

1. General description

Silicon Carbide Schottky diode in a SOD59A (TO-220AC) plastic package, designed for high frequency switched-mode power supplies.

2. Features and benefits

- Highly stable switching performance
- High forward surge capability IFSM
- 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

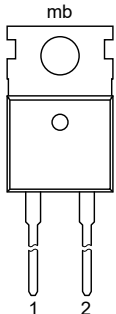
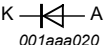
4. Quick reference data

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 | $\delta = 0.5$; $T_{mb} \leq 76$ °C; square-wave pulse; Fig. 1 ; Fig. 2 ; Fig. 3 | - | - | 20 | A |
| T_j | junction temperature | | - | - | 175 | °C |
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 20$ A; $T_j = 25$ °C; Fig. 5 | - | 1.5 | 1.7 | V |
| | | $I_F = 20$ A; $T_j = 150$ °C; Fig. 5 | - | 1.8 | 2.1 | V |
| Dynamic characteristics | | | | | | |
| Q_r | recovered charge | $I_F = 20$ A; $di_F/dt = 500$ A/ μ s; $V_R = 400$ V; $T_j = 25$ °C; Fig. 6 | - | 28 | - | nC |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------------------------|--|---|
| 1 | K | cathode |  <p>TO-220AC (SOD59A)</p> |  |
| 2 | A | anode | | |
| mb | mb | mounting base; connected to cathode | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|----------|--|---------|
| | Name | Description | Version |
| NXPSC20650 | TO-220AC | Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC | SOD59A |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| NXPSC20650 | NXPSC20650 |

8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | 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 | $\delta = 0.5$; T _{mb} ≤ 76 °C; square-wave pulse; Fig. 1; Fig. 2; Fig. 3 | - | 20 | A |
| I _{FRM} | repetitive peak forward current | $\delta = 0.5$; t _p = 25 μs; T _{mb} ≤ 76 °C; square-wave pulse | - | 40 | A |
| I _{FSM} | non-repetitive peak forward current | t _p = 10 ms; T _{j(init)} = 25 °C; SIN | - | 100 | A |
| | | t _p = 10 μs; T _{j(init)} = 25 °C; SIN | - | 900 | A |
| T _{stg} | storage temperature | | -55 | 175 | °C |
| T _j | junction temperature | | - | 175 | °C |

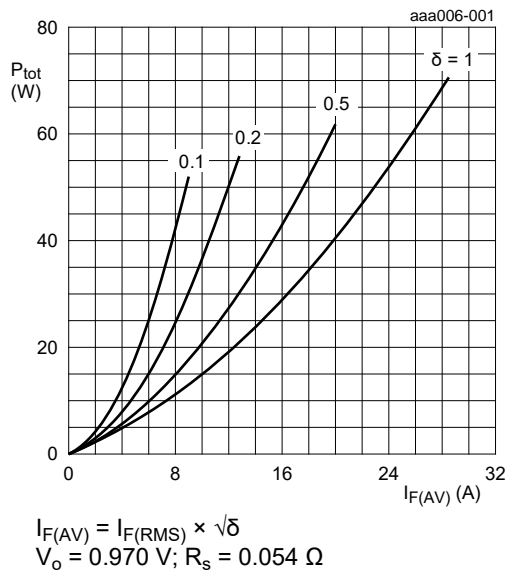


Fig. 1. Forward power dissipation as a function of average forward current; square waveform; maximum values

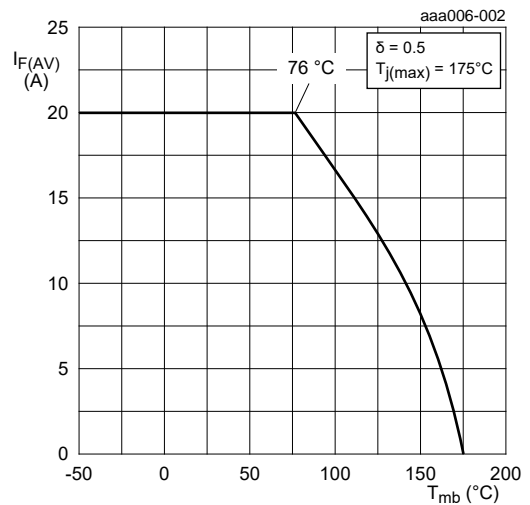


Fig. 2. Forward current as a function of mounting base temperature; maximum values

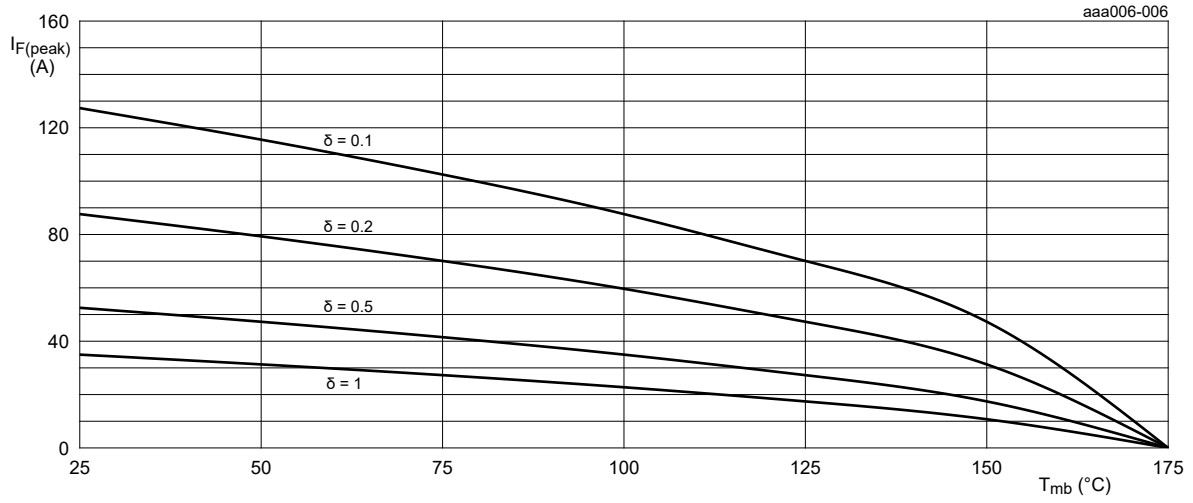


Fig. 3. Current derating as a function of mounting base temperature

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 | Fig. 4 | - | - | 1.5 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient free air | in free air | - | 60 | - | K/W |

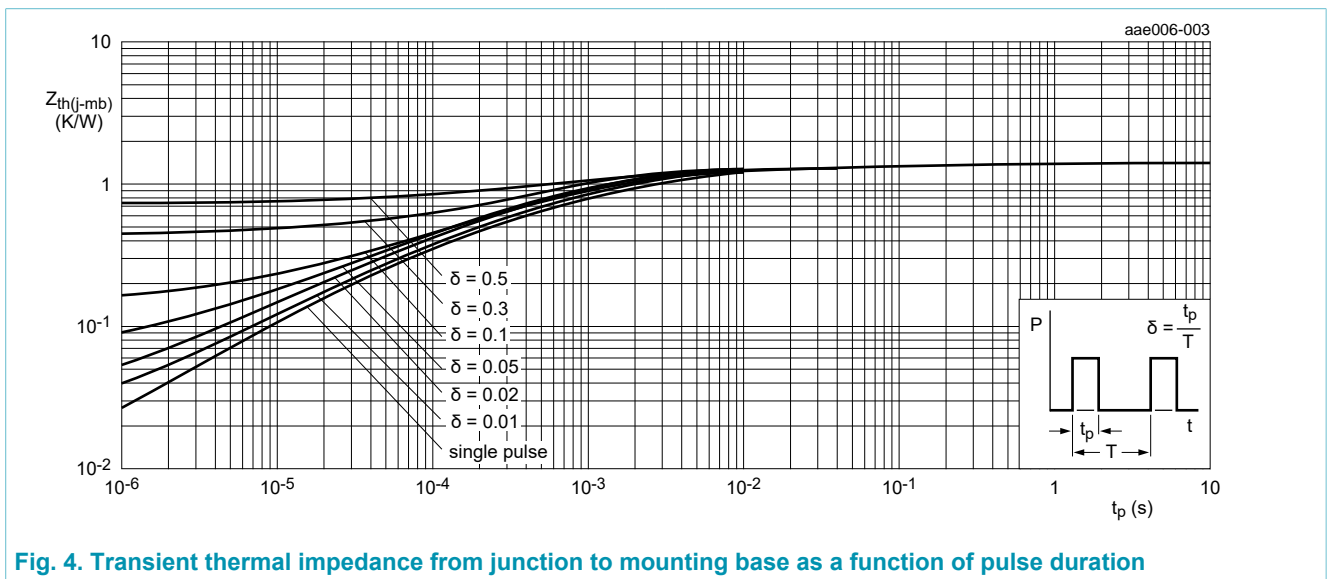
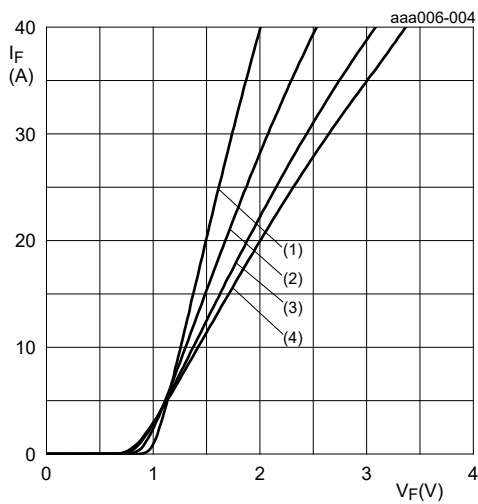


Fig. 4. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-------------------|---|-----|-----|------|------|
| Static characteristics | | | | | | |
| V _F | forward voltage | I _F = 20 A; T _j = 25 °C; Fig. 5 | - | 1.5 | 1.7 | V |
| | | I _F = 20 A; T _j = 150 °C; Fig. 5 | - | 1.8 | 2.1 | V |
| I _R | reverse current | V _R = 650 V; T _j = 25 °C | - | - | 500 | μA |
| | | V _R = 650 V; T _j = 150 °C | - | - | 1600 | μA |
| Dynamic characteristics | | | | | | |
| Q _r | recovered charge | I _F = 20 A; di _F /dt = 500 A/μs; V _R = 400 V; T _j = 25 °C; Fig. 6 | - | 28 | - | nC |
| C _d | diode capacitance | f = 1 MHz; V _R = 1 V; T _j = 25 °C | - | 600 | - | pF |
| | | f = 1 MHz; V _R = 300 V; T _j = 25 °C | - | 64 | - | pF |
| | | f = 1 MHz; V _R = 600 V; T _j = 25 °C | - | 50 | - | pF |



V₀ = 0.970 V; R_s = 0.054 Ω
 (1) T_j = 25 °C; typical values
 (2) T_j = 100 °C; typical values
 (3) T_j = 150 °C; typical values
 (4) T_j = 175 °C; typical values

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

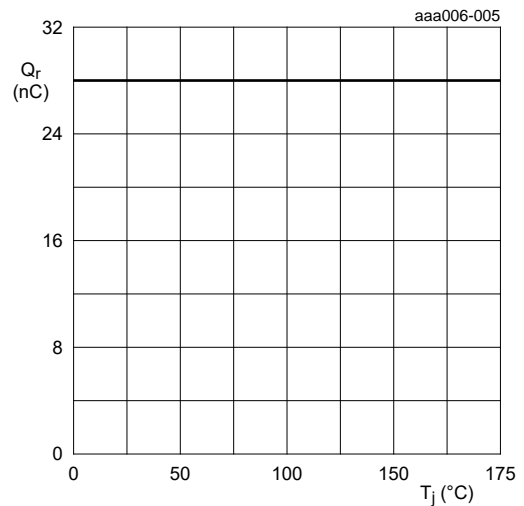
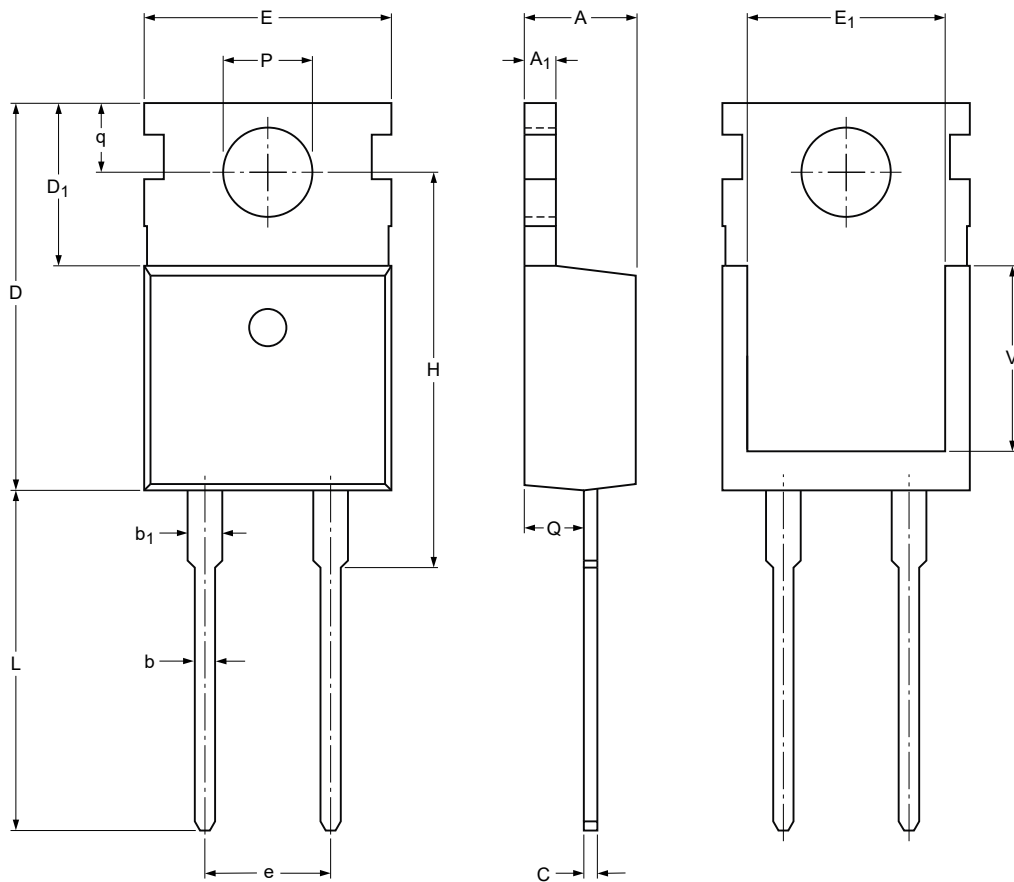


Fig. 6. Recovered charge as a function of junction temperature

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 |
|------|-----|----------------|------|---------------------------------|------|------|----------------|-------|-------|-------|------|------|-----|------|----------------|-------|
| 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 |

Fig. 7. Package outline TO-220AC (SOD59A)

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. |
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- [1] Please consult the most recently issued document before initiating or completing a design.
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