Silicon Carbide (SiC) Schottky Diode – EliteSiC, 20 A, 650 V, D2, D2PAK-3L

FFSB2065BDN-F085

Description
Silicon Carbide (SiC) Schottky Diodes use a completely new technology that provides superior switching performance and higher reliability compared to Silicon. No reverse recovery current, temperature independent switching characteristics, and excellent thermal performance sets Silicon Carbide as the next generation of power semiconductor. System benefits include highest efficiency, faster operating frequency, increased power density, reduced EMI, and reduced system size & cost.

Features
- Max Junction Temperature 175°C
- Avalanche Rated 49 mJ
- High Surge Current Capacity
- Positive Temperature Coefficient
- Ease of Paralleling
- No Reverse Recovery/No Forward Recovery
- AEC–Q101 Qualified and PPAP Capable

Applications
- Automotive BEV–EV
- Automotive HEV–EV Onboard Chargers
- Automotive HEV–EV DC–DC Converters

MOSFET MAXIMUM RATINGS (TC = 25°C unless otherwise noted)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Ratings</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_{RRM}</td>
<td>Peak Repetitive Reverse Voltage</td>
<td>650</td>
<td>V</td>
</tr>
<tr>
<td>E_{AS}</td>
<td>Single Pulse Avalanche Energy (Note 1)</td>
<td>49</td>
<td>mJ</td>
</tr>
<tr>
<td>I_F</td>
<td>Continuous Rectified Forward Current</td>
<td>@ TC &lt; 25°C</td>
<td>23.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>@ TC &lt; 140°C</td>
<td>10</td>
</tr>
<tr>
<td>I_{F, Max}</td>
<td>Non-Repetitive Peak Forward Surge Current</td>
<td>TC = 25°C, 10 μs</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TC = 150°C, 10 μs</td>
<td>554</td>
</tr>
<tr>
<td>I_{F, SM}</td>
<td>Non-Repetitive Forward Surge Current, TC = 25°C</td>
<td>Half-Sine Pulse, t_p = 8.3 ms</td>
<td>45</td>
</tr>
<tr>
<td>P_{tot}</td>
<td>Power Dissipation</td>
<td>TC = 25°C</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>TC = 150°C</td>
<td>12.5</td>
</tr>
<tr>
<td>T_{J, TSTG}</td>
<td>Operating and Storage Temperature Range</td>
<td>-55 to +175</td>
<td>°C</td>
</tr>
</tbody>
</table>

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1. E_{AS} of 49 mJ is based on starting TJ = 25°C, L = 0.5 mH, I_{AS} = 14 A, V = 50 V.

MARKING DIAGRAM

ORDERING INFORMATION
See detailed ordering and shipping information on page 2 of this data sheet.

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February, 2023 – Rev. 3
THERMAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Ratings</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>R_{JC}</td>
<td>Thermal Resistance, Junction to Case, Max</td>
<td>2.0</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

ELECTRICAL CHARACTERISTICS \( (T_C = 25°C \text{ unless otherwise noted – per leg}) \)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ.</th>
<th>Max.</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V_F</td>
<td>Forward Voltage</td>
<td>( I_F = 10 \text{ A}, T_C = 25°C )</td>
<td>–</td>
<td>1.38</td>
<td>1.75</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_F = 10 \text{ A}, T_C = 125°C )</td>
<td>–</td>
<td>1.6</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_F = 10 \text{ A}, T_C = 175°C )</td>
<td>–</td>
<td>1.72</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>I_R</td>
<td>Reverse Current</td>
<td>( V_R = 650 \text{ V}, T_C = 25°C )</td>
<td>–</td>
<td>0.5</td>
<td>40</td>
<td>µA</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_R = 650 \text{ V}, T_C = 125°C )</td>
<td>–</td>
<td>1</td>
<td>80</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_R = 650 \text{ V}, T_C = 175°C )</td>
<td>–</td>
<td>2</td>
<td>160</td>
<td></td>
</tr>
<tr>
<td>Q_C</td>
<td>Total Capacitive Charge</td>
<td>( V = 400 \text{ V} )</td>
<td>–</td>
<td>25</td>
<td>–</td>
<td>nC</td>
</tr>
<tr>
<td>C</td>
<td>Total Capacitance</td>
<td>( V_R = 1 \text{ V}, f = 100 \text{ kHz} )</td>
<td>–</td>
<td>421</td>
<td>–</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_R = 200 \text{ V}, f = 100 \text{ kHz} )</td>
<td>–</td>
<td>46</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_R = 400 \text{ V}, f = 100 \text{ kHz} )</td>
<td>–</td>
<td>35</td>
<td>–</td>
<td></td>
</tr>
</tbody>
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Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

PACKAGE MARKING AND ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Top Mark</th>
<th>Package</th>
<th>Shipping†</th>
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<tr>
<td>FFSB2065BDN–F085</td>
<td>FFSB2065BDN</td>
<td>D2PAK</td>
<td>800 Units/ Tape &amp; Reel</td>
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</table>

†For information on tape and reel specifications, including part orientation and tape sizes, please refer to our Tape and Reel Packaging Specifications Brochure, BRD8011/D.
TYPICAL CHARACTERISTICS (T\textsubscript{J} = 25°C unless otherwise noted)

**Figure 1. Forward Characteristics**

**Figure 2. Reverse Characteristics**

**Figure 3. Current Derating**

**Figure 4. Power Derating**

**Figure 5. Capacitive Charge vs. Reverse Voltage**

**Figure 6. Capacitance vs. Reverse Voltage**
TYPICAL CHARACTERISTICS \((T_C = 25^\circ C\) unless otherwise noted\) (continued)

**Figure 7. Capacitance Stored Energy**

![Normalized Effective Transient Thermal Resistance](image)

**Figure 8. Junction–to–Case Transient Thermal Response Curve**

\[
E_C = \text{CAPACITIVE ENERGY (\(\mu\)J)}
\]

\[
V_R, \text{ REVERSE VOLTAGE (V)}
\]

**Figure 9. Unclamped Inductive Switching Test Circuit & Waveform**

**TEST CIRCUIT AND WAVEFORMS**

\(L = 0.5 \text{ mH}\)
\(R < 0.1 \Omega\)
\(V_{DD} = 50 V\)
\(E_{AVL} = 1/2LI^2 [VR(AVL)] / (VR(AVL) - V_{DD})\)
\(Q1 = IGBT (BV_{CES} > DUT VR(AVL))\)
D²PAK-3 (TO-263, 3-LEAD)
CASE 418AJ
ISSUE F

DATE 11 MAR 2021

NOTES:
1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 2009
2. CONTROLLING DIMENSION INCHES
3. CHAMFER OPTIONAL.
4. DIMENSIONS A AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTER MOLD OF THE PLASTIC BODY AT DATUM M.
5. THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1, I1, AND E1.
6. OPTIONAL MOLD FEATURE.
7. ( ) OPTIONAL CONSTRUCTION FEATURE CALL OUTS.

IC

Standard

Rectifier

SSG

XXXXXX = Specific Device Code
A = Assembly Location
WL = Wafer Lot
Y = Year
WW = Work Week
W = Week Code (SSG)
M = Month Code (SSG)
Pb = Pb-Free Package
AKA = Polarity Indicator

*This information is generic. Please refer to device data sheet for actual part marking. Pb-Free indicator, "G" or microdot "*", may or may not be present. Some products may not follow the Generic Marking.

<table>
<thead>
<tr>
<th>DEVICE MARKING</th>
<th>IC</th>
<th>Standard</th>
<th>Rectifier</th>
<th>SSG</th>
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<tr>
<td>XXXXXXX</td>
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<td>XXXXXXXG</td>
<td>XXXXXXXXG</td>
<td></td>
</tr>
<tr>
<td>AWLYWWG</td>
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<td>XXXXXXXG</td>
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<td></td>
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DOCUMENT NUMBER: 98AON56370E
DESCRIPTION: D²PAK-3 (TO-263, 3-LEAD)

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