



**THE DATASHEET OF  
TPSMP36A-E3/84A**



## High Power Density Surface Mount Automotive Transient Voltage Suppressors


**DO-220AA (SMP)**

| <b>MAJOR RATINGS AND CHARACTERISTICS</b> |               |
|------------------------------------------|---------------|
| $V_{(BR)}$                               | 6.8 V to 43 V |
| $P_{PPM}$ (for $V_{(BR)}$ 6.8 V)         | 250 W         |
| $P_{PPM}$ (for $V_{(BR)}$ 7.5 V - 12 V)  | 300 W         |
| $P_{PPM}$ (for $V_{(BR)}$ 13 V - 43 V)   | 400 W         |
| $P_D$                                    | 1.0 W         |
| $I_{FSM}$                                | 40 A          |
| $T_J$ max.                               | 185 °C        |

**FEATURES**

- Very low profile - typical height of 1.0 mm
- Ideal for automated placement
- Unidirection only
- Exclusive patented PAR oxide passivated chip construction
- Excellent clamping capability
- Low incremental surge resistance
- Very fast response time
- Meets MSL level 1, per J-STD-020C
- Solder Dip 260 °C, 40 seconds
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC


**TYPICAL APPLICATIONS**

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

**MECHANICAL DATA**

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

Epoxy meets UL-94V-0 flammability rating

**Terminals:** Matte tin plated leads, solderable per J-STD-002B and JESD22-B102D

E3 suffix for commercial grade, HE3 suffix for high reliability grade (AEC Q101 qualified)

**Polarity:** Color band denotes cathode end

| <b>MAXIMUM RATINGS</b> ( $T_A = 25$ °C, unless otherwise specified)                   |                |                     |      |
|---------------------------------------------------------------------------------------|----------------|---------------------|------|
| PARAMETER                                                                             | SYMBOL         | VALUE               | UNIT |
| Peak power dissipation with a 10/1000 $\mu$ s waveform <sup>(1)(2)</sup> (Fig. 1 & 3) | $P_{PPM}$      | see table next page | W    |
| Peak power pulse current with a 10/1000 $\mu$ s waveform <sup>(1)</sup> (Fig. 1)      | $I_{PPM}$      | see table next page | A    |
| Power dissipation on infinite heatsink, $T_A = 50$ °C                                 | $P_D$          | 1.0                 | 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   |

**Note:**

(1) Non-repetitive current pulse, per fig. 3 and derated above  $T_A = 25$  °C per Fig. 2

(2) Mounted on P.C.B. with 5.0 x 5.0 mm copper pads attached to each terminal

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

# TPSMP6.8 thru TPSMP43A

Vishay General Semiconductor



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise specified) |                     |                                                          |      |                         |                                |                                                             |                                                                                               |                                                                  |                                                     |                                                                       |
|----------------------------------------------------------------------------------------------------|---------------------|----------------------------------------------------------|------|-------------------------|--------------------------------|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------|------------------------------------------------------------------|-----------------------------------------------------|-----------------------------------------------------------------------|
| DEVICE TYPE                                                                                        | DEVICE MARKING CODE | BREAKDOWN VOLTAGE $V_{(BR)}$ <sup>(1)</sup> 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 $I_{PPM}$ <sup>(2)</sup> (AMPS) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (VOLTS) | 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                                                                 |

**Note:**

- (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 |                 |                        |               |                                  |
|----------------------|-----------------|------------------------|---------------|----------------------------------|
| PREFERRED P/N        | UNIT WEIGHT (g) | PREFERRED PACKAGE CODE | BASE QUANTITY | DELIVERY MODE                    |
| TPSMP6.8A-E3/84A     | 0.024           | 84A                    | 3000          | 7" Diameter Plastic Tape & Reel  |
| TPSMP6.8A-E3/85A     | 0.024           | 85A                    | 10000         | 13" Diameter Plastic Tape & Reel |

**RATINGS AND CHARACTERISTICS CURVES**

(T<sub>A</sub> = 25 °C unless otherwise specified)

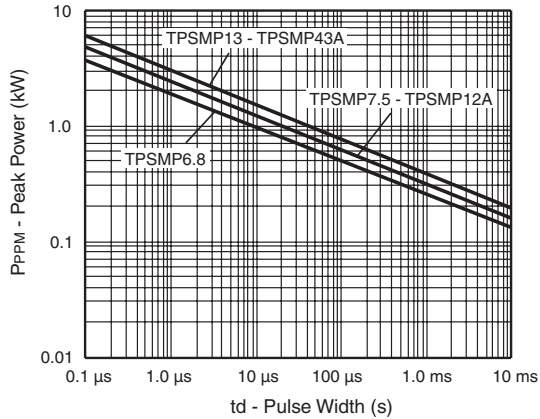


Figure 1. Peak Pulse Power Rating Curve

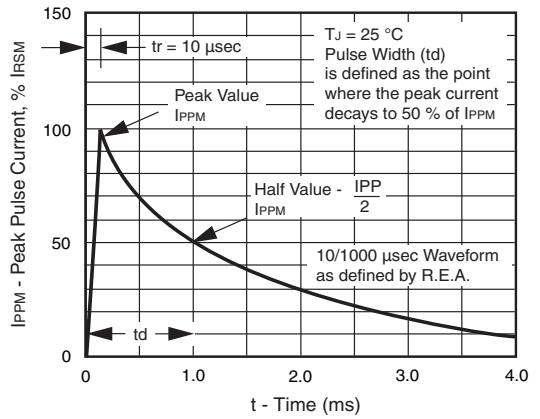


Figure 3. Pulse Waveform

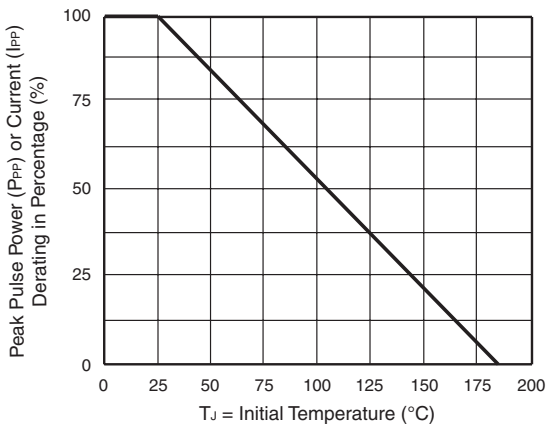


Figure 2. Pulse Derating Curve

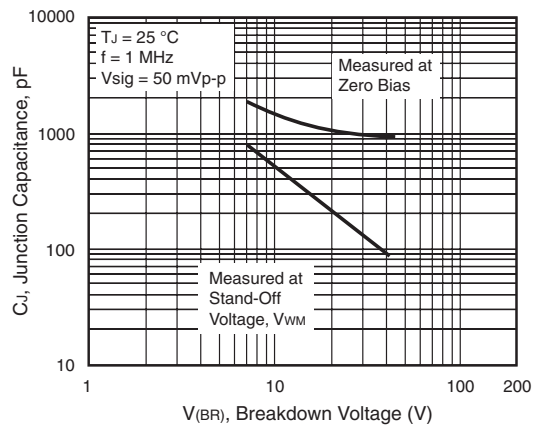


Figure 4. Typical Junction Capacitance

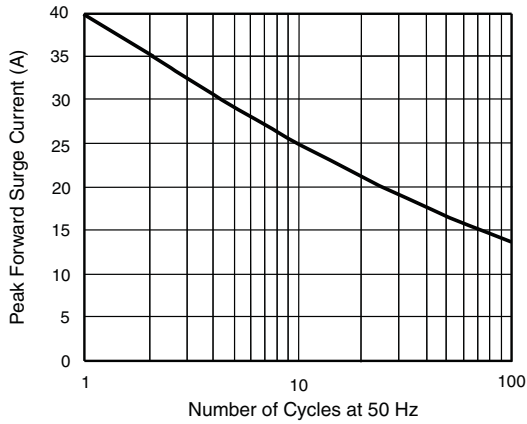


Figure 5. Maximum Peak Forward Surge Current

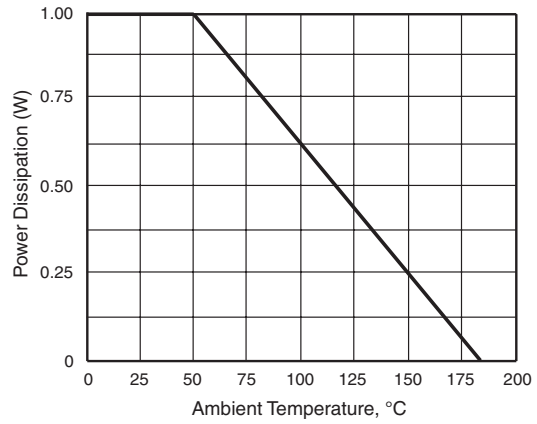
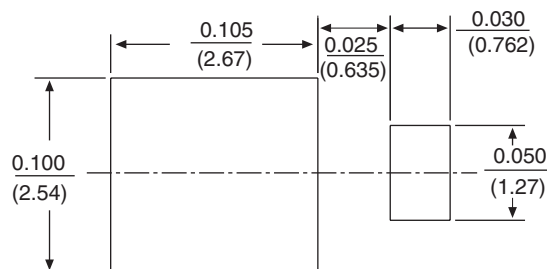
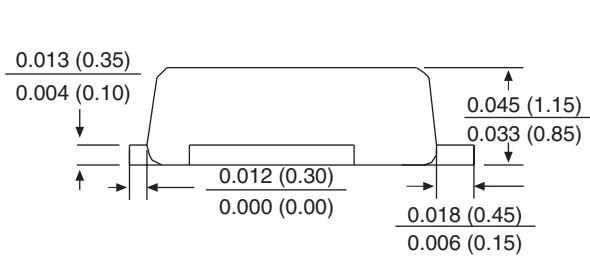
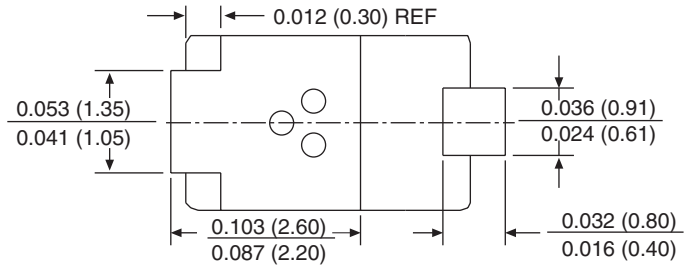
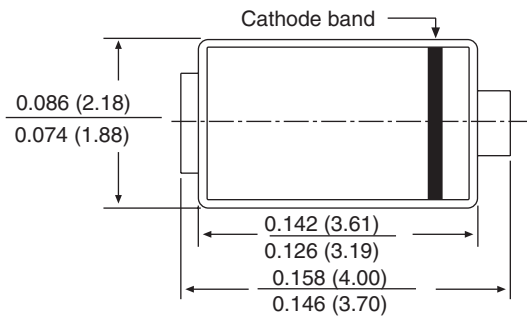


Figure 6. Maximum Peak Forward Surge Current

## PACKAGE OUTLINE DIMENSIONS in inches (millimeters)

### DO-220AA (SMP)





## Notice

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