



## 15,000 Watt Transient Voltage Suppressor (TVS) Protection Device

Screening in  
reference to  
MIL-PRF-19500  
available

### DESCRIPTION

This Transient Voltage Suppressor series of M15KP22A – M15KP280CA offers an extended voltage range and also provides a variety of high reliability, uni- and bi-directional options as well. RoHS compliant versions are also available. These devices have the ability to clamp dangerous high voltage transients such as secondary effects of lightning strikes, providing circuit protection to several class levels in the IEC61000-4-5 specification. Clamping time is virtually instantaneous. It also provides protection from transients caused by inductive load dumps, RFI, and ESD, providing protection to IEC61000-4-2 and -4-4.

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

### FEATURES

- Available in both unidirectional and bidirectional configurations
- 3 $\sigma$  lot norm screening performed on standby current  $I_D$
- 100% surge tested devices
- Suppresses transients up to 15 kW @ 10/1000  $\mu$ s and 100 kW @ 8/20  $\mu$ s (see [Figure 1](#))
- Various screenings in reference to MIL-PRF-19500 are available. Refer to [Hirel Non-Hermetic Product Portfolio](#) for more details on the screening options.  
(See [part nomenclature](#) for all options.)
- High reliability controlled devices have 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 from 22 to 280 volts stand-off voltage ( $V_{WM}$ )
- Economical TVS series for thru-hole mounting
- Protection from switching transients & induced RFI
- Fast sub-nanosecond response (unidirectional)
- 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: M15KP22A to M15KP280CA
  - Class 5: M15KP22A to M15KP280CA (short distance)
  - Class 5: 1M5KP22A to M15KP110CA (long distance)
- Secondary lightning protection per IEC61000-4-5 with 12 ohms source impedance:
  - Class 1 & 2: M15KP22A to M15KP280CA
  - Class 3: M15KP22A to M15KP240CA
  - Class 4: M15KP22A to M15KP120CA
- Secondary lightning protection per IEC61000-4-5 with 2 ohms source impedance:
  - Class 2: M15KP22A to M15KP220CA
  - Class 3: M15KP22A to M15KP110CA
  - Class 4: M15KP22A to M15KP54CA



**DO-204AR  
Package**

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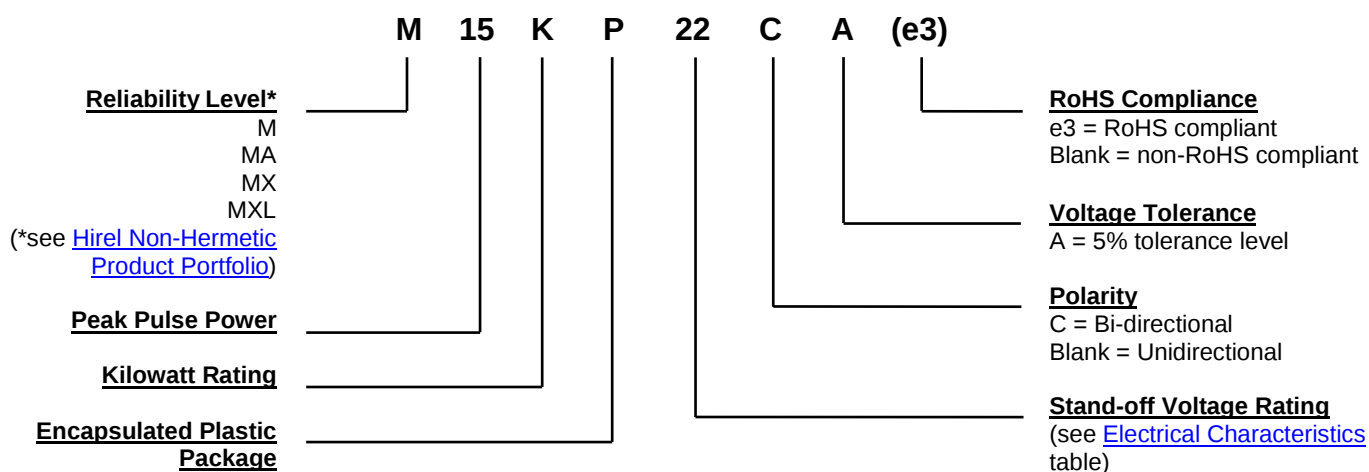
**MAXIMUM RATINGS @ 25 °C unless otherwise noted**

| Parameters/Test Conditions                                                              | Symbol              | Value                    | Unit     |
|-----------------------------------------------------------------------------------------|---------------------|--------------------------|----------|
| Junction and Storage Temperature                                                        | $T_J$ and $T_{STG}$ | -65 to +150              | °C       |
| Thermal Resistance, Junction to Lead @ 3/8 inch (10 mm) lead length from body           | $R_{\theta JL}$     | 20                       | °C/W     |
| Thermal Resistance, Junction to Ambient <sup>(1)</sup>                                  | $R_{\theta JA}$     | 80                       | °C/W     |
| Peak Pulse Power Dissipation <sup>(2)</sup> 10/1000us                                   | $P_{PP}$            | 15,000                   | W        |
| Steady-State Power Dissipation @ $T_L = 30$ °C 3/8 inch (10 mm) from body               | $P_D$               | 6<br>1.56 <sup>(1)</sup> | W        |
| $T_{clamping}$ (0 volts to $V_{(BR)}$ min, theoretical) Unidirectional<br>Bidirectional |                     | < 100<br>< 5             | ps<br>ns |
| Surge Peak Forward Current <sup>(3)</sup>                                               | $I_{FSM}$           | 200                      | A        |
| Solder Temperature @ 10 s                                                               |                     | 260                      | °C       |

- Notes:**
1. When mounted on FR4 PC board with 4 mm<sup>2</sup> copper pads (1 oz) and track width 1 mm, length 25 mm.
  2. With impulse repetition rate (duty factor) of 0.01 % or less (also [Figures 1 and 2](#)).
  3. At 8.3 ms half-sine wave for unidirectional devices 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 $\%/^{\circ}\text{C}$ or $\text{mV}/^{\circ}\text{C}$ .                                                                                                                                                |
| $I_{(BR)}$            | Breakdown Current: The current used for measuring Breakdown Voltage $V_{(BR)}$ .                                                                                                                                                                                                                                                                      |
| $I_D$                 | Standby Current: The current through the device at rated stand-off voltage.                                                                                                                                                                                                                                                                           |
| $I_{FSM}$             | Surge Peak Forward Current: The forward current including all nonrepetitive transient currents but excluding all repetitive transients (ref JESD282-B).                                                                                                                                                                                               |
| $I_{PP}$              | 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. |
| $P_{PP}$              | 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.                                                                                                                                                                                                                                           |
| $V_C$                 | 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.                                                                                                                                                                        |
| $V_{WM}$              | 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.                                                                                                                                                                |

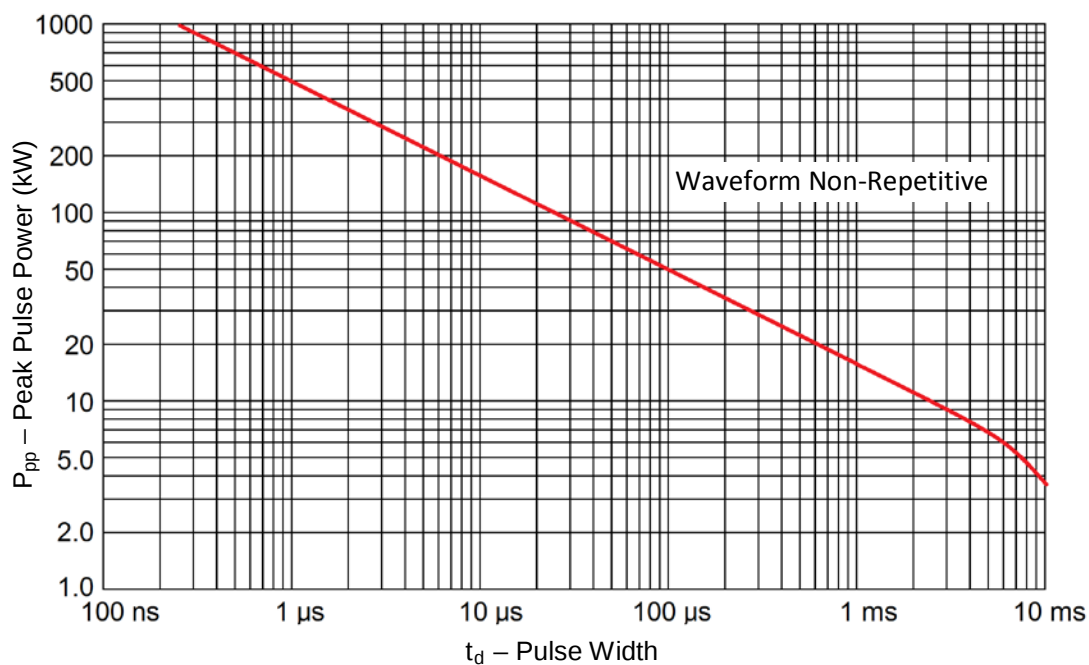
**ELECTRICAL CHARACTERISTICS @ 25 °C**

| PART NUMBER | REVERSE<br>STAND-<br>OFF<br>VOLTAGE<br>$V_{WM}$<br>(Note 1) | BREAKDOWN<br>VOLTAGE<br>$V_{(BR)}$ @ $I_{(BR)}$ |    | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>$V_C$ @ $I_{PP}$ | MAXIMUM<br>STANDBY<br>CURRENT<br>$I_D$ @ $V_{WM}$ | MAXIMUM<br>PEAK PULSE<br>CURRENT<br>$I_{PP}$<br>(FIG. 2) | MAXIMUM<br>TEMPERATURE<br>COEFFICIENT OF<br>$V_{(BR)}$<br>$\alpha_{V(BR)}$ |
|-------------|-------------------------------------------------------------|-------------------------------------------------|----|----------------------------------------------------|---------------------------------------------------|----------------------------------------------------------|----------------------------------------------------------------------------|
|             | V                                                           | V                                               | mA | V                                                  | $\mu A$                                           | A                                                        | mV/°C                                                                      |
| M15KP22A    | 22                                                          | 24.4                                            | 10 | 37.1                                               | 500                                               | 404                                                      | 24                                                                         |
| M15KP24A    | 24                                                          | 26.7                                            | 5  | 40.7                                               | 150                                               | 369                                                      | 27                                                                         |
| M15KP26A    | 26                                                          | 28.9                                            | 5  | 44.0                                               | 50                                                | 341                                                      | 29                                                                         |
| M15KP28A    | 28                                                          | 31.1                                            | 5  | 47.5                                               | 25                                                | 316                                                      | 31                                                                         |
| M15KP30A    | 30                                                          | 33.3                                            | 5  | 50.7                                               | 15                                                | 296                                                      | 34                                                                         |
| M15KP33A    | 33                                                          | 36.7                                            | 5  | 54.8                                               | 10                                                | 274                                                      | 38                                                                         |
| M15KP36A    | 36                                                          | 40.0                                            | 5  | 59.7                                               | 10                                                | 251                                                      | 41                                                                         |
| M15KP40A    | 40                                                          | 44.4                                            | 5  | 65.8                                               | 10                                                | 228                                                      | 46                                                                         |
| M15KP43A    | 43                                                          | 47.8                                            | 5  | 69.7                                               | 10                                                | 215                                                      | 50                                                                         |
| M15KP45A    | 45                                                          | 50.0                                            | 5  | 73.0                                               | 10                                                | 205                                                      | 52                                                                         |
| M15KP48A    | 48                                                          | 53.3                                            | 5  | 77.7                                               | 10                                                | 193                                                      | 56                                                                         |
| M15KP51A    | 51                                                          | 56.7                                            | 5  | 82.8                                               | 10                                                | 181                                                      | 60                                                                         |
| M15KP54A    | 54                                                          | 60.0                                            | 5  | 87.5                                               | 10                                                | 171                                                      | 63                                                                         |
| M15KP58A    | 58                                                          | 64.4                                            | 5  | 94.0                                               | 10                                                | 160                                                      | 68                                                                         |
| M15KP60A    | 60                                                          | 66.7                                            | 5  | 97.3                                               | 10                                                | 154                                                      | 71                                                                         |
| M15KP64A    | 64                                                          | 71.1                                            | 5  | 104                                                | 10                                                | 144                                                      | 76                                                                         |
| M15KP70A    | 70                                                          | 77.8                                            | 5  | 114                                                | 10                                                | 132                                                      | 83                                                                         |
| M15KP75A    | 75                                                          | 83.3                                            | 5  | 122                                                | 10                                                | 123                                                      | 89                                                                         |
| M15KP78A    | 78                                                          | 86.7                                            | 5  | 126                                                | 10                                                | 119                                                      | 93                                                                         |
| M15KP85A    | 85                                                          | 94.4                                            | 5  | 137                                                | 10                                                | 109                                                      | 102                                                                        |
| M15KP90A    | 90                                                          | 100                                             | 5  | 146                                                | 10                                                | 103                                                      | 109                                                                        |
| M15KP100A   | 100                                                         | 111                                             | 5  | 162                                                | 10                                                | 93                                                       | 121                                                                        |
| M15KP110A   | 110                                                         | 122                                             | 5  | 178                                                | 10                                                | 84                                                       | 133                                                                        |
| M15KP120A   | 120                                                         | 133                                             | 5  | 193                                                | 10                                                | 78                                                       | 145                                                                        |
| M15KP130A   | 130                                                         | 144                                             | 5  | 209                                                | 10                                                | 72                                                       | 157                                                                        |
| M15KP150A   | 150                                                         | 167                                             | 5  | 243                                                | 10                                                | 62                                                       | 183                                                                        |
| M15KP160A   | 160                                                         | 178                                             | 5  | 259                                                | 10                                                | 58                                                       | 195                                                                        |
| M15KP170A   | 170                                                         | 189                                             | 5  | 275                                                | 10                                                | 55                                                       | 207                                                                        |
| M15KP180A   | 180                                                         | 200                                             | 5  | 291                                                | 10                                                | 52                                                       | 219                                                                        |
| M15KP200A   | 200                                                         | 222                                             | 5  | 322                                                | 10                                                | 47                                                       | 243                                                                        |
| M15KP220A   | 220                                                         | 245                                             | 5  | 356                                                | 10                                                | 42                                                       | 269                                                                        |
| M15KP240A   | 240                                                         | 267                                             | 5  | 388                                                | 10                                                | 39                                                       | 293                                                                        |
| M15KP260A   | 260                                                         | 289                                             | 5  | 419                                                | 10                                                | 36                                                       | 317                                                                        |
| M15KP280A   | 280                                                         | 311                                             | 5  | 452                                                | 10                                                | 33                                                       | 342                                                                        |

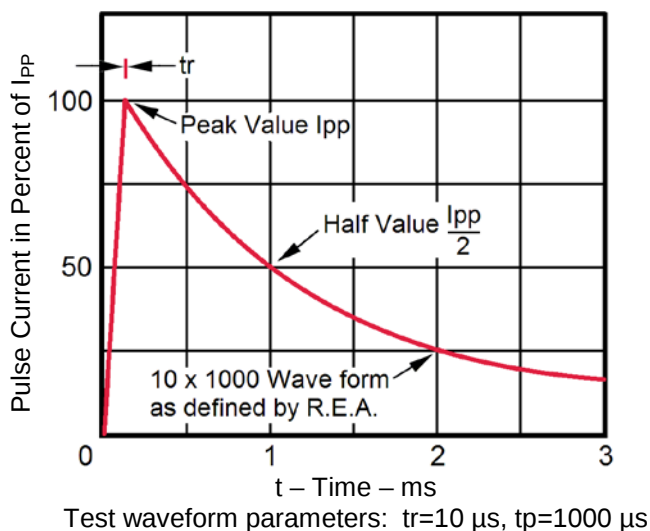
\*\* Consult factory for availability of the 17 and 18 Volt devices on a special order basis.

**NOTES:**

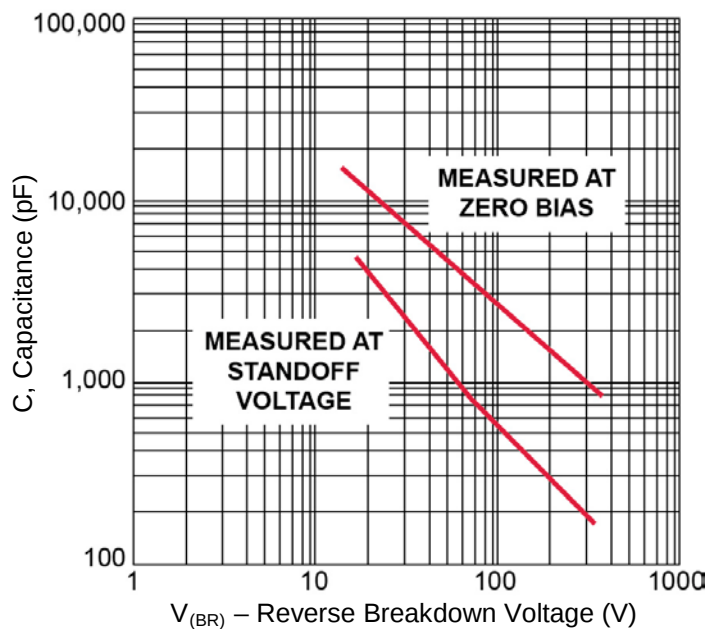
1. Transient Voltage Suppressors are normally selected with reverse "stand-off voltage" ( $V_{WM}$ ) which should be equal to or greater than the dc or continuous peak operating voltage level.

**GRAPHS**


**FIGURE 1**  
Peak Pulse Power Rating Curve

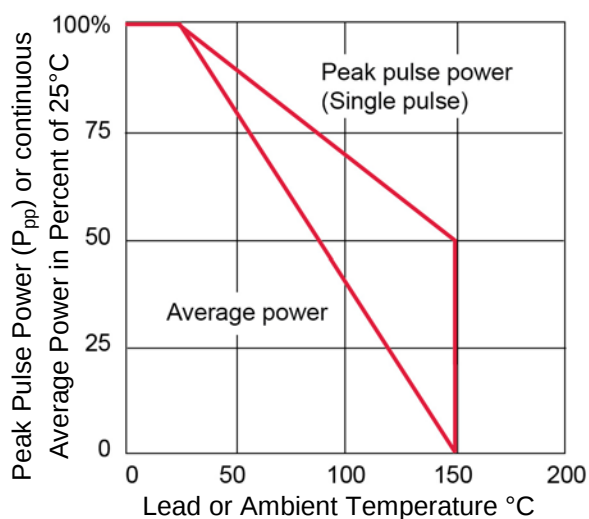


**FIGURE 2**  
Pulse Waveform for 10/1000  $\mu$ s Exponential Surge

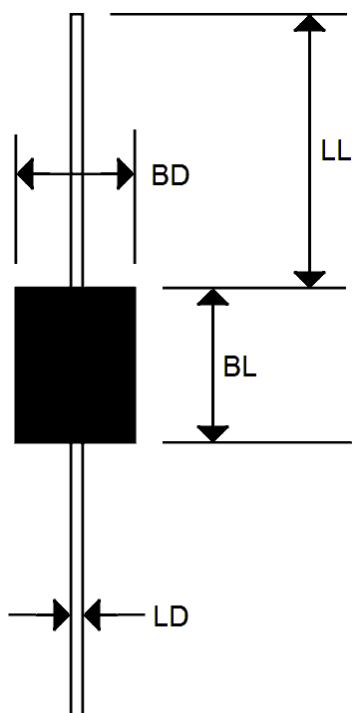
**GRAPHS (continued)**


**FIGURE 3**  
Typical Junction Capacitance

**NOTE:** For bidirectional construction, capacitance will be one-half that shown.



**FIGURE 4**  
Derating Curve

**PACKAGE DIMENSIONS**


| Dim       | Dimensions |       |             |      |
|-----------|------------|-------|-------------|------|
|           | Inch       |       | Millimeters |      |
|           | Min        | Max   | Min         | Max  |
| <b>LL</b> | 1.100      | 1.500 | 27.95       | 38.1 |
| <b>BL</b> | 0.365      | 0.375 | 9.27        | 9.52 |
| <b>BD</b> | 0.240      | 0.250 | 6.1         | 6.35 |
| <b>LD</b> | 0.048      | 0.052 | 1.22        | 1.32 |