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ON Semiconductor®

PCFFS40120AF

Silicon Carbide Schottky Diode

1200 V, 40 A

Features

- Max Junction Temperature 175 °C
- Avalanche Rated 420 mJ
- High Surge Current Capacity
- Positive Temperature Coefficient
- Ease of Paralleling
- No Reverse Recovery / No Forward Recovery

Applications

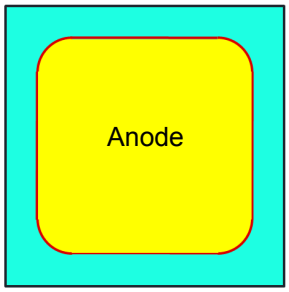
- General Purpose
- SMPS, Solar Inverter, UPS
- Power Switching Circuits

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 dependent switching characteristics, and excellent thermal performance sets Silicon Carbide as the next generation of power semiconductor. System benefits include highest efficiency, faster operation frequency, increased power density, reduced EMI, and reduced system size and cost.

Die Information

- Wafer Diameter 6 inch
- Die Size 4,200 x 4,200 μm (include Scribe Lane)
- Metallization
  - · Top Ti / TiN / AlCu 4μm
  - · Back Ti/ NiV /Ag
- Die Thickness Typ. 200μm
- Bonding Pad Size
  - · Anode 3,620 × 3,620 μm
- Recommended Wire Bond (Note 1)
  - · Anode 20mil ×3



Electrical Characteristics on Wafer (Note 2) T_C = 25°C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_R	Reverse Blocking Voltage	I_R = 200 μA, T_C = 25 °C	1200	-	-	V
V_F	Forward Voltage	I_F = 40 A, T_C = 25 °C	1.20	-	1.75	V
I_R	Reverse Current	V_R = 1200 V, T_C = 25 °C	-	-	200	μA

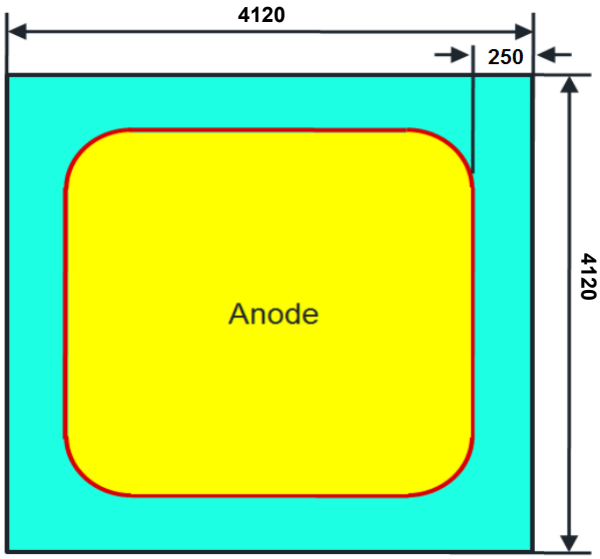
Notes:

1. Based on TO-247 package of ON Semiconductor
2. Tested 100% on wafer

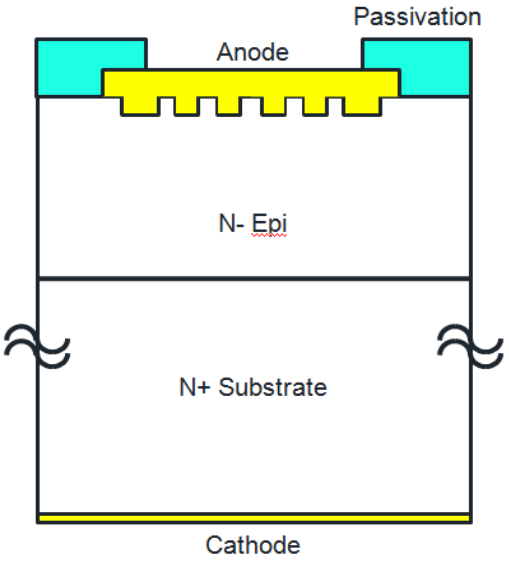
For Additional Product Information and Electrical Characteristics on Package

Refer to *FFSH40120A* product datasheet.

Die Layout (Dimension: μm, except Scribe Lane)



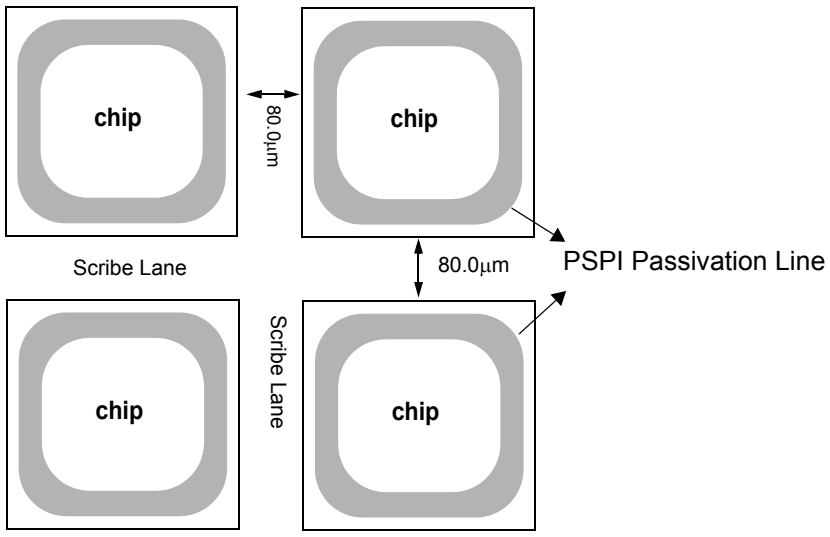
Cross Section



Passivation Information

- Passivation Material: Polymide (PSPI)
- Passivation Type: Local Passivation
- Passivation Thickness: 90KA

The Configuration of chips (Based on 6 inch wafer)



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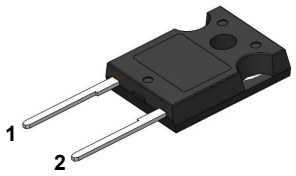
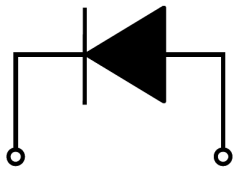


TO-247-2L



1. Cathode **2. Anode**

Absolute Maximum Ratings T_C = 25 °C unless otherwise noted.

Symbol	Parameter		FFSH40120A	Unit
V_{RRM}	Peak Repetitive Reverse Voltage		1200	V
E_{AS}	Single Pulse Avalanche Energy	(Note 1)	420	mJ
I_F	Continuous Rectified Forward Current @ T_C < 155 °C		40	A
	Continuous Rectified Forward Current @ T_C < 135 °C		61	A
$I_{F, Max}$	Non-Repetitive Peak Forward Surge Current	T_C = 25 °C, 10 μs	1650	A
		T_C = 150 °C, 10 μs	1550	A
$I_{F,SM}$	Non-Repetitive Forward Surge Current	Half-Sine Pulse, t_p = 8.3 ms	270	A
$I_{F,RM}$	Repetitive Forward Surge Current	Half-Sine Pulse, t_p = 8.3 ms	120	A
Ptot	Power Dissipation	T_C = 25 °C	682	W
		T_C = 150 °C	114	W
T_J, T_{STG}	Operating and Storage Temperature Range		-55 to +175	°C
	TO247 Mounting Torque, M3 Screw		60	Ncm

Thermal Characteristic

Symbol	Parameter	Rating	Unit
$R_{\theta JC}$	Thermal Resistance, Junction to Case, Max	0.22	°C/W

Semiconductor Components Industries, LLC, 2018
Jan, 2018, Rev. O

Publication Order Number:
FFSH40120A/D

Package Marking and Ordering Information

Part Number	Top Mark	Package	Packing Method	Reel Size	Tape Width	Quantity
FFSH40120A	FFSH40120A	TO-247-2L	Tube	N/A	N/A	30 units

Electrical Characteristics T_C = 25 °C unless otherwise noted.

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V_F	Forward Voltage	I_F = 40 A, T_C = 25 °C	-	1.45	1.75	V
		I_F = 40 A, T_C = 125 °C	-	1.7	2.0	
		I_F = 40 A, T_C = 175 °C	-	2.0	2.4	
I_R	Reverse Current	V_R = 1200 V, T_C = 25 °C	-	-	200	μA
		V_R = 1200 V, T_C = 125 °C	-	-	300	
		V_R = 1200 V, T_C = 175 °C	-	-	400	
Q_C	Total Capacitive Charge	V = 800 V	-	220	-	nC
C	Total Capacitance	V_R = 1 V, f = 100 kHz	-	2250	-	pF
		V_R = 400 V, f = 100 kHz	-	204	-	
		V_R = 800 V, f = 100 kHz	-	169	-	

Notes:
1: E_{AS} of 420 mJ is based on starting T_J = 25 °C, L = 0.5 mH, I_{AS} = 41 A, V = 50 V.

Typical Characteristics T_J = 25 °C unless otherwise noted.

Figure 1. Forward Characteristics

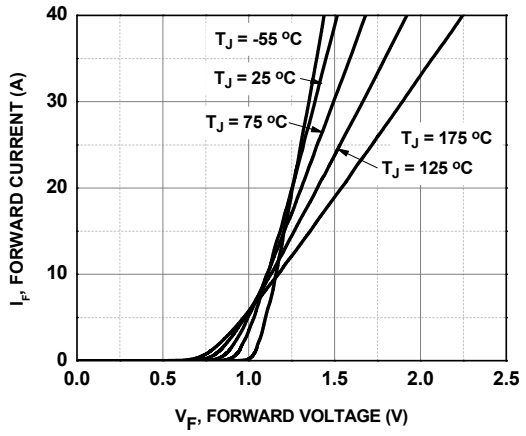


Figure 2. Reverse Characteristics

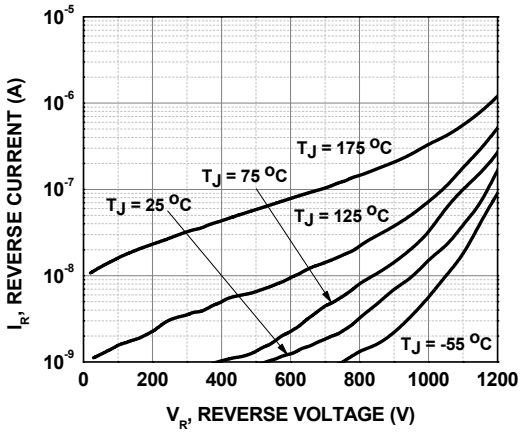


Figure 3. Current Derating

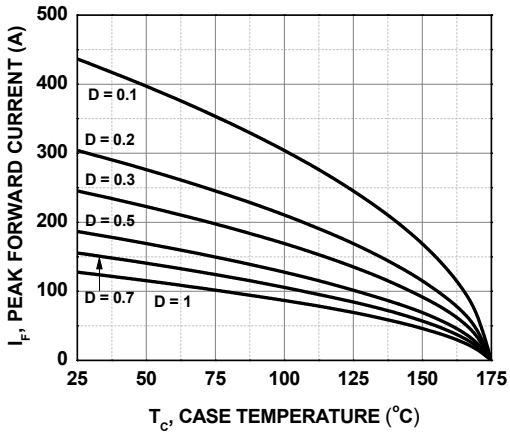
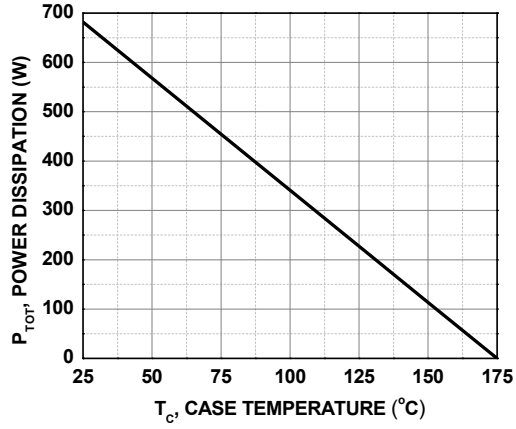


Figure 4. Power Derating



Typical Characteristics T_J = 25 °C unless otherwise noted.

Figure 5. Capacitive Charge vs. Reverse Voltage

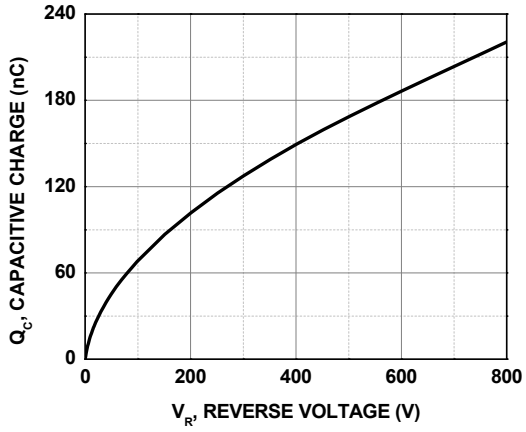


Figure 6. Capacitive vs. Reverse Voltage

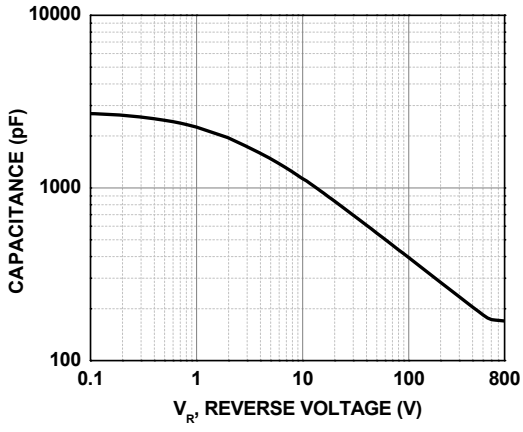


Figure 7. Capacitance Stored Energy

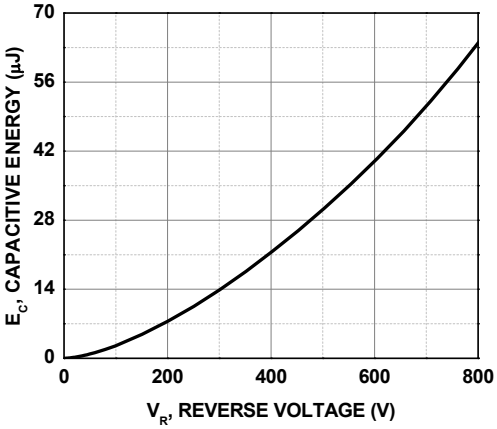
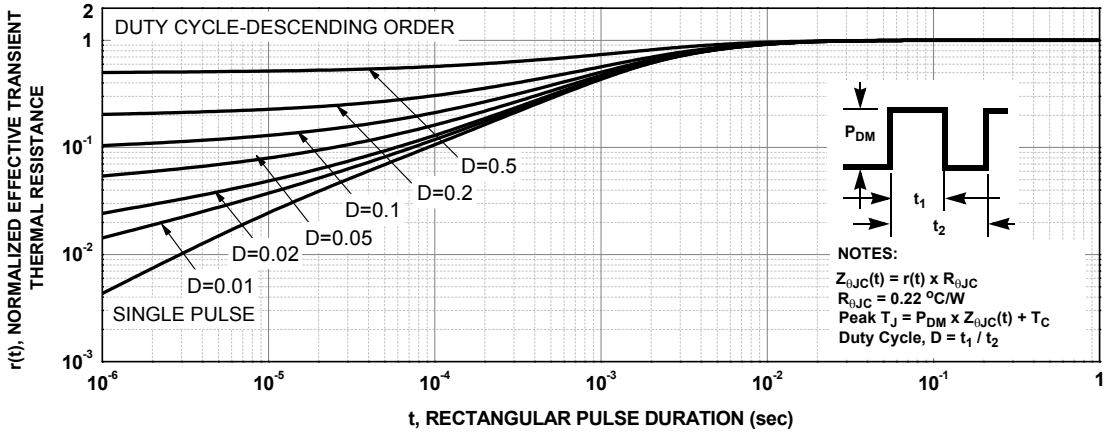
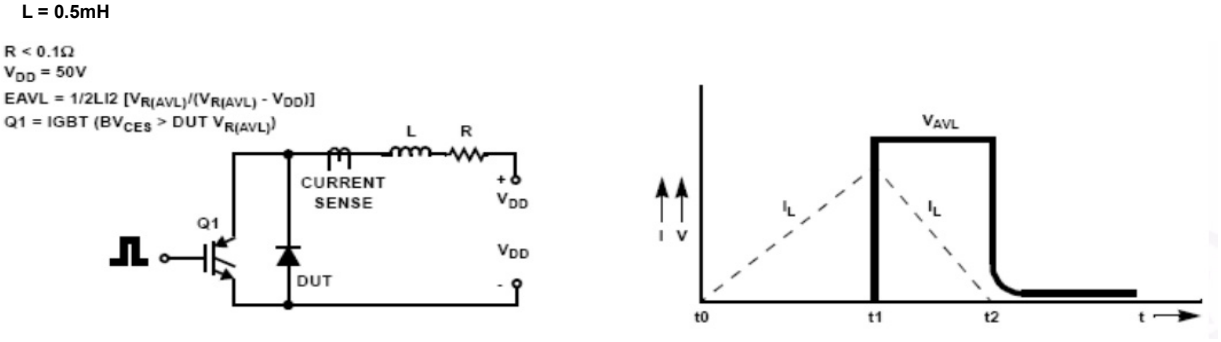


Figure 8. Junction-to-Case Transient Thermal Response Curve

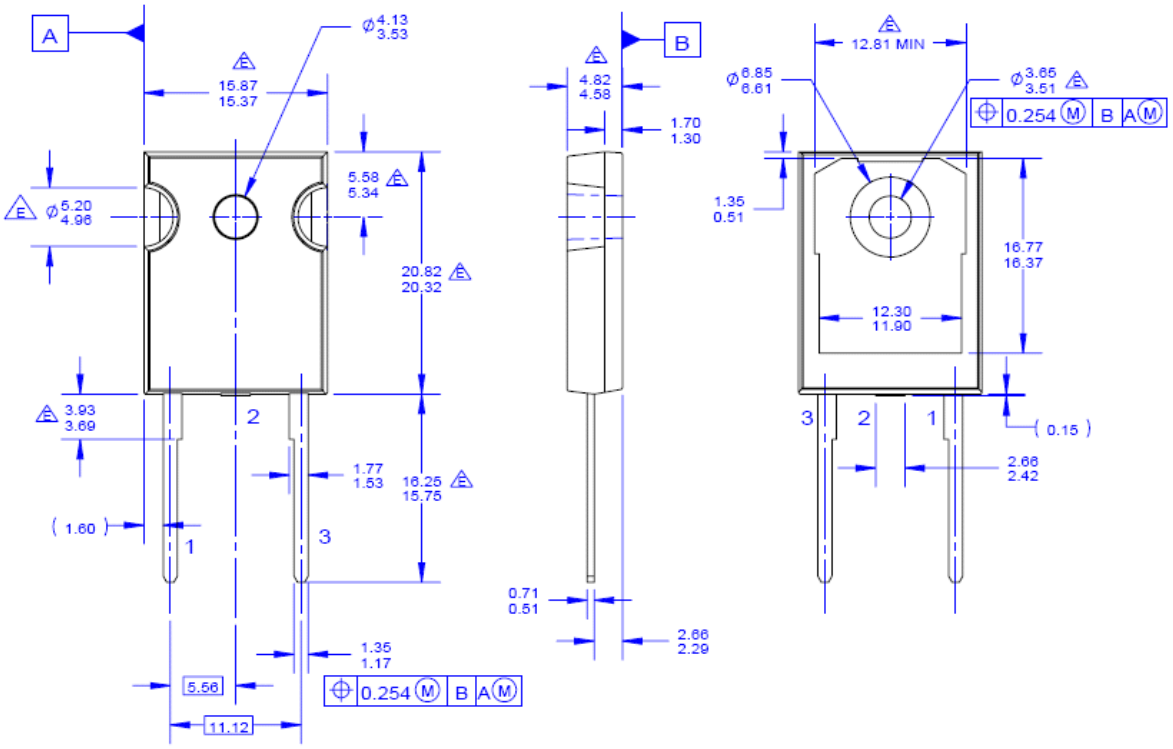


Test Circuit and Waveforms

Figure 9. Unclamped Inductive Switching Test Circuit & Waveform



Mechanical Dimensions



NOTES: UNLESS OTHERWISE SPECIFIED.

A. PACKAGE REFERENCE: JEDEC TO-247, ISSUE E, VARIATION AB, DATED JUNE, 2004.
B. DIMENSIONS ARE EXCLUSIVE OF BURRS, MOLD FLASH, AND TIE BAR EXTRUSIONS.
C. ALL DIMENSIONS ARE IN MILLIMETERS.
D. DRAWING CONFORMS TO ASME Y14.5 - 2009.
E. DOES NOT COMPLY JEDEC STANDARD VALUE.
F. DRAWING FILENAME: MKT-TO247B02_REV04.
G. FAIRCHILD SEMICONDUCTOR.

Figure 10. TO-247, Molded, 2LD, Jedec Option AB