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>T_C = 25°C, 10 µs</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T_C = 150°C, 10 µs</td>
<td>554</td>
</tr>
<tr>
<td>I_{F, SM}</td>
<td>Non-Repetitive Forward Surge Current, T_C = 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>T_C = 25°C</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td></td>
<td>T_C = 150°C</td>
<td>12.5</td>
</tr>
<tr>
<td>T_J, T_{STG}</td>
<td>Operating and Storage Temperature Range</td>
<td>-55 to +175°C</td>
<td></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 \( T_J = 25°C \), \( L = 0.5 \) 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.
## 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 (TC = 25°C 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>$I_F = 10\ A,\ T_C = 25\ ^\circ\ C$</td>
<td>–</td>
<td>1.38</td>
<td>1.75</td>
<td>V</td>
</tr>
<tr>
<td>$I_R$</td>
<td>Reverse Current</td>
<td>$V_R = 650\ V,\ T_C = 25\ ^\circ\ C$</td>
<td>–</td>
<td>0.5</td>
<td>40</td>
<td>μA</td>
</tr>
<tr>
<td>$Q_C$</td>
<td>Total Capacitive Charge</td>
<td>$V = 400\ V$</td>
<td>–</td>
<td>25</td>
<td>–</td>
<td>nC</td>
</tr>
<tr>
<td>$C$</td>
<td>Total Capacitance</td>
<td>$V_R = 1\ V,\ f = 100\ kHz$</td>
<td>–</td>
<td>421</td>
<td>–</td>
<td>pF</td>
</tr>
</tbody>
</table>

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>
</tr>
</thead>
<tbody>
<tr>
<td>FFSB2065BDN-F085</td>
<td>FFSB2065BDN</td>
<td>D2PAK</td>
<td>800 Units/ Tape &amp; Reel</td>
</tr>
</tbody>
</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.
FFSB2065BDN–F085

TYPICAL CHARACTERISTICS (T_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

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**TYPICAL CHARACTERISTICS** \( \text{TC} = 25^\circ\text{C} \) unless otherwise noted) (continued)

![Graph of Capacitance Stored Energy](image)

**Figure 7. Capacitance Stored Energy**

![Graph of Junction−to−Case Transient Thermal Response Curve](image)

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

**TEST CIRCUIT AND WAVEFORMS**

\[ L = 0.5 \text{ mH} \]
\[ R < 0.1 \text{ }\Omega \]
\[ V_{DD} = 50 \text{ V} \]
\[ E_{AVL} = \frac{1}{2}LI_2 \left( \frac{V_{R(AVL)}}{V_{R(AVL)} - V_{DD}} \right) \]
\[ Q1 = \text{IGBT (BV}_{CES} > \text{DUT } V_{R(AVL)}) \]

![Test Circuit and Waveform](image)

**Figure 9. Unclamped Inductive Switching Test Circuit & Waveform**
**MECHANICAL CASE OUTLINE**

**PACKAGE DIMENSIONS**

**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 D AND E 3D NOT INCLUDE MOLD FLASH.

MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE.

THESE DIMENSIONS ARE MEASURED AT THE OUTER MOST EXTREMES OF THE PLASTIC BODY AT DATUM H.

5. THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, L3, AND I1.

6. OPTIONAL MOLD FEATURE.

7. **X**, **O**, OPTIONAL CONSTRUCTION FEATURE CALL OUTS.

**SCALE 1:1**

**RECOMMENDED MOUNTING FOOTPRINT**


**INCHES** | **MILLIMETERS**
--- | ---
A | 0.168 | 0.426 | 4.26 | 4.83
A1 | 0.080 | 0.090 | 2.00 | 2.29
b | 0.020 | 0.020 | 0.51 | 0.99
C | 0.020 | 0.020 | 0.51 | 0.99
C2 | 0.045 | 0.063 | 1.14 | 1.65
E1 | 0.230 | 0.380 | 5.38 | 9.65
E2 | 0.250 | 0.400 | 6.40 | 10.17
E3 | 0.380 | 0.450 | 9.65 | 10.67
E4 | 0.245 | 0.625 | 6.25 | 16.0
f | 0.150 | 0.380 | 0.54 | 1.97
G | 0.375 | 0.825 | 9.46 | 20.48
H | 0.070 | 0.100 | 1.19 | 2.54
L1 | 0.066 | 0.168
L2 | 0.070 | 0.178
L3 | 0.060 | 0.152 | 0.25 | 0.64
M | 0° | 0° | 0° | 0°

**DETAIL C**

TIP LEADFORM

ROTATED 90° CW

**NOTEPAD:**

*Generic Marking Diagrams*

**IC**

XXXXXXX = Specific Device Code

A = Assembly Location

WL = Wafer Lot

Y = Year

WW = Work Week

W = Week Code (SSG)

M = Month Code (SSG)

G = 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.

**DOCUMENT NUMBER:** 98AON56370E

**DESCRIPTION:** D²PAK-3 (TO-263, 3-LEAD)

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