

# Silicon Carbide (SiC) Schottky Diode – EliteSiC, 20 A, 650 V, D2, TO-220-2L

## FFSP2065B

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 and cost.

### Features

- Max Junction Temperature 175°C
- Avalanche Rated 94 mJ
- High Surge Current Capacity
- Positive Temperature Coefficient
- Ease of Paralleling
- No Reverse Recovery / No Forward Recovery
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- General Purpose
- SMPS, Solar Inverter, UPS
- Power Switching Circuit

### ABSOLUTE MAXIMUM RATINGS

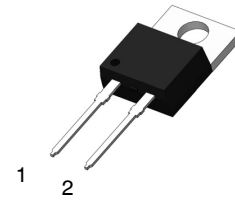
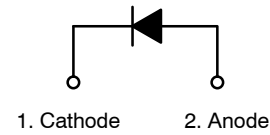
(T<sub>C</sub> = 25°C, Unless otherwise specified)

| Symbol                               | Parameter  | Value                                       | Unit |   |
|--------------------------------------|--|---|------|---|
| V <sub>RRM</sub>                     | Peak Repetitive Reverse Voltage                                  | 650   | V    |   |
| E <sub>AS</sub>                      | Single Pulse Avalanche Energy (Note 1)                           | 94  | mJ   |   |
| I <sub>F</sub>                       | Continuous Rectified Forward Current @<br>T <sub>C</sub> < 141°C | 20  | A    |   |
|                                      | Continuous Rectified Forward Current @<br>T <sub>C</sub> < 135°C | 22.5  |      |   |
| I <sub>F, Max</sub>                  | Non-Repetitive Peak<br>Forward Surge Current                     | T <sub>C</sub> = 25°C, 10 μs                | 882  | A |
|                                      |  | T <sub>C</sub> = 150°C, 10 μs               | 798  |   |
| I <sub>F, SM</sub>                   | Non-Repetitive<br>Forward Surge Current                          | Half-Sine Pulse,<br>t <sub>p</sub> = 8.3 ms | 84   | A |
| P <sub>tot</sub>                     | Power Dissipation  | T <sub>C</sub> = 25°C                       | 150  | W |
|                                      |  | T <sub>C</sub> = 150°C                      | 25   |   |
| T <sub>J</sub> ,<br>T <sub>STG</sub> | Operating and Storage Temperature Range                          | -55 to<br>+175                              | °C   |   |

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.

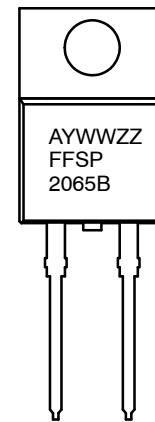
1. E<sub>AS</sub> of 94 mJ is based on starting T<sub>J</sub> = 25°C, L = 0.5 mH, I<sub>AS</sub> = 19.4 A, V = 50 V.

### ELECTRICAL CONNECTION



TO-220-2LD  
CASE 340BB

### MARKING DIAGRAM



A = Assembly Plant Code  
YWW = Date Code (Year & Week)  
ZZ = Assembly Lot Code  
FFSP2065B = Specific Device Code

### ORDERING INFORMATION

See detailed ordering and shipping information in the package dimensions section on page 2 of this data sheet.

# FFSP2065B

## THERMAL CHARACTERISTICS

| Symbol          | Parameter                                  | Ratings | Unit                        |
|-----------------|--|---------|-----------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max. | 1.0     | $^{\circ}\text{C}/\text{W}$ |

## ELECTRICAL CHARACTERISTICS $T_C = 25^{\circ}\text{C}$ unless otherwise noted

| Symbol | Parameter               | Test Conditions                                  | Min. | Typ. | Max. | Unit          |
|--------|-------------------------|--|------|------|------|---------------|
| $V_F$  | Forward Voltage         | $I_F = 20 \text{ A}, T_C = 25^{\circ}\text{C}$   | -    | 1.38 | 1.7  | V             |
|        |                         | $I_F = 20 \text{ A}, T_C = 125^{\circ}\text{C}$  | -    | 1.6  | 2.0  |               |
|        |                         | $I_F = 20 \text{ A}, T_C = 175^{\circ}\text{C}$  | -    | 1.72 | 2.4  |               |
| $I_R$  | Reverse Current         | $V_R = 650 \text{ V}, T_C = 25^{\circ}\text{C}$  | -    | 0.5  | 40   | $\mu\text{A}$ |
|        |                         | $V_R = 650 \text{ V}, T_C = 125^{\circ}\text{C}$ | -    | 1    | 80   |               |
|        |                         | $V_R = 650 \text{ V}, T_C = 175^{\circ}\text{C}$ | -    | 2    | 160  |               |
| $Q_C$  | Total Capacitive Charge | $V = 400 \text{ V}$                              | -    | 51   | -    | nC            |
| C      | Total Capacitance       | $V_R = 1 \text{ V}, f = 100 \text{ kHz}$         | -    | 866  | -    | pF            |
|        |                         | $V_R = 200 \text{ V}, f = 100 \text{ kHz}$       | -    | 80   | -    |               |
|        |                         | $V_R = 400 \text{ V}, f = 100 \text{ kHz}$       | -    | 70   | -    |               |

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

| Part Number | Top Mark  | Package                | Packing Method | Quantity |
|-------------|-----------|------------------------|----------------|----------|
| FFSP2065B   | FFSP2065B | TO-220-2L<br>(Pb-Free) | Tube           | 50 Units |

TYPICAL CHARACTERISTICS  $T_J = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED

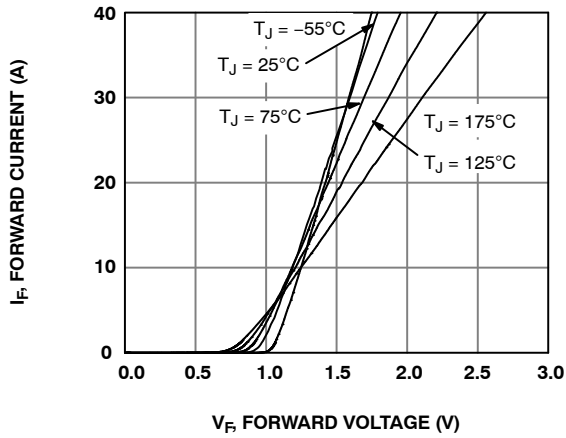


Figure 1. Forward Characteristics

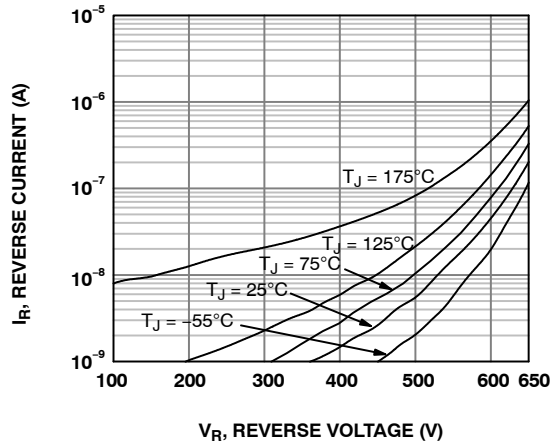


Figure 2. Reverse Characteristics

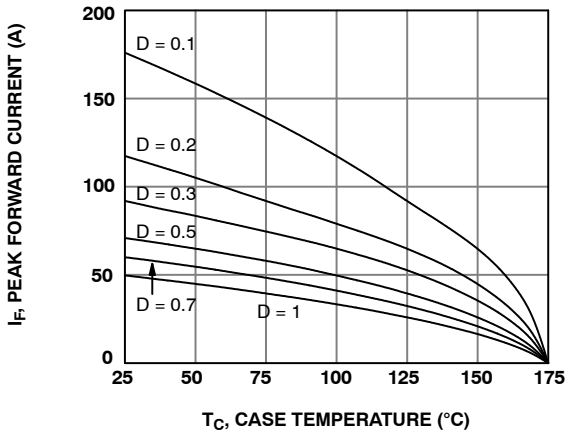


Figure 3. Current Derating

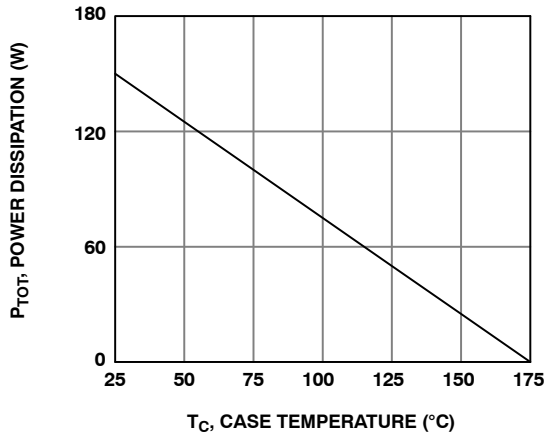


Figure 4. Power Dissipation

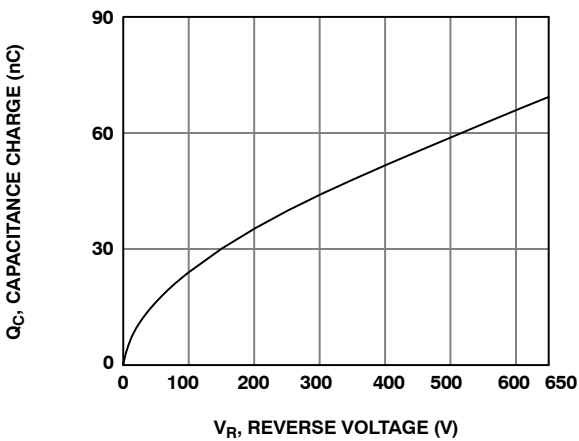


Figure 5. Capacitance Charge vs. Reverse Voltage

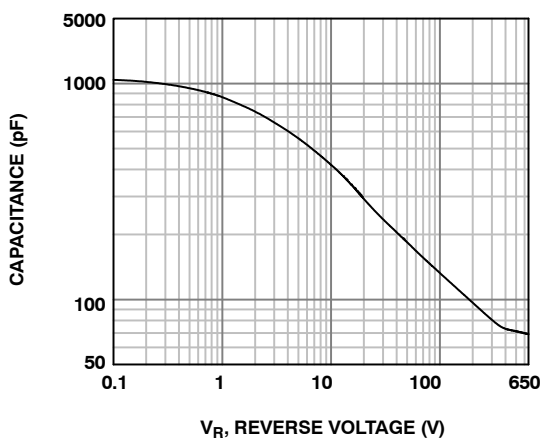


Figure 6. Capacitance vs. Reverse Voltage

TYPICAL CHARACTERISTICS  $T_J = 25^\circ\text{C}$  UNLESS OTHERWISE NOTED (CONTINUED)

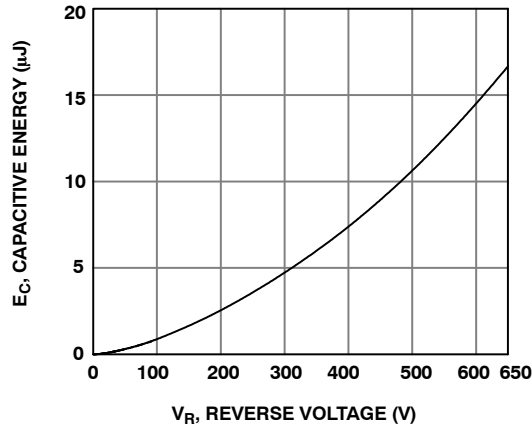


Figure 7. Capacitance Stored Energy

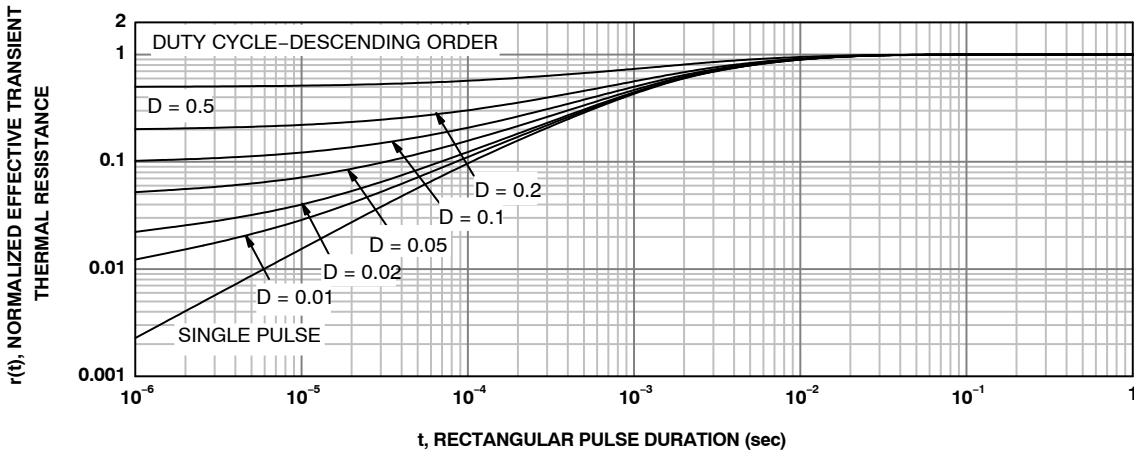


Figure 8. Junction-to-Case Transient Thermal Response Curve

TEST CIRCUIT AND WAVEFORMS

$L = 0.5 \text{ mH}$   
 $R < 0.1 \Omega$   
 $V_{DD} = 50 \text{ V}$   
 $E_{AVL} = 1/2LI^2 [V_{R(AVL)} / (V_{R(AVL)} - V_{DD})]$   
 $Q1 = \text{IGBT (} BV_{CES} > \text{DUT } V_{R(AVL)} \text{)}$

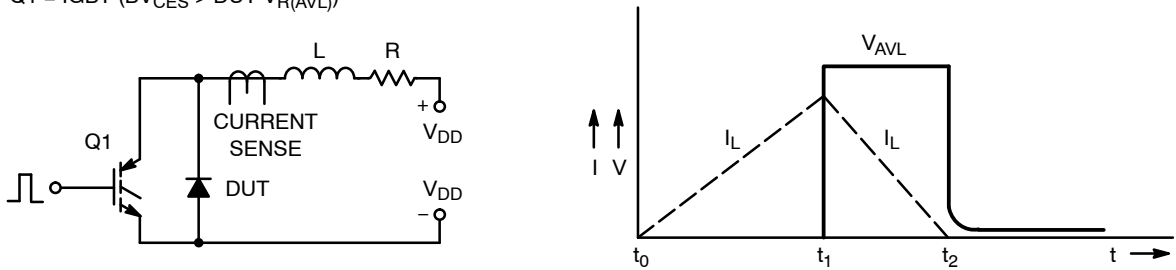


Figure 9. Unclamped Inductive Switching Test Circuit & Waveform



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