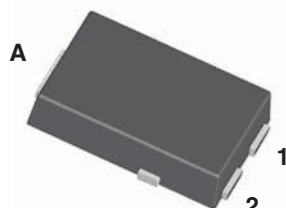


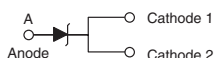
# Surface Mount PAR<sup>®</sup> Transient Voltage Suppressors

High Temperature Stability and High Reliability Conditions

## eSMP<sup>®</sup> Series



**TO-277A (SMPC)**



### PRIMARY CHARACTERISTICS

|            |                  |
|------------|------------------|
| $V_{WM}$   | 5.50 V to 43.6 V |
| $V_{BR}$   | 6.8 V to 51 V    |
| $P_{PPM}$  | 1500 W           |
| $T_J$ max. | 185 °C           |
| Polarity   | Uni-directional  |
| Package    | TO-277A (SMPC)   |

### TYPICAL APPLICATIONS

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

### 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 1.1 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
- AEC-Q101 qualified
- Material categorization: for definitions of compliance please see [www.vishay.com/doc?99912](http://www.vishay.com/doc?99912)



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

### MECHANICAL DATA

**Case:** TO-277A (SMPC)

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

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

| PARAMETER                                                                         | SYMBOL         | VALUE          | UNIT |
|-----------------------------------------------------------------------------------|----------------|----------------|------|
| Peak power dissipation with a 10/1000 $\mu$ s waveform (fig. 3) <sup>(1)(2)</sup> | $P_{PPM}$      | 1500           | W    |
| Peak power pulse current with a 10/1000 $\mu$ s waveform (fig. 1) <sup>(1)</sup>  | $I_{PPM}$      | See next table | A    |
| Peak forward surge current 8.3 ms single half sine-wave <sup>(2)</sup>            | $I_{FSM}$      | 200            | A    |
| Maximum instantaneous forward voltage at 100 A <sup>(3)</sup>                     | $V_F$          | 3.5            | V    |
| Operating junction and storage temperature range                                  | $T_J, T_{STG}$ | -65 to +185    | °C   |

#### Notes

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

<sup>(2)</sup> Measured on 8.3 ms single half sine-wave, or equivalent square wave, duty cycle = 4 pulses per minute maximum

<sup>(3)</sup> 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) |
|-------------|---------------------|-----------------------------------------------|------|-------------------------|--------------------------------|-------------------------------------------------------------|-------------------------------------------------------------------------------------------------|------------------------------------------------------|-------------------------------------------------|
|             |                     | MIN.                                          | MAX. |                         |                                |                                                             |                                                                                                 |                                                      |                                                 |
| TPC6.8      | DDP                 | 6.12                                          | 7.48 | 10                      | 5.50                           | 1500                                                        | 10 000                                                                                          | 139                                                  | 10.8                                            |
| TPC6.8A     | DEP                 | 6.45                                          | 7.14 | 10                      | 5.80                           | 1500                                                        | 10 000                                                                                          | 143                                                  | 10.5                                            |
| TPC7.5      | DFP                 | 6.75                                          | 8.25 | 10                      | 6.05                           | 500                                                         | 5000                                                                                            | 128                                                  | 11.7                                            |
| TPC7.5A     | DGP                 | 7.13                                          | 7.88 | 10                      | 6.40                           | 500                                                         | 5000                                                                                            | 133                                                  | 11.3                                            |
| TPC8.2      | DHP                 | 7.38                                          | 9.02 | 10                      | 6.63                           | 200                                                         | 2000                                                                                            | 120                                                  | 12.5                                            |
| TPC8.2A     | DKP                 | 7.79                                          | 8.61 | 10                      | 7.02                           | 200                                                         | 2000                                                                                            | 124                                                  | 12.1                                            |
| TPC9.1      | DLP                 | 8.19                                          | 10.0 | 1.0                     | 7.37                           | 50                                                          | 500                                                                                             | 109                                                  | 13.8                                            |
| TPC9.1A     | DMP                 | 8.65                                          | 9.55 | 1.0                     | 7.78                           | 50                                                          | 500                                                                                             | 112                                                  | 13.4                                            |
| TPC10       | DNP                 | 9.0                                           | 11.0 | 1.0                     | 8.10                           | 20                                                          | 200                                                                                             | 100                                                  | 15.0                                            |
| TPC10A      | DPP                 | 9.5                                           | 10.5 | 1.0                     | 8.55                           | 20                                                          | 200                                                                                             | 103                                                  | 14.5                                            |
| TPC11       | DQP                 | 9.9                                           | 12.1 | 1.0                     | 8.92                           | 5.0                                                         | 50                                                                                              | 92.6                                                 | 16.2                                            |
| TPC11A      | DRP                 | 10.5                                          | 11.6 | 1.0                     | 9.40                           | 5.0                                                         | 50                                                                                              | 96.2                                                 | 15.6                                            |
| TPC12       | DSP                 | 10.8                                          | 13.2 | 1.0                     | 9.72                           | 2.0                                                         | 10                                                                                              | 86.7                                                 | 17.3                                            |
| TPC12A      | DTP                 | 11.4                                          | 12.6 | 1.0                     | 10.2                           | 2.0                                                         | 10                                                                                              | 89.8                                                 | 16.7                                            |
| TPC13       | DUP                 | 11.7                                          | 14.3 | 1.0                     | 10.5                           | 2.0                                                         | 10                                                                                              | 78.9                                                 | 19.0                                            |
| TPC13A      | DVP                 | 12.4                                          | 13.7 | 1.0                     | 11.1                           | 2.0                                                         | 10                                                                                              | 82.4                                                 | 18.2                                            |
| TPC15       | DWP                 | 13.5                                          | 16.5 | 1.0                     | 12.1                           | 1.0                                                         | 10                                                                                              | 68.2                                                 | 22.0                                            |
| TPC15A      | DXP                 | 14.3                                          | 15.8 | 1.0                     | 12.8                           | 1.0                                                         | 10                                                                                              | 70.8                                                 | 21.2                                            |
| TPC16       | DYP                 | 14.4                                          | 17.6 | 1.0                     | 12.9                           | 1.0                                                         | 10                                                                                              | 63.8                                                 | 23.5                                            |
| TPC16A      | DZP                 | 15.2                                          | 16.8 | 1.0                     | 13.6                           | 1.0                                                         | 10                                                                                              | 66.7                                                 | 22.5                                            |
| TPC18       | EDP                 | 16.2                                          | 19.8 | 1.0                     | 14.5                           | 1.0                                                         | 10                                                                                              | 56.6                                                 | 26.5                                            |
| TPC18A      | EEP                 | 17.1                                          | 18.9 | 1.0                     | 15.3                           | 1.0                                                         | 10                                                                                              | 59.5                                                 | 25.2                                            |
| TPC20       | EFP                 | 18.0                                          | 22.0 | 1.0                     | 16.2                           | 1.0                                                         | 10                                                                                              | 51.5                                                 | 29.1                                            |
| TPC20A      | EGP                 | 19.0                                          | 21.0 | 1.0                     | 17.1                           | 1.0                                                         | 10                                                                                              | 54.2                                                 | 27.7                                            |
| TPC22       | EHP                 | 19.8                                          | 24.2 | 1.0                     | 17.8                           | 1.0                                                         | 10                                                                                              | 47.0                                                 | 31.9                                            |
| TPC22A      | EKP                 | 20.9                                          | 23.1 | 1.0                     | 18.8                           | 1.0                                                         | 10                                                                                              | 49.0                                                 | 30.6                                            |
| TPC24       | ELP                 | 21.6                                          | 26.4 | 1.0                     | 19.4                           | 1.0                                                         | 10                                                                                              | 43.2                                                 | 34.7                                            |
| TPC24A      | EMP                 | 22.8                                          | 25.2 | 1.0                     | 20.5                           | 1.0                                                         | 10                                                                                              | 45.2                                                 | 33.2                                            |
| TPC27       | ENP                 | 24.3                                          | 29.7 | 1.0                     | 21.8                           | 1.0                                                         | 10                                                                                              | 38.4                                                 | 39.1                                            |
| TPC27A      | EPP                 | 25.7                                          | 28.4 | 1.0                     | 23.1                           | 1.0                                                         | 10                                                                                              | 40.0                                                 | 37.5                                            |
| TPC30       | EQP                 | 27.0                                          | 33.0 | 1.0                     | 24.3                           | 1.0                                                         | 10                                                                                              | 34.5                                                 | 43.5                                            |
| TPC30A      | ERP                 | 28.5                                          | 31.5 | 1.0                     | 25.6                           | 1.0                                                         | 10                                                                                              | 36.2                                                 | 41.4                                            |
| TPC33       | ESP                 | 29.7                                          | 36.3 | 1.0                     | 26.8                           | 1.0                                                         | 10                                                                                              | 31.4                                                 | 47.7                                            |
| TPC33A      | ETP                 | 31.4                                          | 34.7 | 1.0                     | 28.2                           | 1.0                                                         | 10                                                                                              | 32.8                                                 | 45.7                                            |
| TPC36       | EUP                 | 32.4                                          | 39.6 | 1.0                     | 29.1                           | 1.0                                                         | 15                                                                                              | 28.8                                                 | 52.0                                            |
| TPC36A      | EVP                 | 34.2                                          | 37.8 | 1.0                     | 30.8                           | 1.0                                                         | 15                                                                                              | 30.1                                                 | 49.9                                            |
| TPC39       | EWP                 | 35.1                                          | 42.9 | 1.0                     | 31.6                           | 1.0                                                         | 15                                                                                              | 26.6                                                 | 56.4                                            |
| TPC39A      | EXP                 | 37.1                                          | 41.0 | 1.0                     | 33.3                           | 1.0                                                         | 15                                                                                              | 27.8                                                 | 53.9                                            |
| TPC43       | EYP                 | 38.7                                          | 47.3 | 1.0                     | 34.8                           | 1.0                                                         | 20                                                                                              | 24.2                                                 | 61.9                                            |
| TPC43A      | EZP                 | 40.9                                          | 45.2 | 1.0                     | 36.8                           | 1.0                                                         | 20                                                                                              | 25.3                                                 | 59.3                                            |
| TPC47A      | FEP                 | 44.7                                          | 49.4 | 1.0                     | 40.2                           | 1.0                                                         | 20                                                                                              | 23.1                                                 | 64.8                                            |
| TPC51A      | FGP                 | 48.5                                          | 53.6 | 1.0                     | 43.6                           | 1.0                                                         | 20                                                                                              | 21.4                                                 | 70.1                                            |

**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                      |
|------------------------------|-----------------|------------------------|---------------|------------------------------------|
| TPC10AHM3/86A <sup>(1)</sup> | 0.10            | 86A                    | 1500          | 7" diameter plastic tape and reel  |
| TPC10AHM3/87A <sup>(1)</sup> | 0.10            | 87A                    | 6500          | 13" diameter plastic tape and reel |

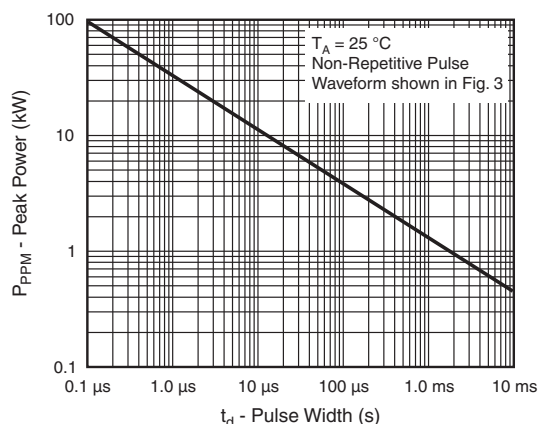
**Note**<sup>(1)</sup> Automotive grade**RATINGS AND CHARACTERISTICS CURVES** ( $T_A = 25^\circ\text{C}$ , unless otherwise noted)

Fig. 1 - Peak Pulse Power Rating Curve

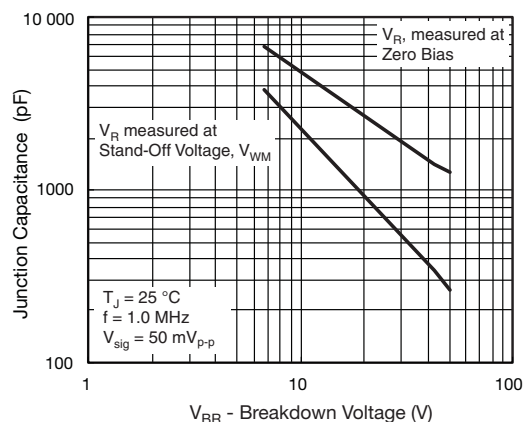


Fig. 4 - Typical Junction Capacitance

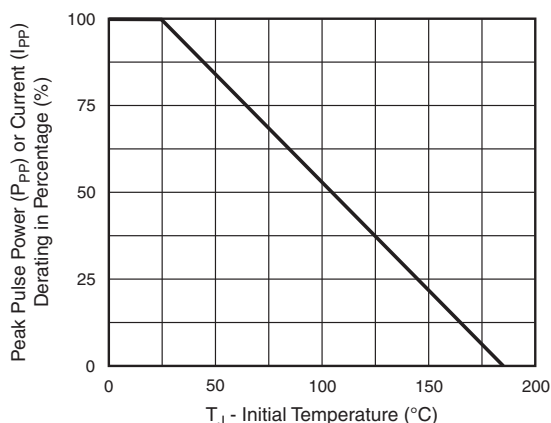


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature

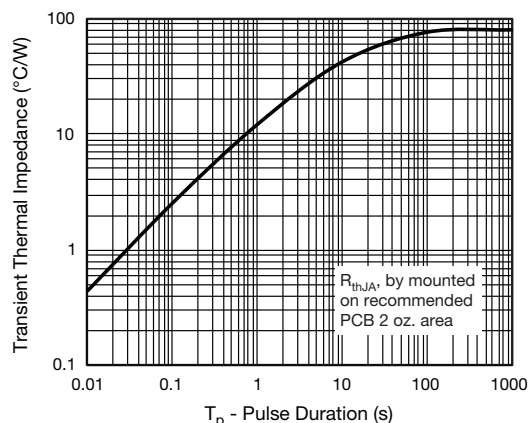


Fig. 5 - Typical Transient Thermal Impedance

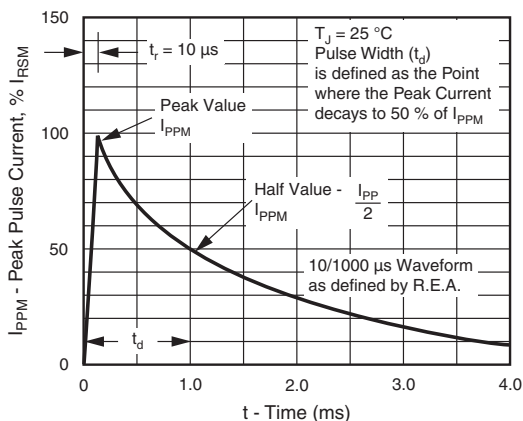
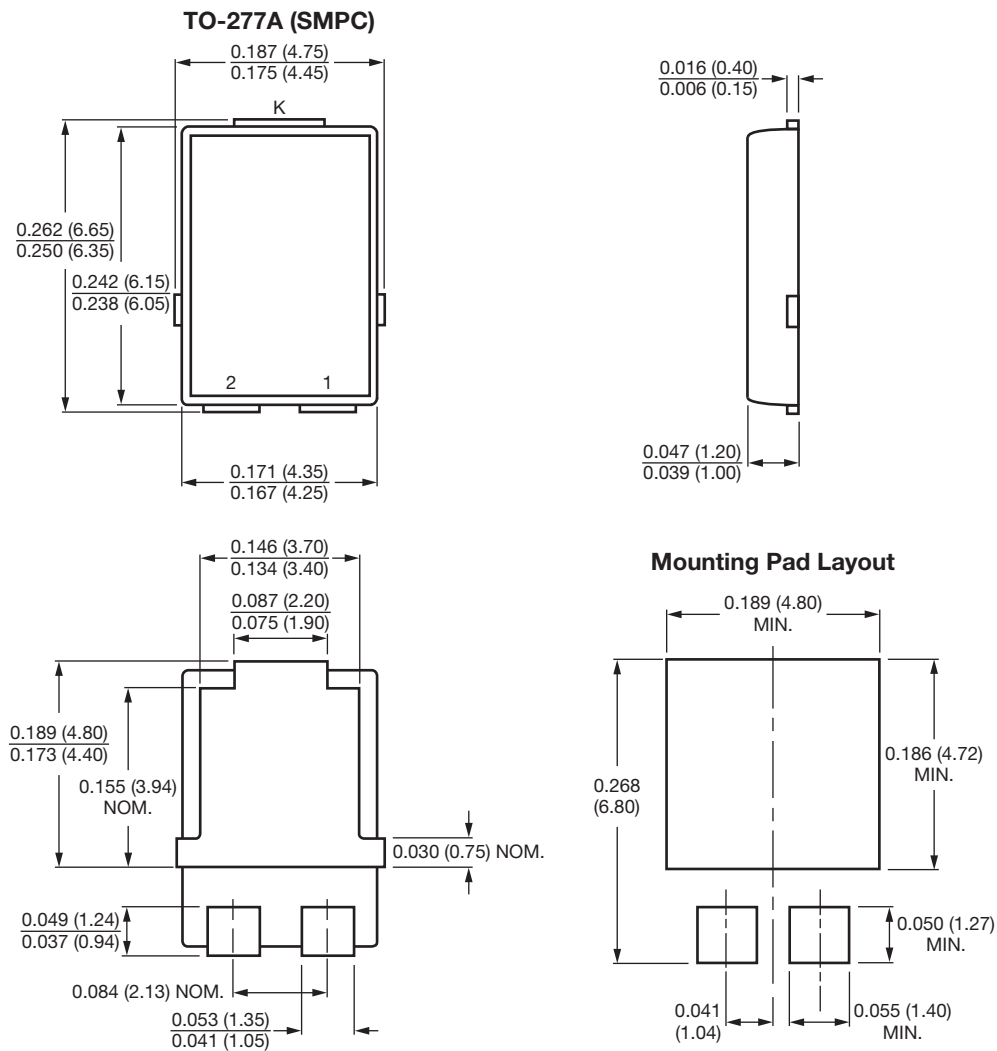


Fig. 3 - Pulse Waveform



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



Conform to JEDEC TO-277A



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