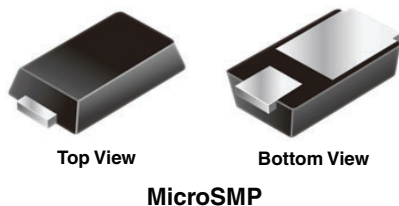


# Surface Mount TRANSZORB® Transient Voltage Suppressors

## eSMP® Series



**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
- Material categorization: For definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)

## PRIMARY CHARACTERISTICS

|                               |                  |
|-------------------------------|------------------|
| $V_{BR}$                      | 6.67 V to 24.5 V |
| $V_{WM}$                      | 6.0 V to 20 V    |
| $P_{PPM}$ (10 x 1000 $\mu$ s) | 150 W            |
| $T_J$ max.                    | 150 °C           |
| Polarity                      | Uni-directional  |
| Package                       | MicroSMP         |

## MECHANICAL DATA

### Case: MicroSMP

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

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

M3 suffix meets JESD 201 class 2 whisker test

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

## 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.

## 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            |      |
| 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

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$  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 $V_{WM}$ ( $\mu$ A) | MAXIMUM $V_C$ AT $I_{PPM}$ |               | $R_D$              | MAXIMUM $V_C$ AT $I_{PPM}$ |               | $R_D$              |
|-------------|---------------------|--------------------------------------------------------|------|-------------------------|--------------------------------|--------------------------------------------------------------|----------------------------|---------------|--------------------|----------------------------|---------------|--------------------|
|             |                     | MIN.                                                   | MAX. |                         |                                |                                                              | 10/1000 $\mu$ s            |               |                    | 8/20 $\mu$ s               |               |                    |
|             |                     |                                                        |      |                         |                                |                                                              | $V_C$ (V)                  | $I_{PPM}$ (A) | $R_D$ ( $\Omega$ ) | $V_C$ (V)                  | $I_{PPM}$ (A) | $R_D$ ( $\Omega$ ) |
| MSMP6.0A    | AG                  | 6.67                                                   | 7.37 | 10                      | 6.0                            | 200                                                          | 10.3                       | 14.6          | 0.201              | 13.7                       | 73.0          | 0.087              |
| MSMP6.5A    | AK                  | 7.22                                                   | 7.98 | 10                      | 6.5                            | 100                                                          | 11.2                       | 13.4          | 0.240              | 14.5                       | 69.0          | 0.095              |
| MSMP7.0A    | AM                  | 7.78                                                   | 8.60 | 10                      | 7.0                            | 50                                                           | 12.0                       | 12.5          | 0.272              | 15.7                       | 63.7          | 0.111              |
| MSMP7.5A    | AP                  | 8.33                                                   | 9.21 | 1.0                     | 7.5                            | 50                                                           | 12.9                       | 11.6          | 0.317              | 17.0                       | 58.8          | 0.132              |
| MSMP8.0A    | AR                  | 8.89                                                   | 9.83 | 1.0                     | 8.0                            | 20                                                           | 13.6                       | 11.0          | 0.342              | 18.2                       | 54.9          | 0.152              |
| MSMP8.5A    | AT                  | 9.44                                                   | 10.4 | 1.0                     | 8.5                            | 2.0                                                          | 14.4                       | 10.4          | 0.384              | 19.5                       | 51.3          | 0.177              |
| MSMP9.0A    | AV                  | 10.0                                                   | 11.1 | 1.0                     | 9.0                            | 2.0                                                          | 15.4                       | 9.7           | 0.441              | 20.6                       | 48.6          | 0.195              |
| MSMP10A     | AX                  | 11.1                                                   | 12.3 | 1.0                     | 10                             | 1.0                                                          | 17.0                       | 8.8           | 0.533              | 21.7                       | 46.1          | 0.204              |
| MSMP11A     | AZ                  | 12.2                                                   | 13.5 | 1.0                     | 11                             | 1.0                                                          | 18.2                       | 8.2           | 0.570              | 24.4                       | 41.0          | 0.266              |
| MSMP12A     | BE                  | 13.3                                                   | 14.7 | 1.0                     | 12                             | 1.0                                                          | 19.9                       | 7.5           | 0.690              | 25.3                       | 39.5          | 0.268              |
| MSMP13A     | BG                  | 14.4                                                   | 15.9 | 1.0                     | 13                             | 1.0                                                          | 21.5                       | 7.0           | 0.803              | 27.2                       | 36.8          | 0.307              |
| MSMP14A     | BK                  | 15.6                                                   | 17.2 | 1.0                     | 14                             | 1.0                                                          | 23.2                       | 6.5           | 0.928              | 29.5                       | 33.9          | 0.364              |
| MSMP15A     | BM                  | 16.7                                                   | 18.5 | 1.0                     | 15                             | 1.0                                                          | 24.4                       | 6.2           | 0.960              | 32.5                       | 30.8          | 0.455              |
| MSMP16A     | BP                  | 17.8                                                   | 19.7 | 1.0                     | 16                             | 1.0                                                          | 26.0                       | 5.8           | 1.092              | 34.7                       | 28.8          | 0.520              |
| MSMP17A     | BR                  | 18.9                                                   | 20.9 | 1.0                     | 17                             | 1.0                                                          | 27.6                       | 5.4           | 1.233              | 36.8                       | 27.2          | 0.586              |
| MSMP18A     | BT                  | 20.0                                                   | 22.1 | 1.0                     | 18                             | 1.0                                                          | 29.2                       | 5.1           | 1.382              | 39.3                       | 25.4          | 0.676              |
| MSMP20A     | BV                  | 22.2                                                   | 24.5 | 1.0                     | 20                             | 1.0                                                          | 32.4                       | 4.6           | 1.706              | 42.8                       | 23.4          | 0.783              |

**Notes**(1) Pulse test:  $t_p \leq 50\text{ ms}$ 

(2) Surge current waveform per Fig. 1 and derate per Fig. 3

(3) To calculate maximum clamping voltage at surge current uses the following formula:  $V_{CL\text{ max.}} = R_D \times I_{PP} + V_{BR\text{ max.}}$ **THERMAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$  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**(1) Free air, mounted on recommended PCB 1 oz. pad area; thermal resistance  $R_{\theta JA}$  - junction to ambient(2) Units mounted on PCB with 6.0 mm x 6.0 mm copper pad areas;  $R_{\theta JM}$  - junction to mount**IMMUNITY TO STATIC ELECTRICAL DISCHARGE TO THE FOLLOWING STANDARDS**( $T_A = 25\text{ }^{\circ}\text{C}$  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   | $> 8\text{ kV}$  |
| 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     | $> 15\text{ kV}$ |

**Notes**(1) Immunity to IEC 61000-4-2 air discharge mode has a typical performance  $> 30\text{ kV}$ 

(2) System ESD standard

**ORDERING INFORMATION** (Example)

| PREFERRED P/N   | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                     |
|-----------------|-----------------|------------------------|---------------|-----------------------------------|
| MSMP6.0A-M3/89A | 0.006           | 89A                    | 4500          | 7" diameter plastic tape and reel |



## RATINGS AND CHARACTERISTICS CURVES

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

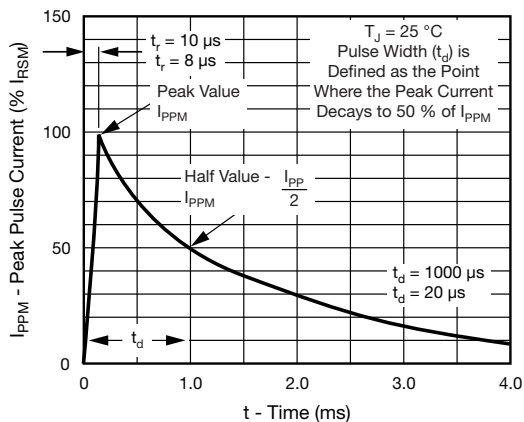


Fig. 1 - Pulse Waveform

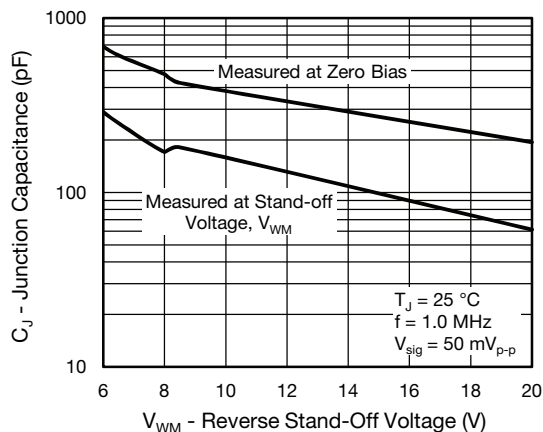


Fig. 4 - Typical Junction Capacitance

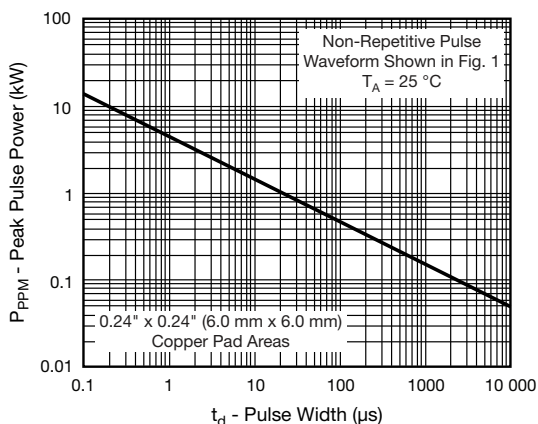


Fig. 2 - Peak Pulse Power Rating Curve

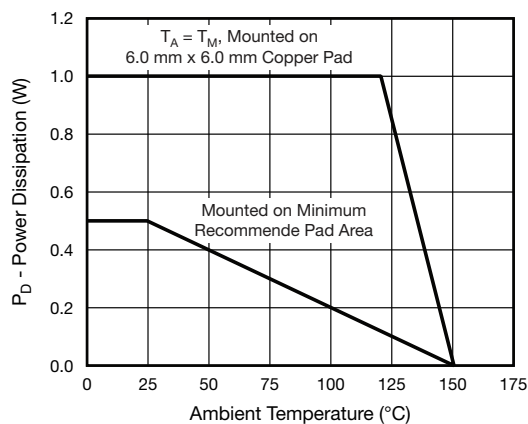


Fig. 5 - Power Dissipation Derating Curve

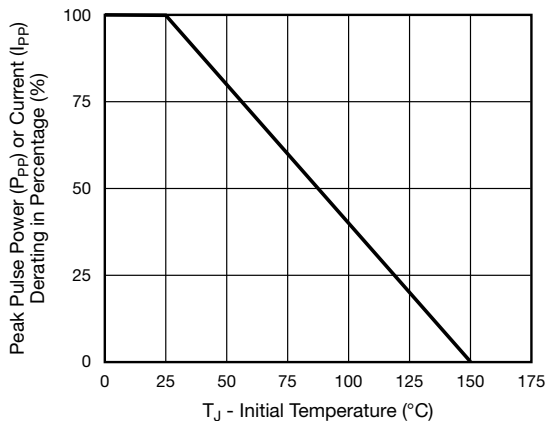


Fig. 3 - Pulse Power or Current vs. Initial Junction Temperature

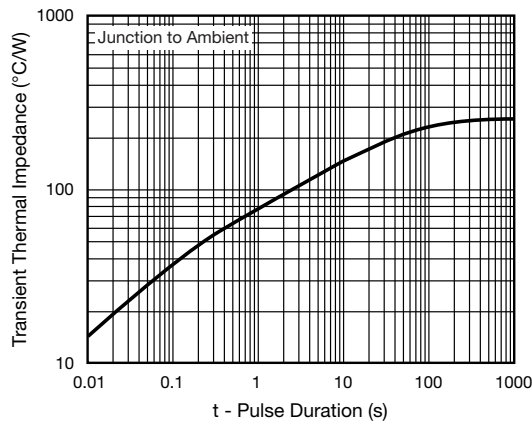
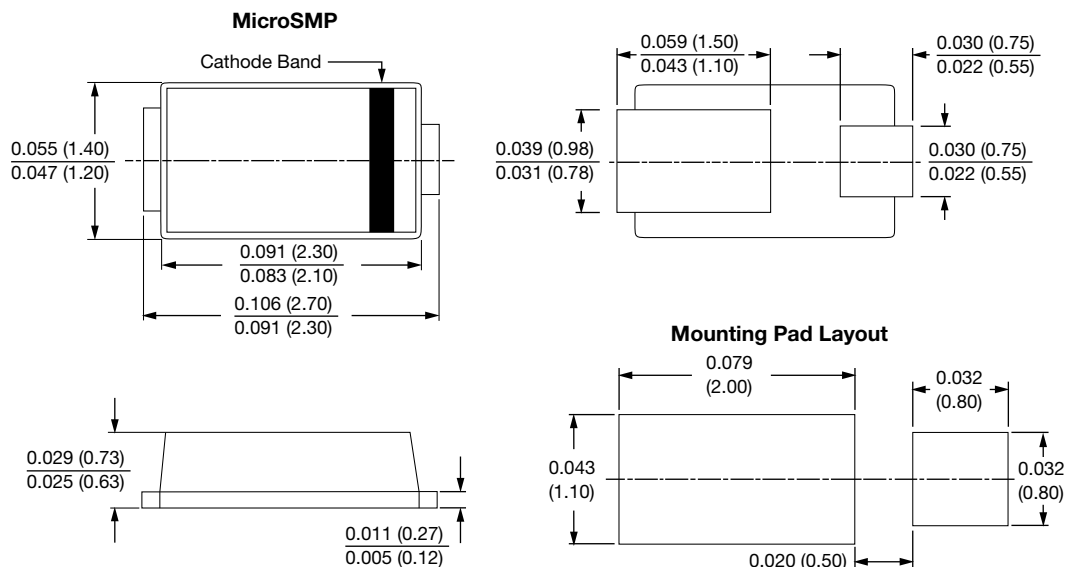


Fig. 6 - Typical Transient Thermal Impedance



## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)





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