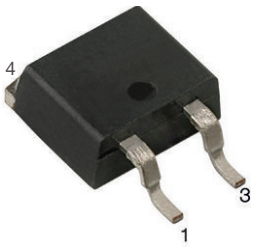
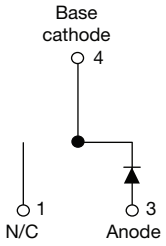
650 V Gen 4 Power Silicon Carbide Schottky Diode, 40 A



D²PAK 2L (TO-263AB 2L)



LINKS TO ADDITIONAL RESOURCES

3D Models

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
- Meets JESD 201 class 1A whisker test
- Meets MSL level 1, per J-STD-020, LF maximum peak of 245 °C
- Material categorization: for definitions of compliance please see 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.

Optimized for extreme high speed hard switching across a wide temperature range. This SiC diode is ideal for applications with high dI/d_t such as high efficiency PFC and ultra-high frequency output rectifiers in AC/DC and DC/DC converters.

MECHANICAL DATA

Case: D²PAK 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

PRIMARY CHARACTERISTICS	
I_F	40 A
V_R	650 V
V_F at I_F at 25 °C, typ.	1.45 V
T_J max.	175 °C
I_R at V_R at 175 °C	125 µA
Q_C (V_R = 400 V)	78 nC
Package	D²PAK 2L (TO-263AB 2L)
Circuit configuration	Single

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 (1)	T_C = 108 °C (DC)	40	A
	I_F (2)	T_C = 79 °C (DC)	40	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 %	94	A
Non-repetitive peak forward surge current	I_{FSM}	T_C = 25 °C, t_p = 10 ms, half sine wave	180	A
		T_C = 110 °C, t_p = 10 ms, half sine wave	160	
Power dissipation	P_{tot} (1)	T_C = 25 °C	167	W
		T_C = 110 °C	72	
	P_{tot} (2)	T_C = 25 °C	115	W
		T_C = 110 °C	50	
I^2t value	$\int i^2 dt$	T_C = 25 °C	162	A^2s
		T_C = 110 °C	128	
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: $dP_D/dT_J < 1/R_{\theta JA}$

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Forward voltage	V_F	I_F = 40 A	-	1.45	1.65	V
		I_F = 40 A, T_J = 150 °C	-	1.73	2.05	
		I_F = 40 A, T_J = 175 °C	-	1.85	-	
Reverse leakage current	I_R	V_R = V_R rated	-	7.0	200	µA
		V_R = V_R rated, T_J = 150 °C	-	60	400	
		V_R = V_R rated, T_J = 175 °C	-	125	-	
Total capacitance	C	V_R = 1 V, f = 1 MHz	-	1315	-	pF
		V_R = 400 V, f = 1 MHz	-	110	-	
Total capacitive charge	Q_C	V_R = 400 V, f = 1 MHz	-	78	-	nC

THERMAL AND MECHANICAL SPECIFICATIONS (T_A = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Thermal resistance, junction-to-case	R_{thJC}		-	0.9	1.3	°C/W
Marking device			4C41ET07S			

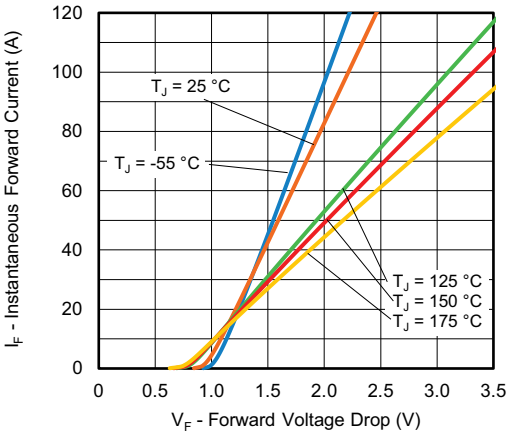


Fig. 1 - Typical Forward Voltage Drop Characteristics

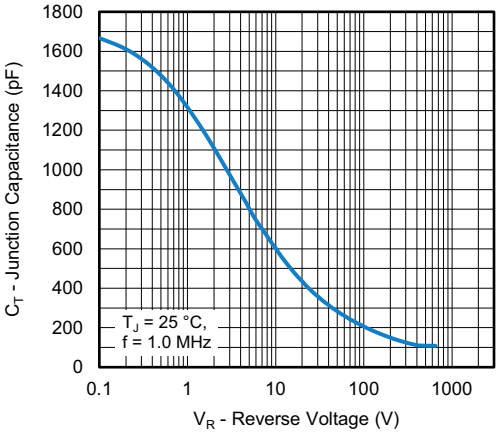


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage

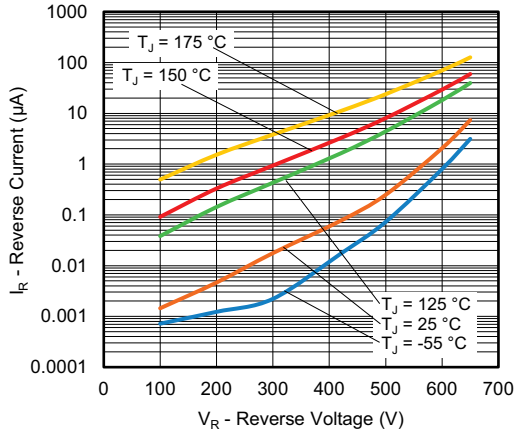


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage

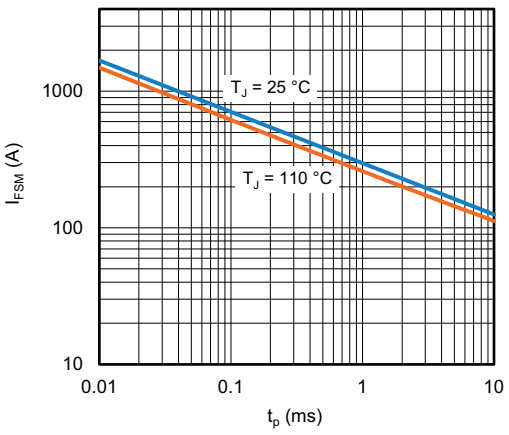


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration (Square Wave)

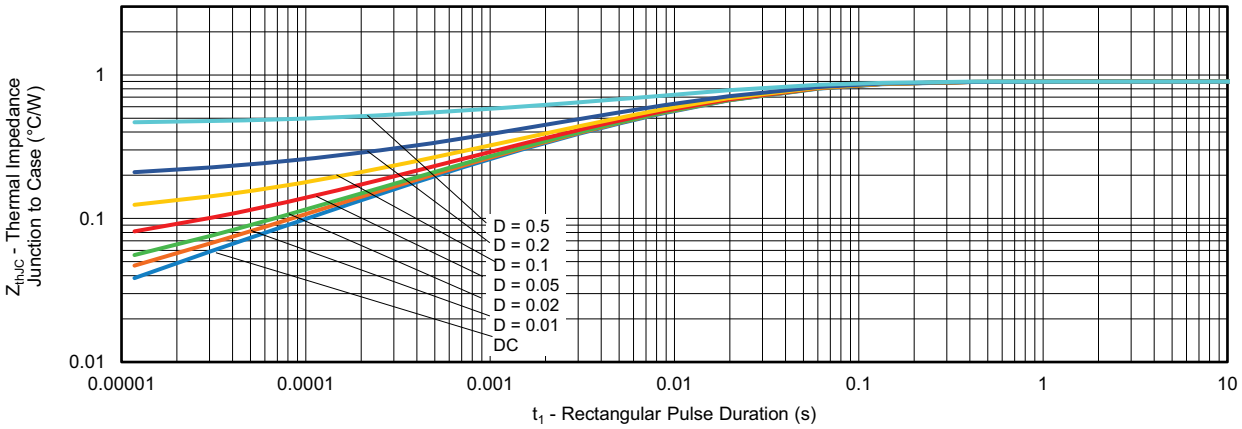


Fig. 5 - Typical Thermal Impedance Z_{thJC} - Characteristics

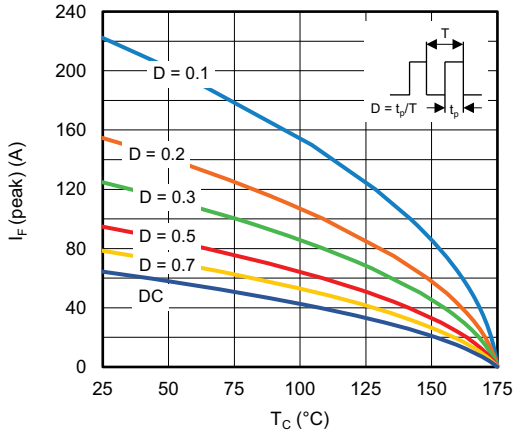


Fig. 6 - Peak Forward Current vs. Maximum Allowable Case Temperature

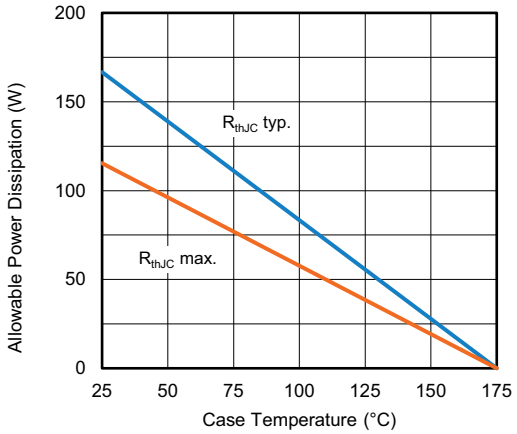


Fig. 7 - Forward Power Loss Characteristics

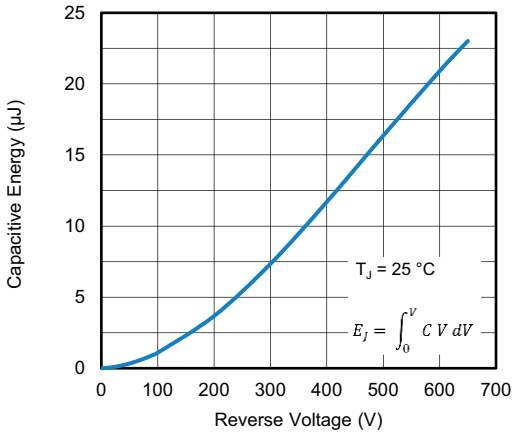


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage

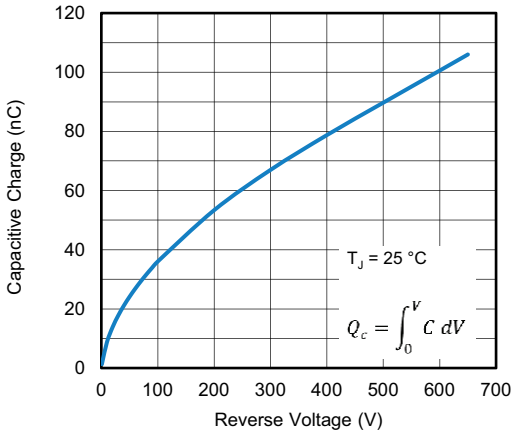
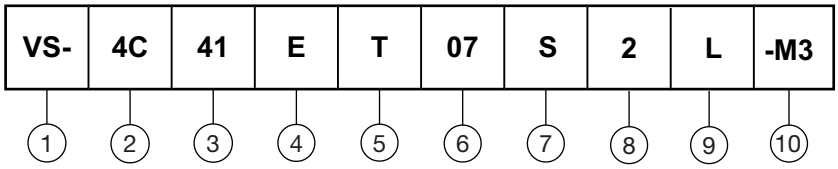


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage

ORDERING INFORMATION TABLE

Device code



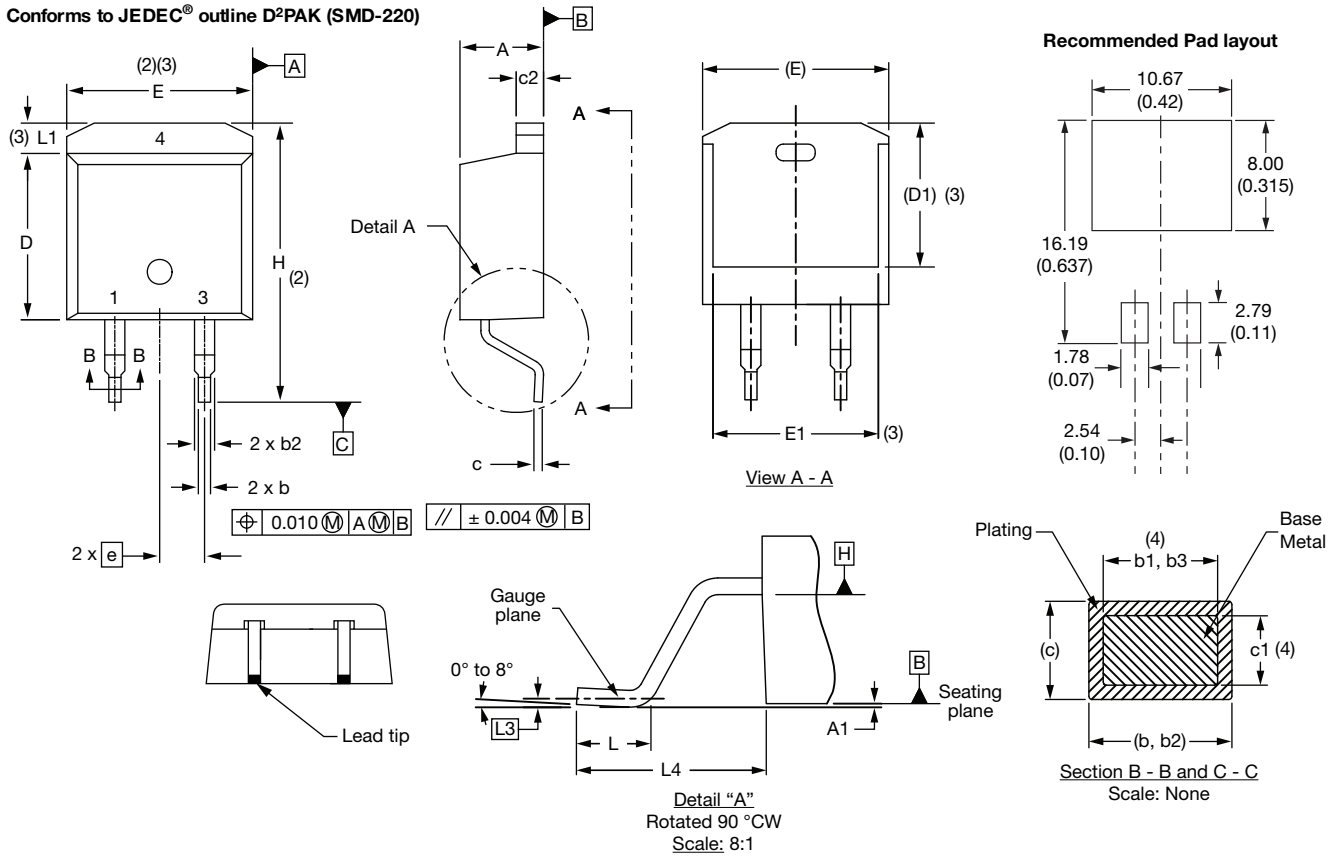
1 - Vishay Semiconductors product
2 - 4C = SiC diode, Generation 4
3 - Current rating (41 = 40 A)
4 - E = single diode
5 - T = package D^2PAK
6 - Voltage rating: 07 = 650 V
7 - S = surface mountable
8 - 2 = true 2 pin D^2PAK
9 - L = tape and reel (left oriented)
10 - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

ORDERING INFORMATION			
PREFERRED P/N	**UNIT WEIGHT**	**BASE QUANTITY**	**PACKAGING DESCRIPTION**
VS-4C41ET07S2L-M3	2 g	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

D²PAK 2L (TO-263AB 2L)

DIMENSIONS in millimeters and inches



SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
A	4.06	4.83	0.160	0.190	
A1	0.00	0.254	0.000	0.010	
b	0.51	0.99	0.020	0.039	
b1	0.51	0.89	0.020	0.035	4
b2	1.14	1.78	0.045	0.070	
b3	1.14	1.73	0.045	0.068	4
c	0.38	0.74	0.015	0.029	
c1	0.38	0.58	0.015	0.023	4
c2	1.14	1.65	0.045	0.065	
D	8.51	9.65	0.335	0.380	2

SYMBOL	MILLIMETERS		INCHES		NOTES
	MIN.	MAX.	MIN.	MAX.	
D1	6.86	8.00	0.270	0.315	3
E	9.65	10.67	0.380	0.420	2, 3
E1	7.90	8.80	0.311	0.346	3
e	2.54 BSC		0.100 BSC		
H	14.61	15.88	0.575	0.625	
L	1.78	2.79	0.070	0.110	
L1	-	1.65	-	0.066	3
L3	0.25 BSC		0.010 BSC		
L4	4.78	5.28	0.188	0.208	

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

Disclaimer

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

Vishay Intertechnology, Inc., its affiliates, agents, and employees, and all persons acting on its or their behalf (collectively, “Vishay”), disclaim any and all liability for any errors, inaccuracies or incompleteness contained in any datasheet or in any other disclosure relating to any product.

Vishay makes no warranty, representation or guarantee regarding the suitability of the products for any particular purpose or the continuing production of any product. To the maximum extent permitted by applicable law, Vishay disclaims (i) any and all liability arising out of the application or use of any product, (ii) any and all liability, including without limitation special, consequential or incidental damages, and (iii) any and all implied warranties, including warranties of fitness for particular purpose, non-infringement and merchantability.

Statements regarding the suitability of products for certain types of applications are based on Vishay's knowledge of typical requirements that are often placed on Vishay products in generic applications. Such statements are not binding statements about the suitability of products for a particular application. It is the customer's responsibility to validate that a particular product with the properties described in the product specification is suitable for use in a particular application. Parameters provided in datasheets and / or specifications may vary in different applications and performance may vary over time. All operating parameters, including typical parameters, must be validated for each customer application by the customer's technical experts. Product specifications do not expand or otherwise modify Vishay's terms and conditions of purchase, including but not limited to the warranty expressed therein.

Hyperlinks included in this datasheet may direct users to third-party websites. These links are provided as a convenience and for informational purposes only. Inclusion of these hyperlinks does not constitute an endorsement or an approval by Vishay of any of the products, services or opinions of the corporation, organization or individual associated with the third-party website. Vishay disclaims any and all liability and bears no responsibility for the accuracy, legality or content of the third-party website or for that of subsequent links.

Vishay products are not designed for use in life-saving or life-sustaining applications or any application in which the failure of the Vishay product could result in personal injury or death unless specifically qualified in writing by Vishay. Customers using or selling Vishay products not expressly indicated for use in such applications do so at their own risk. Please contact authorized Vishay personnel to obtain written terms and conditions regarding products designed for such applications.

No license, express or implied, by estoppel or otherwise, to any intellectual property rights is granted by this document or by any conduct of Vishay. Product names and markings noted herein may be trademarks of their respective owners.