

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

High Temperature Stability and High Reliability Conditions

## eSMP<sup>®</sup> Series



**TO-277A (SMPC)**



AUTOMOTIVE  
GRADE  
Available



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

## FEATURES

- Junction passivation optimized design passivated anisotropic rectifier technology
- $T_J = 185\text{ }^\circ\text{C}$  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)

## 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

| 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.

| MAXIMUM RATINGS ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted)            |                |                |      |
|---|----------------|----------------|------|
| PARAMETER   | SYMBOL         | VALUE          | UNIT |
| Peak power dissipation with a 10/1000 $\mu\text{s}$ waveform (fig. 3) <sup>(1)(2)</sup> | $P_{PPM}$      | 1500           | W    |
| Peak power pulse current with a 10/1000 $\mu\text{s}$ 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  $T_A = 25\text{ }^\circ\text{C}$  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  $\mu\text{s}$  pulse width, 1 % duty cycle



| ELECTRICAL CHARACTERISTICS ( $T_A = 25\text{ }^\circ\text{C}$ , unless otherwise noted) |                     |  |      |                         |                                |   |   |   |   |
|---|---------------------|--|------|-------------------------|--------------------------------|---|---|---|---|
| DEVICE TYPE   | DEVICE MARKING CODE | BREAKDOWN VOLTAGE $V_{BR}$ <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> (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<sub>A</sub> = 25 °C unless otherwise noted)



Fig. 1 - Peak Pulse Power Rating Curve

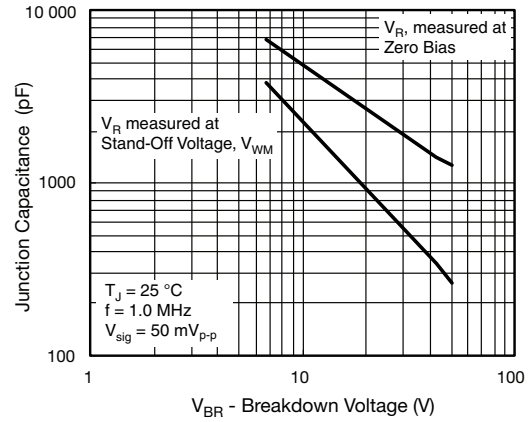


Fig. 4 - Typical Junction Capacitance

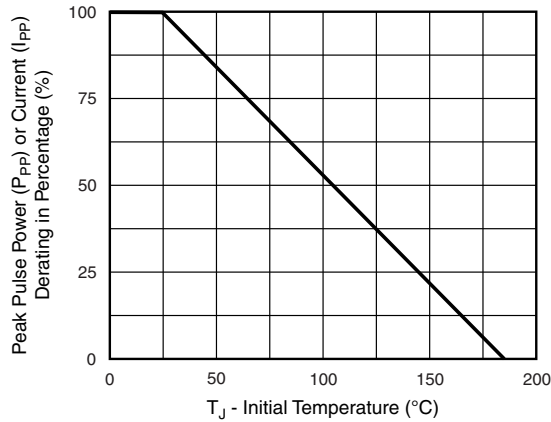


Fig. 2 - Pulse Power or Current vs. Initial Junction Temperature



Fig. 5 - Typical Transient Thermal Impedance

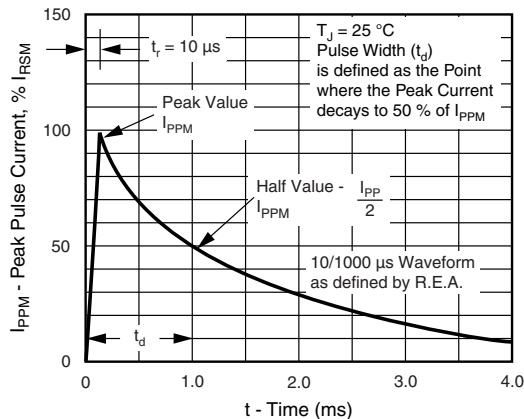
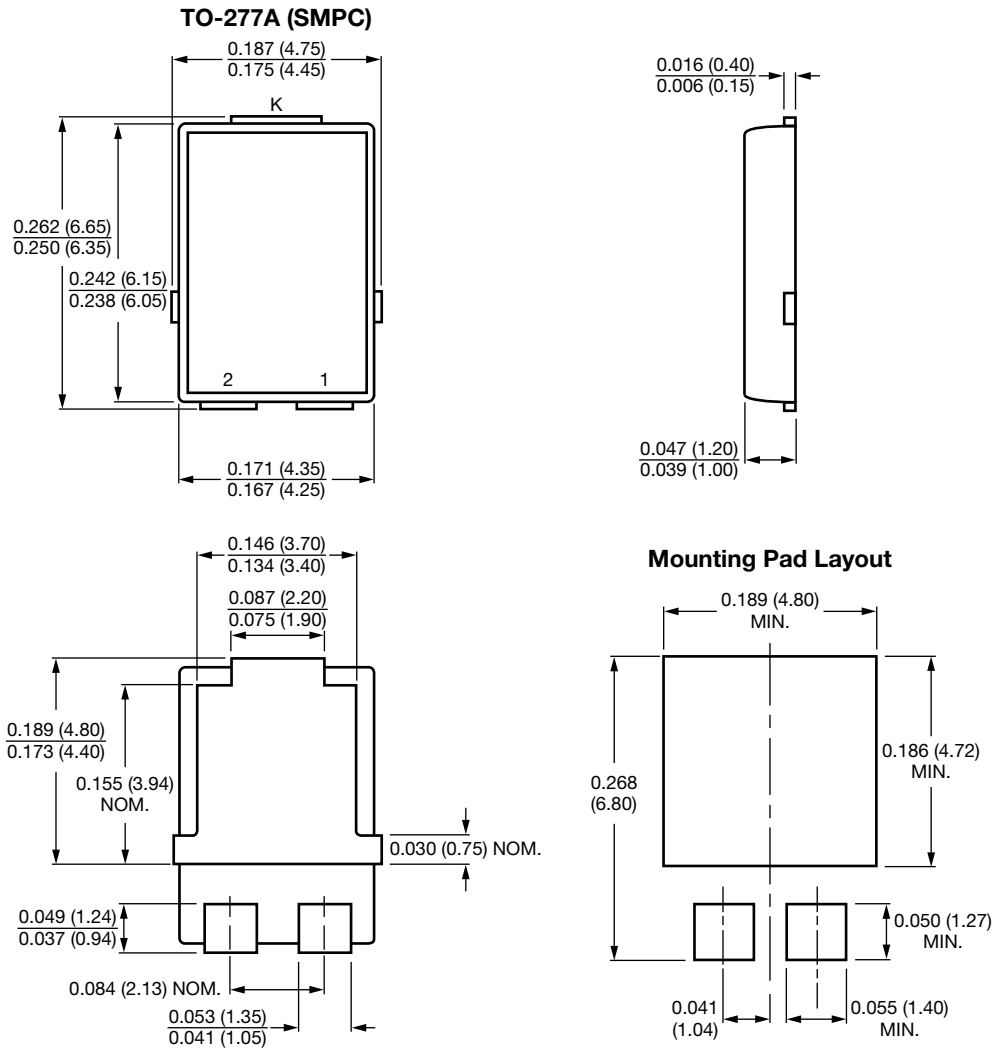


Fig. 3 - Pulse Waveform



### PACKAGE OUTLINE DIMENSIONS in inches (millimeters)





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#### Как с нами связаться

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