# Silicon Carbide (SiC) Schottky Diode – EliteSiC, 4 A, 650 V, D1, TO-220-2L

# FFSP0465A

### 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 and cost.

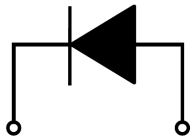
### Features

- 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

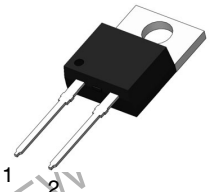
### Applications

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

### ELECTRICAL CONNECTION



1. Cathode 2. Anode

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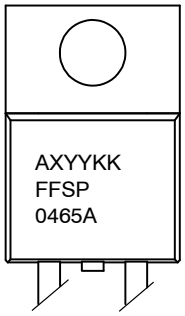
### MARKING DIAGRAM




| | |
|---|---|
| A | = Assembly Plant Code |
| XYY | = Date Code (Year & Week) |
| KK | = Lot Traceability 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.

## ABSOLUTE MAXIMUM RATINGS

($T_C$ = 25°C, Unless otherwise specified)

| Symbol | Parameter | | FFSP0465A | Unit |
|---|---|---|---|---|
| $V_{RRM}$ | Peak Repetitive Reverse Voltage | | 650 | V |
| $E_{AS}$ | Single Pulse Avalanche Energy (Note 1) | | 25 | mJ |
| $I_F$ | Continuous Rectified Forward Current @ $T_C$ < 163°C | | 4 | A |
| | Continuous Rectified Forward Current @ $T_C$ < 135°C | | 8.6 | |
| $I_{F, Max}$ | Non−Repetitive Peak Forward Surge Current | $T_C$ = 25°C, 10 μs | 360 | A |
| | | $T_C$ = 150°C, 10 μs | 330 | |
| $I_{F, SM}$ | Non−Repetitive Forward Surge Current | Half−Sine Pulse, $t_p$ = 8.3 ms | 38 | A |
| $I_{F, RM}$ | Repetitive Forward Surge Current | Half−Sine Pulse, $t_p$ = 8.3 ms | 18 | A |
| $P_{tot}$ | Power Dissipation | $T_C$ = 25°C | 75 | W |
| | | $T_C$ = 150°C | 12.5 | |
| $T_J$, $T_{STG}$ | Operating 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 25 mJ is based on starting $T_J$ = 25°C, L = 0.5 mH, $I_{AS}$ = 10 A, V = 50 V.

## THERMAL CHARACTERISTICS

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

## ELECTRICAL CHARACTERISTICS $T_C$ = 25°C unless otherwise noted

| Symbol | Parameter | Test Conditions | Min. | Typ. | Max. | Unit |
|---|---|---|---|---|---|---|
| $V_F$ | Forward Voltage | $I_F$ = 4 A, $T_C$ = 25°C | – | 1.50 | 1.75 | V |
| | | $I_F$ = 4 A, $T_C$ = 125°C | – | 1.6 | 2.0 | |
| | | $I_F$ = 4 A, $T_C$ = 175°C | – | 1.72 | 2.4 | |
| $I_R$ | Reverse Current | $V_R$ = 650 V, $T_C$ = 25°C | – | – | 200 | μA |
| | | $V_R$ = 650 V, $T_C$ = 125°C | – | – | 400 | |
| | | $V_R$ = 650 V, $T_C$ = 175°C | – | – | 600 | |
| $Q_C$ | Total Capacitive Charge | V = 400 V | – | 16 | – | nC |
| C | Total Capacitance | $V_R$ = 1 V, f = 100 kHz | – | 258 | – | pF |
| | | $V_R$ = 200 V, f = 100 kHz | – | 29 | – | |
| | | $V_R$ = 400 V, f = 100 kHz | – | 21 | – | |

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 | Packing Method | Reel Size | Tape Width | Quantity |
|---|---|---|---|---|---|---|
| FFSP0465A | FFSP0465A | TO−220−2LD | Tube | N/A | N/A | 50 Units |

## TYPICAL CHARACTERISTICS $T_J$ = 25°C UNLESS OTHERWISE NOTED

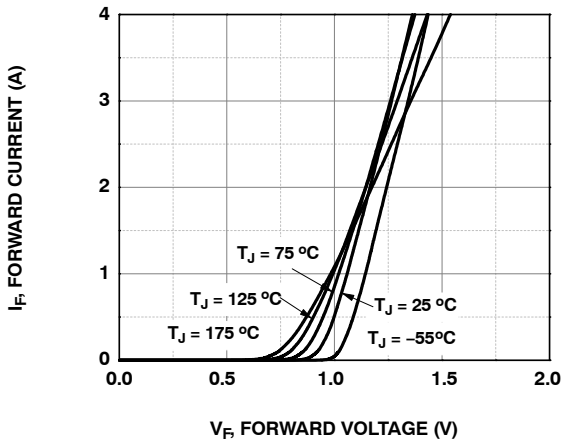



Figure 1. Forward Characteristics

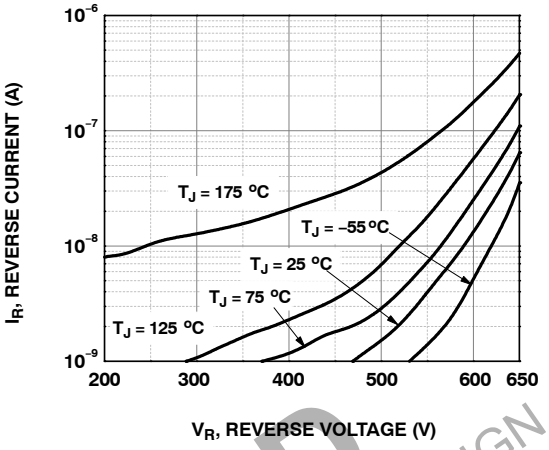



Figure 2. Reverse Characteristics

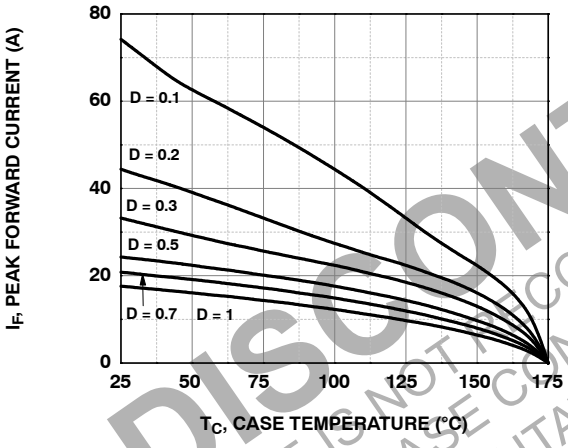



Figure 3. Current Derating

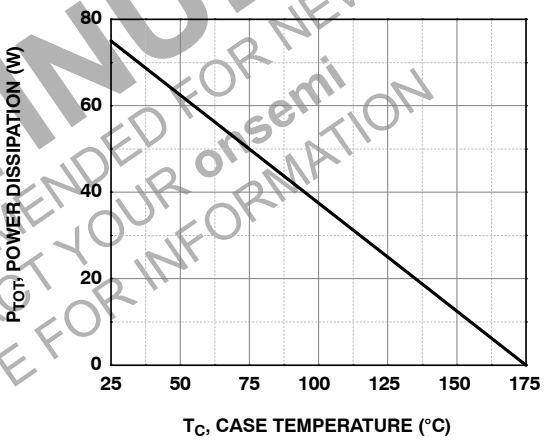



Figure 4. Power Derating

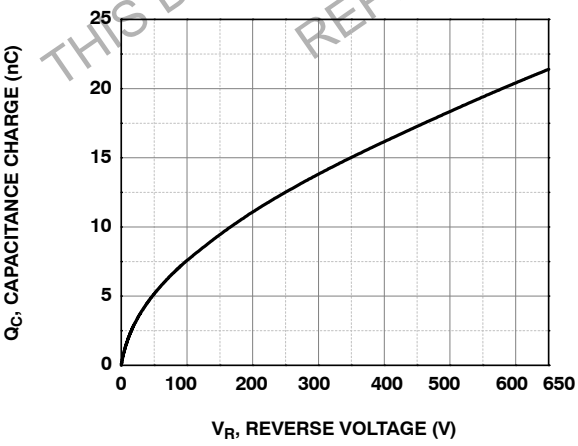



Figure 5. Capacitance Charge vs. Reverse Voltage

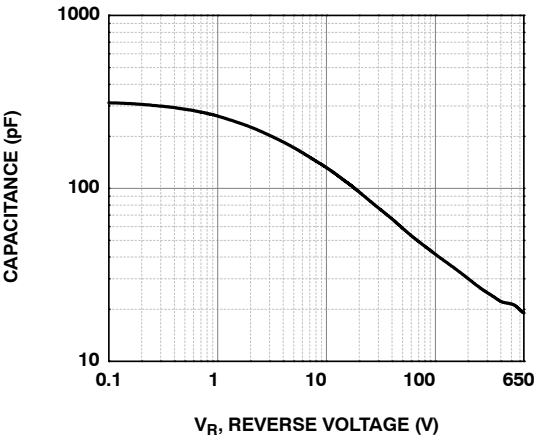



Figure 6. Capacitance vs. Reverse Voltage

**TYPICAL CHARACTERISTICS** $T_J$ = 25°C UNLESS OTHERWISE NOTED (CONTINUED)

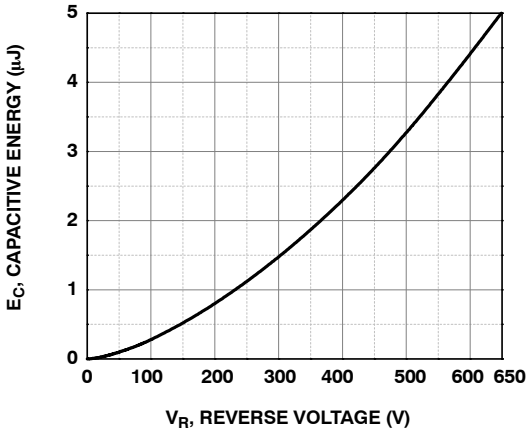



**Figure 7. Capacitance Stored Energy**

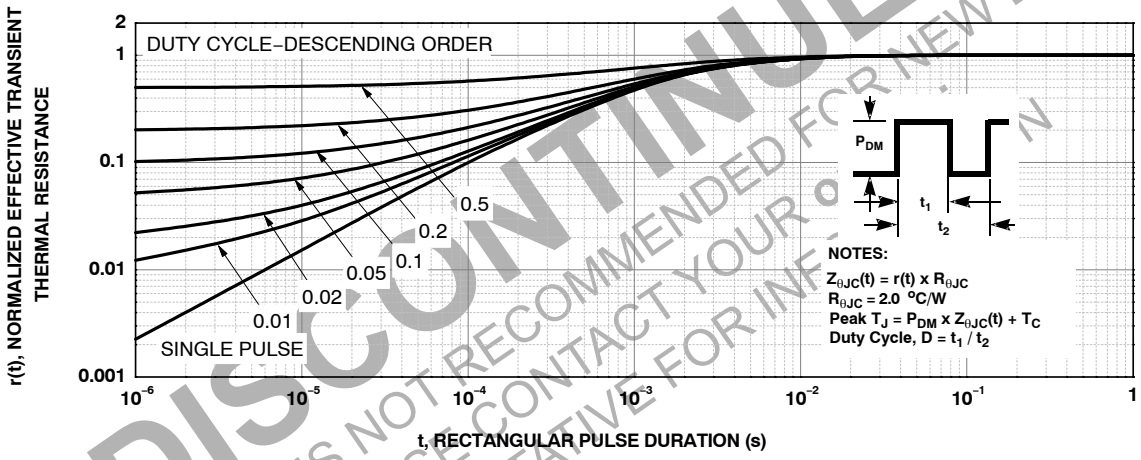



**Figure 8. Junction−to−Case Transient Thermal Response Curve**



## TEST CIRCUIT AND WAVEFORMS

L = 0.5 mH
R < 0.1Ω
$V_{DD}$ = 50V
EAVL = 1/2LI2 [$V_{R(AVL)}$/($V_{R(AVL)}$ - $V_{DD}$)]
Q1 = IGBT ($BV_{CES}$ > DUT $V_{R(AVL)}$)

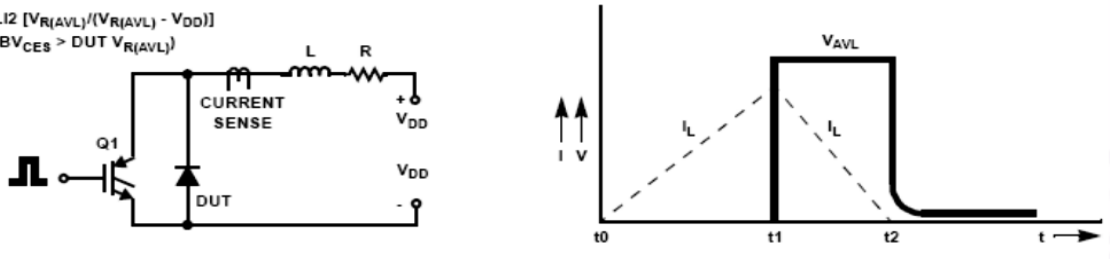



**Figure 9. Unclamped Inductive Switching Test Circuit & Waveform**

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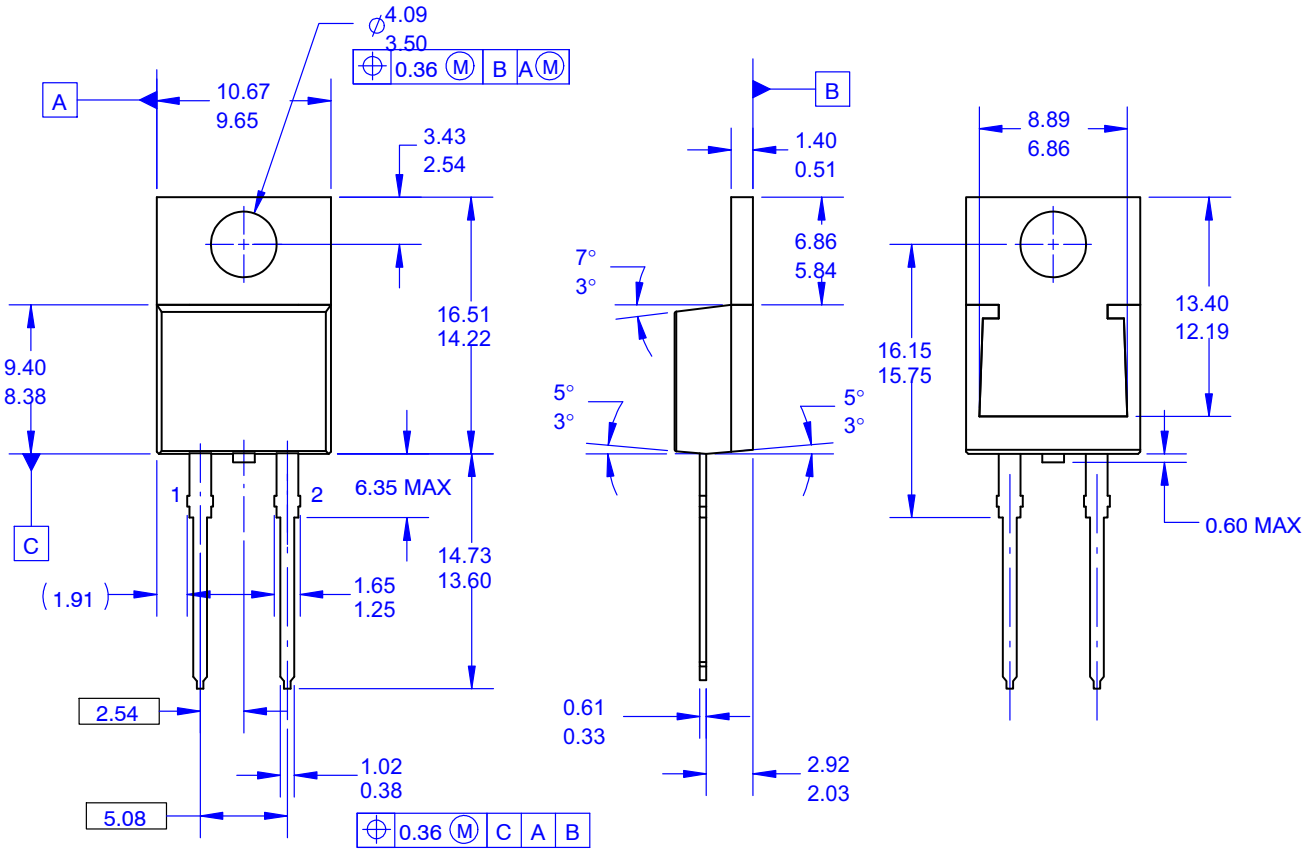


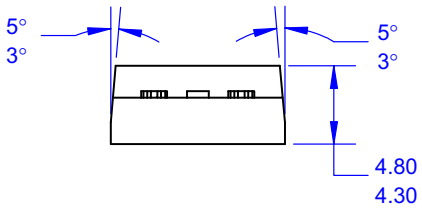


NOTES:

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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| **DESCRIPTION:** | **TO−220−2LD** | | **PAGE 1 OF 1** |

## ADDITIONAL INFORMATION

**TECHNICAL PUBLICATIONS**:
**Technical Library:** www.onsemi.com/design/resources/technical−documentation
**onsemi Website:** www.onsemi.com

**ONLINE SUPPORT**: www.onsemi.com/support
**For additional information, please contact your local Sales Representative at** www.onsemi.com/support/sales