

## 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

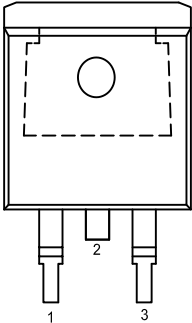
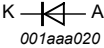
## 4. Quick reference data

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         | $\delta = 0.5$ ; $T_{mb} \leq 106$ °C; square-wave pulse; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> ; <a href="#">Fig. 4</a> | -   | -   | 12  | A    |
| <b>Static characteristics</b> |                                 |                                                                                                                                                             |     |     |     |      |
| $V_F$                         | forward voltage                 | $I_F = 12$ A; $T_j = 25$ °C; <a href="#">Fig. 6</a>                                                                                                         | -   | 1.5 | 1.7 | V    |
|                               |                                 | $I_F = 12$ A; $T_j = 150$ °C; <a href="#">Fig. 6</a>                                                                                                        | -   | 1.8 | 2.1 | V    |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                         | Simplified outline                                                                                      | Graphic symbol                                                                      |
|-----|--------|-------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1   | n.c.   | not connected                       |  <p>D2PAK (TO263N)</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 |
| NXPSC12650B | D2PAK   | 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 <sub>RRM</sub>   | repetitive peak reverse voltage     |                                                                                       | -   | 650 | V    |
| V <sub>RWM</sub>   | crest working reverse voltage       |                                                                                       | -   | 650 | V    |
| V <sub>R</sub>     | reverse voltage                     | DC                                                                                    | -   | 650 | V    |
| I <sub>F(AV)</sub> | average forward current             | δ = 0.5 ; T <sub>mb</sub> ≤ 106 °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3; Fig. 4 | -   | 12  | A    |
| I <sub>FRM</sub>   | repetitive peak forward current     | δ = 0.5 ; t <sub>p</sub> = 25 μs; square-wave pulse                                   | -   | 24  | A    |
| I <sub>FSM</sub>   | non-repetitive peak forward current | t <sub>p</sub> = 10 ms; T <sub>j(init)</sub> = 25 °C; sine-wave pulse                 | -   | 72  | A    |
|                    |                                     | t <sub>p</sub> = 10 μs; T <sub>j(init)</sub> = 25 °C; square-wave pulse               | -   | 620 | A    |
| T <sub>stg</sub>   | storage temperature                 |                                                                                       | -55 | 175 | °C   |
| T <sub>j</sub>     | junction temperature                |                                                                                       | -   | 175 | °C   |

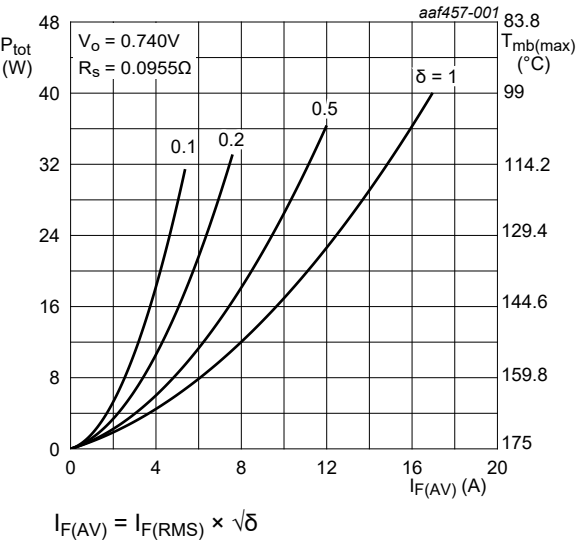


Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values

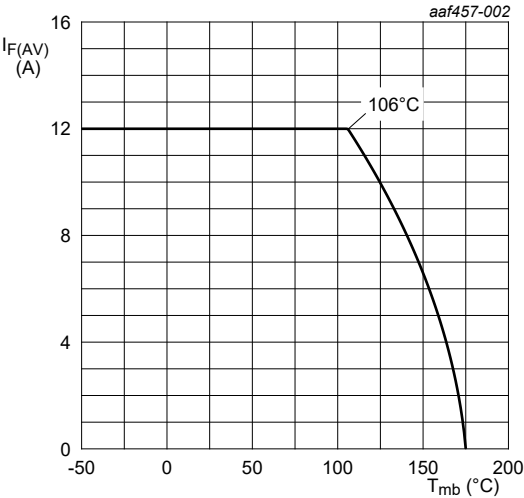


Fig. 2. Forward current as a function of mounting base temperature; maximum values

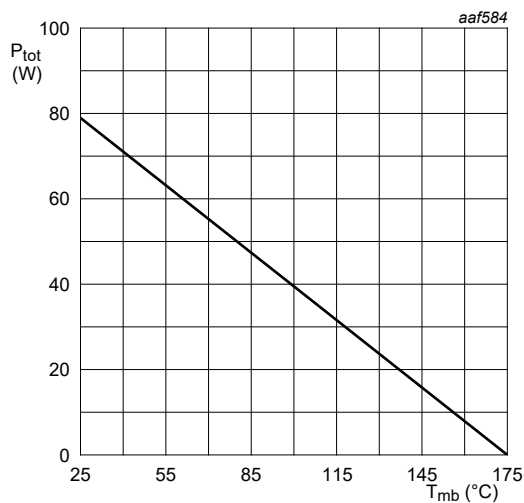


Fig. 3. Total power dissipation as a function of mounting base temperature

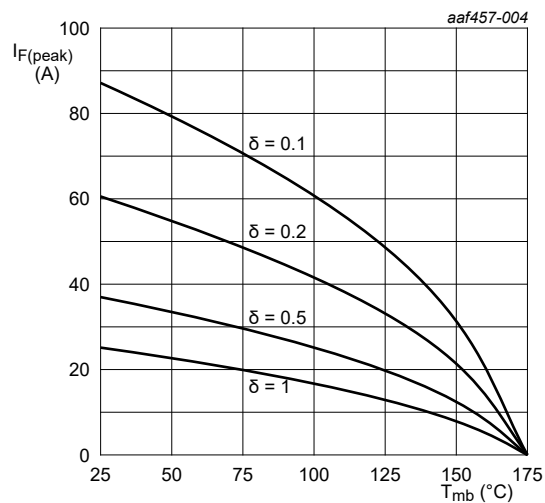


Fig. 4. Current derating as a function of mounting base temperature

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>                               | -   | -   | 1.9 | 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  |

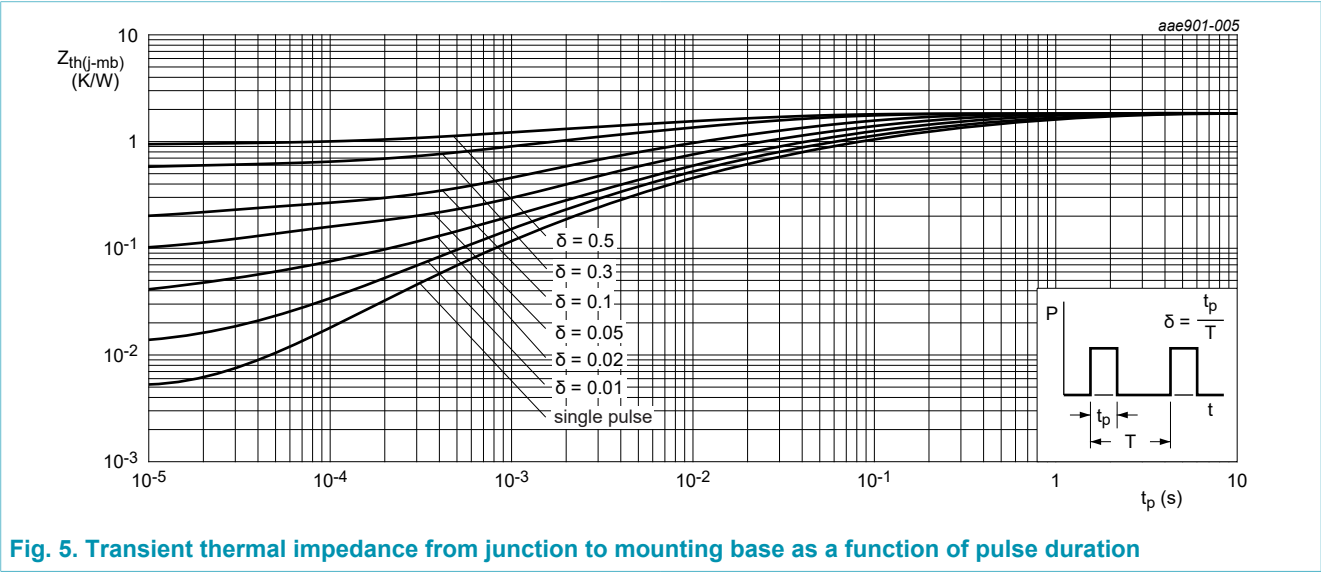
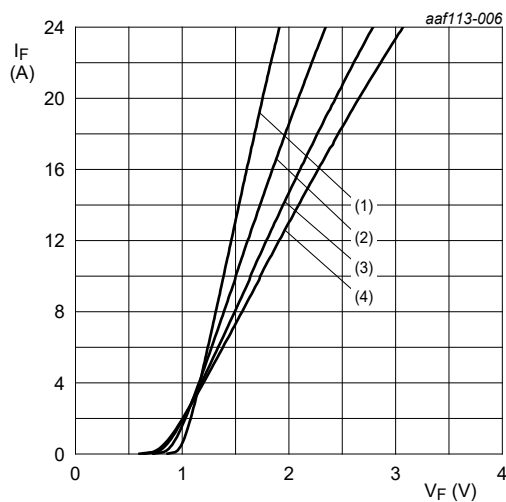


Fig. 5. Transient thermal impedance from junction to mounting base as a function of pulse duration

9. Characteristics

Table 6. Characteristics

| Symbol                  | Parameter         | Conditions                                                                                                                       |  | Min | Typ | Max | Unit |
|-------------------------|-------------------|----------------------------------------------------------------------------------------------------------------------------------|--|-----|-----|-----|------|
| Static characteristics  |                   |                                                                                                                                  |  |     |     |     |      |
| V <sub>F</sub>          | forward voltage   | I <sub>F</sub> = 12 A; T <sub>j</sub> = 25 °C; <a href="#">Fig. 6</a>                                                            |  | -   | 1.5 | 1.7 | V    |
|                         |                   | I <sub>F</sub> = 12 A; T <sub>j</sub> = 150 °C; <a href="#">Fig. 6</a>                                                           |  | -   | 1.8 | 2.1 | V    |
| I <sub>R</sub>          | reverse current   | V <sub>R</sub> = 650 V; T <sub>j</sub> = 25 °C                                                                                   |  | -   | -   | 80  | μA   |
|                         |                   | V <sub>R</sub> = 650 V; T <sub>j</sub> = 150 °C                                                                                  |  | -   | -   | 320 | μA   |
| Dynamic characteristics |                   |                                                                                                                                  |  |     |     |     |      |
| Q <sub>r</sub>          | recovered charge  | I <sub>F</sub> = 12 A; dI <sub>F</sub> /dt = 500 A/μs;<br>V <sub>R</sub> = 400 V; T <sub>j</sub> = 25 °C; <a href="#">Fig. 7</a> |  | -   | 18  | -   | nC   |
| C <sub>d</sub>          | diode capacitance | f = 1 MHz; V <sub>R</sub> = 1 V; T <sub>j</sub> = 25 °C                                                                          |  | -   | 380 | -   | pF   |
|                         |                   | f = 1 MHz; V <sub>R</sub> = 300 V; T <sub>j</sub> = 25 °C                                                                        |  | -   | 60  | -   | pF   |
|                         |                   | f = 1 MHz; V <sub>R</sub> = 600 V; T <sub>j</sub> = 25 °C                                                                        |  | -   | 58  | -   | pF   |



$V_o = 0.740\text{ V}$ ;  $R_s = 0.0955\text{ }\Omega$   
(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

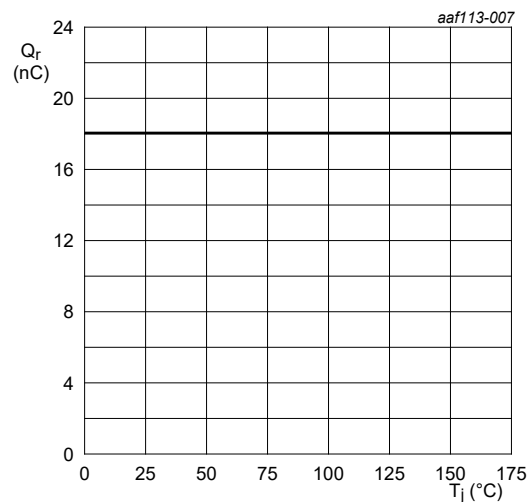


Fig. 7. Recovered charge as a function of junction temperature

10. Package outline

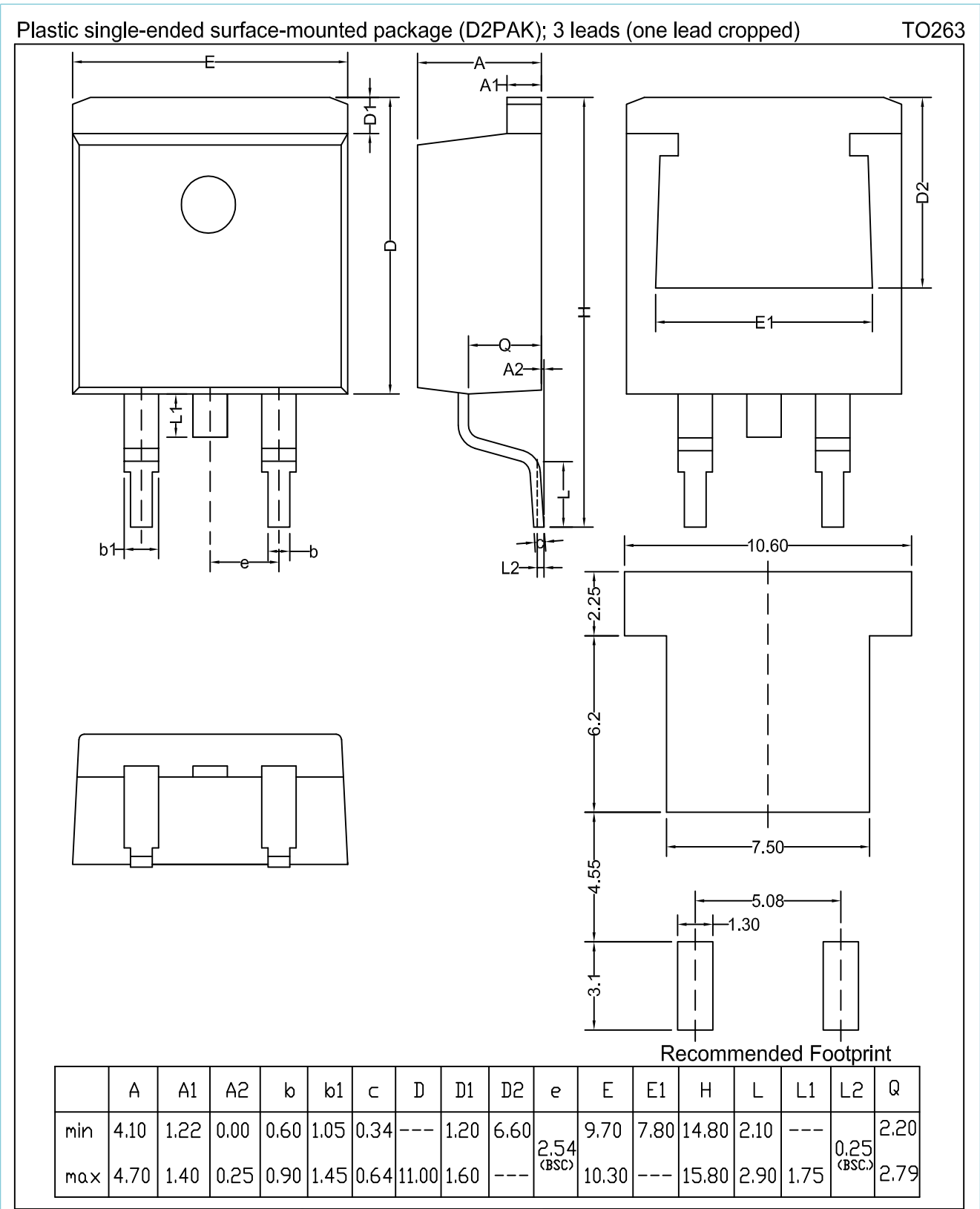


Fig. 8. Package outline D2PAK (TO263N)

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## 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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