



5,000 Watt Transient Voltage Suppressor (TVS) Protection Device

Screening in reference to MIL-PRF-19500 available

DESCRIPTION

This Transient Voltage Suppressor series M5KP5.0A – M5KP110CA provides a range of standoff voltage options from 5.0 to 110 V in unidirectional, bidirectional, RoHS compliant, and SnPb solder dipped options. Multiple advanced screening levels are available for enhanced reliability. Clamping action is almost instantaneous. As a result, they provide effective protection from ESD or EFT per IEC61000-4-2 and IEC61000-4-4, as well as transients caused by inductive switching and RFI. They also protect from secondary lightning effects per 61000-4-5 at the class levels specified below.

Important: For the latest information, visit our website <http://www.microsemi.com>.

FEATURES

- Available in both unidirectional and bidirectional configurations
- 3 σ lot norm screening performed on standby current I_D
- 100% surge tested devices
- Various screening in reference to MIL-PRF-19500. Refer to [HiRel Non-Hermetic Product Portfolio](#) for more details on the screening options (See [part nomenclature](#) for all options.)
- High reliability controlled devices with wafer fabrication and assembly lot traceability
- Moisture classification is level 1 with no dry pack required per IPC/JEDEC J-STD-020B
- RoHS compliant versions are available

APPLICATIONS / BENEFITS

- Selections for 5.0 to 110 volts stand-off voltage (V_{WM})
- Economical TVS series for thru-hole mounting
- This M5KPxxx series has a significantly reduced body diameter than the 5KPxxx commercial series for a smaller size footprint often required for aviation and other applications
- Pico- to nano-second response time
- Protection from transients due to inductive switching and RFI
- Compliant to IEC 61000-4-2 and IEC 61000-4-4 for ESD and EFT protection respectively
- Secondary lightning protection per IEC61000-4-5 with 42 ohms source impedance:
 - Class 1, 2, 3, 4: M5KP5.0A to M5KP110CA
 - Class 5: M5KP5.0A to M5KP110CA (short distance)
 - Class 5: M5KP5.0A to M5KP36CA (long distance)
- Secondary lightning protection per IEC61000-4-5 with 12 ohms source impedance:
 - Class 1 & 2: M5KP5.0A to M5KP110CA
 - Class 3: M5KP5.0A to M5KP78CA
 - Class 4: M5KP5.0A to M5KP40CA
- Secondary lightning protection per IEC61000-4-5 with 2 ohms source impedance:
 - Class 2: M5KP5.0A to M5KP70CA
 - Class 3: M5KP5.0A to M5KP36CA
 - Class 4: M5KP5.0A to M5KP18CA




Case 5A (DO-204AR) Package

Also available in:

P600 package
(commercial plastic axial-leaded)

 [5KP5.0e3 – 5KP250CAe3](#)

DO-13 package
(metal axial-leaded)

 [LC6.5A – LC170A](#)

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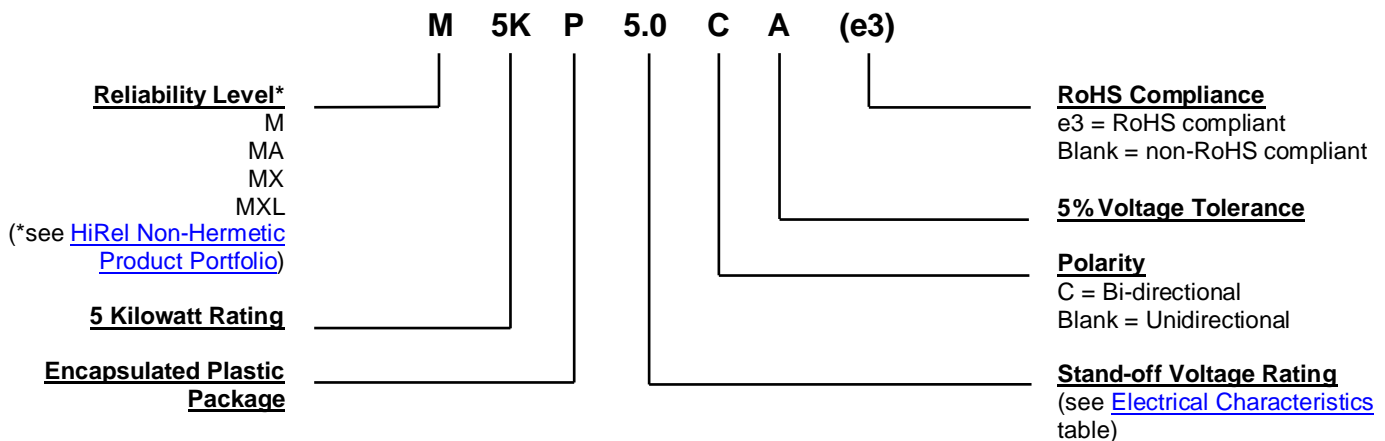
MAXIMUM RATINGS @ 25 °C unless otherwise noted

| Parameters/Test Conditions | Symbol | Value | Unit |
|--|-------------------------------------|--------------------------|----------|
| Junction and Storage Temperature | T _J and T _{STG} | -65 to +150 | °C |
| Thermal Resistance, Junction to Lead @ 0.375 inch (9.5 mm) lead length from body | R _{θJL} | 20 | °C/W |
| Thermal Resistance, Junction to Ambient ⁽¹⁾ | R _{θJA} | 80 | °C/W |
| Peak Pulse Power Dissipation ⁽²⁾ 10/1000 μs | P _{PP} | 5000 | W |
| Steady-State Power Dissipation @ T _L = 25 °C 0.375 inch (9.5 mm) from body | P _D | 6 1.56 ⁽¹⁾ | W |
| T _{clamping} (0 volts to V _(BR) min, theoretical) | Unidirectional Bidirectional | < 100 < 5 | ps ns |
| Forward Voltage ⁽³⁾ | V _F | 3.5 | V |
| Solder Temperature @ 10 s | | 260 | °C |

- Notes:**
- When mounted on FR4 PC board with 4 mm² copper pads (1 oz) and track width 1 mm, length 25 mm.
 - With impulse repetition rate (duty factor) of 0.01 % or less (also [Figure 1 and 2](#)).
 - At 100 amp peak impulse of 8.3 ms half-sine wave (unidirectional only).

MECHANICAL and PACKAGING

- CASE: Void-free transfer molded thermosetting epoxy body meeting UL94V-0
- TERMINALS: Tin-lead or RoHS compliant annealed matte-tin plating. Solderable per MIL-STD-750, method 2026.
- MARKING: Part number
- POLARITY: Cathode indicated by band. No cathode band on bidirectional devices.
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number). Consult factory for quantities.
- WEIGHT: Approximately 1.4 grams
- See [Package Dimensions](#) on last page.

PART NOMENCLATURE


| SYMBOLS & DEFINITIONS | |
|-----------------------|---|
| Symbol | Definition |
| $\alpha_{V(BR)}$ | Temperature Coefficient of Breakdown Voltage: The change in breakdown voltage divided by the change in temperature that caused it expressed in %/°C or mV/°C. |
| V_{WM} | Working Standoff Voltage: The maximum-rated value of dc or repetitive peak positive cathode-to-anode voltage that may be continuously applied over the standard operating temperature. |
| P_{PP} | Peak Pulse Power. The rated random recurring peak impulse power or rated nonrepetitive peak impulse power. The impulse power is the maximum-rated value of the product of I_{PP} and V_C . |
| $V_{(BR)}$ | Breakdown Voltage: The voltage across the device at a specified current $I_{(BR)}$ in the breakdown region. |
| I_D | Standby Current: The current through the device at rated stand-off voltage. |
| I_{PP} | Peak Impulse Current: The maximum rated random recurring peak impulse current or nonrepetitive peak impulse current that may be applied to a device. A random recurring or nonrepetitive transient current is usually due to an external cause, and it is assumed that its effect will have completely disappeared before the next transient arrives. |
| V_C | Clamping Voltage: The voltage across the device in a region of low differential resistance during the application of an impulse current (I_{PP}) for a specified waveform. |
| $I_{(BR)}$ | Breakdown Current: The current used for measuring Breakdown Voltage $V_{(BR)}$. |

ELECTRICAL CHARACTERISTICS @ 25 °C

| PART NUMBER (Note 2) | REVERSE STAND- OFF VOLTAGE V_{WM} (Note 1) | BREAKDOWN VOLTAGE $V_{(BR)}$ @ $I_{(BR)}$ | | MAXIMUM CLAMPING VOLTAGE V_C @ I_{PP} | MAXIMUM STANDBY CURRENT I_D @ V_{WM} | MAXIMUM PEAK PULSE CURRENT I_{PP} (FIG. 2) | MAXIMUM TEMPERATURE COEFFICIENT OF $V_{(BR)}$ $\alpha_{V(BR)}$ |
|-------------------------|---|---|----|--|---|--|--|
| | V | V | mA | V | μ A | A | mV/°C |
| M5KP5.0A | 5.0 | 6.40 – 7.00 | 50 | 9.2 | 2000* | 543 | 4.0 |
| M5KP6.0A | 6.0 | 6.67 – 7.37 | 50 | 10.3 | 5000 | 485 | 4.0 |
| M5KP6.5A | 6.5 | 7.22 – 7.98 | 50 | 11.2 | 2000 | 447 | 4.0 |
| M5KP7.0A | 7.0 | 7.78 – 8.60 | 50 | 12.0 | 1000 | 417 | 5.0 |
| M5KP7.5A | 7.5 | 8.33 – 9.21 | 5 | 12.9 | 250 | 388 | 6.0 |
| M5KP8.0A | 8.0 | 8.89 – 9.83 | 5 | 13.6 | 150 | 367 | 6.0 |
| M5KP8.5A | 8.5 | 9.44 – 10.4 | 5 | 14.4 | 50 | 347 | 7.0 |
| M5KP9.0A | 9.0 | 10.0 – 11.1 | 5 | 15.4 | 20 | 325 | 8.0 |
| M5KP10A | 10 | 11.1 – 12.3 | 5 | 17.0 | 15 | 294 | 9.0 |
| M5KP11A | 11 | 12.2 – 13.5 | 5 | 18.2 | 10 | 274 | 10 |
| M5KP12A | 12 | 13.3 – 14.7 | 5 | 19.9 | 10 | 251 | 11 |
| M5KP13A | 13 | 14.4 – 15.9 | 5 | 21.5 | 10 | 232 | 12 |
| M5KP14A | 14 | 15.6 – 17.2 | 5 | 23.2 | 10 | 215 | 13 |
| M5KP15A | 15 | 16.7 – 18.5 | 5 | 24.4 | 10 | 206 | 15 |
| M5KP16A | 16 | 17.8 – 19.7 | 5 | 26.0 | 10 | 192 | 16 |
| M5KP17A | 17 | 18.9 – 20.9 | 5 | 27.6 | 10 | 181 | 18 |
| M5KP18A | 18 | 20.0 – 22.1 | 5 | 29.2 | 10 | 172 | 19 |
| M5KP20A | 20 | 22.2 – 24.5 | 5 | 32.4 | 10 | 154 | 22 |
| M5KP22A | 22 | 24.4 – 26.9 | 5 | 35.5 | 10 | 141 | 24 |
| M5KP24A | 24 | 26.7 – 29.5 | 5 | 38.9 | 10 | 128 | 27 |
| M5KP26A | 26 | 28.9 – 31.9 | 5 | 42.1 | 10 | 119 | 29 |
| M5KP28A | 28 | 31.1 – 34.4 | 5 | 45.5 | 10 | 110 | 30 |
| M5KP30A | 30 | 33.3 – 36.8 | 5 | 48.4 | 10 | 103 | 35 |
| M5KP33A | 33 | 36.7 – 40.6 | 5 | 53.3 | 10 | 94 | 38 |
| M5KP36A | 36 | 40.0 – 44.2 | 5 | 58.1 | 10 | 86 | 40 |
| M5KP40A | 40 | 44.4 – 49.1 | 5 | 64.5 | 10 | 78 | 45 |
| M5KP43A | 43 | 47.8 – 52.8 | 5 | 69.4 | 10 | 72 | 49 |
| M5KP45A | 45 | 50.0 – 55.3 | 5 | 72.7 | 10 | 69 | 51 |
| M5KP48A | 48 | 53.3 – 58.9 | 5 | 77.4 | 10 | 65 | 55 |
| M5KP51A | 51 | 56.7 – 62.7 | 5 | 82.4 | 10 | 61 | 60 |
| M5KP54A | 54 | 60.0 – 66.3 | 5 | 87.1 | 10 | 57 | 64 |
| M5KP58A | 58 | 64.4 – 71.2 | 5 | 93.6 | 10 | 53 | 69 |
| M5KP60A | 60 | 66.7 – 73.7 | 5 | 96.8 | 10 | 52 | 70 |
| M5KP64A | 64 | 71.1 – 78.6 | 5 | 103.0 | 10 | 49 | 75 |
| M5KP70A | 70 | 77.8 – 86.0 | 5 | 113 | 10 | 44 | 84 |
| M5KP75A | 75 | 83.3 – 92.1 | 5 | 121 | 10 | 41 | 90 |
| M5KP78A | 78 | 86.7 – 95.8 | 5 | 126 | 10 | 40 | 94 |
| M5KP85A | 85 | 94.4 – 104.0 | 5 | 137 | 10 | 36 | 102 |
| M5KP90A | 90 | 100 – 111 | 5 | 146 | 10 | 34 | 109 |
| M5KP100A | 100 | 111 – 123 | 5 | 162 | 10 | 31 | 122 |
| M5KP110A | 110 | 122 - 135 | 5 | 177 | 10 | 28 | 132 |

NOTES:

1. Transient voltage suppressors are normally selected with reverse “stand-off voltage” (V_{WM}) which should be equal to or greater than the dc or continuous peak operating voltage level.
2. For the bidirectional M5KP5.0CA double the I_D maximum standby current to 4000 μ A .

GRAPHS

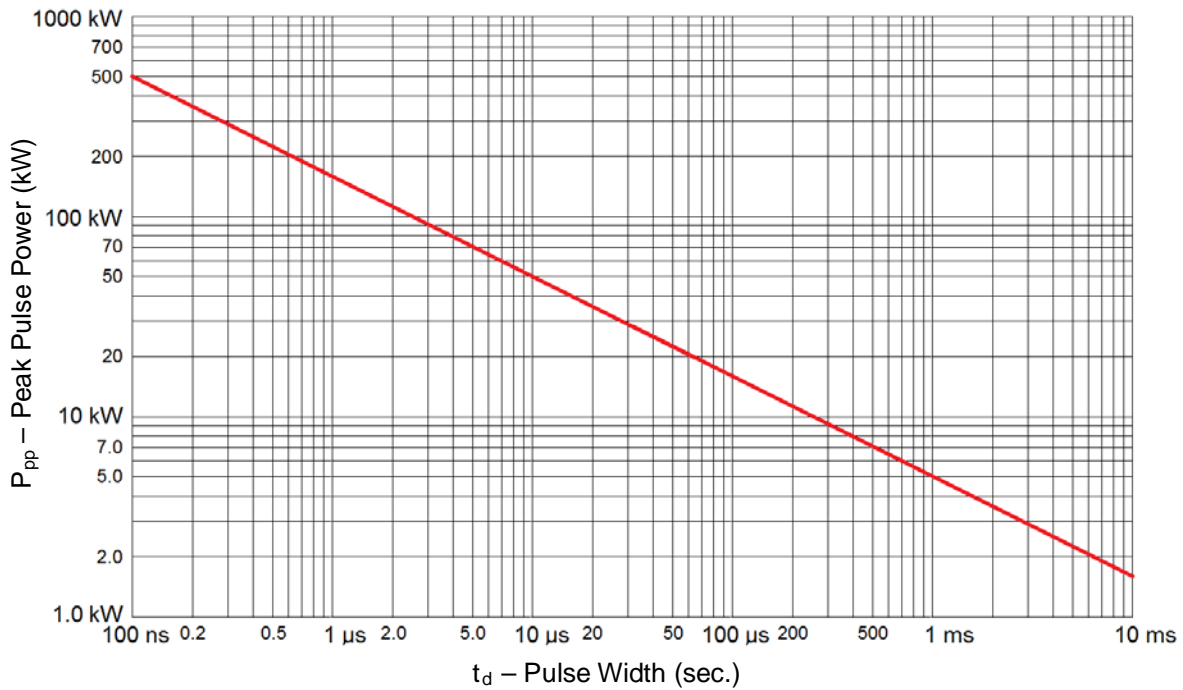


FIGURE 1
Peak Pulse Power Rating Curve

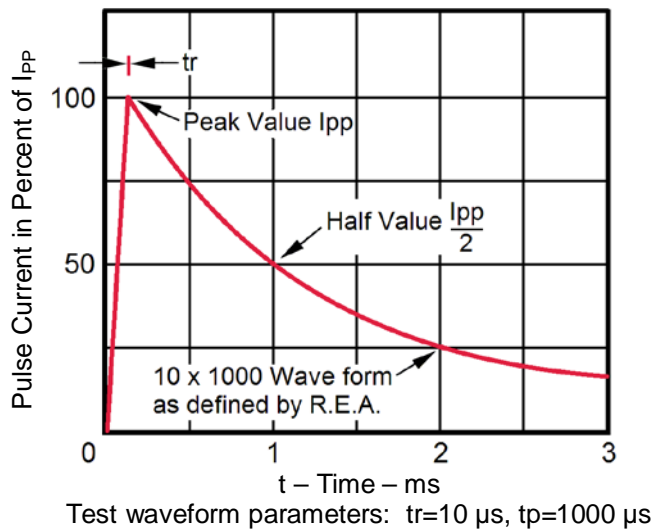


FIGURE 2
Pulse Waveform for 10/1000 μ s Exponential Surge

GRAPHS (continued)

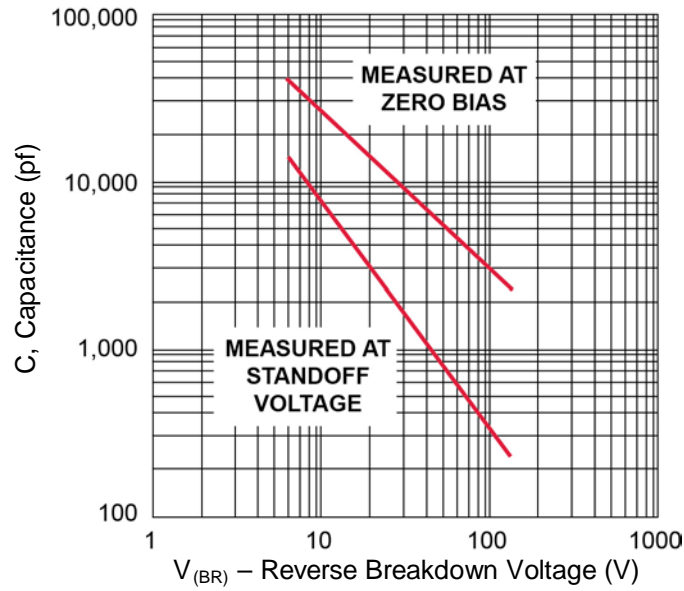
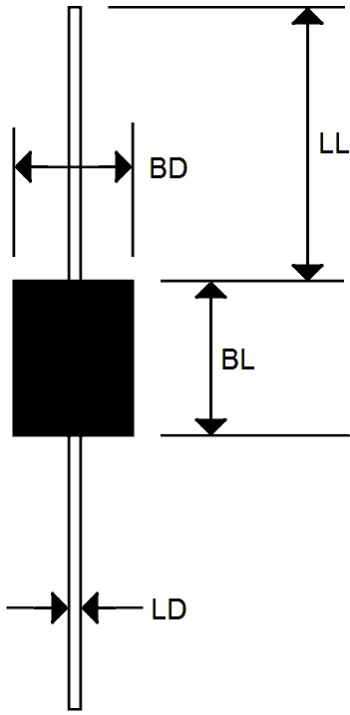


FIGURE 3
Typical Junction Capacitance

PACKAGE DIMENSIONS


| Dim | Dimensions | | | |
|-----|------------|-------|-------------|-------|
| | Inch | | Millimeters | |
| | Min | Max | Min | Max |
| LL | 0.750 | - | 19.05 | - |
| BL | 0.365 | 0.385 | 9.27 | 9.78 |
| BD | 0.235 | 0.255 | 5.97 | 6.48 |
| LD | 0.047 | 0.053 | 1.194 | 1.346 |