

## 1. General description

Silicon Carbide Schottky diode in a TO220-2L plastic package, designed for high frequency switched-mode power supplies.



## 2. Features and benefits

- Highly stable switching performance
- 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

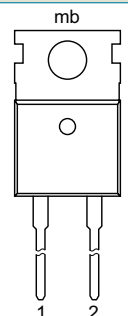
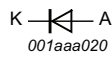
## 4. Quick reference data

Table 1. Quick reference data

| Symbol                         | Parameter                       | Conditions   | Values |     |     | Unit |
|--------------------------------|---------------------------------|--|--------|-----|-----|------|
| <b>Absolute maximum rating</b> |                                 |  |        |     |     |      |
| $V_{RRM}$                      | repetitive peak reverse voltage |  | 650    |     |     | V    |
| $I_{F(AV)}$                    | average forward current         | $\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 139$ °C; <a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | 4      |     |     | A    |
| $T_j$                          | junction temperature            |  | 175    |     |     | °C   |
| Symbol                         | Parameter                       | Conditions   | Min    | Typ | Max | Unit |
| <b>Static characteristics</b>  |                                 |  |        |     |     |      |
| $V_F$                          | forward voltage                 | $I_F = 4$ A; $T_j = 25$ °C; <a href="#">Fig. 5</a>   | -      | 1.5 | 1.7 | V    |
|                                |                                 | $I_F = 4$ A; $T_j = 150$ °C; <a href="#">Fig. 5</a>  | -      | 1.8 | 2.2 | 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>                                      | -      | 6.5 | -   | nC   |

## 5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description                         | Simplified outline   | Graphic symbol  |
|-----|--------|-------------------------------------|--|---|
| 1   | K      | cathode                             |  |  |
| 2   | A      | anode                               |  |   |
| mb  | mb     | 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 |
|-------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| WNSC2D04650 | TO220-2L     | WNSC2D04650Q          | Tube           | 50                     | SOD59A          | 30-Mar-2015        |

## 7. Marking

Table 4. Marking codes

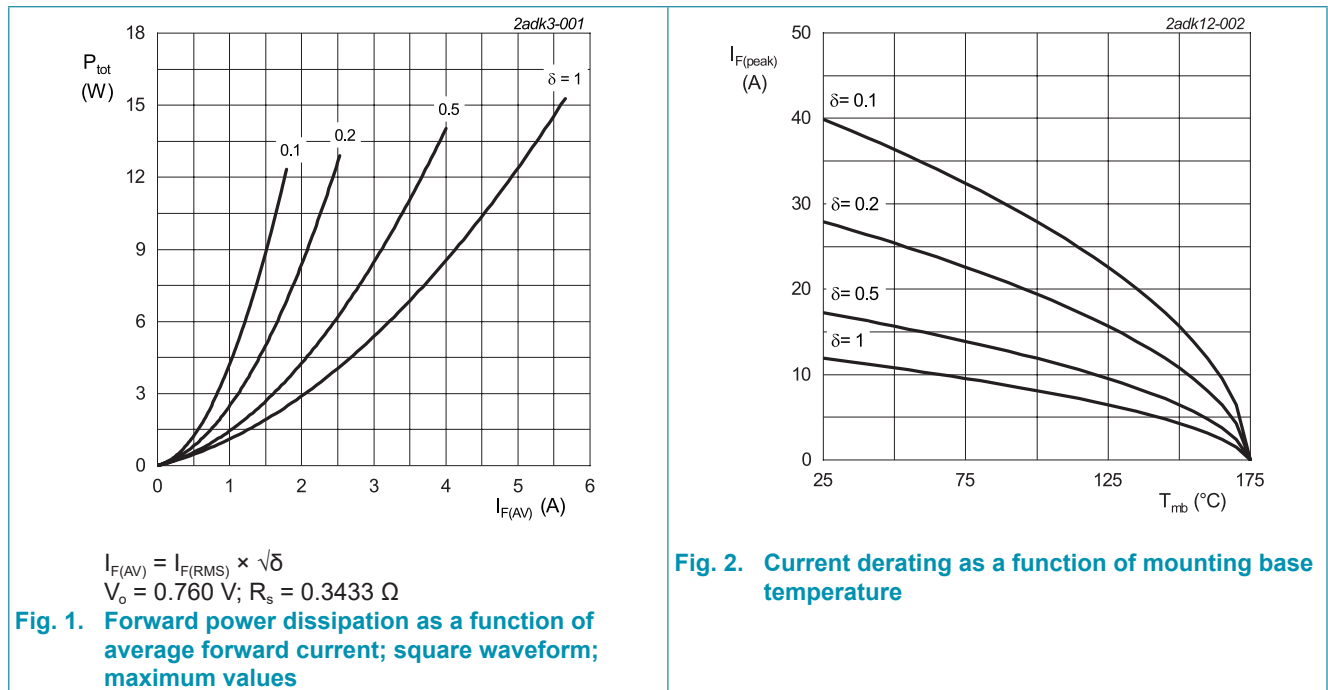
| Type number | Marking codes   |
|-------------|-----------------|
| WNSC2D04650 | WNSC2D<br>04650 |

## 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                    |
| $I_{F(AV)}$ | average forward current             | $\delta = 0.5$ ; square-wave pulse; $T_{mb} \leq 139\text{ }^\circ\text{C}$ ;<br><a href="#">Fig. 1</a> ; <a href="#">Fig. 2</a> ; <a href="#">Fig. 3</a> | 4          | A                    |
| $I_{FRM}$   | repetitive peak forward current     | $\delta = 0.5$ ; $t_p = 25\text{ }\mu\text{s}$ ; $T_{mb} \leq 139\text{ }^\circ\text{C}$ ;<br>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                    |
| $I^2t$      | $I^2t$ for fusing                   | sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$ ; $t_p = 10\text{ ms}$   | 2.88       | $\text{A}^2\text{s}$ |
| $T_{stg}$   | storage temperature                 |   | -55 to 175 | $^\circ\text{C}$     |
| $T_j$       | junction temperature                |   | 175        | $^\circ\text{C}$     |



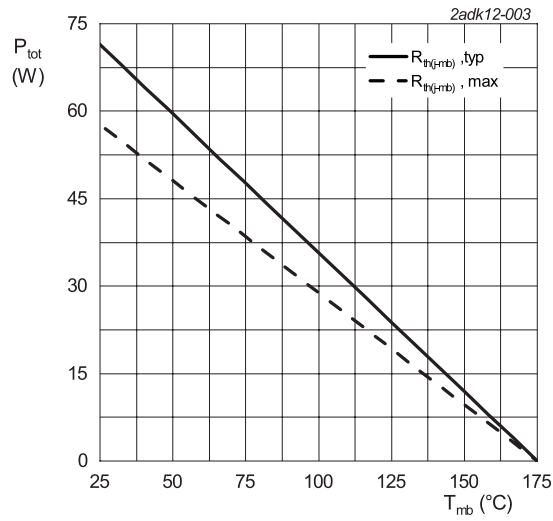


Fig. 3. Total power dissipation as a function of mounting base temperature

### 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    | with heatsink compound; <a href="#">Fig. 4</a> | -   | -   | 2.6 | K/W  |
| $R_{th(j-a)}$  | thermal resistance from junction to ambient free air | in free air                                    | -   | 60  | -   | K/W  |

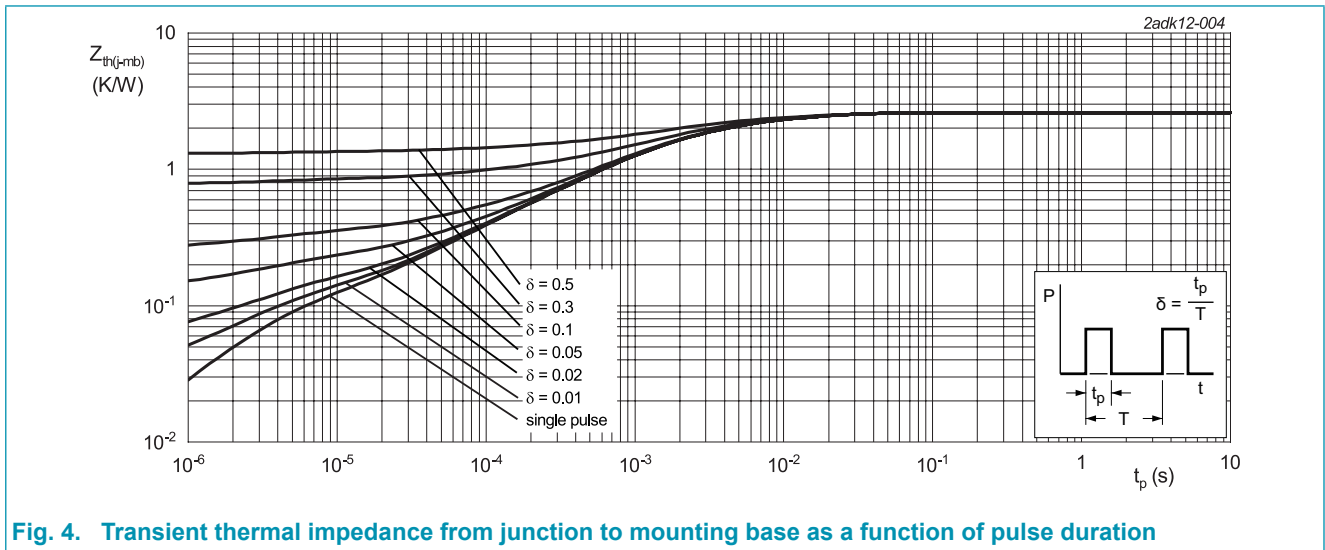
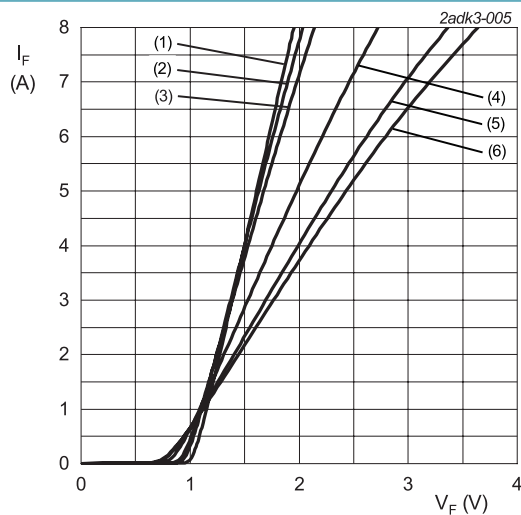


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

### 10. Characteristics

Table 7. Characteristics

| Symbol                         | Parameter                       | Conditions   | Min | Typ | Max | Unit          |
|--------------------------------|---------------------------------|--|-----|-----|-----|---------------|
| <b>Static characteristics</b>  |                                 |  |     |     |     |               |
| $V_F$                          | forward current                 | $I_F = 4 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 5}$   | -   | 1.5 | 1.7 | V             |
|                                |                                 | $I_F = 4 \text{ A}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 5}$  | -   | 1.8 | 2.2 | V             |
|                                |                                 | $I_F = 4 \text{ A}; T_j = 175 \text{ }^\circ\text{C}; \text{ Fig. 5}$  | -   | 2   | 2.3 | V             |
| $I_R$                          | reverse current                 | $V_R = 650 \text{ V}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 6}$   | -   | 0.2 | 20  | $\mu\text{A}$ |
|                                |                                 | $V_R = 650 \text{ V}; T_j = 175 \text{ }^\circ\text{C}; \text{ Fig. 6}$  | -   | 10  | 100 | $\mu\text{A}$ |
| <b>Dynamic characteristics</b> |                                 |  |     |     |     |               |
| $Q_r$                          | recovered charge                | $I_F = 4 \text{ A}; V_R = 400 \text{ V}; dI_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$ | -   | 6.5 | -   | nC            |
| $C_d$                          | diode capacitance               | $f = 1 \text{ MHz}; V_R = 1 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | -   | 125 | -   | pF            |
|                                |                                 | $f = 1 \text{ MHz}; V_R = 300 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | -   | 15  | -   | pF            |
|                                |                                 | $f = 1 \text{ MHz}; V_R = 600 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$  | -   | 14  | -   | pF            |
| $E_{as}$                       | non-repetitive avalanche energy | $I_R = 3.5 \text{ A}; L = 5 \text{ mH}; T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$  | 30  | -   | -   | mJ            |



$V_o = 0.760 \text{ V}; R_s = 0.3433 \text{ } \Omega$   
 (1)  $T_j = -55 \text{ }^\circ\text{C};$  typical values  
 (2)  $T_j = 0 \text{ }^\circ\text{C};$  typical values  
 (3)  $T_j = 25 \text{ }^\circ\text{C};$  typical values  
 (4)  $T_j = 100 \text{ }^\circ\text{C};$  typical values  
 (5)  $T_j = 150 \text{ }^\circ\text{C};$  typical values  
 (6)  $T_j = 175 \text{ }^\circ\text{C};$  typical values

Fig. 5. Forward current as a function of forward voltage; typical values

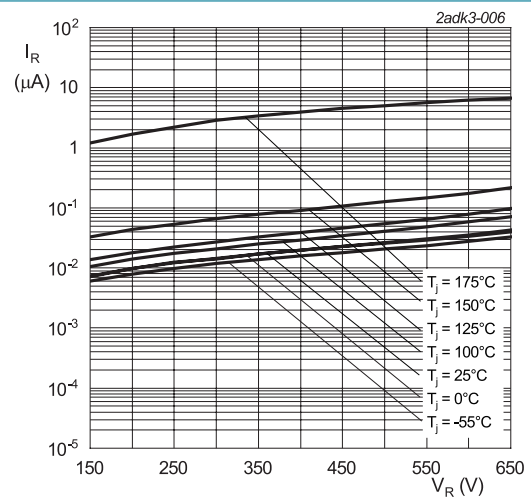
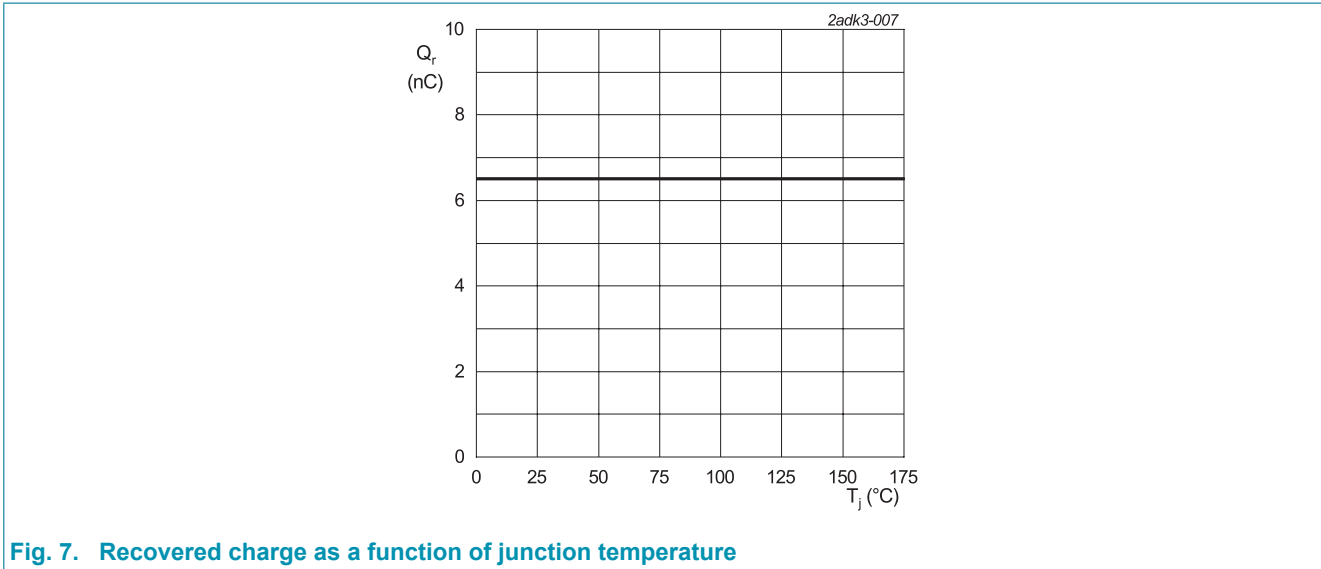


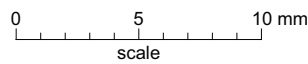
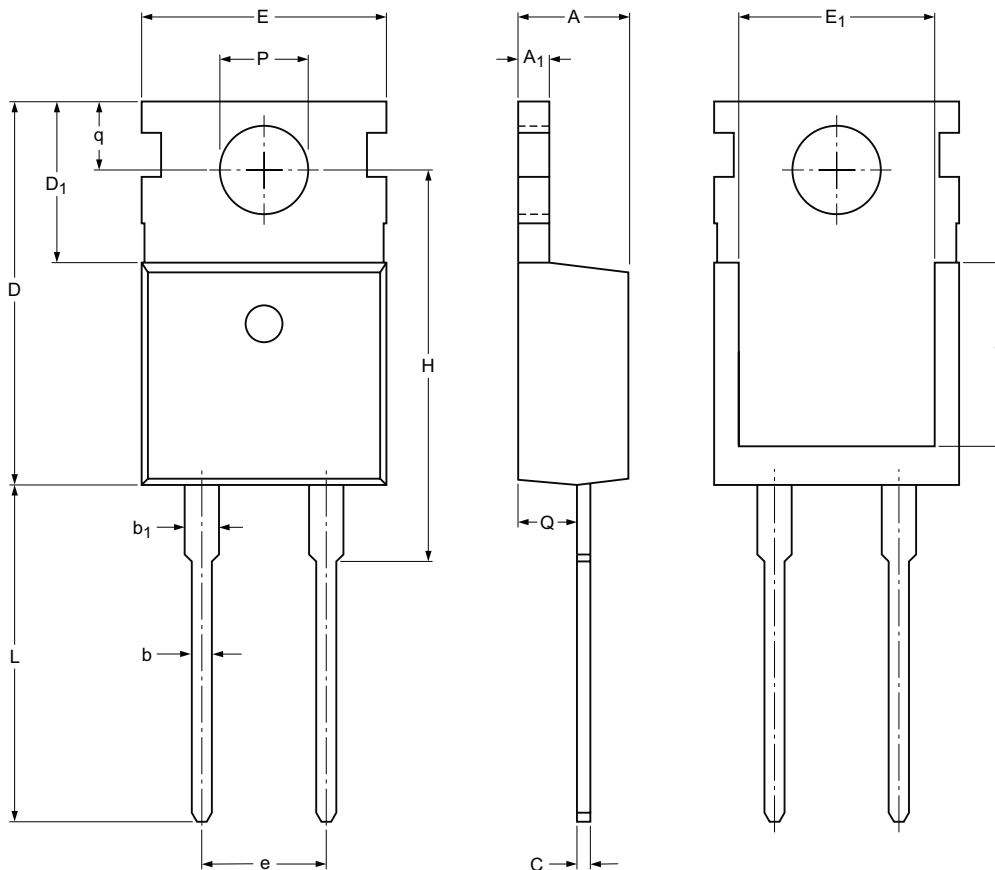
Fig. 6. Reverse leakage current as a function of reverse voltage; typical value



### 11. Package outline

Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC

SOD59A



Dimensions: (mm are the original dimensions)

| Unit | A   | A <sub>1</sub> | b    | b <sub>1</sub> ( <sup>1</sup> ) | c    | D    | D <sub>1</sub> | E     | e     | H     | L    | P    | Q   | q    | E <sub>1</sub> | V     |
|------|-----|----------------|------|---------------------------------|------|------|----------------|-------|-------|-------|------|------|-----|------|----------------|-------|
| max  | 4.7 | 1.40           | 0.95 | 1.70                            | 0.65 | 15.8 | 6.8            | 10.30 | 5.08  | 16.25 | 15.0 | 3.80 | 2.6 | 2.95 | 8.1            | 6.9   |
| nom  |     |                |      |                                 |      |      |                |       | (REF) |       |      |      |     |      |                | (REF) |
| min  | 4.3 | 1.15           | 0.70 | 1.17                            | 0.45 | 15.6 | 6.4            | 9.65  |       | 15.70 | 12.5 | 3.53 | 2.2 | 2.65 | 7.9            |       |

Note

1. Protruded dambar are included in the dimension.

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| Outline version | References        |       |       | European projection | Issue date           |
|-----------------|-------------------|-------|-------|---------------------|----------------------|
|                 | IEC               | JEDEC | JEITA |                     |                      |
| SOD59A          | TO-220AC (2-lead) |       |       |                     | 15-03-24<br>15-03-30 |



## 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".
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