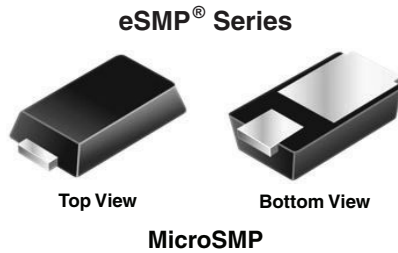




**THE DATASHEET OF  
MSP3V3-E3/89A**



# Surface Mount TRANSZORB<sup>®</sup> Transient Voltage Suppressors



**RoHS**  
COMPLIANT  
HALOGEN  
**FREE**

## FEATURES

- Very low profile - typical height of 0.65 mm
- Ideal for automated placement
- Oxide planar chip junction
- Uni-directional polarity only
- Peak pulse power: 150 W (10/1000  $\mu$ s)
- ESD capability: **15 kV (air), 8 kV (contact)**
- Meets MSL level 1, per J-STD-020C, LF maximum peak of 260 °C
- AEC-Q101 qualified
- Not recommended for PCB bottom side wave mounting
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

PRIMARY CHARACTERISTICS	
$V_{WM}$	3.3 V to 5.0 V
$V_{BR}$	4.1 V to 7.07 V
$P_{PPM}$	150 W
$T_J$ max.	150 °C
Polarity	Uni-directional
Package	MicroSMP

## TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lighting on ICs, MOSFET, signal lines of sensor units for protecting sensitive equipment against transient overvoltages.

## MECHANICAL DATA

### Case: MicroSMP

Molding compound meets UL 94 V-0 flammability rating  
Base P/N-M3 - halogen-free, RoHS compliant, and commercial grade

Base P/NHM3 - halogen-free, RoHS compliant, and automotive grade

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

M3 suffix meets JESD 201 class 1A whisker test, HM3 suffix meets JESD 201 class 2 whisker test

**Polarity:** Color band denotes the cathode end

MAXIMUM RATINGS ( $T_A = 25$ °C unless otherwise noted)				
PARAMETER		SYMBOL	VALUE	UNIT
Peak power dissipation with a 10/1000 $\mu$ s waveform (fig. 1)		$P_{PPM}^{(1)(2)}$	150	W
Peak pulse current with a 10/1000 $\mu$ s waveform		$I_{PPM}^{(1)}$	See next table	A
Power dissipation	$T_M = 120$ °C	$P_D^{(2)}$	1.0	W
Power dissipation	$T_A = 25$ °C	$P_D^{(3)}$	0.5	W
Operating junction and storage temperature range		$T_J, T_{STG}$	- 55 to + 150	°C

### Notes

- (1) Non-repetitive current pulse, per fig. 1
- (2) Mounted on 6.0 mm x 6.0 mm copper pads to each terminal
- (3) Mounted on minimum recommended pad layout



<b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)														
DEVICE TYPE	DEVICE MARKING CODE	BREAKDOWN VOLTAGE $V_{BR}$ AT $I_T$ <sup>(1)</sup> (V)		TEST CURRENT $I_T$ (mA)	STAND-OFF VOLTAGE $V_{WM}$ (V)	MAXIMUM REVERSE LEAKAGE CURRENT $I_R$ AT $V_{WM}$ ( $\mu\text{A}$ )	MAXIMUM $V_C$ AT $I_{PPM}$			$R_D$	MAXIMUM $V_C$ AT $I_{PPM}$		$R_D$	
		MIN.	MAX.				10/1000 $\mu\text{s}$				8/20 $\mu\text{s}$			
							$V_C$ (V)	$I_{PPM}$ (A)	$R_D$ ( $\Omega$ )		$V_C$ (V)	$I_{PPM}$ (A)		$R_D$ ( $\Omega$ )
MSP3V3	KC	4.10	5.10	1.0	3.3	200	7.6	19.7	0.127		11.5	87	0.074	
MSP5.0A	AE	6.40	7.07	10	5.0	100	9.2	16.3	0.131		13.4	75	0.085	

**Notes**

- To calculate maximum clamping voltage at surge current uses the following formula:  $V_{CL\text{ max.}} = R_D \times I_{PP} + V_{BR\text{ max.}}$
- <sup>(1)</sup> Pulse test:  $t_p \leq 50\text{ ms}$

<b>THERMAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)			
PARAMETER	SYMBOL	VALUE	UNIT
Typical thermal resistance	$R_{\theta JA}$ <sup>(1)</sup>	250	$^\circ\text{C/W}$
	$R_{\theta JM}$ <sup>(2)</sup>	30	

**Notes**

- <sup>(1)</sup> Free air, mounted on recommended PCB 1 oz. pad area; thermal resistance  $R_{\theta JA}$  - junction to ambient
- <sup>(2)</sup> Units mounted on PCB with 6.0 mm x 6.0 mm copper pad areas;  $R_{\theta JM}$  - junction to mount

<b>IMMUNITY TO STATIC ELECTRICAL DISCHARGE TO THE FOLLOWING STANDARDS</b>					
$(T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted)					
STANDARD	TEST TYPE	TEST CONDITIONS	SYMBOL	CLASS	VALUE
AEC-Q101-001	Human body model (contact mode)	$C = 100\text{ pF}$ , $R = 1.5\text{ k}\Omega$	$V_C$	H3B	> 8 kV
IEC 61000-4-2 <sup>(2)</sup>	Human body model (air discharge mode) <sup>(1)</sup>	$C = 150\text{ pF}$ , $R = 330\text{ }\Omega$		4	> 15 kV

**Notes**

- <sup>(1)</sup> Immunity to IEC 61000-4-2 air discharge mode has a typical performance > 30 kV
- <sup>(2)</sup> System ESD standard

<b>ORDERING INFORMATION</b> (Example)				
PREFERRED P/N	UNIT WEIGHT (g)	PREFERRED PACKAGE CODE	BASE QUANTITY	DELIVERY MODE
MSP3V3-M3/89A	0.006	89A	4500	7" diameter plastic tape and reel
MSP3V3HM3/89A <sup>(1)</sup>	0.006	89A	4500	7" diameter plastic tape and reel
MSP5.0A-M3/89A	0.006	89A	4500	7" diameter plastic tape and reel
MSP5.0AHM3/89A <sup>(1)</sup>	0.006	89A	4500	7" diameter plastic tape and reel

**Note**

- <sup>(1)</sup> Automotive grade

**RATINGS AND CHARACTERISTICS CURVES**

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

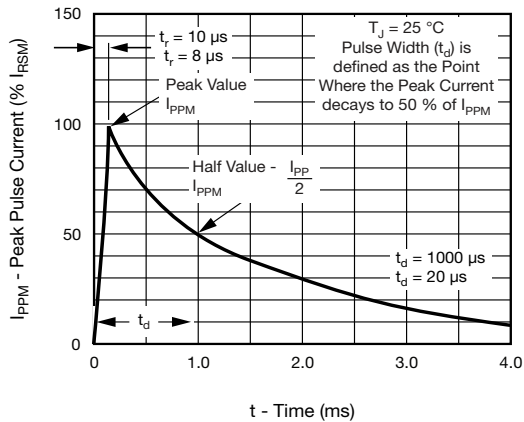


Fig. 1 - Pulse Waveform

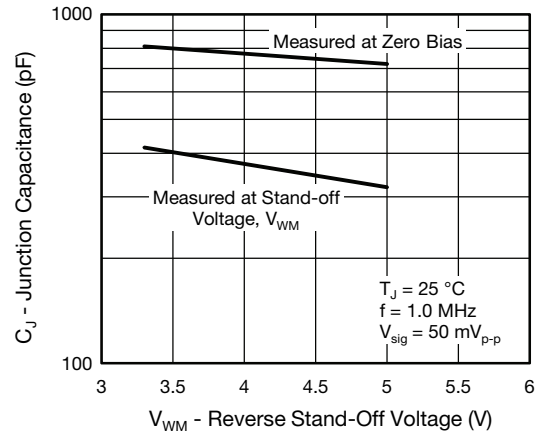


Fig. 4 - Typical Junction Capacitance

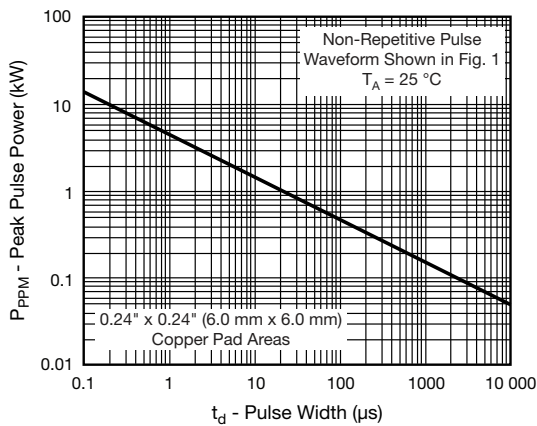


Fig. 2 - Peak Pulse Power Rating Curve

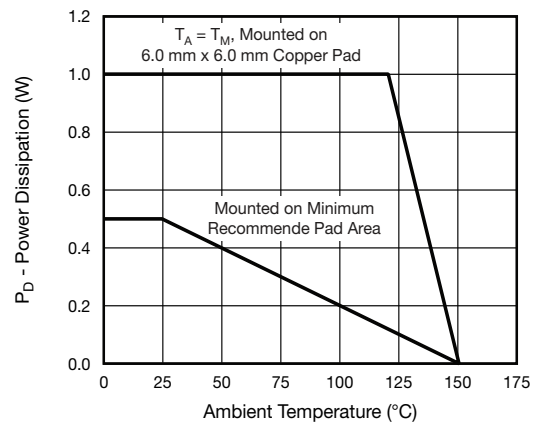


Fig. 5 - Power Dissipation Derating Curve

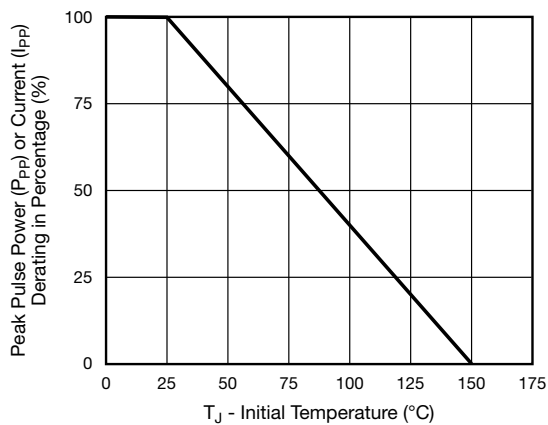


Fig. 3 - Pulse Power or Current vs. Initial Junction Temperature

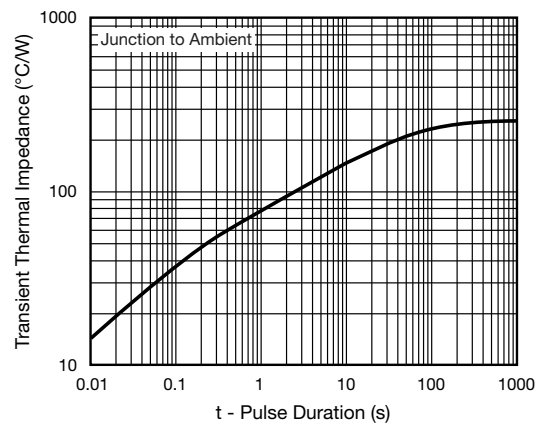
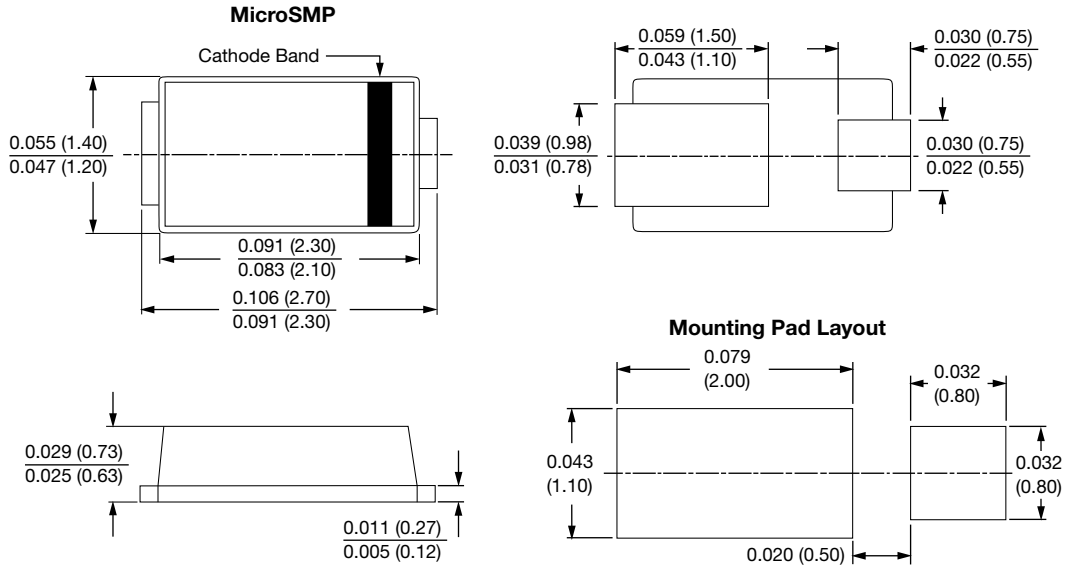


Fig. 6 - Typical Transient Thermal Impedance



### PACKAGE OUTLINE DIMENSIONS in inches (millimeters)





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