

# FFSP4065BDN-F085

## Product Preview

# Silicon Carbide Schottky Diode, 650 V, 40 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 94 mJ
- High Surge Current Capacity
- Positive Temperature Coefficient
- Ease of Paralleling
- No Reverse Recovery/No Forward Recovery
- AEC-Q101 Qualified
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

### Applications

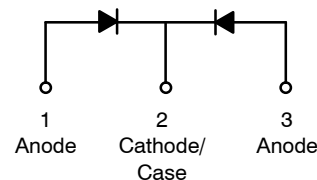
- Automotive HEV-EV Onboard Chargers
- Automotive HEV-EV DC-DC Converters

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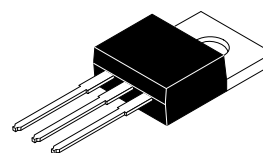


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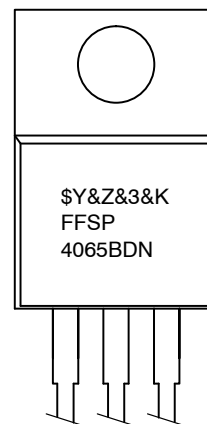


Schottky Diode



TO-220-3LD  
CASE 340AT

### MARKING DIAGRAM



\$Y	= ON Semiconductor Logo
&Z	= Assembly Plant Code
&3	= Numeric Date Code
&K	= Lot Code
FFSP4065BDN	= Specific Device Code

### ORDERING INFORMATION

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

# FFSP4065BDN-F085

## ABSOLUTE MAXIMUM RATINGS (T<sub>C</sub> = 25°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 @ T <sub>C</sub> < 136°C	20*/40**	A	
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	A
I <sub>F, SM</sub>	Non-Repetitive Forward Surge Current T <sub>C</sub> = 25°C	Half-Sine Pulse, t <sub>p</sub> = 8.3 ms	84	A
P <sub>tot</sub>	Power Dissipation	T <sub>C</sub> = 25°C	95	W
		T <sub>C</sub> = 150°C	16	W
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	-55 to +175	°C	
	TO247 Mounting Torque, M3 Screw	60	Ncm	

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.

\* Per Leg, \*\* Per Device

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.

## THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
R <sub>θJC</sub>	Thermal Resistance, Junction to Case, Max	1.6*/0.8**	°C/W

\* Per Leg, \*\* Per Device

## ELECTRICAL CHARACTERISTICS (T<sub>C</sub> = 25°C unless otherwise noted (per leg))

Symbol	Parameter	Test Condition	Min	Typ	Max	Unit
V <sub>F</sub>	Forward Voltage	I <sub>F</sub> = 20 A, T <sub>C</sub> = 25°C	-	1.38	1.7	V
		I <sub>F</sub> = 20 A, T <sub>C</sub> = 125°C	-	1.6	2.0	
		I <sub>F</sub> = 20 A, T <sub>C</sub> = 175°C	-	1.72	2.4	
I <sub>R</sub>	Reverse Current	V <sub>R</sub> = 650 V, T <sub>C</sub> = 25°C	-	0.5	40	μA
		V <sub>R</sub> = 650 V, T <sub>C</sub> = 125°C	-	1	80	
		V <sub>R</sub> = 650 V, T <sub>C</sub> = 175°C	-	2	160	
Q <sub>C</sub>	Total Capacitive Charge	V = 400 V	-	51	-	nC
C	Total Capacitance	V <sub>R</sub> = 1 V, f = 100 kHz	-	866	-	pF
		V <sub>R</sub> = 300 V, f = 100 kHz	-	80	-	
		V <sub>R</sub> = 600 V, f = 100 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 Marking	Package	Shipping
FFSP4065BDN-F085	FFSP4065BDN	TO-220-3LD (Pb-Free / Halogen Free)	50 Units / Tube

# FFSP4065BDN-F085

## TYPICAL CHARACTERISTICS

( $T_J = 25^\circ\text{C}$  unless otherwise noted (per leg))

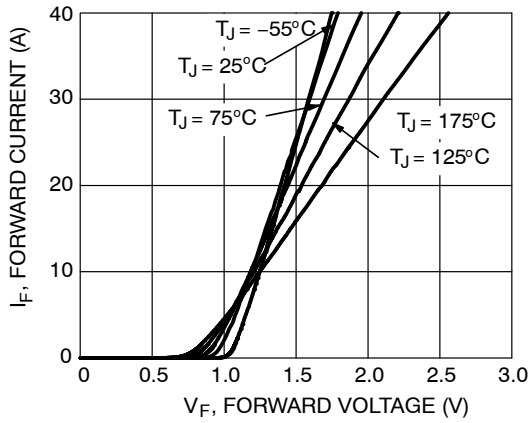


Figure 1. Forward Characteristics

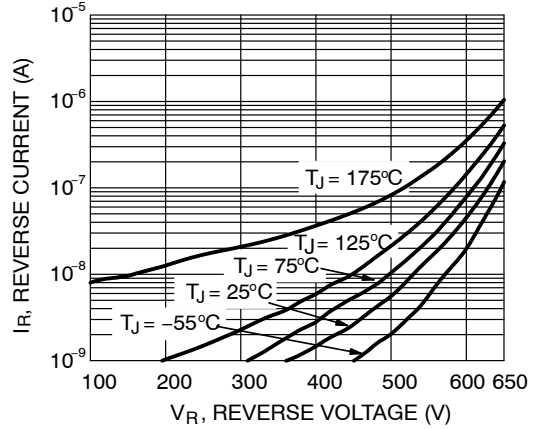


Figure 2. Reverse Characteristics

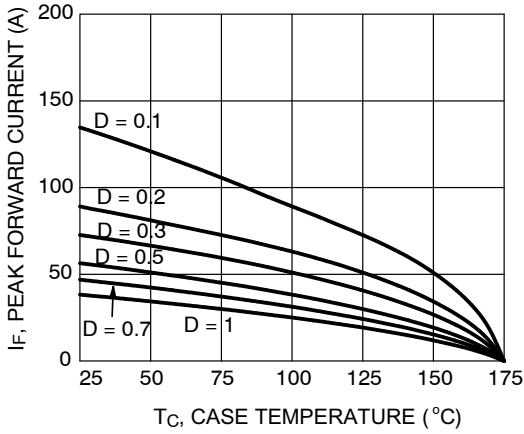


Figure 3. Current Derating

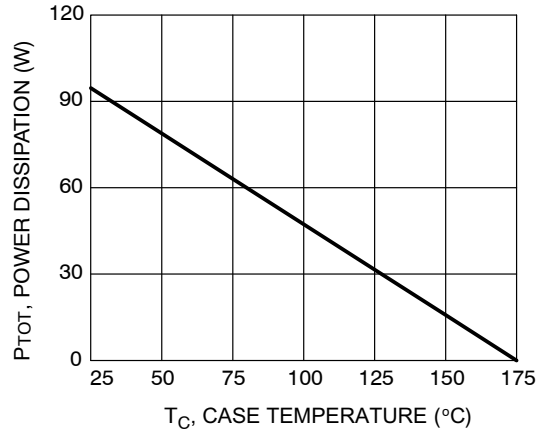


Figure 4. Power Derating

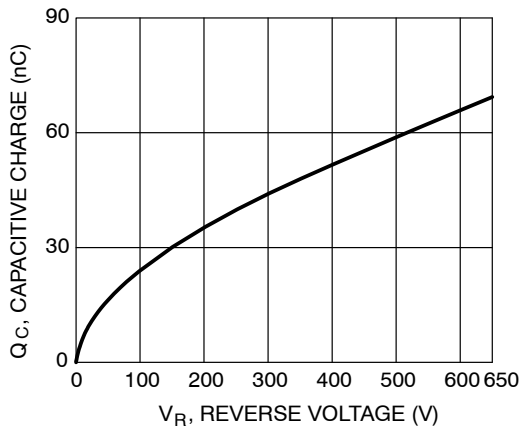


Figure 5. Capacitive Charge vs. Reverse Voltage

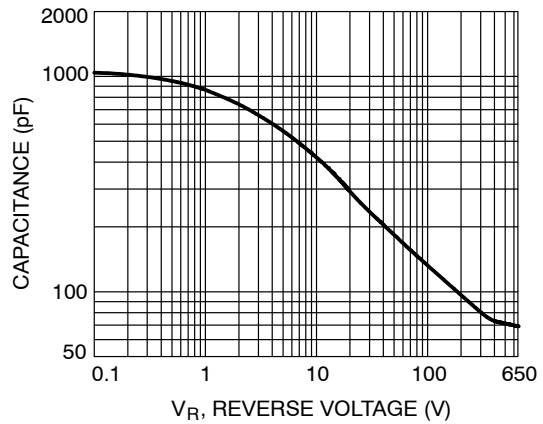


Figure 6. Capacitance vs. Reverse Voltage

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## TYPICAL CHARACTERISTICS

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

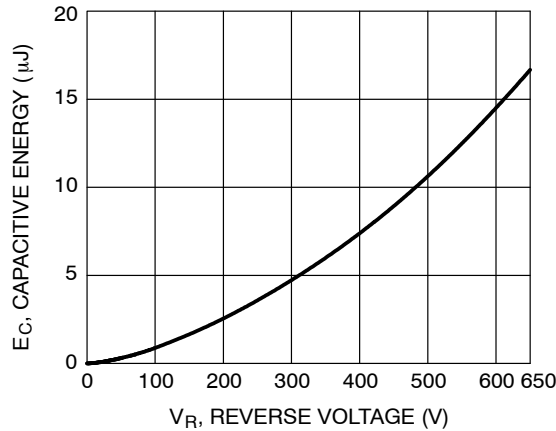


Figure 7. Capacitance Stored Energy

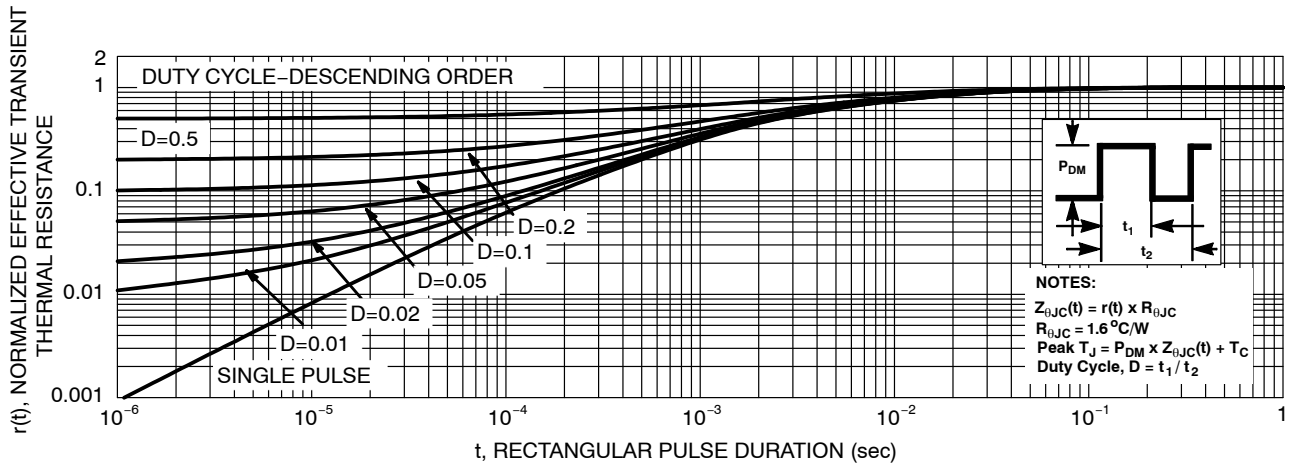


Figure 8. Junction-to-Case Transient Thermal Response Curve

## TEST CIRCUIT AND WAVEFORMS

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

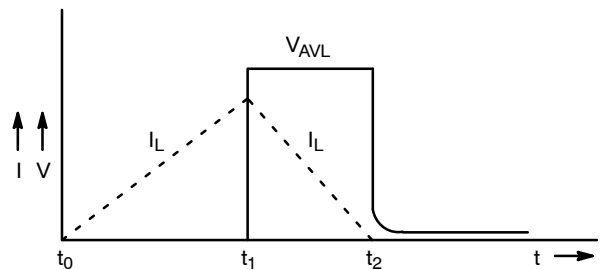
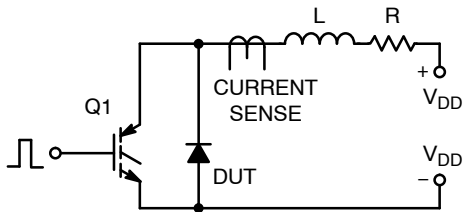
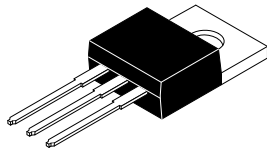


Figure 9. Unclamped Inductive Switching Test Circuit & Waveform

# MECHANICAL CASE OUTLINE

## PACKAGE DIMENSIONS

ON Semiconductor®



Scale 1:1

### TO-220-3LD CASE 340AT ISSUE A

DATE 03 OCT 2017



- NOTES:
- A) REFERENCE JEDEC, TO-220, VARIATION AB
  - B) ALL DIMENSIONS ARE IN MILLIMETERS.
  - C) DIMENSIONS COMMON TO ALL PACKAGE SUPPLIERS EXCEPT WHERE NOTED [ ].
  - D) LOCATION OF MOLDED FEATURE MAY VARY (LOWER LEFT CORNER, LOWER CENTER AND CENTER OF THE PACKAGE)
  - E) DOES NOT COMPLY JEDEC STANDARD VALUE.
  - F) "A1" DIMENSIONS AS BELOW:  
 SINGLE GAUGE = 0.51 - 0.61  
 DUAL GAUGE = 1.10 - 1.45
  - G) PRESENCE IS SUPPLIER DEPENDENT
  - H) SUPPLIER DEPENDENT MOLD LOCKING HOLES IN HEATSINK.

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