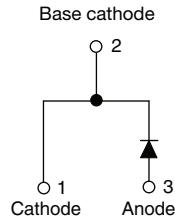


## 650 V Power SiC Merged PIN Schottky Diode, 20 A



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

### FEATURES

- Majority carrier diode using Schottky technology on SiC wide band gap material
- 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)

### 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:** 2L TO-220AC

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

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	20 A
$V_R$	650 V
$V_F$ at $I_F$ at 150 °C	1.6 V
$T_J$ max.	175 °C
$I_R$ at $V_R$ at 175 °C	35 $\mu$ A
$Q_C$ ( $V_R = 400$ V)	68 nC
Package	2L TO-220AC
Circuit configuration	Single

ABSOLUTE MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise specified)				
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS
Peak repetitive reverse voltage	$V_{RRM}$		650	V
Average rectified forward current	$I_{F(AV)}$	$T_C = 125$ °C (DC)	20	A
DC blocking voltage	$V_{DC}$		650	V
Repetitive peak surge current	$I_{FRM}$	$T_C = 25$ °C, $f = 50$ Hz, square wave, DC = 25 %	75	A
Non-repetitive peak forward surge current	$I_{FSM}$	$T_C = 25$ °C, $t_p = 10$ ms, half sine wave	160	
		$T_C = 110$ °C, $t_p = 10$ ms, half sine wave	140	
Power dissipation	$P_{tot}^{(1)}$	$T_C = 25$ °C	119	W
		$T_C = 110$ °C	52	
$I^2t$ value	$\int i^2 dt$	$T_C = 25$ °C	128	A <sup>2</sup> s
		$T_C = 110$ °C	98	
Operating junction and storage temperatures	$T_J^{(2)}, T_{Stg}$		-55 to +175	°C

### Notes

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

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



<b>ELECTRICAL SPECIFICATIONS</b> ( $T_J = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Forward voltage	$V_F$	$I_F = 20\text{ A}$	-	1.45	1.70	V
		$I_F = 20\text{ A}, T_J = 150\text{ }^\circ\text{C}$	-	1.60	1.90	
		$I_F = 20\text{ A}, T_J = 175\text{ }^\circ\text{C}$	-	1.65	-	
Reverse leakage current	$I_R$	$V_R = V_R\text{ rated}$	-	-	100	$\mu\text{A}$
		$V_R = V_R\text{ rated}, T_J = 150\text{ }^\circ\text{C}$	-	-	250	
		$V_R = V_R\text{ rated}, T_J = 175\text{ }^\circ\text{C}$	-	35	-	
Total capacitance	C	$V_R = 1\text{ V}, f = 1\text{ MHz}$	-	1050	-	pF
		$V_R = 400\text{ V}, f = 1\text{ MHz}$	-	105	-	
Total capacitive charge	$Q_C$	$V_R = 400\text{ V}, f = 1\text{ MHz}$	-	68	-	nC

<b>THERMAL - MECHANICAL SPECIFICATIONS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise specified)						
PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Thermal resistance, junction-to-case	$R_{thJC}$		-	0.9	1.3	$^\circ\text{C/W}$
Marking device			C20ET07T			

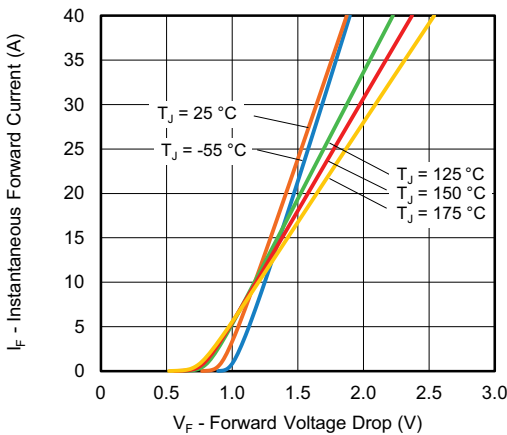


Fig. 1 - Typical Forward Voltage Drop Characteristics

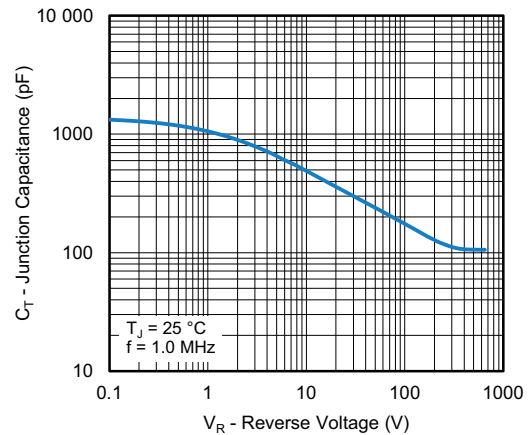


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

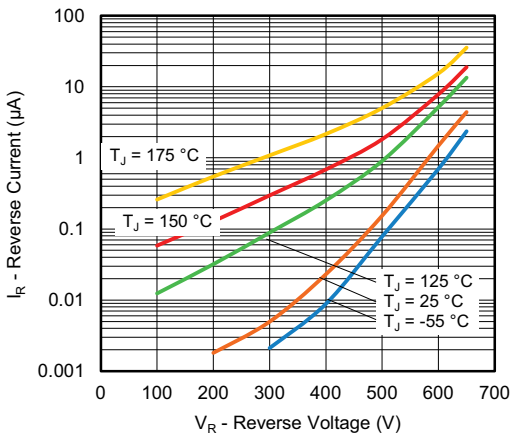


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

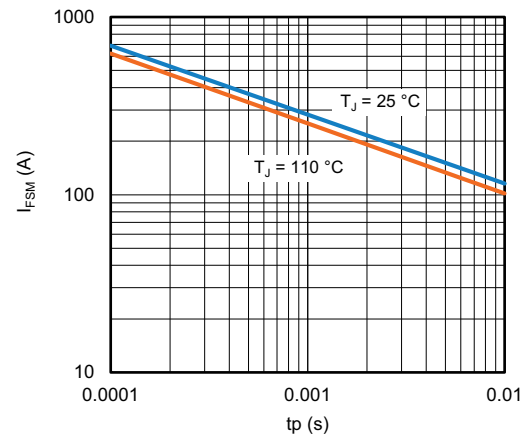


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

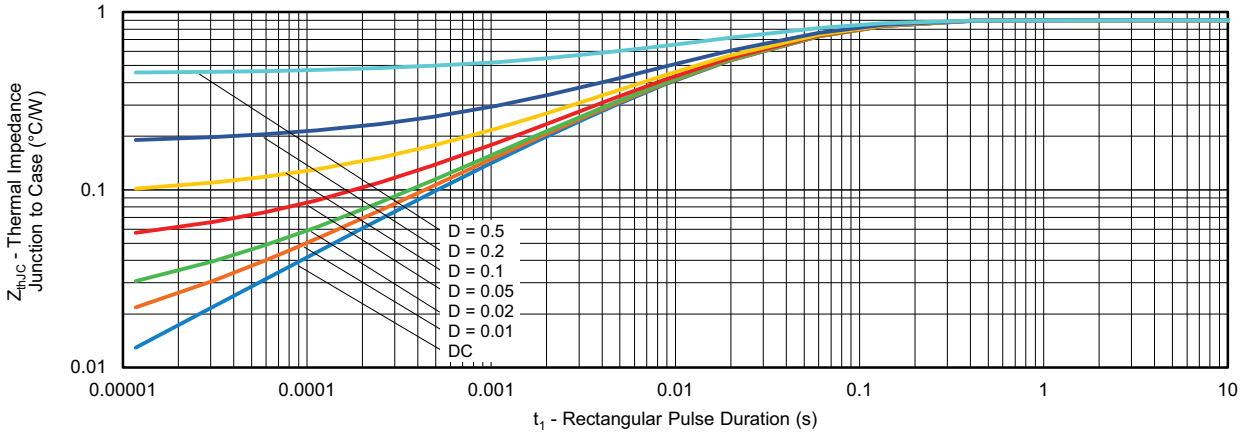


Fig. 5 - Typical Thermal Impedance  $Z_{thJC}$  Characteristics

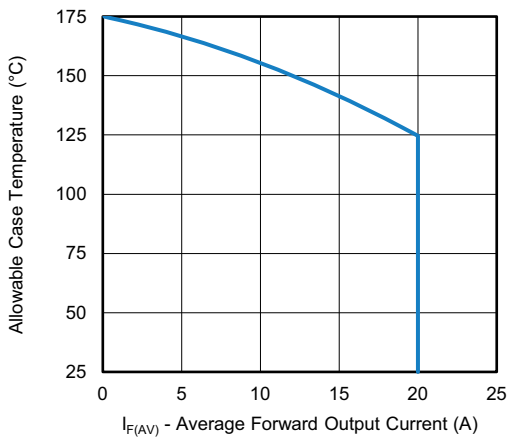


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current

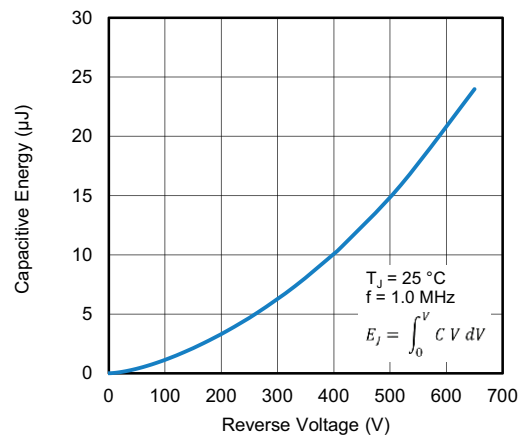


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

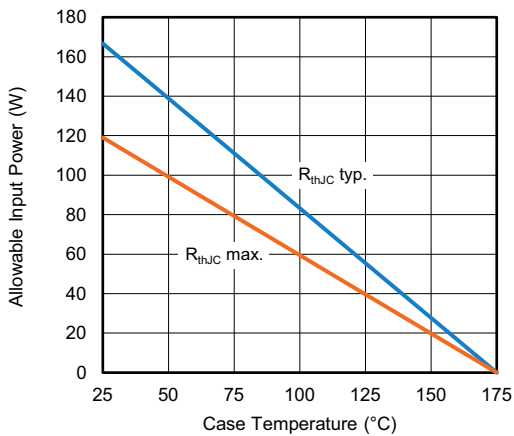


Fig. 7 - Forward Power Loss Characteristics

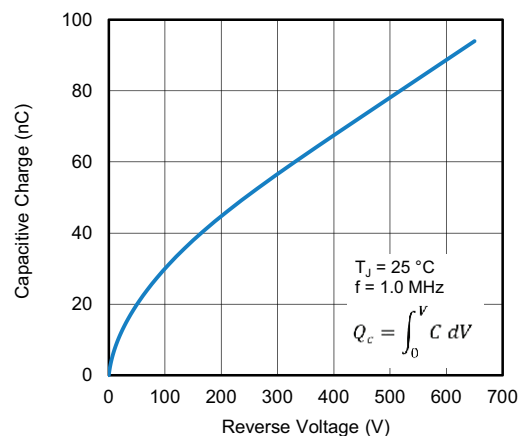
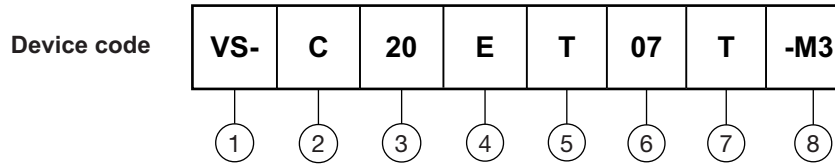


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage



**ORDERING INFORMATION TABLE**



- 1** - Vishay Semiconductors product
- 2** - C = SiC diode
- 3** - Current rating (20 = 20 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

<b>ORDERING INFORMATION</b>			
<b>PREFERRED P/N</b>	<b>BASE QUANTITY</b>	<b>MINIMUM ORDER QUANTITY</b>	<b>PACKAGING DESCRIPTION</b>
VS-C20ET07T-M3	50/tube	1000	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>



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