



NXPSC08650

Silicon Carbide Diode

4 May 2015

Product data sheet

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 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. Quick reference data

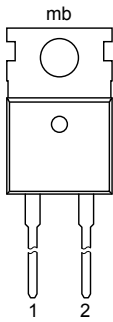
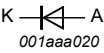
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------------------------|---------------------------------|-----------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| V_{RRM} | repetitive peak reverse voltage | | - | - | 650 | V |
| $I_{F(AV)}$ | average forward current | $\delta = 0.5$; $T_{mb} \leq 120$ °C; square-wave pulse; Fig. 1 ; Fig. 2 | - | - | 8 | A |
| T_j | junction temperature | | - | - | 175 | °C |
| Static characteristics | | | | | | |
| V_F | forward voltage | $I_F = 8$ A; $T_j = 25$ °C; Fig. 4 | - | 1.5 | 1.7 | V |



| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| Dynamic characteristics | | | | | | |
| Q_r | recovered charge | $I_F = 8\text{ A}$; $V_R = 400\text{ V}$; $di_F/dt = 500\text{ A}/\mu\text{s}$; $T_J = 25\text{ }^\circ\text{C}$; Fig. 5 | - | 13 | - | nC |

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 1 | K | cathode |  <p style="text-align: center;">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 |
| NXPSC08650 | TO-220AC | Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC | SOD59A |

7. Marking

Table 4. Marking codes

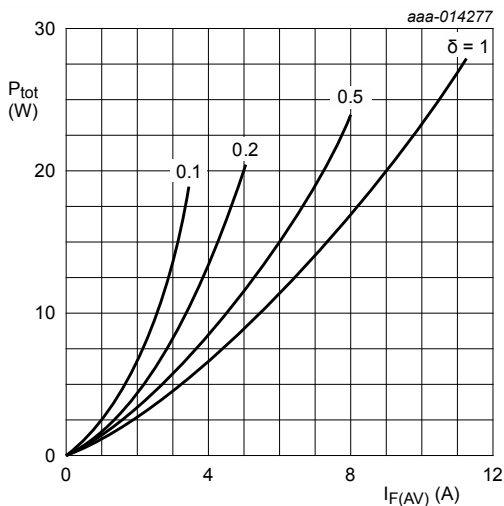
| Type number | Marking code |
|-------------|--------------|
| NXPSC08650 | NXPSC08650 |

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 | $\delta = 0.5$; $T_{mb} \leq 120\text{ }^\circ\text{C}$; square-wave pulse; Fig. 1; Fig. 2 | - | 8 | A |
| I_{FRM} | repetitive peak forward current | $\delta = 0.5$; $t_p = 25\text{ }\mu\text{s}$; $T_{mb} \leq 120\text{ }^\circ\text{C}$; square-wave pulse | - | 16 | 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 | - | 48 | A |
| | | $t_p = 10\text{ }\mu\text{s}$; $T_{j(\text{init})} = 25\text{ }^\circ\text{C}$; square-wave pulse | - | 385 | A |
| T_{stg} | storage temperature | | -55 | 175 | $^\circ\text{C}$ |
| T_j | junction temperature | | - | 175 | $^\circ\text{C}$ |



$$I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta}$$

$$V_o = 1.250\text{ V}; R_s = 0.107\text{ }\Omega$$

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

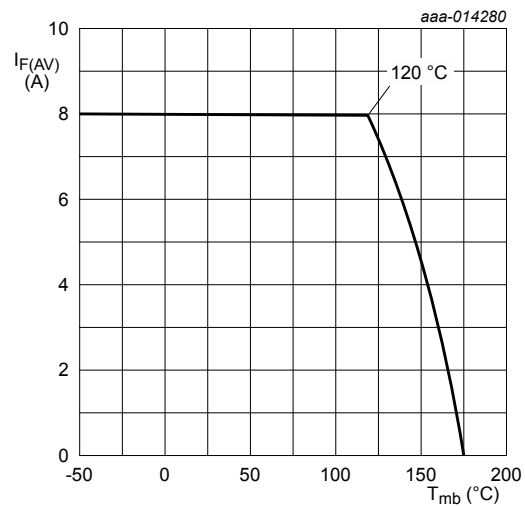


Fig. 2. Forward current as a function of mounting base temperature; maximum values

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. 3 | - | - | 2.3 | K/W |
| $R_{th(j-a)}$ | thermal resistance from junction to ambient | in free air | - | 60 | - | K/W |

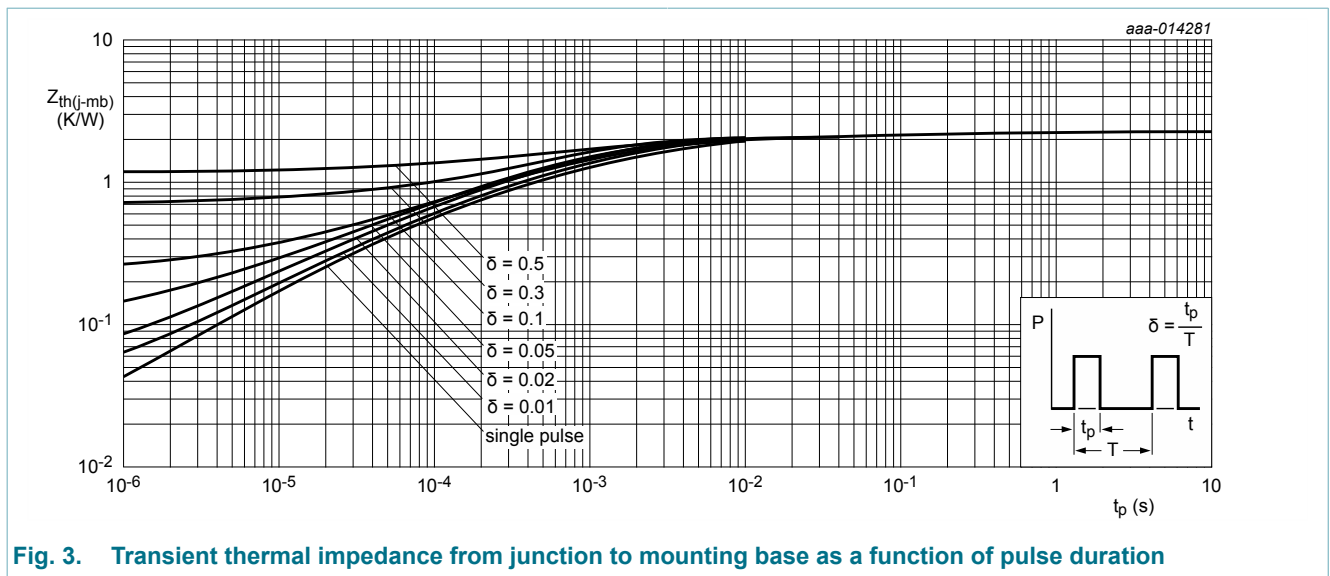
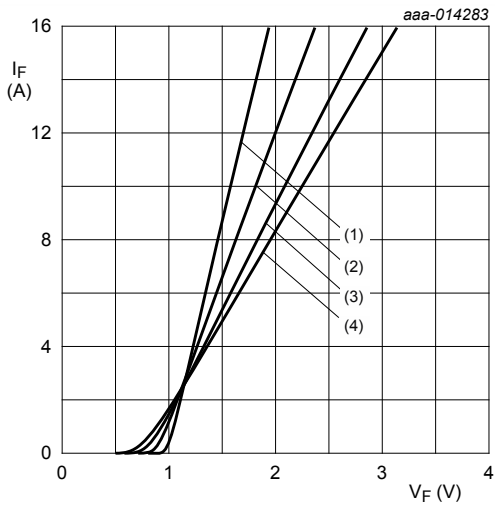


Fig. 3. Transient thermal impedance from junction to mounting base as a function of pulse duration

10. Characteristics

Table 7. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------------------|-------------------|--------------------------------------------------------------------------------------------------------------|-----|-----|-----|------|
| Static characteristics | | | | | | |
| V _F | forward voltage | I _F = 8 A; T _j = 25 °C; Fig. 4 | - | 1.5 | 1.7 | V |
| | | I _F = 8 A; T _j = 150 °C; Fig. 4 | - | 1.8 | 2.1 | V |
| I _R | reverse current | V _R = 650 V; T _j = 25 °C | - | - | 230 | μA |
| | | V _R = 650 V; T _j = 150 °C | - | - | 700 | μA |
| Dynamic characteristics | | | | | | |
| Q _r | recovered charge | I _F = 8 A; dI _F /dt = 500 A/μs; V _R = 400 V; T _j = 25 °C; Fig. 5 | - | 13 | - | nC |
| C _d | diode capacitance | f = 1 MHz; V _R = 1 V; T _j = 25 °C | - | 260 | - | pF |
| | | f = 1 MHz; V _R = 300 V; T _j = 25 °C | - | 30 | - | pF |
| | | f = 1 MHz; V _R = 600 V; T _j = 25 °C | - | 24 | - | pF |



V₀ = 1.250 V; R_s = 0.107 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. 4. Forward current as a function of forward voltage; typical values

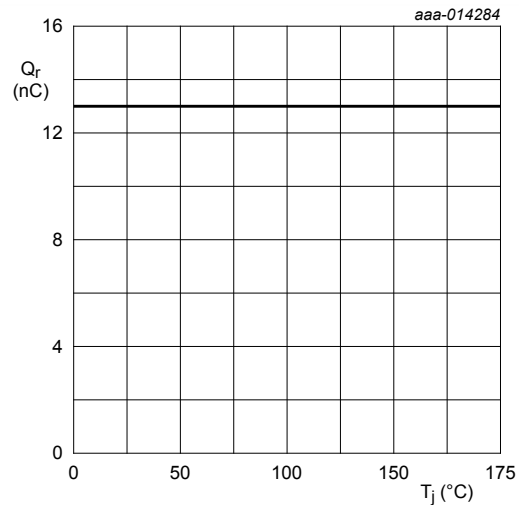
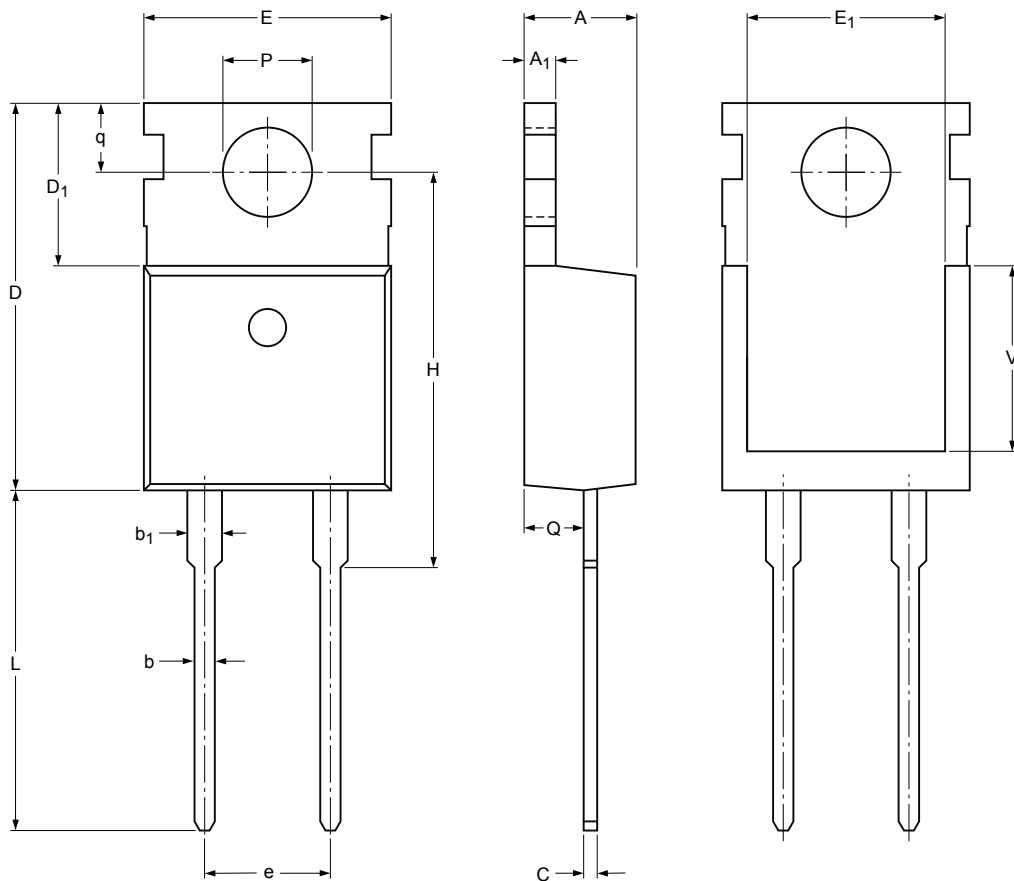


Fig. 5. Forward current as a function of forward voltage; typical values

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. 6. Package outline TO-220AC (SOD59A)

12. Legal information

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|--------------------------------|--------------------|---------------------------------------------------------------------------------------|
| Objective [short] data sheet | Development | This document contains data from the objective specification for product development. |
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13. Contents

| | | |
|------|-------------------------------|---|
| 1 | General description | 1 |
| 2 | Features and benefits | 1 |
| 3 | Applications | 1 |
| 4 | Quick reference data | 1 |
| 5 | Pinning information | 2 |
| 6 | Ordering information | 2 |
| 7 | Marking | 2 |
| 8 | Limiting values | 3 |
| 9 | Thermal characteristics | 4 |
| 10 | Characteristics | 5 |
| 11 | Package outline | 6 |
| 12 | Legal information | 7 |
| 12.1 | Data sheet status | 7 |
| 12.2 | Definitions | 7 |
| 12.3 | Disclaimers | 7 |
| 12.4 | Trademarks | 8 |

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