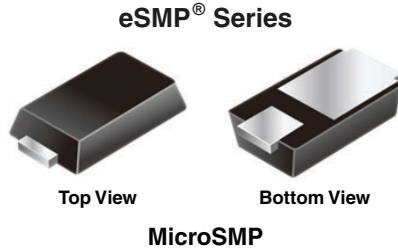


## Surface Mount ESD Capability Rectifier



### FEATURES

- Very low profile - typical height of 0.65 mm
- Ideal for automated placement
- Oxide planar chip junction
- Low forward voltage drop, low leakage current
- ESD capability
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



### TYPICAL APPLICATIONS

General purpose, polarity protection, and rail-to-rail protection in both consumer and automotive applications.

### 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

| PRIMARY CHARACTERISTICS |                            |
|-------------------------|----------------------------|
| $I_{F(AV)}$             | 1.0 A                      |
| $V_{RRM}$               | 100 V, 200 V, 400 V, 600 V |
| $I_{FSM}$               | 20 A                       |
| $V_F$ at $I_F = 1.0$ A  | 0.925 V                    |
| $I_R$                   | 1 $\mu$ A                  |
| $T_J$ max.              | 175 °C                     |
| Package                 | MicroSMP                   |
| Diode variations        | Single die                 |

| MAXIMUM RATINGS ( $T_A = 25$ °C, unless otherwise noted)                          |                |             |        |        |        |      |
|---|----------------|-------------|--------|--------|--------|------|
| PARAMETER   | SYMBOL         | MSE1PB      | MSE1PD | MSE1PG | MSE1PJ | UNIT |
| Device marking code   |                | SB          | SD     | SG     | SJ     |      |
| Max. repetitive peak reverse voltage  | $V_{RRM}$      | 100         | 200    | 400    | 600    | V    |
| Max. average forward rectified current (fig. 1)                                   | $I_{F(AV)}$    | 1.0         |        |        |        | A    |
| Peak forward surge current 10 ms single half sine-wave superimposed on rated load | $I_{FSM}$      | 20          |        |        |        | A    |
| Operating junction and storage temperature range                                  | $T_J, T_{STG}$ | -55 to +175 |        |        |        | °C   |

| ELECTRICAL CHARACTERISTICS ( $T_A = 25$ °C, unless otherwise noted) |   |                |             |       |      |         |
|---|---|----------------|-------------|-------|------|---------|
| PARAMETER   | TEST CONDITIONS                                 |                | SYMBOL      | TYP.  | MAX. | UNIT    |
| Max. instantaneous forward voltage                                  | $I_F = 0.5$ A                                   | $T_A = 25$ °C  | $V_F^{(1)}$ | 0.940 | -    | V       |
|   | $I_F = 1.0$ A                                   |                |             | 1.016 | 1.1  |         |
|   | $I_F = 0.5$ A                                   | $T_A = 125$ °C |             | 0.834 | -    |         |
|   | $I_F = 1.0$ A                                   |                |             | 0.925 | 0.98 |         |
| Max. reverse current  | Rated $V_R$                                     | $T_A = 25$ °C  | $I_R^{(2)}$ | -     | 1.0  | $\mu$ A |
|   |   | $T_A = 125$ °C |             | 3.7   | 50   |         |
| Typical reverse recovery time                                       | $I_F = 0.5$ A, $I_R = 1.0$ A, $t_{rr} = 0.25$ A |                | $t_{rr}$    | 780   | -    | ns      |
| Typical junction capacitance  | 4.0 V, 1 MHz                                    |                | $C_J$       | 5     | -    | pF      |

### Notes

(1) Pulse test: 300  $\mu$ s pulse width, 1 % duty cycle

(2) Pulse test: Pulse width  $\leq$  40 ms



| THERMAL CHARACTERISTICS ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted) |                       |        |        |        |        |                    |
|--|-----------------------|--------|--------|--------|--------|--------------------|
| PARAMETER  | SYMBOL                | MSE1PB | MSE1PD | MSE1PG | MSE1PJ | UNIT               |
| Typical thermal resistance   | $R_{\theta JA}^{(1)}$ | 110    |        |        |        | $^\circ\text{C/W}$ |
|  | $R_{\theta JL}^{(1)}$ | 30     |        |        |        |                    |
|  | $R_{\theta JC}^{(1)}$ | 40     |        |        |        |                    |

**Note**

(1) Thermal resistance from junction to ambient and junction to lead mounted on PCB with 6.0 mm x 6.0 mm copper pad areas.  $R_{\theta JL}$  is measured at the terminal of cathode band.

| IMMUNITY TO ELECTRICAL STATIC DISCHARGE TO THE FOLLOWING STANDARDS<br>( $T_A = 25\text{ }^\circ\text{C}$ , 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   | $> 8\text{ kV}$  |
| AEC-Q101-002   | Machine model (contact mode)                         | $C = 200\text{ pF}$ , $R = 0\text{ }\Omega$    |        | M4    | $> 400\text{ V}$ |
| JESD22-A114  | Human body model (contact mode)                      | $C = 100\text{ pF}$ , $R = 1.5\text{ k}\Omega$ |        | 3B    | $> 8\text{ kV}$  |
| JESD22-A115  | Machine model (contact mode)                         | $C = 200\text{ pF}$ , $R = 0\text{ }\Omega$    |        | C     | $> 400\text{ V}$ |
| IEC 61000-4-2 <sup>(2)</sup>   | Human body model (contact mode)                      | $C = 150\text{ pF}$ , $R = 330\text{ }\Omega$  |        | 4     | $> 8\text{ kV}$  |
|  | 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                     |
| MSE1PJ-M3/89A                  | 0.006           | 89A                    | 4500          | 7" diameter plastic tape and reel |
| MSE1PJHM3/89A <sup>(1)</sup>   | 0.006           | 89A                    | 4500          | 7" diameter plastic tape and reel |

**Note**

(1) AEC-Q101 qualified

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

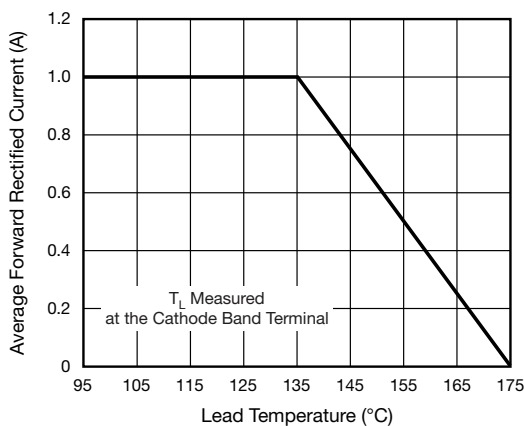


Fig. 1 - Forward Current Derating Curve

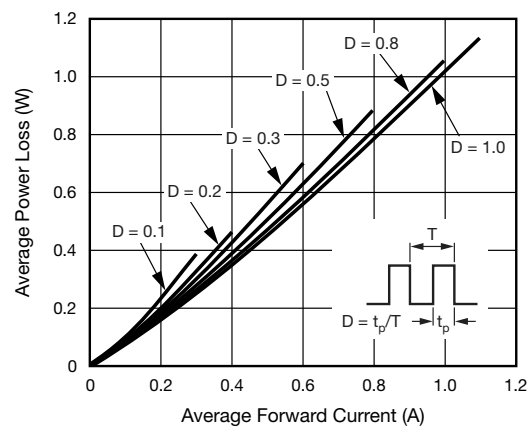


Fig. 2 - Forward Power Loss Characteristics

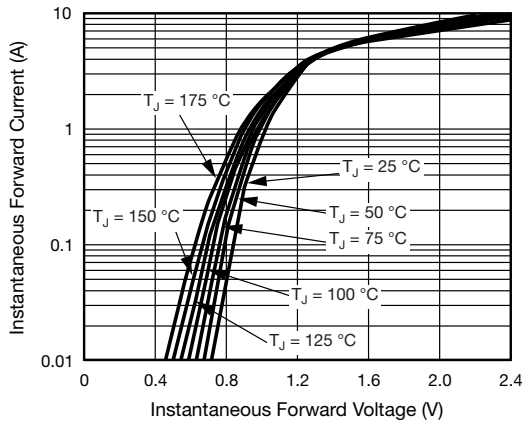


Fig. 3 - Typical Instantaneous Forward Characteristics

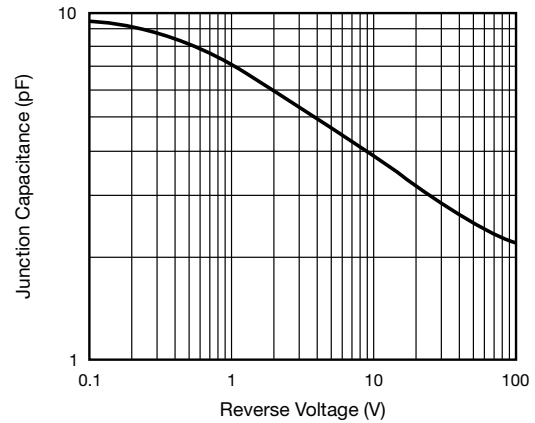


Fig. 5 - Typical Junction Capacitance

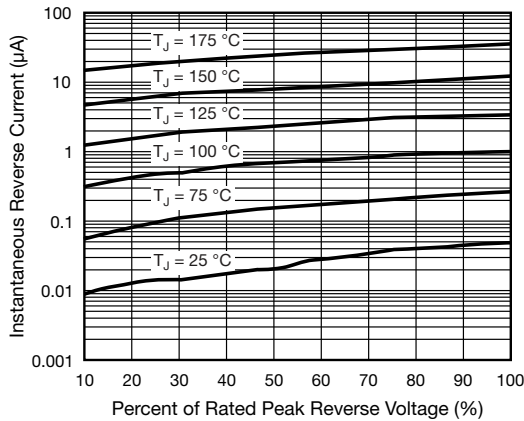


Fig. 4 - Typical Reverse Leakage Characteristics

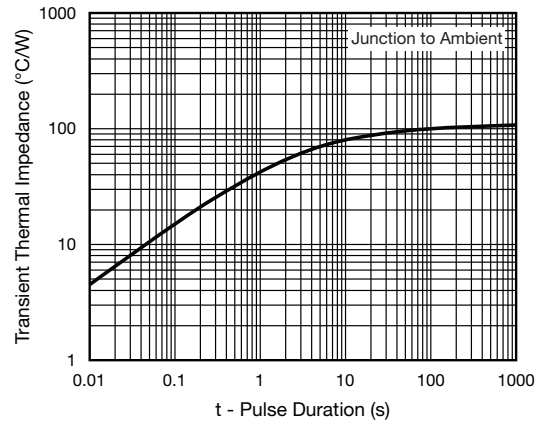
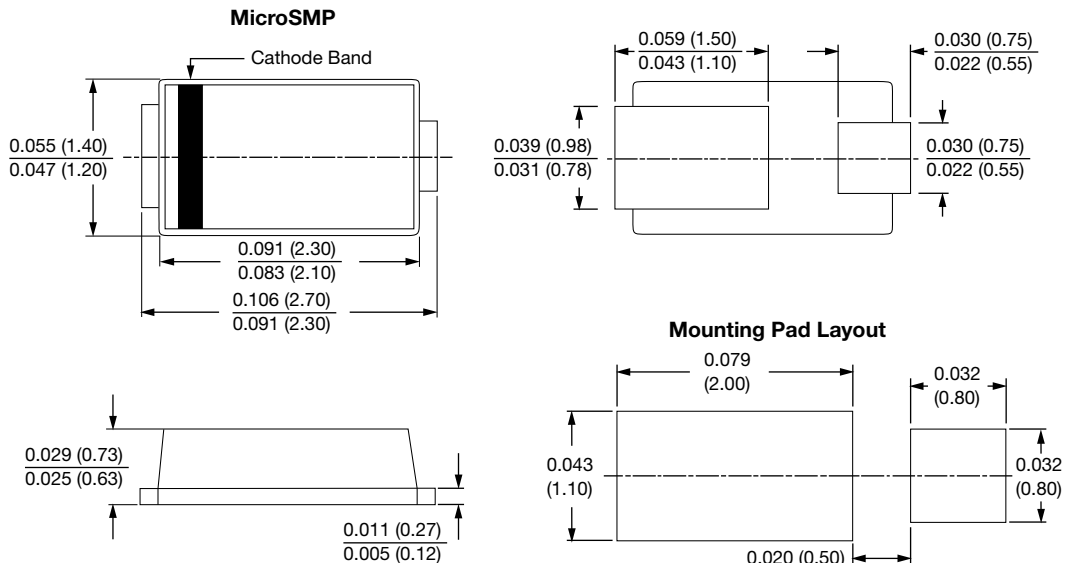


Fig. 6 - Typical Transient Thermal Impedance

## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)





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