



# PNE650150EH

650 V, 15 A hyperfast recovery rectifier

11 June 2026

Product data sheet

## 1. General description

High power density, hyperfast switching time recovery rectifier with high-efficiency planar technology, encapsulated in DPAK Real-2-Pin (SOT8017).

## 2. Features and benefits

- Reverse voltage  $V_R \leq 650$  V
- Forward current  $I_F \leq 15$  A
- Typical switching time  $t_{tr}$  of 20 ns
- Pt doped life time control
- Low inductance and soft recovery
- Planar die design

## 3. Applications

- AC/DC converter
- DC/DC converter
- SMPS / UPS
- PFC
- Freewheeling applications

## 4. Quick reference data

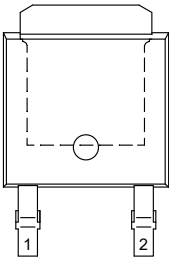
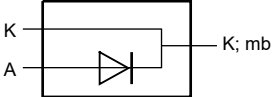
Table 1. Quick reference data

| Symbol      | Parameter                       | Conditions                                                    |     | Min | Typ  | Max  | Unit |
|-------------|---------------------------------|---------------------------------------------------------------|-----|-----|------|------|------|
| $I_{F(AV)}$ | average forward current         | $\delta = 0.5$ ; $f = 20$ kHz; square wave; $T_c \leq 122$ °C |     | -   | -    | 15   | A    |
| $V_{RRM}$   | repetitive peak reverse voltage | $T_j = 25$ °C                                                 |     | -   | -    | 650  | V    |
| $V_R$       | reverse voltage                 |                                                               |     | -   | -    | 650  | V    |
| $V_F$       | forward voltage                 | $I_F = 15$ A; pulsed; $T_j = 25$ °C                           | [1] | -   | 1.6  | 2.4  | V    |
|             |                                 | $I_F = 15$ A; pulsed; $T_j = 125$ °C                          | [1] | -   | 1.3  | 1.93 | V    |
|             |                                 | $I_F = 15$ A; pulsed; $T_j = 175$ °C                          | [1] | -   | 1.23 | -    | V    |
| $I_R$       | reverse current                 | $V_R = 650$ V; pulsed; $T_j = 25$ °C                          | [1] | -   | -    | 5    | μA   |
|             |                                 | $V_R = 650$ V; pulsed; $T_j = 125$ °C                         | [1] | -   | 3.87 | 50   | μA   |
|             |                                 | $V_R = 650$ V; pulsed; $T_j = 175$ °C                         | [1] | -   | 87   | -    | μA   |

[1] Very short pulse, in order to maintain a stable junction temperature.

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                                                       | Simplified outline                                                                                      | Graphic symbol                                                                                    |
|-----|--------|-------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|
| 1   | K      | cathode                                                           | <br>DPAK R2P (SOT8017) | <br>aaa-037872 |
| 2   | A      | anode                                                             |                                                                                                         |                                                                                                   |
| mb  | K      | mounting base; connected to cathode, also referred to as the case |                                                                                                         |                                                                                                   |

6. Ordering information

Table 3. Ordering information

| Type number                 | Package  |                                                                                                                                     |                         |
|-----------------------------|----------|-------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|                             | Name     | Description                                                                                                                         | Version                 |
| <a href="#">PNE650150EH</a> | DPAK R2P | Plastic, single-ended surface-mounted package (DPAK R2P); Real-2-Pin configuration; 4.58 mm pitch; 6.16 mm x 6.54 mm x 2.29 mm body | <a href="#">SOT8017</a> |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PNE650150EH | E65015       |

8. Limiting values

Table 5. Limiting values  
In accordance with the Absolute Maximum Rating System (IEC 601134).

| Symbol             | Parameter                           | Conditions                                                                                                     |     | Min | Max | Unit |
|--------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| V <sub>RRM</sub>   | repetitive peak reverse voltage     | T <sub>j</sub> = 25 °C                                                                                         |     | -   | 650 | V    |
| V <sub>R</sub>     | reverse voltage                     |                                                                                                                |     | -   | 650 | V    |
| V <sub>RMS</sub>   | RMS voltage                         |                                                                                                                |     | -   | 460 | V    |
| I <sub>F</sub>     | forward current                     | δ = 1; T <sub>c</sub> ≤ 109 °C                                                                                 |     | -   | 21  | A    |
| I <sub>F(AV)</sub> | average forward current             | δ = 0.5; f = 20 kHz; square wave; T <sub>c</sub> ≤ 122 °C                                                      |     | -   | 15  | A    |
| I <sub>FSM</sub>   | non-repetitive peak forward current | t <sub>p</sub> = 8.3 ms; single half sine wave (applied at rated load condition); T <sub>j(init)</sub> = 25 °C |     | -   | 130 | A    |
|                    |                                     | t <sub>p</sub> = 10 ms; square wave; T <sub>j(init)</sub> = 25 °C                                              |     | -   | 100 | A    |
| P <sub>tot</sub>   | total power dissipation             | T <sub>c</sub> ≤ 25 °C                                                                                         | [1] | -   | 1.7 | W    |
|                    |                                     |                                                                                                                | [2] | -   | 3.3 | W    |
| T <sub>j</sub>     | junction temperature                |                                                                                                                |     | -   | 175 | °C   |
| T <sub>amb</sub>   | ambient temperature                 |                                                                                                                |     | -55 | 175 | °C   |
| T <sub>stg</sub>   | storage temperature                 |                                                                                                                |     | -65 | 175 | °C   |

[1] Device mounted on an FR4 PCB, single-sided copper and standard footprint.  
[2] Device mounted on an FR4 PCB, single-sided copper, mounting pad for cathode 6 cm<sup>2</sup>.

9. Thermal characteristics

Table 6. Thermal characteristics

| Symbol        | Parameter                                   | Conditions  |     | Min | Typ | Max | Unit |
|---------------|---------------------------------------------|-------------|-----|-----|-----|-----|------|
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | [1] | -   | -   | 90  | K/W  |
|               |                                             |             | [2] | -   | -   | 45  | K/W  |
| $R_{th(j-c)}$ | thermal resistance from junction to case    |             | [3] | -   | -   | 2.1 | K/W  |

- [1] Device mounted on an FR4 PCB, single-sided copper and standard footprint.  
[2] Device mounted on an FR4 PCB, single-sided copper, mounting pad for cathode 6 cm<sup>2</sup>.  
[3] Soldering point of cathode tab.

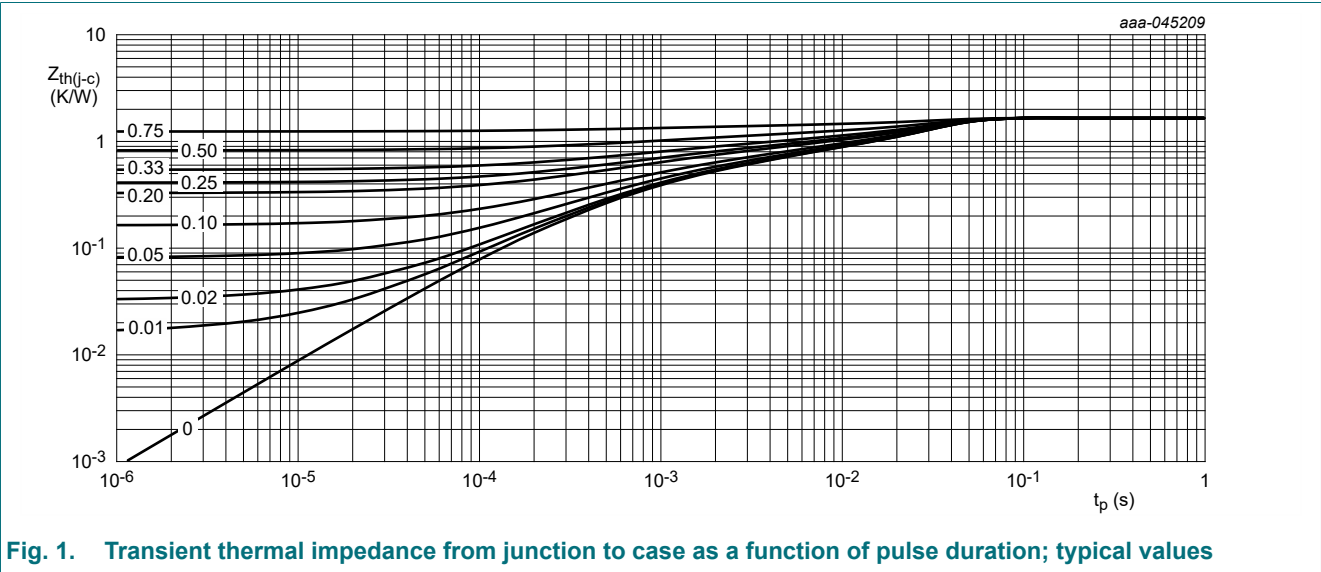


Fig. 1. Transient thermal impedance from junction to case as a function of pulse duration; typical values

## 10. Characteristics

Table 7. Characteristics

| Symbol      | Parameter                             | Conditions                                                                     |     | Min | Typ  | Max  | Unit    |
|-------------|---------------------------------------|--------------------------------------------------------------------------------|-----|-----|------|------|---------|
| $V_{(BR)R}$ | reverse breakdown voltage             | $I_R = 100 \mu A$ ; pulsed; $T_j = 25^\circ C$                                 | [1] | 650 | -    | -    | V       |
| $V_F$       | forward voltage                       | $I_F = 15 A$ ; pulsed; $T_j = 25^\circ C$                                      | [1] | -   | 1.6  | 2.4  | V       |
|             |                                       | $I_F = 15 A$ ; pulsed; $T_j = 125^\circ C$                                     | [1] | -   | 1.3  | 1.93 | V       |
|             |                                       | $I_F = 15 A$ ; pulsed; $T_j = 175^\circ C$                                     | [1] | -   | 1.23 | -    | V       |
| $I_R$       | reverse current                       | $V_R = 650 V$ ; pulsed; $T_j = 25^\circ C$                                     | [1] | -   | -    | 5    | $\mu A$ |
|             |                                       | $V_R = 650 V$ ; pulsed; $T_j = 125^\circ C$                                    | [1] | -   | 3.87 | 50   | $\mu A$ |
|             |                                       | $V_R = 650 V$ ; pulsed; $T_j = 175^\circ C$                                    | [1] | -   | 87   | -    | $\mu A$ |
| $C_d$       | diode capacitance                     | $V_R = 400 V$ ; $f = 1 MHz$ ; $T_j = 25^\circ C$                               |     | -   | 11   | -    | pF      |
| $t_{rr}$    | reverse recovery time ; step recovery | $I_F = 0.5 A$ ; $I_R = 1 A$ ; $I_{R(meas)} = 0.25 A$ ; $T_j = 25^\circ C$      |     | -   | 20   | 30   | ns      |
|             | reverse recovery time ; ramp recovery | $I_F = 1 A$ ; $dI_F/dt = -50 A/\mu s$ ; $V_R = 30 V$ ; $T_j = 25^\circ C$      |     | -   | 26   | -    | ns      |
|             |                                       | $I_F = 15 A$ ; $dI_F/dt = -200 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 25^\circ C$   |     | -   | 80   | -    | ns      |
|             |                                       | $I_F = 15 A$ ; $dI_F/dt = -1000 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 25^\circ C$  |     | -   | 46   | -    | ns      |
|             |                                       | $I_F = 15 A$ ; $dI_F/dt = -200 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 125^\circ C$  |     | -   | 131  | -    | ns      |
|             |                                       | $I_F = 15 A$ ; $dI_F/dt = -1000 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 125^\circ C$ |     | -   | 73   | -    | ns      |
| $I_{RM}$    | peak reverse recovery current         | $I_F = 15 A$ ; $dI_F/dt = -200 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 25^\circ C$   |     | -   | 3.3  | -    | A       |
|             |                                       | $I_F = 15 A$ ; $dI_F/dt = -1000 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 25^\circ C$  |     | -   | 13.1 | -    | A       |
|             |                                       | $I_F = 15 A$ ; $dI_F/dt = -200 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 125^\circ C$  |     | -   | 7.6  | -    | A       |
|             |                                       | $I_F = 15 A$ ; $dI_F/dt = -1000 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 125^\circ C$ |     | -   | 20.7 | -    | A       |
| $Q_{rr}$    | reverse recovery charge               | $I_F = 15 A$ ; $dI_F/dt = -200 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 25^\circ C$   |     | -   | 151  | -    | nC      |
|             |                                       | $I_F = 15 A$ ; $dI_F/dt = -1000 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 25^\circ C$  |     | -   | 340  | -    | nC      |
|             |                                       | $I_F = 15 A$ ; $dI_F/dt = -200 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 125^\circ C$  |     | -   | 577  | -    | nC      |
|             |                                       | $I_F = 15 A$ ; $dI_F/dt = -1000 A/\mu s$ ; $V_R = 400 V$ ; $T_j = 125^\circ C$ |     | -   | 909  | -    | nC      |

[1] Very short pulse, in order to maintain a stable junction temperature.

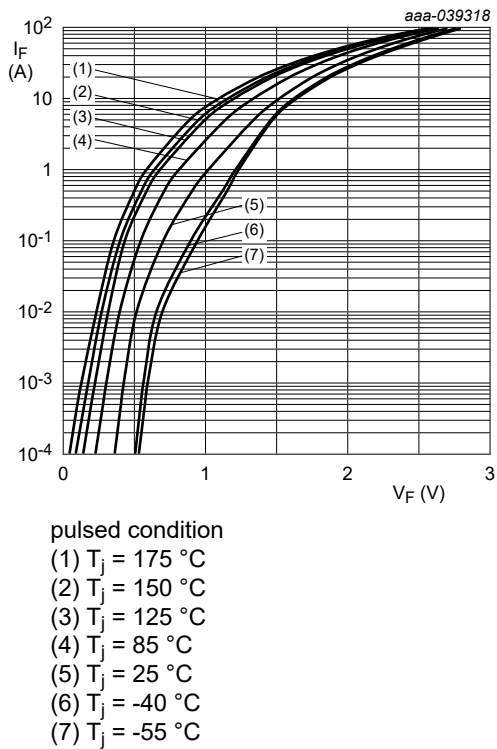


Fig. 2. Forward current as a function of forward voltage; typical values

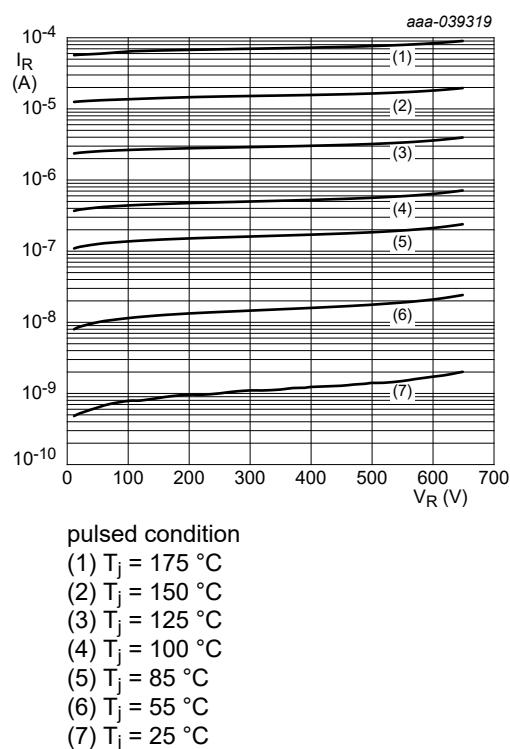


Fig. 3. Reverse current as a function of reverse voltage; typical values

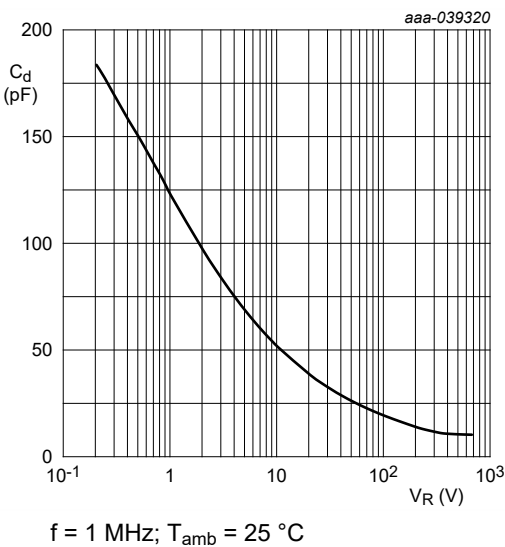


Fig. 4. Diode capacitance as a function of reverse voltage; typical values

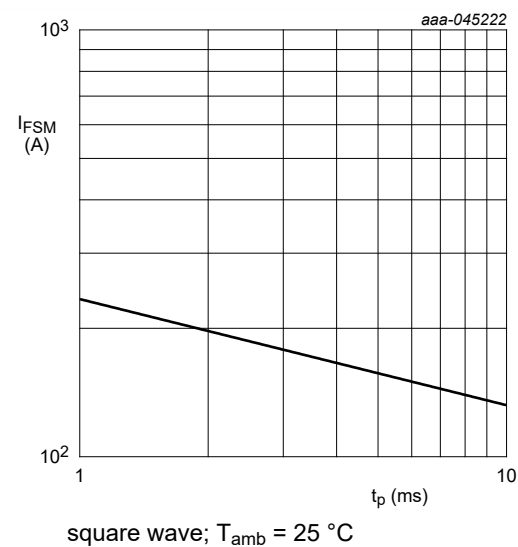


Fig. 5. Non-repetitive peak forward current as a function of pulse duration; typical values

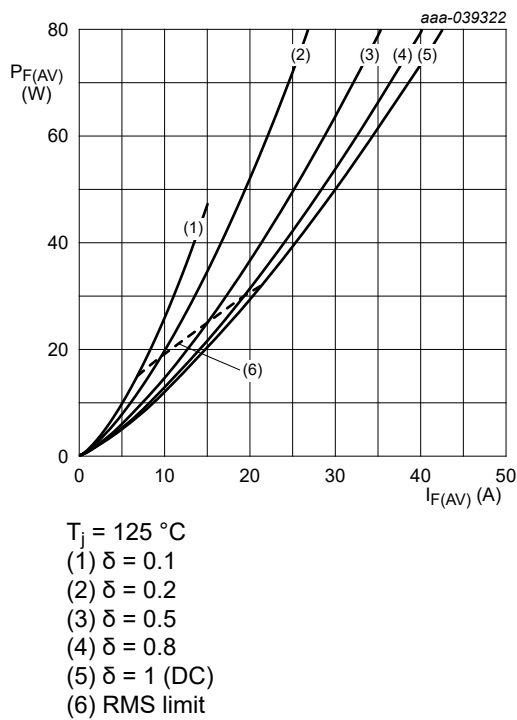


Fig. 6. Average forward power dissipation as a function of average forward current; typical values

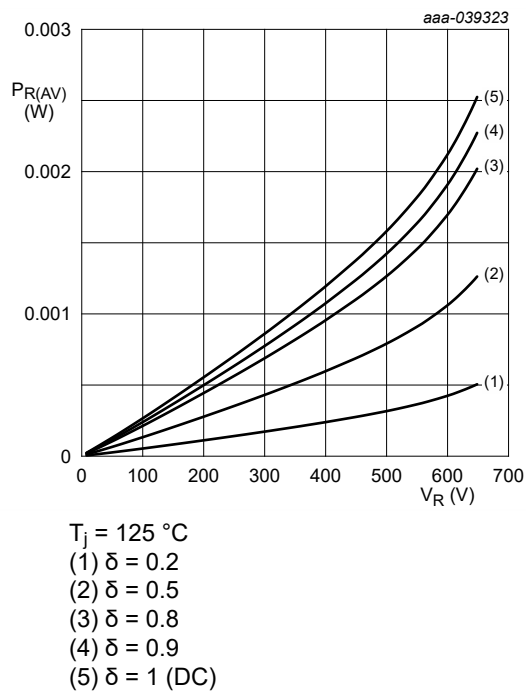


Fig. 7. Average reverse power dissipation as a function of reverse voltage; typical values

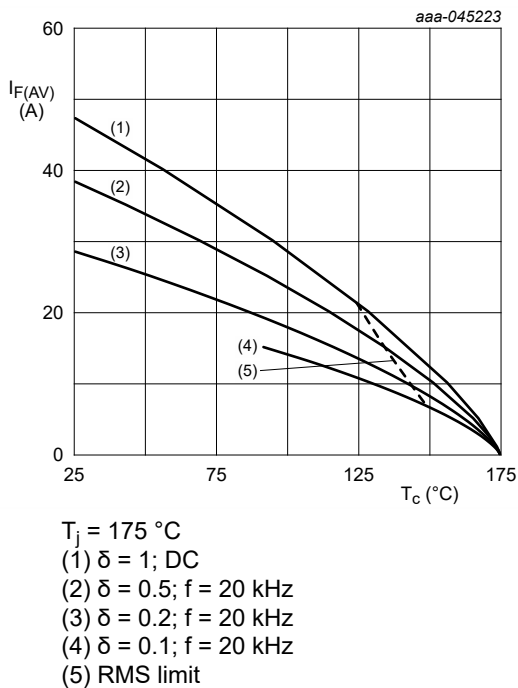


Fig. 8. Average forward current as a function of case temperature; typical values

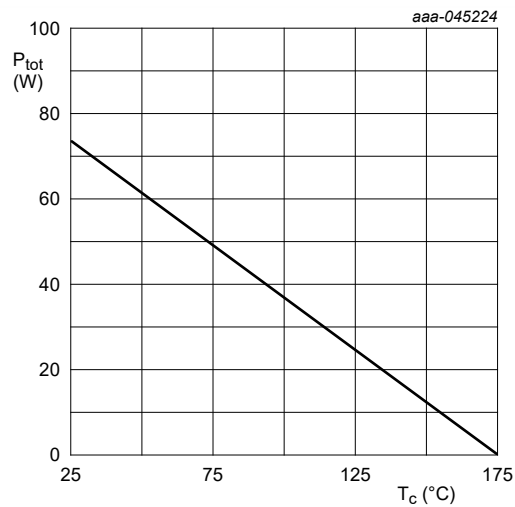
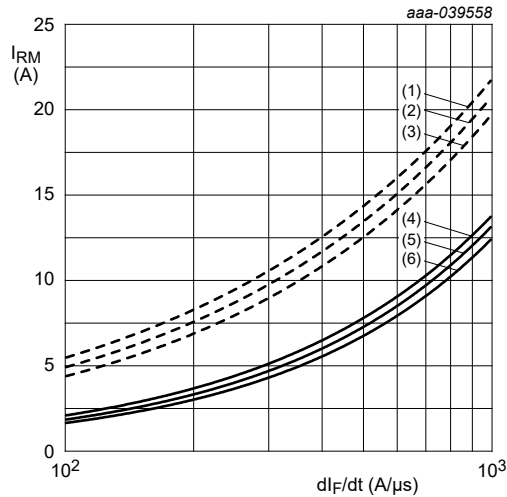


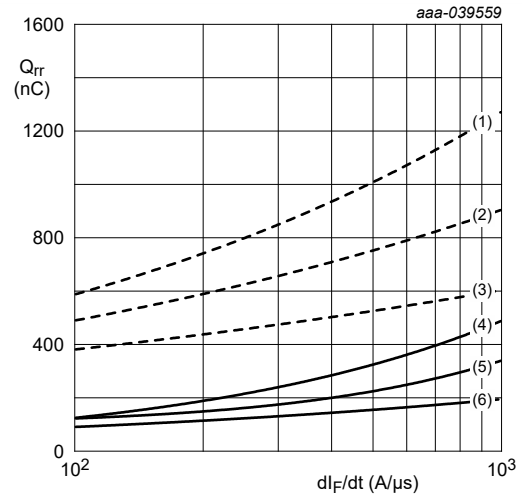
Fig. 9. Power dissipation as a function of case temperature; maximum values



$V_R = 400 \text{ V}$

- (1)  $I_F = 30 \text{ A}$ ;  $T_j = 125 \text{ }^\circ\text{C}$
- (2)  $I_F = 15 \text{ A}$ ;  $T_j = 125 \text{ }^\circ\text{C}$
- (3)  $I_F = 7.5 \text{ A}$ ;  $T_j = 125 \text{ }^\circ\text{C}$
- (4)  $I_F = 30 \text{ A}$ ;  $T_j = 25 \text{ }^\circ\text{C}$
- (5)  $I_F = 15 \text{ A}$ ;  $T_j = 25 \text{ }^\circ\text{C}$
- (6)  $I_F = 7.5 \text{ A}$ ;  $T_j = 25 \text{ }^\circ\text{C}$

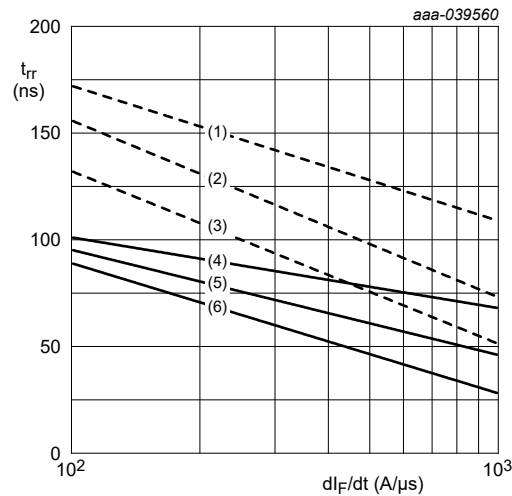
**Fig. 10. Peak reverse recovery current as a function of ramp rate; typical values**



$V_R = 400 \text{ V}$

- (1)  $I_F = 30 \text{ A}$ ;  $T_j = 125 \text{ }^\circ\text{C}$
- (2)  $I_F = 15 \text{ A}$ ;  $T_j = 125 \text{ }^\circ\text{C}$
- (3)  $I_F = 7.5 \text{ A}$ ;  $T_j = 125 \text{ }^\circ\text{C}$
- (4)  $I_F = 30 \text{ A}$ ;  $T_j = 25 \text{ }^\circ\text{C}$
- (5)  $I_F = 15 \text{ A}$ ;  $T_j = 25 \text{ }^\circ\text{C}$
- (6)  $I_F = 7.5 \text{ A}$ ;  $T_j = 25 \text{ }^\circ\text{C}$

**Fig. 11. Reverse recovery charge as a function of ramp rate; typical values**



$V_R = 400 \text{ V}$

- (1)  $I_F = 30 \text{ A}$ ;  $T_j = 125 \text{ }^\circ\text{C}$
- (2)  $I_F = 15 \text{ A}$ ;  $T_j = 125 \text{ }^\circ\text{C}$
- (3)  $I_F = 7.5 \text{ A}$ ;  $T_j = 125 \text{ }^\circ\text{C}$
- (4)  $I_F = 30 \text{ A}$ ;  $T_j = 25 \text{ }^\circ\text{C}$
- (5)  $I_F = 15 \text{ A}$ ;  $T_j = 25 \text{ }^\circ\text{C}$
- (6)  $I_F = 7.5 \text{ A}$ ;  $T_j = 25 \text{ }^\circ\text{C}$

**Fig. 12. Reverse recovery time as a function of ramp rate; typical values**



11. Test information

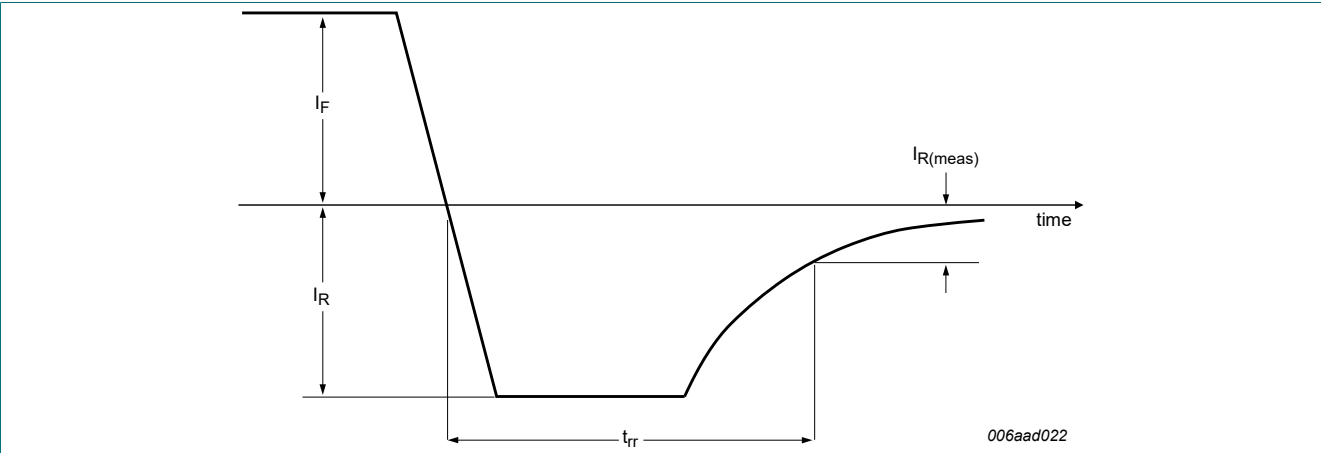


Fig. 13. Reverse recovery definition; step recovery

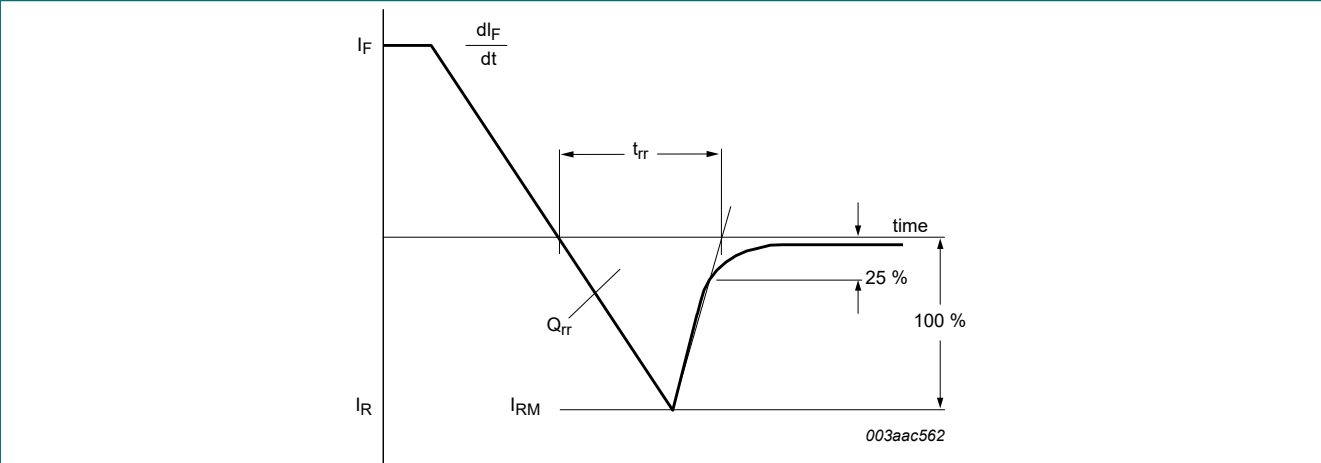


Fig. 14. Reverse recovery definition; ramp recovery

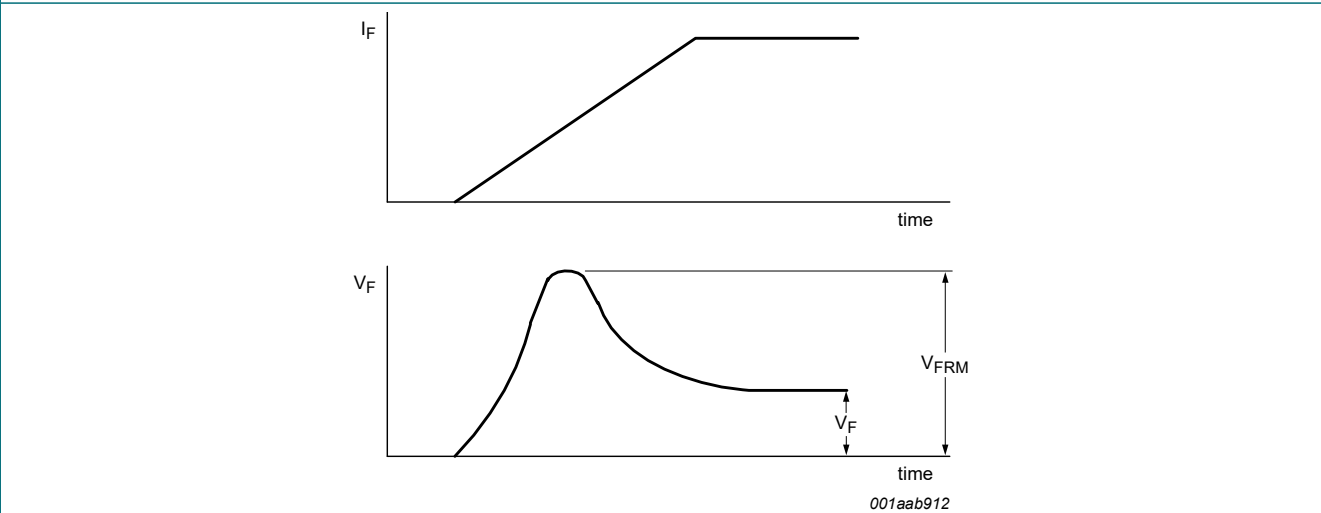


Fig. 15. Forward recovery definition

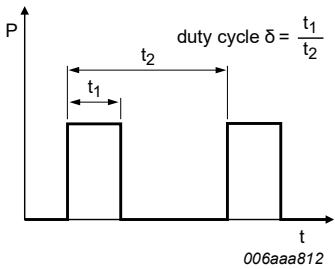


Fig. 16. Duty cycle definition

The current ratings for the typical waveforms are calculated according to the equations:

$I_{F(AV)} = I_M \times \delta$  with  $I_M$  defined as peak current

$I_{RMS} = I_{F(AV)}$  at DC, and  $I_{RMS} = I_M \times \sqrt{\delta}$

with  $I_{RMS}$  defined as RMS current.

12. Package outline

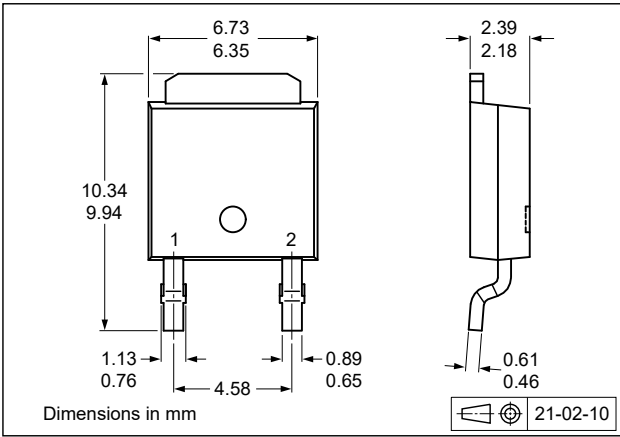


Fig. 17. Package outline DPAK R2P (SOT8017)

13. Soldering

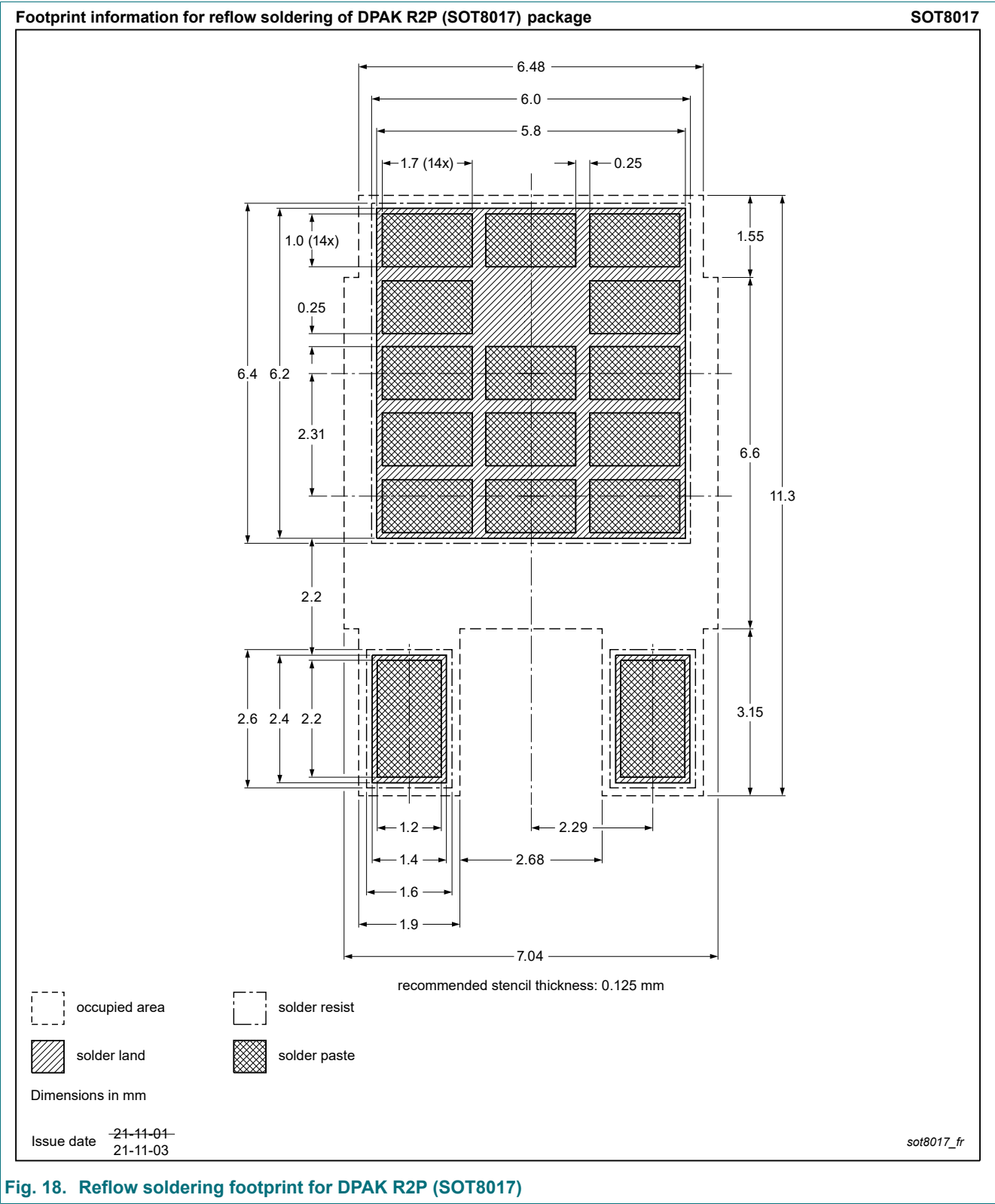


Fig. 18. Reflow soldering footprint for DPAK R2P (SOT8017)

## 14. Revision history

Table 8. Revision history

| Data sheet ID   | Release date | Data sheet status  | Change notice | Supersedes |
|-----------------|--------------|--------------------|---------------|------------|
| PNE650150EH v.1 | 20260611     | Product data sheet | -             | -          |

## 15. Legal information

### Data sheet status

| Document status [1][2]         | Product status [3] | Definition                                                                            |
|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet | Qualification      | This document contains data from the preliminary specification.                       |
| Product [short] data sheet     | Production         | This document contains the product specification.                                     |

- [1] Please consult the most recently issued document before initiating or completing a design.
- [2] The term 'short data sheet' is explained in section "Definitions".
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