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October 2016

ON Semiconductor®

FFSH40120ADN_F155

Silicon Carbide Schottky Diode

1200 V, 40 A

Features

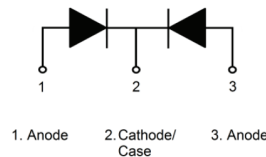
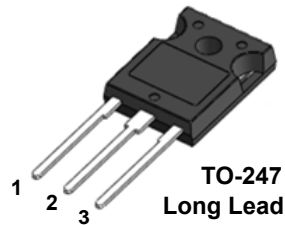
- Max Junction Temperature 175 °C
- Avalanche Rated 200 mJ
- High Surge Current Capacity
- Positive Temperature Coefficient
- Ease of Paralleling
- No Reverse Recovery / No Forward Recovery

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



Absolute Maximum Ratings $T_C = 25^\circ\text{C}$ unless otherwise noted. (per leg)

Symbol	Parameter	FFSH40120ADN_F155	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* / 40**	A
$I_{F, Max}$	Non-Repetitive Peak Forward Surge Current	$T_C = 25^\circ\text{C}, 10 \mu\text{s}$	1190
		$T_C = 150^\circ\text{C}, 10 \mu\text{s}$	990
$I_{F, SM}$	Non-Repetitive Forward Surge Current	Half-Sine Pulse, $t_p = 8.3 \text{ ms}$	135
$I_{F, RM}$	Repetitive Forward Surge Current	Half-Sine Pulse, $t_p = 8.3 \text{ ms}$	74
P_{tot}	Power Dissipation	$T_C = 25^\circ\text{C}$	220
		$T_C = 150^\circ\text{C}$	37
T_J, T_{STG}	Operating and Storage Temperature Range	-55 to +175	$^\circ\text{C}$
	TO247 Mounting Torque, M3 Screw	60	Ncm

Thermal Characteristics

Symbol	Parameter	FFSH40120ADN_F155	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max.	0.68* / 0.34**	$^\circ\text{C}/\text{W}$

* Per Leg, ** Per Device

FFSH40120ADN_F155 — Silicon Carbide Schottky Diode

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FFSH40120ADN_F155	FFSH40120ADN	TO-247 Long Lead	Tube	N/A	N/A	30 units

Electrical Characteristics $T_C = 25^\circ\text{C}$ unless otherwise noted. (per leg)

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	μA
		$V_R = 1200\text{ V}, T_C = 125^\circ\text{C}$	-	-	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 200mJ 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 (per leg).

Figure 1. Forward Characteristics

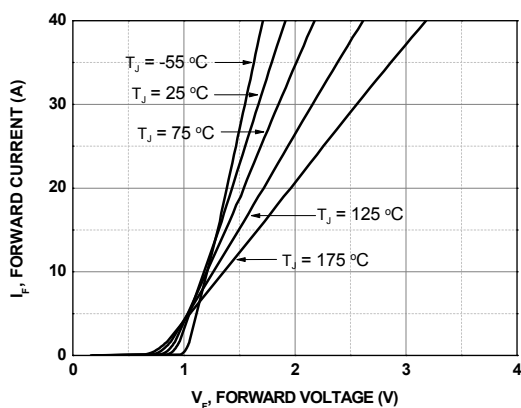


Figure 2. Reverse Characteristics

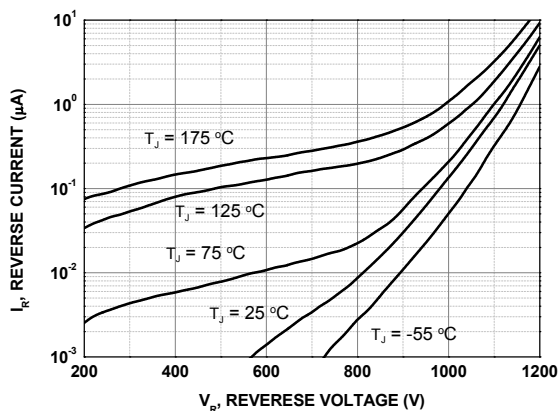


Figure 3. Reverse Characteristics

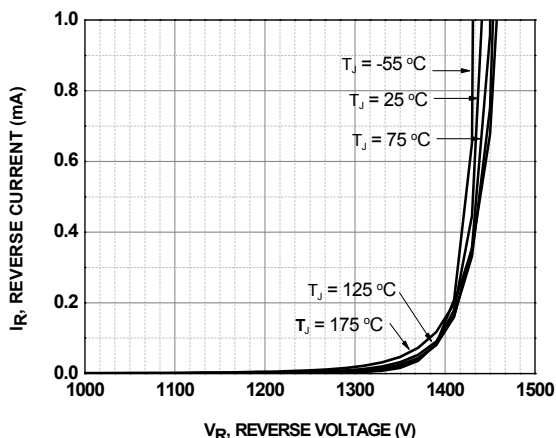
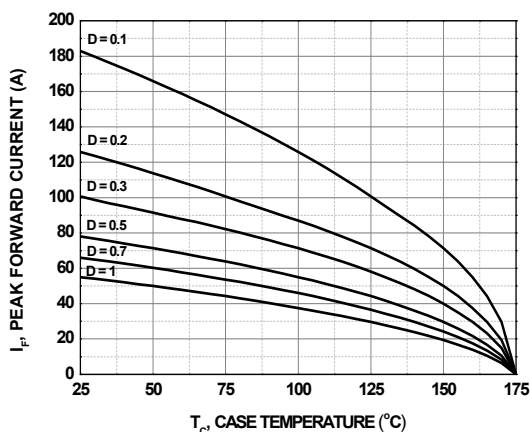


Figure 4. Current Derating



Typical Characteristics $T_J = 25^\circ\text{C}$ unless otherwise noted (per leg, continue).

Figure 5. Power Derating

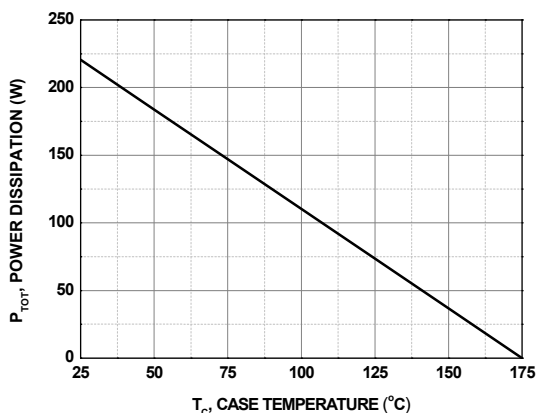


Figure 6. Capacitive Charge vs. Reverse Voltage

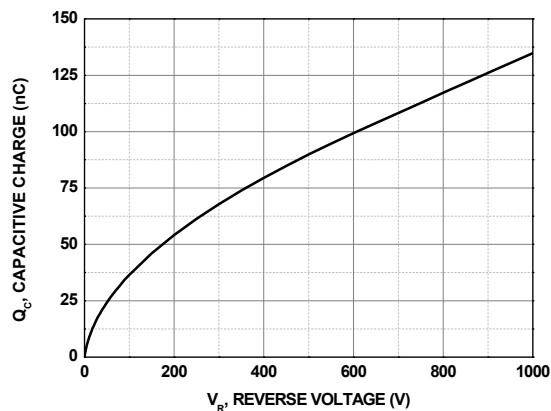


Figure 7. Capacitance vs. Reverse Voltage

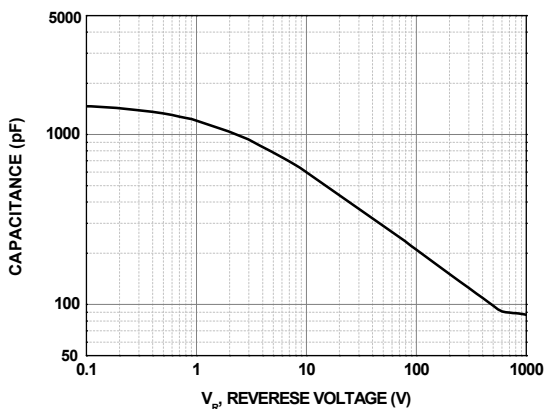


Figure 8. Capacitance Stored Energy

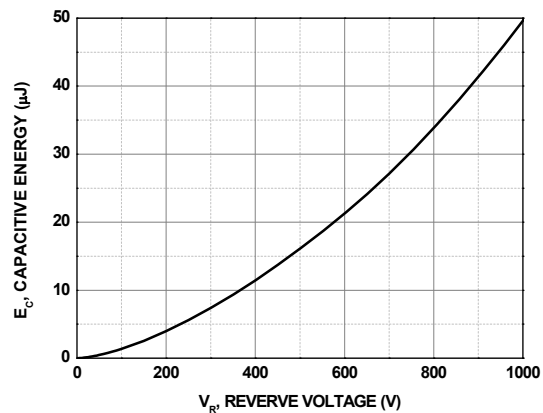
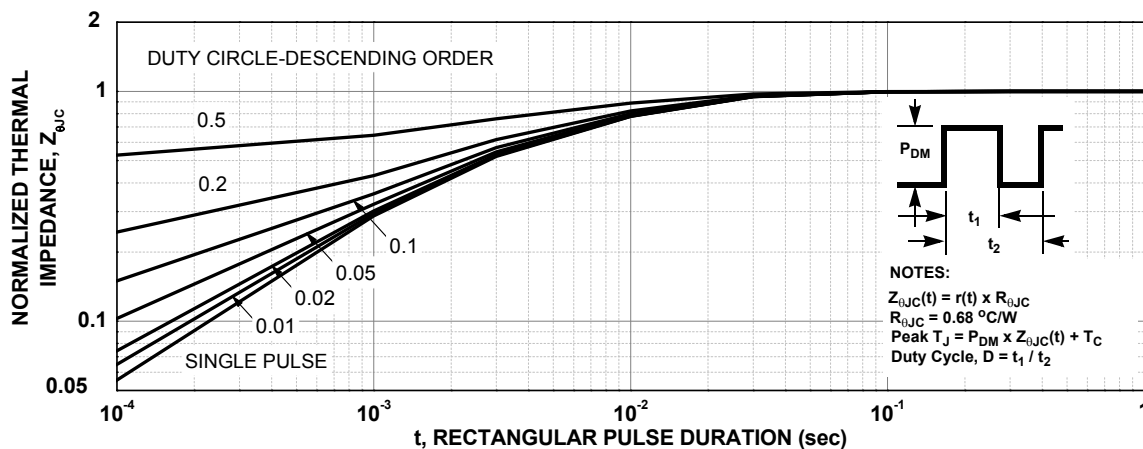


Figure 9. Junction-to-Case Transient Thermal Response Curve



Test Circuit and Waveforms

Figure 10. Unclamped Inductive Switching Test Circuit & Waveform

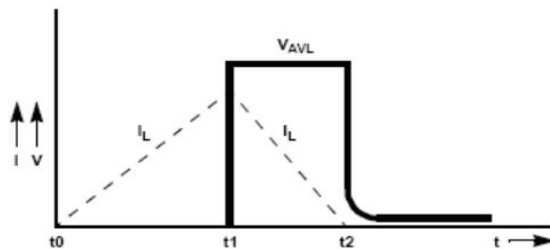
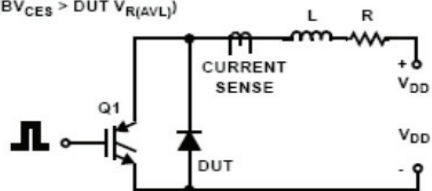
$L = 0.5\text{mH}$

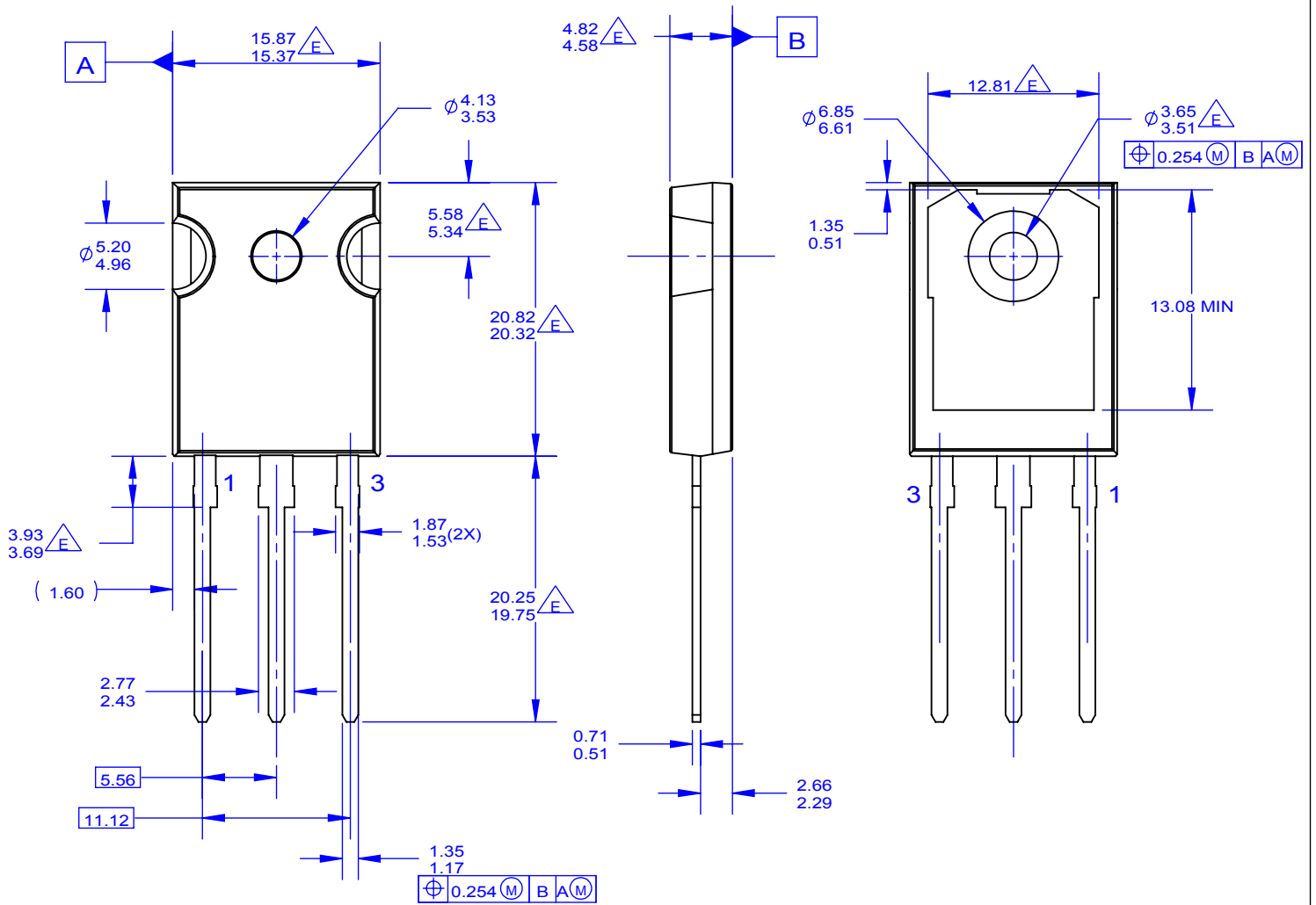
$R < 0.1\Omega$

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

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

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





NOTES: UNLESS OTHERWISE SPECIFIED.

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- D. DRAWING CONFORMS TO ASME Y14.5 - 1994

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