

# High Power Density Surface Mount PAR<sup>®</sup> Transient Voltage Suppressors

## eSMP<sup>®</sup> Series



DO-220AA (SMP)

| PRIMARY CHARACTERISTICS                |                 |
|----------------------------------------|-----------------|
| $V_{BR}$                               | 6.8 V to 43 V   |
| $P_{PPM}$ (for $V_{BR}$ 6.8 V)         | 250 W           |
| $P_{PPM}$ (for $V_{BR}$ 7.5 V to 12 V) | 300 W           |
| $P_{PPM}$ (for $V_{BR}$ 13 V to 43 V)  | 400 W           |
| $V_{WM}$                               | 5.5 V to 36.8 V |
| $P_D$                                  | 2.5 W           |
| $I_{FSM}$                              | 40 A            |
| $T_J$ max.                             | 185 °C          |
| Polarity                               | Uni-directional |
| Package                                | DO-220AA (SMP)  |

## TYPICAL APPLICATIONS

Protection for ICs, drive transistors, signal lines of sensor units, and electronic units in consumer, computer, industrial and automotive applications.

## FEATURES

- Junction passivation optimized design passivated anisotropic rectifier technology
- $T_J = 185$  °C capability suitable for high reliability and automotive requirement
- Very low profile - typical height of 1.0 mm
- Ideal for automated placement
- Uni-direction only
- Excellent clamping capability
- Low incremental surge resistance
- Very fast response time
- 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)

AUTOMOTIVE  
GRADE



**RoHS**  
COMPLIANT  
HALOGEN  
FREE

## MECHANICAL DATA

**Case:** DO-220AA (SMP)

Molding compound meets UL 94 V-0 flammability rating  
Base P/NHM3 - halogen-free, RoHS-compliant, and automotive grade

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

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 $\mu$ s waveform (fig. 1 and 3) <sup>(1)(2)</sup> | $P_{PPM}$      | See table next page | W    |
| Peak power pulse current with a 10/1000 $\mu$ s waveform (fig. 1) <sup>(1)</sup>        | $I_{PPM}$      | See table next page | A    |
| Power dissipation on infinite heatsink, $T_A = 75$ °C                                   | $P_D$          | 2.5                 | W    |
| Peak forward surge current 10 ms single half sine-wave superimposed on rated load       | $I_{FSM}$      | 40                  | A    |
| Maximum instantaneous forward voltage at 25 A <sup>(3)</sup>                            | $V_F$          | 2.5                 | 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 5.0 mm x 5.0 mm copper pads attached to each terminal
- (3) Pulse test: 300  $\mu$ s pulse width, 1 % duty cycle

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25\text{ }^{\circ}\text{C}$ , 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 $V_{WM}$ $I_R$ ( $\mu\text{A}$ ) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $T_J = 150\text{ }^{\circ}\text{C}$ $I_D$ ( $\mu\text{A}$ ) | MAXIMUM PEAK PULSE SURGE CURRENT $I_{PPM}^{(2)}$ (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | MAXIMUM TEMPERATURE COEFFICIENT OF $V_{BR}$ ( $\%/^{\circ}\text{C}$ ) |
|-------------|---------------------|-----------------------------------------------|------|-------------------------|--------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------|-----------------------------------------------------------------------|
|             |                     | MIN.                                          | MAX. |                         |                                |                                                             |                                                                                                 |                                                      |                                                 |                                                                       |
| TPSMP6.8    | ADP                 | 6.12                                          | 7.48 | 10.0                    | 5.50                           | 300                                                         | 1000                                                                                            | 23.2                                                 | 10.8                                            | 0.057                                                                 |
| TPSMP6.8A   | AEP                 | 6.45                                          | 7.14 | 10.0                    | 5.80                           | 300                                                         | 1000                                                                                            | 23.8                                                 | 10.5                                            | 0.057                                                                 |
| TPSMP7.5    | AFP                 | 6.75                                          | 8.25 | 10.0                    | 6.05                           | 150                                                         | 500                                                                                             | 25.6                                                 | 11.7                                            | 0.060                                                                 |
| TPSMP7.5A   | AGP                 | 7.13                                          | 7.88 | 10.0                    | 6.40                           | 150                                                         | 500                                                                                             | 26.5                                                 | 11.3                                            | 0.061                                                                 |
| TPSMP8.2    | AHP                 | 7.38                                          | 9.02 | 10.0                    | 6.63                           | 50.0                                                        | 200                                                                                             | 24.0                                                 | 12.5                                            | 0.065                                                                 |
| TPSMP8.2A   | AKP                 | 7.79                                          | 8.61 | 10.0                    | 7.02                           | 50.0                                                        | 200                                                                                             | 24.8                                                 | 12.1                                            | 0.065                                                                 |
| TPSMP9.1    | ALP                 | 8.19                                          | 10.0 | 1.0                     | 7.37                           | 10.0                                                        | 50.0                                                                                            | 21.7                                                 | 13.8                                            | 0.068                                                                 |
| TPSMP9.1A   | AMP                 | 8.65                                          | 9.55 | 1.0                     | 7.78                           | 10.0                                                        | 50.0                                                                                            | 22.4                                                 | 13.4                                            | 0.068                                                                 |
| TPSMP10     | ANP                 | 9.00                                          | 11.0 | 1.0                     | 8.10                           | 5.0                                                         | 20.0                                                                                            | 20.0                                                 | 15.0                                            | 0.073                                                                 |
| TPSMP10A    | APP                 | 9.50                                          | 10.5 | 1.0                     | 8.55                           | 5.0                                                         | 20.0                                                                                            | 20.7                                                 | 14.5                                            | 0.073                                                                 |
| TPSMP11     | AQP                 | 9.90                                          | 12.1 | 1.0                     | 8.92                           | 2.0                                                         | 10.0                                                                                            | 18.5                                                 | 16.2                                            | 0.075                                                                 |
| TPSMP11A    | ARP                 | 10.5                                          | 11.6 | 1.0                     | 9.40                           | 2.0                                                         | 10.0                                                                                            | 19.2                                                 | 15.6                                            | 0.075                                                                 |
| TPSMP12     | ASP                 | 10.8                                          | 13.2 | 1.0                     | 9.72                           | 1.0                                                         | 5.0                                                                                             | 17.3                                                 | 17.3                                            | 0.076                                                                 |
| TPSMP12A    | ATP                 | 11.4                                          | 12.6 | 1.0                     | 10.2                           | 1.0                                                         | 5.0                                                                                             | 18.0                                                 | 16.7                                            | 0.078                                                                 |
| TPSMP13     | AUP                 | 11.7                                          | 14.3 | 1.0                     | 10.5                           | 1.0                                                         | 5.0                                                                                             | 21.1                                                 | 19.0                                            | 0.081                                                                 |
| TPSMP13A    | AVP                 | 12.4                                          | 13.7 | 1.0                     | 11.1                           | 1.0                                                         | 5.0                                                                                             | 22.0                                                 | 18.2                                            | 0.081                                                                 |
| TPSMP15     | AWP                 | 13.5                                          | 16.3 | 1.0                     | 12.1                           | 1.0                                                         | 5.0                                                                                             | 18.2                                                 | 22.0                                            | 0.084                                                                 |
| TPSMP15A    | AXP                 | 14.3                                          | 15.8 | 1.0                     | 12.8                           | 1.0                                                         | 5.0                                                                                             | 18.9                                                 | 21.2                                            | 0.084                                                                 |
| TPSMP16     | AYP                 | 14.4                                          | 17.6 | 1.0                     | 12.9                           | 1.0                                                         | 5.0                                                                                             | 17.0                                                 | 23.5                                            | 0.086                                                                 |
| TPSMP16A    | AZP                 | 15.2                                          | 16.8 | 1.0                     | 13.6                           | 1.0                                                         | 5.0                                                                                             | 17.8                                                 | 22.5                                            | 0.086                                                                 |
| TPSMP18     | BDP                 | 16.2                                          | 19.8 | 1.0                     | 14.5                           | 1.0                                                         | 5.0                                                                                             | 15.1                                                 | 26.5                                            | 0.088                                                                 |
| TPSMP18A    | BEP                 | 17.1                                          | 18.9 | 1.0                     | 15.3                           | 1.0                                                         | 5.0                                                                                             | 15.9                                                 | 25.5                                            | 0.088                                                                 |
| TPSMP20     | BFP                 | 18.0                                          | 22.0 | 1.0                     | 16.2                           | 1.0                                                         | 5.0                                                                                             | 13.7                                                 | 29.1                                            | 0.090                                                                 |
| TPSMP20A    | BGP                 | 19.0                                          | 21.0 | 1.0                     | 17.1                           | 1.0                                                         | 5.0                                                                                             | 14.4                                                 | 27.7                                            | 0.090                                                                 |
| TPSMP22     | BHP                 | 19.8                                          | 24.2 | 1.0                     | 17.8                           | 1.0                                                         | 5.0                                                                                             | 12.5                                                 | 31.9                                            | 0.092                                                                 |
| TPSMP22A    | BKP                 | 20.9                                          | 23.1 | 1.0                     | 18.8                           | 1.0                                                         | 5.0                                                                                             | 13.1                                                 | 30.6                                            | 0.092                                                                 |
| TPSMP24     | BLP                 | 21.6                                          | 26.4 | 1.0                     | 19.4                           | 1.0                                                         | 5.0                                                                                             | 11.5                                                 | 34.7                                            | 0.094                                                                 |
| TPSMP24A    | BMP                 | 22.8                                          | 25.2 | 1.0                     | 20.5                           | 1.0                                                         | 5.0                                                                                             | 12.0                                                 | 33.2                                            | 0.094                                                                 |
| TPSMP27     | BNP                 | 24.3                                          | 29.7 | 1.0                     | 21.8                           | 1.0                                                         | 5.0                                                                                             | 10.2                                                 | 39.1                                            | 0.100                                                                 |
| TPSMP27A    | BPP                 | 25.7                                          | 28.4 | 1.0                     | 23.1                           | 1.0                                                         | 5.0                                                                                             | 10.7                                                 | 37.5                                            | 0.096                                                                 |
| TPSMP30     | BQP                 | 27.0                                          | 33.0 | 1.0                     | 24.3                           | 1.0                                                         | 5.0                                                                                             | 9.2                                                  | 43.5                                            | 0.097                                                                 |
| TPSMP30A    | BRP                 | 28.5                                          | 31.5 | 1.0                     | 25.6                           | 1.0                                                         | 5.0                                                                                             | 9.7                                                  | 41.4                                            | 0.097                                                                 |
| TPSMP33     | BSP                 | 29.7                                          | 36.3 | 1.0                     | 26.8                           | 1.0                                                         | 5.0                                                                                             | 8.4                                                  | 47.7                                            | 0.098                                                                 |
| TPSMP33A    | BTP                 | 31.4                                          | 34.7 | 1.0                     | 28.2                           | 1.0                                                         | 5.0                                                                                             | 8.8                                                  | 45.7                                            | 0.098                                                                 |
| TPSMP36     | BUP                 | 32.4                                          | 39.6 | 1.0                     | 29.1                           | 1.0                                                         | 5.0                                                                                             | 7.7                                                  | 52.0                                            | 0.099                                                                 |
| TPSMP36A    | BVP                 | 34.2                                          | 37.8 | 1.0                     | 30.8                           | 1.0                                                         | 5.0                                                                                             | 8.0                                                  | 49.9                                            | 0.099                                                                 |
| TPSMP39     | BWP                 | 35.1                                          | 42.9 | 1.0                     | 31.6                           | 1.0                                                         | 5.0                                                                                             | 7.1                                                  | 56.4                                            | 0.100                                                                 |
| TPSMP39A    | BXP                 | 37.1                                          | 41.0 | 1.0                     | 33.3                           | 1.0                                                         | 5.0                                                                                             | 7.4                                                  | 53.9                                            | 0.100                                                                 |
| TPSMP43     | BYP                 | 38.7                                          | 47.3 | 1.0                     | 34.8                           | 1.0                                                         | 5.0                                                                                             | 6.5                                                  | 61.9                                            | 0.101                                                                 |
| TPSMP43A    | BZP                 | 40.9                                          | 45.2 | 1.0                     | 36.8                           | 1.0                                                         | 5.0                                                                                             | 6.7                                                  | 59.3                                            | 0.101                                                                 |

**Notes**(1)  $V_{BR}$  measured after  $I_T$  applied for 300  $\mu\text{s}$ ,  $I_T$  = square wave pulse or equivalent

(2) Surge current waveform per fig. 3 and derated per fig. 2

(3) 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                      |
|---------------------------------|-----------------|------------------------|---------------|------------------------------------|
| TPSMP6.8AHM3/84A <sup>(1)</sup> | 0.024           | 84A                    | 3000          | 7" diameter plastic tape and reel  |
| TPSMP6.8AHM3/85A <sup>(1)</sup> | 0.024           | 85A                    | 10 000        | 13" diameter plastic tape and reel |

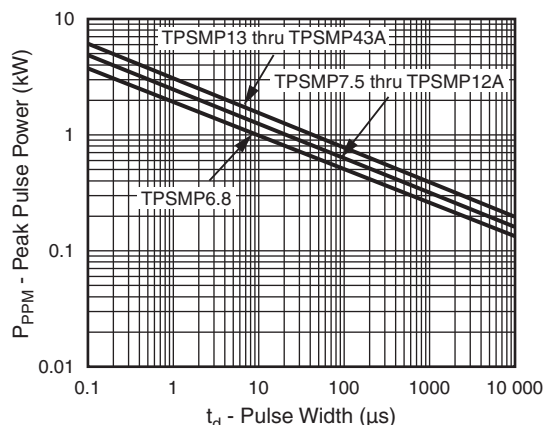
**Note**<sup>(1)</sup> Automotive grade**RATINGS AND CHARACTERISTICS CURVES** $(T_A = 25\text{ }^{\circ}\text{C}$  unless otherwise noted)

Fig. 1 - Peak Pulse Power Rating Curve

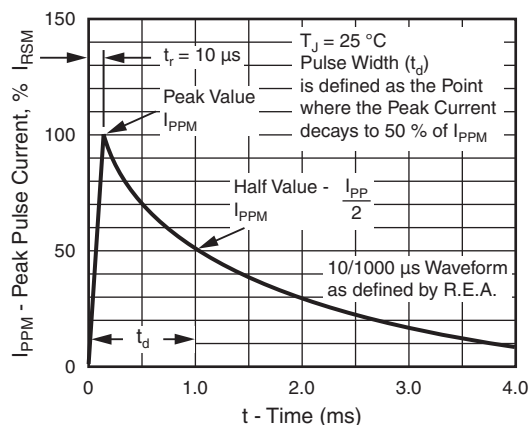


Fig. 3 - Pulse Waveform

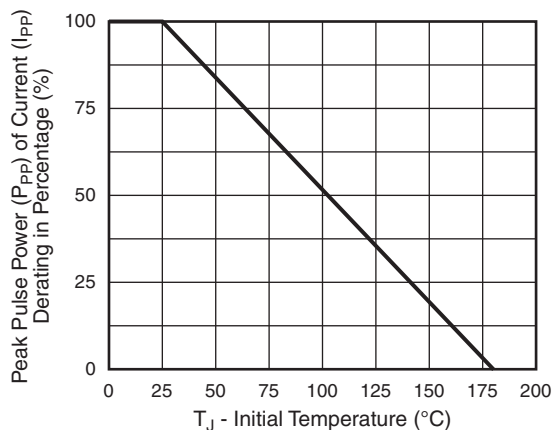


Fig. 2 - Pulse Derating Curve

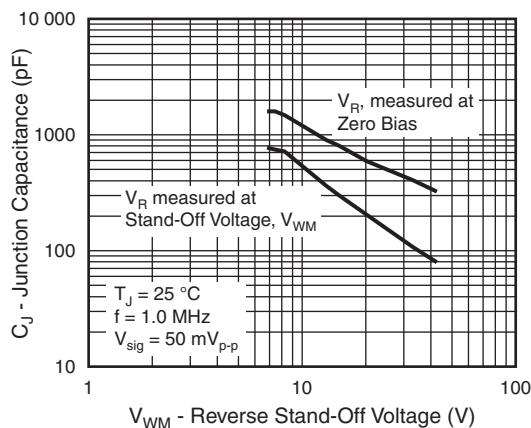


Fig. 4 - Typical Junction Capacitance

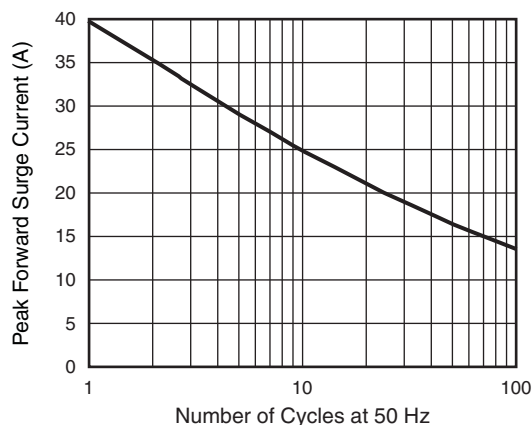


Fig. 5 - Maximum Peak Forward Surge Current

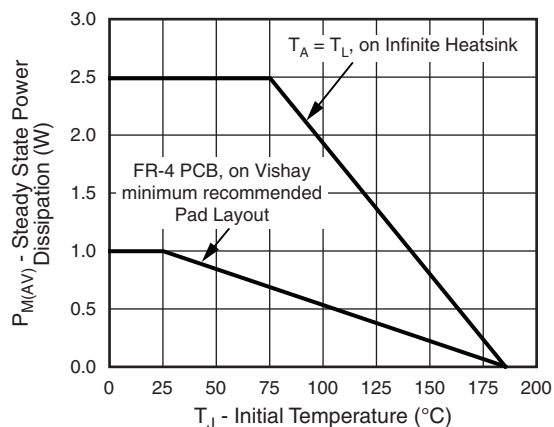
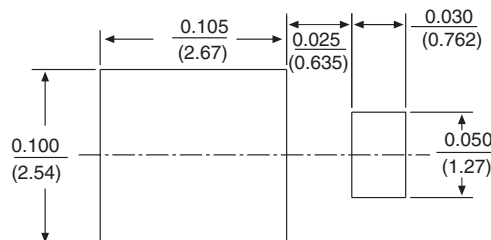
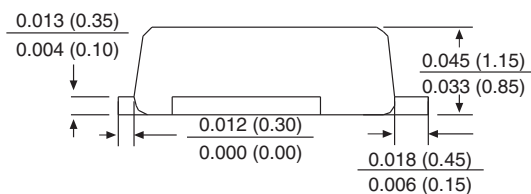
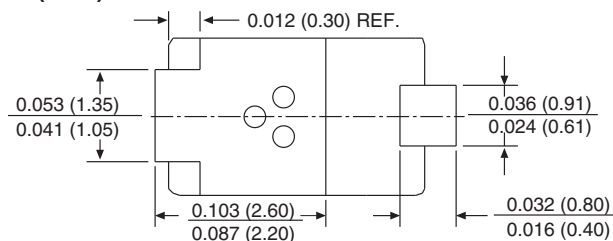
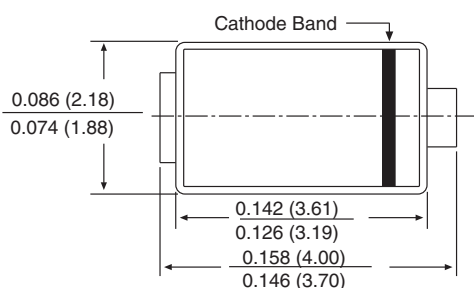


Fig. 6 - Steady State Power Derating Curve

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

**DO-220AA (SMP)**




## Disclaimer

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