SLP1610P4  |
|            | DFN2510A-10 (SOT1176) | x SON10                 | 2.5 x 1.0 x 0.48      |                       |         |                      |             | UDFN10 2.5 x 1, 0.5P           |           | TSLP-9-1    |                   | pQFN-10L        |                                    | SLP1610P4  |
|            | DFN2626-10 (SOT1197)  |                         | 2.6 x 2.6 x 0.48      |                       |         |                      |             | UDFN10 2.6 x 2.6, 0.5P         |           |             |                   |                 |                                    | SLP2626P10 |

Types in brackets (...) show footprint compatibility only

Package cross reference matrix – Part 3

| Pins/leads | NXP                  | Industry standard names | Size (l x w x h) (mm) | P <sub>tot</sub> (mW) | Package | Competitor synonyms |         |                             |         |          |            |         |         |            |
|------------|----------------------|-------------------------|-----------------------|-----------------------|---------|---------------------|---------|-----------------------------|---------|----------|------------|---------|---------|------------|
|            |                      |                         |                       |                       |         | Rohm                | Toshiba | ON Semi                     | Renesas | Infineon | Diodes Inc | ST      | Vishay  | Semtech    |
| 12         | DFN2512-12 (SOT1158) | H x SON12               | 2.5 x 1.2 x 0.48      |                       |         |                     |         | UDFN12, 2.5 x 1.2, 0.4P     |         |          |            |         |         |            |
|            | DFN2514-12 (SOT1167) | HU-SON12                | 2.5 x 1.35 x 0.53     |                       |         |                     |         | UDFN12, 2.5 x 1.35, 0.4P    |         |          |            |         |         | SLP2513P12 |
| 14         | DFN4020-14 (SOT1334) |                         | 4.0 x 2.0 x 0.48      |                       |         |                     |         | WDFN 16 4 x 2 UDRN 16 4 x 2 |         |          |            |         |         |            |
|            | SOT108               | S014                    | 8.65 x 3.9 x 1.75     |                       |         |                     |         |                             |         | SOP 14   |            |         | DS014   |            |
| 16         | DFN3312-16 (SOT1159) | H x SON16               | 3.3 x 1.2 x 0.48      |                       |         |                     |         | UDFN 16, 3.5 x 1.2, 0.4P    |         |          |            |         |         |            |
|            | DFN3314-16 (SOT1168) | HU-SON16                | 3.3 x 1.35 x 0.53     |                       |         |                     |         |                             |         |          |            |         |         | SLP3313P16 |
| 20         | SOT360               | TSSOP20                 | 6.5 x 4.4 x 1.1       |                       |         |                     |         |                             |         |          |            | TSSOP20 | TSSOP20 |            |

Types in brackets (...) show footprint compatibility only

Tape and reel pack for SMD and WLCSF packages

**Choose 10k reels for higher efficiency**

- ▶ Optimized handling and production
- ▶ Reduced packaging and environmental impact
- ▶ Available for many products

## Product orientation (tape and reel pack)

| 2 pin packages | Orientation in tape | Package                    | Packing 12NC ending |
|----------------|---------------------|----------------------------|---------------------|
|                |                     | DFN1006-2 (SOD882)         | 315                 |
|                |                     | DFN1006D-2 (SOD882D)       | 315                 |
|                |                     | DFN1608D-2 (SOD1608)       | 315                 |
|                |                     | DSN0603-2 (SOD962)         | 315                 |
|                |                     | DSN0402-2 (SOD992)         | 315                 |
|                |                     | DSN1006-2 (SOD993)         | 315                 |
|                |                     | DSN1006U-2 (SOD995)        | 315                 |
|                |                     | DSN1608-2 (SOD963, SOD964) | 315                 |
|                |                     | SOD80                      | 115, 135            |
|                |                     | SOD123F                    | 115                 |
|                | CFP3 (SOD123W)      | 115                        |                     |
|                | CFP5 (SOD128)       | 115                        |                     |
|                | SOD323              | 115, 135                   |                     |
|                | SOD323F             | 115                        |                     |
| SOD523         | 115, 135, 315, 335  |                            |                     |

| 3 pin packages | Orientation in tape | Package | Packing 12NC ending | Orientation in tape   | Package  | Packing 12NC ending |
|----------------|---------------------|---------|---------------------|-----------------------|----------|---------------------|
|                |                     | SOT89   | 146                 | DFN1010D-3 (SOT1215)  | 147      |                     |
|                |                     |         |                     | DFN2020-3 (SOT1061)   | 115, 135 |                     |
|                |                     |         |                     | DFN2020D-3 (SOT1061D) | 115, 135 |                     |
|                |                     |         |                     | SOT89                 | 115, 135 |                     |
|                |                     |         |                     | SOT663                | 115      |                     |
|                |                     |         |                     | CFP15 (SOT1289)       | 139, 146 |                     |
|                |                     |         |                     | DPAK (SOT428)         | 118      |                     |
|                |                     |         |                     | D2PAK (SOT404)        | 118      |                     |
|                |                     |         |                     | SOT89                 | 147      |                     |
|                |                     |         |                     |                       |          |                     |

| 4 pin packages | Orientation in tape | Package          | Packing 12NC ending | Orientation in tape | Package | Packing 12NC ending |  |
|----------------|---------------------|------------------|---------------------|---------------------|---------|---------------------|--|
|                |                     | LFPAK56 (SOT669) | 115                 |                     |         |                     |  |
|                |                     | WL CSP4          | 084                 |                     |         |                     |  |
|                |                     |                  |                     |                     |         |                     |  |
|                |                     |                  |                     |                     |         |                     |  |
|                |                     |                  |                     |                     |         |                     |  |
|                |                     |                  |                     |                     |         |                     |  |
|                |                     |                  |                     |                     |         |                     |  |
|                |                     |                  |                     |                     |         |                     |  |
|                |                     |                  |                     |                     |         |                     |  |
|                |                     |                  |                     |                     |         |                     |  |

| 5 pin packages | Orientation in tape | Package | Packing 12NC ending | Orientation in tape | Package | Packing 12NC ending |  |
|----------------|---------------------|---------|---------------------|---------------------|---------|---------------------|--|
|                |                     | WL CSP5 | 087                 |                     |         |                     |  |
|                |                     |         |                     |                     |         |                     |  |
|                |                     |         |                     |                     |         |                     |  |
|                |                     |         |                     |                     |         |                     |  |
|                |                     |         |                     |                     |         |                     |  |
|                |                     |         |                     |                     |         |                     |  |
|                |                     |         |                     |                     |         |                     |  |
|                |                     |         |                     |                     |         |                     |  |
|                |                     |         |                     |                     |         |                     |  |
|                |                     |         |                     |                     |         |                     |  |

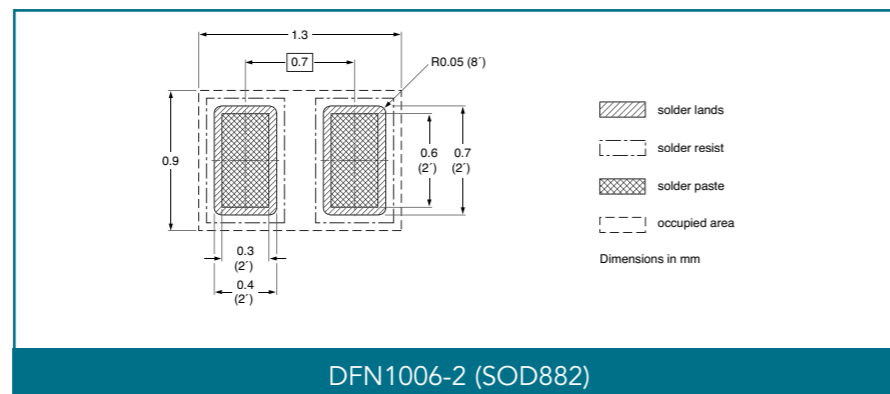
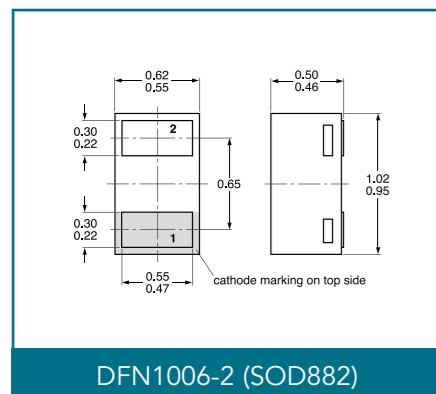
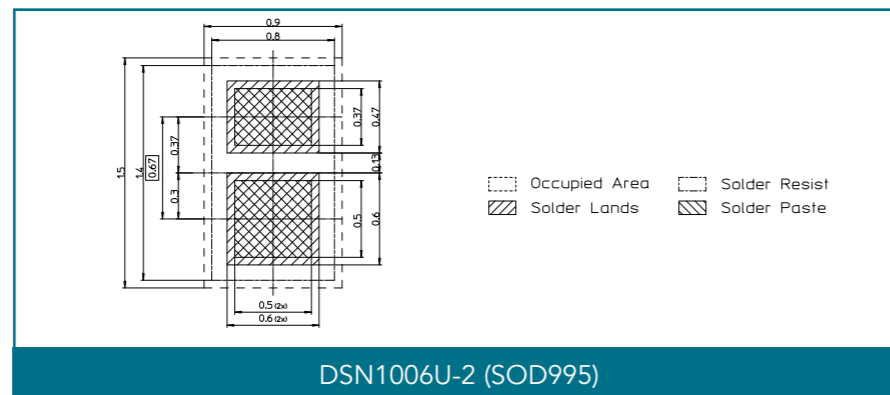
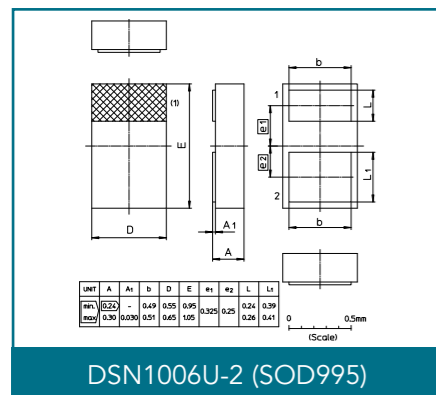
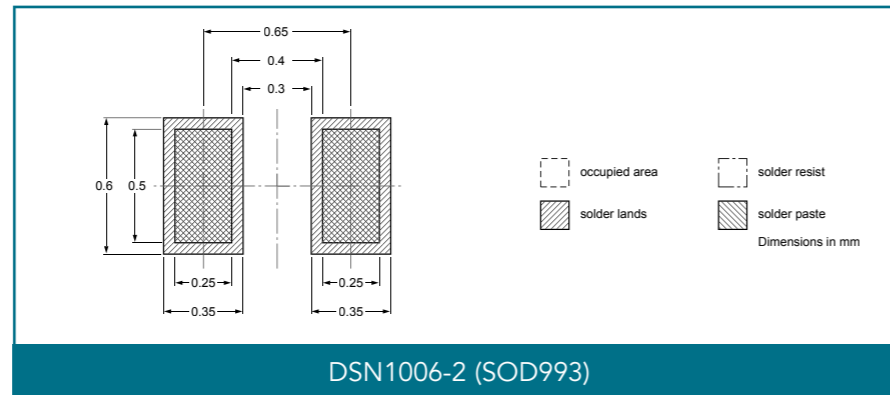
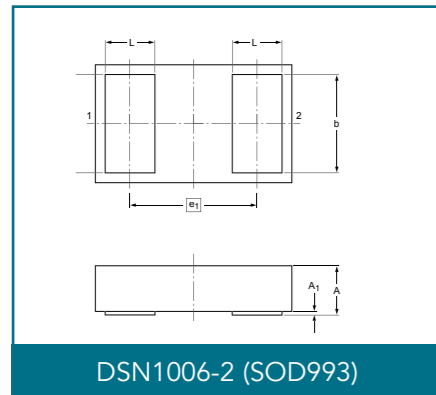
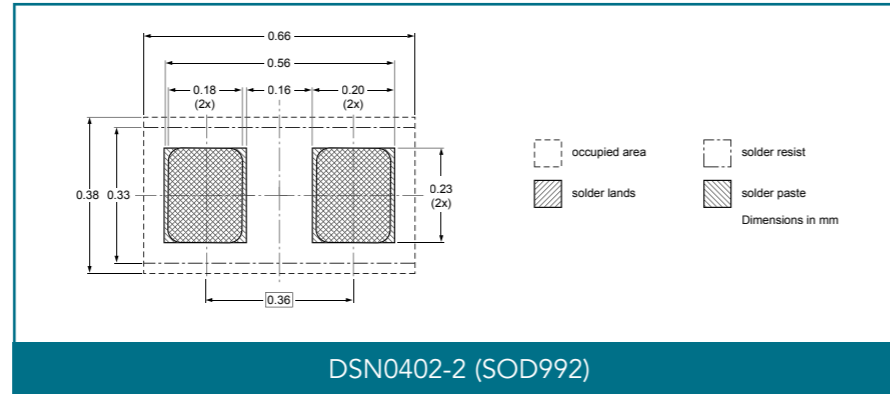
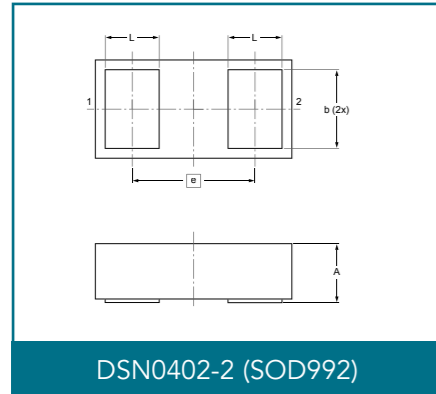
| > 6 pin packages | Orientation in tape | Package               | Packing 12NC ending | Orientation in tape   | Package  | Packing 12NC ending |
|------------------|---------------------|-----------------------|---------------------|-----------------------|----------|---------------------|
|                  |                     | DFN1410-6 (SOT886)    | 115                 | DFN2020-6 (SOT1118)   | 115      |                     |
|                  |                     | DFN1616-6 (SOT1189)   | 115                 | DFN2020D-6 (SOT1118D) | 115      |                     |
|                  |                     | DFN2020MD-6 (SOT1220) | 184                 | DFN2020MD-6 (SOT1220) | 115      |                     |
|                  |                     | LFPAK33 (SOT1210)     | 115                 | DFN1010B-6 (SOT1216)  | 147      |                     |
|                  |                     | LFPAK56D (SOT1205)    | 115                 | SOT363                | 115, 135 |                     |
|                  |                     | WL CSP6               | 023                 | SOT457                | 115, 135 |                     |
|                  |                     |                       |                     | SOT666                | 115, 315 |                     |
|                  |                     |                       |                     |                       |          |                     |
|                  |                     |                       |                     |                       |          |                     |
|                  |                     |                       |                     |                       |          |                     |

# Outline and footprint drawings

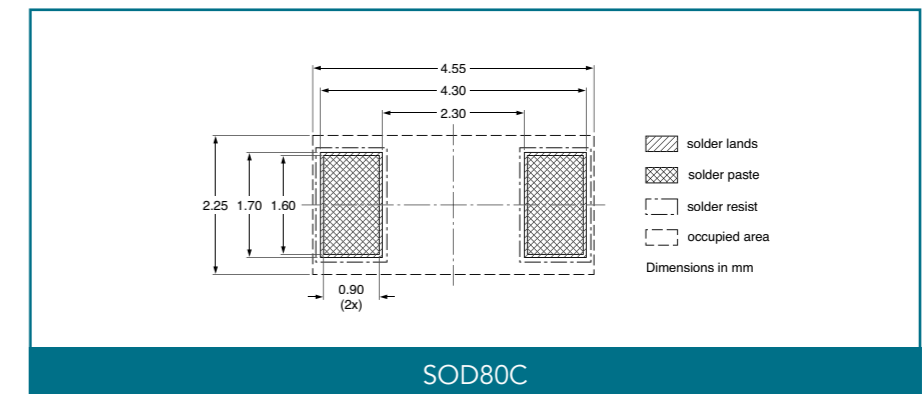
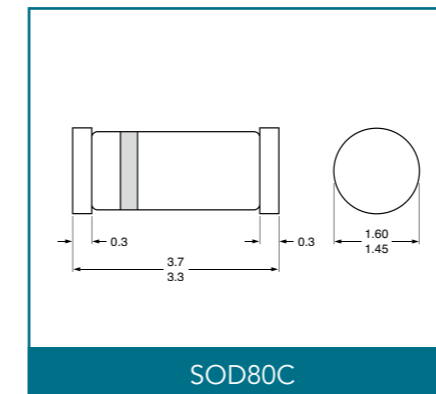
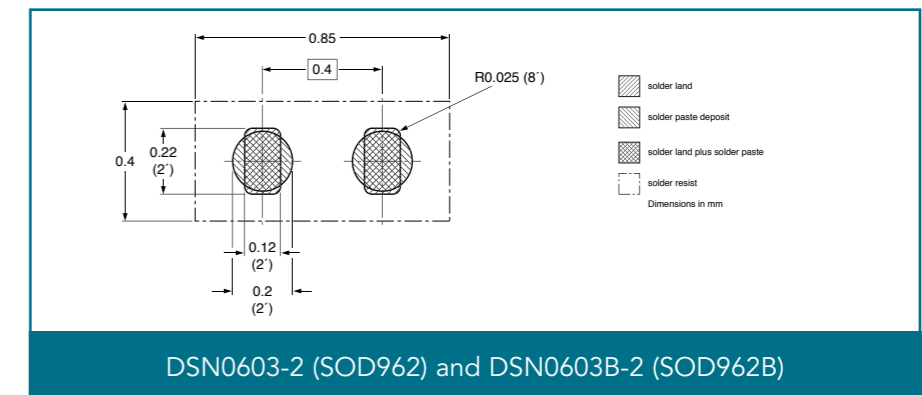
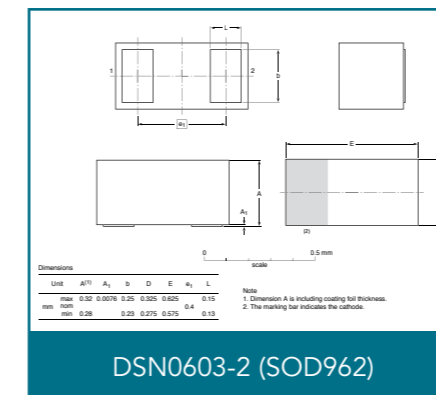
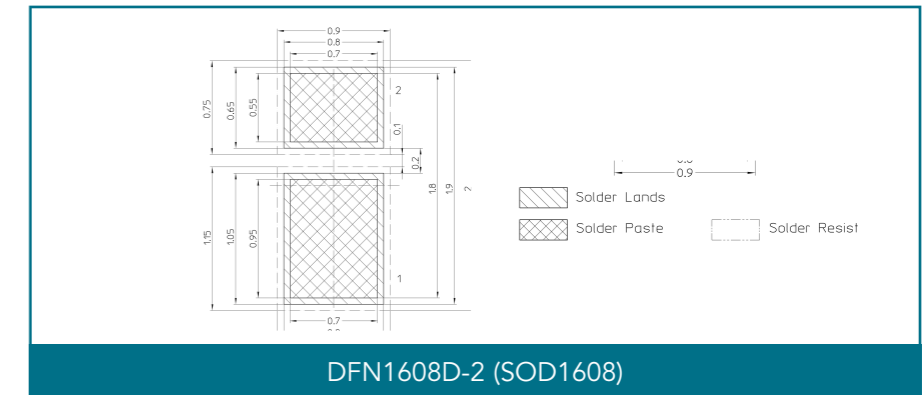
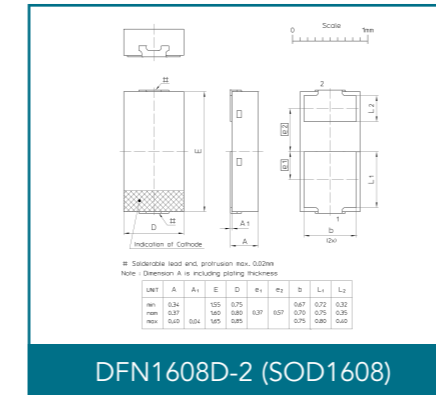
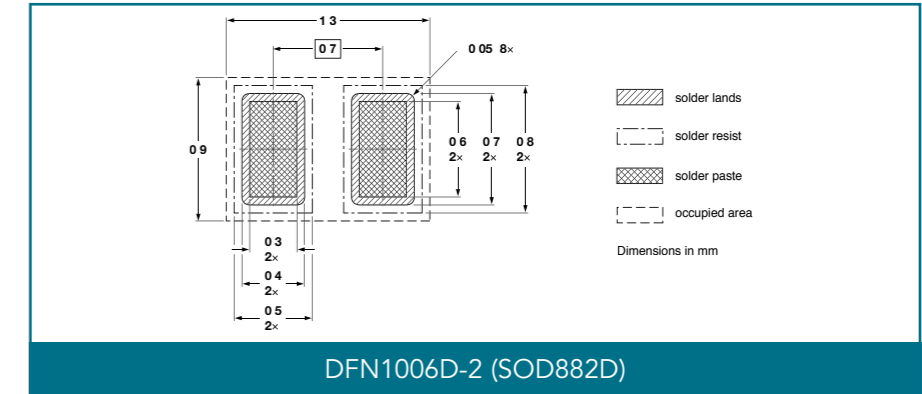
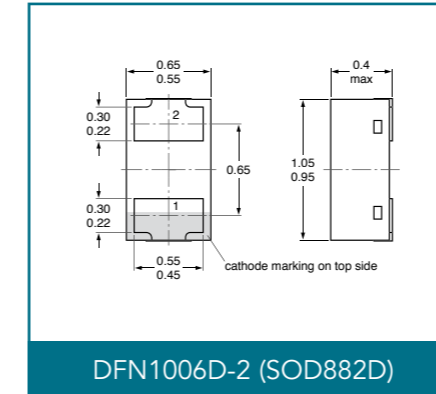
|                             |            |
|-----------------------------|------------|
| <b>2-pin SMD packages</b>   | <b>148</b> |
| DSN0402-2 (SOD992)          | 148        |
| DSN1006-2 (SOD993)          | 148        |
| DSN1006U-2 (SOD995)         | 148        |
| DFN1006-2 (SOD882)          | 148        |
| DFN1006D-2 (SOD882D)        | 149        |
| DFN1608D-2 (SOD1608)        | 149        |
| DSN0603-2 (SOD962)          | 149        |
| SOD80C                      | 149        |
| SOD123F                     | 150        |
| SOD123W                     | 150        |
| SOD128                      | 150        |
| SOD323 (SC-76)              | 150        |
| SOD323F (SC-90)             | 151        |
| SOD523 (SC-79)              | 151        |
| <b>3-pin SMD packages</b>   | <b>151</b> |
| CFP15 (SOT1289)             | 151        |
| DFN1006-3 (SOT883)          | 151        |
| DFN1006B-3 (SOT883B)        | 152        |
| DFN1010D-3 (SOT1215)        | 152        |
| DFN2020-3 (SOT1061)         | 152        |
| DFN2020D-3 (SOT1061D)       | 152        |
| DPAK (SOT428)               | 153        |
| D <sup>2</sup> PAK (SOT404) | 153        |
| SOT23                       | 153        |
| SOT89 (SC-62)               | 153        |
| SOT323 (SC-70)              | 154        |
| SOT663                      | 154        |
| <b>4-pin SMD packages</b>   | <b>154</b> |
| LFPAK56 (SOT669)            | 154        |
| SOT143B                     | 154        |
| SOT223 (SC-73)              | 155        |
| <b>5-pin SMD packages</b>   | <b>155</b> |
| SOT353 (SC-88A)             | 155        |
| SOT665                      | 155        |
| <b>6-pin SMD packages</b>   | <b>155</b> |
| DFN1010-6 (SOT891)          | 155        |
| DFN1010B-6 (SOT1216)        | 156        |
| DFN1410-6 (SOT886)          | 156        |
| DFN1616-6 (SOT1189)         | 156        |
| DFN2020-6 (SOT1118)         | 156        |
| DFN2020D-6 (SOT1118D)       | 157        |
| DFN2020MD-6 (SOT1220)       | 157        |
| SOT363 (SC-88)              | 157        |
| SOT457 (SC-74)              | 157        |
| SOT666                      | 158        |
| <b>7-pin SMD Packages</b>   | <b>158</b> |
| DFN2111-7 (SOT1358)         | 158        |
| D2PAK-7 (SOT428)            | 158        |

|   |            |
|---|------------|
| <b>8-pin SMD packages</b>                     | <b>158</b> |
| DFN1714-8 (SOT1166)                           | 158        |
| DFN1714U-8 (SOT983)                           | 159        |
| SOT96 (SO8)                                   | 159        |
| LFPAK33 (SOT1210)                             | 159        |
| LFPAK56D (SOT1205)                            | 159        |
| <b>More than 8-pin SMD packages</b>           | <b>160</b> |
| DFN2110-9 (SOT1178)                           | 160        |
| DFN2510-10 (SOT1165)                          | 160        |
| DFN2510A-10 (SOT1176)                         | 160        |
| DFN2514-12 (SOT1167)                          | 160        |
| DFN2520-9 (SOT1333)                           | 161        |
| DFN2521-12 (SOT1156)                          | 161        |
| DFN3314-16 (SOT1168)                          | 161        |
| DFN4020-14 (SOT1334)                          | 161        |
| DFN5050-32 (SOT617)                           | 162        |
| SOT360 (TSSOP20)                              | 162        |
| SOT519 (SSOP16)                               | 162        |
| <b>Glass diodes</b>                           | <b>162</b> |
| SOD27 (DO-35)                                 | 162        |
| SOD66 (DO-41)                                 | 162        |
| SOD68 (DO-34)                                 | 162        |
| <b>Single-ended and through-hole packages</b> | <b>163</b> |
| SOT78 (TO220AB)                               | 163        |
| SOT186A (isolated TO220AB)                    | 163        |
| SOT226  | 163        |
| SOT263B-1                                     | 163        |

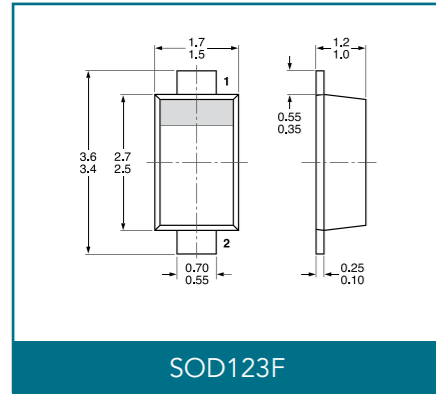
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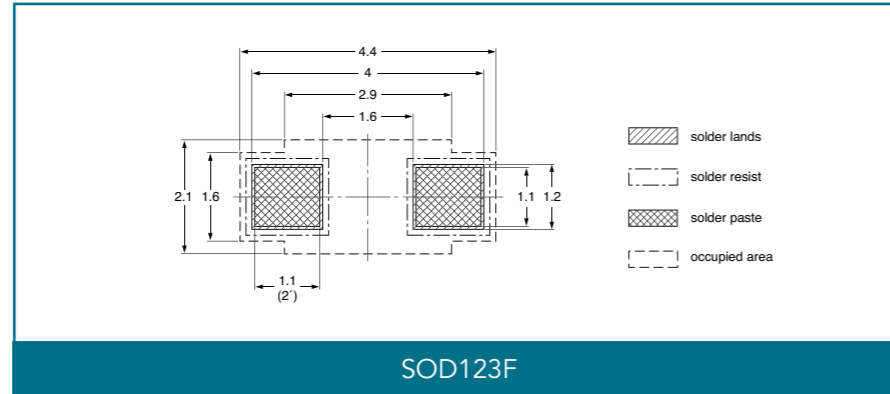
### 2-pin SMD packages



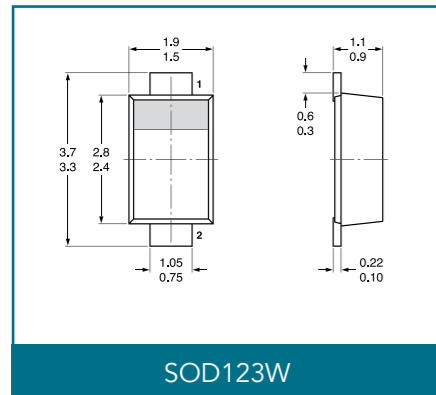
### 2-pin SMD packages



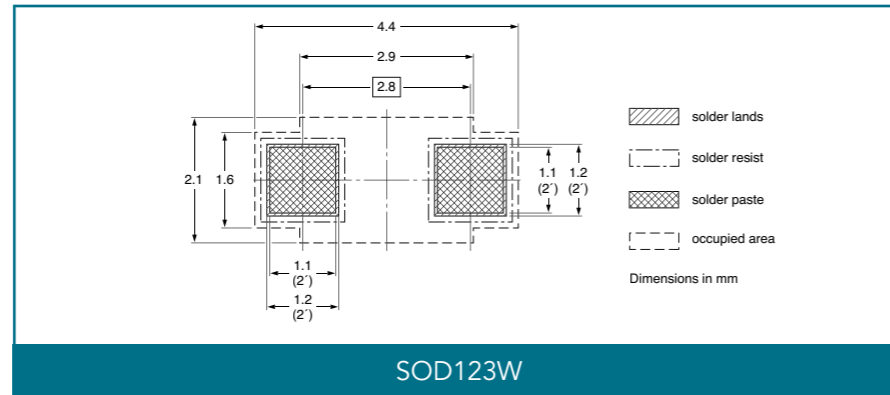
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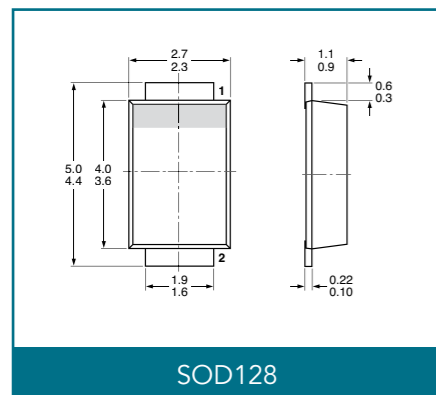
SOD123F



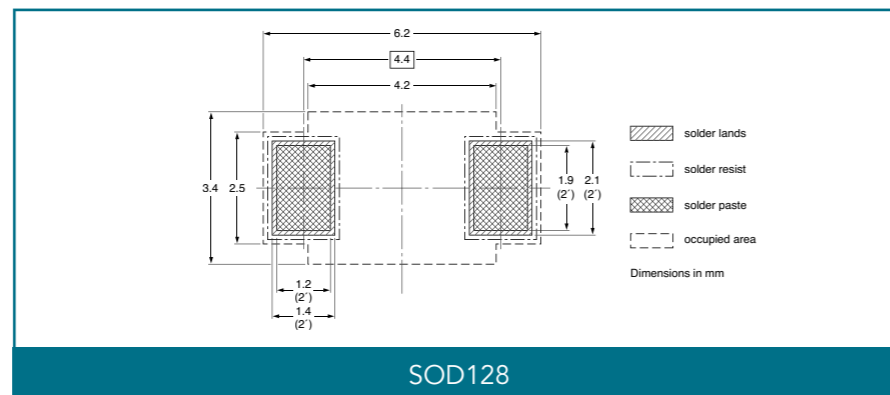
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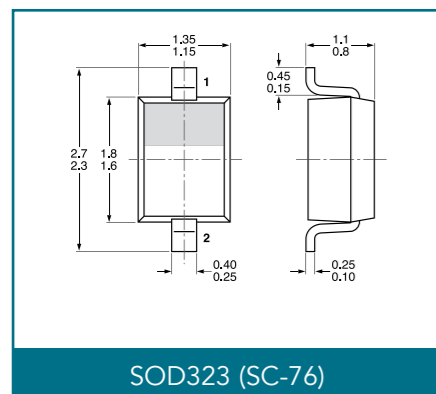
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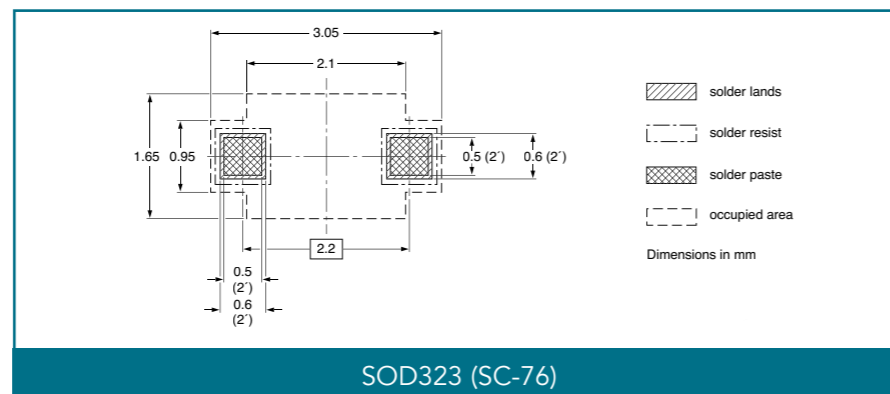
SOD128



SOD128



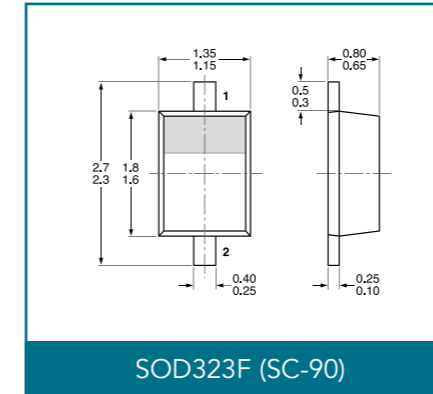
SOD323 (SC-76)



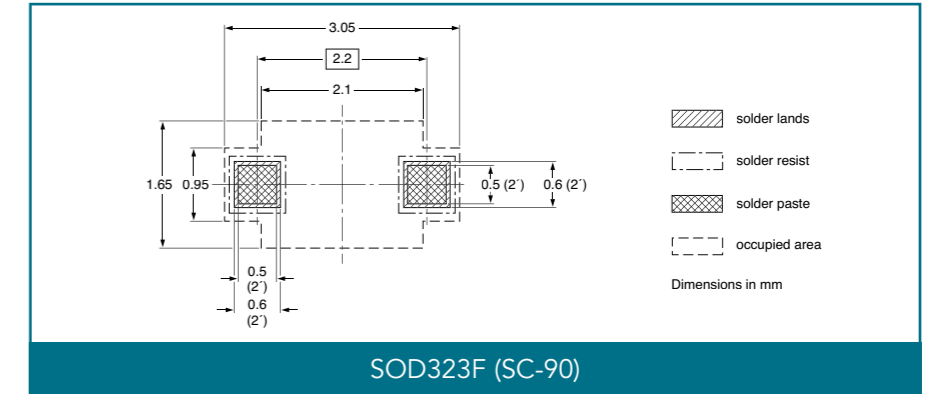
SOD323 (SC-76)

Dimensions in mm

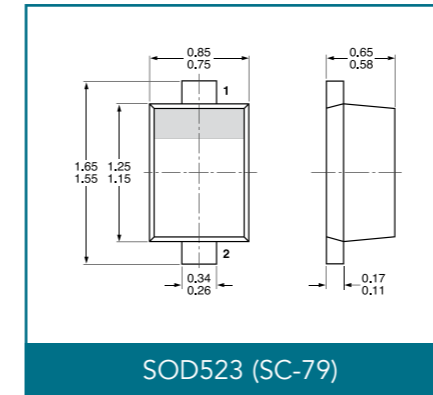
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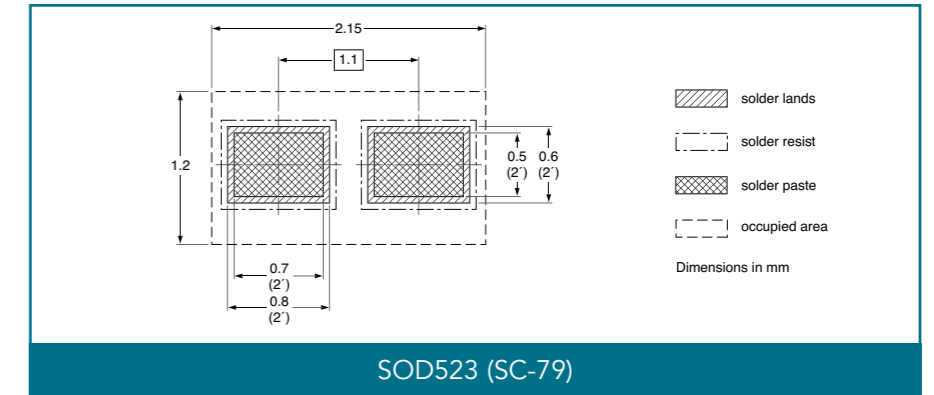
SOD323F (SC-90)



SOD323F (SC-90)

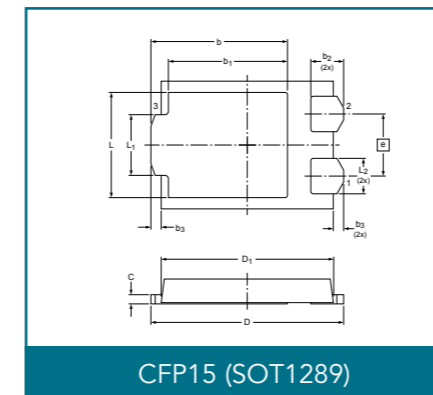


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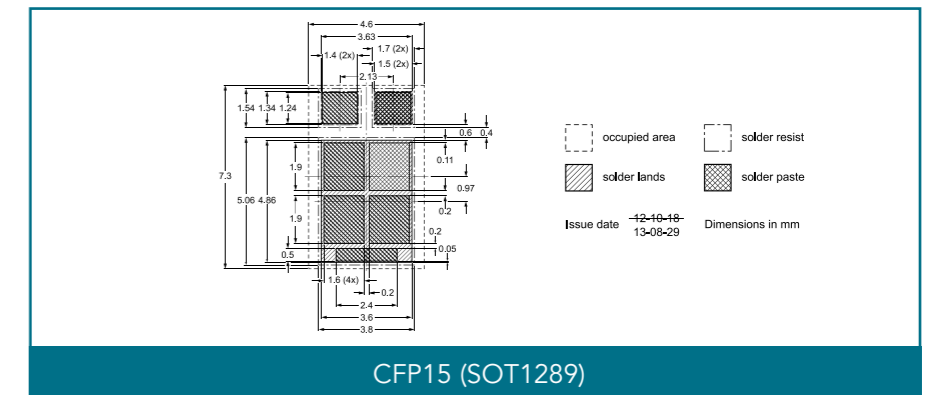


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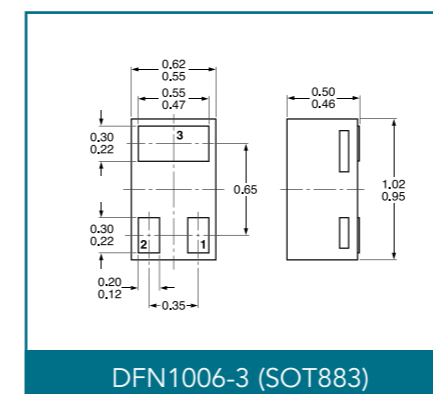
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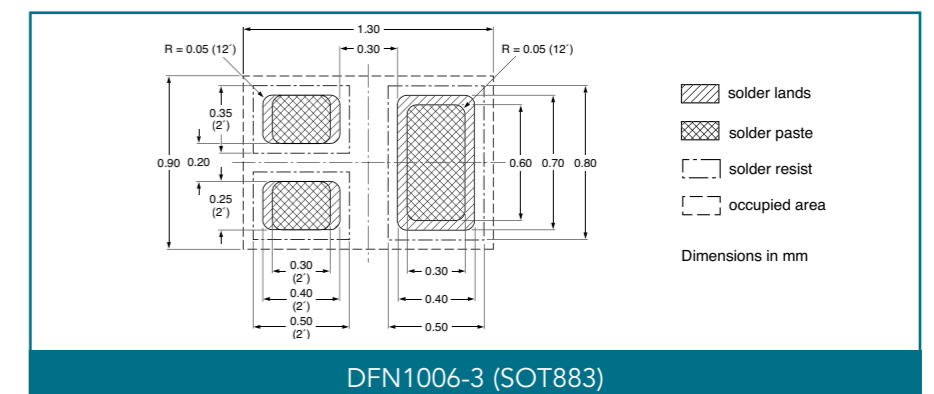
CFP15 (SOT1289)



CFP15 (SOT1289)



DFN1006-3 (SOT883)

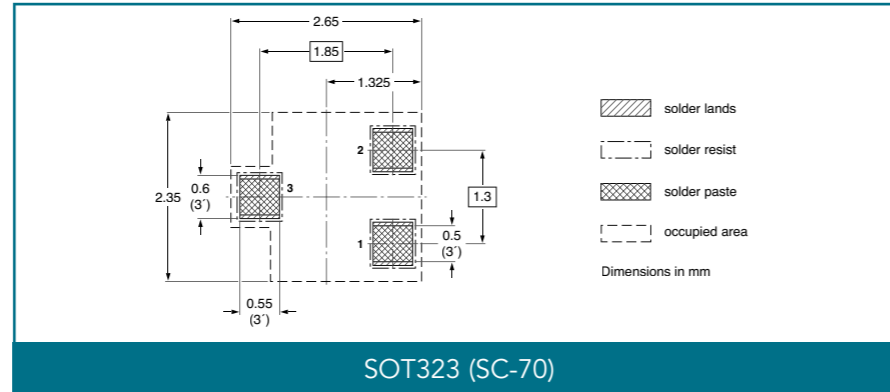
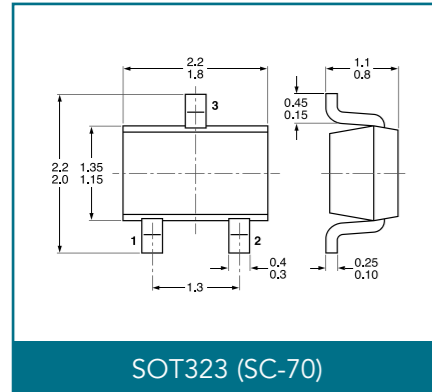


DFN1006-3 (SOT883)

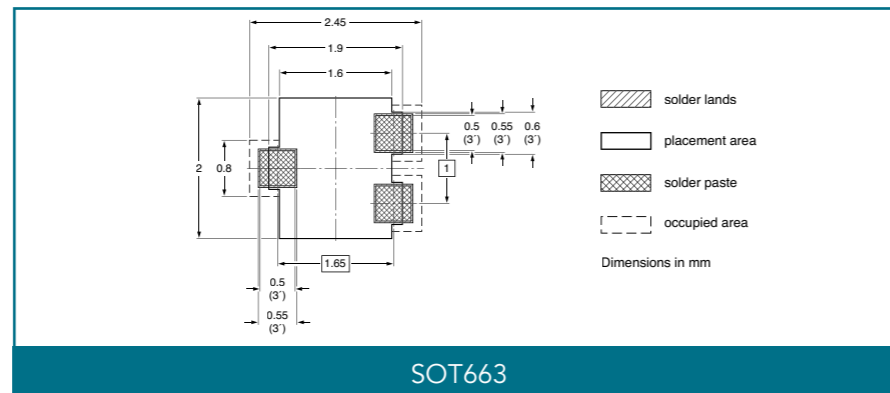
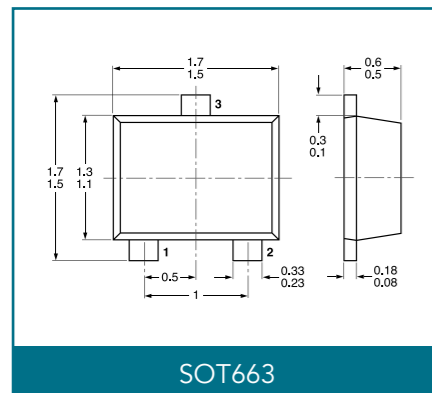
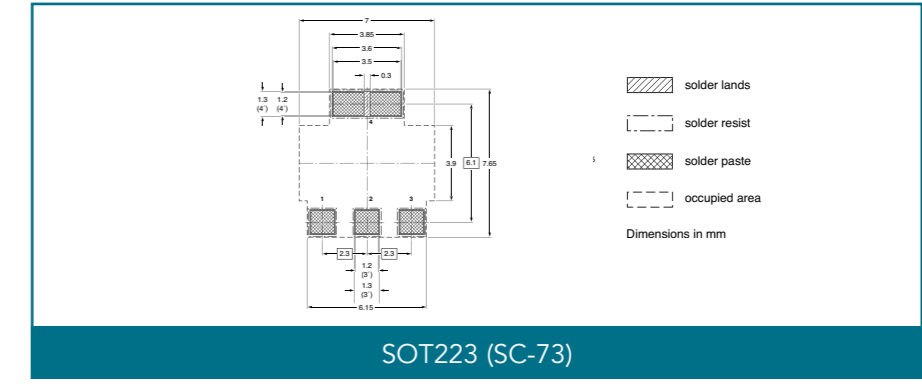
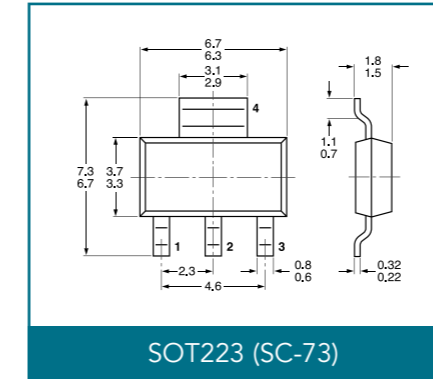
Dimensions in mm



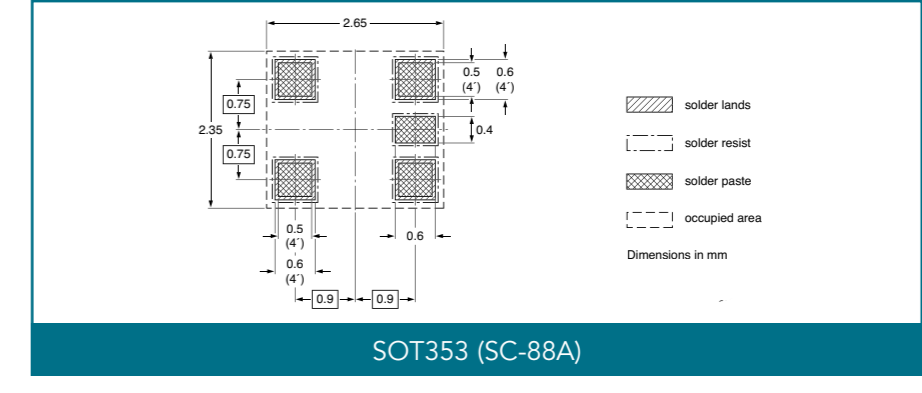
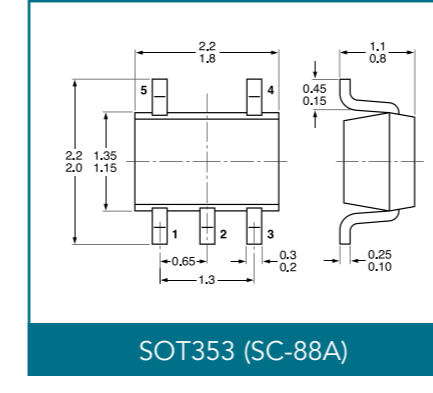
### 3-pin SMD packages



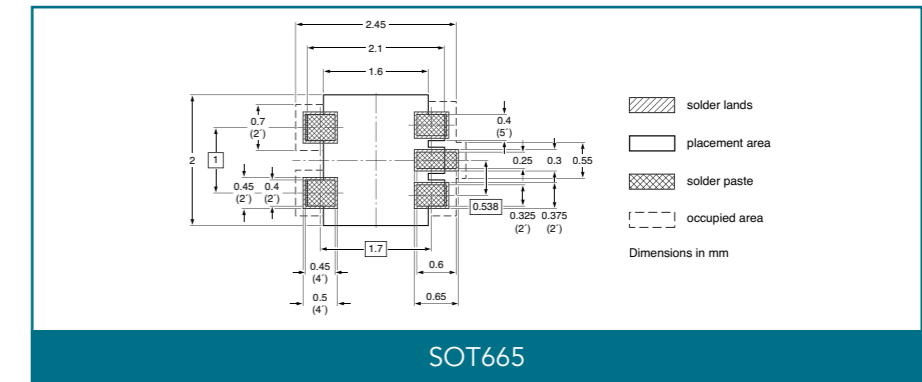
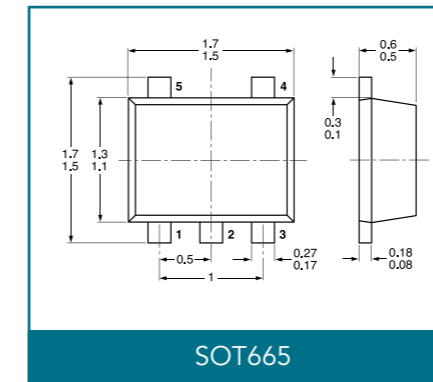
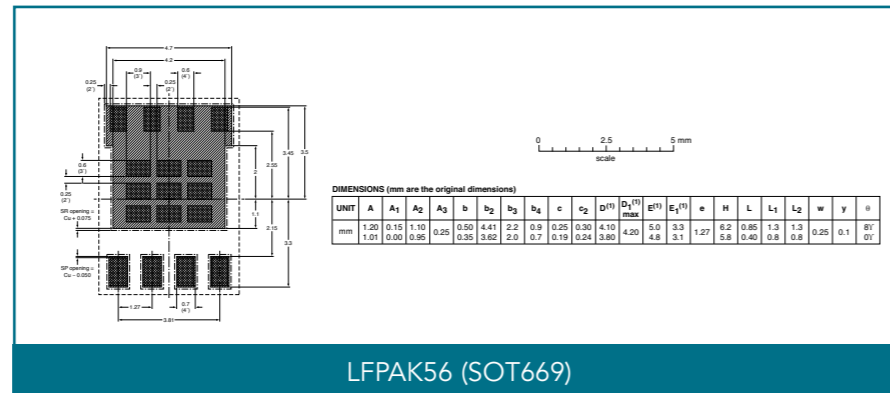
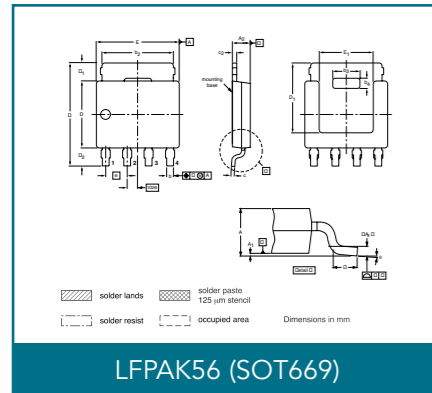
### 4-pin SMD packages



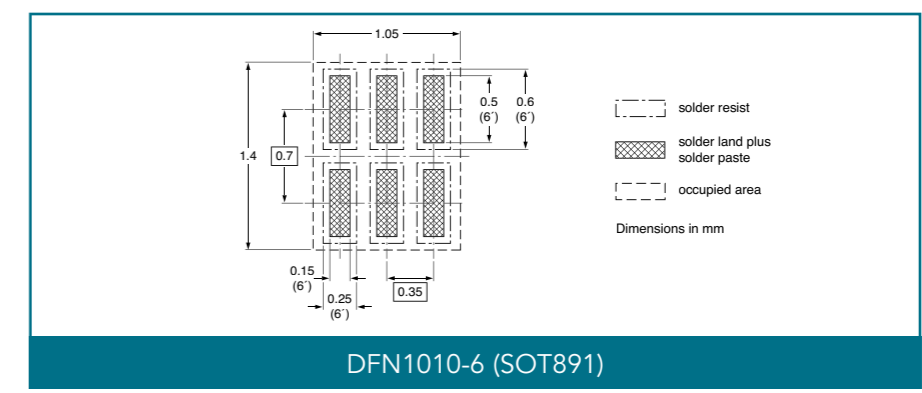
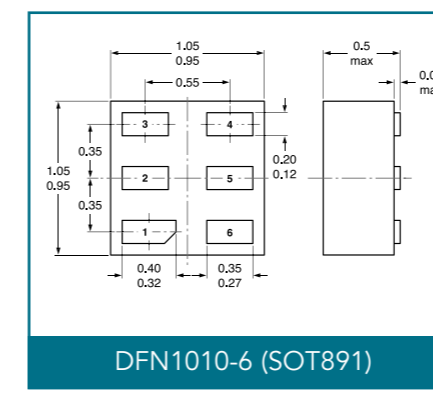
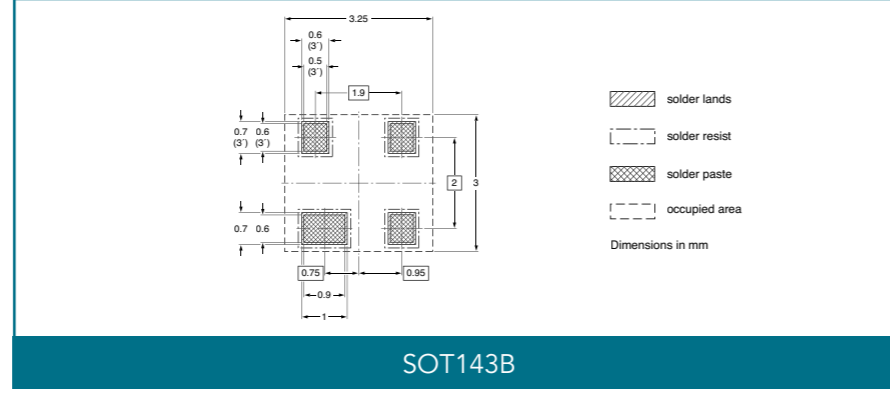
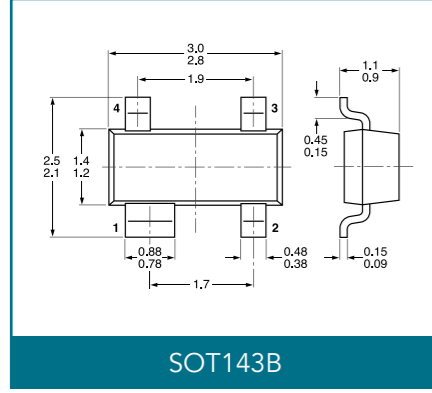
### 5-pin SMD packages



### 4-pin SMD packages

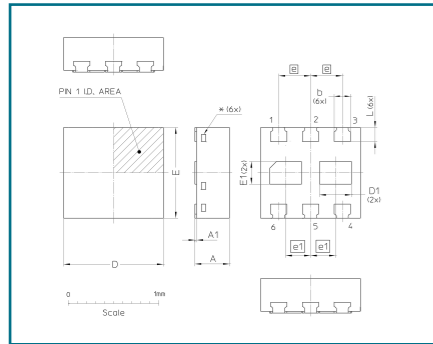


### 6-pin SMD packages

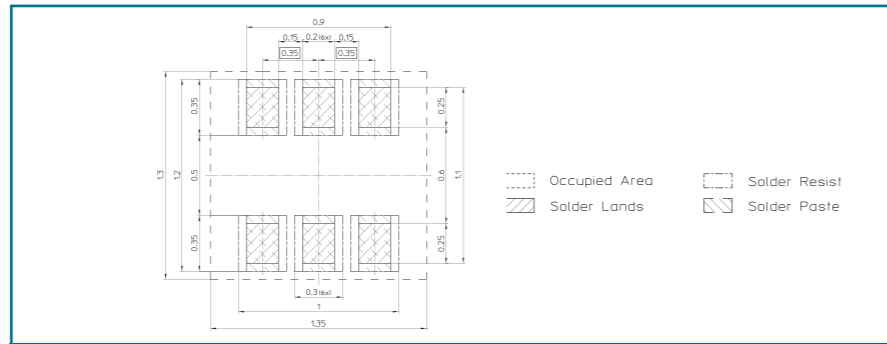


6-pin SMD packages

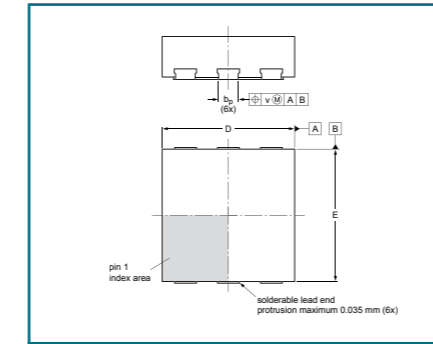
6-pin SMD packages



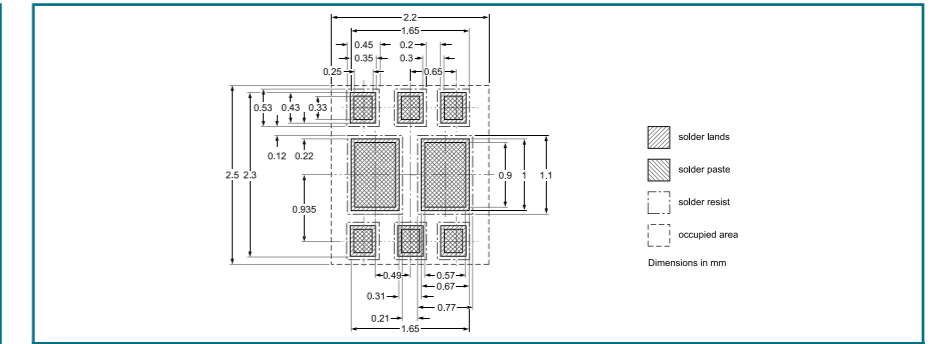
DFN1010B-6 (SOT1216)



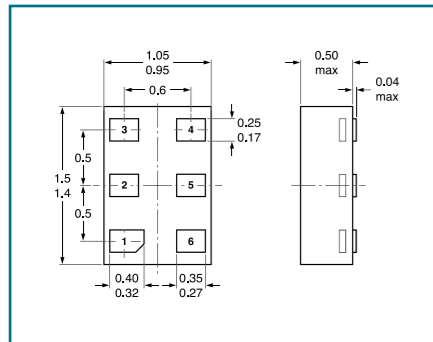
DFN1010B-6 (SOT1216)



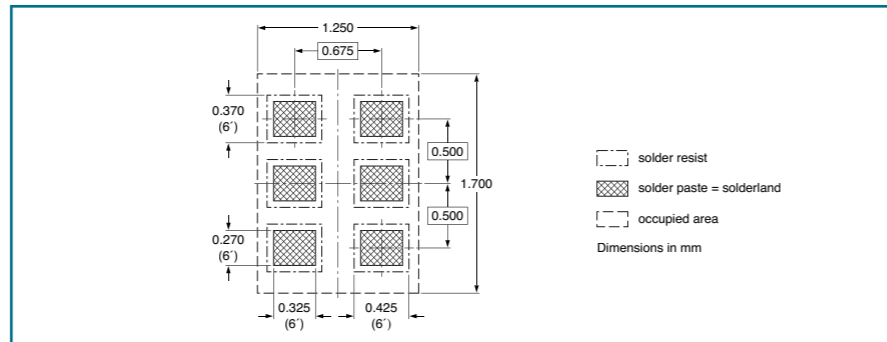
DFN2020D-6 (SOT1118D)



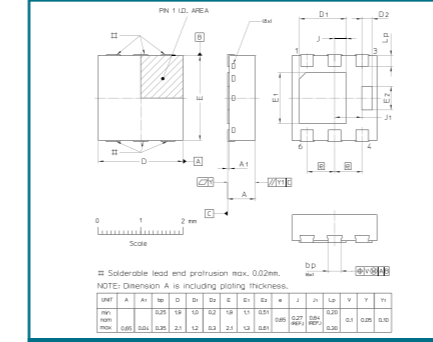
DFN2020D-6 (SOT1118D)



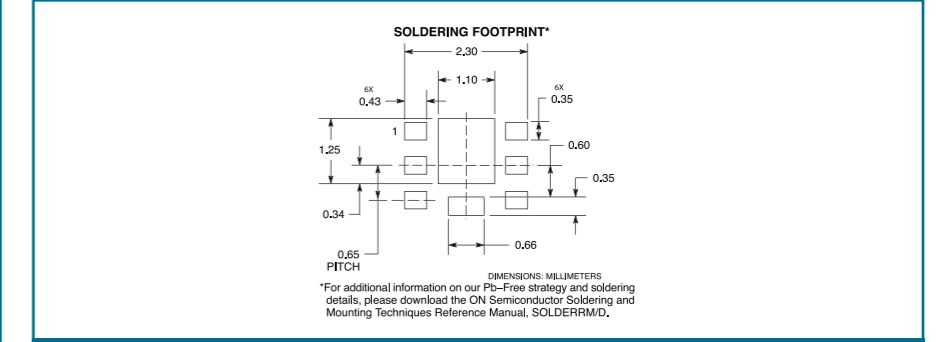
DFN1410-6 (SOT886)



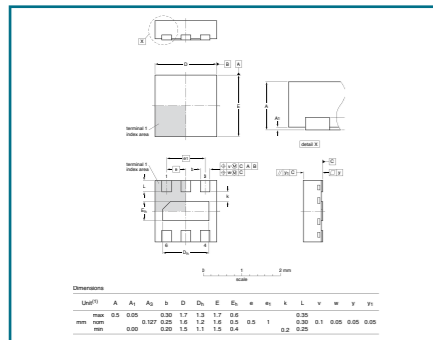
DFN1410-6 (SOT886)



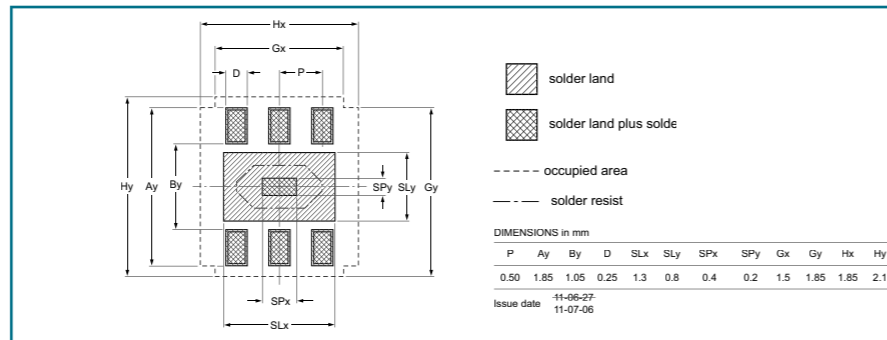
DFN2020MD-6 (SOT1220)



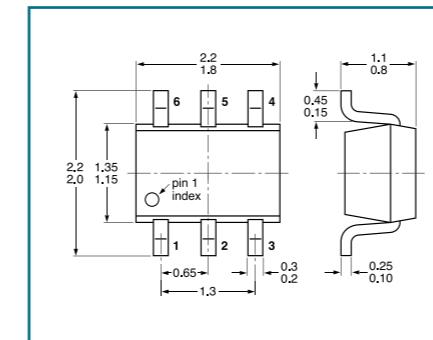
DFN2020MD-6 (SOT1220)



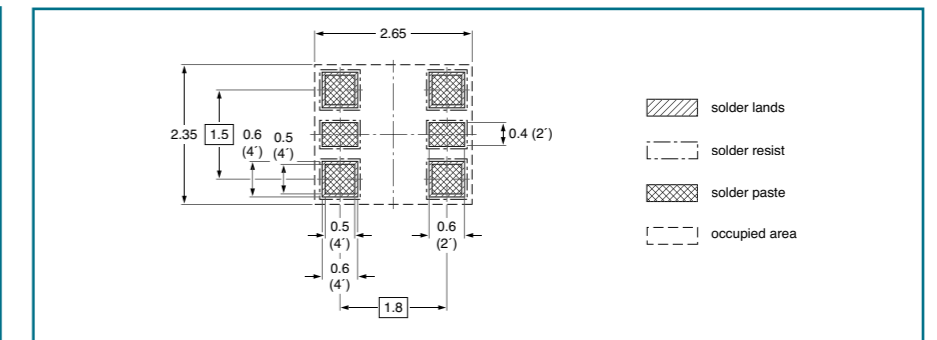
DFN1616-6 (SOT1189)



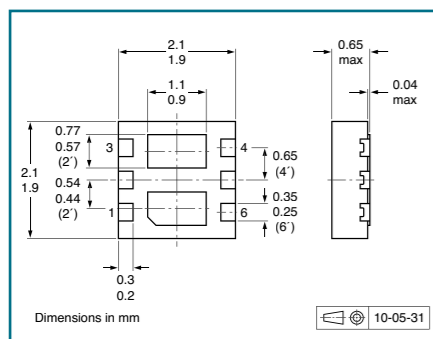
DFN1616-6 (SOT1189)



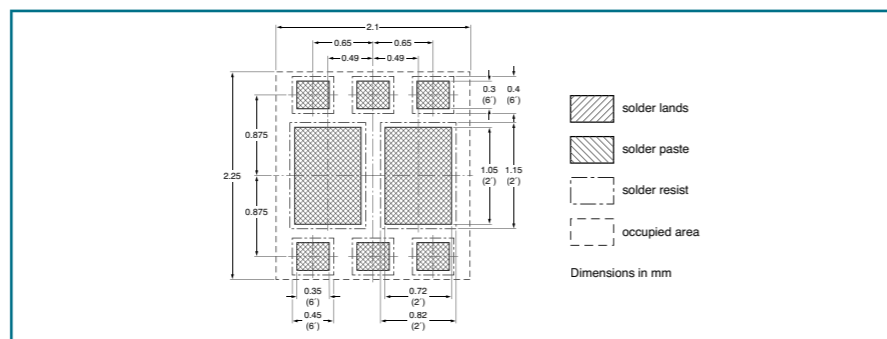
SOT363 (SC-88)



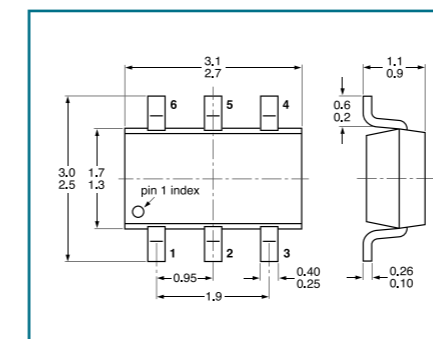
SOT363 (SC-88)



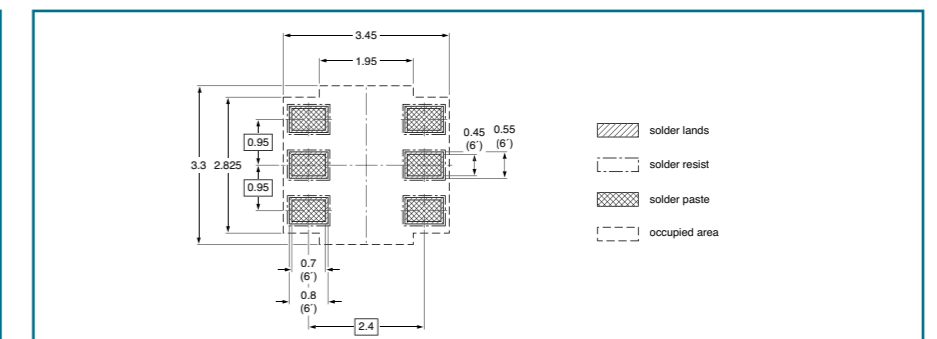
DFN2020-6 (SOT1118)



DFN2020-6 (SOT1118)



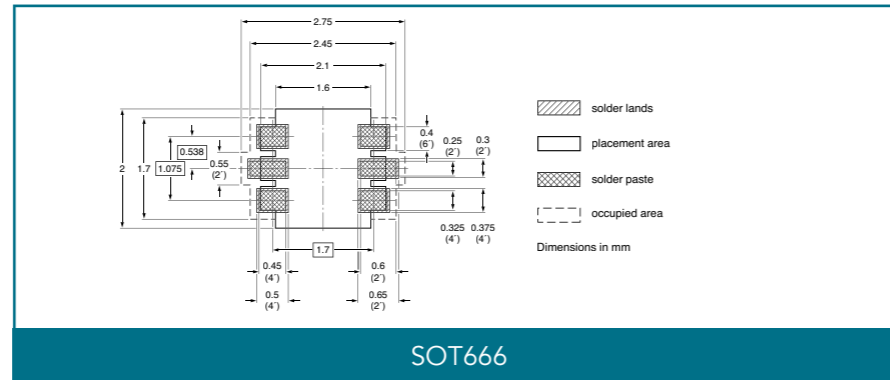
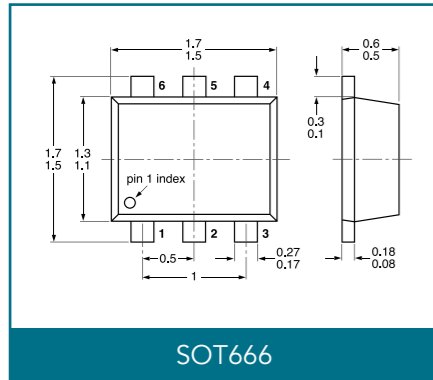
SOT457 (SC-74)



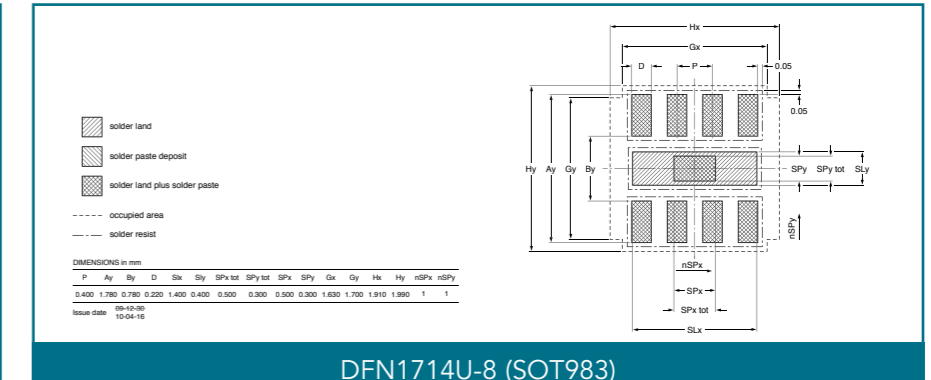
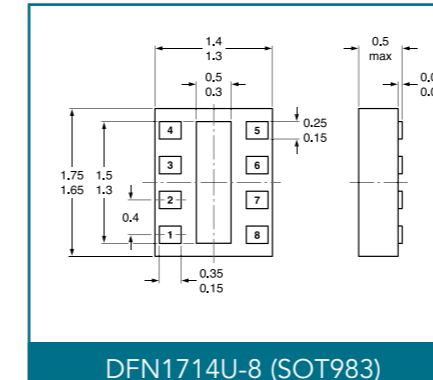
SOT457 (SC-74)



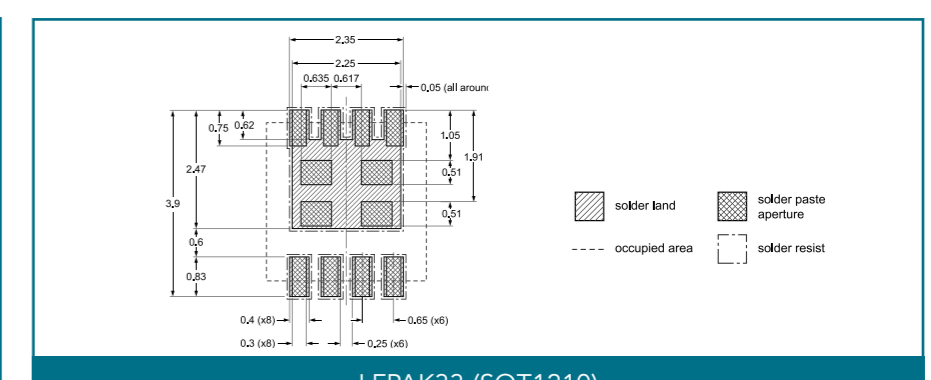
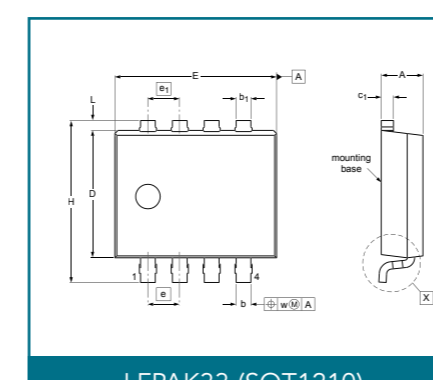
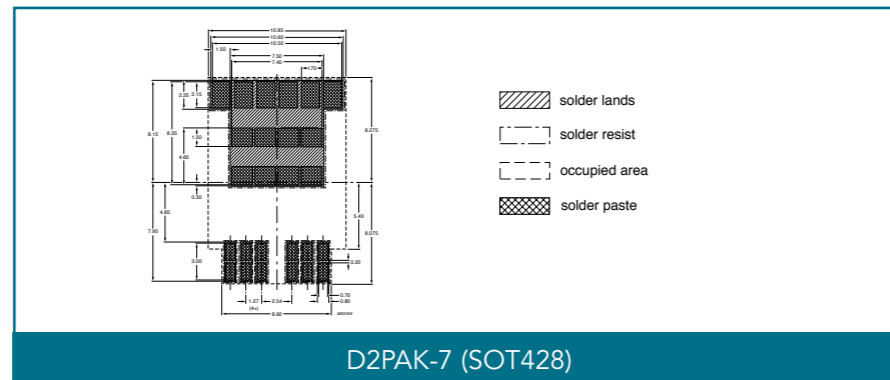
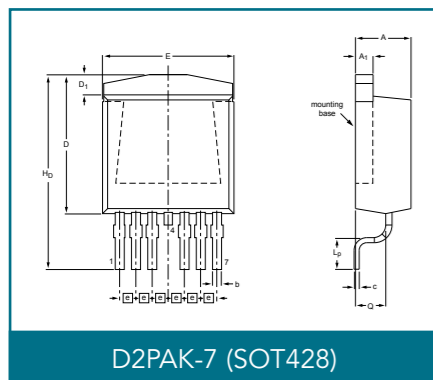
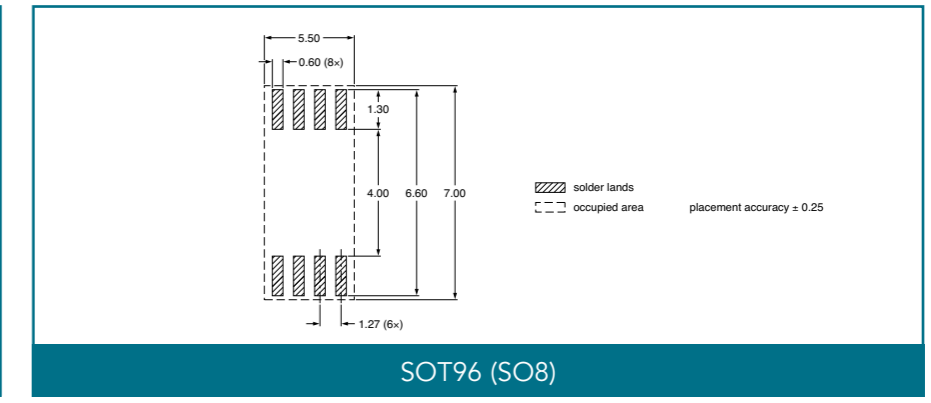
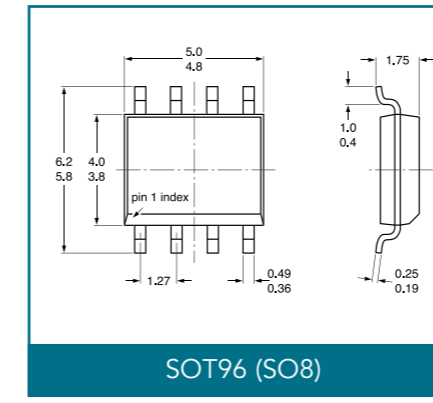
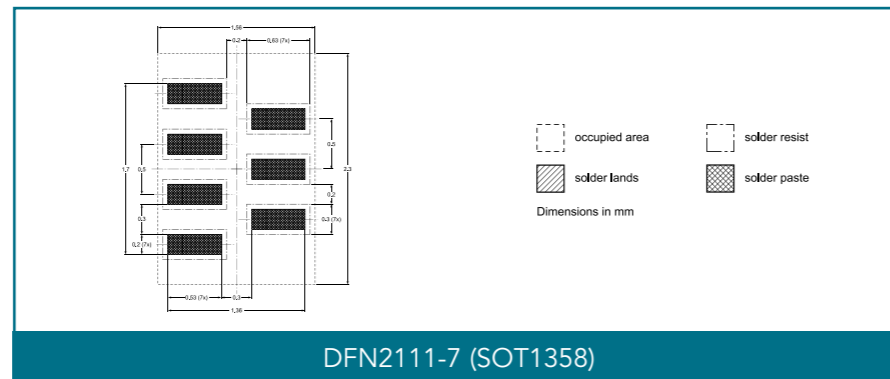
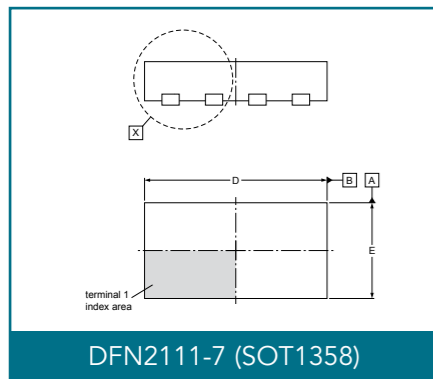
6-pin SMD packages



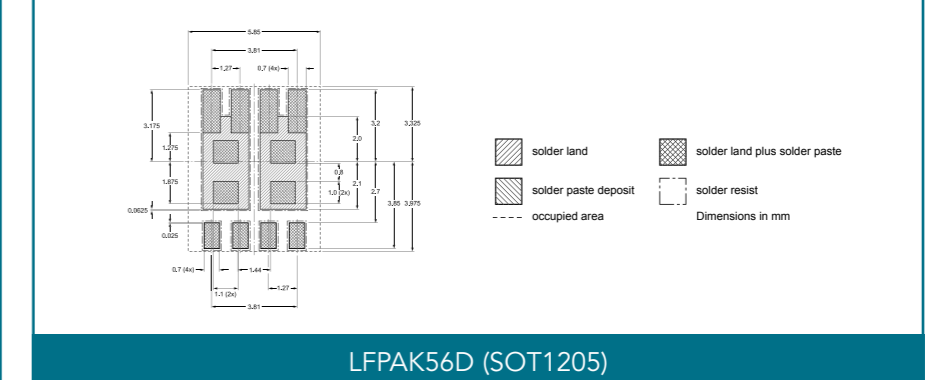
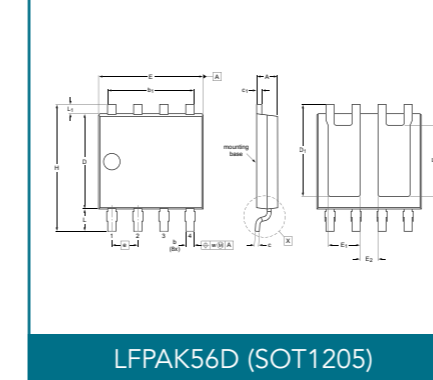
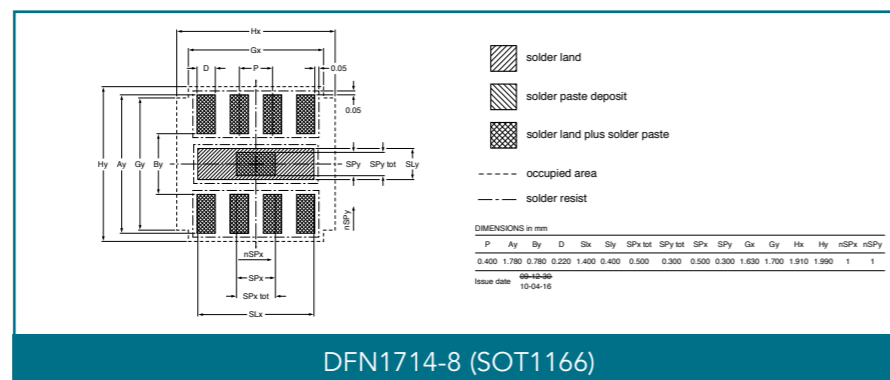
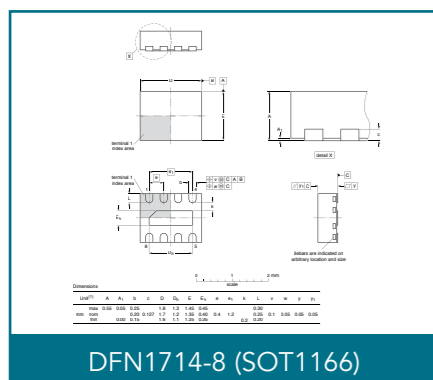
8-pin SMD packages



7-pin SMD packages



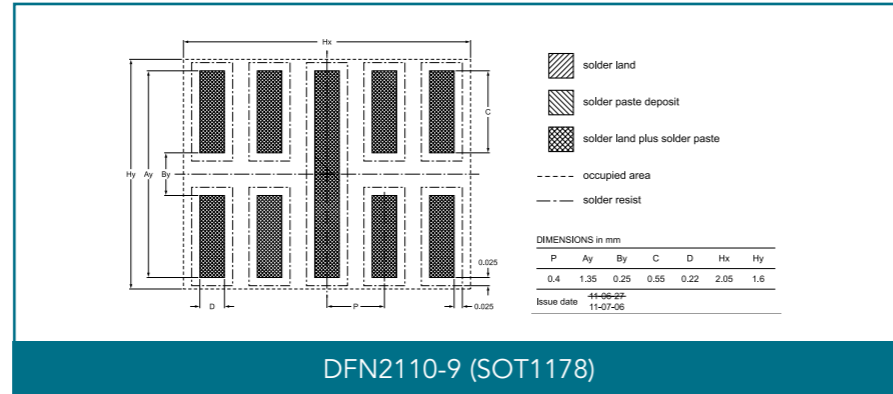
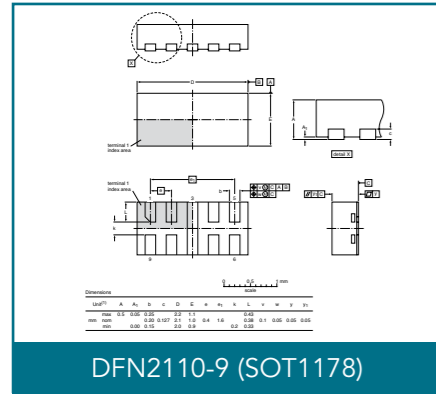
8-pin SMD packages



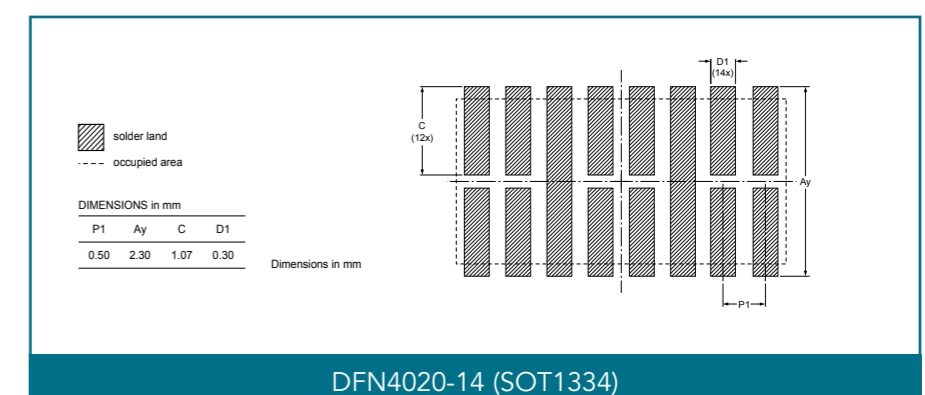
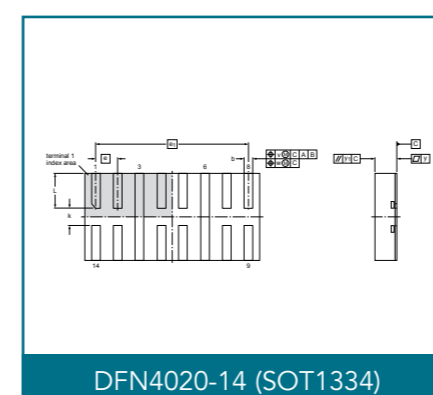
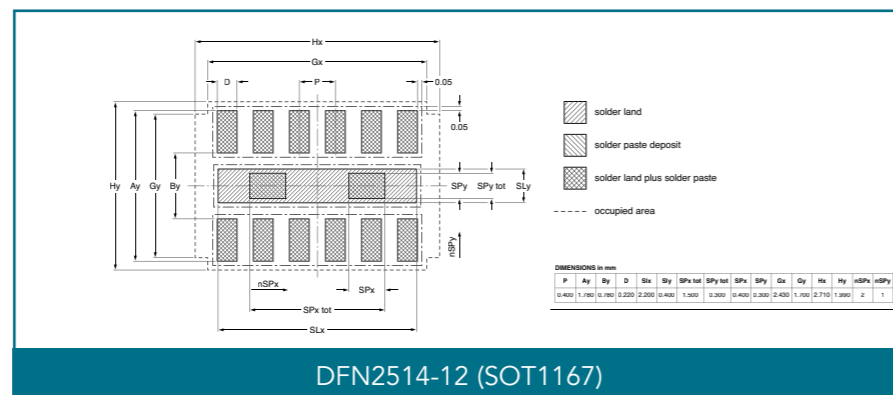
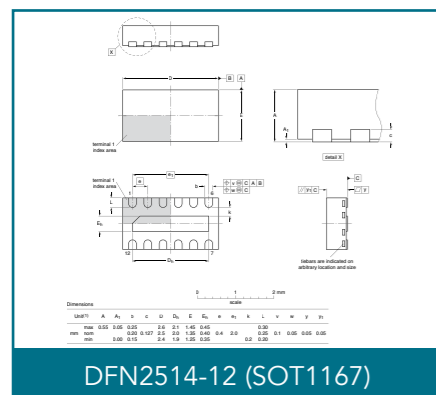
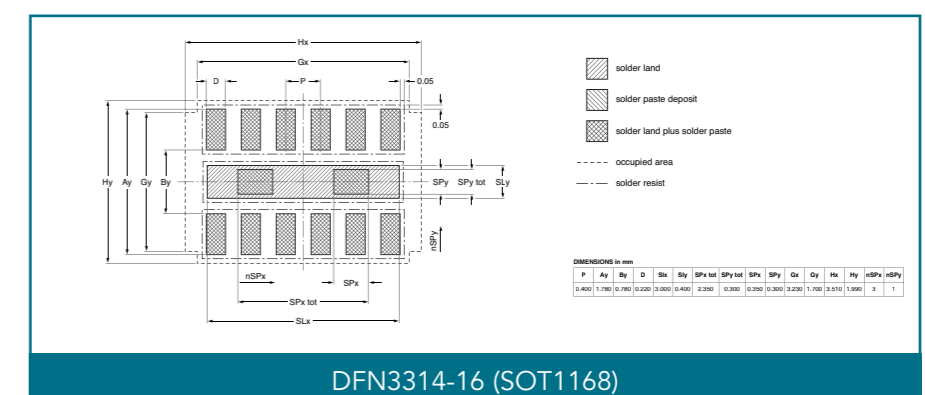
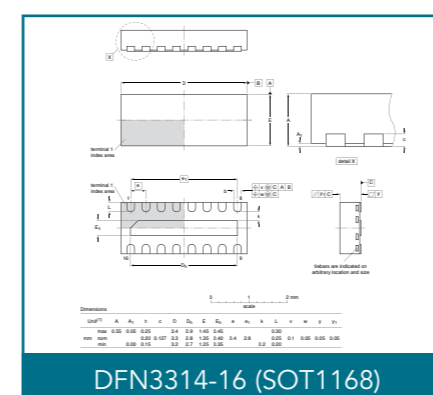
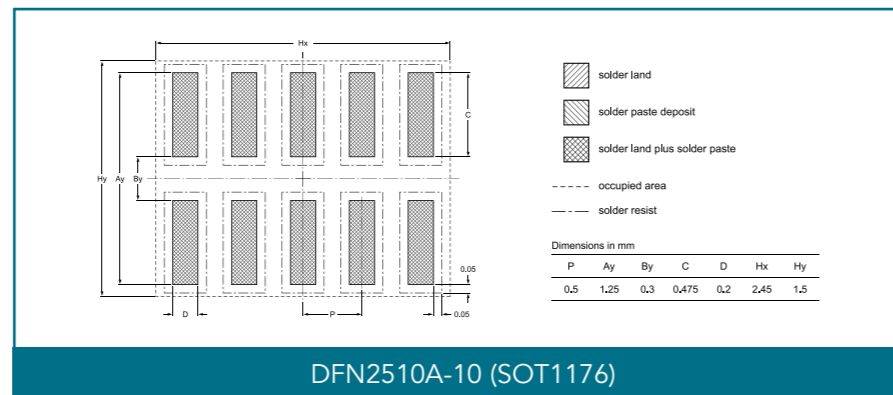
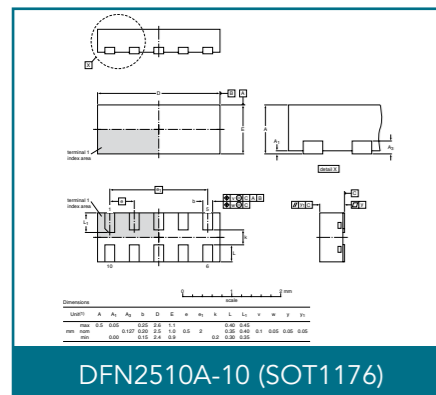
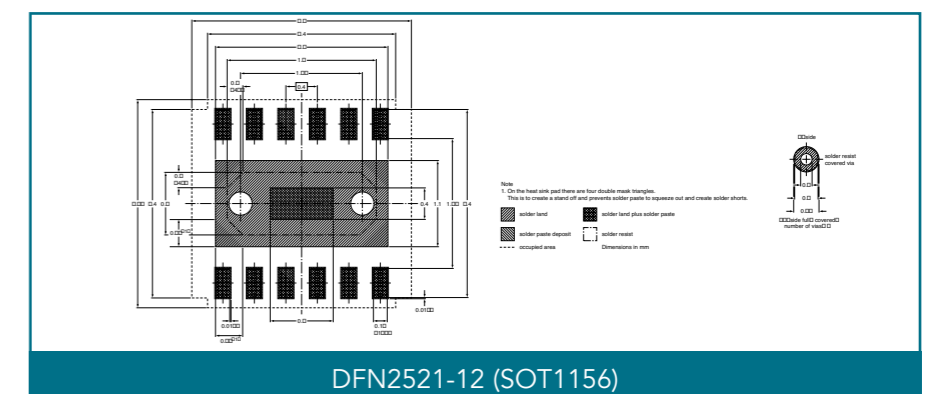
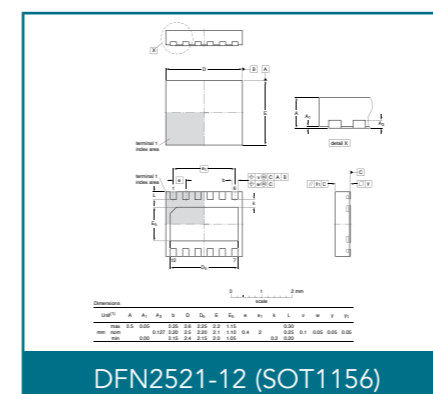
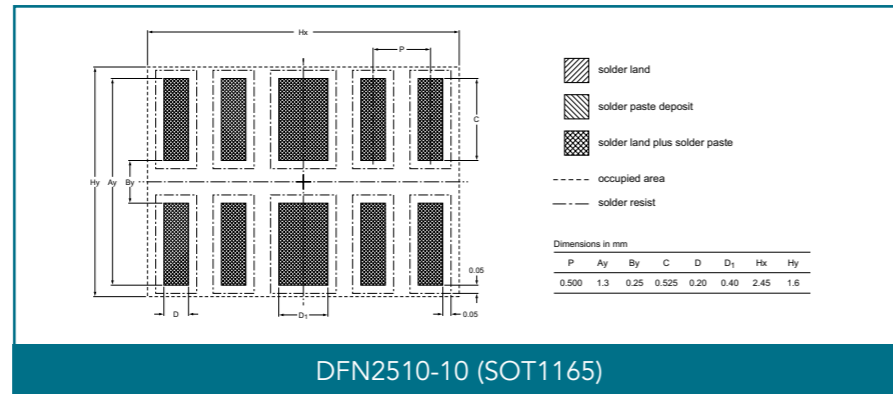
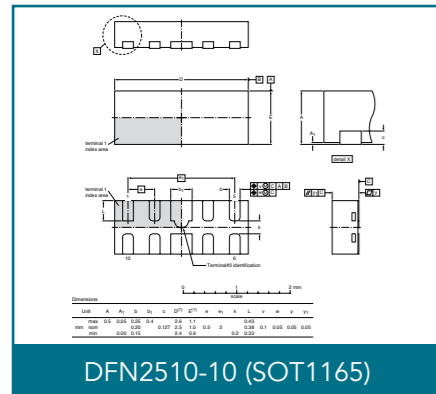
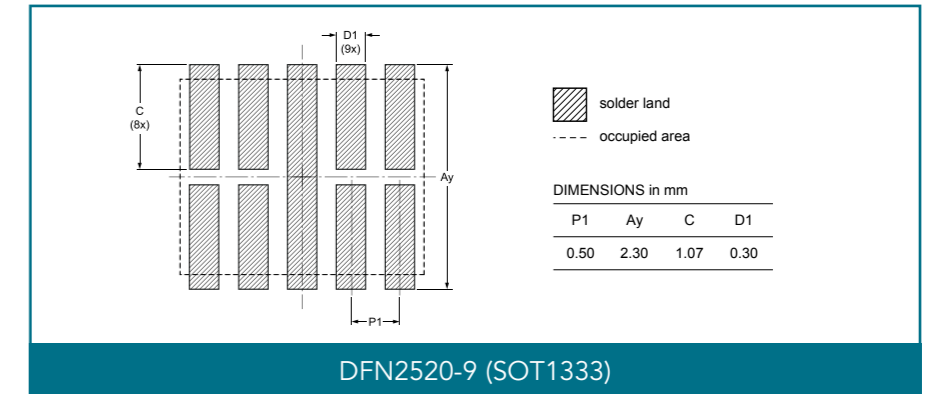
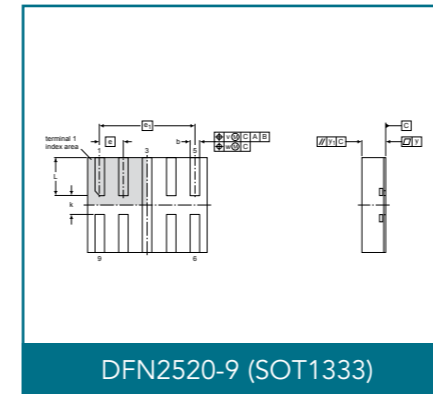
Dimensions in mm

Dimensions in mm

More than 8-pin SMD packages



More than 8-pin SMD packages



More than 8-pin SMD packages

DFN5050-32 (SOT617)

Generic footprint pattern. Refer to the package outline drawing for actual layout.

Legend: solder land, solder paste deposit, solder land plus solder paste, occupied area.

DIMENSIONS in mm

| P     | Ax    | Ay    | Bx    | By    | C     | D     | D1    | SLx   | SLy   | SPx(1) | SPy(1) | SPx   | SPy   | Gx    | Gy    | Hx | Hy |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|-------|-------|-------|-------|----|----|
| 0.500 | 6.000 | 6.000 | 4.200 | 4.200 | 0.900 | 0.200 | 3.100 | 3.100 | 1.800 | 0.700  | 0.700  | 5.300 | 5.300 | 6.250 | 6.250 |    |    |

Issue date: 03-06-15

Single-ended and through-hole packages

SOT78 (TO220AB)

DIMENSIONS (mm are the original dimensions)

| UNIT | A   | A <sub>1</sub> | b   | b <sub>1</sub> (2) | b <sub>2</sub> (2) | c   | D    | D <sub>1</sub> | E    | e    | L    | L <sub>1</sub> (1) | L <sub>2</sub> (1) max. | p   | q   | Q   |
|------|-----|----------------|-----|--------------------|--------------------|-----|------|----------------|------|------|------|--------------------|-------------------------|-----|-----|-----|
| mm   | 4.7 | 1.40           | 0.9 | 1.6                | 1.3                | 0.7 | 16.0 | 6.6            | 10.3 | 2.54 | 15.0 | 3.30               | 3.0                     | 3.8 | 3.0 | 2.6 |
|      | 4.1 | 1.25           | 0.6 | 1.0                | 1.0                | 0.4 | 15.2 | 5.9            | 9.7  |      | 12.8 | 2.79               |                         | 3.5 | 2.7 | 2.2 |

Notes:  
1. Lead shoulder designs may vary.  
2. Dimension includes excess dambar.

SOT360 (TSSOP20)

Generic footprint pattern. Refer to the package outline drawing for actual layout.

Legend: solder land, occupied area.

DIMENSIONS in mm

| P1    | P2    | Ay    | By    | C     | D1    | D2    | Gx    | Gy    | Hx    | Hy    |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.650 | 0.750 | 7.250 | 4.500 | 1.300 | 0.400 | 0.600 | 6.900 | 5.300 | 7.300 | 7.450 |

SOT186A (isolated TO220AB)

DIMENSIONS (mm are the original dimensions)

| UNIT | A   | A <sub>1</sub> | b   | b <sub>1</sub> | b <sub>2</sub> | c   | D    | D <sub>1</sub> | E    | e    | e <sub>1</sub> | j   | K   | L    | L <sub>1</sub> | L <sub>2</sub> (1) max. | P   | Q   | q   | r(2) | w   |
|------|-----|----------------|-----|----------------|----------------|-----|------|----------------|------|------|----------------|-----|-----|------|----------------|-------------------------|-----|-----|-----|------|-----|
| mm   | 4.6 | 2.9            | 0.9 | 1.1            | 1.4            | 0.7 | 15.8 | 6.5            | 10.3 | 2.54 | 5.08           | 2.7 | 0.6 | 14.4 | 3.30           | 3                       | 3.2 | 2.6 | 3.0 | 2.5  | 0.4 |
|      | 4.0 | 2.5            | 0.7 | 0.9            | 1.0            | 0.4 | 15.2 | 6.3            | 9.7  |      | 1.7            | 0.4 |     | 13.5 | 2.79           |                         | 3.0 | 2.3 | 2.6 |      |     |

Notes:  
1. Terminal dimensions within this zone are uncontrolled.  
2. Both recesses are  $\varnothing 2.5 \times 0.8$  max. depth.

SOT519 (SSOP16)

Generic footprint pattern. Refer to the package outline drawing for actual layout.

Legend: solder land, occupied area.

DIMENSIONS in mm

| P1    | P2    | Ay    | By    | C     | D1    | D2    | Gx    | Gy    | Hx    | Hy    |
|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 0.635 | 0.680 | 6.600 | 4.200 | 1.200 | 0.450 | 0.500 | 5.245 | 4.500 | 5.500 | 6.850 |

SOT226

DIMENSIONS (mm are the original dimensions)

| UNIT | A   | A <sub>1</sub> | b    | b <sub>1</sub> | c   | D  | D <sub>1</sub> | E    | e    | L    | L <sub>1</sub> | Q   |
|------|-----|----------------|------|----------------|-----|----|----------------|------|------|------|----------------|-----|
| mm   | 4.5 | 1.40           | 0.85 | 1.3            | 0.7 | 11 | 1.6            | 10.3 | 2.54 | 15.0 | 3.30           | 2.6 |
|      | 4.1 | 1.27           | 0.60 | 1.0            | 0.4 |    | 1.2            | 9.7  |      | 13.5 | 2.79           | 2.2 |

Glass diodes

SOD27 (DO-35)

SOD66 (DO-41)

SOD68 (DO-34)

SOT263B-1

DIMENSIONS (mm are the original dimensions)

| UNIT | A   | A <sub>1</sub> | b    | c   | D    | D <sub>1</sub> | E    | e   | L   | L <sub>2</sub> | L <sub>3</sub> (1) | L <sub>4</sub> (2) max. | m   | ∅p  | p <sub>1</sub> | q   | Q   | Q <sub>1</sub> | Q <sub>2</sub> | R   | w   |     |
|------|-----|----------------|------|-----|------|----------------|------|-----|-----|----------------|--------------------|-------------------------|-----|-----|----------------|-----|-----|----------------|----------------|-----|-----|-----|
| mm   | 4.5 | 1.39           | 0.85 | 0.7 | 15.8 | 6.4            | 10.3 | 1.7 | 9.8 | 5.9            | 5.2                | 2.4                     | 0.5 | 0.8 | 3.8            | 4.3 | 3.0 | 2.0            | 4.5            | 8.2 | 0.5 | 0.4 |
|      | 4.1 | 1.27           | 0.70 | 0.4 | 15.2 | 5.9            | 9.7  |     | 9.7 | 5.3            | 5.0                | 1.6                     |     | 0.6 | 3.6            | 4.1 | 2.7 |                |                |     |     |     |

| Type Number            | Page Number | Type Number   | Page Number | Type Number | Page Number | Type Number                       | Page Number | Type Number                       | Page Number |
|------------------------|-------------|---------------|-------------|-------------|-------------|-----------------------------------|-------------|-----------------------------------|-------------|
| 1N47xxA series         | 40          | 2PD601BRL     | 22          | BAS70-04W   | 38          | BAT160A                           | 37          | BC52PAS / BC52-10PAS / BC52-16PAS | 24          |
| 1PS10SB82              | 39          | 2PD601BSL     | 22          | BAS70-05    | 38          | BAT160C                           | 37          | BC53PA / BC53-10PA / BC53-16PA    | 24          |
| 1PS66SB17              | 39          | 2PD602AQL     | 22          | BAS70-05W   | 38          | BAT160S                           | 37          | BC53PAS / BC53-10PAS / BC53-16PAS | 24          |
| 1PS66SB82              | 39          | 2PD602ARL     | 22          | BAS70-06    | 38          | BAT720                            | 36          | BC54PA / BC54-10PA / BC54-16PA    | 24          |
| 1PS70SB20              | 36          | 2PD602ASL     | 22          | BAS70-06W   | 38          | BAT721                            | 38          | BC54PAS / BC54-10PAS / BC54-16PAS | 24          |
| 1PS70SB82              | 39          | 2PD1820AR / S | 22          | BAS70-07    | 38          | BAT721A                           | 38          | BC55PA / BC55-10PA / BC55-16PA    | 24          |
| 1PS70SB84              | 39          | BAL74         | 42          | BAS70-07S   | 38          | BAT721C                           | 38          | BC55PAS / BC55-10PAS / BC55-16PAS | 24          |
| 1PS70SB85              | 39          | BAL99         | 42          | BAS70-07V   | 38          | BAT721S                           | 38          | BC56PA / BC56-10PA / BC56-16PA    | 24          |
| 1PS70SB86              | 39          | BAS16         | 42          | BAS70H      | 38          | BAT754                            | 38          | BC56PAS / BC56-10PAS / BC56-16PAS | 24          |
| 1PS74SB23              | 36          | BAS16H        | 42          | BAS70L      | 38          | BAT754A                           | 38          | BC68PA / BC68-25PA                | 24          |
| 1PS76SB10              | 38          | BAS16J        | 42          | BAS70VV     | 38          | BAT754C                           | 38          | BC68PAS / BC68-25PAS              | 24          |
| 1PS76SB17              | 39          | BAS16L        | 42          | BAS70W      | 38          | BAT754L                           | 38          | BC69PA / BC69-16PA / BC69-25PA    | 24          |
| 1PS76SB21              | 38          | BAS16LD       | 42          | BAS70XY     | 38          | BAT754S                           | 38          | BC69PAS / BC69-16PAS / BC69-25PAS | 24          |
| 1PS76SB40              | 38          | BAS16QA       | 42          | BAS85       | 38          | BAT760                            | 36          | BC807 / -16 / -25 / -40           | 22          |
| 1PS76SB70              | 38          | BAS16VV       | 42          | BAS86       | 38          | BAT854AW                          | 38          | BC807 / -25QA / -40QA             | 22          |
| 1PS79SB10              | 38          | BAS16VY       | 42          | BAS101      | 43          | BAT854CW                          | 38          | BC807DS                           | 23          |
| 1PS79SB17              | 39          | BAS16W        | 42          | BAS101S     | 43          | BAT854SW                          | 38          | BC807W / -16W / -25W / -40W       | 22          |
| 1PS79SB30              | 38          | BAS19         | 43          | BAS116      | 44          | BAT854W                           | 38          | BC817 / -16 / -25 / -40           | 22          |
| 1PS79SB31              | 38          | BAS20         | 43          | BAS116H     | 44          | BAT960                            | 36          | BC817 / -25QA / -40QA             | 22          |
| 1PS79SB40              | 38          | BAS21         | 43          | BAS116L     | 44          | BAV23                             | 43          | BC817DPN                          | 23          |
| 1PS79SB70              | 38          | BAS21AVD      | 43          | BAS116QA    | 44          | BAV23A                            | 43          | BC817DS                           | 23          |
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