

# Silicon Carbide Schottky Diode

## 650 V, 4 A

### FFSP0465A

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 25 mJ
- High Surge Current Capacity
- Positive Temperature Coefficient
- Ease of Paralleling
- No Reverse Recovery/No Forward Recovery
- This Device is Pb-Free, Halogen Free/BFR Free and RoHS Compliant

#### Applications

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

#### ABSOLUTE MAXIMUM RATINGS

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

| Symbol                            | Parameter   | FFSP0465A                                | Unit |   |
|-----------------------------------|---|--|------|---|
| V <sub>RRM</sub>                  | Peak Repetitive Reverse Voltage                               | 650                                      | V    |   |
| E <sub>AS</sub>                   | Single Pulse Avalanche Energy (Note 1)                        | 25                                       | mJ   |   |
| I <sub>F</sub>                    | Continuous Rectified Forward Current @ T <sub>C</sub> < 163°C | 4  | A    |   |
|                                   | Continuous Rectified Forward Current @ T <sub>C</sub> < 135°C | 8.6                                      |      |   |
| I <sub>F, Max</sub>               | Non-Repetitive Peak Forward Surge Current                     | T <sub>C</sub> = 25°C, 10 μs             | 360  | A |
|                                   |   | T <sub>C</sub> = 150°C, 10 μs            | 330  |   |
| I <sub>F, SM</sub>                | Non-Repetitive Forward Surge Current                          | Half-Sine Pulse, t <sub>p</sub> = 8.3 ms | 38   | A |
| I <sub>F, RM</sub>                | Repetitive Forward Surge Current                              | Half-Sine Pulse, t <sub>p</sub> = 8.3 ms | 18   | A |
| P <sub>tot</sub>                  | Power Dissipation   | T <sub>C</sub> = 25°C                    | 75   | W |
|                                   |   | T <sub>C</sub> = 150°C                   | 12.5 |   |
| T <sub>J</sub> , T <sub>STG</sub> | Operating and Storage Temperature Range                       | -55 to +175                              | °C   |   |

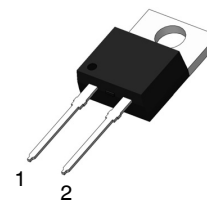
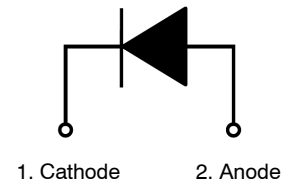
1. E<sub>AS</sub> of 25 mJ is based on starting T<sub>J</sub> = 25°C, L = 0.5 mH, I<sub>AS</sub> = 10 A, V = 50 V.



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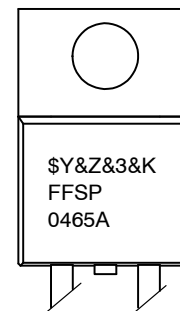
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#### ELECTRICAL CONNECTION



TO-220-2LD  
CASE 340BB

#### MARKING DIAGRAM



\$Y = ON Semiconductor Logo  
 &Z = Assembly Plant Code  
 &3 = Numeric Date Code  
 &K = Lot Code  
 FFSP0465A = Specific Device Code

#### ORDERING INFORMATION

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

# FFSP0465A

## THERMAL CHARACTERISTICS

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

## PACKAGE MARKING AND ORDERING INFORMATION

| Part Number | Top Mark  | Package | Packing Method | Reel Size | Tape Width | Quantity |
|-------------|-----------|---------|----------------|-----------|------------|----------|
| FFSP0465A   | FFSP0465A | 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         | $I_F = 4\text{ A}, T_C = 25^{\circ}C$    | -    | 1.50 | 1.75 | V       |
|        |                         | $I_F = 4\text{ A}, T_C = 125^{\circ}C$   | -    | 1.6  | 2.0  |         |
|        |                         | $I_F = 4\text{ A}, T_C = 175^{\circ}C$   | -    | 1.72 | 2.4  |         |
| $I_R$  | Reverse Current         | $V_R = 650\text{ V}, T_C = 25^{\circ}C$  | -    | -    | 200  | $\mu A$ |
|        |                         | $V_R = 650\text{ V}, T_C = 125^{\circ}C$ | -    | -    | 400  |         |
|        |                         | $V_R = 650\text{ V}, T_C = 175^{\circ}C$ | -    | -    | 600  |         |
| $Q_C$  | Total Capacitive Charge | $V = 400\text{ V}$                       | -    | 16   | -    | nC      |
| C      | Total Capacitance       | $V_R = 1\text{ V}, f = 100\text{ kHz}$   | -    | 258  | -    | pF      |
|        |                         | $V_R = 200\text{ V}, f = 100\text{ kHz}$ | -    | 29   | -    |         |
|        |                         | $V_R = 400\text{ V}, f = 100\text{ kHz}$ | -    | 21   | -    |         |

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

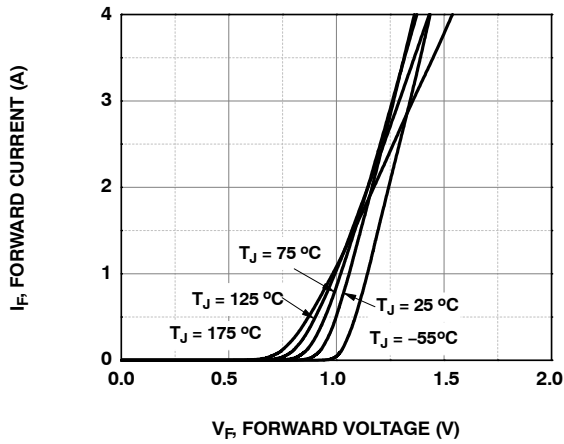


Figure 1. Forward Characteristics

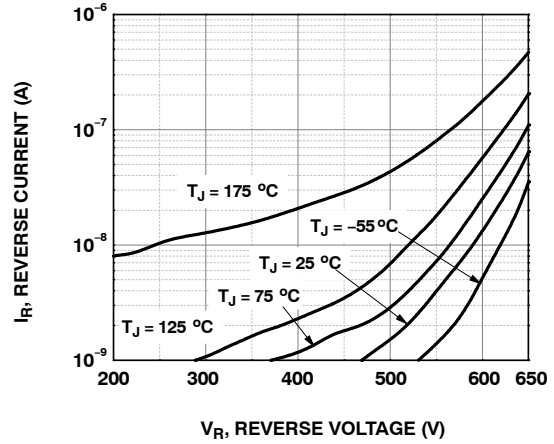


Figure 2. Reverse Characteristics

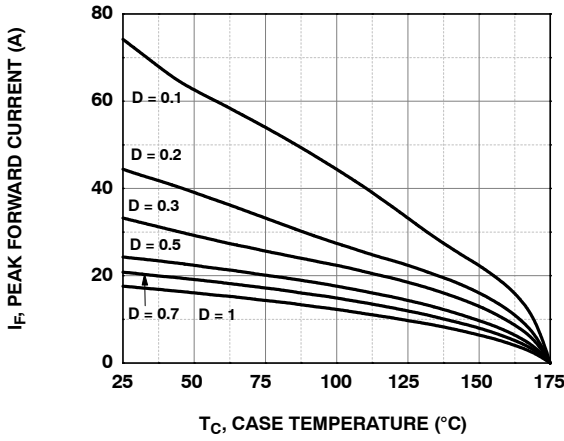


Figure 3. Current Derating

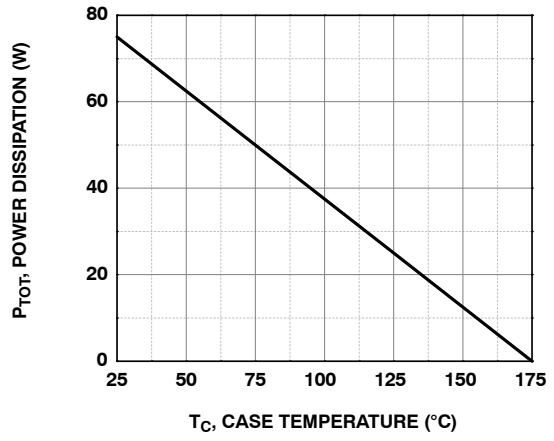


Figure 4. Power Derating

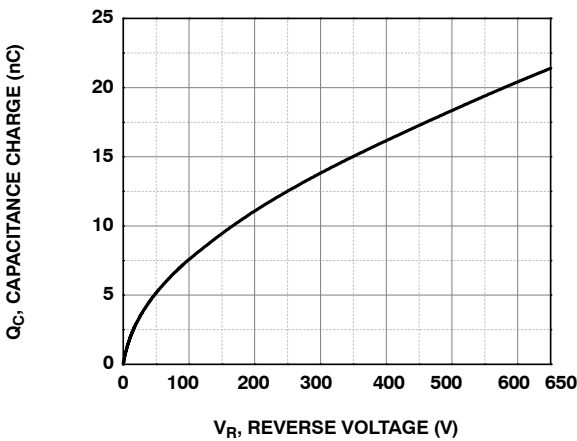


Figure 5. Capacitance Charge vs. Reverse Voltage

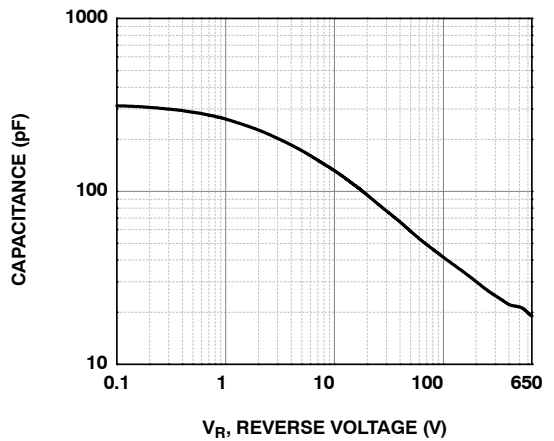


Figure 6. Capacitance vs. Reverse Voltage

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

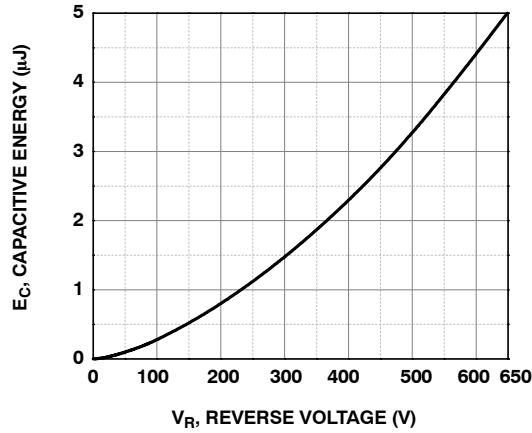


Figure 7. Capacitance Stored Energy

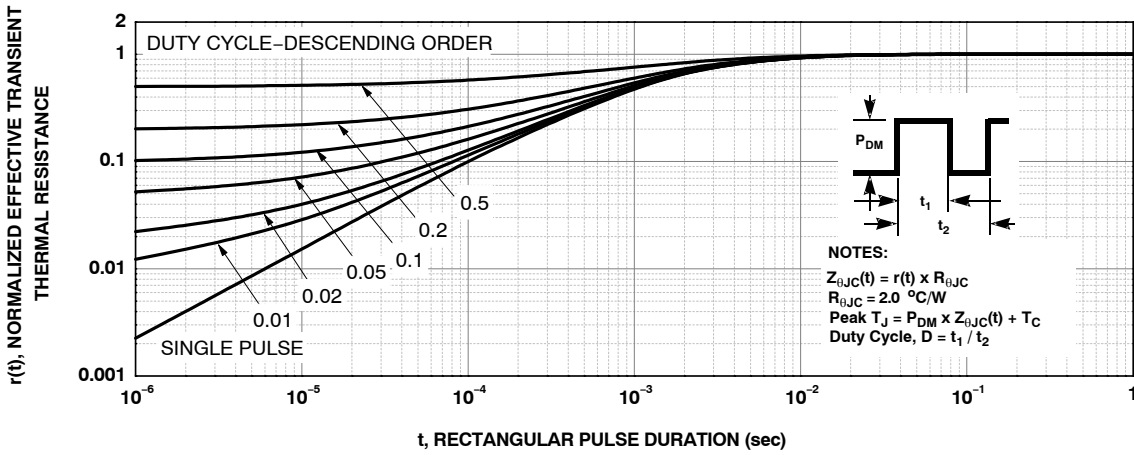


Figure 8. Junction-to-Case Transient Thermal Response Curve

TEST CIRCUIT AND WAVEFORMS

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

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

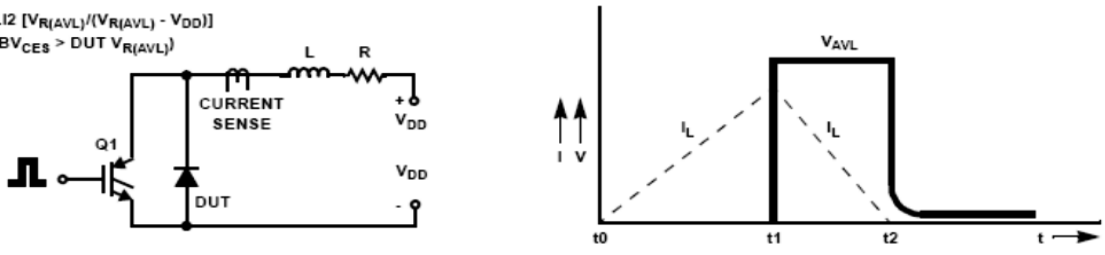


Figure 9. Unclamped Inductive Switching Test Circuit & Waveform

# MECHANICAL CASE OUTLINE

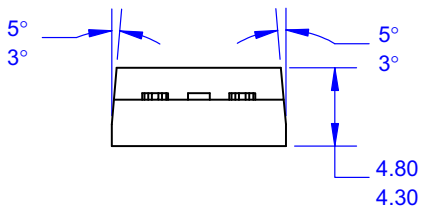
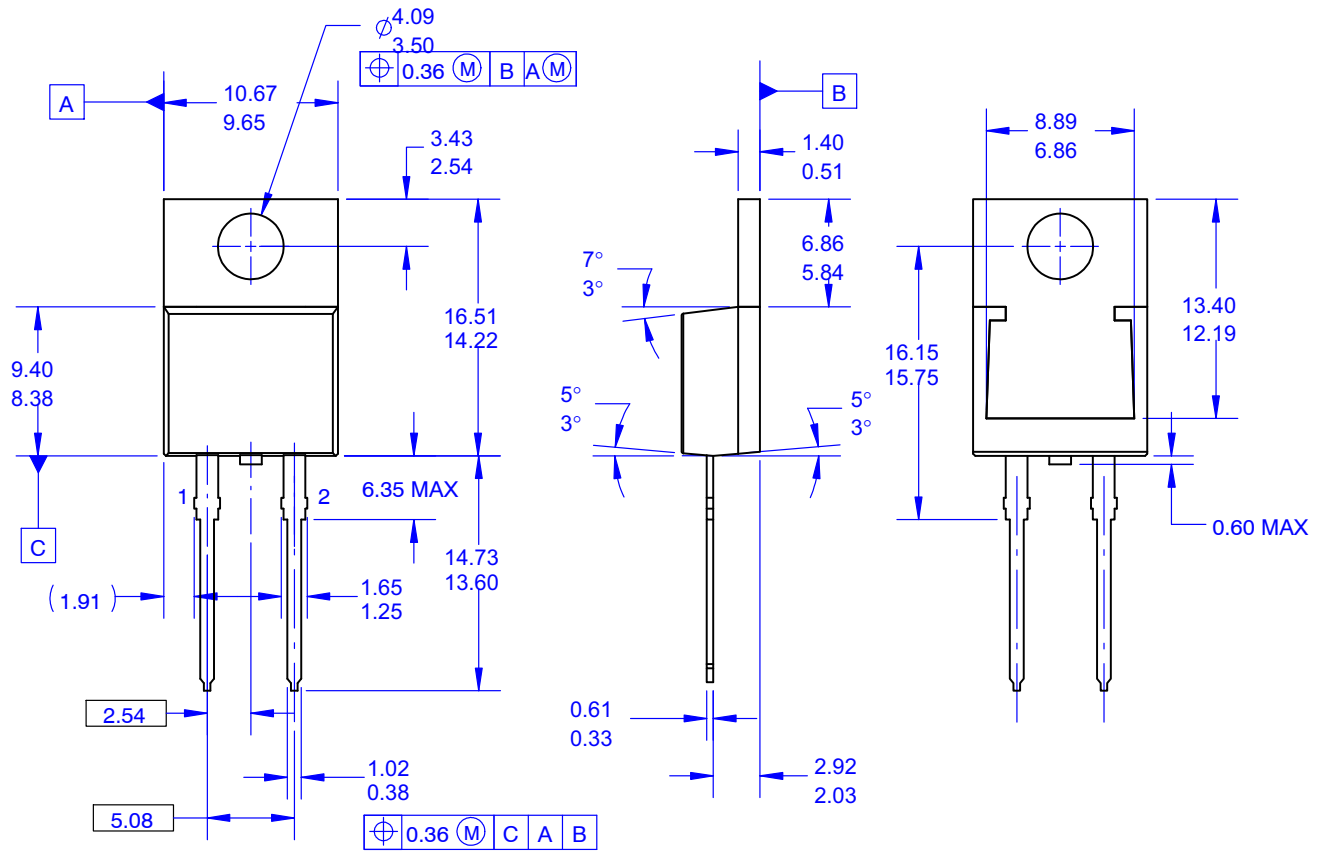
## PACKAGE DIMENSIONS

ON Semiconductor®



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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