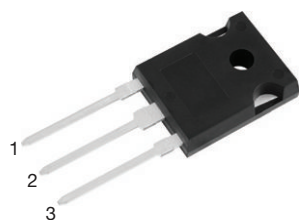
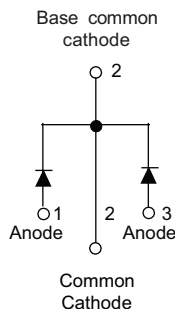


# 650 V Power SiC Gen 3 Merged PIN Schottky Diode, 2 x 10 A



TO-247AD 3L



## FEATURES

- Majority carrier diode using Schottky technology on SiC wide band gap material
- Improved  $V_F$  and efficiency by thin wafer technology
- Positive  $V_F$  temperature coefficient, for easy paralleling
- Virtually no recovery tail and no switching losses
- Temperature invariant switching behavior
- 175 °C maximum operating junction temperature
- MPS structure for high ruggedness to forward current surge events
- Meets JESD 201 class 1A whisker test
- Solder Bath temperature 275 °C maximum, 10 s per JESD 22-B106
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



**RoHS**  
COMPLIANT  
**HALOGEN**  
**FREE**

## LINKS TO ADDITIONAL RESOURCES



3D Models



Application Notes

PRIMARY CHARACTERISTICS	
$I_F$	2 x 10 A
$V_R$	650 V
$V_F$ at $I_F$ at 25 °C, typ.	1.3 V
$T_J$ max.	175 °C
$I_R$ at $V_R$ at 175 °C	4.5 $\mu$ A
$Q_C$ ( $V_R = 400$ V)	29 nC
Package	TO-247AD 3L
Circuit configuration	Common cathode

## DESCRIPTION / APPLICATIONS

Wide band gap SiC based 650 V Schottky diode, designed for high performance and ruggedness.

Optimum choice for high speed hard switching and efficient operation over a wide temperature range, it is also recommended for all applications suffering from Silicon ultrafast recovery behavior.

Typical applications include AC/DC PFC and DC/DC ultra high frequency output rectification in FBPS and LLC converters.

## MECHANICAL DATA

**Case:** TO-247AD 3L

Molding compound meets UL 94 V-0 flammability rating Base P/N-M3 - halogen-free, RoHS-compliant

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

**Mounting torque:** 10 in-lbs maximum

MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise specified)				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		650	V
Continuous forward current, per leg	$I_F^{(1)}$	$T_C = 146$ °C (DC)	10	A
	$I_F^{(2)}$	$T_C = 154$ °C (DC)		
DC blocking voltage	$V_{DC}$		650	V
Repetitive peak forward current	$I_{FRM}$	$T_C = 25$ °C, $f = 50$ Hz, square wave, DC = 25 %	41	A
Non-repetitive peak forward surge current, per leg	$I_{FSM}$	$T_C = 25$ °C, $t_p = 10$ ms, half sine wave	60	
		$T_C = 110$ °C, $t_p = 10$ ms, half sine wave	58	
Power dissipation, per leg	$P_{tot}^{(1)}$	$T_C = 25$ °C	79	W
		$T_C = 110$ °C	34	
	$P_{tot}^{(2)}$	$T_C = 25$ °C	107	W
		$T_C = 110$ °C	46	
$I^2t$ value, per leg	$\int i^2 dt$	$T_C = 25$ °C	18	A <sup>2</sup> s
		$T_C = 110$ °C	17	
Operating junction and storage temperatures	$T_J^{(2)}$ , $T_{Stg}$		-55 to +175	°C

## Notes

(1) Based on maximum  $R_{th}$

(2) Based on typical  $R_{th}$

(3) The heat generated must be less than the thermal conductivity from junction-to-ambient:  $dP_D/dT_J < 1/R_{\theta JA}$

**ELECTRICAL SPECIFICATIONS** ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Forward voltage, per leg	$V_F$	$I_F = 10\text{ A}$	-	1.3	1.5	V
		$I_F = 10\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$	-	1.46	1.85	
		$I_F = 10\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$	-	1.52	-	
Reverse leakage current, per leg	$I_R$	$V_R = V_R\text{ rated}$	-	0.7	55	$\mu\text{A}$
		$V_R = V_R\text{ rated}, T_J = 150\text{ }^{\circ}\text{C}$	-	2.8	125	
		$V_R = V_R\text{ rated}, T_J = 175\text{ }^{\circ}\text{C}$	-	4.5	-	
Total capacitance, per leg	C	$V_R = 1\text{ V}, f = 1\text{ MHz}$	-	445	-	pF
		$V_R = 400\text{ V}, f = 1\text{ MHz}$	-	43	-	
Total capacitive charge, per leg	$Q_C$	$V_R = 400\text{ V}, f = 1\text{ MHz}$	-	29	-	nC

**THERMAL - MECHANICAL SPECIFICATIONS** ( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

PARAMETER		SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction-to-case	per leg	$R_{thJC}$		-	1.4	1.9	$^{\circ}\text{C/W}$
	per device			-	0.8	1	$^{\circ}\text{C/W}$
Marking device				3C20CP07L			

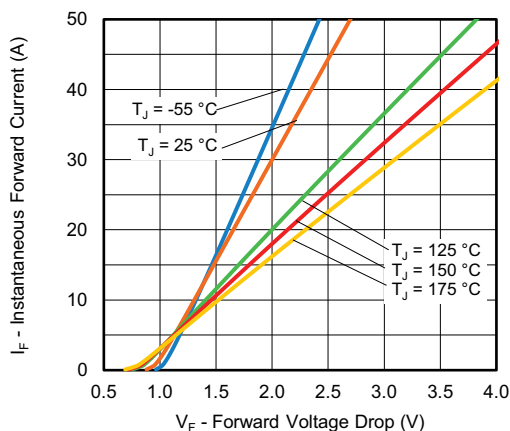


Fig. 1 - Typical Forward Voltage Drop Characteristics, Per Leg

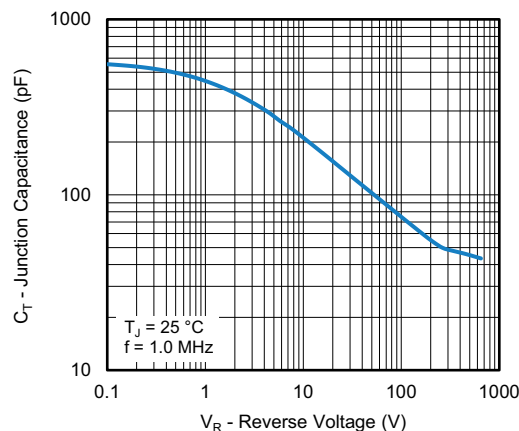


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, Per Leg

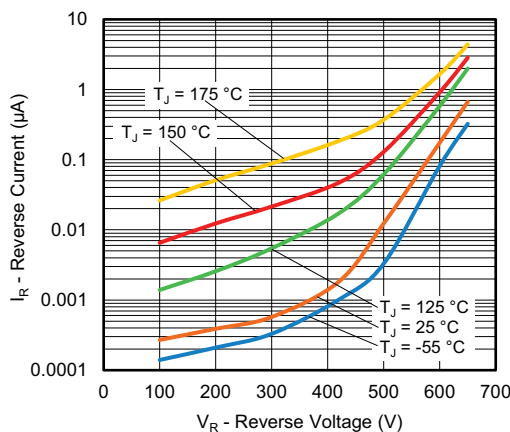


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage, Per Leg

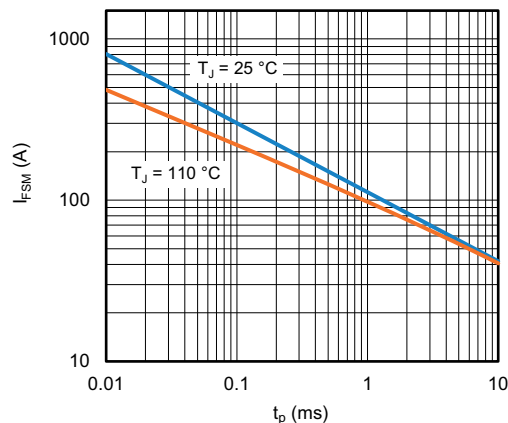


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration, Per Leg (Square Wave)

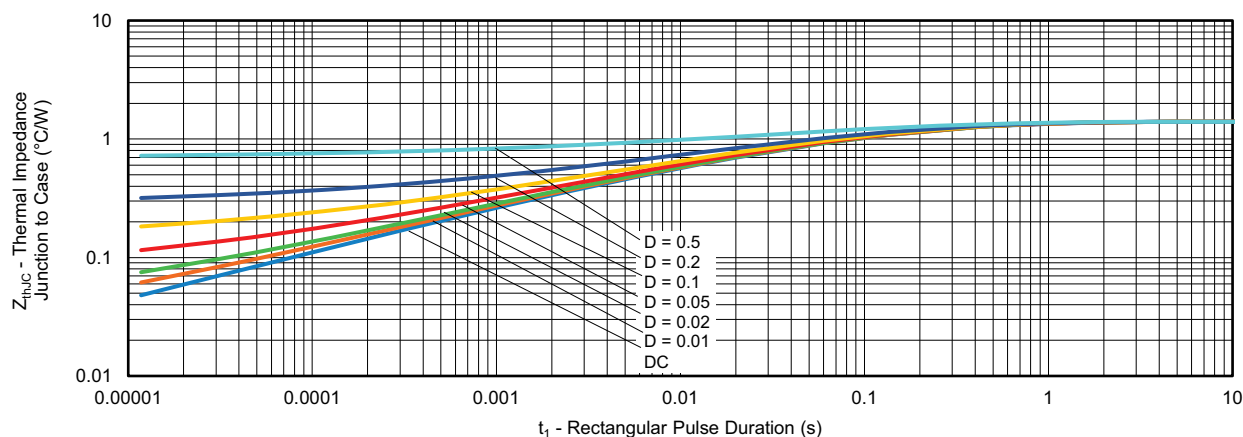
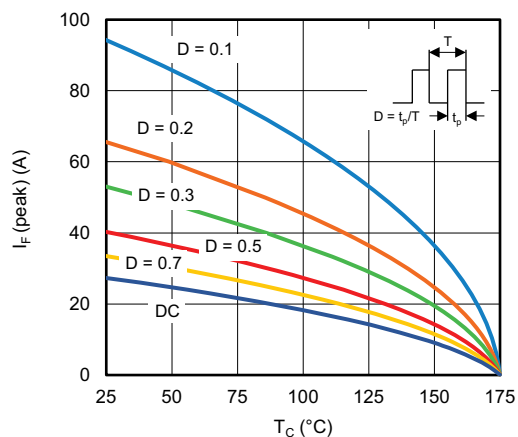

Fig. 5 - Typical Thermal Impedance  $Z_{thJC}$  Characteristics, Per Leg


Fig. 6 - Peak Forward Current vs. Maximum Allowable Case Temperature, Per Leg

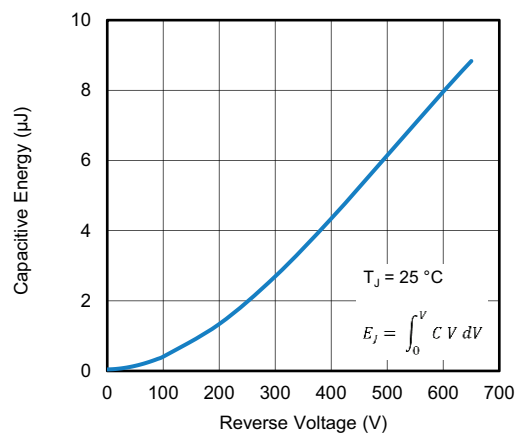


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage, Per Leg

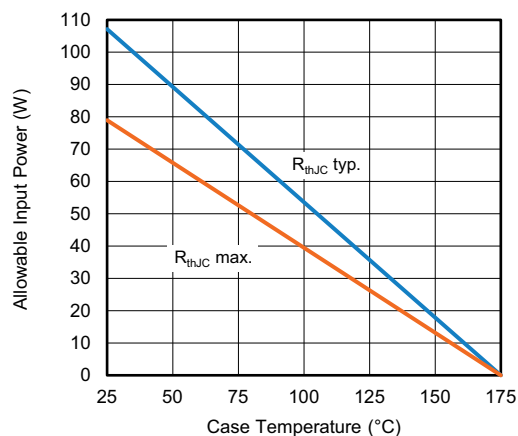


Fig. 7 - Forward Power Loss Characteristics, Per Leg

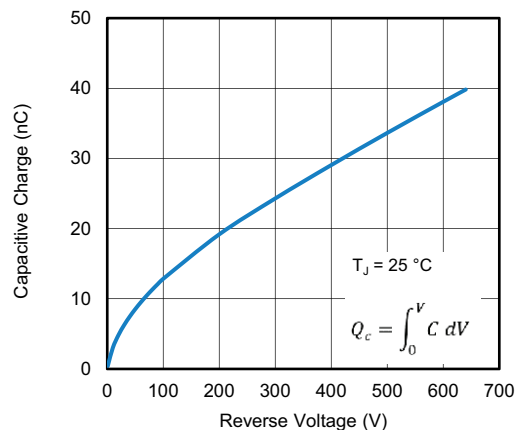


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage, Per Leg



## ORDERING INFORMATION TABLE

Device code	VS-	3C	20	C	P	07	L	-M3
	1	2	3	4	5	6	7	8

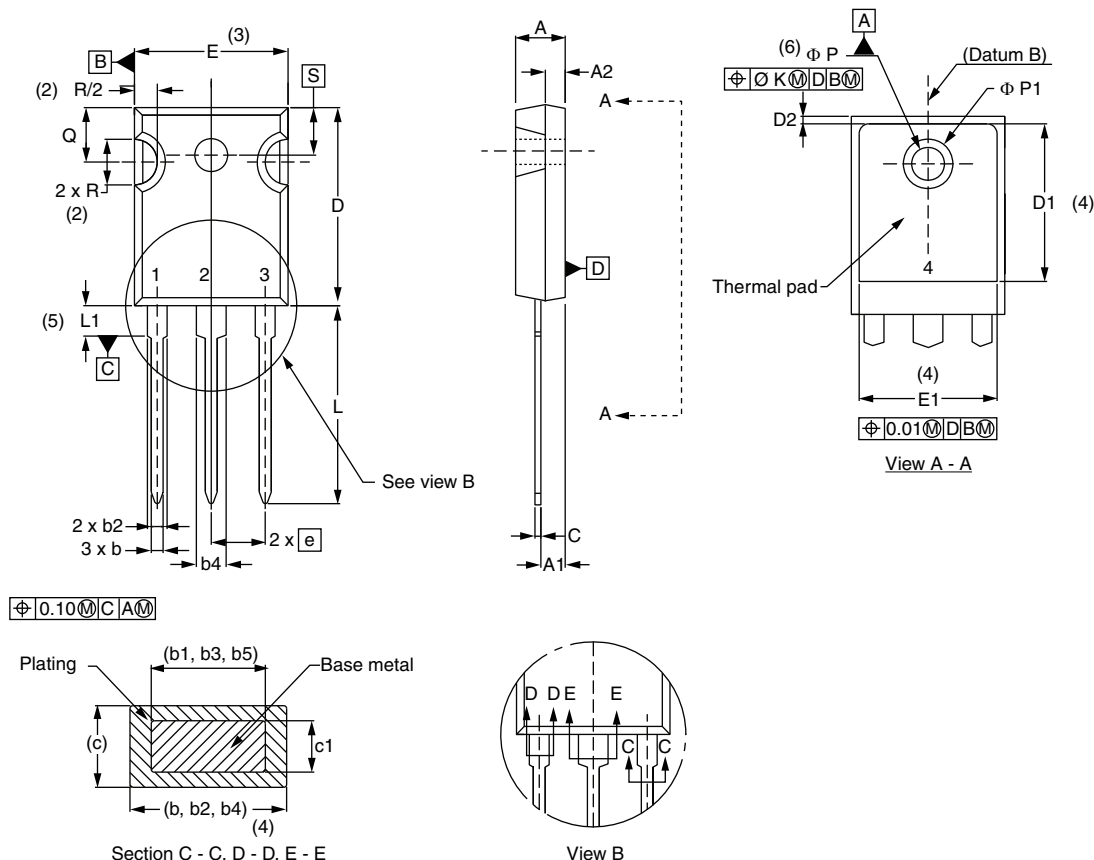
- |          |   |  |
|----------|---|--|
| <b>1</b> | - | Vishay Semiconductors product                                      |
| <b>2</b> | - | 3C = SiC diode, Generation 3                                       |
| <b>3</b> | - | Current rating (20 = 20 A)   |
| <b>4</b> | - | C = common cathode   |
| <b>5</b> | - | P = package TO-247   |
| <b>6</b> | - | Voltage rating: (07 = 650 V)                                       |
| <b>7</b> | - | L = long lead  |
| <b>8</b> | - | Environmental digit:   |
|          |   | -M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free |

ORDERING INFORMATION		
PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-3C20CP07L-M3	25/tube	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?95626">www.vishay.com/doc?95626</a>
Part marking information	<a href="http://www.vishay.com/doc?95007">www.vishay.com/doc?95007</a>

### TO-247AD 3L

**DIMENSIONS** in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.65	5.31	0.183	0.209	
A1	2.21	2.59	0.087	0.102	
A2	1.50	2.49	0.059	0.098	
b	0.99	1.40	0.039	0.055	
b1	0.99	1.35	0.039	0.053	
b2	1.65	2.39	0.065	0.094	
b3	1.65	2.34	0.065	0.092	
b4	2.59	3.43	0.102	0.135	
b5	2.59	3.38	0.102	0.133	
c	0.38	0.89	0.015	0.035	
c1	0.38	0.84	0.015	0.033	
D	19.71	20.70	0.776	0.815	3
D1	13.08	-	0.515	-	4

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D2	0.51	1.30	0.020	0.051	
E	15.29	15.87	0.602	0.625	3
E1	13.46	-	0.53	-	
e	5.46 BSC		0.215 BSC		
Ø K	0.254		0.010		
L	19.81	20.32	0.780	0.800	
L1	3.71	4.29	0.146	0.169	
Ø P	3.56	3.66	0.14	0.144	
Ø P1	-	6.98	-	0.275	
Q	5.31	5.69	0.209	0.224	
R	4.52	5.49	0.178	0.216	
S	5.51 BSC		0.217 BSC		

#### Notes

- Dimensioning and tolerancing per ASME Y14.5M-1994
- Contour of slot optional
- Dimension D and E do not include mold flash. These dimensions are measured at the outermost extremes of the plastic body
- Thermal pad contour optional with dimensions D1 and E1
- Lead finish uncontrolled in L1
- Ø P to have a maximum draft angle of 1.5 to the top of the part with a maximum hole diameter of 3.91 mm (0.154")
- Outline conforms to JEDEC® outline TO-247 with exception of dimension A min., D, E min., Q min., S, and note 4



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