

## 1. General description

Silicon Carbide Schottky diode in a TO263 (D2PAK) plastic package, designed for high frequency switched-mode power supplies.

## 2. Features and benefits

- Highly stable switching performance
- High forward surge capability  $I_{FSM}$
- Extremely fast reverse recovery time
- Superior in efficiency to Silicon Diode alternatives
- Reduced losses in associated MOSFET
- Reduced EMI
- Reduced cooling requirements
- RoHS compliant

## 3. Applications

- Power factor correction
- Telecom/Server SMPS
- UPS
- PV inverter
- PC Silverbox
- LED/OLED TV
- Motor Drives

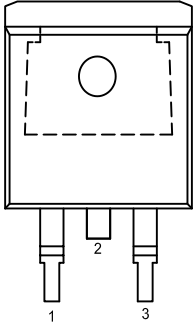
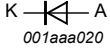
## 4. Quick reference data

Table 1. Quick reference data

| Symbol                         | Parameter                       | Conditions  | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------|---|-----|-----|-----|------|
| $V_{RRM}$                      | repetitive peak reverse voltage |   | -   | -   | 650 | V    |
| $I_{F(AV)}$                    | average forward current         | $\delta = 0.5$ ; $T_{mb} \leq 136$ °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> ; <a href="#">Fig. 4</a> | -   | -   | 4   | A    |
| $T_j$                          | junction temperature            |   | -   | -   | 175 | °C   |
| <b>Static characteristics</b>  |                                 |   |     |     |     |      |
| $V_F$                          | forward voltage                 | $I_F = 4$ A; $T_j = 25$ °C; <a href="#">Fig. 6</a>  | -   | 1.5 | 1.7 | V    |
|                                |                                 | $I_F = 4$ A; $T_j = 150$ °C; <a href="#">Fig. 6</a>   | -   | 1.8 | 2.1 | V    |
| <b>Dynamic characteristics</b> |                                 |   |     |     |     |      |
| $Q_r$                          | recovered charge                | $I_F = 4$ A; $di_F/dt = 500$ A/ $\mu$ s; $V_R = 400$ V; $T_j = 25$ °C; <a href="#">Fig. 7</a>   | -   | 7   | -   | nC   |

## 5. Pinning information

**Table 2. Pinning information**

| Pin | Symbol | Description                         | Simplified outline   | Graphic symbol  |
|-----|--------|-------------------------------------|--|---|
| 1   | n.c.   | not connected                       |  <p style="text-align: center;"><b>TO263N</b></p> |  |
| 2   | K      | cathode[1]                          |  |   |
| 3   | A      | anode                               |  |   |
| mb  | K      | mounting base; connected to cathode |  |   |

[1] It is not possible to connect to pin 2 of the TO263 package.

## 6. Ordering information

**Table 3. Ordering information**

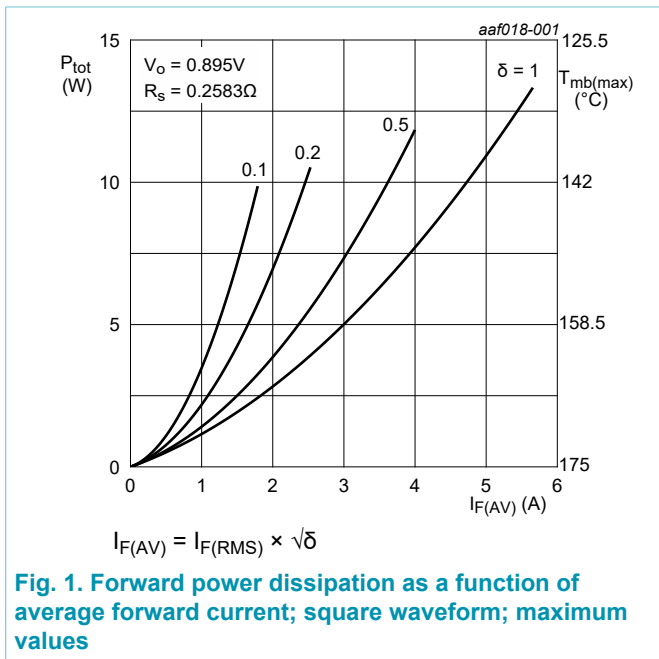
| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description  | Version |
| NXPSC04650B | -       | plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) | TO263N  |

## 7. Limiting values

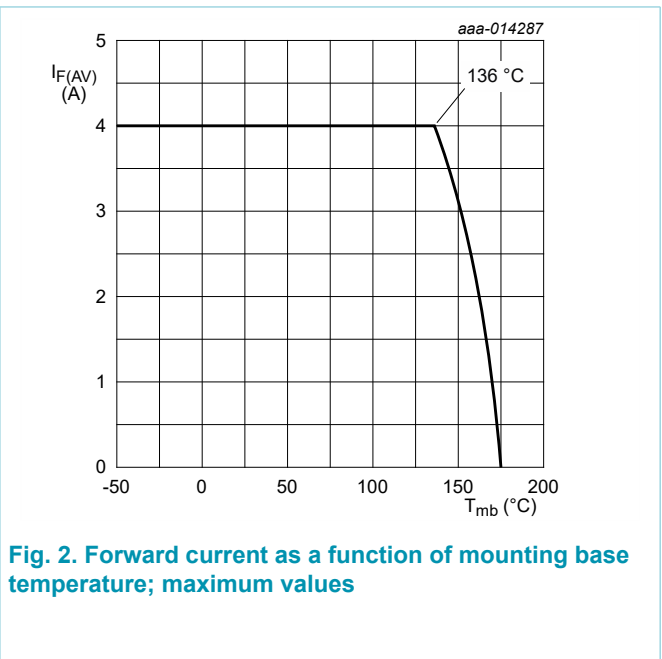
**Table 4. Limiting values**

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol      | Parameter                           | Conditions   | Min | Max | Unit             |
|-------------|-------------------------------------|--|-----|-----|------------------|
| $V_{RRM}$   | repetitive peak reverse voltage     |  | -   | 650 | V                |
| $V_{RWM}$   | crest working reverse voltage       |  | -   | 650 | V                |
| $V_R$       | reverse voltage                     | DC   | -   | 650 | V                |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; $T_{mb} \leq 136\text{ }^\circ\text{C}$ ; square-wave pulse; Fig. 1; Fig. 2; Fig. 3; Fig. 4 | -   | 4   | A                |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; square-wave pulse   | -   | 8   | A                |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 10\text{ ms}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; sine-wave pulse                     | -   | 24  | A                |
|             |                                     | $t_p = 10\text{ }\mu\text{s}$ ; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; square-wave pulse          | -   | 235 | A                |
| $T_{stg}$   | storage temperature                 |  | -55 | 175 | $^\circ\text{C}$ |
| $T_j$       | junction temperature                |  | -   | 175 | $^\circ\text{C}$ |



**Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values**



**Fig. 2. Forward current as a function of mounting base temperature; maximum values**

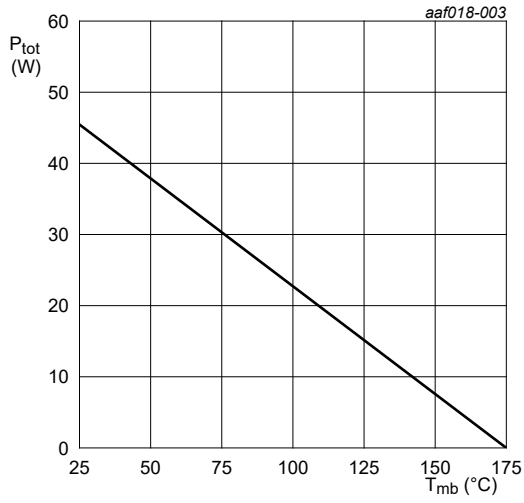


Fig. 3. Total power dissipation as a function of mounting base temperature

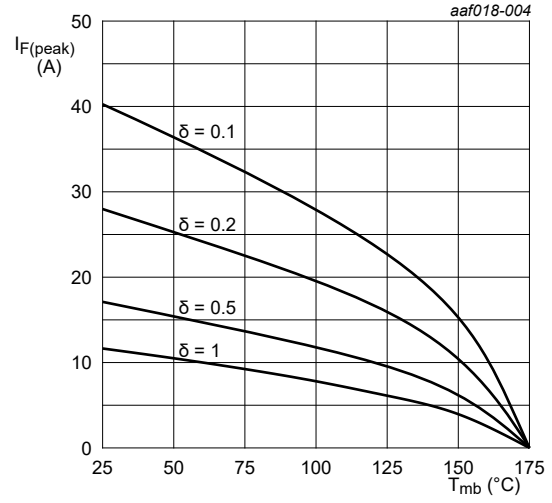


Fig. 4. Current derating as a function of mounting base temperature

## 8. Thermal characteristics

Table 5. Thermal characteristics

| Symbol         | Parameter  | Conditions   | Min | Typ | Max | Unit |
|----------------|--|--|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base    | <a href="#">Fig. 5</a>                               | -   | -   | 3.3 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient free air | Device mounted on an FR4 Printed-Circuit Board (PCB) | -   | 50  | -   | K/W  |

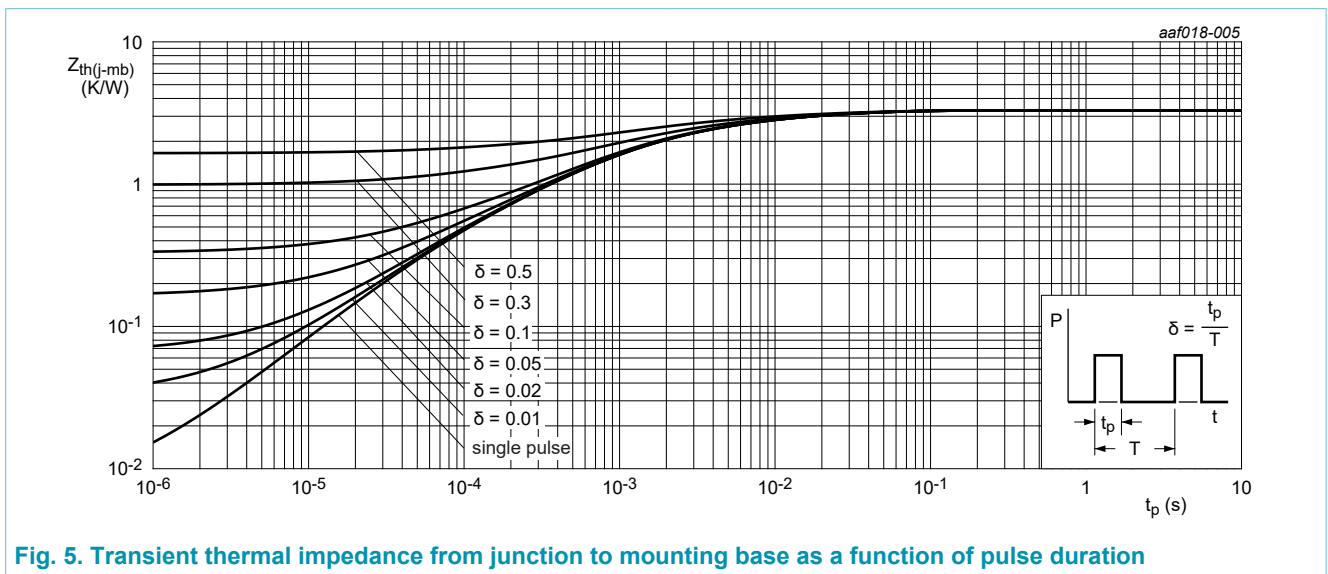
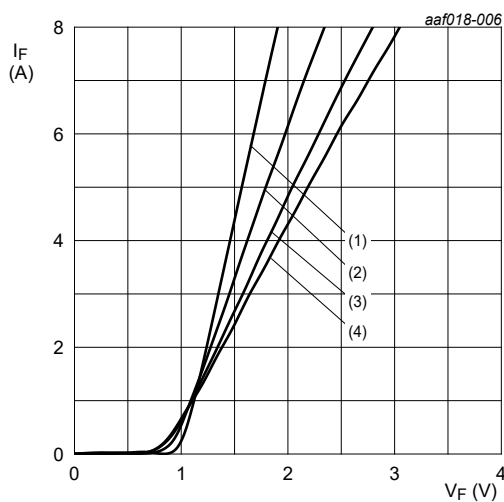


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

## 9. Characteristics

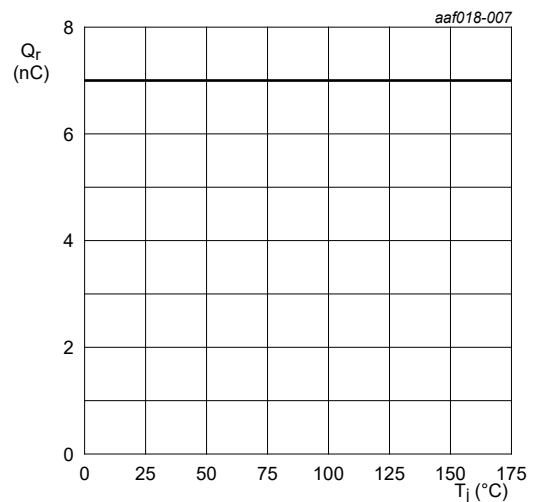
**Table 6. Characteristics**

| Symbol                         | Parameter         | Conditions   | Min | Typ | Max | Unit          |
|--------------------------------|-------------------|--|-----|-----|-----|---------------|
| <b>Static characteristics</b>  |                   |  |     |     |     |               |
| $V_F$                          | forward voltage   | $I_F = 4 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 6}$   | -   | 1.5 | 1.7 | V             |
|                                |                   | $I_F = 4 \text{ A}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 6}$  | -   | 1.8 | 2.1 | V             |
| $I_R$                          | reverse current   | $V_R = 650 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$   | -   | -   | 170 | $\mu\text{A}$ |
|                                |                   | $V_R = 650 \text{ V}; T_j = 150 \text{ }^\circ\text{C}$  | -   | -   | 550 | $\mu\text{A}$ |
| <b>Dynamic characteristics</b> |                   |  |     |     |     |               |
| $Q_r$                          | recovered charge  | $I_F = 4 \text{ A}; dI_F/dt = 500 \text{ A}/\mu\text{s}; V_R = 400 \text{ V}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$ | -   | 7   | -   | nC            |
| $C_d$                          | diode capacitance | $f = 1 \text{ MHz}; V_R = 1 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | -   | 130 | -   | pF            |
|                                |                   | $f = 1 \text{ MHz}; V_R = 300 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | -   | 16  | -   | pF            |
|                                |                   | $f = 1 \text{ MHz}; V_R = 600 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | -   | 13  | -   | pF            |



- (1)  $T_j = 25 \text{ }^\circ\text{C}$ ; typical values
- (2)  $T_j = 100 \text{ }^\circ\text{C}$ ; typical values
- (3)  $T_j = 150 \text{ }^\circ\text{C}$ ; typical values
- (4)  $T_j = 175 \text{ }^\circ\text{C}$ ; typical values

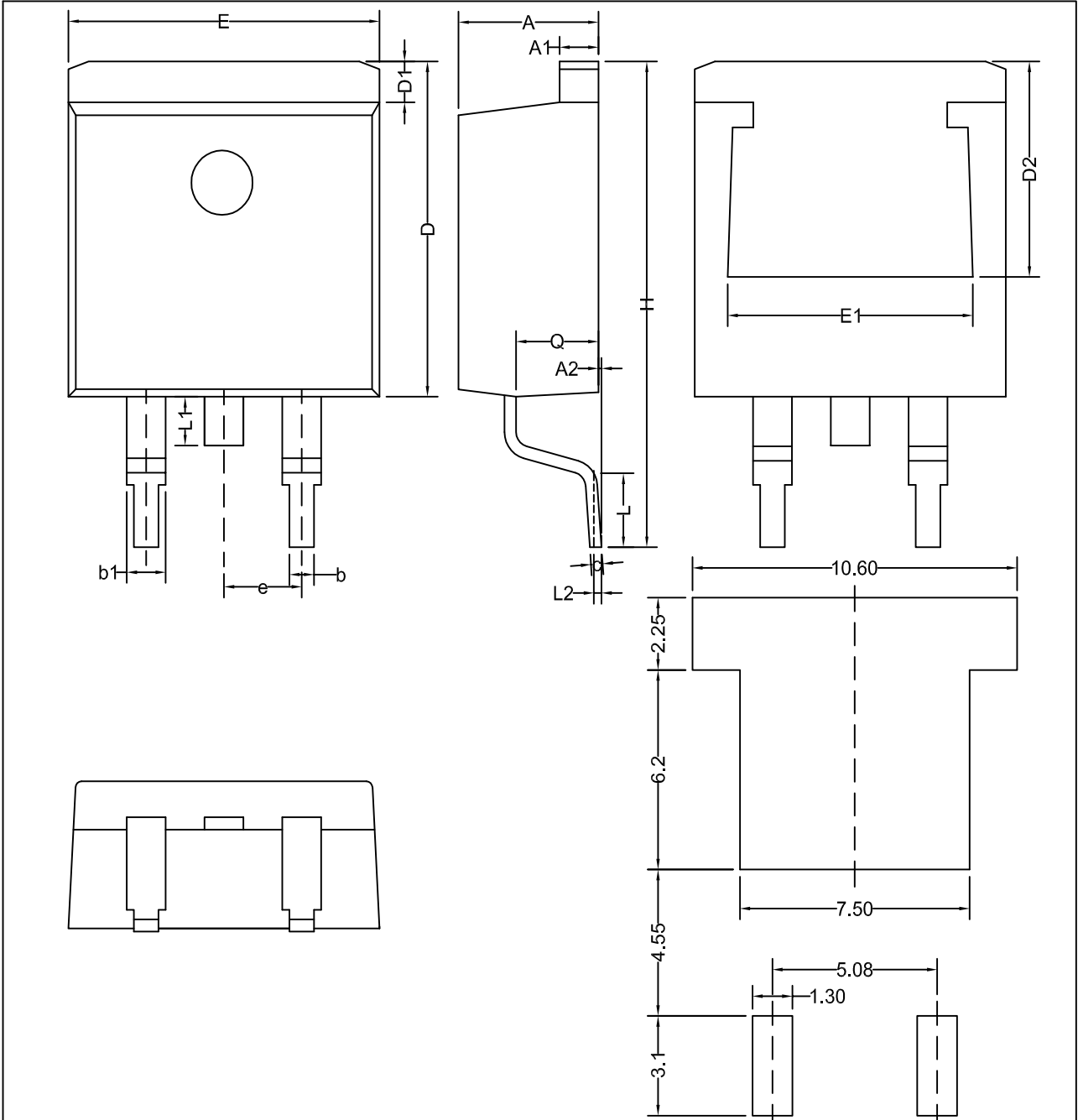
**Fig. 6. Forward current as a function of forward voltage; typical values**



**Fig. 7. Recovered charge as a function of junction temperature**

10. Package outline

Plastic single-ended surface-mounted package (D2PAK); 3 leads (one lead cropped) TO263



Recommended Footprint

| Unit | A    | A1   | A2   | b    | b1   | c    | D     | D1   | D2   | e             | E     | E1   | H     | L    | L1   | L2            | Q    |
|------|------|------|------|------|------|------|-------|------|------|---------------|-------|------|-------|------|------|---------------|------|
| min  | 4.10 | 1.22 | 0.00 | 0.60 | 1.05 | 0.34 | ---   | 1.20 | 6.60 | 2.54<br>(BSC) | 9.70  | 7.80 | 14.80 | 2.10 | ---  | 0.25<br>(BSC) | 2.20 |
| max  | 4.70 | 1.40 | 0.25 | 0.90 | 1.45 | 0.64 | 11.00 | 1.60 | ---  | ---           | 10.30 | ---  | 15.80 | 2.90 | 1.75 | ---           | 2.79 |

Fig. 8. Package outline TO263N

## 11. Legal information

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| Objective [short] data sheet   | Development        | This document contains data from the objective specification for product development. |
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