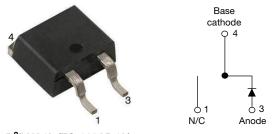
Vishay Semiconductors

# 650 V Gen 3 Power SiC Merged PIN Schottky Diode, 6 A



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

### LINKS TO ADDITIONAL RESOURCES



SHA



PRIMARY CHARACTERISTICS									
I <sub>F(AV)</sub>	6 A								
V <sub>R</sub>	650 V								
V <sub>F</sub> at I <sub>F</sub> at 150 °C	1.5 V								
T <sub>J</sub> max.	175 °C								
I <sub>R</sub> at V <sub>R</sub> at 175 °C	1.3 µA								
Q <sub>C</sub> (V <sub>R</sub> = 400 V)	17 nC								
Package	D <sup>2</sup> PAK 2L (TO-263AB 2L)								
Circuit configuration	Single								

### FEATURES

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



- Improved V<sub>F</sub> and efficiency by thin wafer COMPLIANT technology
   Positive V<sub>F</sub> temperature coefficient for easy FREE
- Positive V<sub>F</sub> 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  $^{\circ}\mathrm{C}$
- 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 <u>www.vishay.com/doc?99912</u>

### **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

<b>ABSOLUTE MAXIMUM RATINGS</b> ( $T_A = 25 \text{ °C}$ unless otherwise specified)									
PARAMETER	SYMBOL	TEST CONDITIONS	VALUES	UNITS					
Peak repetitive reverse voltage	V <sub>RRM</sub>		650	V					
Average rectified forward current	I <sub>F(AV)</sub>	T <sub>C</sub> = 141 °C (DC)	6	А					
DC blocking voltage	V <sub>DC</sub>		650	V					
Repetitive peak forward current	I <sub>FRM</sub>	$T_C$ = 25 °C, f = 50 Hz, square wave, DC = 25 $\%$	28						
Non-repetitive peak forward surge current	I <sub>FSM</sub>	$T_{C} = 25 \text{ °C}, t_{p} = 10 \text{ ms}, \text{ half sine wave}$	42	А					
Non-repetitive peak forward surge current		$T_{C}$ = 110 °C, $t_{p}$ = 10 ms, half sine wave	40						
Power dissipation	P <sub>tot</sub> <sup>(1)</sup>	$T_{C} = 25 \ ^{\circ}C$	50	w					
Fower dissipation	⊂tot`′	T <sub>C</sub> = 110 °C	22	vv					
		T <sub>C</sub> = 25 °C	9						
l <sup>2</sup> t value	∫i <sup>2</sup> dt	T <sub>C</sub> = 110 °C	8	A <sup>2</sup> s					
Operating junction and storage temperatures	T <sub>J</sub> <sup>(2)</sup> , T <sub>Stg</sub>		-55 to +175	°C					

#### Notes

<sup>(1)</sup> Based on maximum R<sub>th</sub>

 $^{(2)}$  The heat generated must be less than the thermal conductivity from junction-to-ambient: dP<sub>D</sub>/dT<sub>J</sub> < 1/R<sub> $\theta$ JA</sub>

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 1
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# VS-3C06ET07S2L-M3

## **Vishay Semiconductors**

<b>ELECTRICAL SPECIFICATIONS</b> ( $T_J$ = 25 °C unless otherwise specified)									
PARAMETER	SYMBOL TEST CONDITIONS				MAX.	UNITS			
		I <sub>F</sub> = 6 A	-	1.3	1.5				
Forward voltage	V <sub>F</sub>	I <sub>F</sub> = 6 A, T <sub>J</sub> = 150 °C	-	1.5	1.75	V			
		I <sub>F</sub> = 6 A, T <sub>J</sub> = 175 °C	-	1.58	-				
	I <sub>R</sub>	V <sub>R</sub> = V <sub>R</sub> rated -		0.2	35				
Reverse leakage current		$V_{R} = V_{R}$ rated, $T_{J} = 150 \text{ °C}$	-	0.8	75	μA			
		$V_{R} = V_{R}$ rated, $T_{J} = 175 \text{ °C}$	-	1.3	-				
Total capacitance	С	V <sub>R</sub> = 1 V, f = 1 MHz	-	255	-	pF			
		V <sub>R</sub> = 400 V, f = 1 MHz	-	27	-	рг			
Total capacitive charge	Q <sub>C</sub>	V <sub>R</sub> = 400 V, f = 1 MHz	-	17	-	nC			

<b>THERMAL - MECHANICAL SPECIFICATIONS</b> (T <sub>A</sub> = 25 °C unless otherwise specified)										
PARAMETER	PARAMETER SYMBOL TEST CONDITIONS MIN. TYP. MAX. UNIT									
Thermal resistance, junction to case	R <sub>thJC</sub>		-	2.3	3.0	°C/W				
Marking device		3C06ET07S								

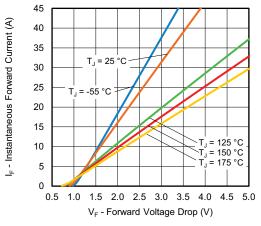


Fig. 1 - Typical Forward Voltage Drop Characteristics

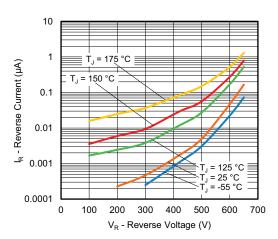


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

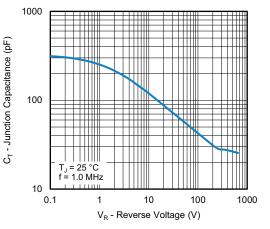


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

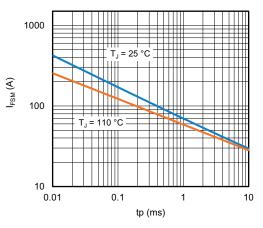


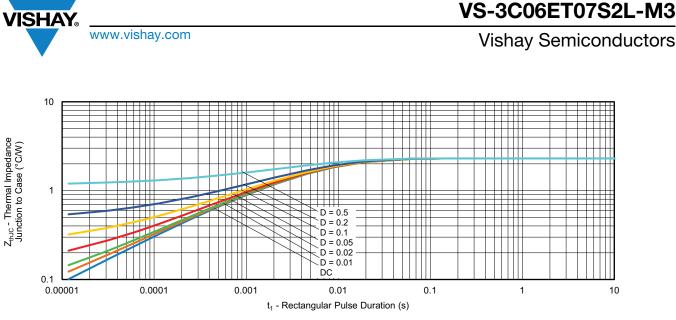
Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

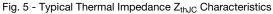
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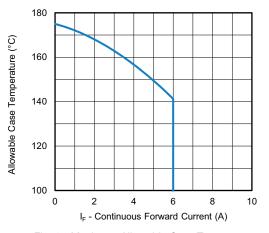


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current

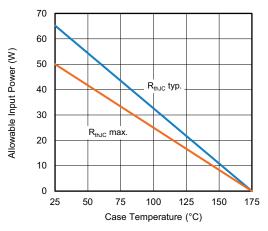


Fig. 7 - Forward Power Loss Characteristics

7 6 Capacitive Energy (µJ) 5 4 3 2 T, = 25 °C 1 C V dV  $E_I =$ 0 0 100 200 300 400 500 600 700 Reverse Voltage (V)

Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

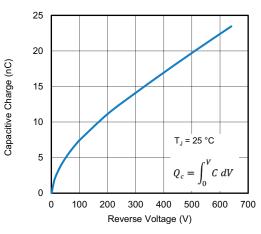


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage

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### **ORDERING INFORMATION TABLE**

Device code	VS-	3C	06	E	т	07	S	2	L	-МЗ	
	1	2	3	4	5	6	7	8	9	10	
	1 - Vishay Semiconductors product										
	2	- 3C	= SiC c	diode, ge	eneratio	n 3					
	3	- Cur	rent rat	ing (06 =	= 6 A)						
	4	- E=	single of	diode							
	5	- T=	D <sup>2</sup> PAK	packag	е						
	6	- Vol	tage rat	ing: (07	= 650 V	)					
	7	- S =	surface	mounta	able						
	8	- 2 =	$2 = true 2 pin D^2 PAK$								
	9	- L=	L = tape and reel (left oriented)								
	10	- Environmental digit:									
		-M3	3 = halo	gen-free	e, RoHS	-complia	ant, and	termina	ation lea	d (Pb)-fre	

ORDERING INFORMATION		
PREFERRED P/N	BASE QUANTITY	PACKAGING DESCRIPTION
VS-3C06ET07S2L-M3	800 per reel	13" diameter reel

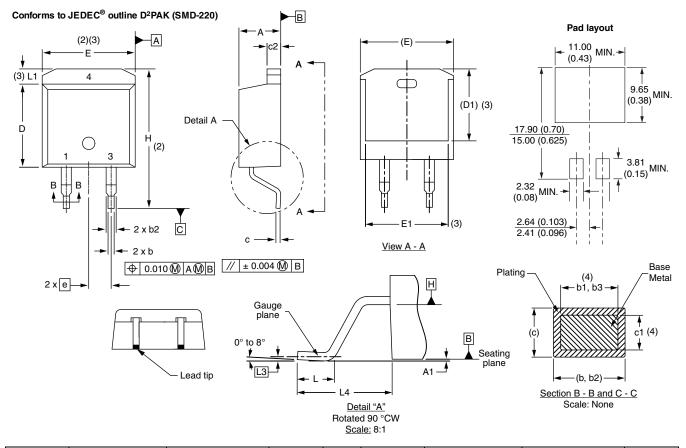
LINKS TO RELATED DOCUMENTS						
Dimensions	www.vishay.com/doc?96683					
Part marking information	www.vishay.com/doc?96693					
Packaging information	www.vishay.com/doc?95032					

**Vishay Semiconductors** 



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

### **DIMENSIONS** in millimeters and inches



SYMBOL	MILLIM	ETERS	INC	HES	NOTES	NOTES	NOTES	SYMBOL	MILLIM	ETERS	INC	HES	NOTES
STMBOL	MIN.	MAX.	MIN.	MAX.	NOTES		STWIDOL	MIN.	MAX.	MIN.	MAX.	NUTES	
А	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		е	2.54	BSC	0.100	BSC		
b2	1.14	1.78	0.045	0.070			Н	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		
с	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

<sup>(1)</sup> 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 and contain antional within dimension E 1.1, D1 and E1.

<sup>(3)</sup> Thermal pad contour optional within dimension E, L1, D1 and E1

<sup>(4)</sup> Dimension b1 and c1 apply to base metal only

<sup>(5)</sup> Datum A and B to be determined at datum plane H

<sup>(6)</sup> Controlling dimension: inch

(7) Outline conforms to JEDEC® outline TO-263AB

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