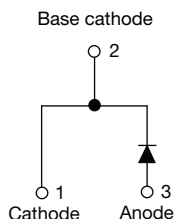


# 1200 V Gen 4 Power Silicon Carbide Schottky Diode, 20 A



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
- AEC-Q101 qualified, meets JESD 201 class 2 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

## PRIMARY CHARACTERISTICS

$I_F$	20 A
$V_R$	1200 V
$V_F$ at $I_F$ at 25 °C, typ.	1.38 V
$T_J$ max.	175 °C
$I_R$ at $V_R$ at 175 °C	260 $\mu$ A
$Q_C$ ( $V_R = 800$ V)	101 nC
Package	TO-220AC 2L
Circuit configuration	Single

## DESCRIPTION / APPLICATIONS

Wide band gap SiC based 1200 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 demanding applications such as high efficiency PFC diodes 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/NHM3 - halogen-free, RoHS-compliant, and AEC-Q101 qualified

**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	$V_{RRM}$		1200	V
Continuous forward current	$I_F$ (1)	$T_C = 145$ °C (DC)	20	A
	$I_F$ (2)	$T_C = 129$ °C (DC)	20	A
DC blocking voltage	$V_{DC}$		1200	V
Repetitive peak forward current	$I_{FRM}$	$T_C = 25$ °C, $f = 50$ Hz, square wave, $DC = 25$ %	69	A
Non-repetitive peak forward surge current	$I_{FSM}$	$T_C = 25$ °C, $t_p = 10$ ms, half sine wave	116	A
		$T_C = 110$ °C, $t_p = 10$ ms, half sine wave	90	
Power dissipation	$P_{tot}$ (1)	$T_C = 25$ °C	125	W
		$T_C = 110$ °C	54	
	$P_{tot}$ (2)	$T_C = 25$ °C	187	W
		$T_C = 110$ °C	81	
$I^2t$ value	$\int i^2 dt$	$T_C = 25$ °C	67	A <sup>2</sup> s
		$T_C = 110$ °C	40	
Operating junction and storage temperatures	$T_J$ (3), $T_{Stg}$		-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:  $dP_D/dT_J < 1/R_{thJA}$



ELECTRICAL SPECIFICATIONS ( $T_J = 25\text{ }^{\circ}\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Forward voltage	$V_F$	$I_F = 20\text{ A}$	-	1.38	1.6	V
		$I_F = 20\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$	-	1.77	2.2	
		$I_F = 20\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$	-	1.9	-	
Reverse leakage current	$I_R$	$V_R = V_R\text{ rated}$	-	9	150	$\mu\text{A}$
		$V_R = V_R\text{ rated}, T_J = 150\text{ }^{\circ}\text{C}$	-	120	800	
		$V_R = V_R\text{ rated}, T_J = 175\text{ }^{\circ}\text{C}$	-	260	-	
Total capacitance	C	$V_R = 1\text{ V}, f = 1\text{ MHz}$	-	1160	-	pF
		$V_R = 800\text{ V}, f = 1\text{ MHz}$	-	69	-	
Total capacitive charge	$Q_C$	$V_R = 800\text{ V}, f = 1\text{ MHz}$	-	101	-	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	$R_{thJC}$		-	0.8	1.2	$^{\circ}\text{C/W}$
Marking device				4C20ET12T		

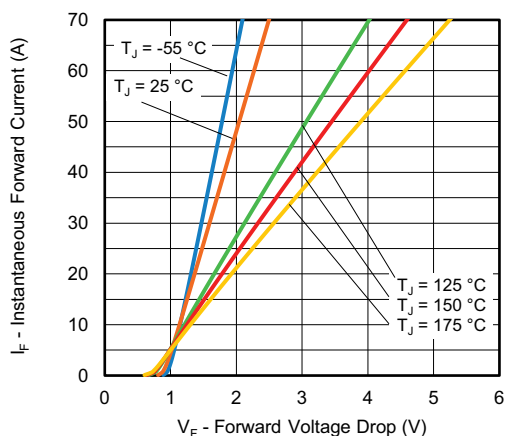


Fig. 1 - Typical Forward Voltage Drop Characteristics

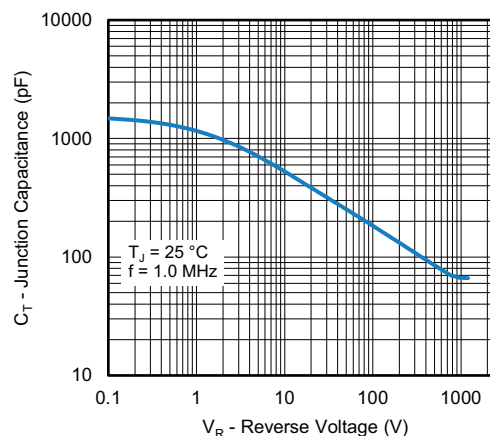


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

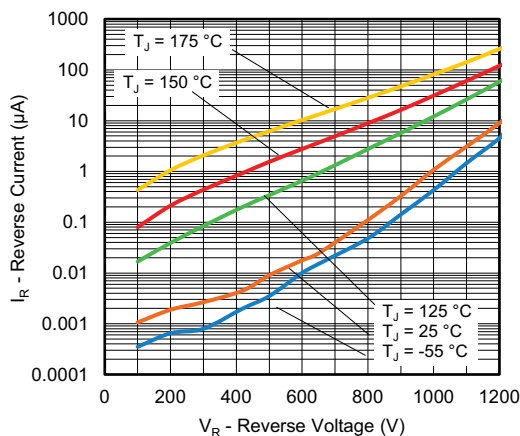


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

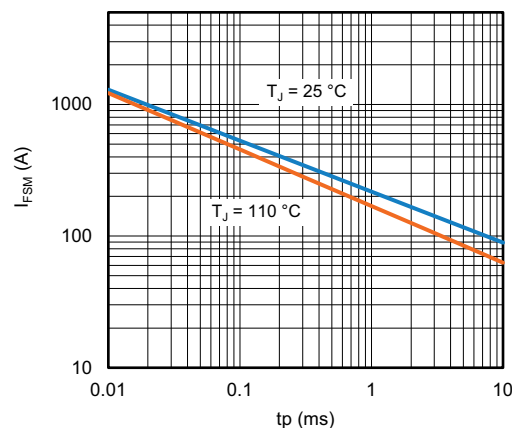


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

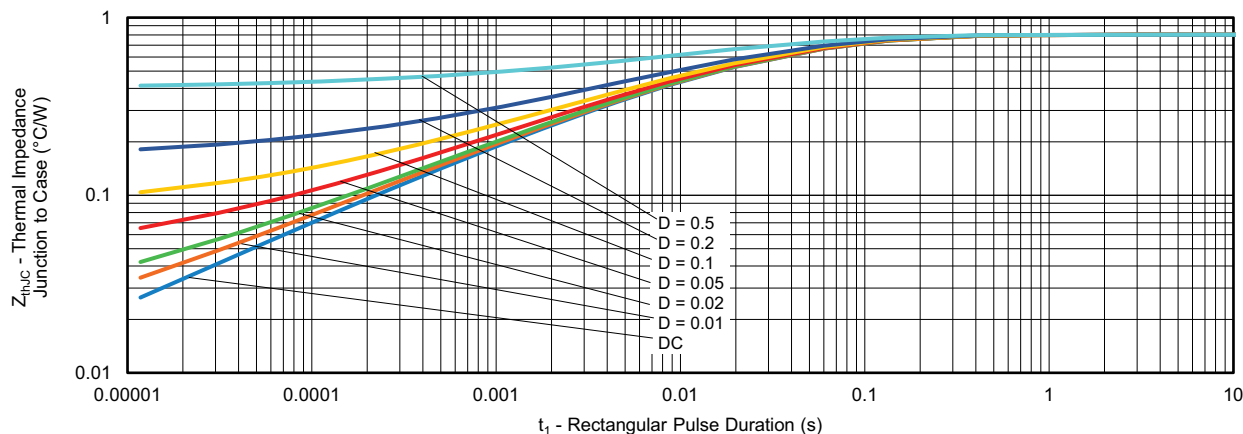
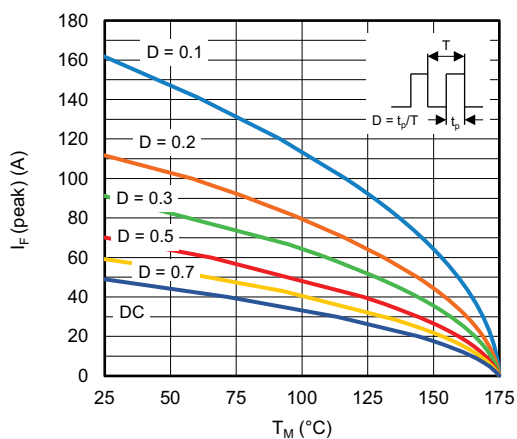

Fig. 5 - Thermal Impedance  $Z_{thJC}$  - Characteristics


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

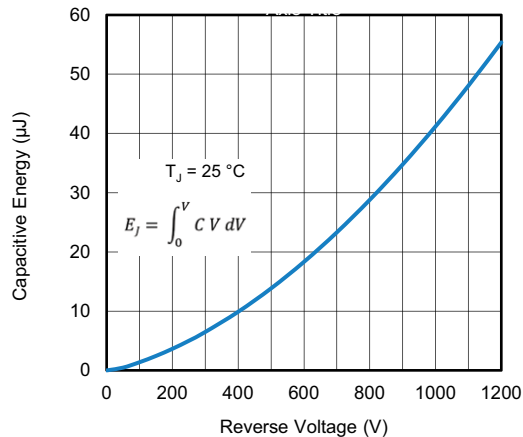


Fig. 8 - Capacitance Energy vs. Reverse Voltage

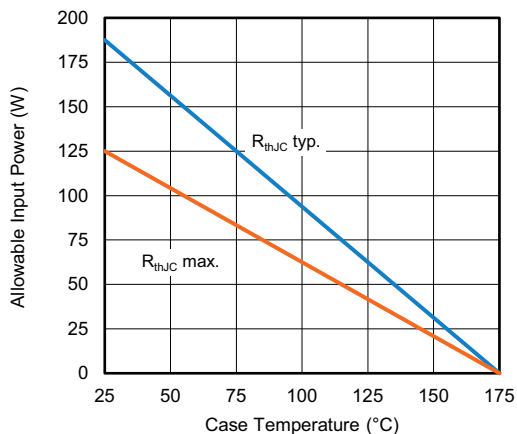


Fig. 7 - Allowable Input Power vs. Case Temperature

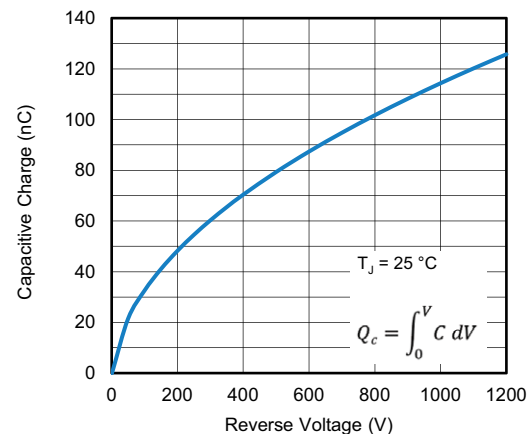


Fig. 9 - Capacitance Change vs. Reverse Voltage

**ORDERING INFORMATION TABLE**

Device code	<b>VS-</b>	<b>4C</b>	<b>20</b>	<b>E</b>	<b>T</b>	<b>12</b>	<b>T</b>	<b>H</b>	<b>M3</b>
	1	2	3	4	5	6	7	8	9

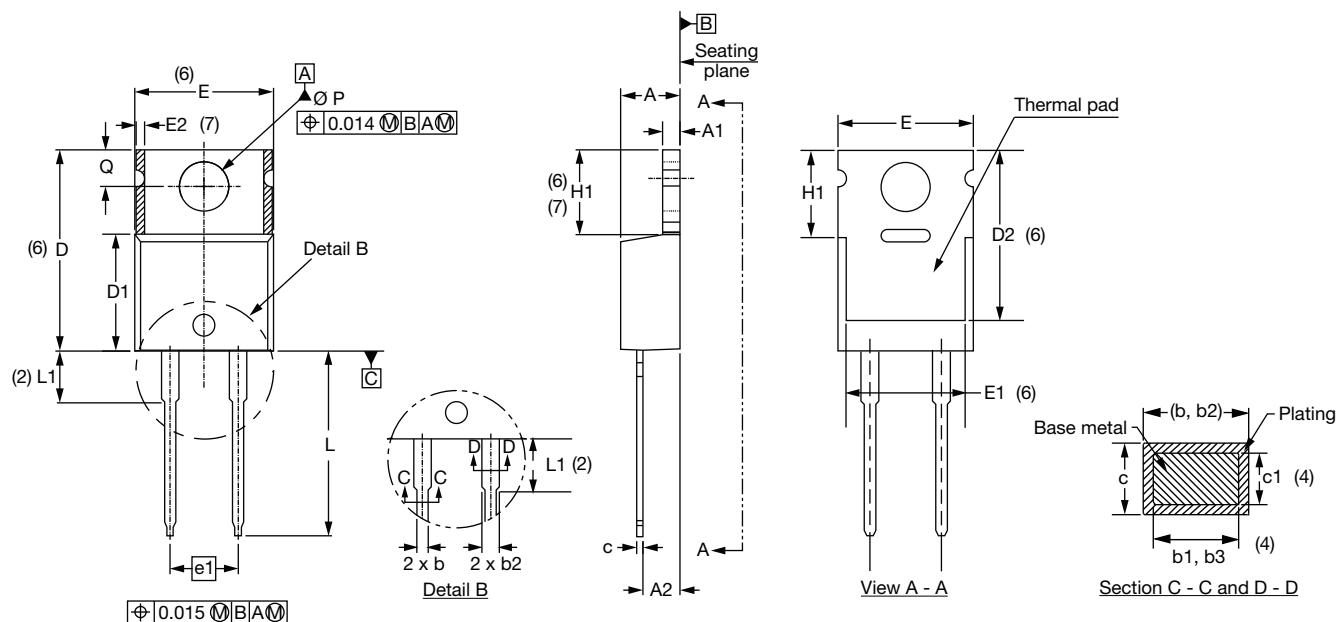
<b>1</b>	-	Vishay Semiconductors product
<b>2</b>	-	4C = SiC diode, generation 4
<b>3</b>	-	Current rating (20 = 20 A)
<b>4</b>	-	E = single diode
<b>5</b>	-	T = TO-220 package
<b>6</b>	-	Voltage rating: (12 = 1200 V)
<b>7</b>	-	T = true 2 pin
<b>8</b>	-	H = AEC-Q101 qualified
<b>9</b>	-	Environmental digit: M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

<b>ORDERING INFORMATION</b>			
PREFERRED P/N	UNIT WEIGHT	BASE QUANTITY	PACKAGING DESCRIPTION
VS-4C20ET12T-HM3	2 g	50 / tube	Antistatic plastic tubes

<b>LINKS TO RELATED DOCUMENTS</b>	
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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