

# FFSB2065BDN-F085

## Silicon Carbide Schottky Diode

**650 V, 20 A**

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

| Symbol         | Parameter   | Ratings                                   | Unit             |
|----------------|---|---|------------------|
| $V_{RRM}$      | Peak Repetitive Reverse Voltage                                 | 650                                       | V                |
| $E_{AS}$       | Single Pulse Avalanche Energy (Note 1)                          | 49  | mJ               |
| $I_F$          | Continuous Rectified Forward Current                            | @ $T_C < 25^\circ\text{C}$                | 23.6             |
|                |   | @ $T_C < 140^\circ\text{C}$               | 10               |
| $I_{F, Max}$   | Non-Repertitive Peak Forward Surge Current                      | $T_C = 25^\circ\text{C}, 10 \mu\text{s}$  | 600              |
|                |   | $T_C = 150^\circ\text{C}, 10 \mu\text{s}$ | 554              |
| $I_{F, SM}$    | Non-Repertitive Forward Surge Current, $T_C = 25^\circ\text{C}$ | Half-Sine Pulse, $t_p = 8.3 \text{ ms}$   | 45               |
| $P_{tot}$      | Power Dissipation   | $T_C = 25^\circ\text{C}$                  | 75               |
|                |   | $T_C = 150^\circ\text{C}$                 | 12.5             |
| $T_J, T_{STG}$ | Operating and Storage Temperature Range                         | -55 to +175                               | $^\circ\text{C}$ |

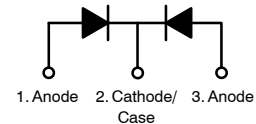
Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

1.  $E_{AS}$  of 49 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.5 \text{ mH}$ ,  $I_{AS} = 14 \text{ A}$ ,  $V = 50 \text{ V}$ .

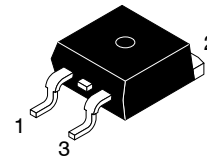


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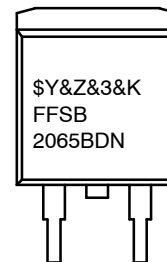


**Schottky Diode**



**D<sup>2</sup>PAK-3 (TO-263, 3-LEAD)  
CASE 418AJ**

### MARKING DIAGRAM



$\$Y$  = ON Semiconductor Logo  
 $\&Z$  = Assembly Plant Code  
 $\&3$  = Numeric Date Code  
 $\&K$  = Lot Code  
 FFSB2065BDN = Specific Device Code

### ORDERING INFORMATION

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

# FFSB2065BDN-F085

## THERMAL CHARACTERISTICS

| Symbol          | Parameter                                 | Ratings | Unit          |
|-----------------|---|---------|---------------|
| $R_{\theta JC}$ | Thermal Resistance, Junction to Case, Max | 2.0     | $^{\circ}C/W$ |

## ELECTRICAL CHARACTERISTICS ( $T_C = 25^{\circ}C$ unless otherwise noted – per leg)

| Symbol | Parameter               | Test Conditions                          | Min | Typ. | Max. | Unit    |
|--------|-------------------------|--|-----|------|------|---------|
| $V_F$  | Forward Voltage         | $I_F = 10\text{ A}, T_C = 25^{\circ}C$   | –   | 1.38 | 1.75 | V       |
|        |                         | $I_F = 10\text{ A}, T_C = 125^{\circ}C$  | –   | 1.6  | 2.0  |         |
|        |                         | $I_F = 10\text{ A}, T_C = 175^{\circ}C$  | –   | 1.72 | 2.4  |         |
| $I_R$  | Reverse Current         | $V_R = 650\text{ V}, T_C = 25^{\circ}C$  | –   | 0.5  | 40   | $\mu A$ |
|        |                         | $V_R = 650\text{ V}, T_C = 125^{\circ}C$ | –   | 1    | 80   |         |
|        |                         | $V_R = 650\text{ V}, T_C = 175^{\circ}C$ | –   | 2    | 160  |         |
| $Q_C$  | Total Capacitive Charge | $V = 400\text{ V}$                       | –   | 25   | –    | nC      |
| C      | Total Capacitance       | $V_R = 1\text{ V}, f = 100\text{ kHz}$   | –   | 421  | –    | pF      |
|        |                         | $V_R = 200\text{ V}, f = 100\text{ kHz}$ | –   | 46   | –    |         |
|        |                         | $V_R = 400\text{ V}, f = 100\text{ kHz}$ | –   | 35   | –    |         |

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 | Shipping <sup>†</sup>     |
|------------------|-------------|---------|---------------------------|
| FFSB2065BDN-F085 | FFSB2065BDN | D2PAK   | 800 Units/<br>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)

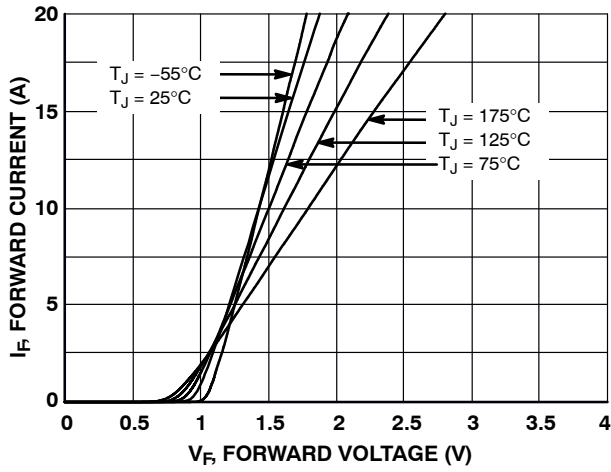


Figure 1. Forward Characteristics

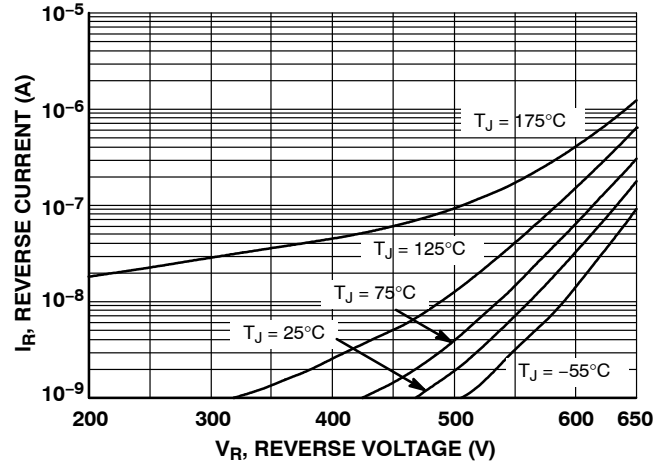


Figure 2. Reverse Characteristics

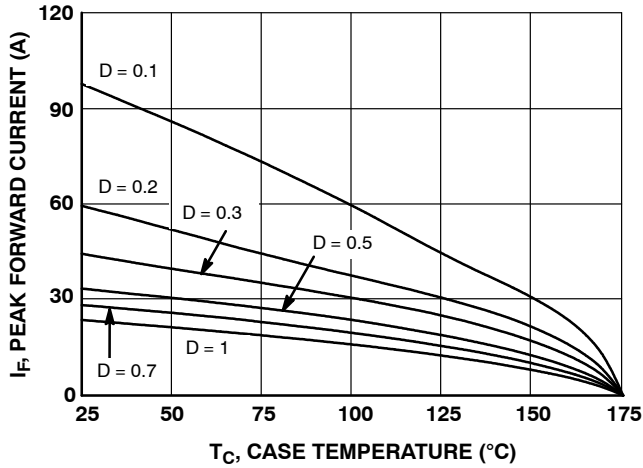


Figure 3. Current Derating

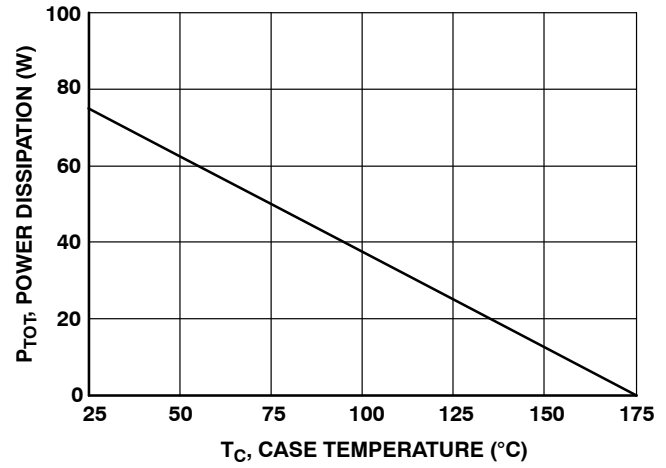


Figure 4. Power Derating

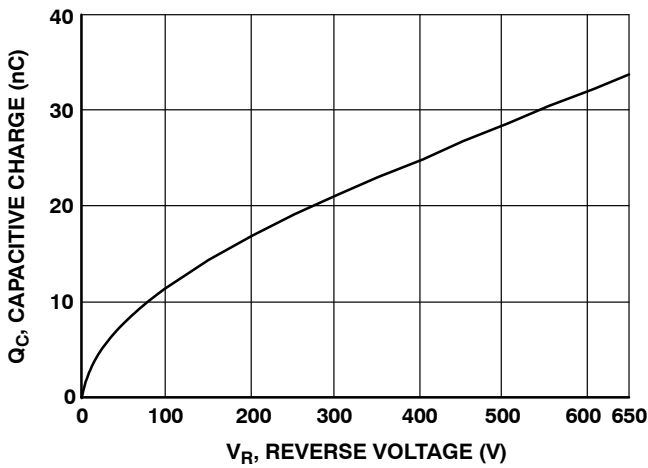


Figure 5. Capacitive Charge vs. Reverse Voltage

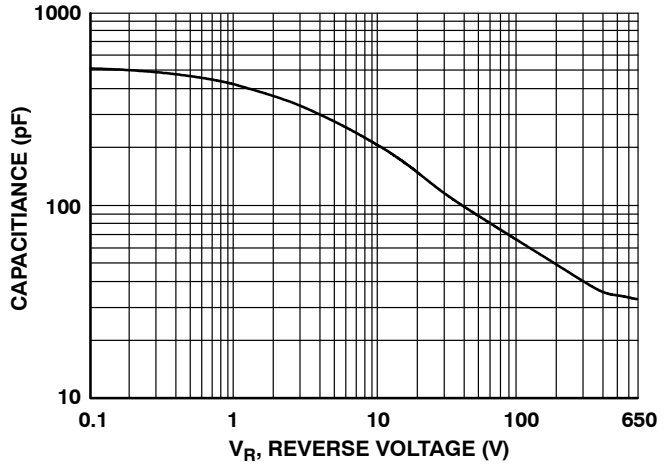


Figure 6. Capacitance vs. Reverse Voltage

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

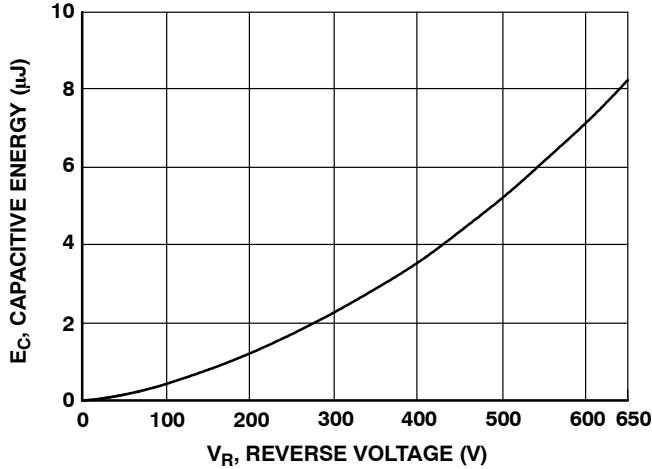


Figure 7. Capacitance Stored Energy

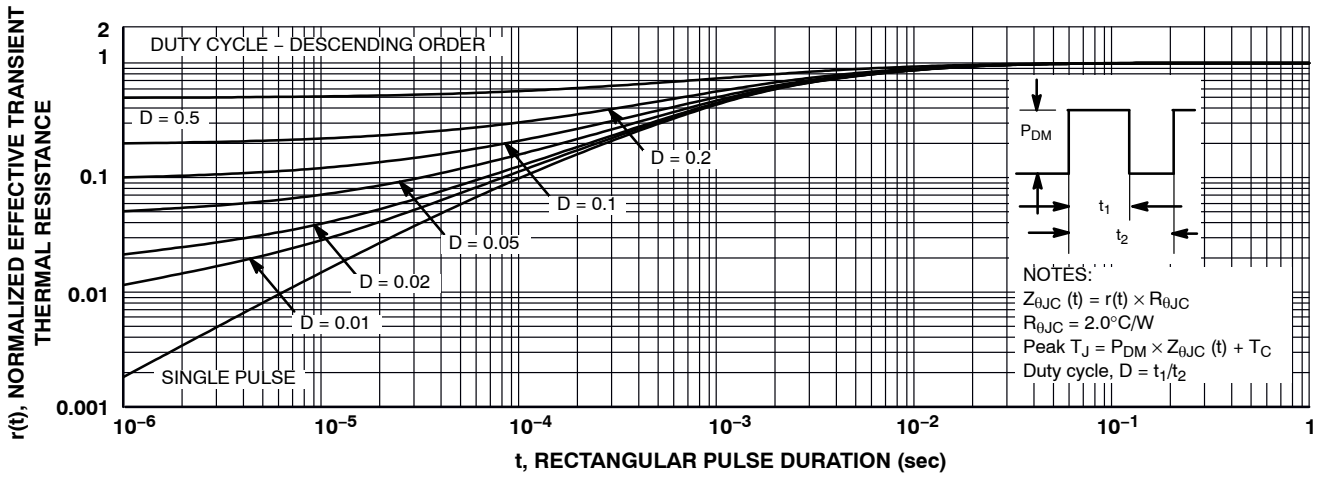


Figure 8. Junction-to-Case Transient Thermal Response Curve

TEST CIRCUIT AND WAVEFORMS

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

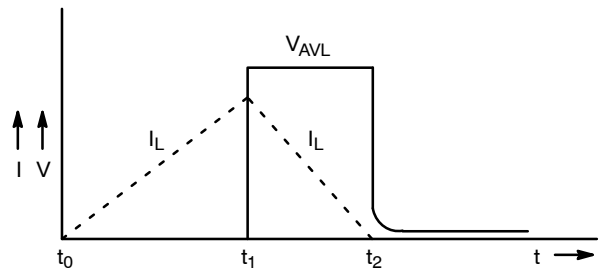
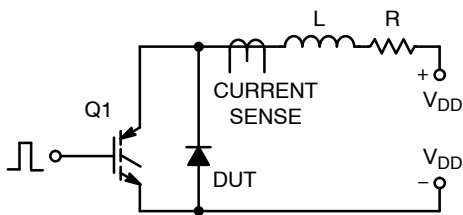
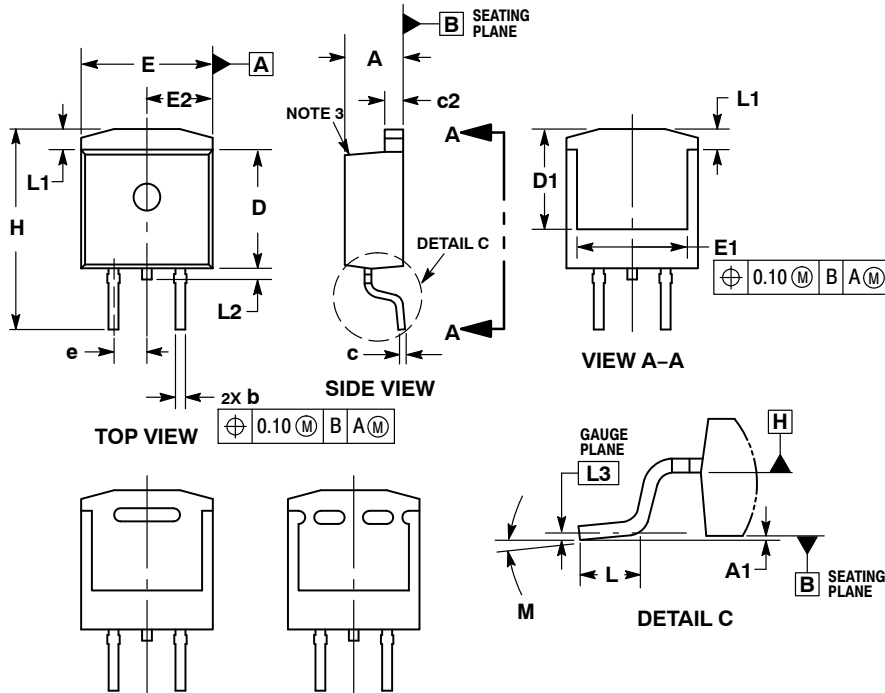


Figure 9. Unclamped Inductive Switching Test Circuit & Waveform

# FFSB2065BDN-F085

## PACKAGE DIMENSIONS

**D<sup>2</sup>PAK-3 (TO-263, 3-LEAD)**  
CASE 418AJ  
ISSUE C



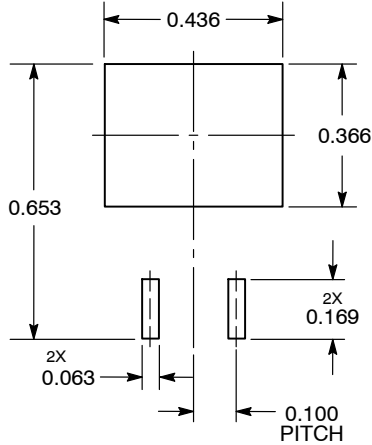
**NOTES:**

1. DIMENSIONING AND TOLERANCING PER ASME Y14.5M, 1994.
2. CONTROLLING DIMENSION: INCHES.
3. CHAMFER OPTIONAL
4. DIMENSIONS D AND E DO NOT INCLUDE MOLD FLASH. MOLD FLASH SHALL NOT EXCEED 0.005 PER SIDE. THESE DIMENSIONS ARE MEASURED AT THE OUTERMOST EXTREMES OF THE PLASTIC BODY AT DATUM H.
5. THERMAL PAD CONTOUR IS OPTIONAL WITHIN DIMENSIONS E, L1, D1 AND E1.

| DIM | INCHES    |       | MILLIMETERS |       |
|-----|-----------|-------|-------------|-------|
|     | MIN       | MAX   | MIN         | MAX   |
| A   | 0.160     | 0.190 | 4.06        | 4.83  |
| A1  | 0.000     | 0.010 | 0.00        | 0.25  |
| b   | 0.020     | 0.039 | 0.51        | 0.99  |
| c   | 0.012     | 0.029 | 0.30        | 0.74  |
| c2  | 0.045     | 0.065 | 1.14        | 1.65  |
| D   | 0.330     | 0.380 | 8.38        | 9.65  |
| D1  | 0.260     | ----- | 6.60        | ----- |
| E   | 0.380     | 0.420 | 9.65        | 10.67 |
| E1  | 0.245     | ----- | 6.22        | ----- |
| e   | 0.100 BSC |       | 2.54 BSC    |       |
| H   | 0.575     | 0.625 | 14.60       | 15.88 |
| L   | 0.070     | 0.110 | 1.78        | 2.79  |
| L1  | -----     | 0.066 | -----       | 1.68  |
| L2  | -----     | 0.070 | -----       | 1.78  |
| L3  | 0.010 BSC |       | 0.25 BSC    |       |
| M   | -8°       | 8°    | -8°         | 8°    |


VIEW A-A  
OPTIONAL CONSTRUCTIONS

**RECOMMENDED  
SOLDERING FOOTPRINT\***



DIMENSIONS: INCHES

\*For additional information on our Pb-Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.

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