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>
<thead>
<tr>
<th>Table 1. Quick reference data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol</td>
</tr>
<tr>
<td>$V_{RRM}$</td>
</tr>
<tr>
<td>$I_{F(AV)}$</td>
</tr>
<tr>
<td>$T_j$</td>
</tr>
</tbody>
</table>

Static characteristics

$V_F$ forward voltage $I_F = 6$ A; $T_j = 25 ^\circ C$; Fig. 4 | - | 1.5 | 1.7 | V |
### Dynamic characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$Q_r$</td>
<td>recovered charge</td>
<td>$I_F = 6,A; V_R = 400,V; ,dI_F/dt = 500,A/\mu s;, T_j = 25,^\circ C; \text{Fig. 5}$</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>nC</td>
</tr>
</tbody>
</table>

### 5. Pinning information

#### Table 2. Pinning information

<table>
<thead>
<tr>
<th>Pin</th>
<th>Symbol</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>K</td>
<td>cathode</td>
<td>K</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>mb</td>
<td>mb</td>
<td>mounting base; connected to cathode</td>
<td>mb</td>
<td></td>
</tr>
</tbody>
</table>

#### TO-220AC (SOD59A)

### 6. Ordering information

#### Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Name</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>NXPSC06650</td>
<td>TO-220AC</td>
<td>Plastic single-ended package; heatsink mounted; 1 mounting hole; 2-lead TO-220AC</td>
<td>SOD59A</td>
<td></td>
</tr>
</tbody>
</table>

### 7. Marking

#### Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>NXPSC06650</td>
<td>NXPSC06650</td>
</tr>
</tbody>
</table>
8. Limiting values

Table 5. Limiting values
In accordance with the Absolute Maximum Rating System (IEC 60134).

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{RRM}</td>
<td>repetitive peak reverse voltage</td>
<td></td>
<td>-</td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>V_{RWM}</td>
<td>crest working reverse voltage</td>
<td></td>
<td>-</td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>V_{R}</td>
<td>reverse voltage</td>
<td>DC</td>
<td>-</td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>I_{F(AV)}</td>
<td>average forward current</td>
<td>δ = 0.5; T_{mb} ≤ 124 °C; square-wave pulse; Fig. 1, Fig. 2</td>
<td>-</td>
<td>6</td>
<td>A</td>
</tr>
<tr>
<td>I_{FRM}</td>
<td>repetitive peak forward current</td>
<td>δ = 0.5; t_p = 25 µs; T_{mb} ≤ 124 °C; square-wave pulse</td>
<td>-</td>
<td>12</td>
<td>A</td>
</tr>
<tr>
<td>I_{FSM}</td>
<td>non-repetitive peak forward current</td>
<td>t_p = 10 ms; T_{j(init)} = 25 °C; sine-wave pulse</td>
<td>-</td>
<td>36</td>
<td>A</td>
</tr>
<tr>
<td>T_{slg}</td>
<td>storage temperature</td>
<td>t_p = 10 µs; T_{j(init)} = 25 °C; square-wave pulse</td>
<td>-</td>
<td>310</td>
<td>A</td>
</tr>
<tr>
<td>T_{j}</td>
<td>junction temperature</td>
<td></td>
<td>-</td>
<td>175</td>
<td>°C</td>
</tr>
</tbody>
</table>

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

\[ I_{F(AV)} = I_{F(RMS)} \times \sqrt{\delta} \]
\[ V_o = 0.766 \text{ V}; R_s = 0.196 \text{ Ω} \]

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

Table 6. Thermal characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$R_{\text{th(j-mb)}}$</td>
<td>thermal resistance from junction to mounting base</td>
<td>Fig. 3</td>
<td>-</td>
<td>-</td>
<td>2.7</td>
<td>K/W</td>
</tr>
<tr>
<td>$R_{\text{th(j-a)}}$</td>
<td>thermal resistance from junction to ambient</td>
<td>in free air</td>
<td>-</td>
<td>60</td>
<td>-</td>
<td>K/W</td>
</tr>
</tbody>
</table>

![Graph showing transient thermal impedance from junction to mounting base as a function of pulse duration.](image_url)

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

Table 7. Characteristics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Static characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$V_F$</td>
<td>forward voltage</td>
<td>$I_F = 6 , A; , T_J = 25 , ^\circ C; , \text{Fig. 4}$</td>
<td>-</td>
<td>1.5</td>
<td>1.7</td>
<td>V</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$V_R = 650 , V; , T_J = 25 , ^\circ C$</td>
<td>-</td>
<td>1.8</td>
<td>2.1</td>
<td></td>
<td>V</td>
</tr>
<tr>
<td></td>
<td>$V_R = 650 , V; , T_J = 150 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>200</td>
<td>640</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td>Dynamic characteristics</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Q_r$</td>
<td>recovered charge</td>
<td>$I_F = 6 , A; , \frac{dI_F}{dt} = 500 , \text{A/µs}; , V_R = 400 , V; , T_J = 25 , ^\circ C; , \text{Fig. 5}$</td>
<td>-</td>
<td>10</td>
<td>-</td>
<td>nC</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 , \text{MHz}; , V_R = 1 , V; , T_J = 25 , ^\circ C$</td>
<td>-</td>
<td>190</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td>$f = 1 , \text{MHz}; , V_R = 300 , V; , T_J = 25 , ^\circ C$</td>
<td>-</td>
<td>23</td>
<td>-</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>$f = 1 , \text{MHz}; , V_R = 600 , V; , T_J = 25 , ^\circ C$</td>
<td>-</td>
<td>19</td>
<td>-</td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 4. Forward current as a function of forward voltage; typical values

Fig. 5. Recovered charge as a function of junction temperature

$V_o = 0.766 \, V; \, R_s = 0.196 \, \Omega$
(1) $T_J = 25 \, ^\circ C$; typical values
(2) $T_J = 100 \, ^\circ C$; typical values
(3) $T_J = 150 \, ^\circ C$; typical values
(4) $T_J = 175 \, ^\circ C$; typical values
11. Package outline

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

Dimensions: (mm are the original dimensions)

<table>
<thead>
<tr>
<th>Unit</th>
<th>A</th>
<th>A₁</th>
<th>b</th>
<th>b₁⁽¹⁾</th>
<th>c</th>
<th>D</th>
<th>D₁</th>
<th>E</th>
<th>e</th>
<th>H</th>
<th>L</th>
<th>P</th>
<th>Q</th>
<th>q</th>
<th>E₁</th>
<th>V</th>
</tr>
</thead>
<tbody>
<tr>
<td>max</td>
<td>4.7</td>
<td>1.40</td>
<td>0.95</td>
<td>1.70</td>
<td>0.65</td>
<td>15.8</td>
<td>6.8</td>
<td>10.30</td>
<td>5.08</td>
<td>16.25</td>
<td>15.0</td>
<td>3.80</td>
<td>2.6</td>
<td>2.95</td>
<td>8.1</td>
<td>6.9</td>
</tr>
<tr>
<td>nom</td>
<td>4.3</td>
<td>1.15</td>
<td>0.70</td>
<td>1.17</td>
<td>0.45</td>
<td>15.6</td>
<td>6.4</td>
<td>9.65</td>
<td>(REF)</td>
<td>15.70</td>
<td>12.5</td>
<td>3.53</td>
<td>2.2</td>
<td>2.65</td>
<td>7.9</td>
<td>(REF)</td>
</tr>
<tr>
<td>min</td>
<td>4.3</td>
<td>1.15</td>
<td>0.70</td>
<td>1.17</td>
<td>0.45</td>
<td>15.6</td>
<td>6.4</td>
<td>9.65</td>
<td>(REF)</td>
<td>15.70</td>
<td>12.5</td>
<td>3.53</td>
<td>2.2</td>
<td>2.65</td>
<td>7.9</td>
<td>(REF)</td>
</tr>
</tbody>
</table>

Note
1. Protruded dambar are included in the dimension.

Outline version | References | European projection | Issue date
SOD59A | TO-220AC (2-lead) | sod059a_po | 15-03-24 | 15-03-30

Fig. 6. Package outline TO-220AC (SOD59A)
12. Legal information

<table>
<thead>
<tr>
<th>Data sheet status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective [short] data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary [short] data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product [short] data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

[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".
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.ween-semi.com.

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