

# Silicon Carbide Schottky Diode

650 V, 20 A

## FFSB2065B-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 94 mJ
- High Surge Current Capacity
- Positive Temperature Coefficient
- Ease of Paralleling
- No Reverse Recovery/No Forward Recovery
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

- Automotive HEV-EV Onboard Chargers
- Automotive HEV-EV DC-DC Converters

### ABSOLUTE MAXIMUM RATINGS ( $T_C = 25^\circ\text{C}$ unless otherwise noted)

| 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> < 142°C |                                             | 20          | A    |
|                                      | Continuous Rectified Forward Current<br>@ T <sub>C</sub> < 135°C |                                             | 22.8        |      |
| I <sub>F, Max</sub>                  | Non-Repetitive Peak 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 Forward Surge Current T <sub>C</sub> = 25°C       | 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                       | 153         | W    |
|                                      |                                                                  | T <sub>C</sub> = 150°C                      | 25.5        |      |
| T <sub>J</sub> ,<br>T <sub>STG</sub> | Operating Junction and Storage Temperature Range                 |                                             | -55 to +175 | °C   |

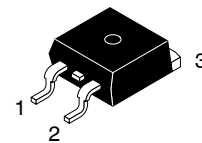
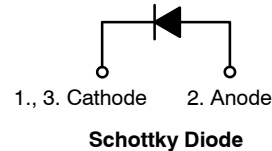
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1.  $E_{AS}$  of 94 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.5 \text{ mH}$ ,  $I_{AS} = 19.4 \text{ A}$ ,  $V = 50 \text{ V}$ .



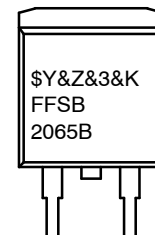
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D<sup>2</sup>PAK2 (TO-263-2L)  
CASE 418BK

### MARKING DIAGRAM



|           |                         |
|-----------|-------------------------|
| \$Y       | = ON Semiconductor Logo |
| &Z        | = Assembly Plant Code   |
| &3        | = Numeric Date Code     |
| &K        | = Lot Code              |
| FFSB2065B | = Specific Device Code  |

### ORDERING INFORMATION

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

# FFSB2065B-F085

## THERMAL CHARACTERISTICS

| Symbol          | Parameter                                 | Ratings | Unit                        |
|-----------------|-------------------------------------------|---------|-----------------------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max | 0.98    | $^{\circ}\text{C}/\text{W}$ |

## 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            |
| $C_{\text{tot}}$ | Total Capacitance       | $V_R = 1\text{ V}, f = 100\text{ kHz}$          | –    | 866  | –    | pF            |
|                  |                         | $V_R = 300\text{ V}, f = 100\text{ kHz}$        | –    | 80   | –    |               |
|                  |                         | $V_R = 600\text{ V}, f = 100\text{ kHz}$        | –    | 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.

## ORDERING INFORMATION

| Part Number    | Top Marking | Package              | Shipping <sup>†</sup> |
|----------------|-------------|----------------------|-----------------------|
| FFSB2065B-F085 | FFSB2065B   | D <sup>2</sup> PAK-3 | 800/Tape & Reel       |

<sup>†</sup>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 ( $T_J = 25^\circ\text{C}$  unless otherwise noted)

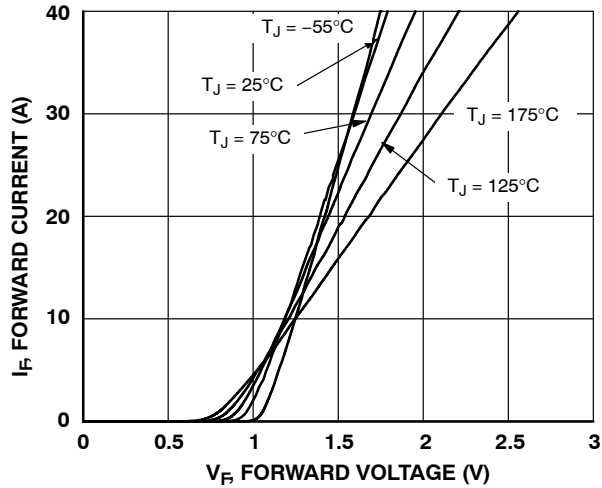


Figure 1. Forward Characteristics

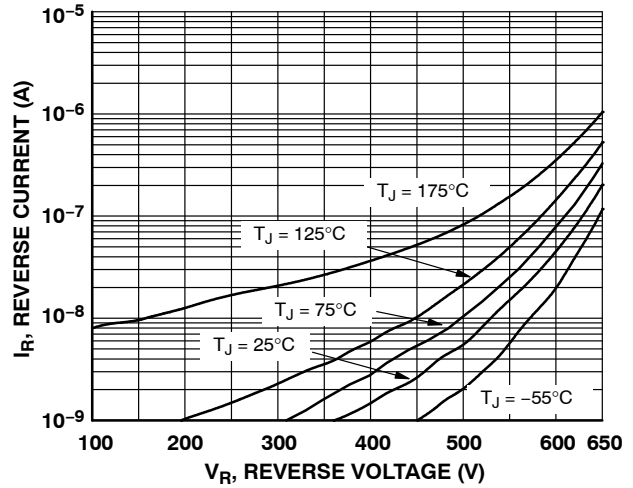


Figure 2. Reverse Characteristics

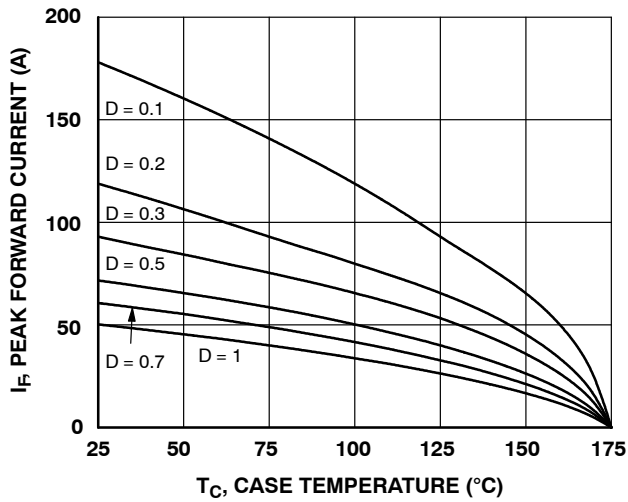


Figure 3. Current Derating

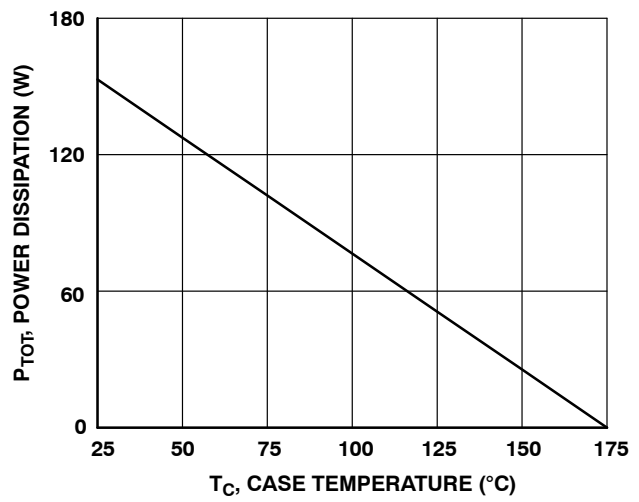


Figure 4. Power Derating

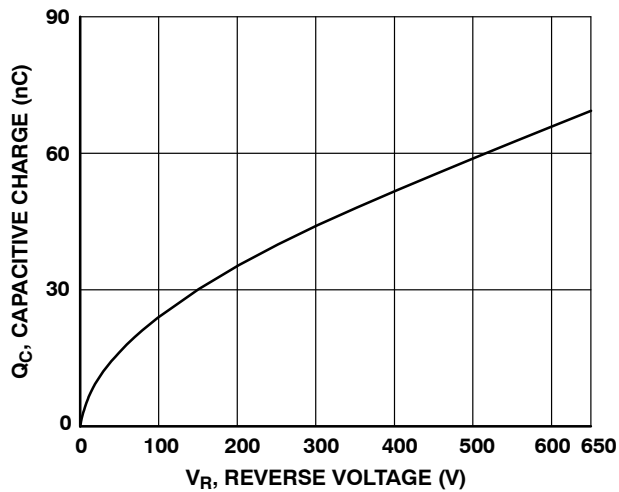


Figure 5. Capacitive Charge vs. Reverse Voltage

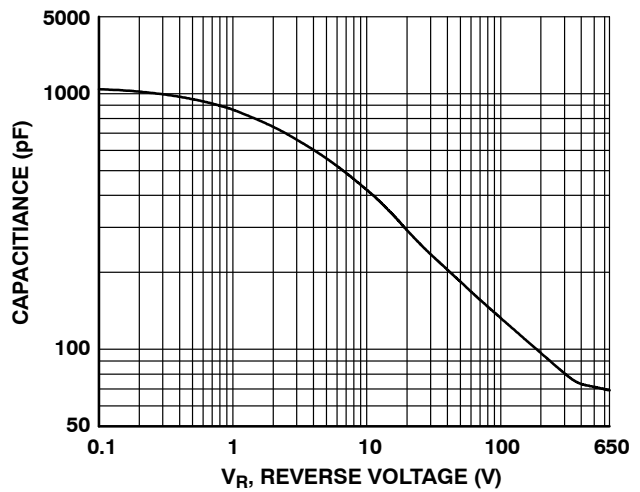


Figure 6. Capacitance vs. Reverse Voltage

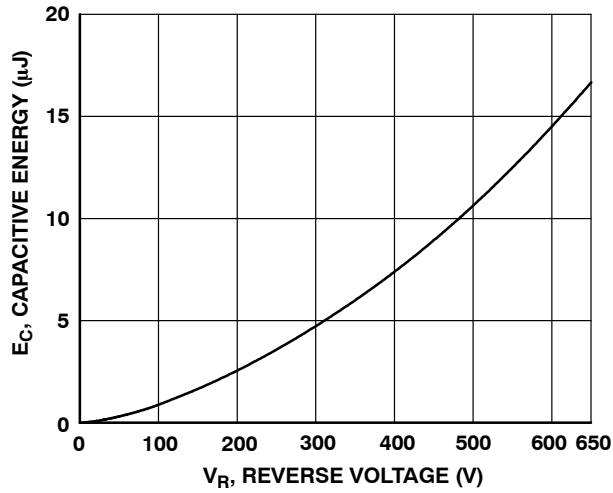
TYPICAL CHARACTERISTICS ( $T_J = 25^\circ\text{C}$  unless otherwise noted) (continued)

Figure 7. Capacitance Stored Energy

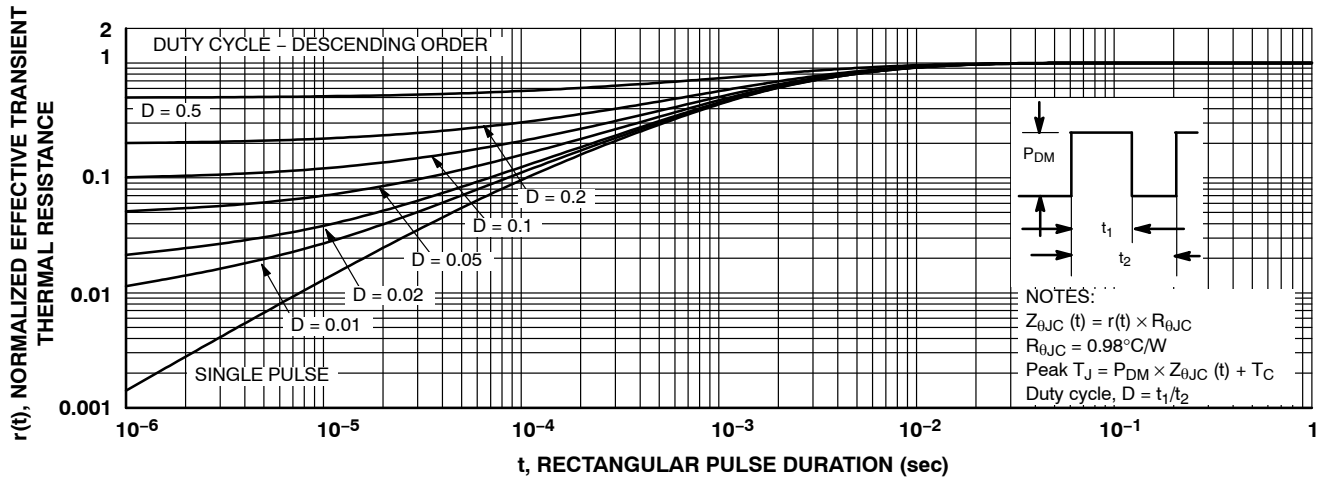


Figure 8. Junction-to-Case Transient Thermal Response Curve

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

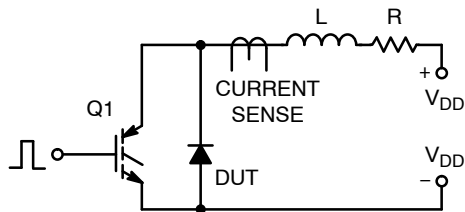
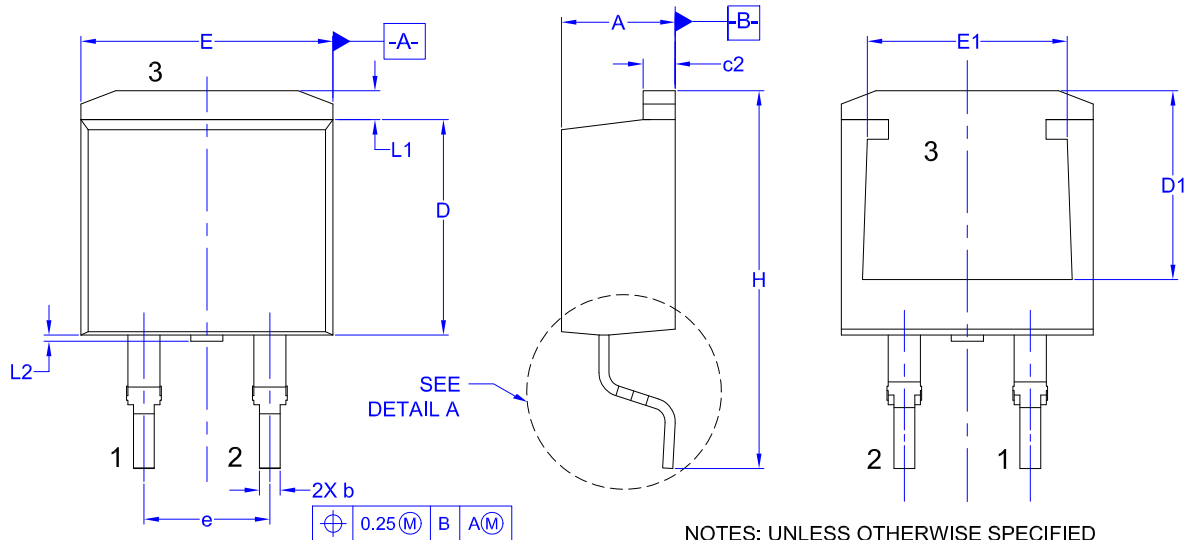


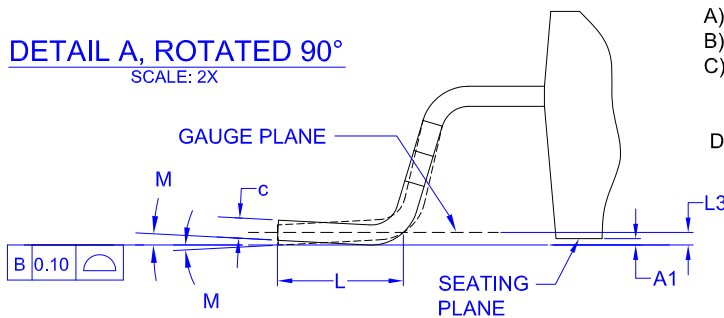
Figure 9. Unclamped Inductive Switching Test Circuit &amp; Waveform

### D<sup>2</sup>PAK2 (TO-263-2L) CASE 418BK ISSUE O

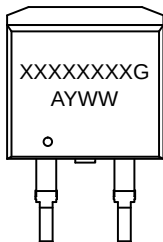
DATE 02 AUG 2018



**DETAIL A, ROTATED 90°**  
SCALE: 2X

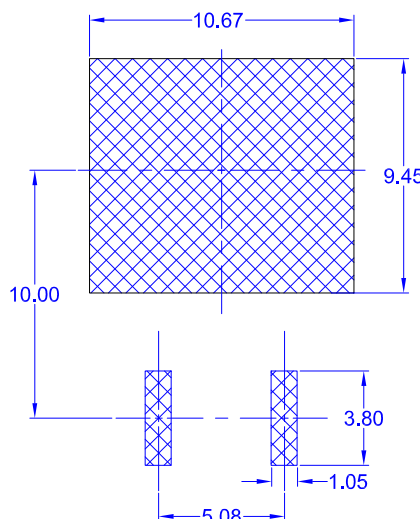


#### GENERIC MARKING DIAGRAM\*



XXX = Specific Device Code  
A = Assembly Location  
Y = Year  
WW = Work Week  
G = Pb-Free Package

\*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.



**LAND PATTERN RECOMMENDATION**  
UNLESS NOTED, ALL DIMS TYPICAL

#### NOTES: UNLESS OTHERWISE SPECIFIED

- A) ALL DIMENSIONS ARE IN MILLIMETERS.
- B) REFERENCE JEDEC, TO-263, VARIATION AB.
- C) DIMENSIONING AND TOLERANCING PER ASME Y14.5 - 2009.
- D) LANDPATTERN RECOMMENDATION PER IPC TO254P1524X482-3N

| DIM | MILLIMETERS |       |       |
|-----|-------------|-------|-------|
|     | MIN         | NOM   | MAX   |
| A   | 4.06        | 4.57  | 4.83  |
| A1  | 0.00        | 0.10  | 0.25  |
| b   | 0.51        | 0.81  | 0.99  |
| c   | 0.30        | 0.407 | 0.74  |
| c2  | 1.14        | 1.30  | 1.65  |
| D   | 8.38        | 8.69  | 9.65  |
| D1  | 7.30        | 7.80  | 8.30  |
| E   | 9.65        | 10.16 | 10.67 |
| E1  | 8.00        | 8.62  | 9.00  |
| e   | 5.08 BSC    |       |       |
| H   | 14.60       | 15.35 | 15.88 |
| L   | 1.78        | 2.54  | 2.79  |
| L1  | 0.90        | 1.29  | 1.68  |
| L2  | 0.00        | 0.15  | 0.25  |
| L3  | 0.25 BSC    |       |       |
| M   | 0°          | 4°    | 8°    |

|                         |                                      |                                                                                                                                                                                     |
|-------------------------|--------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
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| <b>DESCRIPTION:</b>     | <b>D<sup>2</sup>PAK2 (TO-263-2L)</b> | <b>PAGE 1 OF 1</b>                                                                                                                                                                  |

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