

Surface Mount PAR[®] Transient Voltage Suppressors

High Temperature Stability and High Reliability Conditions



DO-218AB

Cathode  Anode

LINKS TO ADDITIONAL RESOURCES



FEATURES

- Junction passivation optimized design passivated anisotropic rectifier technology
- $T_J = 175\text{ }^{\circ}\text{C}$ capability suitable for high reliability and automotive requirement
- Available in unidirectional polarity only
- Low leakage current
- Low forward voltage drop
- High surge capability
- Meets ISO7637-2 surge specification (varied by test condition)
- Meets MSL level 1, per J-STD-020, LF maximum peak of $245\text{ }^{\circ}\text{C}$
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912



RoHS
COMPLIANT

TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lightning, especially for automotive load dump protection application.

MECHANICAL DATA

Case: DO-218AB

Molding compound meets UL 94 V-0 flammability rating Base P/NHE3_X - RoHS-compliant and AEC-Q101 qualified ("X" denotes revision code e.g. A, B, ...)

Terminals: matte tin plated leads, solderable per J-STD-002 and JESD 22-B102

HE3 suffix meets JESD 201 class 2 whisker test

Polarity: heatsink is anode

PRIMARY CHARACTERISTICS	
V_{WM}	10 V to 36 V
V_{BR}	11.1 V to 44.2 V
P_{PPM} (10 x 1000 μs)	3600 W
P_{PPM} (10 x 10 000 μs)	2800 W
P_D	5 W
I_{FSM}	500 A
T_J max.	$175\text{ }^{\circ}\text{C}$
Polarity	Unidirectional
Package	DO-218AB

MAXIMUM RATINGS ($T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted)			
PARAMETER	SYMBOL	VALUE	UNIT
Peak pulse power dissipation	P_{PPM}	with 10/1000 μs waveform 3600	W
		with 10/10 000 μs waveform 2800	
Power dissipation on infinite heatsink at $T_A = 25\text{ }^{\circ}\text{C}$ (fig. 1)	P_D	5.0	W
Peak pulse current with 10/1000 μs waveform	$I_{PPM}^{(1)}$	See next table	A
Peak forward surge current 8.3 ms single half sine-wave	I_{FSM}	500	A
Operating junction and storage temperature range	T_J, T_{STG}	-55 to +175	$^{\circ}\text{C}$

Note

(1) Non-repetitive current pulse at $T_A = 25\text{ }^{\circ}\text{C}$

**ELECTRICAL CHARACTERISTICS** ($T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted)

DEVICE TYPE	BREAKDOWN VOLTAGE V_{BR} (V)			TEST CURRENT I_T (mA)	STAND-OFF VOLTAGE V_{WM} (V)	MAXIMUM REVERSE LEAKAGE AT V_{WM} I_D (μA)	MAXIMUM REVERSE LEAKAGE AT V_{WM} $T_J = 175\text{ }^{\circ}\text{C}$ I_D (μA)	MAX. PEAK PULSE CURRENT AT 10/1000 μs WAVEFORM (A)	MAXIMUM CLAMPING VOLTAGE AT I_{PPM} V_C (V)	TYPICAL TEMP. COEFFICIENT OF V_{BR} α_T ($\%/^{\circ}\text{C}$)
	MIN.	NOM.	MAX.							
SM5S10A	11.1	11.7	12.3	5.0	10.0	15	250	212	17.0	0.069
SM5S11A	12.2	12.9	13.5	5.0	11.0	10	150	198	18.2	0.072
SM5S12A	13.3	14.0	14.7	5.0	12.0	10	150	181	19.9	0.074
SM5S13A	14.4	15.2	15.9	5.0	13.0	10	150	167	21.5	0.076
SM5S14A	15.6	16.4	17.2	5.0	14.0	10	150	155	23.2	0.078
SM5S15A	16.7	17.6	18.5	5.0	15.0	10	150	148	24.4	0.080
SM5S16A	17.8	18.8	19.7	5.0	16.0	10	150	138	26.0	0.081
SM5S17A	18.9	19.9	20.9	5.0	17.0	10	150	130	27.6	0.082
SM5S18A	20.0	21.1	22.1	5.0	18.0	10	150	123	29.2	0.083
SM5S20A	22.2	23.4	24.5	5.0	20.0	10	150	111	32.4	0.085
SM5S22A	24.4	25.7	26.9	5.0	22.0	10	150	101	35.5	0.086
SM5S24A	26.7	28.1	29.5	5.0	24.0	10	150	93	38.9	0.087
SM5S26A	28.9	30.4	31.9	5.0	26.0	10	150	86	42.1	0.088
SM5S28A	31.1	32.8	34.4	5.0	28.0	10	150	79	45.4	0.089
SM5S30A	33.3	35.1	36.8	5.0	30.0	10	150	74	48.4	0.090
SM5S33A	36.7	38.7	40.6	5.0	33.0	10	150	68	53.3	0.091
SM5S36A	40.0	42.1	44.2	5.0	36.0	10	150	62	58.1	0.091

Notes

- For all types maximum $V_F = 2.0\text{ V}$ at $I_F = 100\text{ A}$ measured on $300\text{ }\mu\text{s}$ square pulse width
- (1) To calculate V_{BR} vs. junction temperature, use the following formula: V_{BR} at $T_J = V_{BR}$ at $25\text{ }^{\circ}\text{C} \times (1 + \alpha_T \times (T_J - 25))$

THERMAL CHARACTERISTICS ($T_A = 25\text{ }^{\circ}\text{C}$ unless otherwise noted)

PARAMETER	SYMBOL	VALUE	UNIT
Typical thermal resistance	$R_{\theta JA}$ ⁽¹⁾	55	$^{\circ}\text{C/W}$
	$R_{\theta JM}$ ⁽²⁾	0.45	$^{\circ}\text{C/W}$

Notes

- Thermal resistance junction-to-ambient to follow JEDEC[®]51-2A, device mounted on FR4 PCB, 2 oz. standard footprint
- Thermal resistance junction-to-mount to follow JEDEC[®]51-14 using Transient Dual Interface Test Method (TDIM)



ORDERING INFORMATION TABLE

Device code	SM	x	S	xx	A	H	E3
	1	2	3	4	5	6	7
	1	-	Surface mount				
	2	-	Power dissipation P_D (5 = 5 W, 6 = 6 W, 8 = 8 W)				
	3	-	Standard V_F type				
	4	-	Stand-off voltage				
	5	-	Breakdown voltage tolerance and polarity ($A \pm 5\%$, unidirectional)				
	6	-	Quality grade (H = AEC-Q101 qualified, otherwise = industry grade)				
	7	-	Material / Environment category (E3 = non halogen-free, RoHS-compliant, and termination lead (Pb)-free)				

ORDERING INFORMATION (Example)				
PREFERRED P/N	UNIT WEIGHT (g)	PREFERRED PACKAGE CODE	BASE QUANTITY	DELIVERY MODE
SM5S10AHE3_A/I ⁽¹⁾	2.505	I	750	13" diameter plastic tape and reel, anode towards the sprocket hole

Note

⁽¹⁾ AEC-Q101 qualified



RATINGS AND CHARACTERISTICS CURVES ($T_A = 25^\circ\text{C}$ unless otherwise noted)

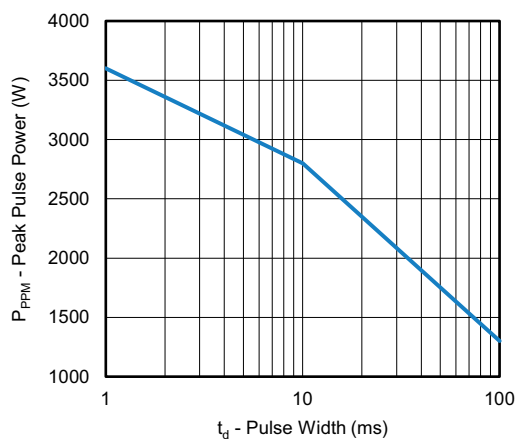


Fig. 1 - Peak Pulse Power Derating Curve

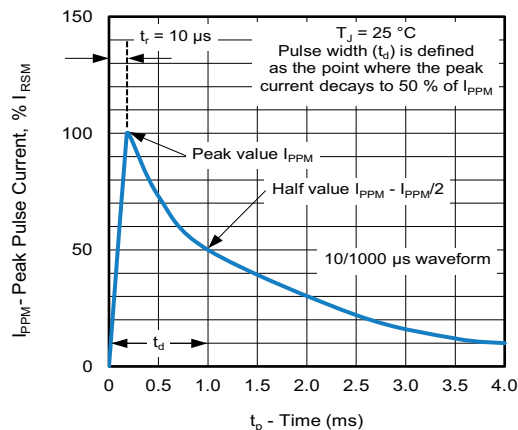


Fig. 4 - Pulse waveform

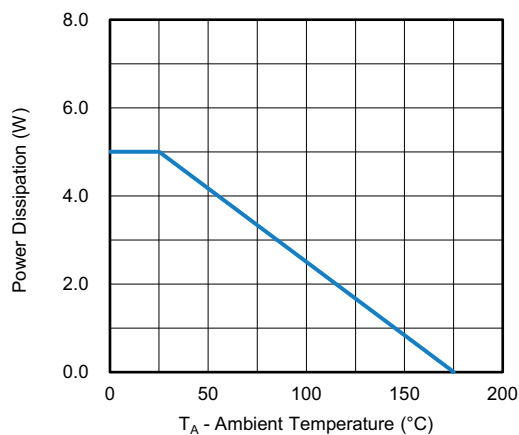


Fig. 2 - Power Derating Curve

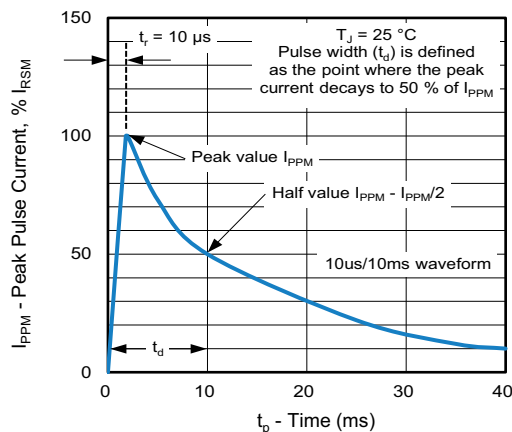


Fig. 5 - Pulse Waveform

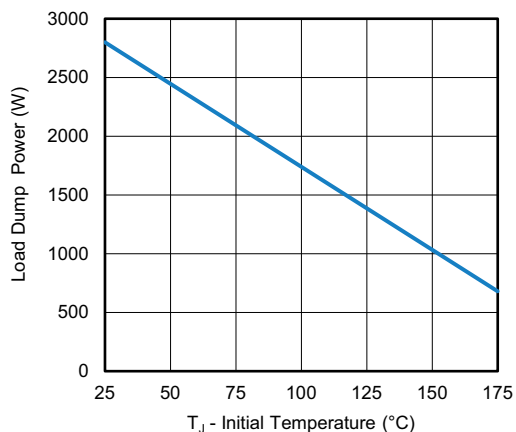


Fig. 3 - Load Dump Power Characteristics (10 ms Exponential Waveform)

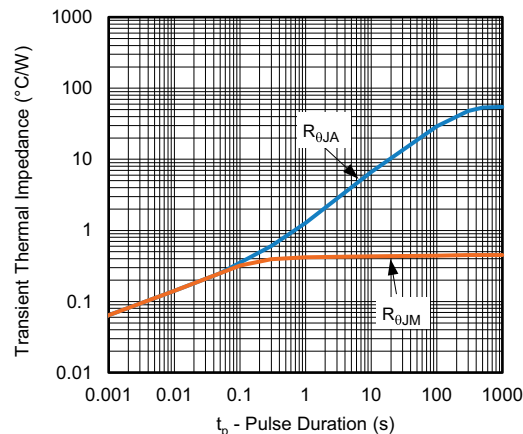
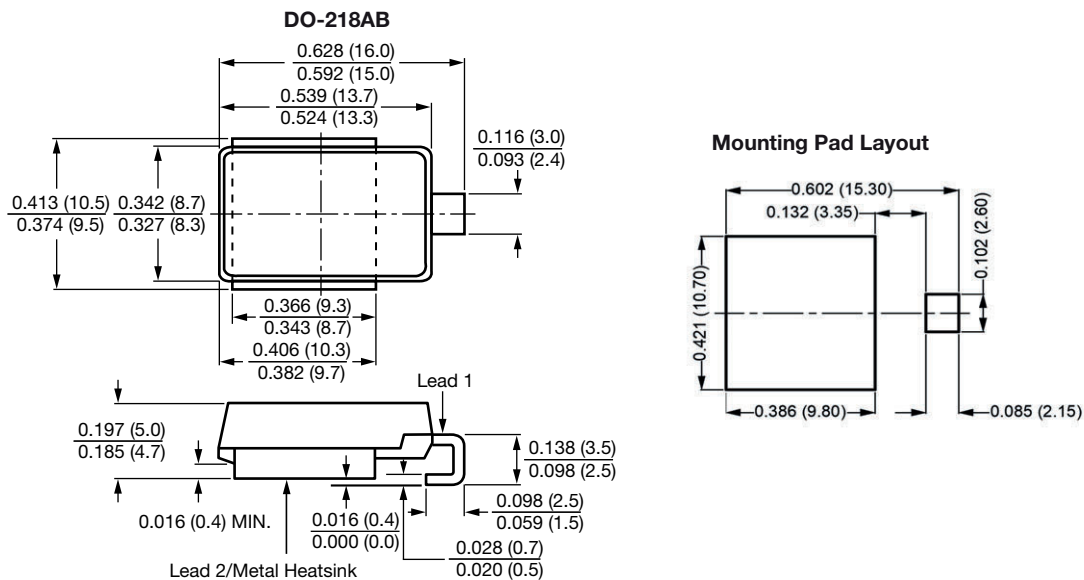


Fig. 6 - Typical Transient Thermal Impedance



PACKAGE OUTLINE DIMENSIONS in inches (millimeters)



Note

- Footprint in accordance with IPC 7351 standard



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.