

# FFSP2065B-F085

## Silicon Carbide Schottky Diode

### 650 V, 20 A

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
- 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 specified)

Symbol	Parameter	FF-SP2065B-F085	Unit	
$V_{RRM}$	Peak Repetitive Reverse Voltage	650	V	
$E_{AS}$	Single Pulse Avalanche Energy (Note 1)	94	mJ	
$I_F$	Continuous Rectified Forward Current @ $T_C < 141^\circ\text{C}$	20	A	
		Continuous Rectified Forward Current @ $T_C < 135^\circ\text{C}$		22.5
$I_{F, Max}$	Non-Repetitive Peak Forward Surge Current	$T_C = 25^\circ\text{C}$ , 10 $\mu\text{s}$	882	A
		$T_C = 150^\circ\text{C}$ , 10 $\mu\text{s}$	798	
$I_{F, SM}$	Non-Repetitive Forward Surge Current	Half-Sine Pulse, $t_p = 8.3 \text{ ms}$	84	A
$P_{tot}$	Power Dissipation	$T_C = 25^\circ\text{C}$	150	W
		$T_C = 150^\circ\text{C}$	25	
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$	

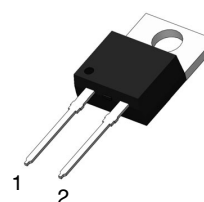
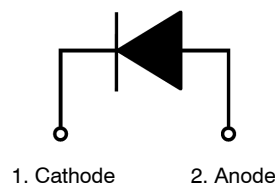
1.  $E_{AS}$  of 94 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.5 \text{ mH}$ ,  $I_{AS} = 19.4 \text{ A}$ ,  $V = 50 \text{ V}$ .



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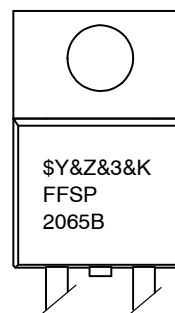
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#### ELECTRICAL CONNECTION



TO-220-2LD  
CASE 340BB

#### MARKING DIAGRAM



\$Y = ON Semiconductor Logo  
&Z = Assembly Plant Code  
&3 = Numeric Date Code  
&K = Lot Code  
FFSP2065B-F085 = Specific Device Code

#### ORDERING INFORMATION

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

## FFSP2065B–F085

### THERMAL CHARACTERISTICS

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

### PACKAGE MARKING AND ORDERING INFORMATION

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FFSP2065B–F085	FFSP2065B	TO220	Tube	N/A	N/A	50 Units

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

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_F$	Forward Voltage	$I_F = 20\text{ A}, T_C = 25^{\circ}C$	–	1.38	1.7	V
		$I_F = 20\text{ A}, T_C = 125^{\circ}C$	–	1.6	2.0	
		$I_F = 20\text{ A}, T_C = 175^{\circ}C$	–	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	$V = 400\text{ V}$	–	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	–	

TYPICAL CHARACTERISTICS  $T_J = 25^\circ\text{C}$  Unless Otherwise Noted

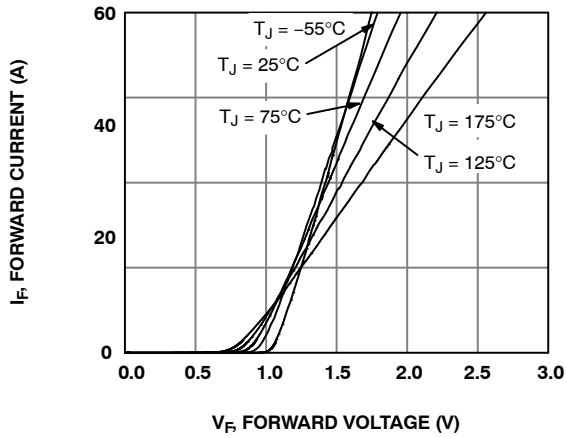


Figure 1. Forward Characteristics

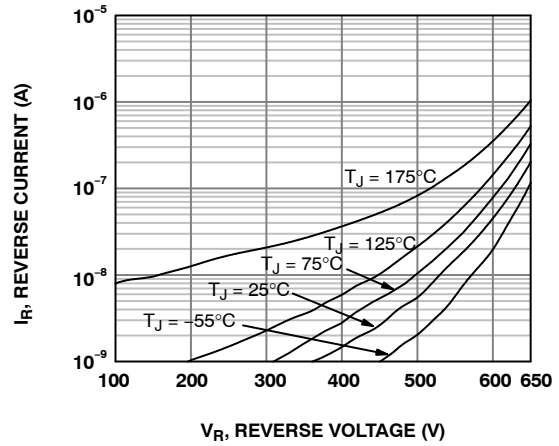


Figure 2. Reverse Characteristics

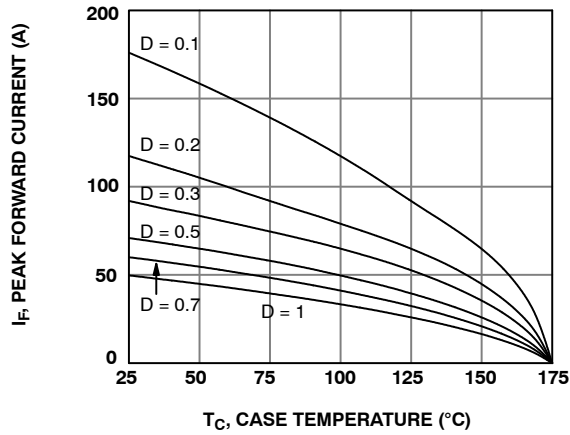


Figure 3. Current Derating

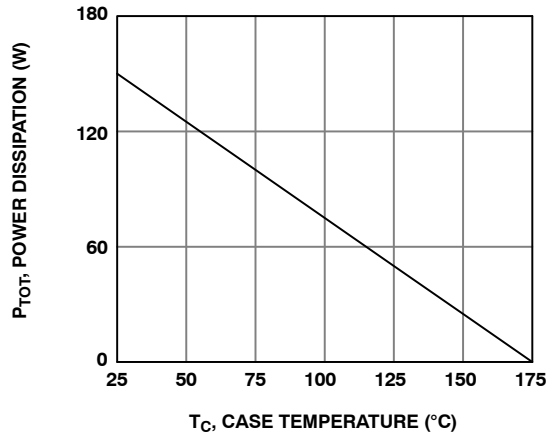


Figure 4. Power Dissipation

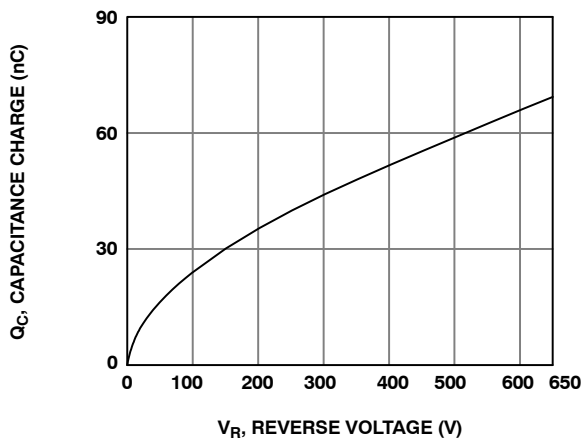


Figure 5. Capacitance Charge vs. Reverse Voltage

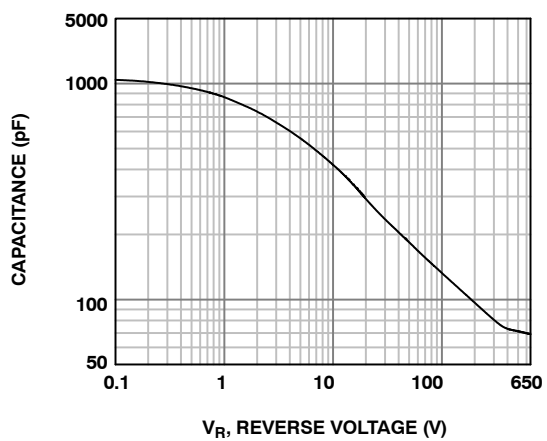


Figure 6. Capacitance vs. Reverse Voltage

# FFSP2065B-F085

TYPICAL CHARACTERISTICS  $T_J = 25^\circ\text{C}$  Unless Otherwise Noted (continued)

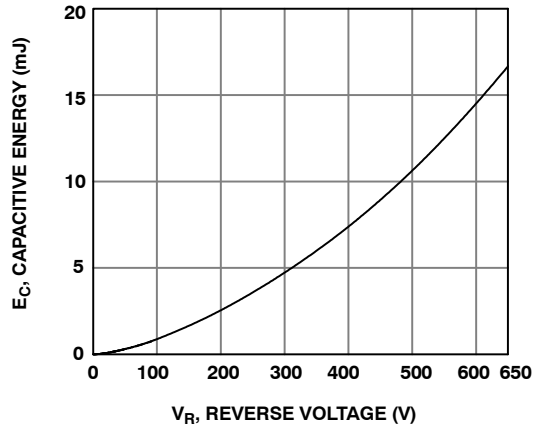


Figure 7. Capacitance Stored Energy

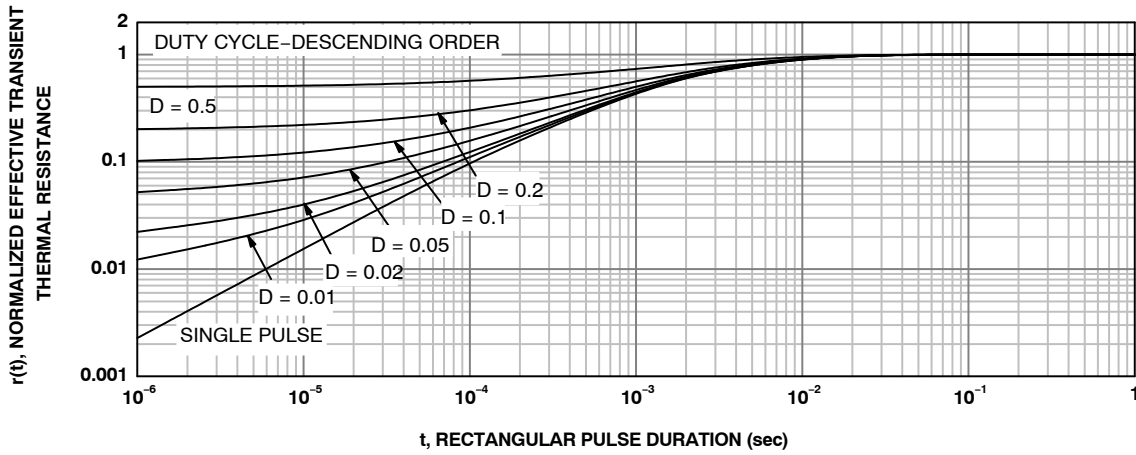


Figure 8. Junction-to-Case Transient Thermal Response Curve

## TEST CIRCUIT AND WAVEFORMS

$L = 0.5 \text{ mH}$   
 $R < 0.1 \Omega$   
 $V_{DD} = 50 \text{ V}$

$E_{AVL} = 1/2LI^2 [V_{R(AVL)}/(V_{R(AVL)} - V_{DD})]$   
 $Q1 = \text{IGBT (} BV_{CES} > DUT V_{R(AVL)} \text{)}$

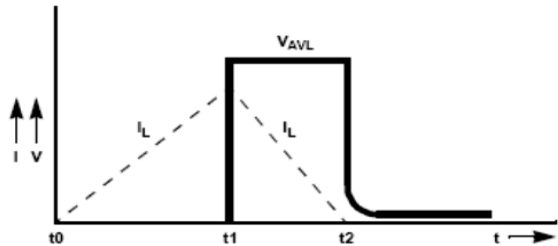
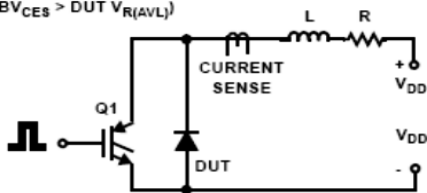


Figure 9. Unclamped Inductive Switching Test Circuit & Waveform

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

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TO-220-2LD  
CASE 340BB  
ISSUE O

DATE 31 AUG 2016



### NOTES:

- A. PACKAGE REFERENCE: JEDEC TO220,ISSUE K, VARIATION AC, DATED APRIL 2002.
- B. ALL DIMENSIONS ARE IN MILLIMETERS.
- C. DIMENSION AND TOLERANCE AS PER ASME Y14.5-2009.
- D. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH AND TIE BAR PROTRUSIONS.

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