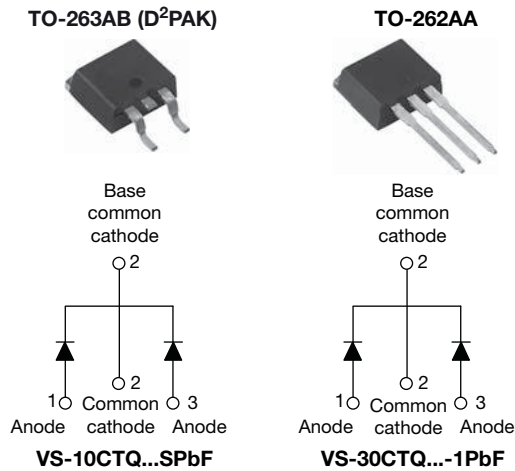


## High Performance Schottky Rectifier, 2 x 15 A



### FEATURES

- 175 °C T<sub>J</sub> operation
- Center tap TO-220 package
- Very low forward voltage drop
- High frequency operation
- High purity, high temperature epoxy encapsulation for enhanced mechanical strength and moisture resistance
- Guard ring for enhanced ruggedness and long term reliability
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

| PRODUCT SUMMARY                  |   |
|----------------------------------|---|
| Package                          | TO-263AB (D <sup>2</sup> PAK), TO-262AA |
| I <sub>F(AV)</sub>               | 2 x 15 A                                |
| V <sub>R</sub>                   | 35 V, 40 V, 45 V                        |
| V <sub>F</sub> at I <sub>F</sub> | 0.56 V                                  |
| I <sub>RM</sub>                  | 15 mA at 125 °C                         |
| T <sub>J</sub> max.              | 175 °C                                  |
| Diode variation                  | Common cathode                          |
| E <sub>AS</sub>                  | 20 mJ                                   |

### DESCRIPTION

The VS-30CTQ... center tap Schottky rectifier has been optimized for very low forward voltage drop, with moderate leakage. The proprietary barrier technology allows for reliable operation up to 175 °C junction temperature. Typical applications are in switching power supplies, converters, freewheeling diodes, and reverse battery protection.

| MAJOR RATINGS AND CHARACTERISTICS |  |             |       |
|-----------------------------------|--|-------------|-------|
| SYMBOL                            | CHARACTERISTICS  | VALUES      | UNITS |
| I <sub>F(AV)</sub>                | Rectangular waveform                                   | 30          | A     |
| V <sub>R(RRM)</sub>               |  | 35 to 45    | V     |
| I <sub>FSM</sub>                  | t <sub>p</sub> = 5 μs sine                             | 1060        | A     |
| V <sub>F</sub>                    | 15 A <sub>pk</sub> , T <sub>J</sub> = 125 °C (per leg) | 0.56        | V     |
| T <sub>J</sub>                    | Range  | -55 to +175 | °C    |

| VOLTAGE RATINGS                      |                    |                                     |                                     |                                     |       |
|--------------------------------------|--------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------|
| PARAMETER                            | SYMBOL             | VS-30CTQ035SPbF<br>VS-30CTQ035-1PbF | VS-30CTQ040SPbF<br>VS-30CTQ040-1PbF | VS-30CTQ045SPbF<br>VS-30CTQ045-1PbF | UNITS |
| Maximum DC reverse voltage           | V <sub>R</sub>     | 35                                  | 40                                  | 45                                  | V     |
| Maximum working peak reverse voltage | V <sub>R(WM)</sub> |                                     |                                     |                                     |       |

| ABSOLUTE MAXIMUM RATINGS  |                    |  |   |        |       |
|---|--------------------|--|---|--------|-------|
| PARAMETER   | SYMBOL             | TEST CONDITIONS  |   | VALUES | UNITS |
| Maximum average forward current<br>See fig. 5                           | I <sub>F(AV)</sub> | 50 % duty cycle at T <sub>C</sub> = 127 °C, rectangular waveform   |   | 30     | A     |
| Maximum peak one cycle non-repetitive surge current per leg, see fig. 7 | I <sub>FSM</sub>   | 5 μs sine or 3 μs rect. pulse  | Following any rated load condition and with rated V <sub>R(RRM)</sub> applied | 1060   |       |
|   |                    | 10 ms sine or 6 ms rect. pulse   |   | 265    |       |
| Non-repetitive avalanche energy per leg                                 | E <sub>AS</sub>    | T <sub>J</sub> = 25 °C, I <sub>AS</sub> = 3.0 A, L = 4.40 mH   |   | 20     | mJ    |
| Repetitive avalanche current per leg                                    | I <sub>AR</sub>    | Current decaying linearly to zero in 1 μs<br>Frequency limited by T <sub>J</sub> maximum V <sub>A</sub> = 1.5 x V <sub>R</sub> typical |   | 3.0    | A     |



| <b>ELECTRICAL SPECIFICATIONS</b>                      |                |   |                                   |        |            |
|---|----------------|---|-----------------------------------|--------|------------|
| PARAMETER   | SYMBOL         | TEST CONDITIONS   |                                   | VALUES | UNITS      |
| Maximum forward voltage drop per leg<br>See fig. 1    | $V_{FM}^{(1)}$ | 15 A  | $T_J = 25\text{ }^\circ\text{C}$  | 0.62   | V          |
|   |                | 30 A  |                                   | 0.76   |            |
|   |                | 15 A  | $T_J = 125\text{ }^\circ\text{C}$ | 0.56   |            |
|   |                | 30 A  |                                   | 0.70   |            |
| Maximum reverse leakage current per leg<br>See fig. 2 | $I_{RM}^{(1)}$ | $T_J = 25\text{ }^\circ\text{C}$  | $V_R = \text{Rated } V_R$         | 2      | mA         |
|   |                | $T_J = 125\text{ }^\circ\text{C}$   |                                   | 15     |            |
| Maximum junction capacitance per leg                  | $C_T$          | $V_R = 5 V_{DC}$ (test signal range 100 kHz to 1 MHz), $25\text{ }^\circ\text{C}$ |                                   | 900    | pF         |
| Typical series inductance per leg                     | $L_S$          | Measured lead to lead 5 mm from package body                                      |                                   | 8.0    | nH         |
| Maximum voltage rate of change                        | dV/dt          | Rated $V_R$   |                                   | 10 000 | V/ $\mu$ s |

**Note**

(1) Pulse width < 300  $\mu$ s, duty cycle < 2 %

| <b>THERMAL - MECHANICAL SPECIFICATIONS</b>               |                |  |  |             |                        |
|--|----------------|--|--|-------------|------------------------|
| PARAMETER  | SYMBOL         | TEST CONDITIONS                          |  | VALUES      | UNITS                  |
| Maximum junction and storage temperature range           | $T_J, T_{Stg}$ |  |  | -55 to +175 | $^\circ\text{C}$       |
| Maximum thermal resistance, junction to case per leg     | $R_{thJC}$     | DC operation<br>See fig. 4               |  | 3.25        | $^\circ\text{C/W}$     |
| Maximum thermal resistance, junction to case per package |                | DC operation                             |  | 1.63        |                        |
| Typical thermal resistance, case to heatsink             | $R_{thCS}$     | Mounting surface, smooth and greased     |  | 0.50        |                        |
| Approximate weight                                       |                |  |  | 2           | g                      |
|  |                |  |  | 0.07        | oz.                    |
| Mounting torque  | minimum        |  |  | 6 (5)       | kgf · cm<br>(lbf · in) |
|  | maximum        |  |  | 12 (10)     |                        |
| Marking device   |                | Case style TO-263AB (D <sup>2</sup> PAK) |  | 30CTQ045S   |                        |
|  |                | Case style TO-262AA                      |  | 30CTQ045-1  |                        |

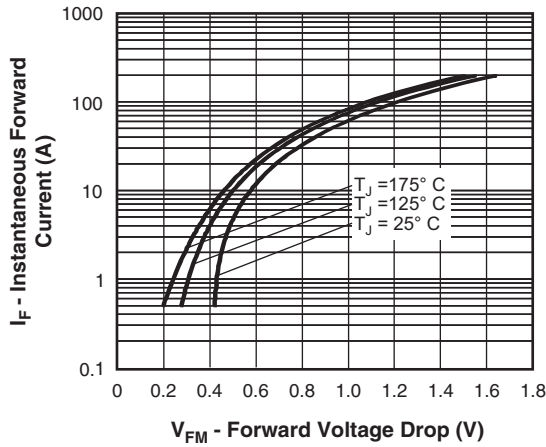


Fig. 1 - Maximum Forward Voltage Drop Characteristics (Per Leg)

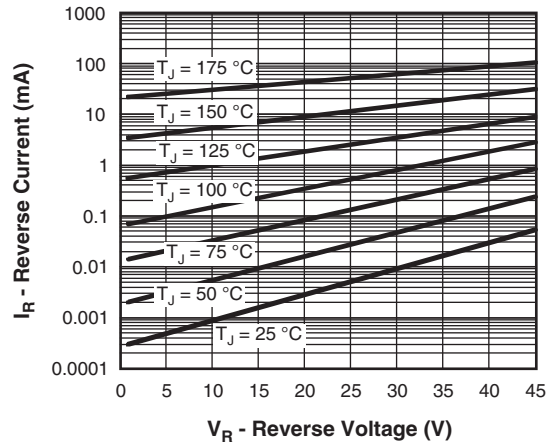


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage (Per Leg)

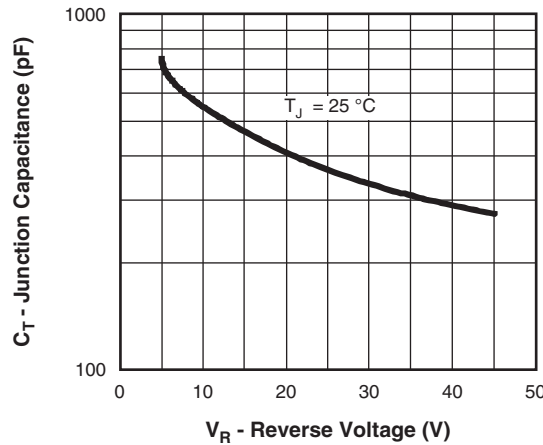


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage (Per Leg)

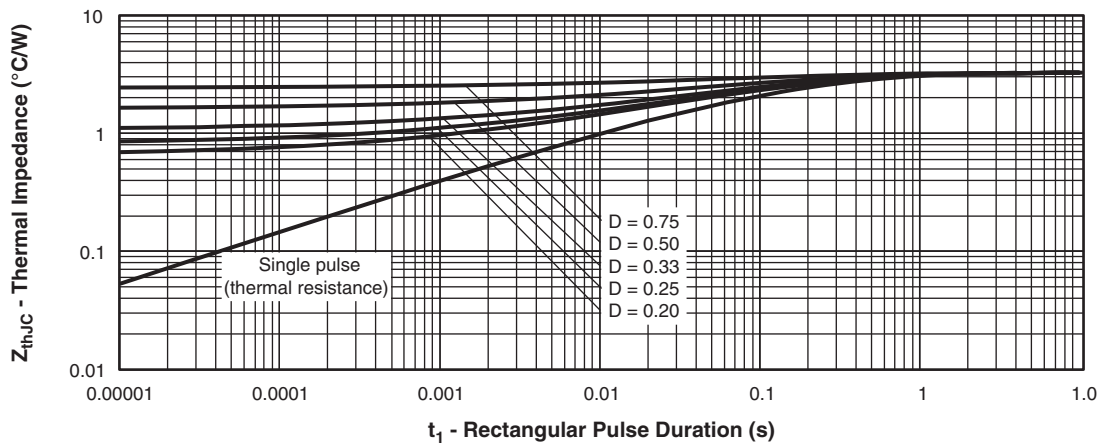


Fig. 4 - Maximum Thermal Impedance  $Z_{thJC}$  Characteristics (Per Leg)

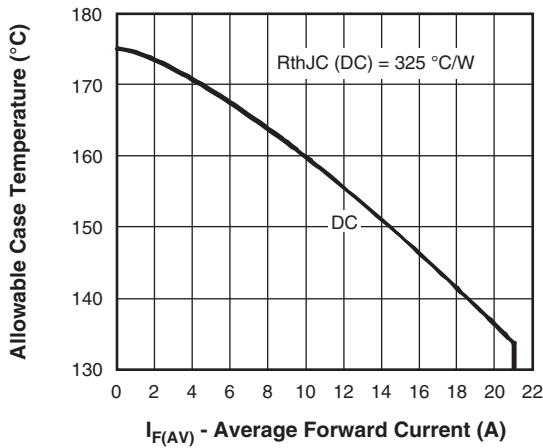


Fig. 5 - Maximum Allowable Case Temperature vs. Average Forward Current (Per Leg)

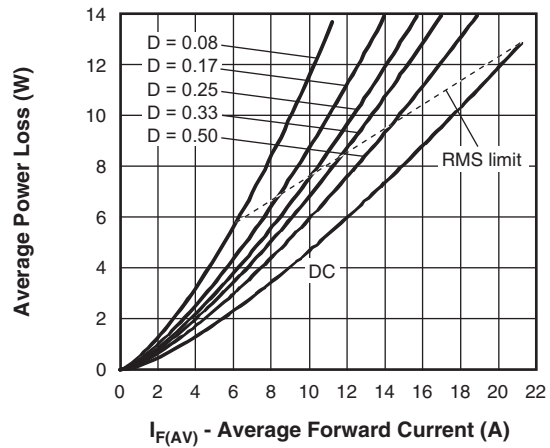


Fig. 6 - Forward Power Loss Characteristics (Per Leg)

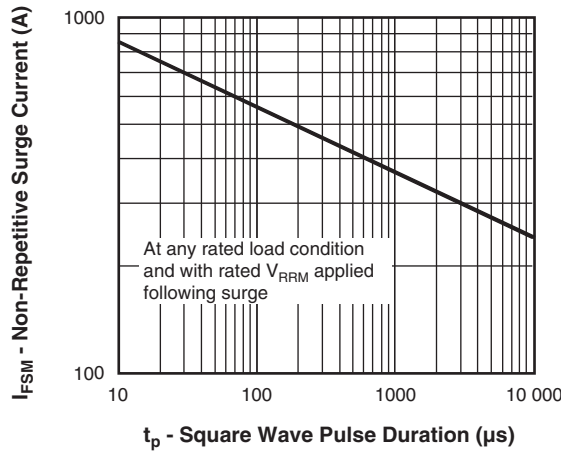


Fig. 7 - Maximum Non-Repetitive Surge Current (Per Leg)

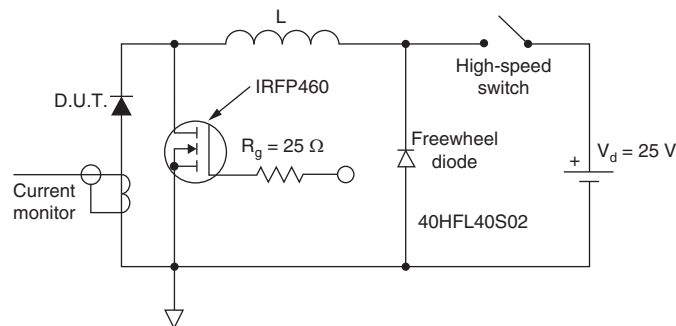
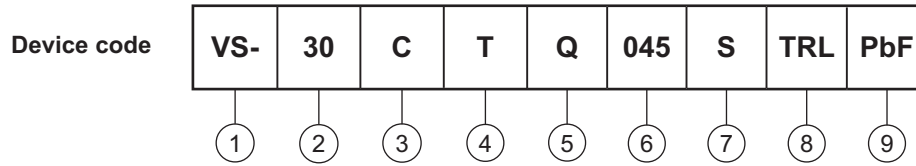


Fig. 8 - Unclamped Inductive Test Circuit



## ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - Current rating (30 A)
- 3** - Circuit configuration: C = common cathode
- 4** - T = TO-220
- 5** - Schottky "Q" series
 

|            |
|------------|
| 035 = 35 V |
| 040 = 40 V |
| 045 = 45 V |
- 6** - Voltage ratings
- 7** -
  - S = D<sup>2</sup>PAK
  - -1 = TO-262
- 8** -
  - None = tube (50 pieces)
  - TRL = tape and reel (left oriented - for D<sup>2</sup>PAK only)
  - TRR = tape and reel (right oriented - for D<sup>2</sup>PAK only)
- 9** - PbF = lead (Pb)-free

| ORDERING INFORMATION (Example) |                   |                        |                                    |
|--------------------------------|-------------------|------------------------|------------------------------------|
| PREFERRED P/N                  | QUANTITY PER REEL | MINIMUM ORDER QUANTITY | PACKAGING DESCRIPTION              |
| VS-30CTQ035SPBF                | 50                | 1000                   | Antistatic plastic tubes           |
| VS-30CTQ035STRRPBF             | 800               | 800                    | 13" diameter plastic tape and reel |
| VS-30CTQ035STRLPBF             | 800               | 800                    | 13" diameter plastic tape and reel |
| VS-30CTQ035-1PBF               | 50                | 1000                   | Antistatic plastic tubes           |
| VS-30CTQ040SPBF                | 50                | 1000                   | Antistatic plastic tubes           |
| VS-30CTQ040STRRPBF             | 800               | 800                    | 13" diameter plastic tape and reel |
| VS-30CTQ040STRLPBF             | 800               | 800                    | 13" diameter plastic tape and reel |
| VS-30CTQ040-1PBF               | 50                | 1000                   | Antistatic plastic tubes           |
| VS-30CTQ045SPBF                | 50                | 1000                   | Antistatic plastic tubes           |
| VS-30CTQ045STRRPBF             | 800               | 800                    | 13" diameter plastic tape and reel |
| VS-30CTQ045STRLPBF             | 800               | 800                    | 13" diameter plastic tape and reel |
| VS-30CTQ045-1PBF               | 50                | 1000                   | Antistatic plastic tubes           |

| LINKS TO RELATED DOCUMENTS |                               |  |
|----------------------------|-------------------------------|--|
| Dimensions                 | TO-263AB (D <sup>2</sup> PAK) | <a href="http://www.vishay.com/doc?95046">www.vishay.com/doc?95046</a> |
|                            | TO-262AA                      | <a href="http://www.vishay.com/doc?95419">www.vishay.com/doc?95419</a> |
| Part marking information   |                               | <a href="http://www.vishay.com/doc?95008">www.vishay.com/doc?95008</a> |
| Packaging information      |                               | <a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a> |

## D<sup>2</sup>PAK, TO-262

### DIMENSIONS FOR D<sup>2</sup>PAK in millimeters and inches

Conforms to JEDEC outline D<sup>2</sup>PAK (SMD-220)



| SYMBOL | MILLIMETERS |       | INCHES |       | NOTES |
|--------|-------------|-------|--------|-------|-------|
|        | MIN.        | MAX.  | MIN.   | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160  | 0.190 |       |
| A1     | 0.00        | 0.254 | 0.000  | 0.010 |       |
| b      | 0.51        | 0.99  | 0.020  | 0.039 |       |
| b1     | 0.51        | 0.89  | 0.020  | 0.035 | 4     |
| b2     | 1.14        | 1.78  | 0.045  | 0.070 |       |
| b3     | 1.14        | 1.73  | 0.045  | 0.068 | 4     |
| c      | 0.38        | 0.74  | 0.015  | 0.029 |       |
| c1     | 0.38        | 0.58  | 0.015  | 0.023 | 4     |
| c2     | 1.14        | 1.65  | 0.045  | 0.065 |       |
| D      | 8.51        | 9.65  | 0.335  | 0.380 | 2     |

| SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| D1     | 6.86        | 8.00  | 0.270     | 0.315 | 3     |
| E      | 9.65        | 10.67 | 0.380     | 0.420 | 2, 3  |
| E1     | 7.90        | 8.80  | 0.311     | 0.346 | 3     |
| e      | 2.54 BSC    |       | 0.100 BSC |       |       |
| H      | 14.61       | 15.88 | 0.575     | 0.625 |       |
| L      | 1.78        | 2.79  | 0.070     | 0.110 |       |
| L1     | -           | 1.65  | -         | 0.066 | 3     |
| L2     | 1.27        | 1.78  | 0.050     | 0.070 |       |
| L3     | 0.25 BSC    |       | 0.010 BSC |       |       |
| L4     | 4.78        | 5.28  | 0.188     | 0.208 |       |

#### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inch

- (7) Outline conforms to JEDEC outline TO-263AB

## DIMENSIONS FOR TO-262 in millimeters and inches



| SYMBOL | MILLIMETERS |       | INCHES    |       | NOTES |
|--------|-------------|-------|-----------|-------|-------|
|        | MIN.        | MAX.  | MIN.      | MAX.  |       |
| A      | 4.06        | 4.83  | 0.160     | 0.190 |       |
| A1     | 2.03        | 3.02  | 0.080     | 0.119 |       |
| b      | 0.51        | 0.99  | 0.020     | 0.039 |       |
| b1     | 0.51        | 0.89  | 0.020     | 0.035 | 4     |
| b2     | 1.14        | 1.78  | 0.045     | 0.070 |       |
| b3     | 1.14        | 1.73  | 0.045     | 0.068 | 4     |
| c      | 0.38        | 0.74  | 0.015     | 0.029 |       |
| c1     | 0.38        | 0.58  | 0.015     | 0.023 | 4     |
| c2     | 1.14        | 1.65  | 0.045     | 0.065 |       |
| D      | 8.51        | 9.65  | 0.335     | 0.380 | 2     |
| D1     | 6.86        | 8.00  | 0.270     | 0.315 | 3     |
| E      | 9.65        | 10.67 | 0.380     | 0.420 | 2, 3  |
| E1     | 7.90        | 8.80  | 0.311     | 0.346 | 3     |
| e      | 2.54 BSC    |       | 0.100 BSC |       |       |
| L      | 13.46       | 14.10 | 0.530     | 0.555 |       |
| L1     | -           | 1.65  | -         | 0.065 | 3     |
| L2     | 3.56        | 3.71  | 0.140     | 0.146 |       |

**Notes**

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Dimension D and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Outline conform to JEDEC TO-262 except A1 (maximum), b (minimum) and D1 (minimum) where dimensions derived the actual package outline



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