

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

- New 6th Generation Technology
- Low Forward Voltage Drop
- Low Reverse Leakage Current
- High Forward Surge Capability IFSM
- 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

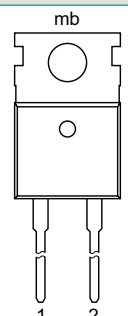
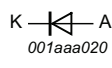
4. Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Values | | | Unit |
|--------------------------------|---------------------------------|--|--------|------|------|------|
| Absolute maximum rating | | | | | | |
| V_{RRM} | repetitive peak reverse voltage | | 650 | | | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; square-wave pulse; $T_{mb} \leq 153$ °C; Fig. 1 ; Fig. 2 ; Fig. 3 | 4 | | | A |
| T_j | junction temperature | | 175 | | | °C |
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 4$ A; $T_j = 25$ °C; Fig. 5 | - | 1.27 | 1.4 | V |
| | | $I_F = 4$ A; $T_j = 150$ °C; Fig. 5 | - | 1.34 | 1.55 | V |
| Dynamic characteristics | | | | | | |
| Q_r | recovered charge | $I_F = 4$ A; $dI_F/dt = 500$ A/ μ s; $V_R = 400$ V; $T_j = 25$ °C; Fig. 7 | - | 16 | - | 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 |
|-------------|--------------|-----------------------|----------------|------------------------|-----------------|--------------------|
| WNSC6D04650 | TO220-2L | WNSC6D04650Q | Tube | 50 | SOD59A | 30-Mar-2015 |

7. Marking

Table 4. Marking codes

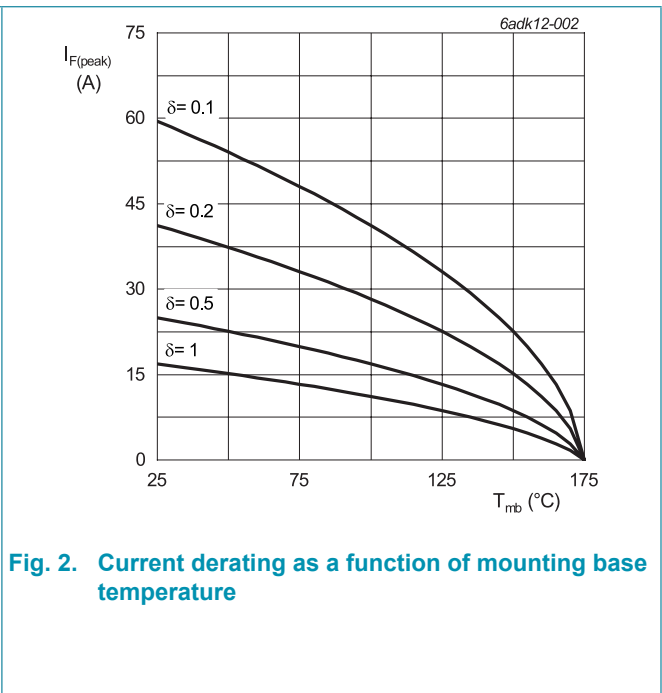
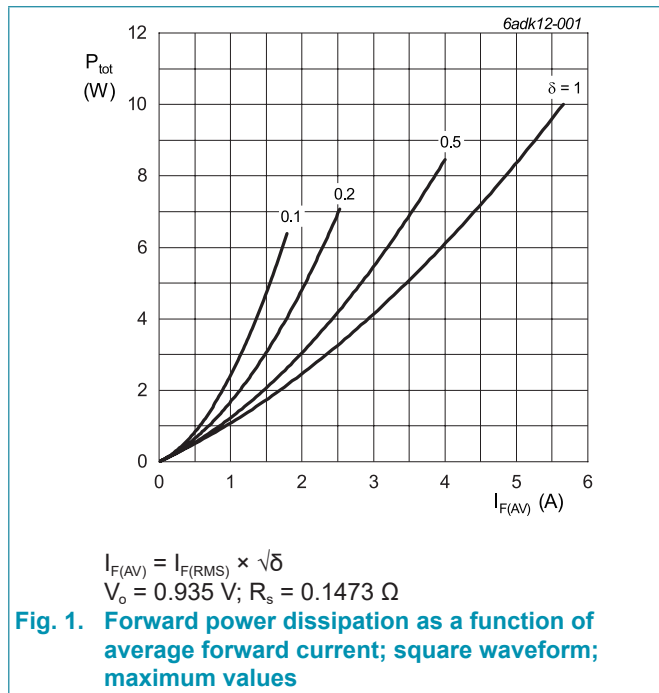
| Type number | Marking codes |
|-------------|-----------------|
| WNSC6D04650 | WNSC6D 04650 |

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; $T_{mb} \leq 153\text{ }^\circ\text{C}$; Fig. 1 ; Fig. 2 ; Fig. 3 | 4 | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_{mb} \leq 153\text{ }^\circ\text{C}$; 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 | 30 | A |
| | | $t_p = 10\text{ }\mu\text{s}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; square-wave pulse | 450 | A |
| I^2t | I^2t for fusing | sine-wave pulse; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; $t_p = 10\text{ ms}$ | 5 | A^2s |
| T_{stg} | storage temperature | | -55 to 175 | $^\circ\text{C}$ |
| T_j | junction temperature | | 175 | $^\circ\text{C}$ |



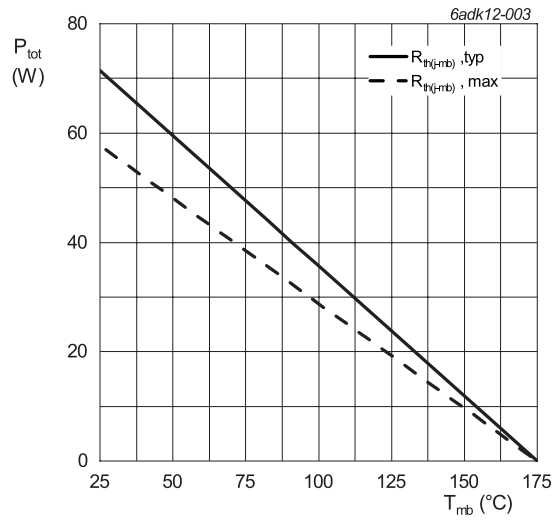


Fig. 3. Total power dissipation as a function of mounting base temperature

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; Fig. 4 | - | 2.1 | 2.6 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | - | 60 | - | K/W |

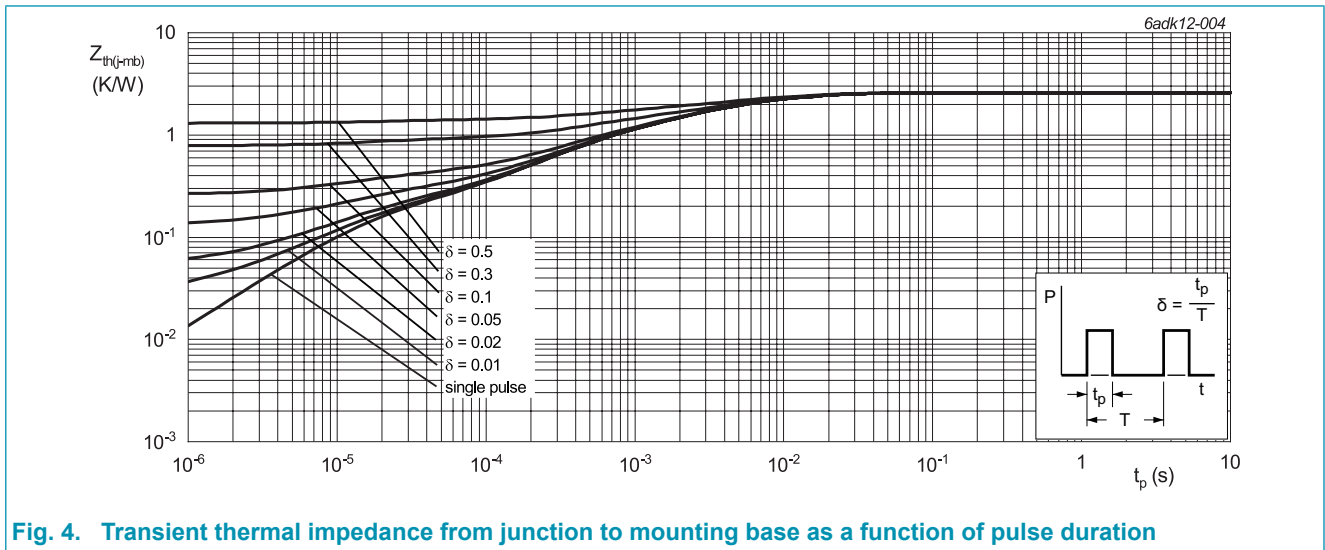
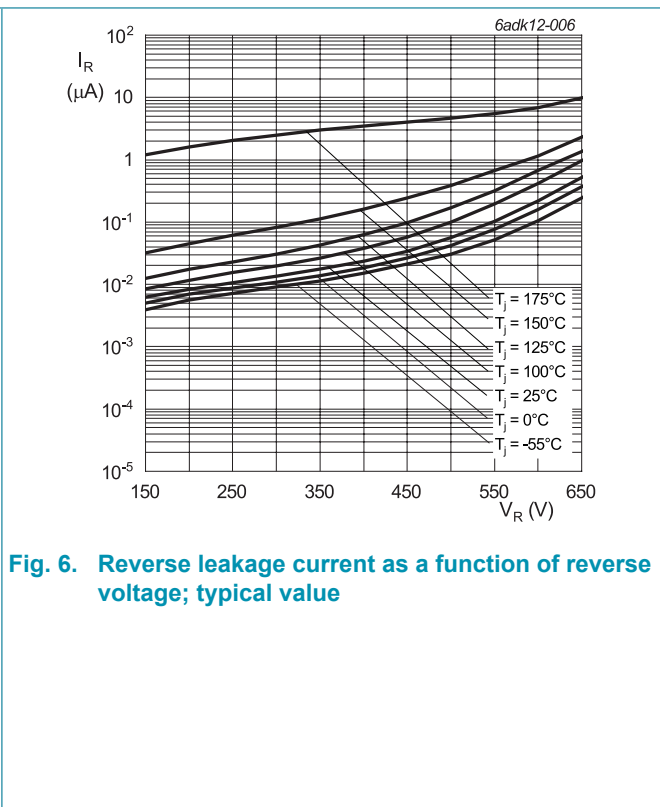
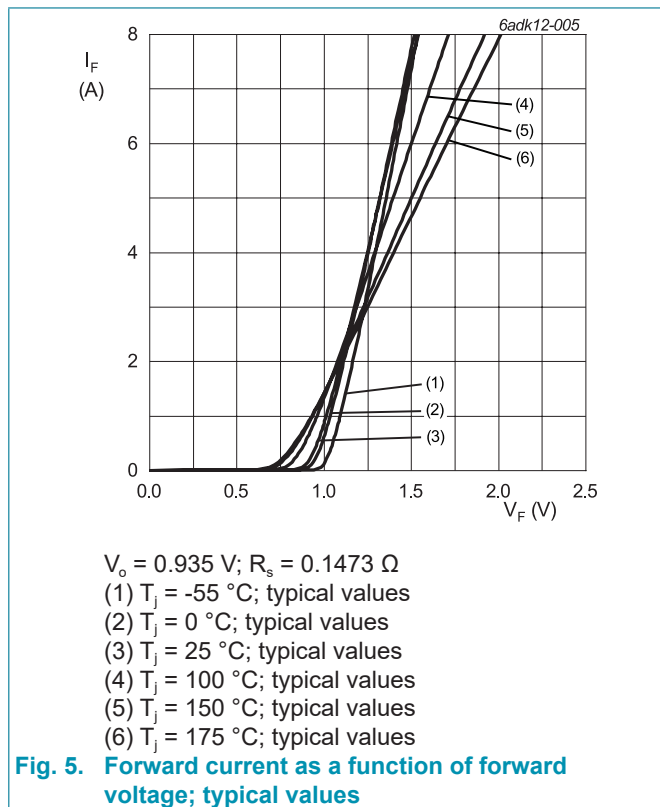


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|---------------------------------|--|-----|------|------|---------------|
| Static characteristics | | | | | | |
| I_F | forward current | $I_F = 4 \text{ A}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 5}$ | - | 1.27 | 1.4 | V |
| | | $I_F = 4 \text{ A}; T_j = 150 \text{ }^\circ\text{C}; \text{ Fig. 5}$ | - | 1.34 | 1.55 | V |
| | | $I_F = 4 \text{ A}; T_j = 175 \text{ }^\circ\text{C}; \text{ Fig. 5}$ | - | 1.37 | 1.6 | V |
| I_R | reverse current | $V_R = 650 \text{ V}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 6}$ | - | 1 | 30 | μA |
| | | $V_R = 650 \text{ V}; T_j = 175 \text{ }^\circ\text{C}; \text{ Fig. 6}$ | - | 12 | 80 | μA |
| Dynamic characteristics | | | | | | |
| Q_r | recovered charge | $I_F = 4 \text{ A}; V_R = 400 \text{ V}; dI_F/dt = 500 \text{ A}/\mu\text{s}; T_j = 25 \text{ }^\circ\text{C}; \text{ Fig. 7}$ | - | 12 | - | nC |
| C_d | diode capacitance | $f = 1 \text{ MHz}; V_R = 1 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | 233 | - | pF |
| | | $f = 1 \text{ MHz}; V_R = 300 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | 28 | - | pF |
| | | $f = 1 \text{ MHz}; V_R = 600 \text{ V}; T_j = 25 \text{ }^\circ\text{C}$ | - | 23 | - | pF |
| E_{as} | non-repetitive avalanche energy | $I_R = 4 \text{ A}; L = 5 \text{ mH}; T_{j(\text{init})} = 25 \text{ }^\circ\text{C}$ | 40 | - | - | mJ |



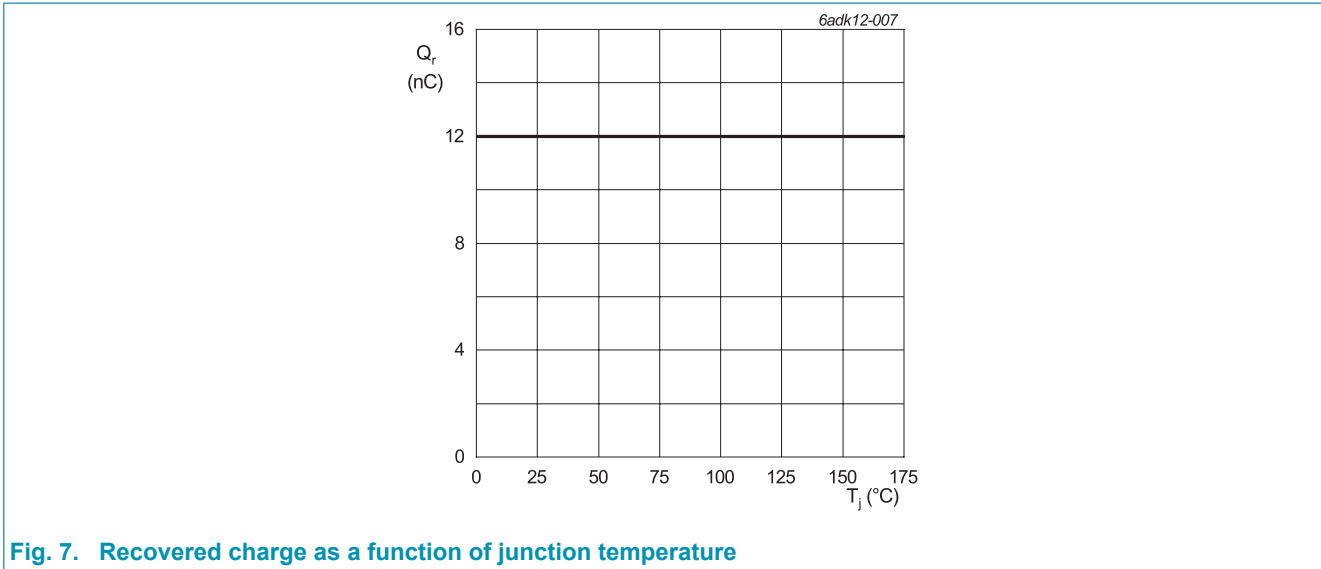
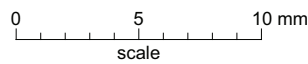
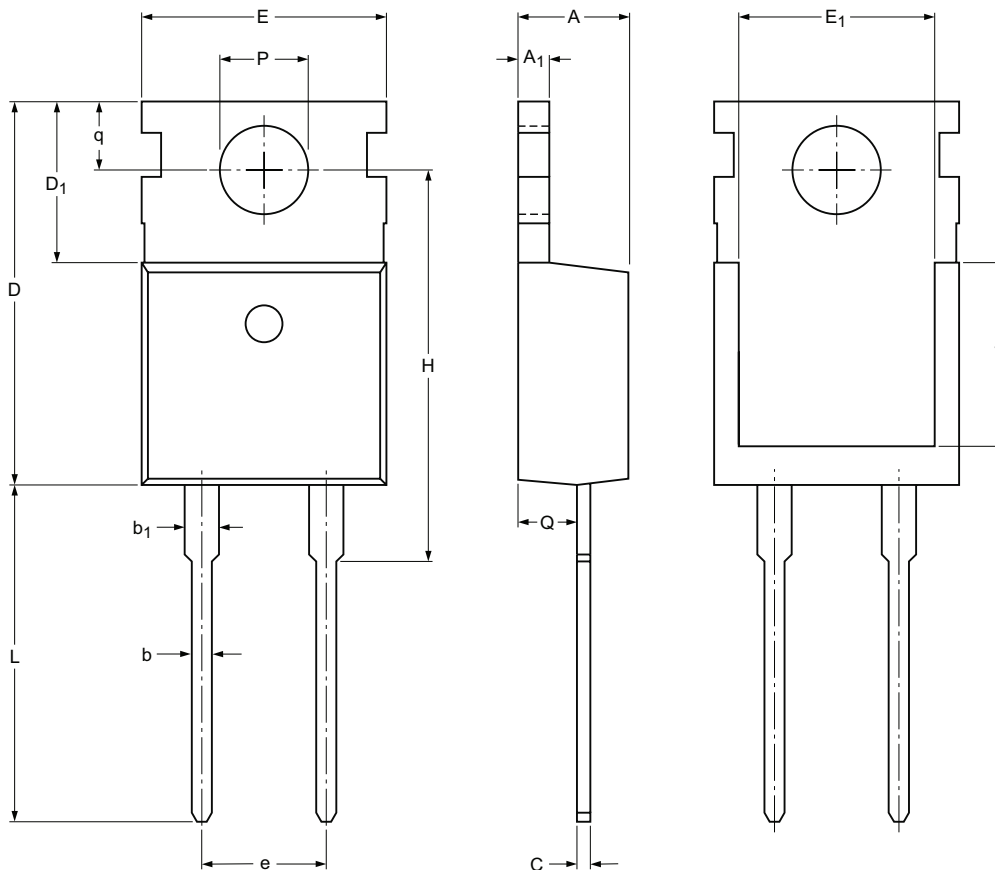


Fig. 7. Recovered charge as a function of junction temperature

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 ₁ | b | b ₁ (¹) | c | D | D ₁ | E | e | H | L | P | Q | q | E ₁ | V |
|------|---------|----------------|------|---------------------------------|------|------|----------------|-------|-------|-------|------|------|-----|------|----------------|-------|
| mm | 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.

sod059a_po

| Outline version | References | | | European projection | Issue date |
|-----------------|-------------------|-------|-------|---------------------|-----------------------|
| | IEC | JEDEC | JEITA | | |
| SOD59A | TO-220AC (2-lead) | | | | -15-03-24 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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Date of release: 22 April 2021
