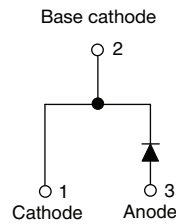


## 650 V Power SiC Gen 3 Merged PIN Schottky Diode, 4 A



### 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



PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	4 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	1.3 $\mu$ A
$Q_C$ ( $V_R = 400$ V)	12 nC
Package	TO-220AC 2L
Circuit configuration	Single

### 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-220AC 2L

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	$I_F$ (1)	$T_C = 151$ °C (DC)	4	A
		$T_C = 156$ °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 %	21	A
Non-repetitive peak forward surge current	$I_{FSM}$	$T_C = 25$ °C, $t_p = 10$ ms, half sine wave	29	A
		$T_C = 110$ °C, $t_p = 10$ ms, half sine wave	26	
Power dissipation	$P_{tot}$ (1)	$T_C = 25$ °C	40	W
		$T_C = 110$ °C	17	
	$P_{tot}$ (2)	$T_C = 25$ °C	52	
		$T_C = 110$ °C	22	
$I^2t$ value	$\int i^2 dt$	$T_C = 25$ °C	4.1	A <sup>2</sup> s
		$T_C = 110$ °C	3.3	
Operating junction and storage temperatures	$T_J$ (3), $T_{Stg}$		-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 <sub>J</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 4 A	-	1.3	1.5	V
		I <sub>F</sub> = 4 A, T <sub>J</sub> = 150 °C	-	1.50	1.85	
		I <sub>F</sub> = 4 A, T <sub>J</sub> = 175 °C	-	1.58	-	
Reverse leakage current	I <sub>R</sub>	V <sub>R</sub> = V <sub>R</sub> rated	-	0.2	25	μA
		V <sub>R</sub> = V <sub>R</sub> rated, T <sub>J</sub> = 150 °C	-	0.8	50	
		V <sub>R</sub> = V <sub>R</sub> rated, T <sub>J</sub> = 175 °C	-	1.3	-	
Total capacitance	C	V <sub>R</sub> = 1 V, f = 1 MHz	-	175	-	pF
		V <sub>R</sub> = 400 V, f = 1 MHz	-	21	-	
Total capacitive charge	Q <sub>C</sub>	V <sub>R</sub> = 400 V, f = 1 MHz	-	12	-	nC

THERMAL - MECHANICAL SPECIFICATIONS (T <sub>A</sub> = 25 °C unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction-to-case	R <sub>thJC</sub>		-	2.9	3.8	°C/W
Marking device			3C04ET07T			

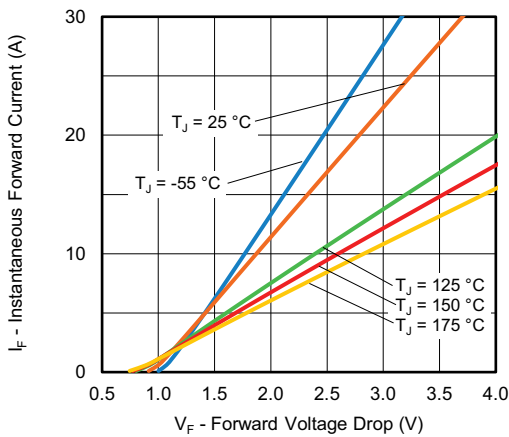


Fig. 1 - Typical Forward Voltage Drop Characteristics

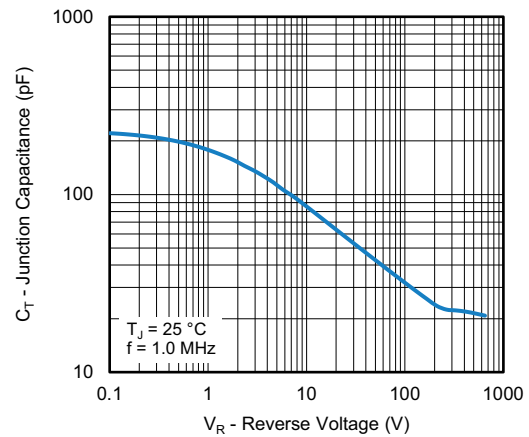


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

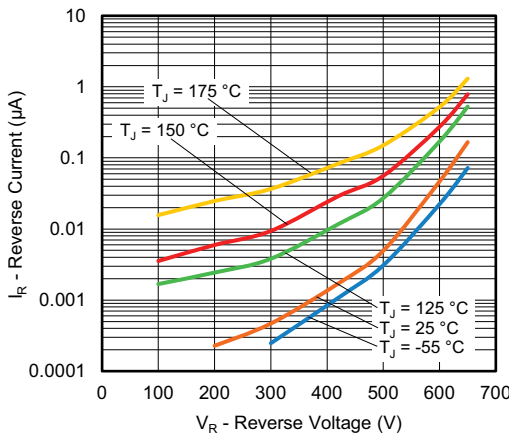


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

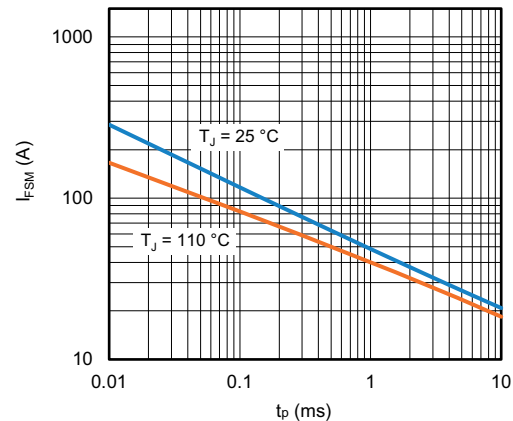


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

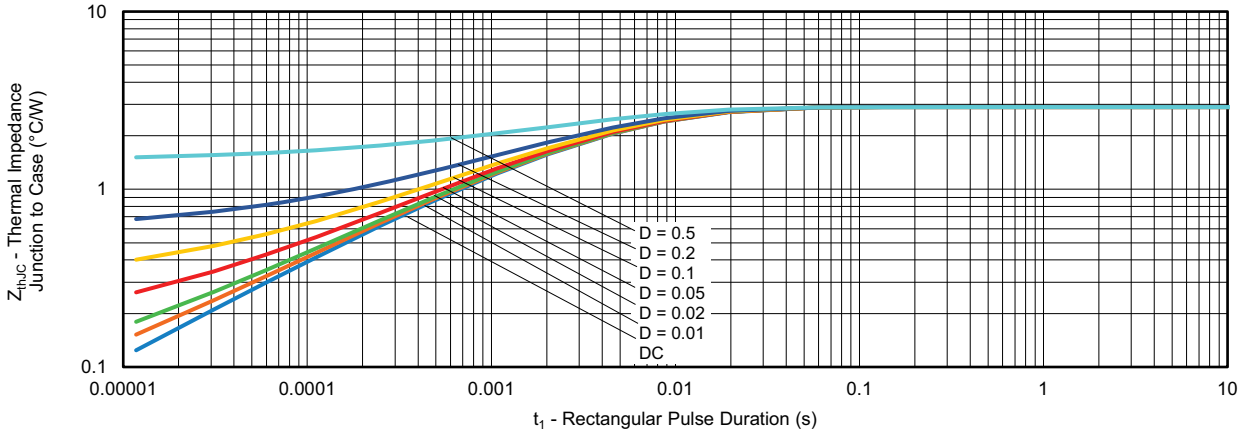


Fig. 5 - Typical Thermal Impedance  $Z_{thJC}$  Characteristics

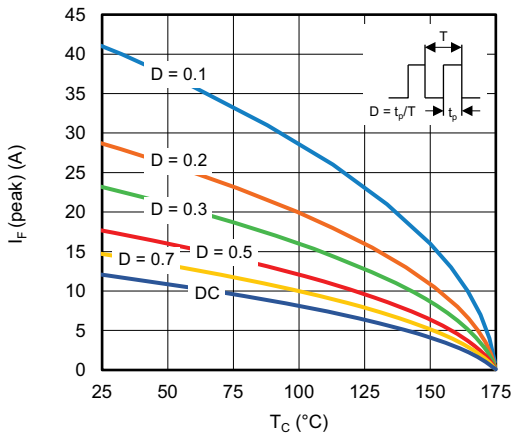


Fig. 6 - Peak Forward Current vs. Maximum Allowable Case Temperature

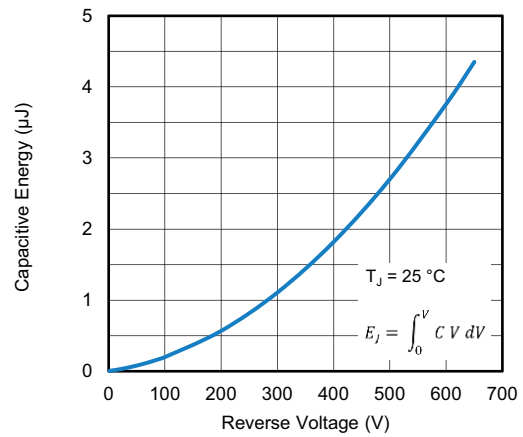


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

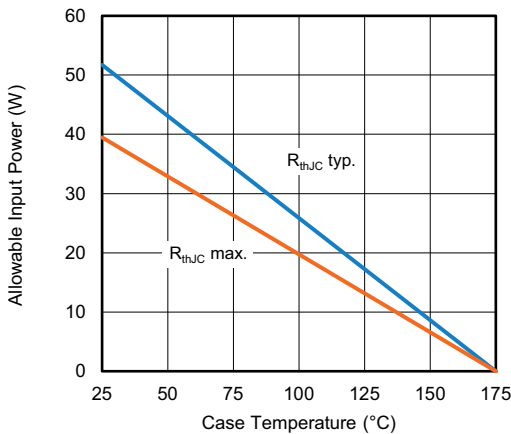


Fig. 7 - Forward Power Loss Characteristics

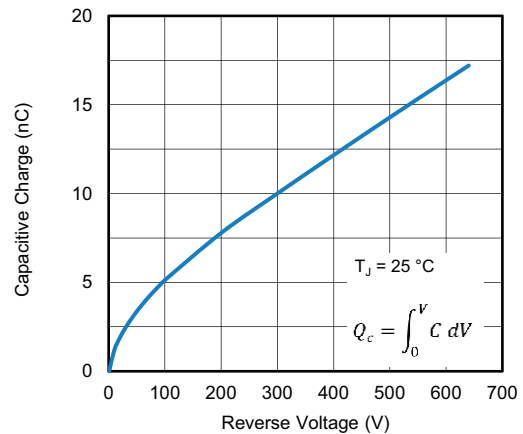
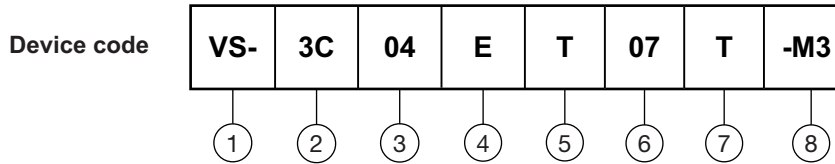


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage



### ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - 3C = SiC diode, Generation 3
- 3** - Current rating (04 = 4 A)
- 4** - E = single diode
- 5** - Package TO-220
- 6** - Voltage rating: (07 = 650 V)
- 7** - T = true 2 pin
- 8** - Environmental digit:  
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

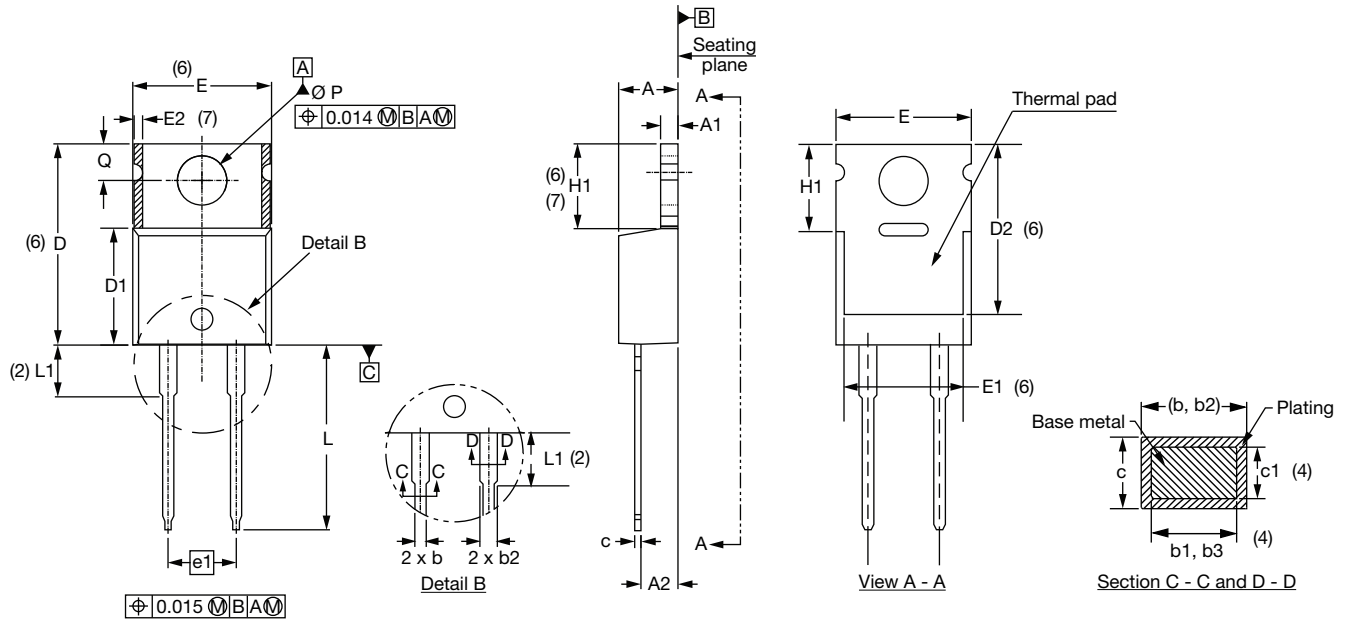
ORDERING INFORMATION		
PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-3C04ET07T-M3	50 / tube	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?96069">www.vishay.com/doc?96069</a>
Part marking information	<a href="http://www.vishay.com/doc?95391">www.vishay.com/doc?95391</a>



TO-220AC 2L

**DIMENSIONS** in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.25	4.65	0.167	0.183	
A1	1.14	1.40	0.045	0.055	
A2	2.56	2.92	0.101	0.115	
b	0.69	1.01	0.027	0.040	
b1	0.38	0.97	0.015	0.038	4
b2	1.20	1.73	0.047	0.068	
b3	1.14	1.73	0.045	0.068	4
c	0.36	0.61	0.014	0.024	
c1	0.36	0.56	0.014	0.022	4
D	14.85	15.25	0.585	0.600	3
D1	8.38	9.02	0.330	0.355	
D2	11.68	12.88	0.460	0.507	6
E	10.11	10.51	0.398	0.414	3, 6

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
E1	6.86	8.89	0.270	0.350	6
E2	-	0.76	-	0.030	7
e1	4.88	5.28	0.192	0.208	
H1	5.84	6.86	0.230	0.270	6, 7
L	13.52	14.02	0.532	0.552	
L1	3.32	3.82	0.131	0.150	2
Ø P	3.54	3.73	0.139	0.147	
Q	2.60	3.00	0.102	0.118	

**Notes**

- (1) Dimensioning and tolerancing as per ASME Y14.5M-1994
- (2) Lead dimension and finish uncontrolled in L1
- (3) Dimension D, D1 and E do not include mold flash. Mold flash shall not exceed 0.127 mm (0.005") per side. These dimensions are measured at the outermost extremes of the plastic body
- (4) Dimension b1, b3 and c1 apply to base metal only
- (5) Controlling dimension: inches
- (6) Thermal pad contour optional within dimensions E, H1, D2 and E1
- (7) Dimension E2 x H1 define a zone where stamping and singulation irregularities are allowed
- (8) Outline conforms to JEDEC® TO-220, except D2, where JEDEC® minimum is 0.480"



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