

# Surface Mount PAR<sup>®</sup> 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](http://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 $\mu\text{s}$ )	3600 W
$P_{PPM}$ (10 x 10 000 $\mu\text{s}$ )	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	$P_{PPM}$	3600	W
		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 $\mu\text{s}$ 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 $V_{WM}$ $I_D$ ( $\mu\text{A}$ )	MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $T_J = 175\text{ }^{\circ}\text{C}$ $I_D$ ( $\mu\text{A}$ )	MAX. PEAK PULSE CURRENT AT 10/1000 $\mu\text{s}$ WAVEFORM (A)	MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V)	TYPICAL TEMP. COEFFICIENT OF $V_{BR}$ $\alpha_T$ ( $\%/^{\circ}\text{C}$ )
	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  $\mu\text{s}$  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**

- (1) Thermal resistance junction-to-ambient to follow JEDEC®51-2A, device mounted on FR4 PCB, 2 oz. standard footprint
- (2) 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 <sup>(1)</sup>	2.505	I	750	13" diameter plastic tape and reel, anode towards the sprocket hole

### Note

<sup>(1)</sup> AEC-Q101 qualified



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

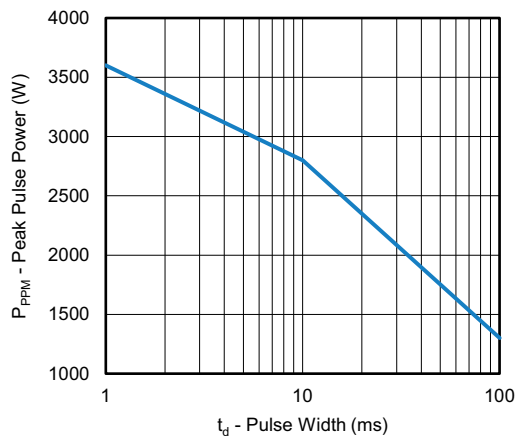


Fig. 1 - Peak Pulse Power Derating Curve

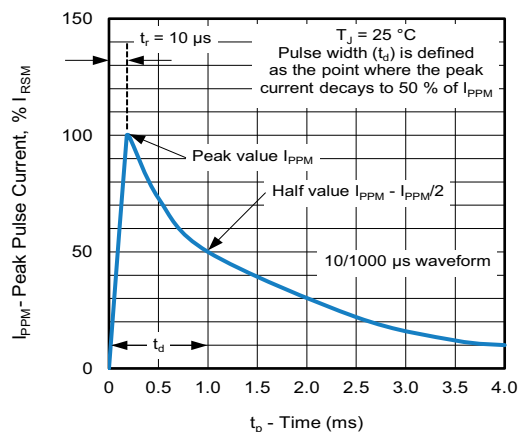


Fig. 4 - Pulse waveform

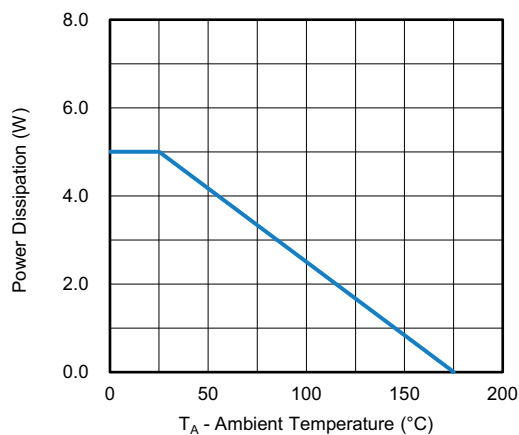


Fig. 2 - Power Derating Curve

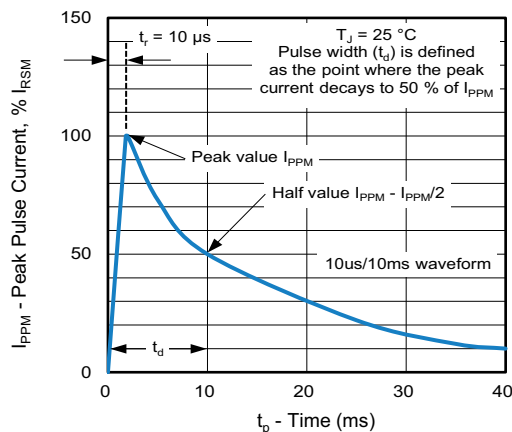


Fig. 5 - Pulse Waveform

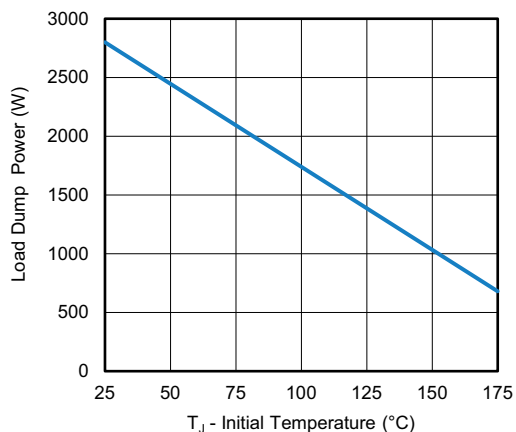


Fig. 3 - Load Dump Power Characteristics (10 ms Exponential Waveform)

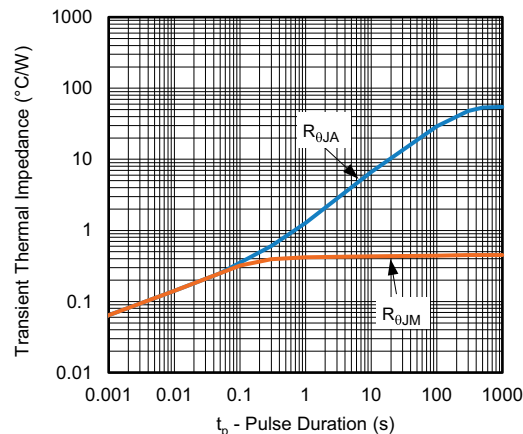
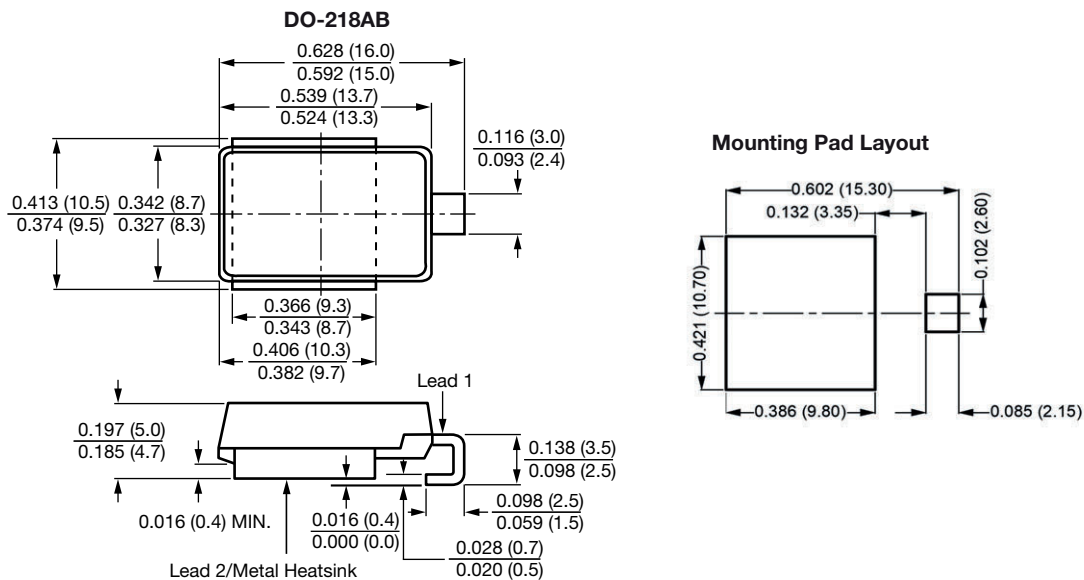


Fig. 6 - Typical Transient Thermal Impedance



## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)



### Note

- Footprint in accordance with IPC 7351 standard



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