

## 1. General description

Dual Silicon Carbide Schottky diode in a 3-lead TO-247 plastic package, designed for high frequency switched-mode power supplies. This product is qualified to AEC-Q101 standard for use in automotive applications.



AEC - Q101 Qualified



## 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
- AEC-Q101 compliant
- High junction operating temperature capability ( $T_{j(max)} = 175\text{ °C}$ )

## 3. Applications

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

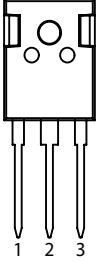
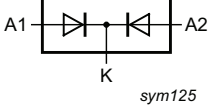
## 4. Quick reference data

Table 1. Quick reference data

| Symbol                         | Parameter                       | Conditions   | Values |     |     | Unit |
|--------------------------------|---------------------------------|--|--------|-----|-----|------|
| <b>Absolute maximum rating</b> |                                 |  |        |     |     |      |
| $V_{RRM}$                      | repetitive peak reverse voltage |  | 650    |     |     | V    |
| $I_{O(AV)}$                    | limiting average output current | $\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 105\text{ °C}$ ; both diodes conducting; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a>    | 20     |     |     | A    |
| $T_j$                          | junction temperature            |  | 175    |     |     | °C   |
| Symbol                         | Parameter                       | Conditions   | Min    | Typ | Max | Unit |
| <b>Static characteristics</b>  |                                 |  |        |     |     |      |
| $V_F$                          | forward voltage                 | $I_F = 10\text{ A}$ ; $T_j = 25\text{ °C}$ ; per diode; <a href="#">Fig. 4</a>   | -      | 1.5 | 1.7 | V    |
|                                |                                 | $I_F = 10\text{ A}$ ; $T_j = 150\text{ °C}$ ; per diode; <a href="#">Fig. 4</a>  | -      | 1.8 | 2.1 | V    |
| <b>Dynamic characteristics</b> |                                 |  |        |     |     |      |
| $Q_r$                          | recovered charge                | $I_F = 10\text{ A}$ ; $V_R = 400\text{ V}$ ; $di_F/dt = 500\text{ A}/\mu\text{s}$ ; $T_j = 25\text{ °C}$ ; per diode; <a href="#">Fig. 6</a> | -      | 16  | -   | nC   |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                         | Simplified outline  | Graphic symbol  |
|-----|--------|-------------------------------------|---|---|
| 1   | A1     | anode                               |  |  |
| 2   | K      | cathode                             |   |   |
| 3   | A2     | anode                               |   |   |
| mb  | K      | mounting base; connected to cathode |   |   |

## 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-A | TO247        | NXPSC20650W-AQ        | Tube           | 30                     | TO247N          | 20-Jul-2016        |

## 7. Marking

Table 4. Marking codes

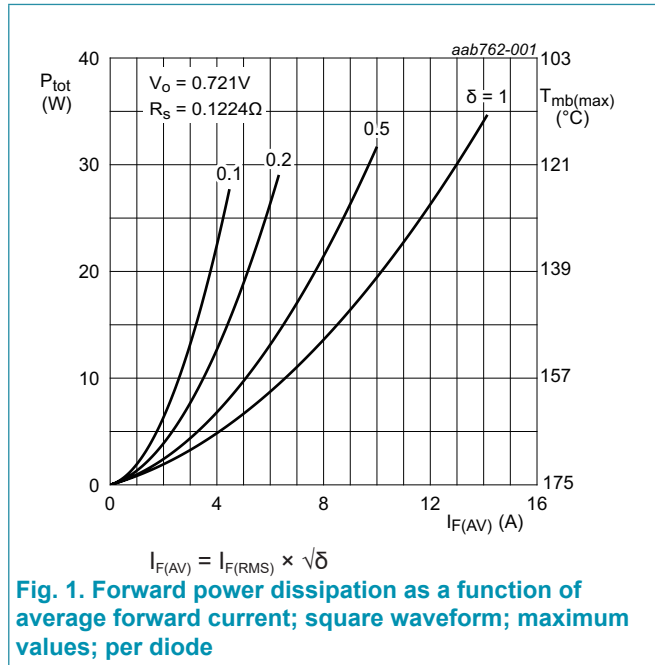
| Type number   | Marking codes |
|---------------|---------------|
| NXPSC20650W-A | NXPSC20650W-A |

## 8. Limiting values

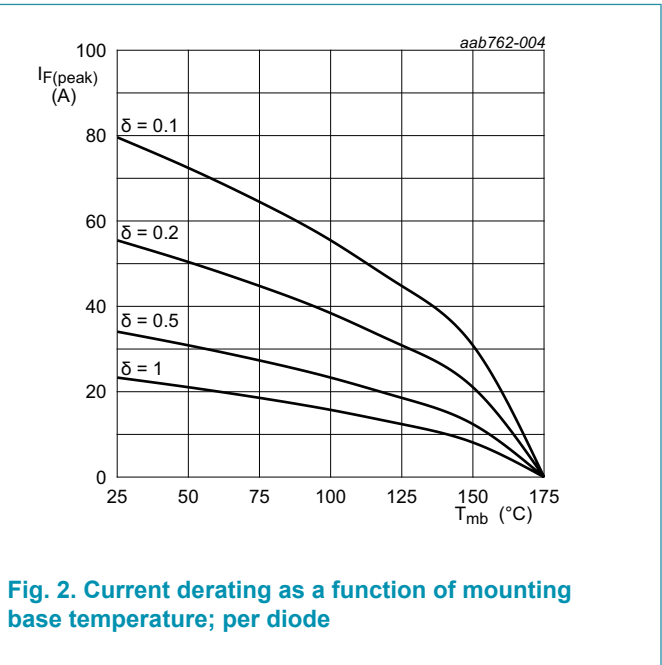
**Table 5. Limiting values**

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                |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25 \mu s$ ; $T_{mb} \leq 112 \text{ }^\circ C$ ; square-wave pulse; per diode  | 20         | A                |
| $I_{O(AV)}$ | limiting average output current     | $\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 105 \text{ }^\circ C$ ; both diodes conducting; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> | 20         | A                |
| $I_{FSM}$   | non-repetitive peak forward current | $t_p = 10 \text{ ms}$ ; $T_{j(\text{init})} = 25 \text{ }^\circ C$ ; sine-wave pulse; per diode  | 50         | A                |
|             |                                     | $t_p = 10 \mu s$ ; $T_{j(\text{init})} = 25 \text{ }^\circ C$ ; sine-wave pulse; per diode   | 450        | A                |
| $I^2t$      | $I^2t$ for fusing                   | sine-wave pulse; $T_{j(\text{init})} = 25 \text{ }^\circ C$ ; $t_p = 10 \text{ ms}$ ; per diode  | 12.5       | A <sup>2</sup> s |
| $T_{stg}$   | storage temperature                 |  | -55 to 175 | $^\circ C$       |
| $T_j$       | junction temperature                |  | 175        | $^\circ C$       |



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

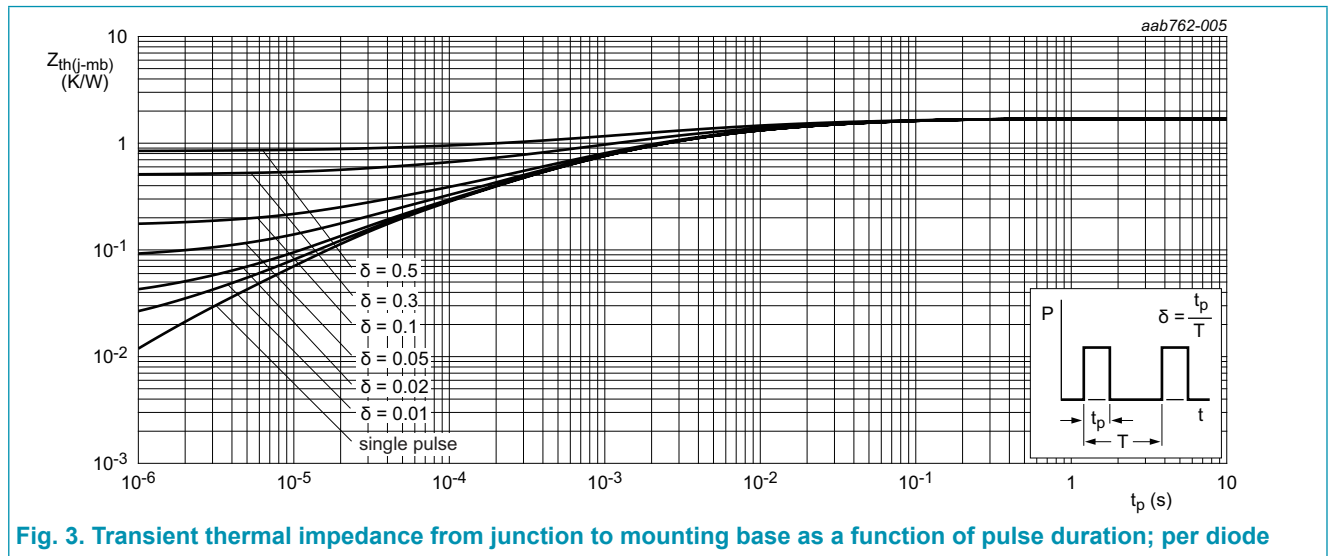


**Fig. 2. Current derating as a function of mounting base temperature; per diode**

## 9. Thermal characteristics

**Table 6. Thermal characteristics**

| Symbol         | Parameter  | Conditions                        | Min | Typ | Max | Unit |
|----------------|--|-----------------------------------|-----|-----|-----|------|
| $R_{th(j-mb)}$ | thermal resistance from junction to mounting base    | Per diode; <a href="#">Fig. 3</a> | -   | -   | 1.8 | K/W  |
|                |  | both diodes conducting            | -   | -   | 1   | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient free air | in free air                       | -   | 45  | -   | K/W  |

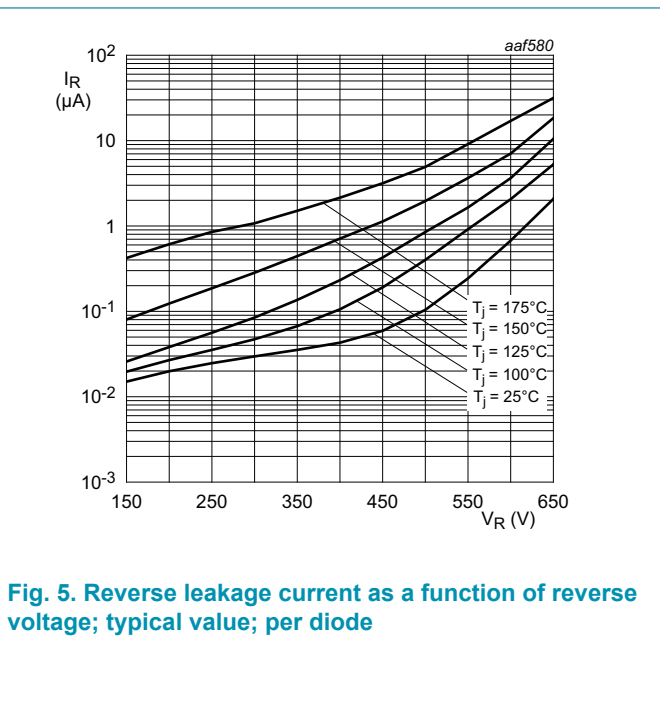
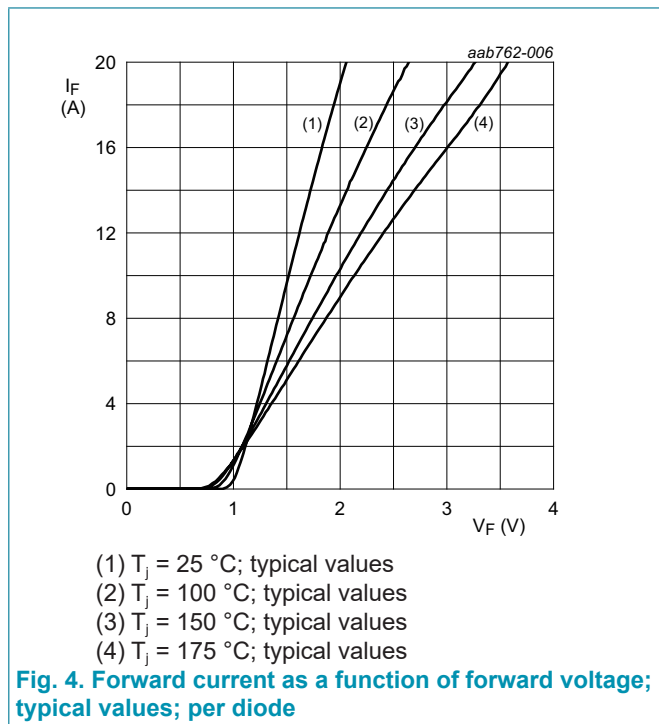


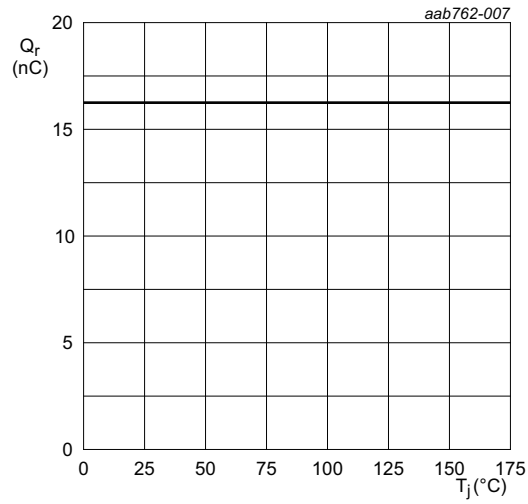
**Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration; per diode**

### 10. Characteristics

Table 7. Characteristics

| Symbol                         | Parameter                       | Conditions   | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------|--|-----|-----|-----|------|
| <b>Static characteristics</b>  |                                 |  |     |     |     |      |
| V <sub>F</sub>                 | forward current                 | I <sub>F</sub> = 10 A; T <sub>J</sub> = 25 °C; per diode; <a href="#">Fig. 4</a>   | -   | 1.5 | 1.7 | V    |
|                                |                                 | I <sub>F</sub> = 10 A; T <sub>J</sub> = 150 °C; per diode; <a href="#">Fig. 4</a>  | -   | 1.8 | 2.1 | V    |
| I <sub>R</sub>                 | reverse current                 | V <sub>R</sub> = 650 V; T <sub>J</sub> = 25 °C; per diode; <a href="#">Fig. 5</a>  | -   | -   | 60  | μA   |
|                                |                                 | V <sub>R</sub> = 650 V; T <sub>J</sub> = 150 °C; per diode; <a href="#">Fig. 5</a>   | -   | -   | 240 | μA   |
| <b>Dynamic characteristics</b> |                                 |  |     |     |     |      |
| Q <sub>r</sub>                 | recovered charge                | I <sub>F</sub> = 10 A; V <sub>R</sub> = 400 V; dI <sub>F</sub> /dt = 500 A/μs; T <sub>J</sub> = 25 °C; per diode; <a href="#">Fig. 6</a> | -   | 16  | -   | nC   |
| C <sub>d</sub>                 | diode capacitance               | f = 1 MHz; V <sub>R</sub> = 1 V; T <sub>J</sub> = 25 °C; per diode   | -   | 328 | -   | pF   |
|                                |                                 | f = 1 MHz; V <sub>R</sub> = 300 V; T <sub>J</sub> = 25 °C; per diode   | -   | 44  | -   | pF   |
|                                |                                 | f = 1 MHz; V <sub>R</sub> = 600 V; T <sub>J</sub> = 25 °C; per diode   | -   | 42  | -   | pF   |
| E <sub>as</sub>                | non-repetitive avalanche energy | I <sub>R</sub> = 5.5 A; T <sub>J(initial)</sub> = 25 °C; L = 5 mH; per diode   | 75  | -   | -   | mJ   |



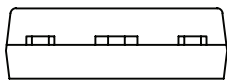
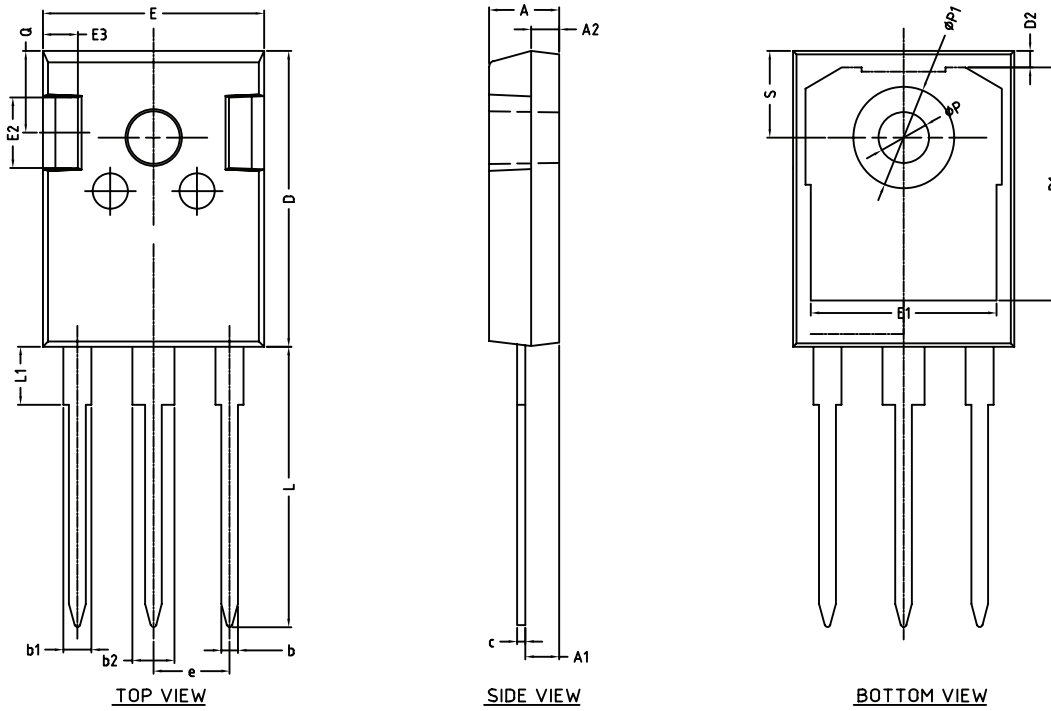


**Fig. 6. Recovered charge as a function of junction temperature; per diode**

### 11. Package outline

Plastic single-ended through-hole package; heatsink mounted; 1 mounting hole; 3-lead TO-247

SOT429N



SIDE VIEW

| UNIT | A   | A1   | A2   | b    | b1   | b2   | c    | D    | D1    | D2    | E    | E1    | E2    | E3   | e    | L     | L1   | P    | P1   | Q    | S    |
|------|-----|------|------|------|------|------|------|------|-------|-------|------|-------|-------|------|------|-------|------|------|------|------|------|
| mm   | MAX | 5.20 | 2.60 | 2.10 | 1.40 | 2.20 | 3.20 | 0.70 | 21.10 | 16.85 | 1.35 | 15.90 | 13.50 | 5.20 | 2.60 | 20.10 | 4.75 | 3.70 | 7.40 | 6.00 | 6.25 |
|      | MIN | 4.70 | 2.20 | 1.90 | 1.00 | 1.80 | 2.80 | 0.50 | 20.90 | 16.25 | 1.05 | 15.70 | 13.10 | 4.80 | 2.40 | 19.80 | -    | 3.50 | -    | 5.60 | 6.05 |

| OUTLINE VERSION | REFERENCES |        |      | PROJECTION | ISSUE DATE |
|-----------------|------------|--------|------|------------|------------|
|                 | IEC        | JEDEC  | EIAJ |            |            |
| SOT429N         |            | TO-247 |      |            |            |

## 12. Legal information

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