Silicon Carbide (SiC) Schottky Diode – EliteSiC, 20 A, 650 V, D1, TO-247-2L

FFSH2065A

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 95 mJ
- High Surge Current Capacity
- Positive Temperature Coefficient
- Ease of Paralleling
- No Reverse Recovery / No Forward Recovery
- This Device is Pb-Free and is RoHS Compliant

Applications
- General Purpose
- SMPS, Solar Inverter, UPS
- Power Switching Circuits

<table>
<thead>
<tr>
<th>VRRM</th>
<th>IF</th>
</tr>
</thead>
<tbody>
<tr>
<td>650 V</td>
<td>20 A</td>
</tr>
</tbody>
</table>

MARKING DIAGRAM

AYWWZZ
FFSH
2065A

A = Assembly Plant Code
YWW = Date Code (Year & Week)
ZZ = Lot Traceability Code
FFSH2065A = Specific Device Code

ORDERING INFORMATION
See detailed ordering and shipping information on page 2 of this data sheet.
ABSOLUTE MAXIMUM RATINGS \( (T_C = 25^\circ C, \text{ Unless otherwise specified}) \)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>FFSH2065A</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>95</td>
<td>mJ</td>
</tr>
<tr>
<td>( I_F )</td>
<td>Continuous Rectified Forward Current @ ( T_C &lt; 146^\circ C )</td>
<td>20</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>25</td>
<td></td>
</tr>
<tr>
<td>( I_{F,\text{Max}} )</td>
<td>Non–Repetitive Peak Forward Surge Current ( T_C = 25^\circ C, 10 \mu s )</td>
<td>1100</td>
<td>A</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_C = 150^\circ C, 10 \mu s )</td>
<td>1000</td>
</tr>
<tr>
<td>( I_{F,\text{SM}} )</td>
<td>Non–Repetitive Forward Surge Current Half–Sine Pulse, ( t_p = 8.3 \text{ ms} )</td>
<td>105</td>
<td>A</td>
</tr>
<tr>
<td>( I_{F,\text{RM}} )</td>
<td>Repetitive Forward Surge Current Half–Sine Pulse, ( t_p = 8.3 \text{ ms} )</td>
<td>58</td>
<td>A</td>
</tr>
<tr>
<td>( P_{\text{tot}} )</td>
<td>Power Dissipation ( T_C = 25^\circ C )</td>
<td>183</td>
<td>W</td>
</tr>
<tr>
<td></td>
<td></td>
<td>( T_C = 150^\circ C )</td>
<td>31</td>
</tr>
<tr>
<td>( T_J, T_{\text{STG}} )</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 95 mJ is based on starting \( T_J = 25^\circ C, L = 0.5 \text{ mH}, I_{AS} = 19.5 \text{ A}, V = 50 \text{ V} \).

THERMAL CHARACTERISTICS

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Rating</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>( R_{JUC} )</td>
<td>Thermal Resistance, Junction to Case, Max.</td>
<td>0.82</td>
<td>°C/W</td>
</tr>
</tbody>
</table>

ELECTRICAL CHARACTERISTICS \( (T_C = 25^\circ C \text{ unless otherwise noted}) \)

<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 ( I_F = 20 \text{ A}, T_C = 25^\circ C )</td>
<td>–</td>
<td>1.50</td>
<td>1.75</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_F = 20 \text{ A}, T_C = 125^\circ C )</td>
<td>–</td>
<td>1.6</td>
<td>2.0</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( I_F = 20 \text{ A}, T_C = 175^\circ C )</td>
<td>–</td>
<td>1.72</td>
<td>2.4</td>
<td></td>
</tr>
<tr>
<td>( I_R )</td>
<td>Reverse Current ( V_R = 650 \text{ V}, T_C = 25^\circ C )</td>
<td>–</td>
<td>–</td>
<td>200</td>
<td>μA</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_R = 650 \text{ V}, T_C = 125^\circ C )</td>
<td>–</td>
<td>–</td>
<td>400</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_R = 650 \text{ V}, T_C = 175^\circ C )</td>
<td>–</td>
<td>–</td>
<td>600</td>
<td></td>
</tr>
<tr>
<td>( Q_C )</td>
<td>Total Capacitive Charge ( V = 400 \text{ V} )</td>
<td>–</td>
<td>64</td>
<td>–</td>
<td>nC</td>
<td></td>
</tr>
<tr>
<td>( C )</td>
<td>Total Capacitance ( V_R = 1 \text{ V}, f = 100 \text{ kHz} )</td>
<td>–</td>
<td>1085</td>
<td>–</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>( V_R = 200 \text{ V}, f = 100 \text{ kHz} )</td>
<td>–</td>
<td>117</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>88</td>
<td>–</td>
<td></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 Marking</th>
<th>Package</th>
<th>Shipping</th>
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<tbody>
<tr>
<td>FFSH2065A</td>
<td>FFSH2065A</td>
<td>TO–247–2LD</td>
<td>30 Units / Tube</td>
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TYPICAL CHARACTERISTICS
(TJ = 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 (CONTINUED)

(T_J = 25°C UNLESS OTHERWISE NOTED)

Figure 7. Capacitance Stored Energy

![Graph showing capacitance stored energy vs. rectangular pulse duration.

Figure 8. Junction-to-Case Transient Thermal Response Curve

![Graph showing junction-to-case transient thermal response curve.

Notes:
- \( Z_{JC}(t) = r(t) \times R_{JC} \)
- \( R_{JC} = 0.82^\circ C/W \)
- Peak \( T_J = P_{DM} \times Z_{JC}(t) + T_C \)
- Duty Cycle, \( D = t_1 / t_2 \)
L = 0.5 mH
R < 0.1 Ω
VDD = 50 V
EAVL = 1/2LI2 \( \frac{VR(AVL)}{VR(AVL) - VDD} \)
Q1 = IGBT (BV_{CES} > DUT VR(AVL))

Figure 9. Unclamped Inductive Switching Test Circuit & Waveform
### GENERIC MARKING DIAGRAM*

<table>
<thead>
<tr>
<th>XXXX = Specific Device Code</th>
<th>A = Assembly Location</th>
<th>Y = Year</th>
<th>WW = Work Week</th>
<th>ZZ = Assembly Lot Code</th>
</tr>
</thead>
</table>

**NOTES: UNLESS OTHERWISE SPECIFIED.**

A. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
B. ALL DIMENSIONS ARE IN MILLIMETERS.
C. DRAWING CONFORMS TO ASME Y14.5 - 2009.
D. DIMENSION A1 TO BE MEASURED IN THE REGION DEFINED BY L1.
E. LEAD FINISH IS UNCONTROLLED IN THE REGION DEFINED BY L1.

#### TO-247-2LD

**CASE 340CL**

**ISSUE A**

<table>
<thead>
<tr>
<th>DIM</th>
<th>MILLIMETERS</th>
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</thead>
<tbody>
<tr>
<td>MIN</td>
<td>NOM</td>
</tr>
<tr>
<td>A</td>
<td>4.58</td>
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<td>A1</td>
<td>2.29</td>
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<td>A2</td>
<td>1.30</td>
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<td>b</td>
<td>1.17</td>
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<td>b2</td>
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<tr>
<td>c</td>
<td>0.51</td>
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<tr>
<td>D</td>
<td>20.32</td>
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<tr>
<td>D1</td>
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<tr>
<td>D2</td>
<td>0.51</td>
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<td>E</td>
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<td>E1</td>
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<tr>
<td>e</td>
<td>~</td>
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<tr>
<td>L</td>
<td>15.75</td>
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<td>L1</td>
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<tr>
<td>ØP1</td>
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</tr>
<tr>
<td>Q</td>
<td>5.34</td>
</tr>
<tr>
<td>S</td>
<td>5.34</td>
</tr>
</tbody>
</table>

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