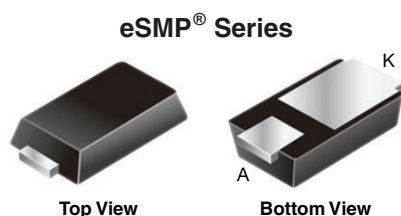


## Surface-Mount ESD Capability Rectifier



**MicroSMP (DO-219AD)**

Anode  Cathode

### 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 available
  - Automotive ordering code: base P/NHM3
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### LINKS TO ADDITIONAL RESOURCES



| PRIMARY CHARACTERISTICS         |                            |
|---------------------------------|----------------------------|
| $I_{F(AV)}$                     | 1.0 A                      |
| $V_{RRM}$                       | 100 V, 200 V, 400 V, 600 V |
| $I_{FSM}$                       | 18 A                       |
| $V_F$ at $I_F = 1.0$ A (125 °C) | 0.9 V                      |
| $T_J$ max.                      | 175 °C                     |
| Package                         | MicroSMP (DO-219AD)        |
| Circuit configuration           | Single                     |

### TYPICAL APPLICATIONS

General purpose, polarity protection, and rail-to-rail protection in commercial, industrial, and automotive applications.

### MECHANICAL DATA

**Case:** MicroSMP (DO-219AD)

Molding compound meets UL 94 V-0 flammability rating  
Base P/N-M3 - halogen-free and RoHS-compliant  
Base P/NHM3 - halogen-free, RoHS-compliant, and AEC-Q101 qualified

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

M3 and 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         | MSX1PB      | MSX1PD | MSX1PG | MSX1PJ | UNIT |
| Device marking code                                                               |                | XB          | XD     | XG     | XJ     |      |
| Maximum repetitive peak reverse voltage                                           | $V_{RRM}$      | 100         | 200    | 400    | 600    | V    |
| Maximum average forward rectified current                                         | $I_{F(AV)}$    | 1.0         |        |        |        | A    |
| Peak forward surge current 10 ms single half sine-wave superimposed on rated load | $I_{FSM}$      | 18          |        |        |        | A    |
| Operating junction and storage temperature range                                  | $T_J, T_{STG}$ | -55 to +175 |        |        |        | °C   |

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

| PARAMETER                             | TEST CONDITIONS                                                          |                         | SYMBOL                        | TYP. | MAX. | UNIT |
|---------------------------------------|--------------------------------------------------------------------------|-------------------------|-------------------------------|------|------|------|
| Maximum instantaneous forward voltage | I <sub>F</sub> = 0.5 A                                                   | T <sub>A</sub> = 25 °C  | V <sub>F</sub> <sup>(1)</sup> | 0.93 | -    | V    |
|                                       | I <sub>F</sub> = 1.0 A                                                   |                         |                               | 1.0  | 1.1  |      |
|                                       | I <sub>F</sub> = 0.5 A                                                   | T <sub>A</sub> = 125 °C |                               | 0.81 | -    |      |
|                                       | I <sub>F</sub> = 1.0 A                                                   |                         |                               | 0.9  | 0.98 |      |
| Maximum reverse current               | Rated V <sub>R</sub>                                                     | T <sub>A</sub> = 25 °C  | I <sub>R</sub> <sup>(2)</sup> | -    | 1.0  | μA   |
|                                       |                                                                          | T <sub>A</sub> = 125 °C |                               | 4.1  | 50   |      |
| Typical reverse recovery time         | I <sub>F</sub> = 0.5 A, I <sub>R</sub> = 1.0 A, I <sub>rr</sub> = 0.25 A |                         | t <sub>rr</sub>               | 960  | -    | ns   |
| Typical junction capacitance          | 4.0 V, 1 MHz                                                             |                         | C <sub>J</sub>                | 5    | -    | pF   |

**Notes**(1) Pulse test: 300  $\mu\text{s}$  pulse width, 1 % duty cycle(2) Pulse test: pulse width  $\leq 40\text{ ms}$ **THERMAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)

| PARAMETER                  | SYMBOL                          | MSX1PB | MSX1PD | MSX1PG | MSX1PJ | UNIT |
|----------------------------|---------------------------------|--------|--------|--------|--------|------|
| Typical thermal resistance | R <sub>θJA</sub> <sup>(1)</sup> | 110    |        |        |        | °C/W |
|                            | R <sub>θJL</sub> <sup>(1)</sup> | 30     |        |        |        |      |

**Note**(1) Thermal resistance from junction to ambient and junction to lead mounted on PCB with 5.0 mm x 5.0 mm copper pad areas.  $R_{\theta JL}$  is measured at the terminal of cathode band**IMMUNITY TO ELECTRICAL STATIC DISCHARGE TO THE FOLLOWING STANDARDS**( $T_A = 25\text{ }^{\circ}\text{C}$ , 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    | $> 400\text{ V}$ |
| JESD 22-A114                 | Human body model (contact mode)                      | $C = 100\text{ pF}$ , $R = 1.5\text{ k}\Omega$ |        | 3B    | $> 8\text{ kV}$  |
| JESD 22-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     | $> 15\text{ kV}$ |
| ISO 10605                    | Contact mode                                         | $C = 330\text{ pF}$ , $R = 2\text{ k}\Omega$   |        | -     | 20 kV typ.       |

**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                     |
|------------------------------|-----------------|------------------------|---------------|-----------------------------------|
| MSX1PJ-M3/89A                | 0.006           | 89A                    | 4500          | 7" diameter plastic tape and reel |
| MSX1PJHM3/89A <sup>(1)</sup> | 0.006           | 89A                    | 4500          | 7" diameter plastic tape and reel |

**Note**

(1) AEC-Q101 qualified



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

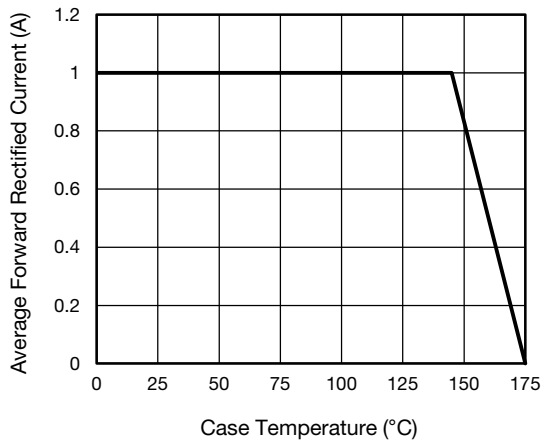


Fig. 1 - Maximum Forward Current Derating Curve

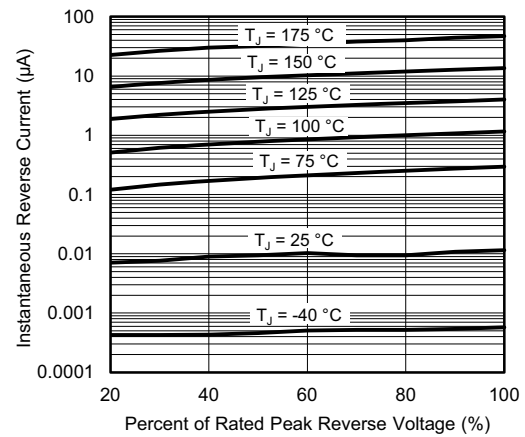


Fig. 4 - Typical Reverse Leakage Characteristics

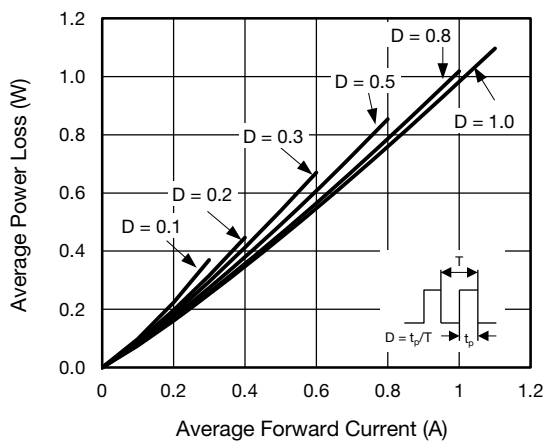


Fig. 2 - Average Power Loss Characteristics

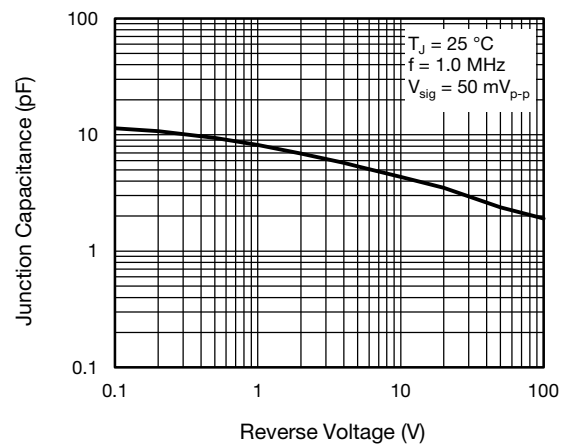


Fig. 5 - Typical Junction Capacitance

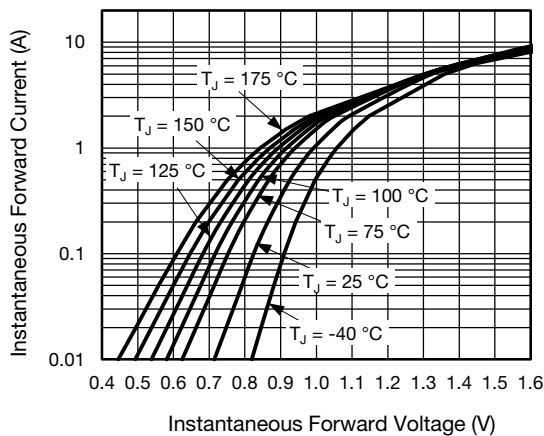


Fig. 3 - Typical Instantaneous Forward Characteristics

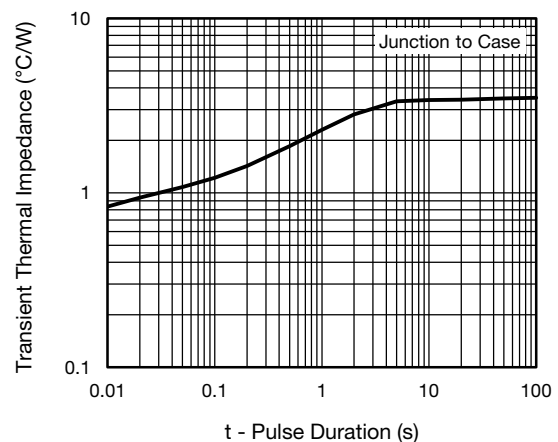


Fig. 6 - Typical Transient Thermal Impedance

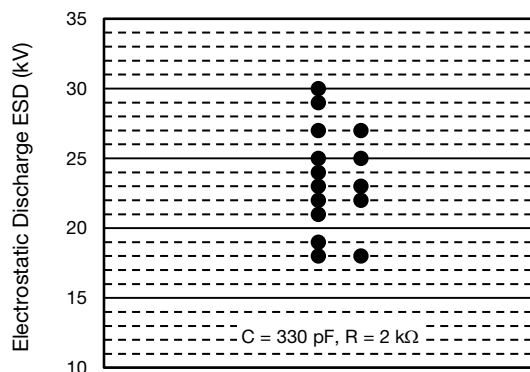
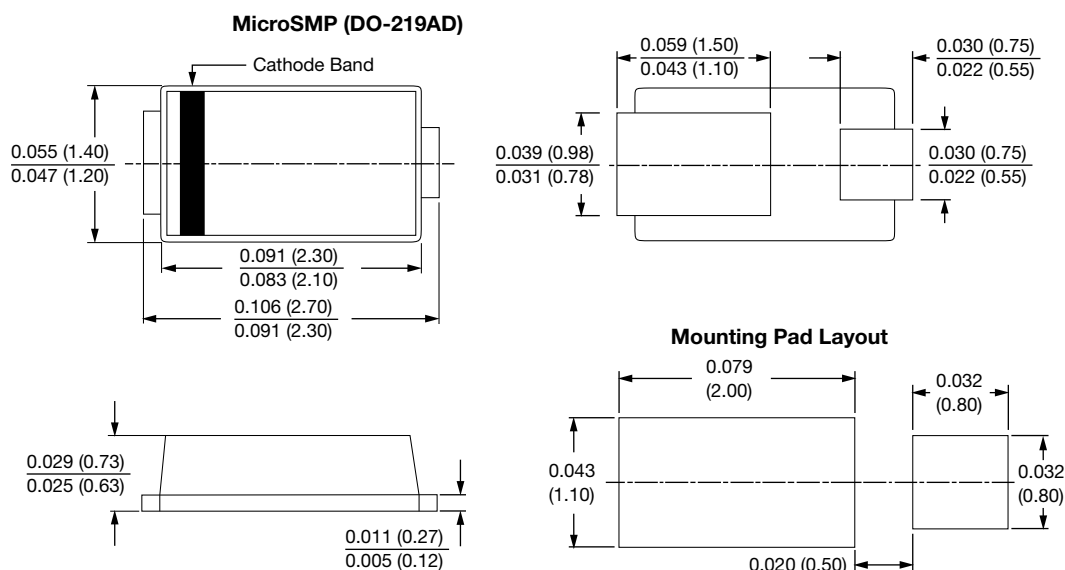


Fig. 7 - ESD Dispersion Map

**PACKAGE OUTLINE DIMENSIONS** in inches (millimeters)




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