

TRANSZORB® Transient Voltage Suppressors



Case Style P600

| MAJOR RATINGS AND 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 Unidirectional polarity only
- 5000 W peak pulse power capability with a 10/1000 μ s waveform, repetitive rate (duty cycle): 0.01 %
- Excellent clamping capability
- Very fast response time
- Low incremental surge resistance
- Typical I_D less than 1 μ A $V_{(BR)}$ above 10 V rating
- Solder Dip 260 °C, 40 seconds
- Component in accordance to RoHS 2002/95/EC and WEEE 2002/96/EC



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

Epoxy meets UL 94V-0 flammability rating

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

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

Polarity: Color band denotes cathode end

| MAXIMUM RATINGS ($T_A = 25$ °C unless otherwise noted) | | | |
|---|----------------|----------------|------|
| PARAMETER | SYMBOL | VALUE | UNIT |
| Peak pulse power dissipation with a 10/1000 μ s waveform ⁽¹⁾ | P_{PPM} | 5000 | W |
| Peak pulse current with a 10/1000 μ s waveform ⁽¹⁾ | 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 ⁽²⁾ | V_F | 3.5 | V |
| Operating junction and storage temperature range | T_J, T_{STG} | - 55 to + 175 | °C |

Note:

(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

5KP5.0 thru 5KP188A

Vishay General Semiconductor



| ELECTRICAL CHARACTERISTICS ($T_A = 25\text{ }^\circ\text{C}$ unless otherwise noted) | | | | | | | | |
|--|---|------|----------------------------|--------------------------------|---|---|---|--|
| DEVICE TYPE | BREAKDOWN VOLTAGE $V_{(BR)}$ (V) ⁽¹⁾ | | TEST CURRENT AT I_T (mA) | STAND-OFF VOLTAGE V_{WM} (V) | MAXIMUM REVERSE LEAKAGE AT V_{WM} I_D (μA) | MAXIMUM PEAK PULSE CURRENT I_{PPM} ⁽²⁾ (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 |



| ELECTRICAL CHARACTERISTICS (T _A = 25 °C unless otherwise noted) | | | | | | | | |
|--|--|-------|-------------------------------------|---------------------------------------|--|--|---|---|
| DEVICE TYPE | BREAKDOWN VOLTAGE V _(BR) (V) ⁽¹⁾ | | TEST CURRENT AT I _T (mA) | STAND-OFF VOLTAGE V _{WM} (V) | MAXIMUM REVERSE LEAKAGE AT V _{WM} I _D (µA) | MAXIMUM PEAK PULSE CURRENT I _{PPM} ⁽²⁾ (A) | MAXIMUM CLAMPING VOLTAGE AT I _{PPM} V _C (V) | MAXIMUM TEMPERATURE COEFFICIENT OF V _(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 | TBD |
| 5KP120A | 133 | 147 | 5.0 | 120 | 2.0 | 25.9 | 193 | TBD |
| 5KP130 | 144 | 176 | 5.0 | 130 | 2.0 | 21.6 | 230 | TBD |
| 5KP130A | 144 | 159 | 5.0 | 130 | 2.0 | 23.9 | 209 | TBD |
| 5KP150 | 167 | 204 | 5.0 | 150 | 2.0 | 18.7 | 268 | TBD |
| 5KP150A | 167 | 185 | 5.0 | 150 | 2.0 | 20.6 | 243 | TBD |
| 5KP160 | 178 | 218 | 5.0 | 160 | 2.0 | 17.4 | 287 | TBD |
| 5KP160A | 178 | 197 | 5.0 | 160 | 2.0 | 19.3 | 259 | TBD |
| 5KP170 | 189 | 231 | 5.0 | 170 | 2.0 | 16.4 | 304 | TBD |
| 5KP170A | 189 | 209 | 5.0 | 170 | 2.0 | 18.2 | 275 | TBD |
| 5KP188 | 209 | 255 | 5.0 | 188 | 2.0 | 14.5 | 344 | TBD |
| 5KP188A | 209 | 231 | 5.0 | 188 | 2.0 | 15.2 | 328 | TBD |

Note:

- (1) Pulse test: t_p ≤ 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 | | | | |
|----------------------|-----------------|------------------------|---------------|--------------------------------|
| 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 & Reel |

RATINGS AND CHARACTERISTICS CURVES

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

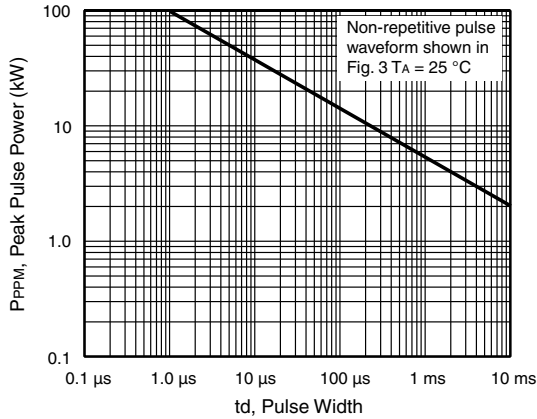


Figure 1. Peak Pulse Power Rating Curve

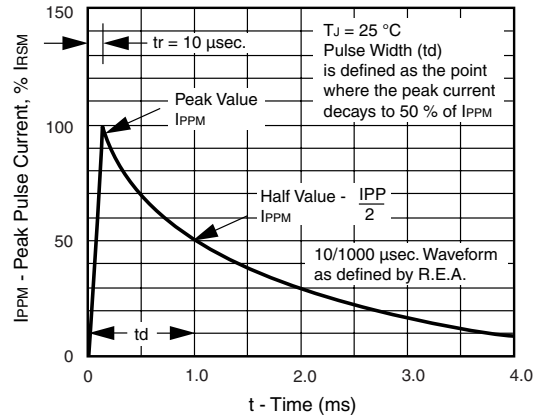


Figure 3. Pulse Waveform

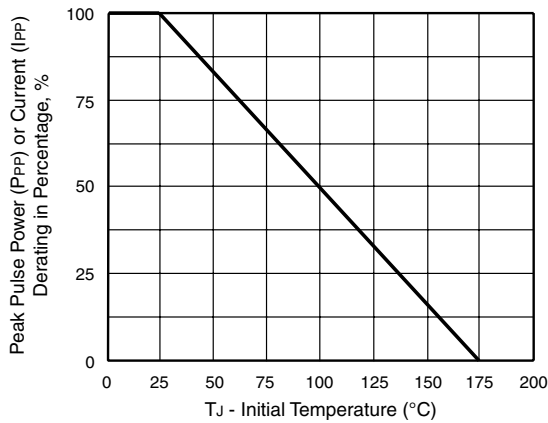


Figure 2. Pulse Power or Current vs. Initial Junction Temperature

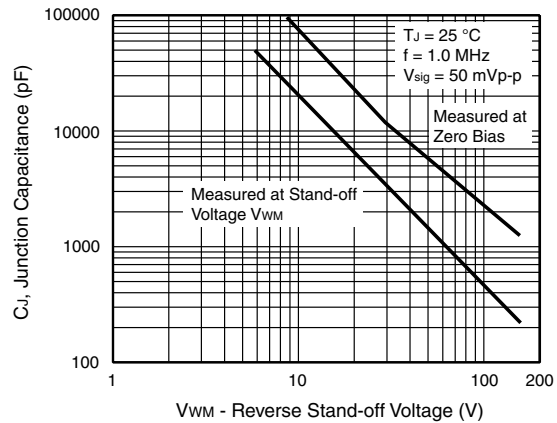


Figure 4. Typical Junction Capacitance

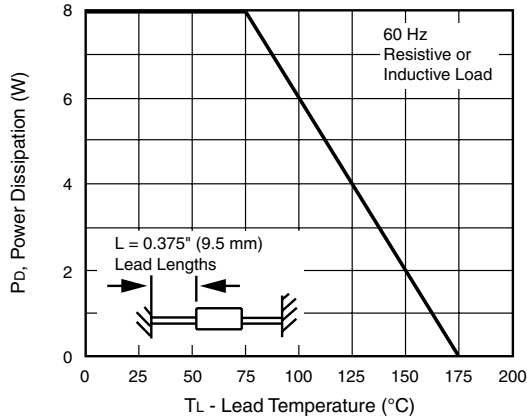


Figure 5. Power Derating Curve

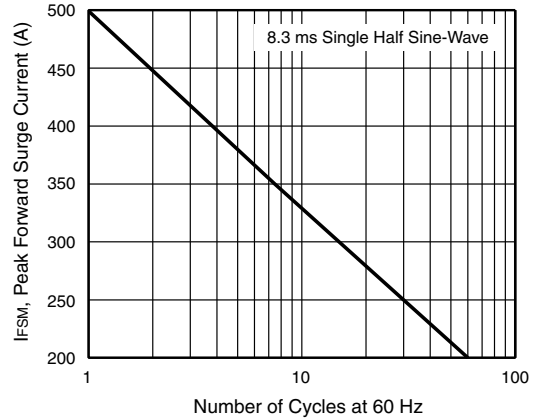
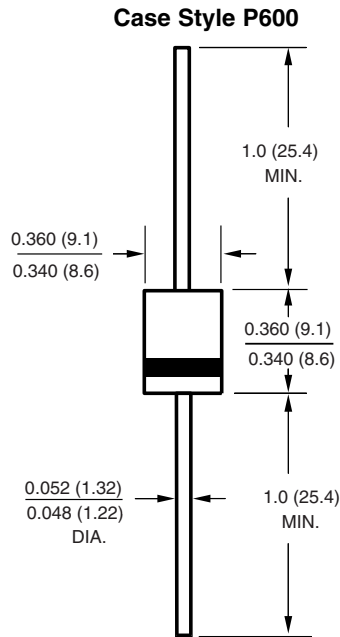


Figure 6. Maximum Non-repetitive Forward Surge Current

PACKAGE OUTLINE DIMENSIONS in inches (millimeters)



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 percent 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.



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