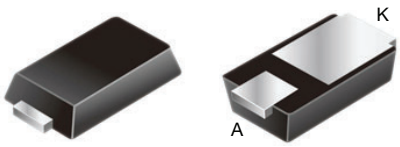
# Surface-Mount ESD Capability Rectifier

**eSMP® Series**




Top View Bottom View

**MicroSMP (DO-219AD)**


## LINKS TO ADDITIONAL RESOURCES

3D Models

| PRIMARY CHARACTERISTICS | |
|---|---|
| $I_{F(AV)}$ | 1.0 A |
| $V_{RRM}$ | 400 V, 600 V |
| $I_{FSM}$ | 15 A |
| $V_F$ at $I_F$ = 1.0 A | 0.99 V |
| $T_J$ max. | 175 °C |
| Package | MicroSMP (DO-219AD) |
| Circuit configuration | Single |

## FEATURES

AUTOMOTIVE GRADE Available

RoHS COMPLIANT HALOGEN FREE

- 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
- Meet 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

## TYPICAL APPLICATIONS

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

## MECHANICAL DATA

**Case:** MicroSMP (DO-219AD)
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 AEC-Q101 qualified

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102
M3 and HM3 suffix meet JESD 201 class 2 whisker test

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

**MAXIMUM RATINGS** ($T_A$ = 25 °C, unless otherwise noted)

| PARAMETER | SYMBOL | MSQ1PG | MSQ1PJ | UNIT |
|---|---|---|---|---|
| Device marking code | | QG | QJ | |
| Max. repetitive peak reverse voltage | $V_{RRM}$ | 400 | 600 | V |
| Max. average forward rectified current (fig. 1) | $I_{F(AV)}$ | 1.0 | | A |
| Peak forward surge current 8.3 ms single half sine-wave superimposed on rated load | $I_{FSM}$ | 15 | | 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) | 0.99 | - | V |
| | $I_F$ = 1.0 A | | | 1.09 | 1.2 | |
| | $I_F$ = 0.5 A | $T_A$ = 125 °C | | 0.88 | - | |
| | $I_F$ = 1.0 A | | | 0.99 | 1.05 | |
| Max. reverse current | Rated $V_R$ | $T_A$ = 25 °C | $I_R$ (2) | - | 1.0 | µA |
| | | $T_A$ = 125 °C | | 6.0 | 50 | |
| Typical reverse recovery time | $I_F$ = 0.5 A, $I_R$ = 1.0 A, $I_{rr}$ = 0.25 A | | $t_{rr}$ | 650 | - | ns |
| Typical junction capacitance | 4.0 V, 1 MHz | | $C_J$ | 4 | - | pF |

**Notes**

(1) Pulse test: 300 µs pulse width, 1 % duty cycle

(2) Pulse test: Pulse width ≤ 40 ms

| THERMAL CHARACTERISTICS ($T_A$ = 25 °C, unless otherwise noted) | | | | |
|---|---|---|---|---|
| PARAMETER | SYMBOL | MSQ1PG | MSQ1PJ | UNIT |
| Typical thermal resistance | $R_{\theta JA}$ (1)(2) | 110 | | °C/W |
| | $R_{\theta JM}$ (2) | 30 | | |

**Notes**

(1) The heat generated must be less than the thermal conductivity from junction to ambient: $dP_D/dT_J < 1/R_{\theta JA}$

(2) Thermal resistance $R_{\theta JA}$ – junction to ambient and $R_{\theta JM}$ - mounted on PCB with 6.0 mm x 6.0 mm copper pad areas.

| IMMUNITY TO ELECTRICAL STATIC DISCHARGE TO THE FOLLOWING STANDARDS ($T_A$ = 25 °C, unless otherwise noted) | | | | | |
|---|---|---|---|---|---|
| STANDARD | TEST TYPE | TEST CONDITIONS | SYMBOL | CLASS | VALUE |
| AEC-Q101-001 | Human body model (contact mode) | C = 100 pF, R = 1.5 kΩ | $V_C$ | H3B | > 8 kV |
| AEC-Q101-002 | Machine model (contact mode) | C = 200 pF, R = 0 Ω | | M4 | > 400 V |
| JESD 22-A114 | Human body model (contact mode) | C = 100 pF, R = 1.5 kΩ | | 3B | > 8 kV |
| JESD 22-A115 | Machine model (contact mode) | C = 200 pF, R = 0 Ω | | C | > 400 V |
| IEC 61000-4-2 (2) | Human body model (contact mode) | C = 150 pF, R = 330 Ω | | 4 | > 8 kV |
| | Human body model (air-discharge mode) (1) | C = 150 pF, R = 330 Ω | | 4 | > 15 kV |

**Notes**

(1) Immunity to IEC 61000-4-2 air discharge mode has a typical performance > 30 kV

(2) System ESD standard

| ORDERING INFORMATION (Example) | | | | |
|---|---|---|---|---|
| PREFERRED P/N | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE |
| MSQ1PJ-M3/H | 0.006 | H | 4500 | 7" diameter plastic tape and reel |
| MSQ1PJHM3/H (1) | 0.006 | H | 4500 | 7" diameter plastic tape and reel |

**Note**

(1) AEC-Q101 qualified

## RATINGS AND CHARACTERISTICS CURVES ($T_A$ = 25 °C unless otherwise noted)

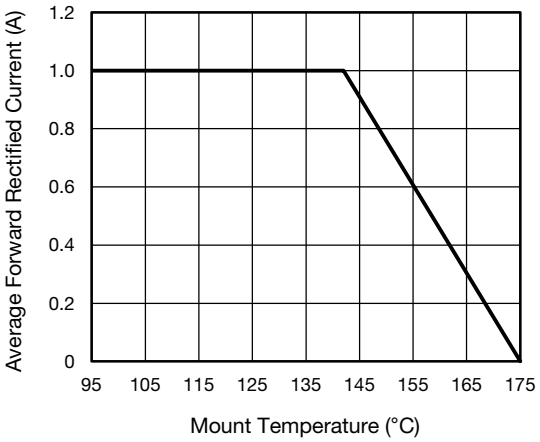



Fig. 1 - Forward Current Derating Curve

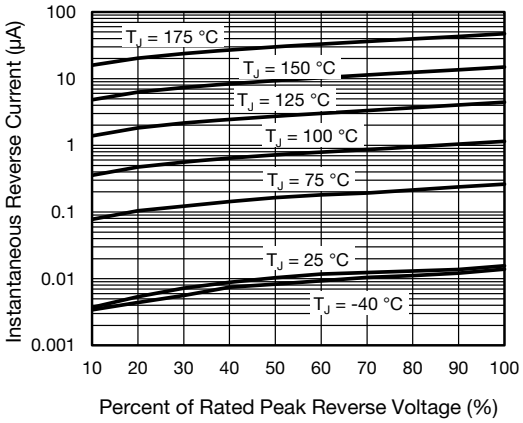



Fig. 4 - Typical Reverse Leakage Characteristics

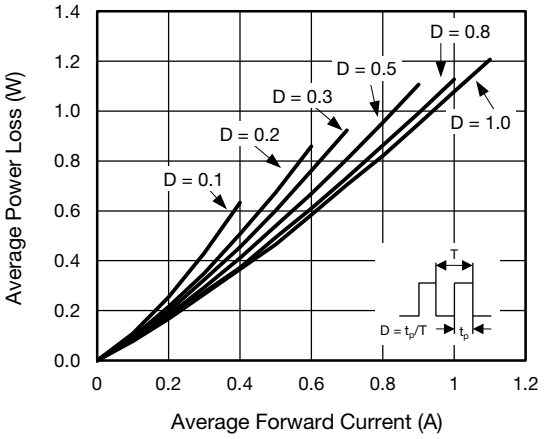



Fig. 2 - Forward Power Loss Characteristics

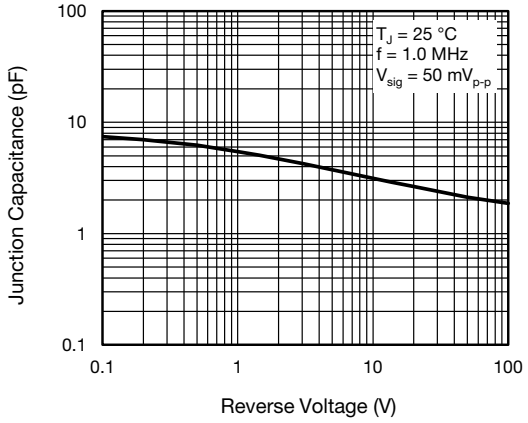



Fig. 5 - Typical Junction Capacitance

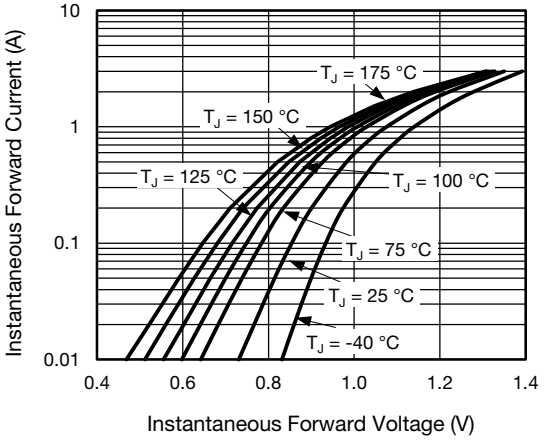



Fig. 3 - Typical Instantaneous Forward Characteristics

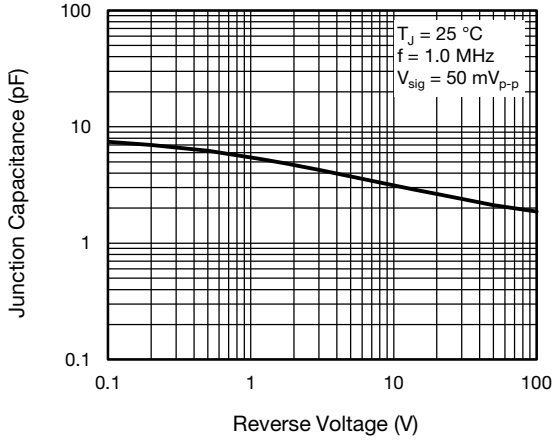



Fig. 6 - Typical Transient Thermal Impedance

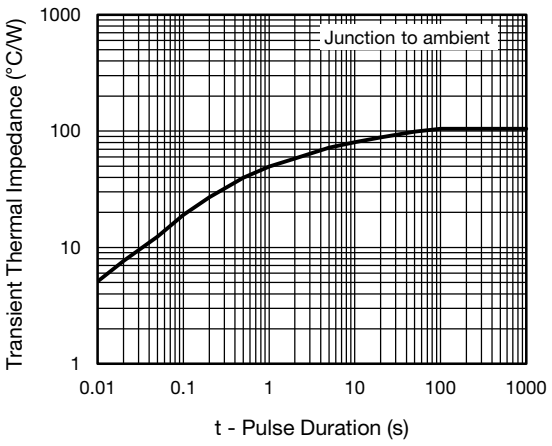
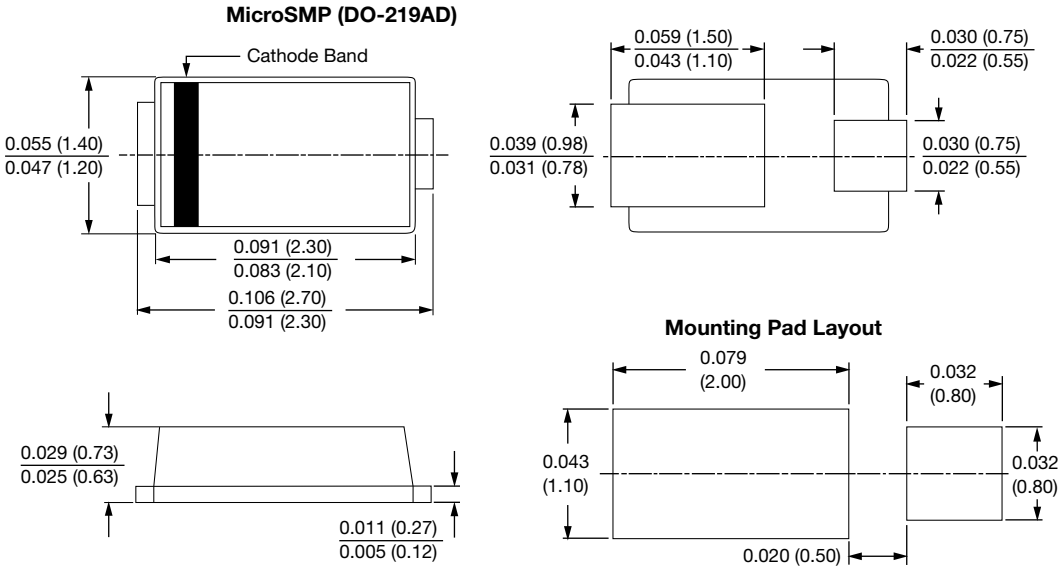



Fig. 7 - Thermal Resistance

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



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