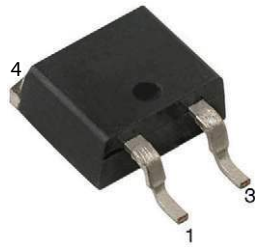
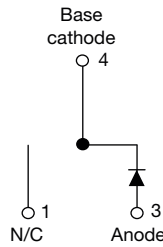


# 650 V Gen 3 Power SiC Merged PIN Schottky Diode, 20 A


**D<sup>2</sup>PAK 2L (TO-263AB 2L)**


## 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
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- MPS structure for high ruggedness to forward current surge events
- Meets JESD 201 class 1A whisker test
- 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



Application Notes

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	20 A
$V_R$	650 V
$V_F$ at $I_F$ at 150 °C	1.5 V
$T_J$ max.	175 °C
$I_R$ at $V_R$ at 175 °C	9 $\mu$ A
$Q_C$ ( $V_R = 400$ V)	53 nC
Package	D <sup>2</sup> PAK 2L (TO-263AB 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:** D<sup>2</sup>PAK 2L (TO-263AB 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

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	$I_{F(AV)}$	$T_C = 111$ °C (DC)	20	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 %	63	A
Non-repetitive peak forward surge current	$I_{FSM}$	$T_C = 25$ °C, $t_p = 10$ ms, half sine wave	110	
		$T_C = 110$ °C, $t_p = 10$ ms, half sine wave	104	
Power dissipation	$P_{tot}^{(1)}$	$T_C = 25$ °C	93	W
		$T_C = 110$ °C	41	
$I^2t$ value	$\int i^2 dt$	$T_C = 25$ °C	60.5	A <sup>2</sup> s
		$T_C = 110$ °C	54	
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:  $dP_D/dT_J < 1/R_{\theta JA}$



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> = 20 A	-	1.3	1.5	V
		I <sub>F</sub> = 20 A, T <sub>J</sub> = 150 °C	-	1.5	1.85	
		I <sub>F</sub> = 20 A, T <sub>J</sub> = 175 °C	-	1.60	-	
Reverse leakage current	I <sub>R</sub>	V <sub>R</sub> = V <sub>R</sub> rated	-	1.3	100	μA
		V <sub>R</sub> = V <sub>R</sub> rated, T <sub>J</sub> = 150 °C	-	5.5	250	
		V <sub>R</sub> = V <sub>R</sub> rated, T <sub>J</sub> = 175 °C	-	9	-	
Total capacitance	C	V <sub>R</sub> = 1 V, f = 1 MHz	-	845	-	pF
		V <sub>R</sub> = 400 V, f = 1 MHz	-	82	-	
Total capacitive charge	Q <sub>C</sub>	V <sub>R</sub> = 400 V, f = 1 MHz	-	53	-	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>		-	1.2	1.6	°C/W
Marking device			3C20ET07S			

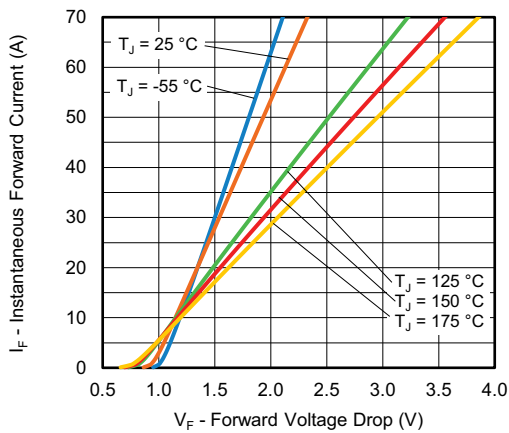


Fig. 1 - Typical Forward Voltage Drop Characteristics

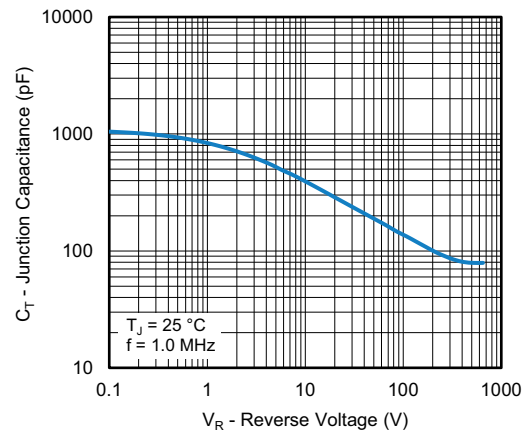


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

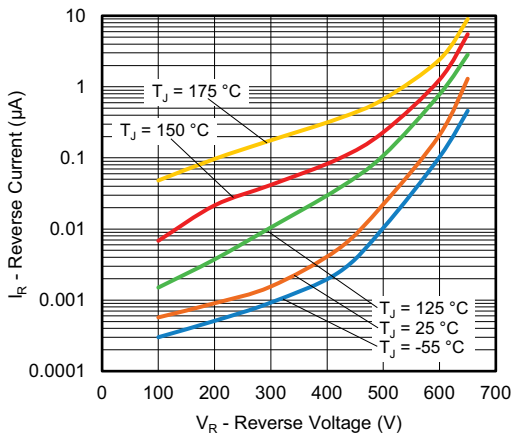


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

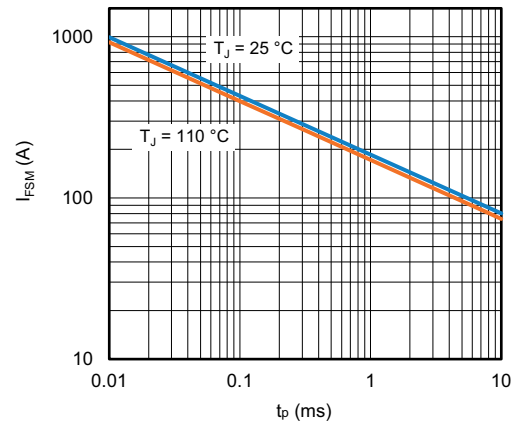


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

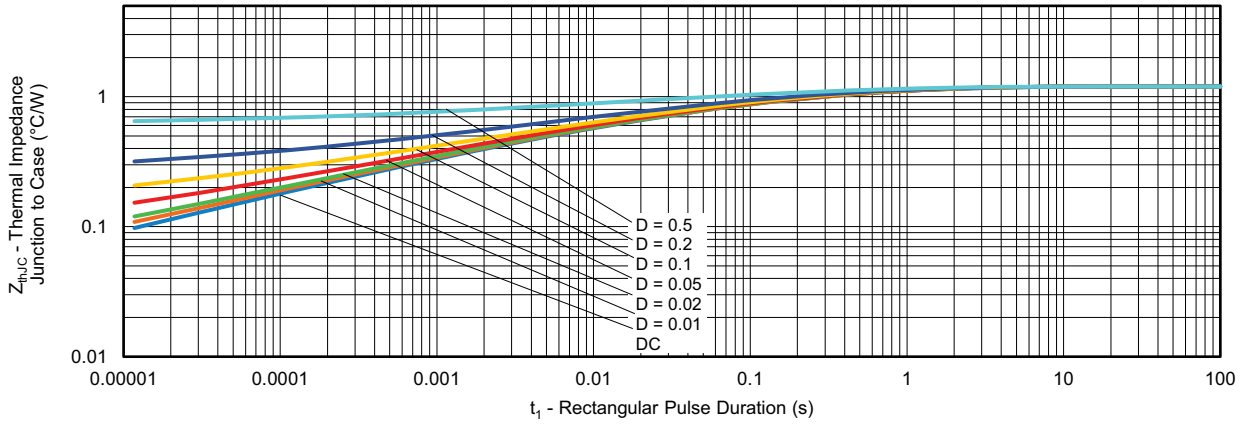


Fig. 5 - Typical Thermal Impedance  $Z_{thJC}$  Characteristics

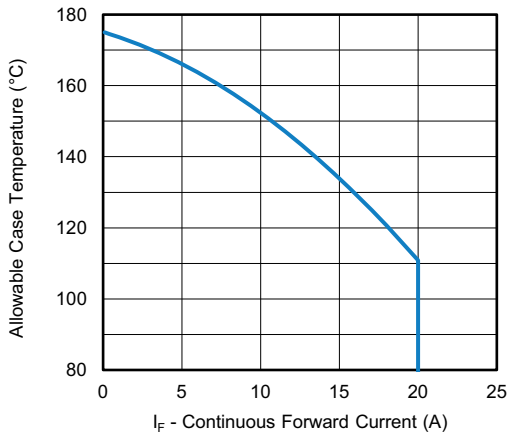


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current

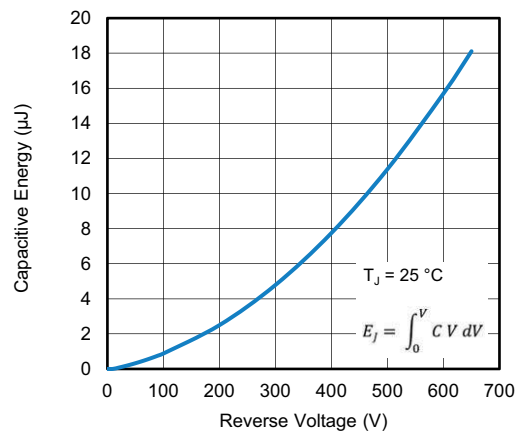


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

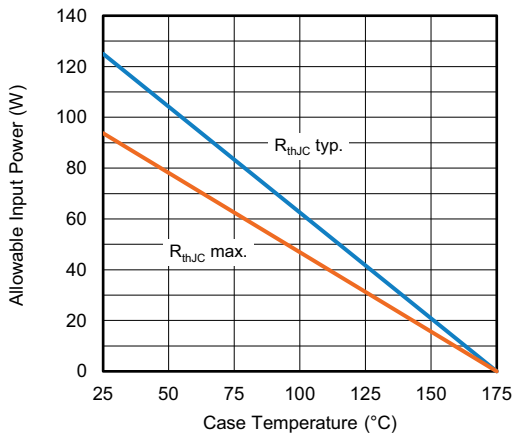


Fig. 7 - Forward Power Loss Characteristics

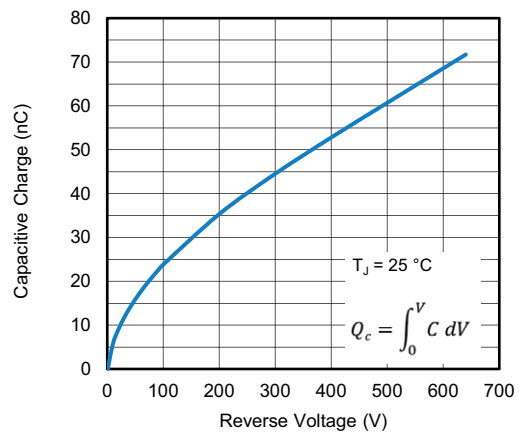
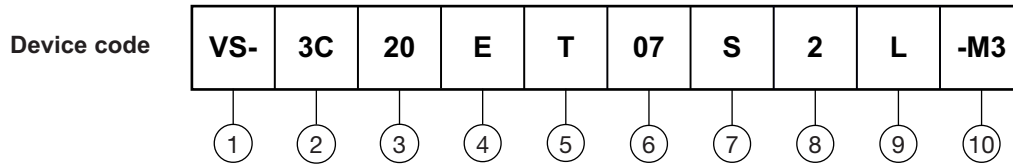


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage



ORDERING INFORMATION TABLE



- 1** - Vishay Semiconductors product
- 2** - 3C = SiC diode, generation 3
- 3** - Current rating (20 = 20 A)
- 4** - E = single diode
- 5** - T = D<sup>2</sup>PAK package
- 6** - Voltage rating: (07 = 650 V)
- 7** - S = surface mountable
- 8** - 2 = true 2 pin D<sup>2</sup>PAK
- 9** - L = tape and reel (left oriented)
- 10** - Environmental digit:  
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

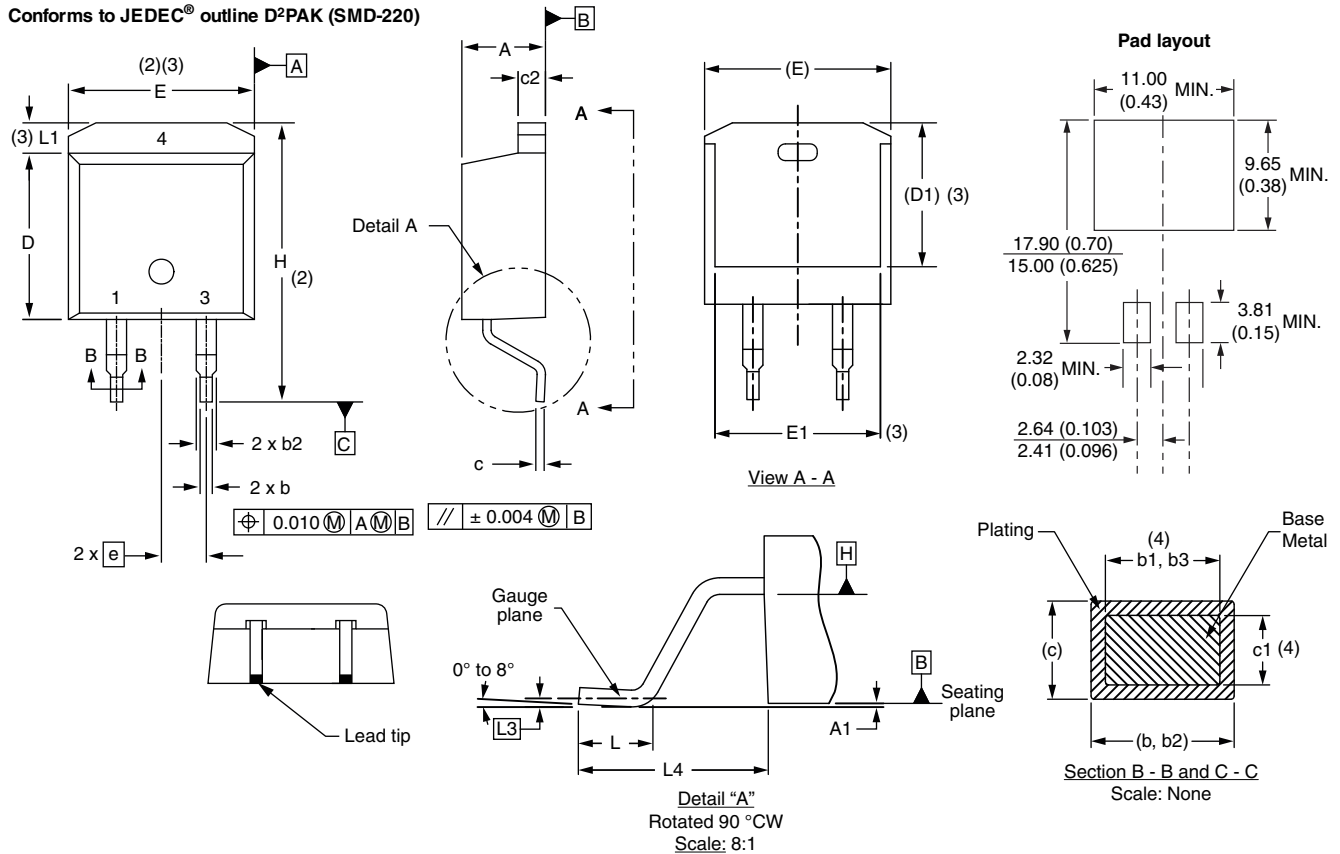
ORDERING INFORMATION		
PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-3C20ET07S2L-M3	800 per reel	13" diameter reel

LINKS TO RELATED DOCUMENTS	
Dimensions	<a href="http://www.vishay.com/doc?96683">www.vishay.com/doc?96683</a>
Part marking information	<a href="http://www.vishay.com/doc?96693">www.vishay.com/doc?96693</a>
Packaging information	<a href="http://www.vishay.com/doc?95032">www.vishay.com/doc?95032</a>

## D<sup>2</sup>PAK 2L (TO-263AB 2L)

### DIMENSIONS in millimeters and inches

Conforms to JEDEC® outline D<sup>2</sup>PAK (SMD-220)



SYMBOL	MILLIMETERS		INCHES		NOTES	SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.			MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190		D1	6.86	8.00	0.270	0.315	3
A1	0.00	0.254	0.000	0.010		E	9.65	10.67	0.380	0.420	2, 3
b	0.51	0.99	0.020	0.039		E1	7.90	8.80	0.311	0.346	3
b1	0.51	0.89	0.020	0.035	4	e	2.54 BSC		0.100 BSC		
b2	1.14	1.78	0.045	0.070		H	14.61	15.88	0.575	0.625	
b3	1.14	1.73	0.045	0.068	4	L	1.78	2.79	0.070	0.110	
c	0.38	0.74	0.015	0.029		L1	-	1.65	-	0.066	3
c1	0.38	0.58	0.015	0.023	4	L3	0.25 BSC		0.010 BSC		
c2	1.14	1.65	0.045	0.065		L4	4.78	5.28	0.188	0.208	
D	8.51	9.65	0.335	0.380	2						

### Notes

- (1) Dimensioning and tolerancing per ASME Y14.5 M-1994
- (2) Dimension D 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 outmost extremes of the plastic body
- (3) Thermal pad contour optional within dimension E, L1, D1 and E1
- (4) Dimension b1 and c1 apply to base metal only
- (5) Datum A and B to be determined at datum plane H
- (6) Controlling dimension: inch
- (7) Outline conforms to JEDEC® outline TO-263AB



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