

## TRANSZORB® Transient Voltage Suppressors



Case Style P600

### 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

### 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         |

### 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

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| DEVICE TYPE | BREAKDOWN VOLTAGE<br>$V_{BR}$<br>(V) <sup>(1)</sup> |      | TEST CURRENT<br>AT $I_T$<br>(mA) | STAND-OFF VOLTAGE<br>$V_{WM}$<br>(V) | MAXIMUM REVERSE LEAKAGE<br>AT $V_{WM}$<br>$I_D$ ( $\mu\text{A}$ ) | MAXIMUM PEAK PULSE CURRENT<br>$I_{PPM}^{(2)}$ (A) | MAXIMUM CLAMPING VOLTAGE AT<br>$I_{PPM}$<br>$V_C$ (V) | MAXIMUM TEMPERATURE COEFFICIENT OF $V_{BR}$<br>(%/°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                                                 |

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  unless otherwise noted)

| DEVICE TYPE | BREAKDOWN VOLTAGE<br>$V_{BR}$<br>(V) <sup>(1)</sup> |       | TEST CURRENT<br>AT $I_T$<br>(mA) | STAND-OFF VOLTAGE<br>$V_{WM}$<br>(V) | MAXIMUM REVERSE LEAKAGE<br>AT $V_{WM}$<br>$I_D$ ( $\mu\text{A}$ ) | MAXIMUM PEAK PULSE CURRENT<br>$I_{PPM}$ <sup>(2)</sup> (A) | MAXIMUM CLAMPING VOLTAGE AT<br>$I_{PPM}$<br>$V_C$ (V) | MAXIMUM TEMPERATURE COEFFICIENT<br>OF $V_{BR}$<br>(%/°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:  $t_p \leq 50$  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

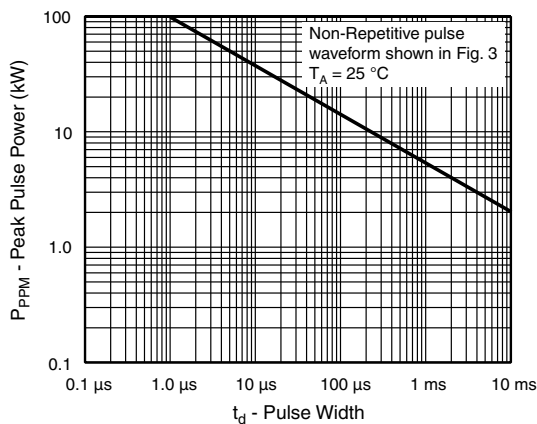
**RATINGS AND CHARACTERISTICS CURVES**(T<sub>A</sub> = 25 °C unless otherwise noted)

Figure 1. Peak Pulse Power Rating Curve

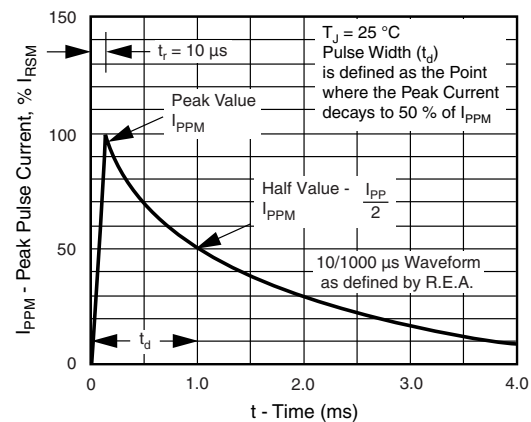


Figure 3. Pulse Waveform

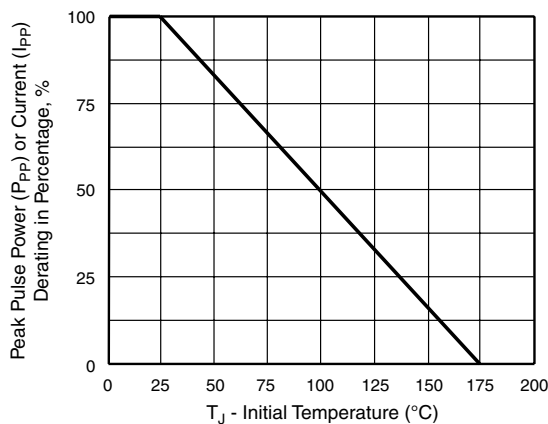


Figure 2. Pulse Power or Current vs. Initial Junction Temperature

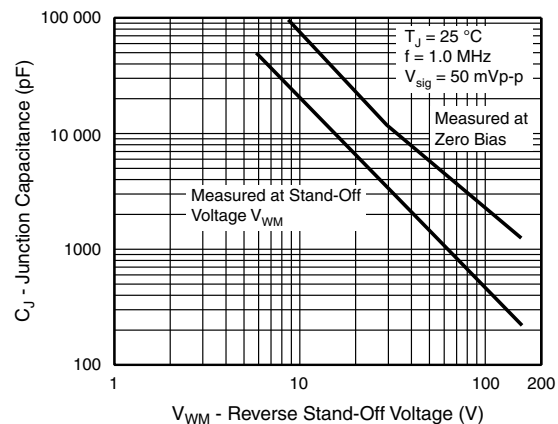


Figure 4. Typical Junction Capacitance

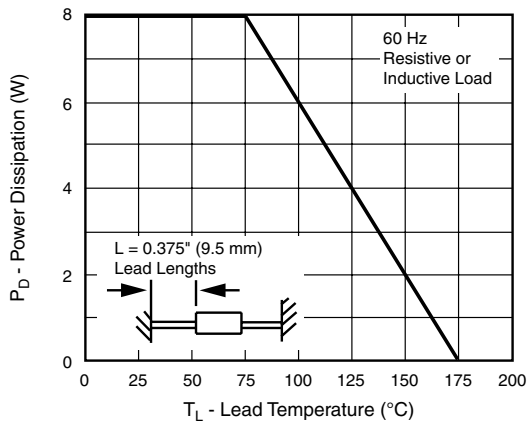


Figure 5. Power Derating Curve

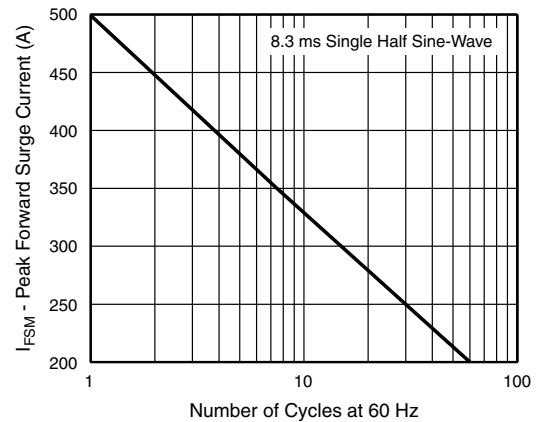
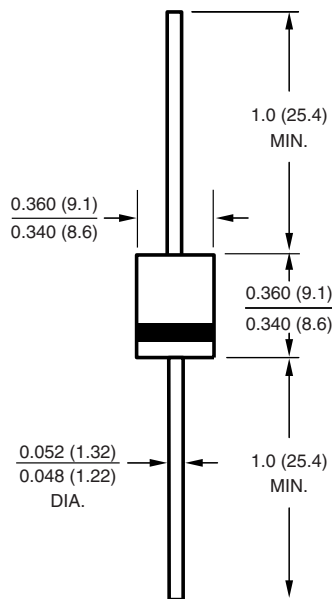


Figure 6. Maximum Non-repetitive Forward Surge Current

### 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

ALL PRODUCT, PRODUCT SPECIFICATIONS AND DATA ARE SUBJECT TO CHANGE WITHOUT NOTICE TO IMPROVE RELIABILITY, FUNCTION OR DESIGN OR OTHERWISE.

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## Material Category Policy

**Vishay Intertechnology, Inc. hereby certifies that all its products that are identified as RoHS-Compliant fulfill the definitions and restrictions defined under Directive 2011/65/EU of The European Parliament and of the Council of June 8, 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (EEE) - recast, unless otherwise specified as non-compliant.**

**Please note that some Vishay documentation may still make reference to RoHS Directive 2002/95/EC. We confirm that all the products identified as being compliant to Directive 2002/95/EC conform to Directive 2011/65/EU.**