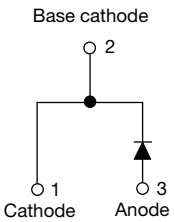
650 V Gen 4 Power Silicon Carbide Schottky Diode, 12 A

TO-220AC 2L



FEATURES

- 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
- 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

RoHS COMPLIANT
HALOGEN FREE

LINKS TO ADDITIONAL RESOURCES

3D Models

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	12 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	84 µA
Q_C (V_R = 400 V)	33 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.

Optimized for extreme high-speed hard switching across a wide temperature range. This SiC diode is ideal for applications with high dI/d_t such as high efficiency PFC and ultra-high frequency output rectifiers in AC/DC and DC/DC 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 = 145 °C (DC)	12	A
	I_F (2)	T_C = 139 °C (DC)	12	A
DC blocking voltage	V_{DC}		650	V
Repetitive peak forward current	I_{FRM}	T_C = 25 °C, f = 50 Hz, square wave, DC = 25 %	51	A
Non-repetitive peak forward surge current	I_{FSM}	T_C = 25 °C, t_p = 10 ms, half sine wave	72	A
		T_C = 110 °C, t_p = 10 ms, half sine wave	57	A
Power dissipation	P_{tot} (1)	T_C = 25 °C	91	W
		T_C = 110 °C	39	W
	P_{tot} (2)	T_C = 25 °C	75	W
		T_C = 110 °C	32.5	W
I^2t value	$\int i^2 dt$	T_C = 25 °C	25.9	A^2s
		T_C = 110 °C	16.2	A^2s
Operating junction and storage temperatures	T_J (2), T_{Stg}		-55 to +175	°C

Notes

(1) Based on typical R_{th}

(2) Based on maximum 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 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Forward voltage	V_F	I_F = 12 A	-	1.3	1.5	V
		I_F = 12 A, T_J = 150 °C	-	1.45	1.75	
		I_F = 12 A, T_J = 175 °C	-	1.55	-	
Reverse leakage current	I_R	V_R = V_R rated	-	2.2	80	µA
		V_R = V_R rated, T_J = 150 °C	-	38	190	
		V_R = V_R rated, T_J = 175 °C	-	84	-	
Total capacitance	C	V_R = 1 V, f = 1 MHz	-	549	-	pF
		V_R = 400 V, f = 1 MHz	-	48	-	
Total capacitive charge	Q_C	V_R = 400 V, f = 1 MHz	-	33	-	nC

THERMAL AND MECHANICAL SPECIFICATIONS (T_A = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Thermal resistance, junction to case	R_{thJC}		-	1.65	2.0	°C/W
Marking device			4C12ET07T			

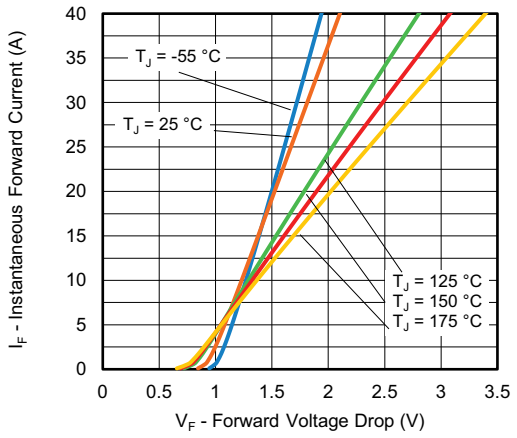


Fig. 1 - Typical Forward Voltage Drop Characteristics

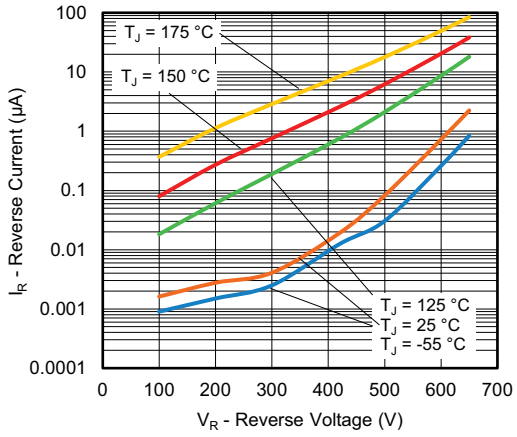


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

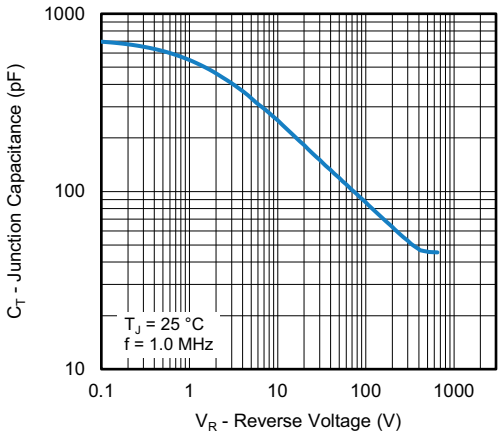


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

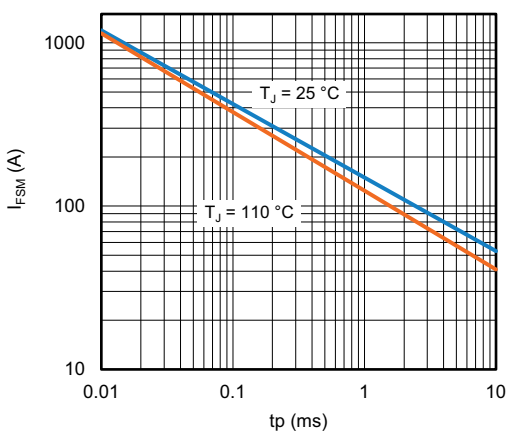


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

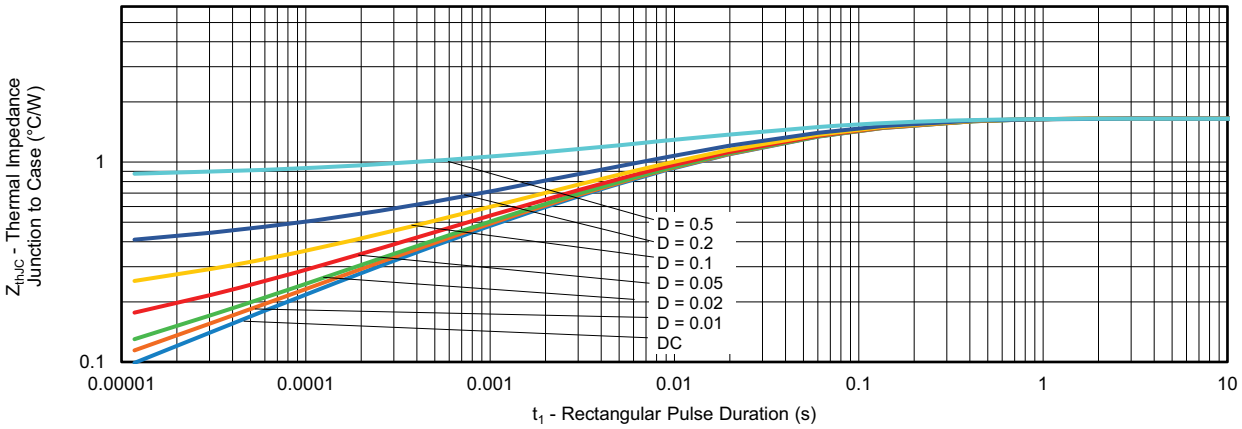


Fig. 5 - Typical Thermal Impedance Z_{thJC} Characteristics

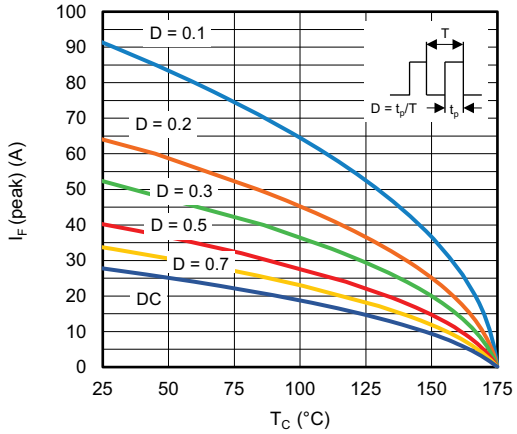


Fig. 6 - Peak Forward Current vs. Maximum Allowable Case Temperature

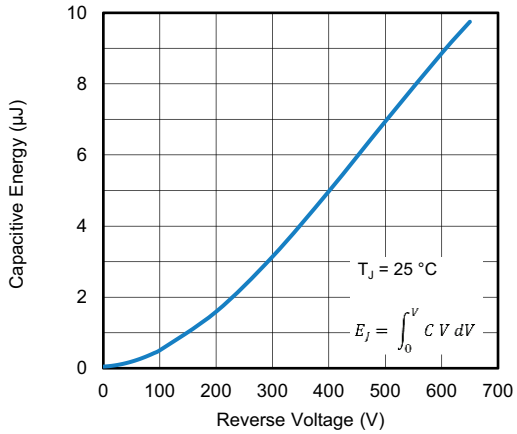


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

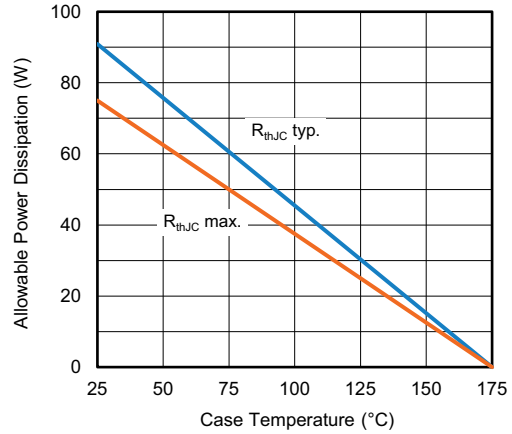


Fig. 7 - Forward Power Loss Characteristics

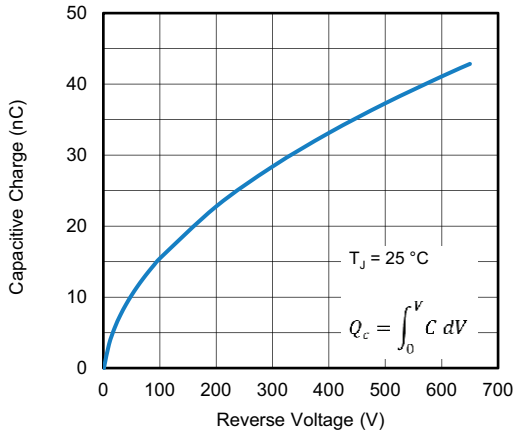
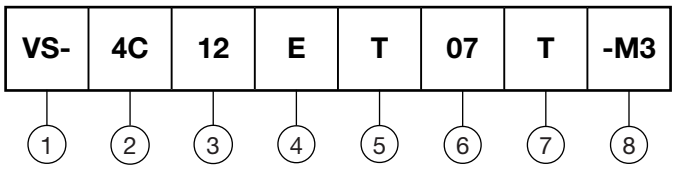


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage

ORDERING INFORMATION TABLE

Device code



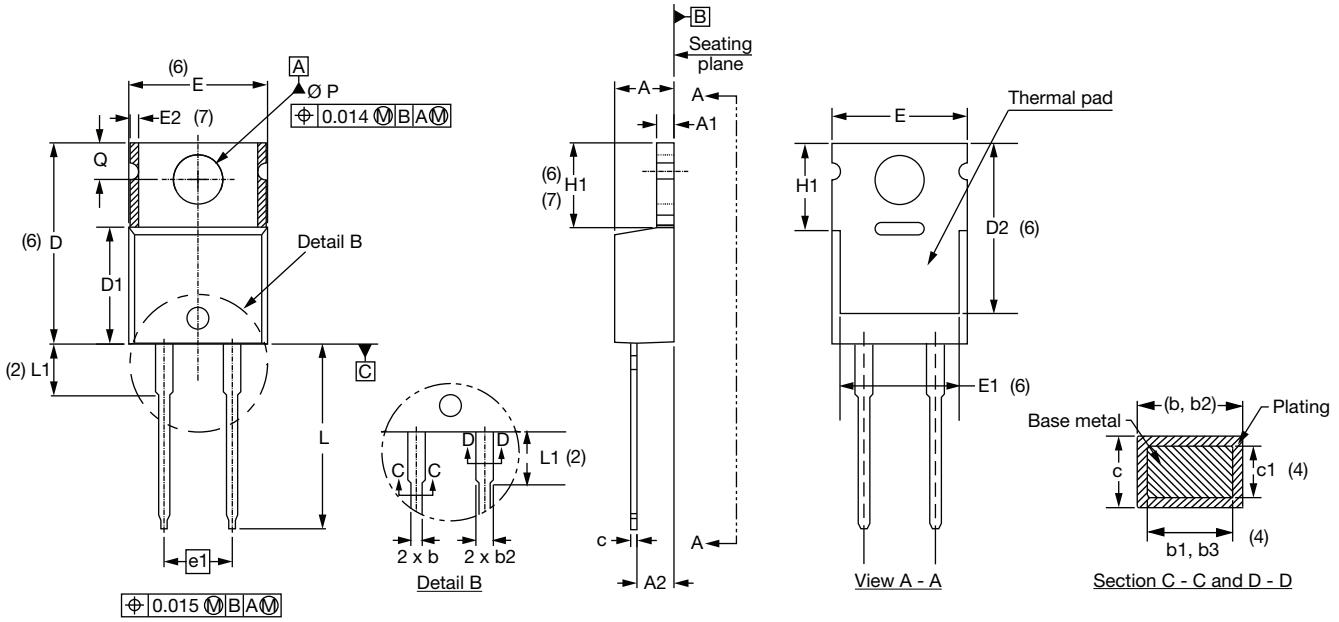
1 - Vishay Semiconductors product
2 - 4C = SiC diode, generation 4
3 - Current rating (12 = 12 A)
4 - E = single diode
5 - T = TO-220 package
6 - Voltage rating: (07 = 650 V)
7 - T = true 2 pin
8 - Environmental digit:
M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

ORDERING INFORMATION			
PREFERRED P/N	**UNIT WEIGHT**	**BASE QUANTITY**	**PACKAGING DESCRIPTION**
VS-4C12ET07T-M3	2 g	50 per tube	Antistatic plastic tube

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?96069
Part marking information	www.vishay.com/doc?95391

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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