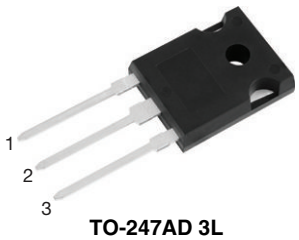
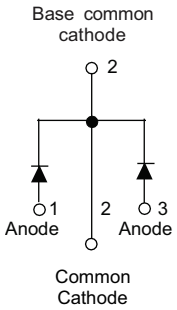
650 V Power SiC Merged PIN Schottky Diode, 2 x 20 A



TO-247AD 3L



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

RoHS COMPLIANT
HALOGEN FREE

LINKS TO ADDITIONAL RESOURCES

3D Models | SPICE Models | Application Notes

PRIMARY CHARACTERISTICS	
$I_{F(AV)}$	2 x 20 A
V_R	650 V
V_F at I_F at 150 °C	1.55 V
T_J max.	175 °C
I_R at V_R at 175 °C	35 µA
Q_C (V_R = 400 V)	68 nC
Package	TO-247AD 3L
Circuit configuration	Common cathode

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: TO-247AD 3L

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

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, per leg	$I_{F(AV)}$	T_C = 140 °C (DC)	20	A
DC blocking voltage	V_{DC}		650	V
Repetitive peak surge current, per leg	I_{FRM}	T_C = 25 °C, f = 50 Hz, square wave, DC = 25 %	92	A
Non-repetitive peak forward surge current, per leg	I_{FSM}	T_C = 25 °C, t_p = 10 ms, half sine wave	160	A
		T_C = 110 °C, t_p = 10 ms, half sine wave	140	
Power dissipation, per leg	P_{tot} (1)	T_C = 25°C	170	W
		T_C = 110 °C	74	
I^2t value, per leg	$\int i^2 dt$	T_C = 25°C	128	A^2s
		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: $dP_D/dT_J < 1/R_{\theta JA}$

ELECTRICAL SPECIFICATIONS (T_J = 25 °C unless otherwise specified)						
PARAMETER	**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Forward voltage, per leg	V_F	I_F = 20 A	-	1.40	1.70	V
		I_F = 20 A, T_J = 150 °C	-	1.55	1.9	
		I_F = 20 A, T_J = 175 °C	-	1.60	-	
Reverse leakage current, per leg	I_R	V_R = V_R rated	-	-	100	µA
		V_R = V_R rated, T_J = 150 °C	-	-	250	
		V_R = V_R rated, T_J = 175 °C	-	35	-	
Total capacitance, per leg	C	V_R = 1 V, f = 1 MHz	-	1040	-	pF
		V_R = 400 V, f = 1 MHz	-	110	-	
Total capacitive charge, per leg	Q_C	V_R = 400 V, f = 1 MHz	-	68	-	nC

THERMAL - MECHANICAL SPECIFICATIONS (T_A = 25 °C unless otherwise specified)							
PARAMETER		**SYMBOL**	**TEST CONDITIONS**	**MIN.**	**TYP.**	**MAX.**	**UNITS**
Thermal resistance, junction-to-case	per leg	R_{thJC}		-	0.63	0.88	°C/W
	per device			-	0.38	0.53	
Marking device				C40CP07L			

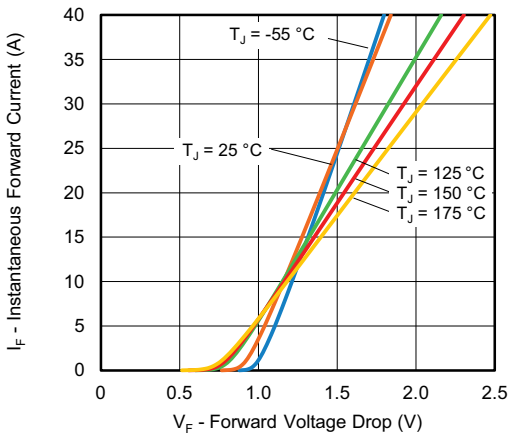


Fig. 1 - Typical Forward Voltage Drop Characteristics, per leg

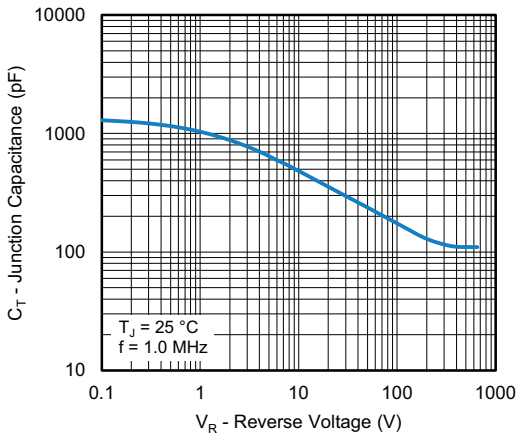


Fig. 3 - Typical Junction Capacitance vs. Reverse Voltage, per leg

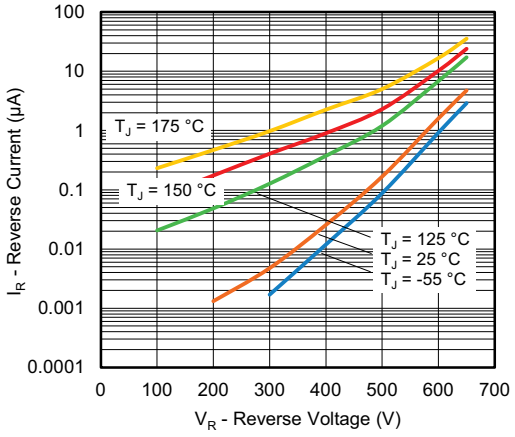


Fig. 2 - Typical Values of Reverse Current vs. Reverse Voltage, per leg

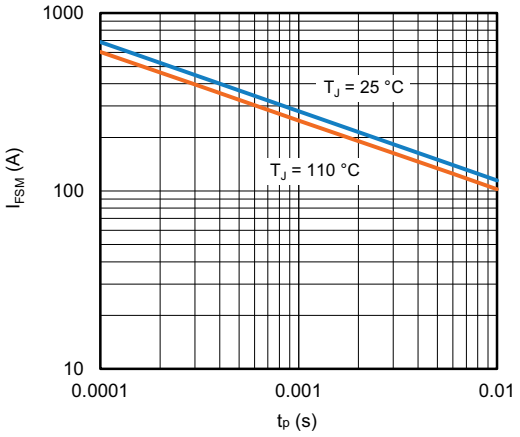


Fig. 4 - Non-Repetitive Peak Forward Surge Current vs. Pulse Duration, Per Leg (Square Wave)

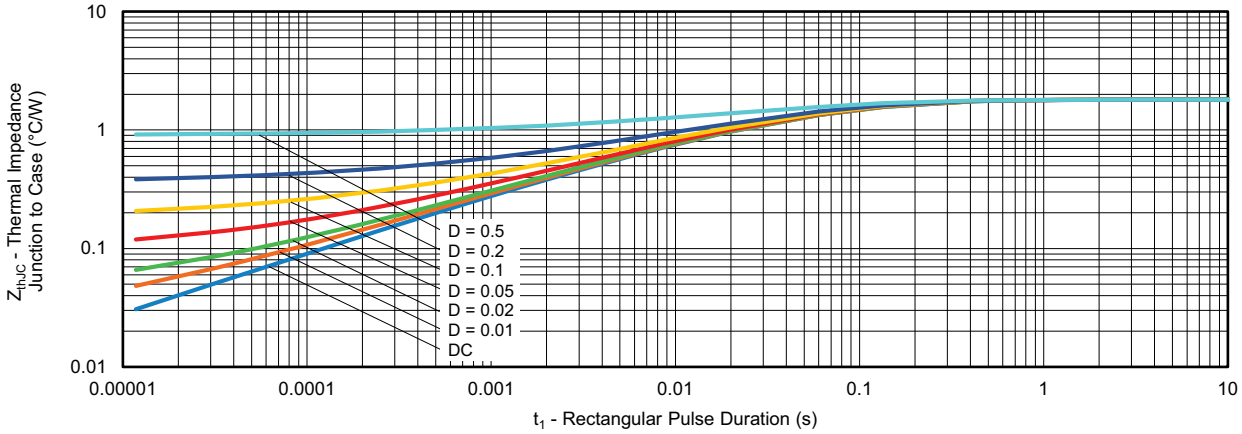


Fig. 5 - Typical Thermal Impedance Z_{thJC} Characteristics, per leg

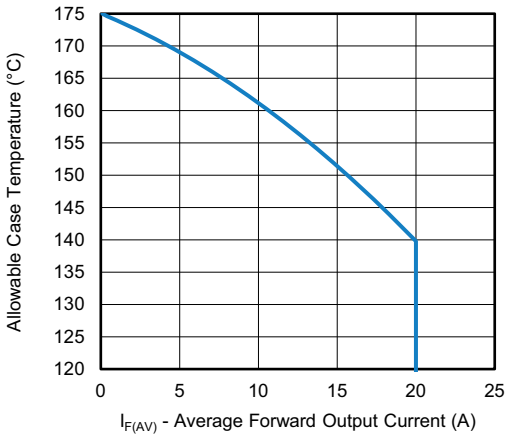


Fig. 6 - Maximum Allowable Case Temperature vs. Average Forward Current, per leg

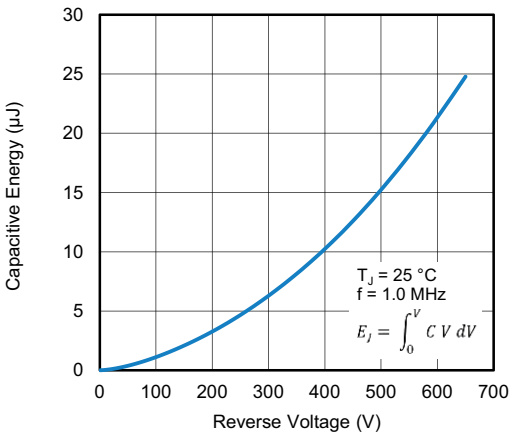


Fig. 8 - Typical Capacitive Energy vs. Reverse Voltage, per leg

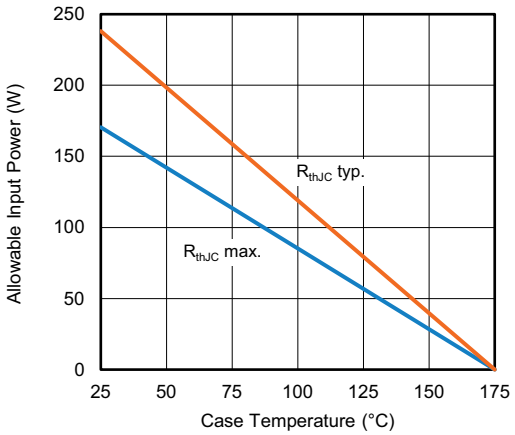


Fig. 7 - Forward Power Loss Characteristics, per leg

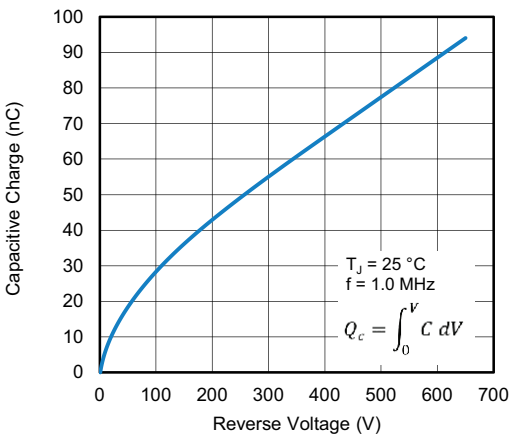
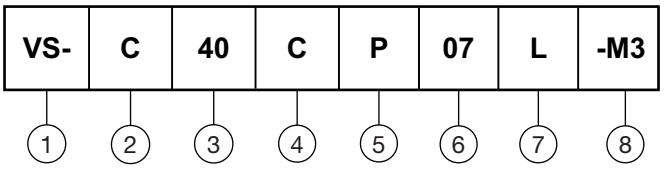


Fig. 9 - Typical Capacitive Charge vs. Reverse Voltage, per leg

ORDERING INFORMATION TABLE

Device code



1 - Vishay Semiconductors product
2 - C = SiC diode
3 - Current rating (40 = 40 A)
4 - C = common cathode
5 - P = package TO-247
6 - Voltage rating: (07 = 650 V)
7 - L = long lead
8 - Environmental digit:
-M3 = halogen-free, RoHS-compliant, and termination lead (Pb)-free

ORDERING INFORMATION			
PREFERRED P/N	**BASE QUANTITY**	**MINIMUM ORDER QUANTITY**	**PACKAGING DESCRIPTION**
VS-C40CP07L-M3	25/tube	500	Antistatic plastic tubes

LINKS TO RELATED DOCUMENTS	
Dimensions	www.vishay.com/doc?95626
Part marking information	www.vishay.com/doc?95007
SPICE model	www.vishay.com/doc?96888

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.

Except as expressly indicated in writing, Vishay products are not designed for use in medical, life-saving, or life-sustaining applications or for any other application in which the failure of the Vishay product could result in personal injury or death. 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.