WeEn

NXPSC20650W

Silicon Carbide Diode

Rev.03 - 06 May 2020

Product data sheet

1. General description

Dual Silicon Carbide Schottky diode in a 3-lead TO247 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. Q | uick reference data | | | | | | |
|--------------------|---------------------------------|--|-------------|---|------|------|----|
| Symbol | Parameter | Conditions | Values | | | Unit | |
| Absolute | maximum rating | | | | | | |
| V_{RRM} | repetitive peak reverse voltage | | 650 | | | V | |
| I _{O(AV)} | average forward current | δ = 0.5 ; square-wave pulse; T _{mb} ≤ 105 °C; both diodes conducting; <u>Fig. 1</u> ; <u>Fig. 2</u> ; <u>Fig. 3</u> | 20 | | А | | |
| T _j | junction temperature | | 175 | | °C | | |
| Symbol | Parameter | Conditions | Min Typ Max | | Unit | | |
| Static ch | aracteristics | | | | | | |
| V _F | forward voltage | $I_F = 10 \text{ A}; T_j = 25 \text{ °C}; \text{ per diode}; Fig. 5$ | | - | 1.5 | 1.7 | V |
| | | $I_F = 10 \text{ A}; T_j = 150 \text{ °C}; \text{ per diode}; Fig. 5$ | | - | 1.8 | 2.1 | V |
| Dynamic | characteristics | | | | | | |
| Q _r | recovered charge | $I_F = 10 \text{ A}; dI_F/\text{d}t = 500 A/\mu\text{s}; V_R = 400 \text{ V}; \\ T_j = 25 ^\circ\text{C}; \text{ per diode}; \underline{\text{Fig. } 7}$ | | - | 16 | - | nC |

5. Pinning information

| Table 2. P | inning infor | mation | | |
|------------|--------------|-------------------------------------|--------------------|----------------|
| Pin | Symbol | Description | Simplified outline | Graphic symbol |
| 1 | A1 | anode | | |
| 2 | К | cathode | | |
| 3 | A2 | anode | | <u> </u> |
| mb | mb | mounting base; connected to cathode | | sym125 |

6. Ordering information

| Table 3. Ordering information | | | | | | | | |
|-------------------------------|-----------------|-----------------------|-------------------|---------------------------|-----------------|-----------------------|--|--|
| Type number | Package name | Orderable part number | Packing method | Small packing quantity | Package version | Package issue date | | |
| NXPSC20650W | TO247 | NXPSC20650W6Q | Tube | 30 | TO247N | 20-July-2016 | | |

7. Marking

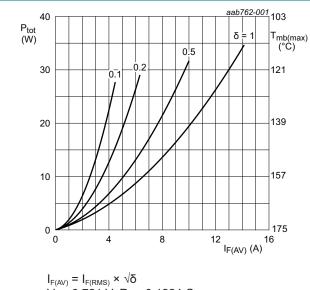
| Table 4. Marking codes | | | | | | |
|------------------------|-----------------|--|--|--|--|--|
| Type number | Marking codes | | | | | |
| NXPSC20650W | NXPSC 20650W | | | | | |

8. Limiting values

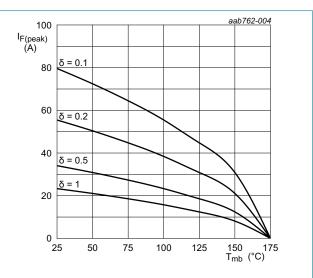
Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Values | 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 _{O(AV)} | average forward current | δ = 0.5; square-wave pulse; T _{mb} ≤ 105 °C; both diodes conducting; <u>Fig. 1</u> ; <u>Fig. 2</u> ; <u>Fig. 3</u> | 20 | A |
| I _{FRM} | repetitive peak forward current | δ = 0.5; t _p = 25 µs; T _{mb} ≤ 112 °C; square-wave pulse; per diode | 20 | A |
| I _{FSM} | non-repetitive peak forward current | t_p = 10 ms; $T_{j(init)}$ = 25 °C; sine-wave pulse; per diode | 50 | A |
| | | t_p = 10 µs; $T_{j(init)}$ = 25 °C; square-wave pulse; per diode | 450 | A |
| l ² t | I ² t for fusing | sine-wave pulse; $T_{j(init)}$ = 25 °C; t_p = 10 ms | 12.5 | A ² s |
| T _{stg} | storage temperature | | -55 to 175 | °C |
| Tj | junction temperature | | 175 | °C |

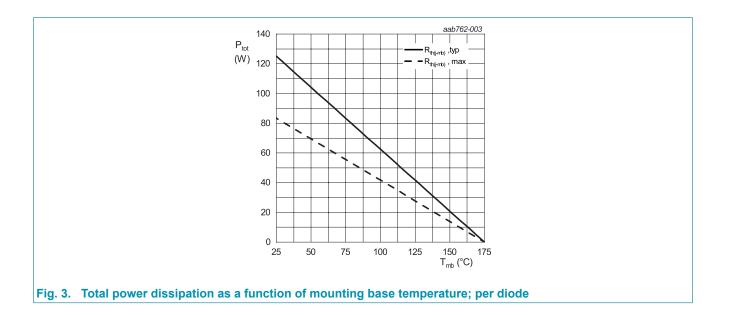


I_{F(AV)} = I_{F(RMS)} × √δ
V_o = 0.721 V; R_s = 0.1224 Ω
Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values; per diode



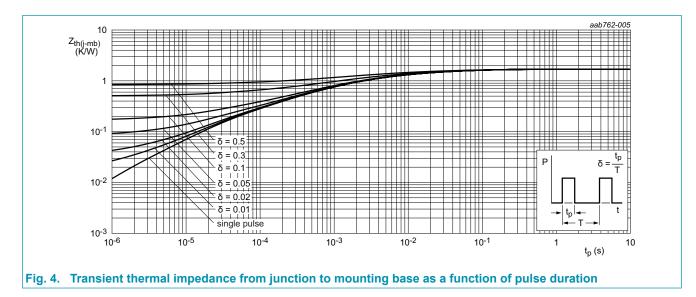


NXPSC20650W Silicon Carbide Diode



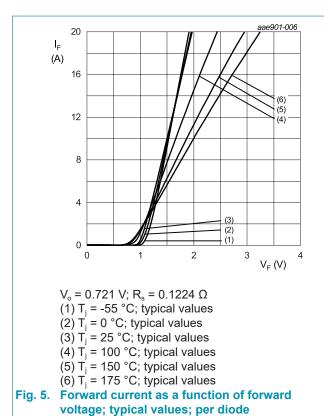
9. Thermal characteristics

| Table 6. Th | ermal characteristics | | | | | |
|-----------------------|--|--------------------------|-----|-----|-----|------|
| Symbol | Parameter | Conditions | Min | Тур | Мах | Unit |
| $R_{\text{th(j-mb)}}$ | thermal resistance | per diode; <u>Fig. 4</u> | - | 1.2 | 1.8 | K/W |
| | from junction to mounting base | both diodes conducting | - | - | 1 | K/W |
| $R_{\text{th(j-a)}}$ | thermal resistance from junction to ambient free air | in free air | - | 45 | - | K/W |



10. Characteristics

| Symbol | Parameter | Conditions | Min | Тур | Max | Unit |
|-----------------|------------------------------------|--|-----|-----|-----|------|
| | aracteristics | | | | | |
| V_{F} | forward current | $I_{F} = 10 \text{ A}; T_{j} = 25 \text{ °C}; \text{ per diode}; Fig. 5$ | - | 1.5 | 1.7 | V |
| | | I _F = 10 A; T _j = 150 °C; per diode; <u>Fig. 5</u> | - | 1.8 | 2.1 | V |
| I _R | reverse current | V_{R} = 650 V; T _j = 25 °C; per diode; <u>Fig. 6</u> | - | - | 60 | μA |
| | | V_{R} = 650 V; T _j = 150 °C; per diode; <u>Fig. 6</u> | - | - | 240 | μA |
| Dynamic | characteristics | | | | | , |
| Q _r | recovered charge | I _F = 10 A; V _R = 400 V; dI _F /dt = 500 A/μs; T _i = 25 °C; per diode; <u>Fig. 7</u> | - | 16 | - | nC |
| C _d | diode capacitance | f = 1 MHz; V _R = 1 V; T _j = 25 °C | - | 328 | - | pF |
| | | f = 1 MHz; V _R = 300 V; T _j = 25 °C | - | 44 | - | pF |
| | | f = 1 MHz; V _R = 600 V; T _j = 25 °C | - | 42 | - | pF |
| E _{as} | non-repetitive avalanche energy | $I_R = 5.5 \text{ A}; \text{ L} = 5 \text{ mH}; \text{ T}_{j(init)} = 25 \text{ °C};$ per diode | 75 | - | - | mJ |



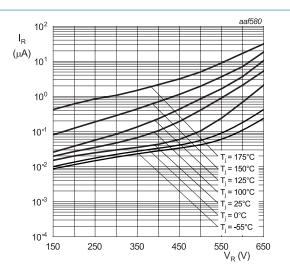
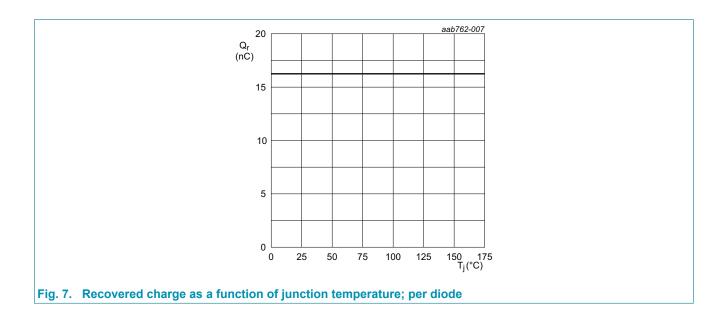
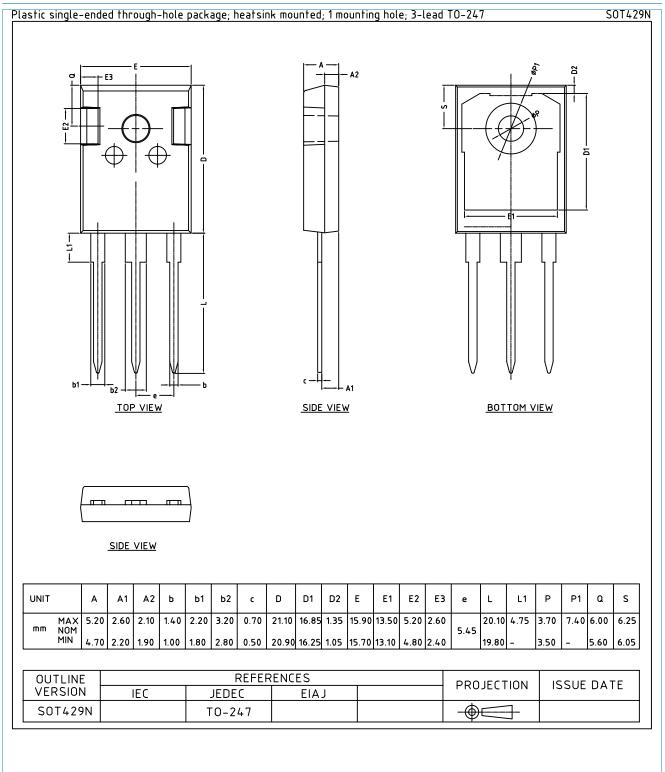


Fig. 6. Reverse leakage current as a function of reverse voltage; typical value; per diode

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11. Package outline



NXPSC20650W

12. 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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL <u>http://www.ween-semi.com</u>.

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