

## TRANSZORB® Transient Voltage Suppressors



Case Style P600

| PRIMARY CHARACTERISTICS |                |
|-------------------------|----------------|
| $V_{WM}$                | 5.0 V to 188 V |
| $P_{PPM}$               | 5000 W         |
| $P_D$                   | 8.0 W          |
| $I_{FSM}$               | 500 A          |
| $T_J$ max.              | 175 °C         |

### FEATURES

- P600, glass passivated chip junction
- Available in uni-directional polarity only
- 5000 W peak pulse power capability with a 10/1000  $\mu$ s waveform, repetitive rate (duty cycle): 0.01 %
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Solder dip 260 °C, 40 s
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC


**RoHS**  
COMPLIANT

### 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.

### MECHANICAL DATA

**Case:** Molded epoxy body over passivated junction  
Molding compound meets UL 94 V-0 flammability rating

Base P/N-E3 - RoHS compliant, commercial grade

Base P/NHE3 - RoHS compliant, high reliability/automotive grade (AEC Q101 qualified)

**Terminals:** Matte tin plated leads, solderable per J-STD-002 and JESD22-B102

E3 suffix meets JESD 201 class 1A whisker test, HE3 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 pulse power dissipation with a 10/1000 $\mu$ s waveform <sup>(1)</sup> | $P_{PPM}$      | 5000           | W    |
| Peak pulse current with a 10/1000 $\mu$ s waveform <sup>(1)</sup>           | $I_{PPM}$      | See next table | A    |
| Power dissipation on infinite heatsink at $T_L = 75$ °C (Fig. 5)            | $P_D$          | 8.0            | W    |
| Peak forward surge current 8.3 ms single half sine-wave (Fig. 5)            | $I_{FSM}$      | 600            | A    |
| Instantaneous forward voltage at 100 A <sup>(2)</sup>                       | $V_F$          | 3.5            | V    |
| Operating junction and storage temperature range                            | $T_J, T_{STG}$ | - 55 to + 175  | °C   |

#### Notes:

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

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

| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) |   |      |                            |                                |   |   |   |  |
|--|---|------|----------------------------|--------------------------------|---|---|---|--|
| DEVICE TYPE  | BREAKDOWN VOLTAGE $V_{BR}$ (V) <sup>(1)</sup> |      | TEST CURRENT AT $I_T$ (mA) | STAND-OFF VOLTAGE $V_{WM}$ (V) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_D$ ( $\mu\text{A}$ ) | MAXIMUM PEAK PULSE CURRENT $I_{PPM}$ <sup>(2)</sup> (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | MAXIMUM TEMPERATURE COEFFICIENT OF $V_{BR}$ (%/ $^\circ\text{C}$ ) |
|  | MIN.  | MAX. |                            |                                |   |   |   |  |
| 5KP5.0   | 6.40  | 7.30 | 50                         | 5.0                            | 2000  | 521   | 9.6   | 0.057  |
| 5KP5.0A  | 6.40  | 7.00 | 50                         | 5.0                            | 2000  | 543   | 9.2   | 0.057  |
| 5KP6.0   | 6.67  | 8.15 | 50                         | 6.0                            | 5000  | 439   | 11.4  | 0.061  |
| 5KP6.0A  | 6.67  | 7.37 | 50                         | 6.0                            | 5000  | 485   | 10.3  | 0.061  |
| 5KP6.5   | 7.22  | 8.82 | 50                         | 6.5                            | 2000  | 407   | 12.3  | 0.065  |
| 5KP6.5A  | 7.22  | 7.98 | 50                         | 6.5                            | 2000  | 446   | 11.2  | 0.065  |
| 5KP7.0   | 7.78  | 9.51 | 50                         | 7.0                            | 1000  | 376   | 13.3  | 0.068  |
| 5KP7.0A  | 7.78  | 8.60 | 50                         | 7.0                            | 1000  | 417   | 12.0  | 0.068  |
| 5KP7.5   | 8.33  | 10.2 | 5.0                        | 7.5                            | 250   | 350   | 14.3  | 0.073  |
| 5KP7.5A  | 8.33  | 9.21 | 5.0                        | 7.5                            | 250   | 388   | 12.9  | 0.073  |
| 5KP8.0   | 8.89  | 10.9 | 5.0                        | 8.0                            | 150   | 333   | 15.0  | 0.075  |
| 5KP8.0A  | 8.89  | 9.83 | 5.0                        | 8.0                            | 150   | 368   | 13.6  | 0.075  |
| 5KP8.5   | 9.44  | 11.5 | 5.0                        | 8.5                            | 50  | 314   | 15.9  | 0.078  |
| 5KP8.5A  | 9.44  | 10.4 | 5.0                        | 8.5                            | 50  | 347   | 14.4  | 0.078  |
| 5KP9.0   | 10.0  | 12.2 | 5.0                        | 9.0                            | 20  | 296   | 16.9  | 0.081  |
| 5KP9.0A  | 10.0  | 11.1 | 5.0                        | 9.0                            | 20  | 325   | 15.4  | 0.081  |
| 5KP10  | 11.1  | 13.6 | 5.0                        | 10.0                           | 15  | 266   | 18.8  | 0.084  |
| 5KP10A   | 11.1  | 12.3 | 5.0                        | 10.0                           | 15  | 294   | 17.0  | 0.084  |
| 5KP11  | 12.2  | 14.9 | 5.0                        | 11.0                           | 10  | 249   | 20.1  | 0.086  |
| 5KP11A   | 12.2  | 13.5 | 5.0                        | 11.0                           | 10  | 275   | 18.2  | 0.086  |
| 5KP12  | 13.3  | 16.3 | 5.0                        | 12.0                           | 5.0   | 227   | 22.0  | 0.088  |
| 5KP12A   | 13.3  | 14.7 | 5.0                        | 12.0                           | 5.0   | 251   | 19.9  | 0.088  |
| 5KP13  | 14.4  | 17.6 | 5.0                        | 13.0                           | 2.0   | 210   | 23.8  | 0.090  |
| 5KP13A   | 14.4  | 15.9 | 5.0                        | 13.0                           | 2.0   | 233   | 21.5  | 0.090  |
| 5KP14  | 15.6  | 19.1 | 5.0                        | 14.0                           | 2.0   | 194   | 25.8  | 0.092  |
| 5KP14A   | 15.6  | 17.2 | 5.0                        | 14.0                           | 2.0   | 216   | 23.2  | 0.092  |
| 5KP15  | 16.7  | 20.4 | 5.0                        | 15.0                           | 2.0   | 186   | 26.9  | 0.094  |
| 5KP15A   | 16.7  | 18.5 | 5.0                        | 15.0                           | 2.0   | 205   | 24.4  | 0.094  |
| 5KP16  | 17.8  | 21.8 | 5.0                        | 16.0                           | 2.0   | 174   | 28.8  | 0.096  |
| 5KP16A   | 17.8  | 19.7 | 5.0                        | 16.0                           | 2.0   | 192   | 26.0  | 0.096  |
| 5KP17  | 18.9  | 23.1 | 5.0                        | 17.0                           | 2.0   | 164   | 30.5  | 0.097  |
| 5KP17A   | 18.9  | 20.9 | 5.0                        | 17.0                           | 2.0   | 181   | 27.6  | 0.097  |
| 5KP18  | 20.0  | 24.4 | 5.0                        | 18.0                           | 2.0   | 155   | 32.2  | 0.098  |
| 5KP18A   | 20.0  | 22.1 | 5.0                        | 18.0                           | 2.0   | 171   | 29.2  | 0.098  |
| 5KP20  | 22.2  | 27.1 | 5.0                        | 20.0                           | 2.0   | 140   | 35.8  | 0.099  |
| 5KP20A   | 22.2  | 24.5 | 5.0                        | 20.0                           | 2.0   | 154   | 32.4  | 0.099  |
| 5KP22  | 24.4  | 29.8 | 5.0                        | 22.0                           | 2.0   | 127   | 39.4  | 0.100  |
| 5KP22A   | 24.4  | 26.9 | 5.0                        | 22.0                           | 2.0   | 141   | 35.5  | 0.100  |
| 5KP24  | 26.7  | 32.6 | 5.0                        | 24.0                           | 2.0   | 116   | 43.0  | 0.101  |
| 5KP24A   | 26.7  | 29.5 | 5.0                        | 24.0                           | 2.0   | 129   | 38.9  | 0.101  |
| 5KP26  | 28.9  | 35.3 | 5.0                        | 26.0                           | 2.0   | 107   | 46.6  | 0.101  |
| 5KP26A   | 28.9  | 31.9 | 5.0                        | 26.0                           | 2.0   | 119   | 42.1  | 0.101  |
| 5KP26A   | 28.9  | 31.9 | 5.0                        | 26.0                           | 2.0   | 119   | 42.1  | 0.101  |
| 5KP28  | 31.1  | 38.0 | 5.0                        | 28.0                           | 2.0   | 100   | 50.1  | 0.102  |
| 5KP28A   | 31.1  | 34.4 | 5.0                        | 28.0                           | 2.0   | 110   | 45.4  | 0.102  |
| 5KP30  | 33.3  | 40.7 | 5.0                        | 30.0                           | 2.0   | 93.5  | 53.5  | 0.103  |
| 5KP30A   | 33.3  | 36.8 | 5.0                        | 30.0                           | 2.0   | 103   | 48.4  | 0.103  |
| 5KP33  | 36.7  | 44.9 | 5.0                        | 33.0                           | 2.0   | 84.7  | 59.0  | 0.104  |
| 5KP33A   | 36.7  | 40.6 | 5.0                        | 33.0                           | 2.0   | 93.8  | 53.3  | 0.104  |
| 5KP36  | 40.0  | 48.9 | 5.0                        | 36.0                           | 2.0   | 77.8  | 64.3  | 0.104  |
| 5KP36A   | 40.0  | 44.2 | 5.0                        | 36.0                           | 2.0   | 86.1  | 58.1  | 0.104  |



| <b>ELECTRICAL CHARACTERISTICS</b> ( $T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) |   |       |                            |                                |   |   |   |   |
|--|---|-------|----------------------------|--------------------------------|---|---|---|---|
| DEVICE TYPE  | BREAKDOWN VOLTAGE $V_{BR}$ (V) <sup>(1)</sup> |       | TEST CURRENT AT $I_T$ (mA) | STAND-OFF VOLTAGE $V_{WM}$ (V) | MAXIMUM REVERSE LEAKAGE AT $V_{WM}$ $I_D$ ( $\mu\text{A}$ ) | MAXIMUM PEAK PULSE CURRENT $I_{PPM}$ <sup>(2)</sup> (A) | MAXIMUM CLAMPING VOLTAGE AT $I_{PPM}$ $V_C$ (V) | MAXIMUM TEMPERATURE COEFFICIENT OF $V_{BR}$ ( $\%/\text{ }^\circ\text{C}$ ) |
|  | MIN.  | MAX.  |                            |                                |   |   |   |   |
| 5KP40  | 44.4  | 54.3  | 5.0                        | 40.0                           | 2.0   | 70.0  | 71.4  | 0.105   |
| 5KP40A   | 44.4  | 49.1  | 5.0                        | 40.0                           | 2.0   | 77.5  | 64.5  | 0.105   |
| 5KP43  | 47.8  | 58.4  | 5.0                        | 43.0                           | 2.0   | 65.2  | 76.7  | 0.105   |
| 5KP43A   | 47.8  | 52.8  | 5.0                        | 43.0                           | 2.0   | 72.0  | 69.4  | 0.105   |
| 5KP45  | 50.0  | 61.1  | 5.0                        | 45.0                           | 2.0   | 62.3  | 80.3  | 0.106   |
| 5KP45A   | 50.0  | 55.3  | 5.0                        | 45.0                           | 2.0   | 68.8  | 72.7  | 0.106   |
| 5KP48  | 53.3  | 65.2  | 5.0                        | 48.0                           | 2.0   | 58.5  | 85.5  | 0.106   |
| 5KP48A   | 53.3  | 58.9  | 5.0                        | 48.0                           | 2.0   | 64.6  | 77.4  | 0.106   |
| 5KP51  | 56.1  | 69.3  | 5.0                        | 51.0                           | 2.0   | 54.9  | 91.1  | 0.107   |
| 5KP51A   | 56.7  | 62.7  | 5.0                        | 51.0                           | 2.0   | 60.7  | 82.4  | 0.107   |
| 5KP54  | 60.0  | 73.3  | 5.0                        | 54.0                           | 2.0   | 51.9  | 96.3  | 0.107   |
| 5KP54A   | 60.0  | 66.3  | 5.0                        | 54.0                           | 2.0   | 57.4  | 87.1  | 0.107   |
| 5KP58  | 64.4  | 78.7  | 5.0                        | 58.0                           | 2.0   | 48.5  | 103   | 0.107   |
| 5KP58A   | 64.4  | 71.2  | 5.0                        | 58.0                           | 2.0   | 53.4  | 94  | 0.107   |
| 5KP60  | 66.7  | 81.5  | 5.0                        | 60.0                           | 2.0   | 46.7  | 107   | 0.108   |
| 5KP60A   | 66.7  | 73.7  | 5.0                        | 60.0                           | 2.0   | 51.7  | 97  | 0.108   |
| 5KP64  | 71.1  | 96.9  | 5.0                        | 64.0                           | 2.0   | 43.9  | 114   | 0.108   |
| 5KP64A   | 71.1  | 78.6  | 5.0                        | 64.0                           | 2.0   | 48.5  | 103   | 0.108   |
| 5KP70  | 77.6  | 95.1  | 5.0                        | 70.0                           | 2.0   | 40.0  | 125   | 0.108   |
| 5KP70A   | 77.8  | 86.0  | 5.0                        | 70.0                           | 2.0   | 44.2  | 113   | 0.108   |
| 5KP75  | 83.3  | 102   | 5.0                        | 75.0                           | 2.0   | 37.3  | 134   | 0.108   |
| 5KP75A   | 83.3  | 92.1  | 5.0                        | 75.0                           | 2.0   | 41.3  | 121   | 0.108   |
| 5KP78  | 86.7  | 106.0 | 5.0                        | 78.0                           | 2.0   | 36.0  | 139   | 0.108   |
| 5KP78A   | 86.7  | 95.8  | 5.0                        | 78.0                           | 2.0   | 39.7  | 126   | 0.108   |
| 5KP85  | 94.4  | 115   | 5.0                        | 85.0                           | 2.0   | 33.1  | 151   | 0.108   |
| 5KP85A   | 94.4  | 104   | 5.0                        | 85.0                           | 2.0   | 36.5  | 137   | 0.110   |
| 5KP90  | 100   | 122   | 5.0                        | 90.0                           | 2.0   | 31.3  | 160   | 0.110   |
| 5KP90A   | 100   | 111   | 5.0                        | 90.0                           | 2.0   | 34.2  | 146   | 0.110   |
| 5KP100   | 111   | 136   | 5.0                        | 100                            | 2.0   | 27.9  | 179   | 0.110   |
| 5KP100A  | 111   | 123   | 5.0                        | 100                            | 2.0   | 30.9  | 162   | 0.110   |
| 5KP110   | 122   | 149   | 5.0                        | 110                            | 2.0   | 25.5  | 196   | 0.112   |
| 5KP110A  | 122   | 135   | 5.0                        | 110                            | 2.0   | 28.2  | 177   | 0.112   |
| 5KP120   | 133   | 163   | 5.0                        | 120                            | 2.0   | 23.4  | 214   | 0.112   |
| 5KP120A  | 133   | 147   | 5.0                        | 120                            | 2.0   | 25.9  | 193   | 0.112   |
| 5KP130   | 144   | 176   | 5.0                        | 130                            | 2.0   | 21.6  | 230   | 0.112   |
| 5KP130A  | 144   | 159   | 5.0                        | 130                            | 2.0   | 23.9  | 209   | 0.112   |
| 5KP150   | 167   | 204   | 5.0                        | 150                            | 2.0   | 18.7  | 268   | 0.112   |
| 5KP150A  | 167   | 185   | 5.0                        | 150                            | 2.0   | 20.6  | 243   | 0.112   |
| 5KP160   | 178   | 218   | 5.0                        | 160                            | 2.0   | 17.4  | 287   | 0.112   |
| 5KP160A  | 178   | 197   | 5.0                        | 160                            | 2.0   | 19.3  | 259   | 0.112   |
| 5KP170   | 189   | 231   | 5.0                        | 170                            | 2.0   | 16.4  | 304   | 0.112   |
| 5KP170A  | 189   | 209   | 5.0                        | 170                            | 2.0   | 18.2  | 275   | 0.112   |
| 5KP188   | 209   | 255   | 5.0                        | 188                            | 2.0   | 14.5  | 344   | 0.112   |
| 5KP188A  | 209   | 231   | 5.0                        | 188                            | 2.0   | 15.2  | 328   | 0.112   |

**Notes:**

- (1) Pulse test:  $t_p \leq 50\text{ ms}$
- (2) Surge current waveform per Fig. 3 and derate per Fig. 2
- (3) All items 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                    |
| 5KP5.0A-E3/54                  | 2.776           | 54                     | 800           | 13" diameter paper tape and reel |
| 5KP5.0AHE3/54 <sup>(1)</sup>   | 2.776           | 54                     | 800           | 13" diameter paper tape and reel |

**Note:**

(1) Automotive grade AEC Q101 qualified

### RATINGS AND CHARACTERISTICS CURVES

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

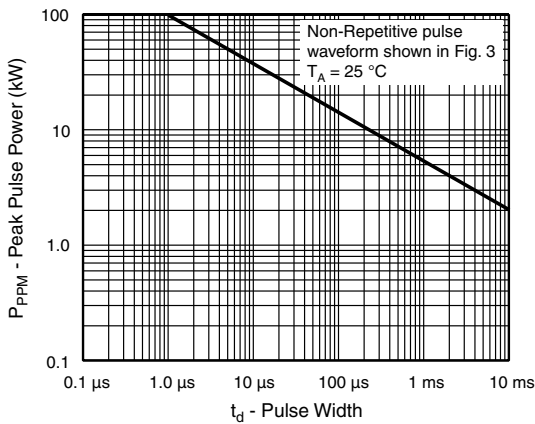


Figure 1. Peak Pulse Power Rating Curve

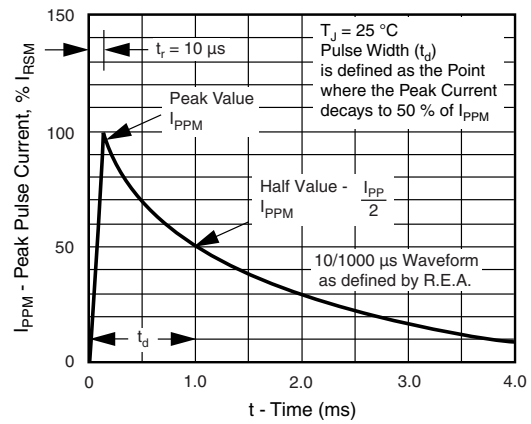


Figure 3. Pulse Waveform

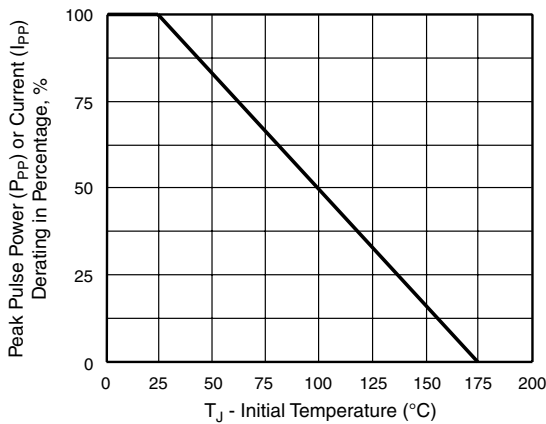


Figure 2. Pulse Power or Current vs. Initial Junction Temperature

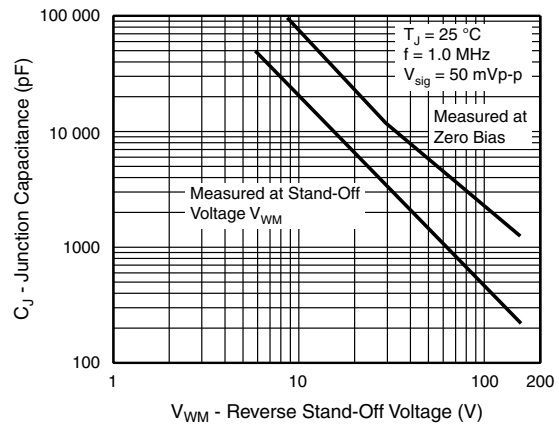


Figure 4. Typical Junction Capacitance

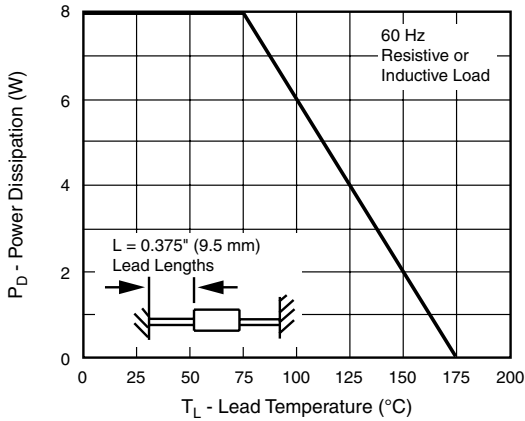


Figure 5. Power Derating Curve

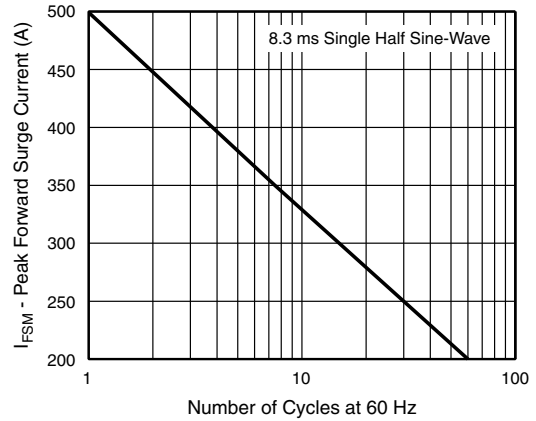
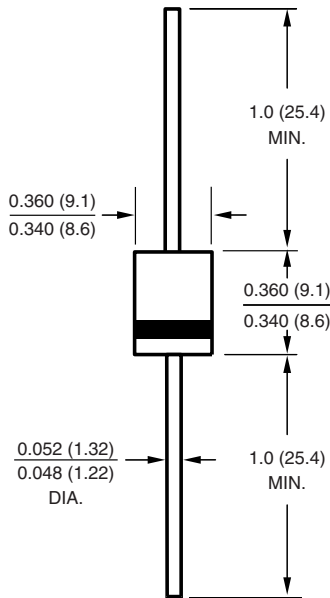


Figure 6. Maximum Non-repetitive Forward Surge Current

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

**Case Style P600**



**APPLICATION NOTE**

The 5KP series of high power transient voltage suppressors were designed to be used on the output of switching power supplies. These devices may be used to replace crowbar circuits. Both the 5 % and 10 % voltage tolerances are referenced to the power supply output voltage level.

They are able to withstand high levels of peak current while allowing a circuit breaker to trip or a fuse blow before shorting. This will enable the user to reset the breaker or replace the fuse and continue operation. For this type operation, it is recommended that a sufficient mounting surface be used for dissipating the heat generated by the Transient Voltage Suppressor during the transient or over-voltage condition.



## Disclaimer

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