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# Silicon Carbide Schottky Diode

1200 V, 40 A

### 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 210 mJ
- High Surge Current Capacity
- Positive Temperature Coefficient
- Ease of Paralleling
- No Reverse Recovery/No Forward Recovery
- AEC-Q101 Qualified and PPAP Capable
- These Devices are Pb-Free, Halogen Free/BFR Free and are RoHS Compliant

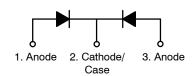
# **Applications**

- Automotive HEV-EV Onboard Chargers
- Automotive HEV-EV DC-DC Converters

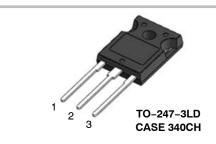


### ON Semiconductor®

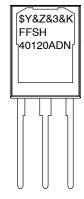
www.onsemi.com



**Schottky Diode** 



#### MARKING DIAGRAM



\$Y = ON Semiconductor Logo &Z = Assembly Plant Code &3 = Numeric Date Code

kK = Lot Code

FFSH40120ADN = Specific Device Code

#### **ORDERING INFORMATION**

See detailed ordering and shipping information on page 2 of this data sheet.

# ABSOLUTE MAXIMUM RATINGS ( $T_C = 25$ °C unless otherwise noted)

Symbol	Parameter		Value	Unit
$V_{RRM}$	Peak Repetitive Reverse Voltage		1200	V
E <sub>AS</sub>	Single Pulse Avalanche Energy (Note 1)		210	mJ
I <sub>F</sub>	Continuous Rectified Forward Current @ T <sub>C</sub> < 148°C		20* / 40**	Α
	Continuous Rectified Forward Current @ T <sub>C</sub> <	135°C	25* / 50**	
I <sub>F, Max</sub>	Non-Repetitive Peak Forward Surge Current	T <sub>C</sub> = 25°C, 10 μs	1190	Α
		T <sub>C</sub> = 150°C, 10 μs	990	Α
I <sub>F,SM</sub>	Non-Repetitive Forward Surge Current	Half-Sine Pulse, t <sub>p</sub> = 8.3 ms	135	Α
I <sub>F,RM</sub>	Repetitive Forward Surge Current	Half-Sine Pulse, t <sub>p</sub> = 8.3 ms	74	А
Ptot	Power Dissipation	T <sub>C</sub> = 25°C	220	W
		T <sub>C</sub> = 150°C	37	W
T <sub>J</sub> , T <sub>STG</sub>	Operating and Storage Temperature Range	•	-55 to +175	°C
	TO247 Mounting Torque, M3 Screw		60	Ncm

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 210 mJ is based on starting  $T_J = 25^{\circ}C$ , L = 0.5 mH,  $I_{AS} = 29$  A, V = 50 V. \*Per leg, \*\* Per Device

#### THERMAL CHARACTERISTICS

Symbol	Parameter	Value	Unit
$R_{ heta JC}$	Thermal Resistance, Junction to Case, Max	0.68* / 0.34**	°C/W

<sup>\*</sup>Per leg, \*\* Per Device

# **ELECTRICAL CHARACTERISTICS** (T<sub>C</sub> = 25°C unless otherwise noted)

Symbol	Parameter	Test Condition	Min	Тур	Max	Unit
V <sub>F</sub>	Forward Voltage	I <sub>F</sub> = 20 A, T <sub>C</sub> = 25°C	-	1.45	1.75	V
		I <sub>F</sub> = 20 A, T <sub>C</sub> = 125°C	-	1.7	2.0	
		I <sub>F</sub> = 20 A, T <sub>C</sub> = 175°C	-	2.0	2.4	
I <sub>R</sub>	Reverse Current	V <sub>R</sub> = 1200 V, T <sub>C</sub> = 25°C	-	-	200	μΑ
		V <sub>R</sub> = 1200 V, T <sub>C</sub> = 125°C	-	-	300	
		V <sub>R</sub> = 1200 V, T <sub>C</sub> = 175°C	-	-	400	
Q <sub>C</sub>	Total Capacitive Charge	V = 800 V	-	120	-	nC
С	Total Capacitance	V <sub>R</sub> = 1 V, f = 100 kHz	-	1220	-	pF
		V <sub>R</sub> = 400 V, f = 100 kHz	_	111	_	
		V <sub>R</sub> = 800 V, f = 100 kHz	_	88	_	

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.

#### **ORDERING INFORMATION**

Part Number	Top Marking	Package	Shipping
FFSH40120ADN-F085	FFSH40120ADN	TO-247-3LD (Pb-Free / Halogen Free)	30 Units / Tube

#### TYPICAL CHARACTERISTICS

(T<sub>J</sub> = 25°C unless otherwise noted; per leg)

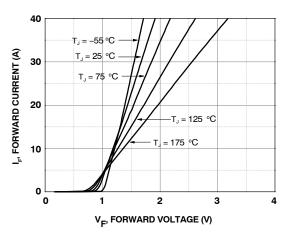


Figure 1. Forward Characteristics

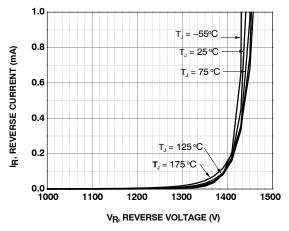


Figure 3. Reverse Characteristics

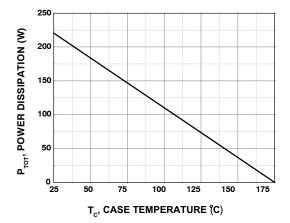


Figure 5. Power Derating

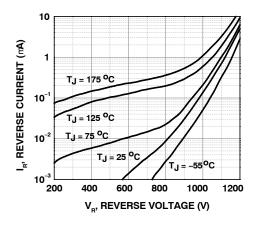


Figure 2. Reverse Characteristics

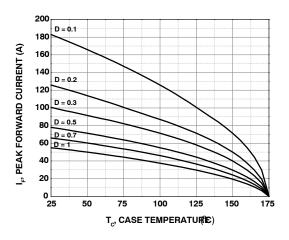


Figure 4. Current Derating

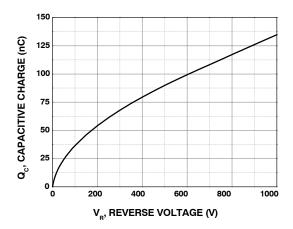


Figure 6. Capacitive Charge vs. Reverse Voltage

# **TYPICAL CHARACTERISTICS**

 $(T_J = 25^{\circ}C \text{ unless otherwise noted; per leg; continued})$ 

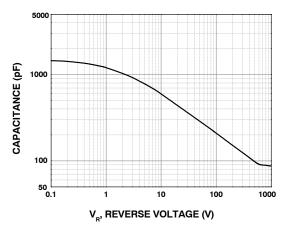


Figure 7. Capacitance vs. Reverse Voltage

Figure 8. Capacitance Stored Energy

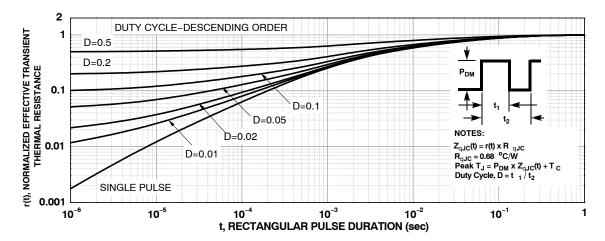


Figure 9. Junction-to-Case Transient Thermal Response Curve

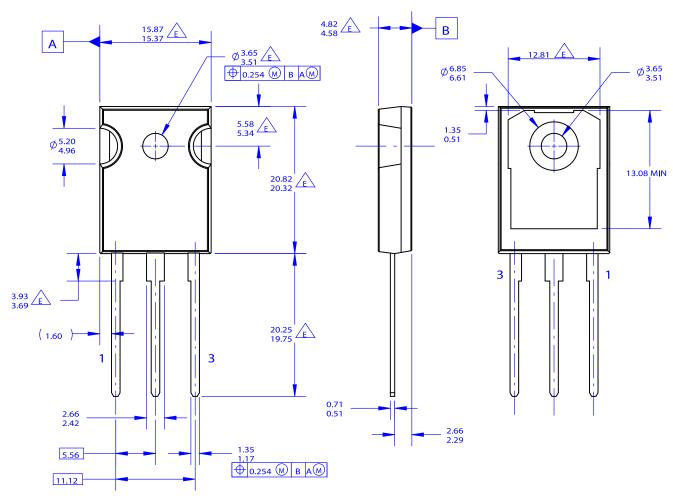
# **TEST CIRCUIT AND WAVEFORMS**

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

Figure 10. Unclamped Inductive Switching Test Circuit & Waveform

TO-247-3LD CASE 340CH ISSUE O

**DATE 31 OCT 2016** 



NOTES: UNLESS OTHERWISE SPECIFIED.

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- D. DRAWING CONFORMS TO ASME Y14.5 1994

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