# Surface-Mount PAR® Transient Voltage Suppressors

High Temperature Stability and High Reliability Conditions



**SMA (DO-214AC)**

Cathode ○—|◀|—○ Anode

## LINKS TO ADDITIONAL RESOURCES

3D Models

| PRIMARY CHARACTERISTICS | |
|---|---|
| $V_{WM}$ | 5.8 V to 36.8 V |
| $V_{BR}$ | 6.8 V to 43 V |
| $P_{PPM}$ | 400 W |
| $P_D$ | 1.0 W |
| $I_{FSM}$ | 40 A |
| $T_J$ max. | 185 °C |
| Polarity | Unidirectional |
| Package | SMA (DO-214AC) |

## TYPICAL APPLICATIONS

Use in sensitive electronics protection against voltage transients induced by inductive load switching and lightning on ICs, MOSFET, signal lines of sensor units for consumer, computer, industrial, automotive, and telecommunication.

## FEATURES

AUTOMOTIVE GRADE Available

RoHS COMPLIANT

HALOGEN FREE Available

- Junction passivation optimized design passivated anisotropic rectifier technology
- $T_J$ = 185 °C capability suitable for high reliability and automotive requirement
- Available in uni-directional polarity only
- 400 W peak pulse power capability with a 10/1000 µs waveform, repetitive rate (duty cycle): 0.01 %
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Meets MSL level 1, per J-STD-020, LF maximum peak of 260 °C
- AEC-Q101 qualified available
  - Automotive ordering code: base P/NHE3 or P/NHM3
- Material categorization: for definitions of compliance please see www.vishay.com/doc?99912

## MECHANICAL DATA

**Case:** SMA (DO-214AC)
Molding compound meets UL 94 V-0 flammability rating
Base P/NHE3_X - RoHS-compliant and AEC-Q101 qualified
Base P/NHM3_X - halogen-free, RoHS-compliant, and AEC-Q101 qualified
("_X" denotes revision code e.g. A, B, ...)

**Terminals:** matte tin plated leads, solderable per J-STD-002 and JESD 22-B102
HE3 and HM3 suffix meets JESD 201 class 2 whisker test

**Polarity:** color band denotes cathode end

| MAXIMUM RATINGS ($T_A$ = 25 °C unless otherwise noted) | | | |
|---|---|---|---|
| **PARAMETER** | **SYMBOL** | **VALUE** | **UNIT** |
| Peak power dissipation with a 10/1000 µs waveform (1)(2) (fig. 3) | $P_{PPM}$ | 400 | W |
| Peak power pulse current with a 10/1000 µs waveform (1) (fig. 1) | $I_{PPM}$ | See next table | A |
| Power dissipation at $T_A$ = 25 °C (4) | $P_D$ | 1.0 | W |
| Peak forward surge current 8.3 ms single half sine-wave (3) | $I_{FSM}$ | 40 | A |
| Maximum instantaneous forward voltage at 25 A (3) | $V_F$ | 3.5 | V |
| Operating junction and storage temperature range | $T_J$, $T_{STG}$ | -65 to +185 | °C |

**Notes**

(1) Non-repetitive current pulse, per fig. 3 and derated above $T_A$ = 25 °C per fig. 2
(2) Mounted on PCB with 0.2" x 0.2" (5.0 mm x 5.0 mm) copper pads attached to each terminal
(3) Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minutes maximum
(4) Mounted on minimum recommended pad layout



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## ELECTRICAL CHARACTERISTICS ($T_A$ = 25 °C unless otherwise noted)

| DEVICE TYPE | DEVICE MARKING CODE | BREAKDOWN VOLTAGE $V_{BR}$ (1) AT $I_T$ (V) | | | TEST CURRENT $I_T$ (mA) | STAND-OFF VOLTAGE $V_{WM}$ (V) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_R$ (µA) | $T_J$ = 150 °C MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_D$ (µA) | MAXIMUM PEAK PULSE SURGE CURRENT $I_{PPM}$ (2) (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | TYPICAL TEMP. COEFFICIENT OF $V_{BR}$ (3) $\alpha T$ (%/°C) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MIN. | NOM. | MAX. | | | | | | | |
| TPSMA6.8A | AEP | 6.45 | 6.80 | 7.14 | 10 | 5.80 | 300 | 1000 | 38.1 | 10.5 | 0.047 |
| TPSMA7.5A | AGP | 7.13 | 7.50 | 7.88 | 10 | 6.40 | 150 | 500 | 35.4 | 11.3 | 0.052 |
| TPSMA8.2A | AKP | 7.79 | 8.20 | 8.61 | 10 | 7.02 | 50 | 200 | 33.1 | 12.1 | 0.056 |
| TPSMA9.1A | AMP | 8.65 | 9.10 | 9.55 | 1.0 | 7.78 | 10 | 50 | 29.9 | 13.0 | 0.060 |
| TPSMA10A | APP | 9.50 | 10.0 | 10.50 | 1.0 | 8.65 | 5.0 | 20 | 27.6 | 14.5 | 0.064 |
| TPSMA11A | ARP | 10.50 | 11.0 | 11.60 | 1.0 | 9.40 | 1.0 | 5.0 | 25.6 | 15.6 | 0.067 |
| TPSMA12A | ATP | 11.40 | 12.0 | 12.60 | 1.0 | 10.20 | 1.0 | 5.0 | 24.0 | 16.7 | 0.070 |
| TPSMA13A | AVP | 12.40 | 13.0 | 13.70 | 1.0 | 11.10 | 1.0 | 5.0 | 22.0 | 18.2 | 0.072 |
| TPSMA15A | AXP | 14.30 | 15.0 | 15.80 | 1.0 | 12.80 | 1.0 | 5.0 | 18.9 | 21.2 | 0.076 |
| TPSMA16A | AZP | 15.20 | 16.0 | 16.80 | 1.0 | 13.60 | 1.0 | 5.0 | 17.8 | 22.0 | 0.078 |
| TPSMA18A | BEP | 17.10 | 18.0 | 18.90 | 1.0 | 15.30 | 1.0 | 5.0 | 15.9 | 25.5 | 0.080 |
| TPSMA20A | BGP | 19.00 | 20.0 | 21.00 | 1.0 | 17.10 | 1.0 | 5.0 | 14.4 | 27.7 | 0.082 |
| TPSMA22A | BKP | 20.90 | 22.0 | 23.10 | 1.0 | 18.80 | 1.0 | 5.0 | 13.1 | 30.6 | 0.084 |
| TPSMA24A | BMP | 22.80 | 24.0 | 25.20 | 1.0 | 20.50 | 1.0 | 5.0 | 12.0 | 33.2 | 0.085 |
| TPSMA27A | BPP | 25.70 | 27.0 | 28.40 | 1.0 | 23.10 | 1.0 | 5.0 | 10.7 | 37.5 | 0.087 |
| TPSMA30A | BRP | 28.50 | 30.0 | 31.50 | 1.0 | 25.60 | 1.0 | 5.0 | 9.7 | 41.4 | 0.088 |
| TPSMA33A | BTP | 31.40 | 33.0 | 34.70 | 1.0 | 28.20 | 1.0 | 5.0 | 8.8 | 45.7 | 0.089 |
| TPSMA36A | BVP | 34.20 | 36.0 | 37.80 | 1.0 | 30.80 | 1.0 | 5.0 | 8.0 | 49.9 | 0.090 |
| TPSMA39A | BXP | 37.10 | 39.0 | 41.00 | 1.0 | 33.30 | 1.0 | 5.0 | 7.4 | 53.9 | 0.091 |
| TPSMA43A | BZP | 40.90 | 43.0 | 45.20 | 1.0 | 36.80 | 1.0 | 5.0 | 6.7 | 59.3 | 0.092 |

**Notes**

(1) $V_{BR}$ measured after $I_T$ applied for 300 µs, $I_T$ = square wave pulse or equivalent
(2) Surge current waveform per fig. 3 and derated per fig. 2
(3) To calculate $V_{BR}$ vs. junction temperature, use the following formula: $V_{BR}$ at $T_J$ = $V_{BR}$ at 25 °C x (1 + $\alpha T$ x ($T_J$ - 25))
(4) All terms and symbols are consistent with ANSI/IEEE C62.35

## ORDERING INFORMATION (Example)

| PREFERRED P/N | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE |
|---|---|---|---|---|
| TPSMA6.8AHE3_B/H (1) | 0.064 | H | 1800 | 7" diameter plastic tape and reel |
| TPSMA6.8AHE3_B/I (1) | 0.064 | I | 7500 | 13" diameter plastic tape and reel |
| TPSMA6.8AHM3_B/H (1) | 0.064 | H | 1800 | 7" diameter plastic tape and reel |
| TPSMA6.8AHM3_B/I (1) | 0.064 | I | 7500 | 13" diameter plastic tape and reel |

**Note**

(1) AEC-Q101 qualified


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

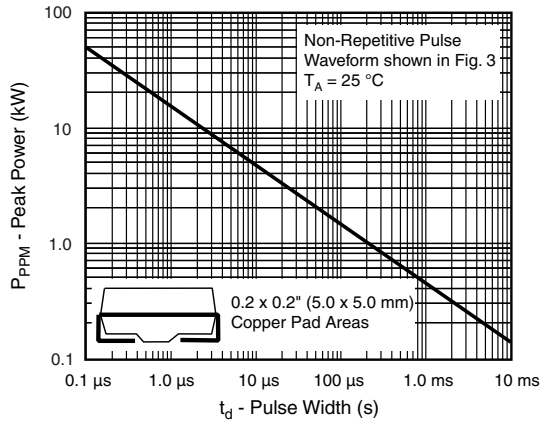



Fig. 1 - Peak Pulse Power Rating Curve

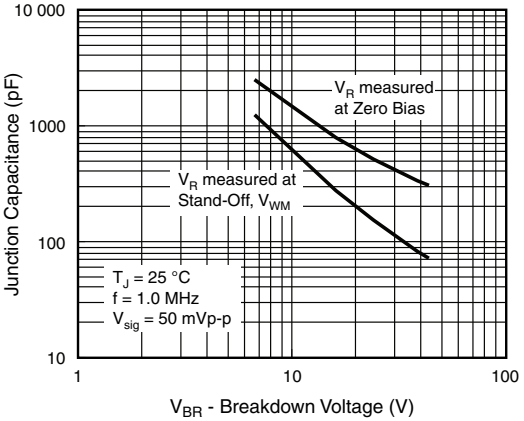



Fig. 4 - Typical Junction Capacitance

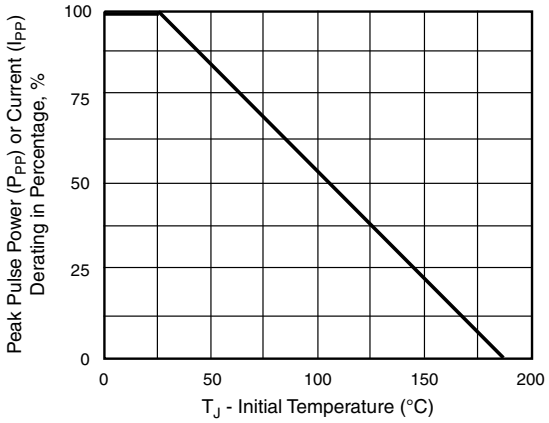



Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

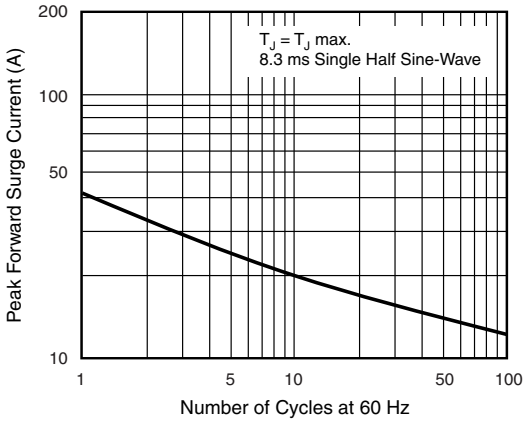



Fig. 5 - Maximum Non-Repetitive Peak Forward Surge Current

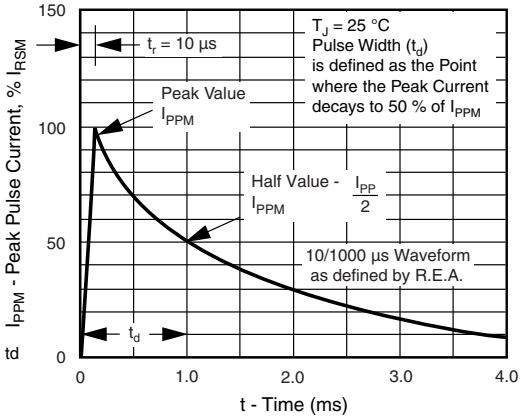
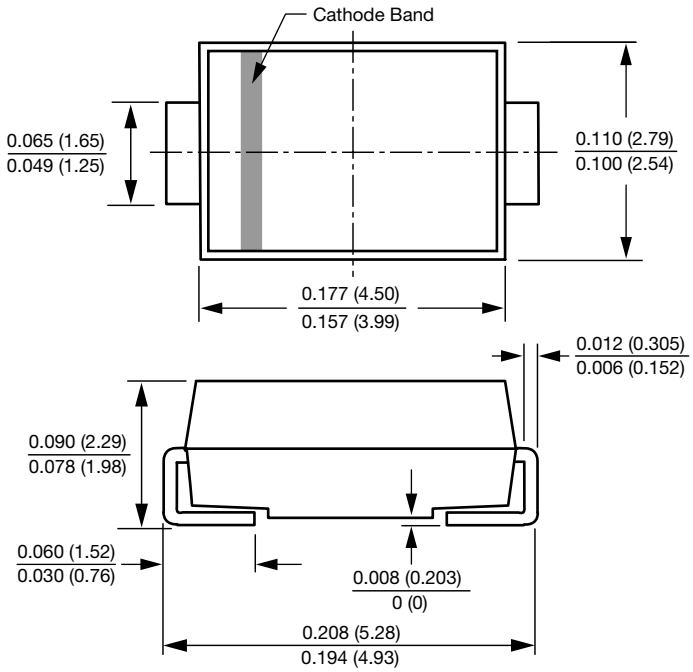



Fig. 3 - Pulse Waveform

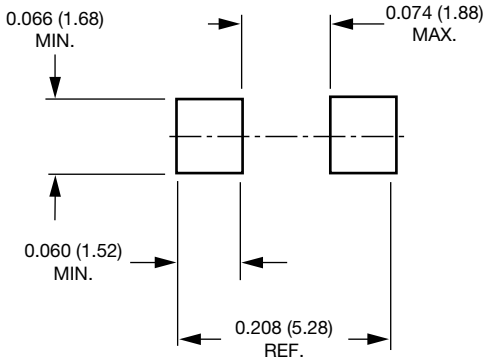

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## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

**SMA (DO-214AC)**




**Mounting Pad Layout**





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