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October 2016

# ON Semiconductor® FFSP20120A

## Silicon Carbide Schottky Diode 1200 V, 20 A

### Features

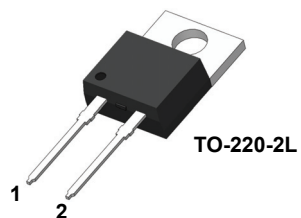
- Max Junction Temperature 175 °C
- Avalanche Rated 200 mJ
- High Surge Current Capacity
- Positive Temperature Coefficient
- Ease of Paralleling
- No Reverse Recovery / No Forward Recovery

### Description

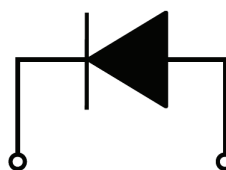
Silicon Carbide (SiC) Schottky Diodes use a completely new technology that provides superior switching performance and higher reliability compared to Silicon. No reverse recovery current, temperature independent switching characteristics, and excellent thermal performance sets Silicon Carbide as the next generation of power semiconductor. System benefits include highest efficiency, faster operating frequency, increased power density, reduced EMI, and reduced system size and cost.

### Applications

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



1. Cathode 2. Anode



1. Cathode 2. Anode

### Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted.

Symbol	Parameter	Ratings	Unit	
$V_{RRM}$	Peak Repetitive Reverse Voltage	1200	V	
$E_{AS}$	Single Pulse Avalanche Energy (Note 1)	200	mJ	
$I_F$	Continuous Rectified Forward Current @ $T_C < 148^\circ\text{C}$	20	A	
$I_{F, Max}$	Non-Repetitive Peak Forward Surge Current	$T_C = 25^\circ\text{C}, 10 \mu\text{s}$	1190	A
		$T_C = 150^\circ\text{C}, 10 \mu\text{s}$	990	A
$I_{F, SM}$	Non-Repetitive Forward Surge Current	Half-Sine Pulse, $t_p = 8.3 \text{ ms}$	135	A
$I_{F, RM}$	Repetitive Forward Surge Current	Half-Sine Pulse, $t_p = 8.3 \text{ ms}$	74	A
$P_{tot}$	Power Dissipation	$T_C = 25^\circ\text{C}$	340	W
		$T_C = 150^\circ\text{C}$	57	W
$T_J, T_{STG}$	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$	

### Thermal Characteristics

Symbol	Parameter	Ratings	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.44	$^\circ\text{C/W}$

## Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FFSP20120A	FFSP20120A	TO-220-2L	Tube	N/A	N/A	50 units

## Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted.

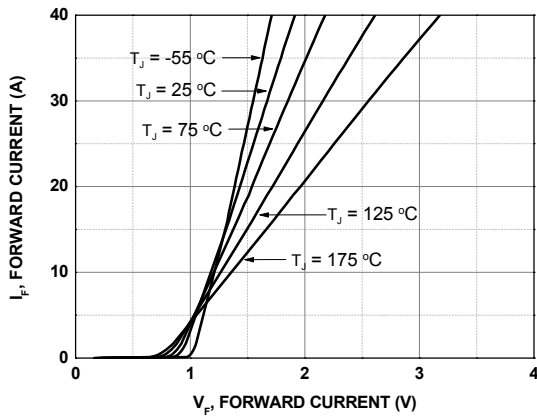
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$V_F$	Forward Voltage	$I_F = 20\text{ A}, T_C = 25^\circ\text{C}$	-	1.45	1.75	V
		$I_F = 20\text{ A}, T_C = 125^\circ\text{C}$	-	1.7	2	
		$I_F = 20\text{ A}, T_C = 175^\circ\text{C}$	-	2	2.4	
$I_R$	Reverse Current	$V_R = 1200\text{ V}, T_C = 25^\circ\text{C}$	-	-	200	$\mu\text{A}$
		$V_R = 1200\text{ V}, T_C = 125^\circ\text{C}$	-	-	300	
		$V_R = 1200\text{ V}, T_C = 175^\circ\text{C}$	-	-	400	
$Q_C$	Total Capacitive Charge	$V = 800\text{ V}$	-	120	-	nC
C	Total Capacitance	$V_R = 1\text{ V}, f = 100\text{ kHz}$	-	1220	-	pF
		$V_R = 400\text{ V}, f = 100\text{ kHz}$	-	111	-	
		$V_R = 800\text{ V}, f = 100\text{ kHz}$	-	88	-	

**Notes:**

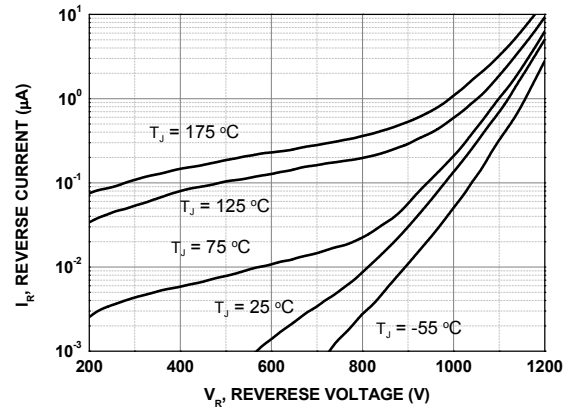
1: EAS of 200 mJ is based on starting  $T_J = 25^\circ\text{C}$ ,  $L = 0.5\text{ mH}$ ,  $I_{AS} = 29\text{ A}$ ,  $V = 150\text{ V}$ .

## Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted.

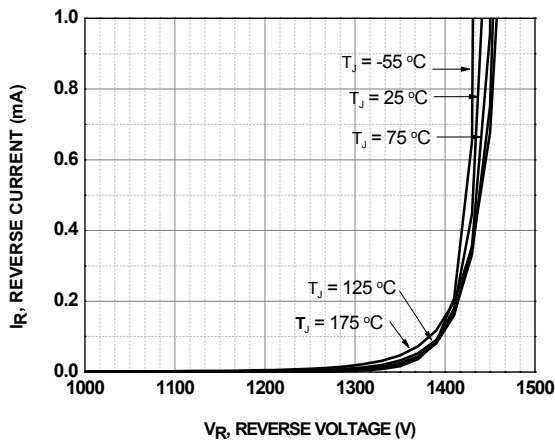
**Figure 1. Forward Characteristics**



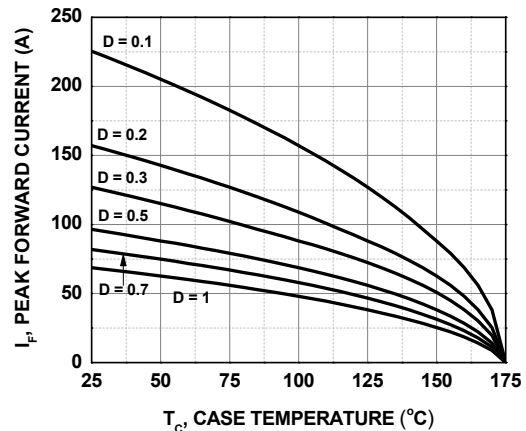
**Figure 2. Reverse Characteristics**



**Figure 3. Reverse Characteristics**

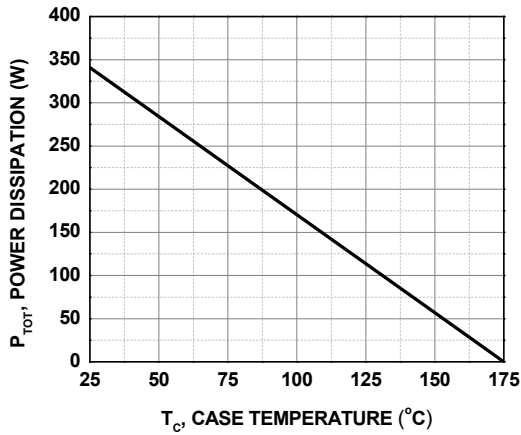


**Figure 4. Current Derating**

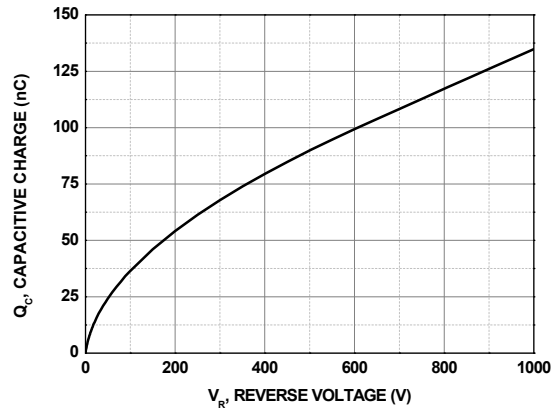


**Typical Characteristics**  $T_J = 25\text{ }^\circ\text{C}$  unless otherwise noted.

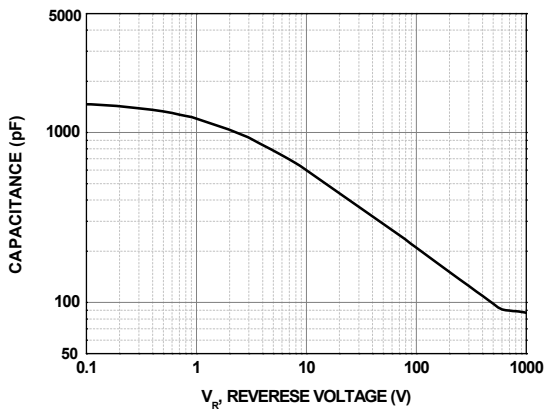
**Figure 5. Power Derating**



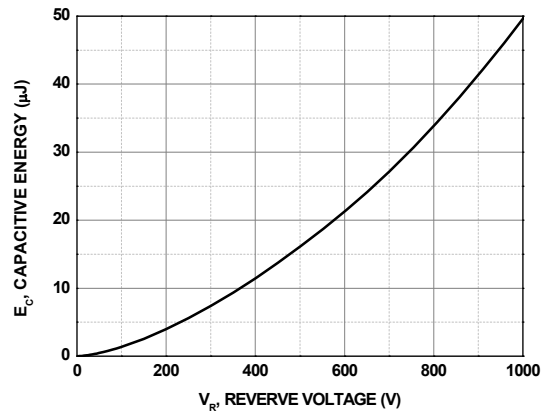
**Figure 6. Capacitive Charge vs. Reverse Voltage**



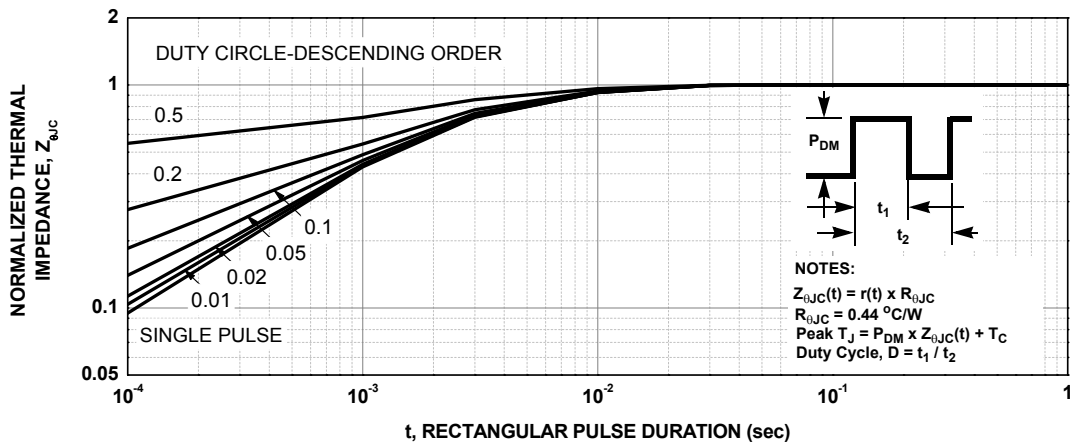
**Figure 7. Capacitance vs. Reverse Voltage**



**Figure 8. Capacitance Stored Energy**



**Figure 9. Junction-to-Case Transient Thermal Response Curve**



### Test Circuit and Waveforms

Figure 10. Unclamped Inductive Switching Test Circuit & Waveform

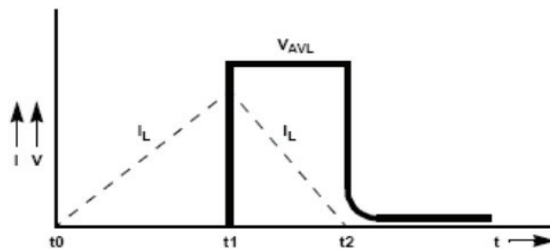
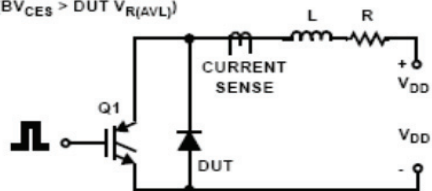
$L = 0.5\text{mH}$

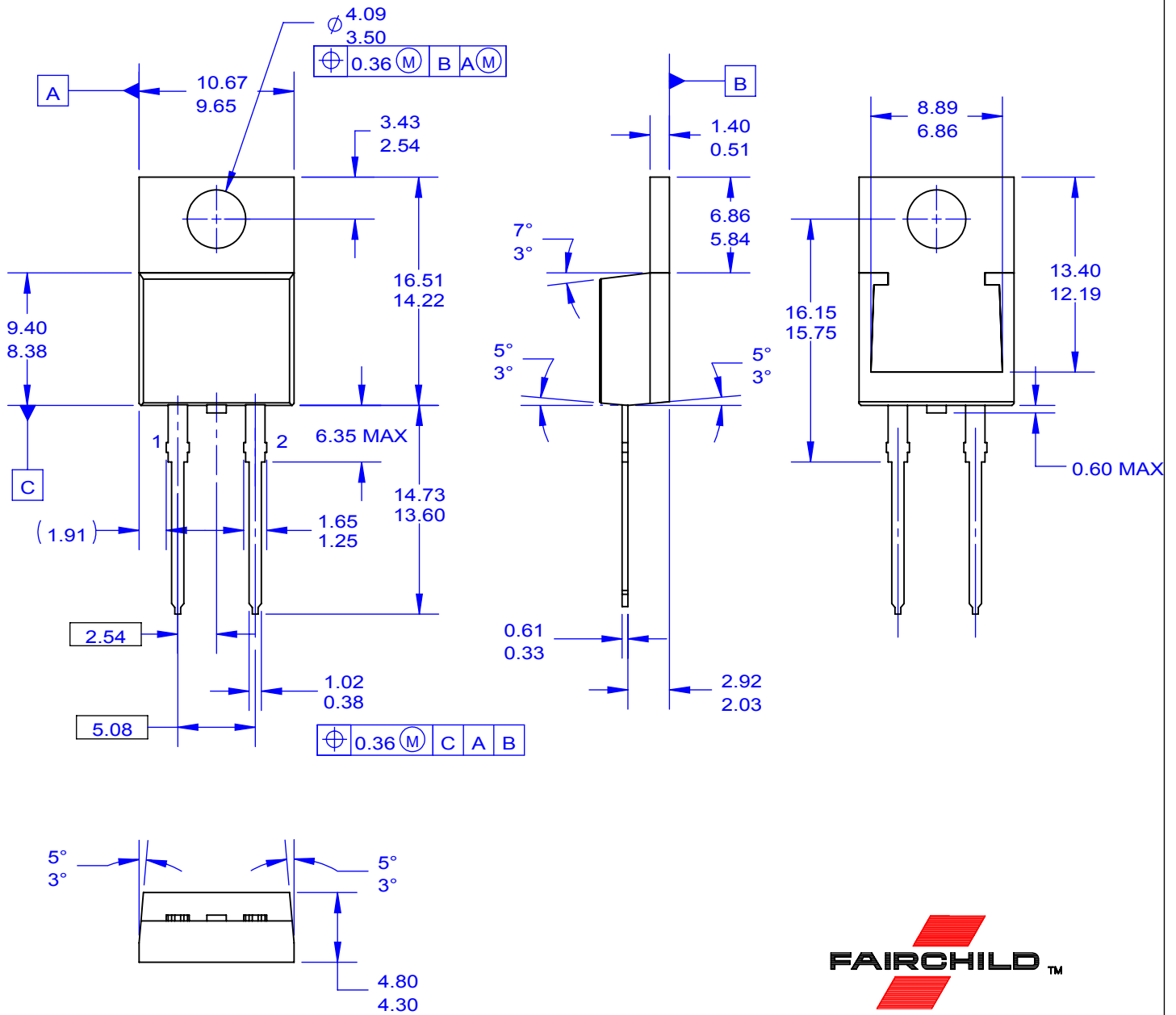
$R < 0.1\Omega$

$V_{DD} = 50\text{V}$

$E_{AVL} = 1/2 L I^2 [V_{R(AVL)} / (V_{R(AVL)} - V_{DD})]$

$Q1 = \text{IGBT (} BV_{CES} > DUT V_{R(AVL)} \text{)}$





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.
- E. DRAWING FILE NAME: TO220A02REV5

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