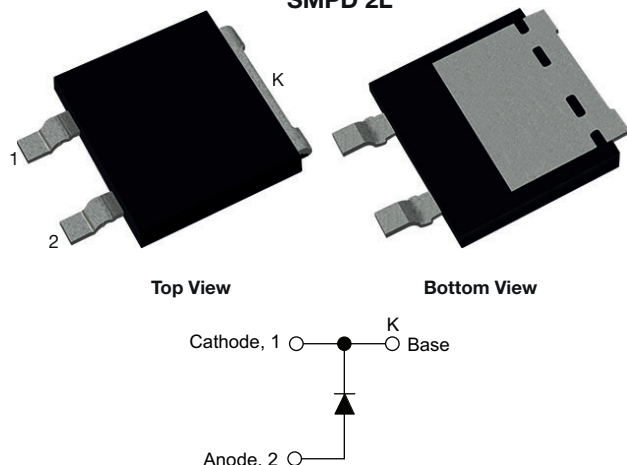


# 650 V Power SiC Gen 3 Merged PIN Schottky Diode, 20 A

## eSMP® Series SMPD 2L



## LINKS TO ADDITIONAL RESOURCES



### PRIMARY CHARACTERISTICS

$I_F$	20 A
$V_R$	650 V
$V_F$ at $I_F$ at 25 °C, typ.	1.30 V
$T_J$ max.	175 °C
$I_R$ at $V_R$ at 175 °C	32 $\mu$ A
$Q_C$ ( $V_R = 400$ V)	53 nC
Package	SMPD 2L
Circuit configuration	Single

## FEATURES

- Creepage and clearance distance 3.6 mm minimum
- Very low profile – typical height of 1.7mm
- 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 2 whisker test
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

## 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:** SMPD 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

### 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	$I_F$	$T_M = 132$ °C (DC)	20	A
DC blocking voltage	$V_{DC}$		650	V
Repetitive peak surge current	$I_{FRM}$	$T_M = 25$ °C, $f = 50$ Hz, square wave, DC = 25 %	77	A
Non-repetitive peak forward surge current	$I_{FSM}$	$T_M = 25$ °C, $t_p = 10$ ms, half sine wave	110	A
		$T_M = 110$ °C, $t_p = 10$ ms, half sine wave	104	
Power dissipation	$P_{tot}^{(1)}$	$T_M = 25$ °C	114	W
		$T_M = 110$ °C	49	
	$P_{tot}^{(2)}$	$T_M = 25$ °C	149	W
		$T_M = 110$ °C	64	
$I^2t$ value	$\int i^2 dt$	$T_M = 25$ °C	60.5	A <sup>2</sup> s
		$T_M = 110$ °C	54	
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** ( $T_J = 25\text{ }^{\circ}\text{C}$  unless otherwise specified)

PARAMETER	SYMBOL	TEST CONDITIONS	MIN.	TYP.	MAX.	UNITS
Forward voltage	$V_F$	$I_F = 20\text{ A}$	-	1.3	1.5	V
		$I_F = 20\text{ A}, T_J = 150\text{ }^{\circ}\text{C}$	-	1.5	1.85	
		$I_F = 20\text{ A}, T_J = 175\text{ }^{\circ}\text{C}$	-	1.60	-	
Reverse leakage current	$I_R$	$V_R = V_R\text{ rated}$	-	1.3	100	$\mu\text{A}$
		$V_R = V_R\text{ rated}, T_J = 150\text{ }^{\circ}\text{C}$	-	18	250	
		$V_R = V_R\text{ rated}, T_J = 175\text{ }^{\circ}\text{C}$	-	32	-	
Total capacitance	C	$V_R = 1\text{ V}, f = 1\text{ MHz}$	-	845	-	pF
		$V_R = 400\text{ V}, f = 1\text{ MHz}$	-	82	-	
Total capacitive charge	$Q_C$	$V_R = 400\text{ V}, f = 1\text{ MHz}$	-	53	-	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-mount	$R_{thJM}$		-	1.0	1.30	$^{\circ}\text{C/W}$
Marking device				3C20ED07T		

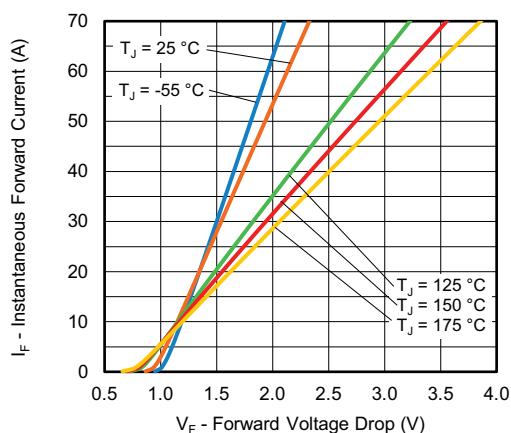


Fig. 1 - Typical Forward Voltage Drop Characteristics

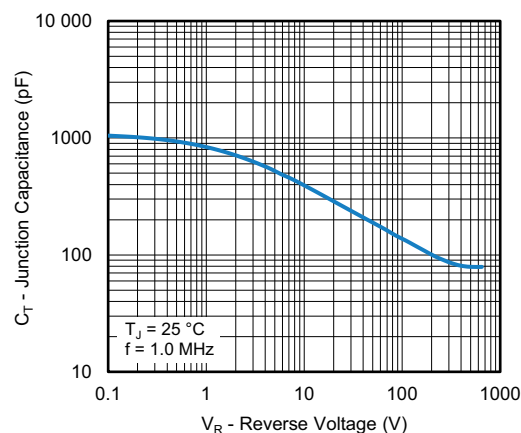


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

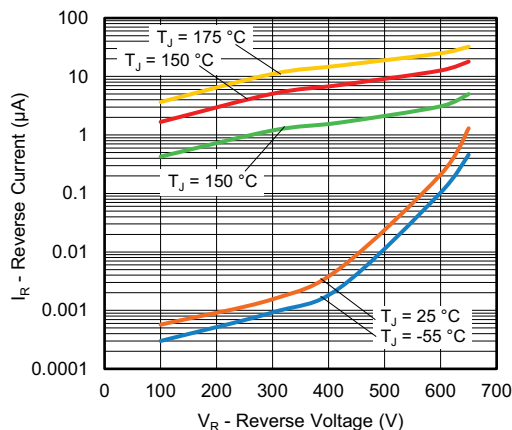


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

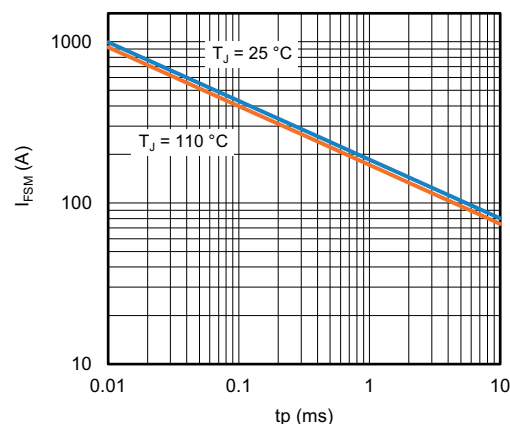


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

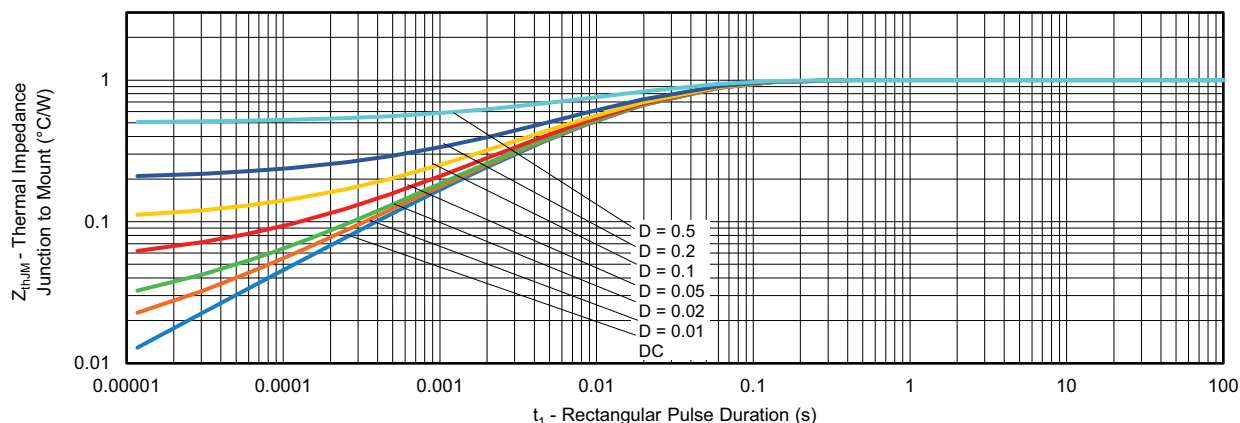
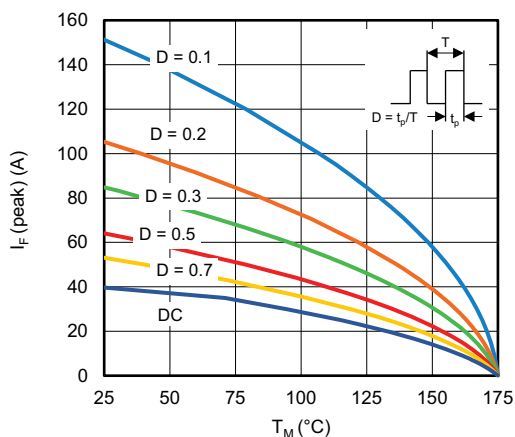

Fig. 5 - Typical Thermal Impedance  $Z_{thJM}$  Characteristics


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

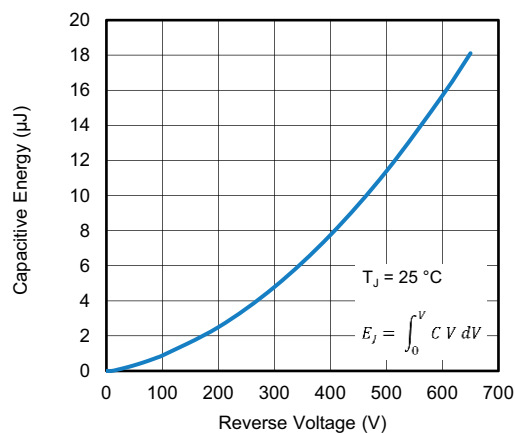


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

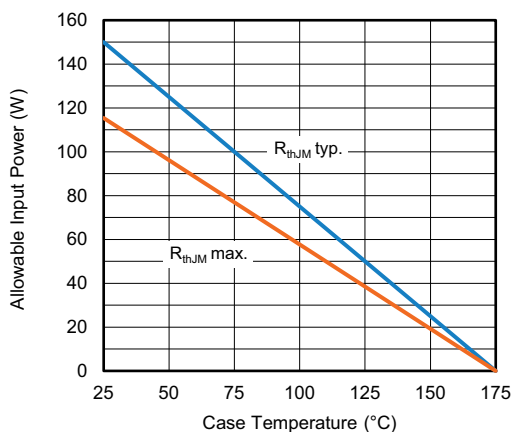


Fig. 7 - Forward Power Loss Characteristics

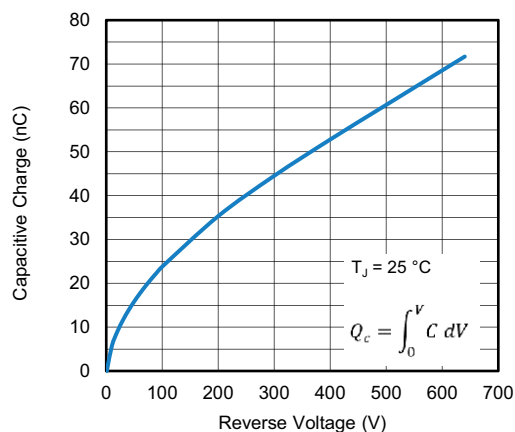


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage



ORDERING INFORMATION TABLE

Device code	VS-	3C	20	E	D	07	T	-M3
	1	2	3	4	5	6	7	8
1	- Vishay Semiconductors product							
2	- 3C = SiC diode, Generation 3							
3	- Current rating (20 = 20 A)							
4	- E = single diode							
5	- Package SMPD 2L							
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				
ORDERING P/N	UNIT WEIGHT	PACKAGE CODE	BASE QUANTITY	DELIVERY MODE
VS-3C20ED07T-M3/I	0.52 g	I	2000/reel	13" diameter plastic tape and reel

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?97059">www.vishay.com/doc?97059</a>
Part marking information	<a href="http://www.vishay.com/doc?97105">www.vishay.com/doc?97105</a>
Packaging information	<a href="http://www.vishay.com/doc?88869">www.vishay.com/doc?88869</a>



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