



## 500 Watt Transient Voltage Suppressor (TVS) Protection Device

Screening in  
reference to  
MIL-PRF-19500  
available

### DESCRIPTION

This MP5KE5.0A – MP5KE170CA is a family of economical 500 W transient voltage suppressors (TVS) for protecting voltage-sensitive components from destruction or degradation. It is available in both unidirectional and bi-directional configurations as well as RoHS compliant (annealed matte-tin finish) and upscreened, enhanced high reliability options. The response time of their clamping time is virtually instantaneous. As a result, they may also be used effectively for protection from ESD or EFT per IEC61000-4-2 and IEC61000-4-4 or for inductive switching environments and induced RFI. They can also be used for protection from the secondary effects of lightning per IEC61000-4-5 at the class levels listed below.

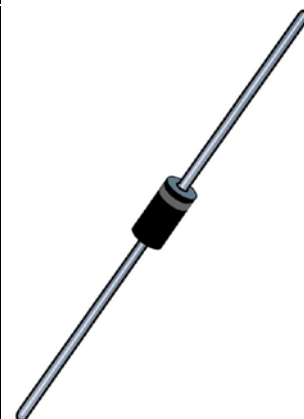
**Important:** For the latest information, visit our website <http://www.microsemi.com>.

### FEATURES

- Available in both unidirectional and bidirectional configurations
- Suppresses transients up to 500 watts Peak Pulse Power ( $P_{PP}$ ) @ 10/1000  $\mu$ s
- 3 $\sigma$  lot norm screening performed on standby current  $I_D$
- 100% surge tested devices
- Various screening 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

- Protects sensitive components such as IC's, CMOS, Bipolar, BiCMOS, ECL, DTL, T<sup>2</sup>L, etc.
- Selections from 5.0 to 170 volts stand-off voltage ( $V_{WM}$ )
- Economical TVS series for thru-hole mounting
- Similar to SA5.0 thru SA170 series
- Protection from switching transients & induced RFI
- Sub-nanosecond response time (unidirectional)
- Compliant to IEC61000-4-2 and IEC61000-4-4 for ESD and EFT protection respectively
- Secondary lightning protection per IEC61000-4-5 with 42 ohms source impedance:
  - Class 1: MP5KE5.0A to MP5KE120A or CA
  - Class 2: MP5KE5.0A to MP5KE60A or CA
  - Class 3: MP5KE5.0A to MP5KE30A or CA
  - Class 4: MP5KE5.0A to MP5KE15A or CA
- Secondary lightning protection per IEC61000-4-5 with 12 ohms source impedance:
  - Class 1: MP5KE5.0A to MP5KE36A or CA
  - Class 2: MP5KE5.0A to MP5KE18A or CA



**DO-204AL  
(DO-41) Plastic  
Package**

Also available in:  
**DO-214AC package**  
(tabbed surface mount)  
 [SMAJ5.0 – SMAJ170A](#)

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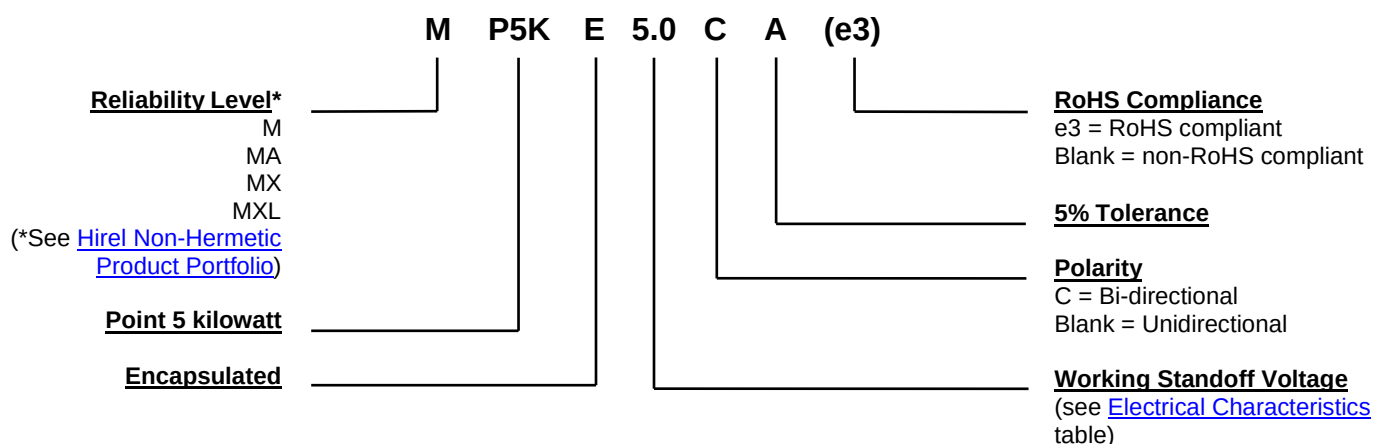
**MAXIMUM RATINGS @ 25 °C unless otherwise noted**

| 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 | $R_{\theta JL}$     | 45                          | °C/W |
| Thermal Resistance, Junction to Ambient <sup>(1)</sup>                        | $R_{\theta JA}$     | 105                         | °C/W |
| Peak Pulse Power Dissipation <sup>(2)</sup> 10/1000 us                        | $P_{PP}$            | 500                         | W    |
| Steady-State Power Dissipation @ $T_L = 25$ °C 3/8 inch (10 mm) from body     | $P_D$               | 2.77<br>1.19 <sup>(1)</sup> | W    |
| Forward Voltage <sup>(3)</sup>                                                | $V_F$               | 3.5                         | V    |
| Solder Temperature @ 10 s                                                     |                     | 260                         | °C   |

**Notes:** 1. At  $T_A = 25$  °C 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 Figure 1 and 4).  
 3. At 30 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: RoHS compliant annealed matte/tin over copper. Solderable per MIL-STD-750, method 2026.
- MARKING: Body marked with part number.
- POLARITY: Band denotes cathode. Bidirectional not marked.
- TAPE & REEL option: Standard per EIA-296 (add TR suffix to part number). Consult factory for quantities.
- WEIGHT: Approximately 0.3 grams.
- See [Package Dimensions](#) on last page.

**PART NOMENCLATURE**


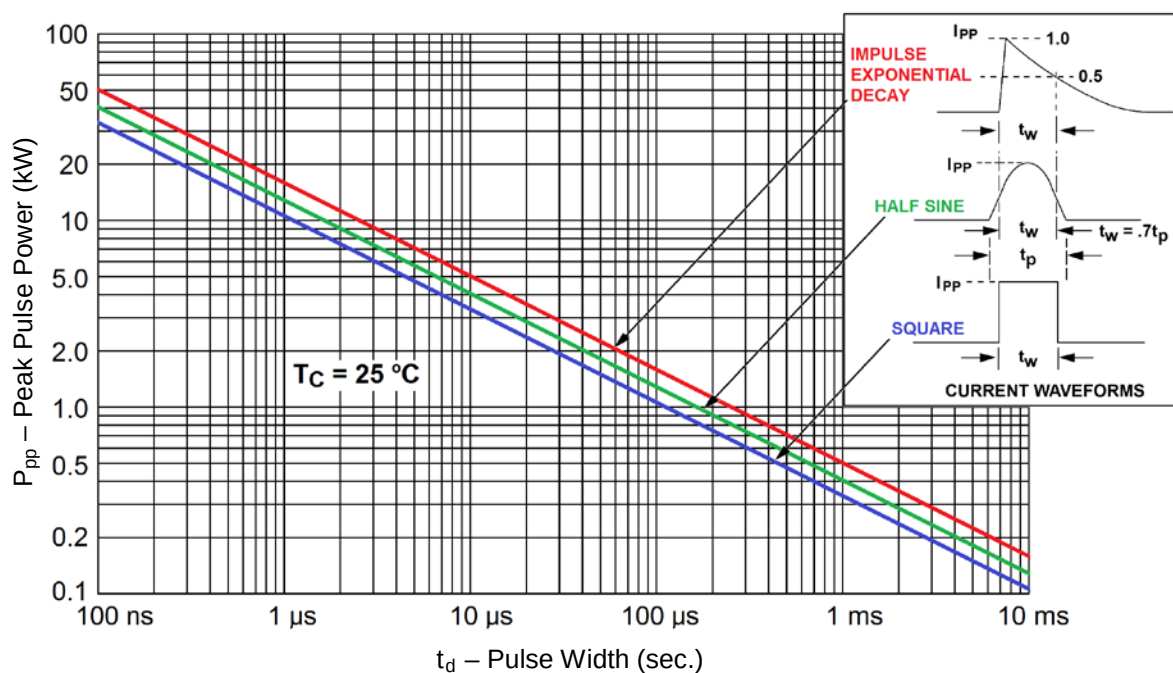
| SYMBOLS & DEFINITIONS |                                                                                                                                                                                                                                                                                                                                                       |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 $\text{mV}/^{\circ}\text{C}$ .                                                                                                                                                |
| $V_{WM}$              | 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**

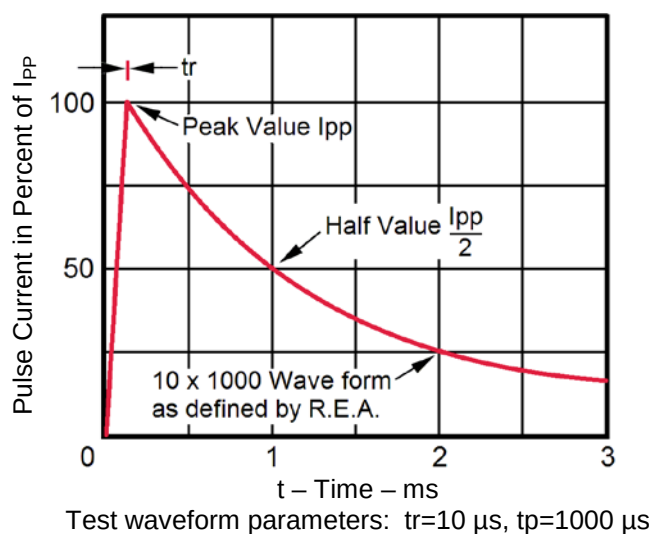
| PART<br>NUMBER | BREAKDOWN<br>VOLTAGE<br>$V_{(BR)}$ |       | TEST<br>CURRENT<br>$I_{(BR)}$ | RATED<br>STANDOFF<br>VOLTAGE<br>$V_{WM}$ | MAX<br>STANDBY<br>CURRENT<br>$I_D @ V_{WM}$ | MAX<br>CLAMPING<br>VOLTAGE<br>$V_C @ I_{PP}$ | MAX PEAK<br>PULSE<br>CURRENT<br>$I_{PP}$ | MAX TEMP<br>COEFFICIENT<br>OF $V_{(BR)}$<br>$\alpha_{V(BR)}$ |
|----------------|------------------------------------|-------|-------------------------------|------------------------------------------|---------------------------------------------|----------------------------------------------|------------------------------------------|--------------------------------------------------------------|
|                | Min.                               | Max.  |                               |                                          |                                             |                                              |                                          |                                                              |
|                | V                                  | V     |                               |                                          |                                             |                                              |                                          |                                                              |
| MP5KE5.0A      | 6.4                                | 7.0   | 10                            | 5.0                                      | 600                                         | 9.2                                          | 54.3                                     | 0.057                                                        |
| MP5KE6.0A      | 6.67                               | 7.37  | 10                            | 6.0                                      | 600                                         | 10.3                                         | 48.5                                     | 0.059                                                        |
| MP5KE6.5A      | 7.22                               | 7.98  | 10                            | 6.5                                      | 400                                         | 11.2                                         | 44.7                                     | 0.061                                                        |
| MP5KE7.0A      | 7.78                               | 8.60  | 10                            | 7.0                                      | 150                                         | 12.0                                         | 41.7                                     | 0.065                                                        |
| MP5KE7.5A      | 8.33                               | 9.21  | 1                             | 7.5                                      | 50                                          | 12.9                                         | 38.8                                     | 0.067                                                        |
| MP5KE8.0A      | 8.89                               | 9.83  | 1                             | 8.0                                      | 25                                          | 13.6                                         | 36.7                                     | 0.070                                                        |
| MP5KE8.5A      | 9.44                               | 10.4  | 1                             | 8.5                                      | 5                                           | 14.4                                         | 34.7                                     | 0.073                                                        |
| MP5KE9.0A      | 10.0                               | 11.1  | 1                             | 9.0                                      | 1                                           | 15.4                                         | 32.5                                     | 0.076                                                        |
| MP5KE10A       | 11.1                               | 12.3  | 1                             | 10                                       | 1                                           | 17.0                                         | 29.4                                     | 0.078                                                        |
| MP5KE11A       | 12.2                               | 13.5  | 1                             | 11                                       | 1                                           | 18.2                                         | 27.4                                     | 0.081                                                        |
| MP5KE12A       | 13.3                               | 14.7  | 1                             | 12                                       | 1                                           | 19.9                                         | 25.1                                     | 0.082                                                        |
| MP5KE13A       | 14.4                               | 15.9  | 1                             | 13                                       | 1                                           | 21.5                                         | 23.2                                     | 0.084                                                        |
| MP5KE14A       | 15.6                               | 17.2  | 1                             | 14                                       | 1                                           | 23.2                                         | 21.5                                     | 0.086                                                        |
| MP5KE15A       | 16.7                               | 18.5  | 1                             | 15                                       | 1                                           | 24.4                                         | 20.6                                     | 0.087                                                        |
| MP5KE16A       | 17.8                               | 19.7  | 1                             | 16                                       | 1                                           | 26.0                                         | 19.2                                     | 0.088                                                        |
| MP5KE17A       | 18.9                               | 20.9  | 1                             | 17                                       | 1                                           | 27.6                                         | 18.1                                     | 0.090                                                        |
| MP5KE18A       | 20.0                               | 22.1  | 1                             | 18                                       | 1                                           | 29.2                                         | 17.2                                     | 0.092                                                        |
| MP5KE20A       | 22.2                               | 24.5  | 1                             | 20                                       | 1                                           | 32.4                                         | 15.4                                     | 0.093                                                        |
| MP5KE22A       | 24.4                               | 26.9  | 1                             | 22                                       | 1                                           | 35.5                                         | 14.1                                     | 0.094                                                        |
| MP5KE24A       | 26.7                               | 29.5  | 1                             | 24                                       | 1                                           | 38.9                                         | 12.8                                     | 0.096                                                        |
| MP5KE26A       | 28.9                               | 31.9  | 1                             | 26                                       | 1                                           | 42.1                                         | 11.9                                     | 0.097                                                        |
| MP5KE28A       | 31.1                               | 34.4  | 1                             | 28                                       | 1                                           | 45.4                                         | 11.0                                     | 0.098                                                        |
| MP5KE30A       | 33.3                               | 36.8  | 1                             | 30                                       | 1                                           | 48.4                                         | 10.3                                     | 0.099                                                        |
| MP5KE33A       | 36.7                               | 40.6  | 1                             | 33                                       | 1                                           | 53.3                                         | 9.4                                      | 0.100                                                        |
| MP5KE36A       | 40.0                               | 44.2  | 1                             | 36                                       | 1                                           | 58.1                                         | 8.6                                      | 0.101                                                        |
| MP5KE40A       | 44.4                               | 49.1  | 1                             | 40                                       | 1                                           | 64.5                                         | 7.8                                      | 0.101                                                        |
| MP5KE43A       | 47.8                               | 52.8  | 1                             | 43                                       | 1                                           | 69.4                                         | 7.2                                      | 0.102                                                        |
| MP5KE45A       | 50.0                               | 55.3  | 1                             | 45                                       | 1                                           | 72.7                                         | 6.9                                      | 0.102                                                        |
| MP5KE48A       | 53.3                               | 58.9  | 1                             | 48                                       | 1                                           | 77.4                                         | 6.5                                      | 0.103                                                        |
| MP5KE51A       | 56.7                               | 62.7  | 1                             | 51                                       | 1                                           | 82.4                                         | 6.1                                      | 0.103                                                        |
| MP5KE54A       | 60.0                               | 66.3  | 1                             | 54                                       | 1                                           | 87.1                                         | 5.7                                      | 0.104                                                        |
| MP5KE58A       | 64.4                               | 71.2  | 1                             | 58                                       | 1                                           | 93.6                                         | 5.3                                      | 0.104                                                        |
| MP5KE60A       | 66.7                               | 73.7  | 1                             | 60                                       | 1                                           | 96.8                                         | 5.2                                      | 0.104                                                        |
| MP5KE64A       | 71.1                               | 78.6  | 1                             | 64                                       | 1                                           | 103.0                                        | 4.9                                      | 0.105                                                        |
| MP5KE70A       | 77.8                               | 86.0  | 1                             | 70                                       | 1                                           | 113.0                                        | 4.4                                      | 0.105                                                        |
| MP5KE75A       | 83.3                               | 92.1  | 1                             | 75                                       | 1                                           | 121.0                                        | 4.1                                      | 0.105                                                        |
| MP5KE78A       | 86.7                               | 95.8  | 1                             | 78                                       | 1                                           | 126.0                                        | 4.0                                      | 0.106                                                        |
| MP5KE85A       | 94.4                               | 104.0 | 1                             | 85                                       | 1                                           | 137.0                                        | 3.6                                      | 0.106                                                        |
| MP5KE90A       | 100.0                              | 111.0 | 1                             | 90                                       | 1                                           | 146.0                                        | 3.4                                      | 0.107                                                        |
| MP5KE100A      | 111.0                              | 123.0 | 1                             | 100                                      | 1                                           | 162.0                                        | 3.1                                      | 0.107                                                        |
| MP5KE110A      | 122.0                              | 135.0 | 1                             | 110                                      | 1                                           | 177.0                                        | 2.8                                      | 0.107                                                        |
| MP5KE120A      | 133.0                              | 147.0 | 1                             | 120                                      | 1                                           | 193.0                                        | 2.0                                      | 0.107                                                        |
| MP5KE130A      | 144.0                              | 159.0 | 1                             | 130                                      | 1                                           | 209.0                                        | 2.4                                      | 0.108                                                        |
| MP5KE150A      | 167.0                              | 185.0 | 1                             | 150                                      | 1                                           | 243.0                                        | 2.1                                      | 0.108                                                        |
| MP5KE160A      | 178.0                              | 197.0 | 1                             | 160                                      | 1                                           | 259.0                                        | 1.9                                      | 0.108                                                        |
| MP5KE170A      | 189.0                              | 209.0 | 1                             | 170                                      | 1                                           | 275.0                                        | 1.8                                      | 0.108                                                        |

**NOTES:**

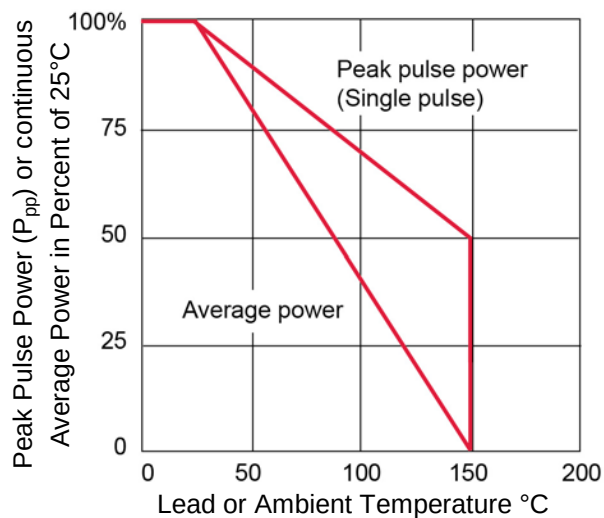
- Forward voltage ( $V_F$ ) @ 35 amps peak, 8.3 ms sine wave equal to 3.5 volts max. (Excluding bidirectional).
- For bidirectional construction, capacitance will be one-half that shown in [Figure 4](#).

**GRAPHS**


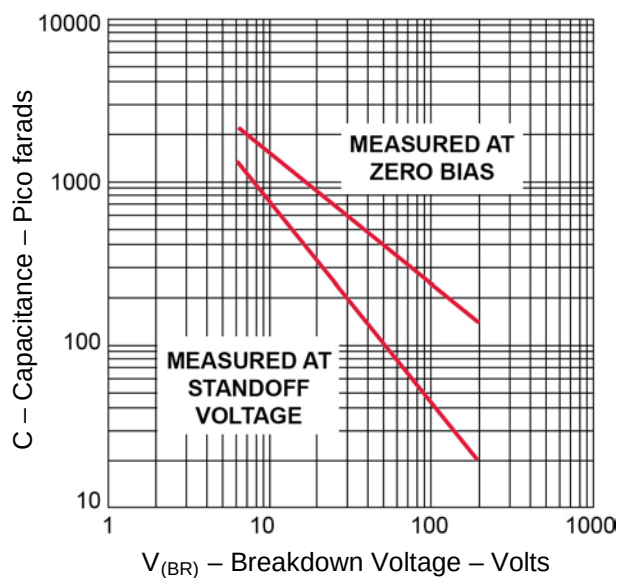
**FIGURE 1**  
Peak Pulse Power Rating Curve



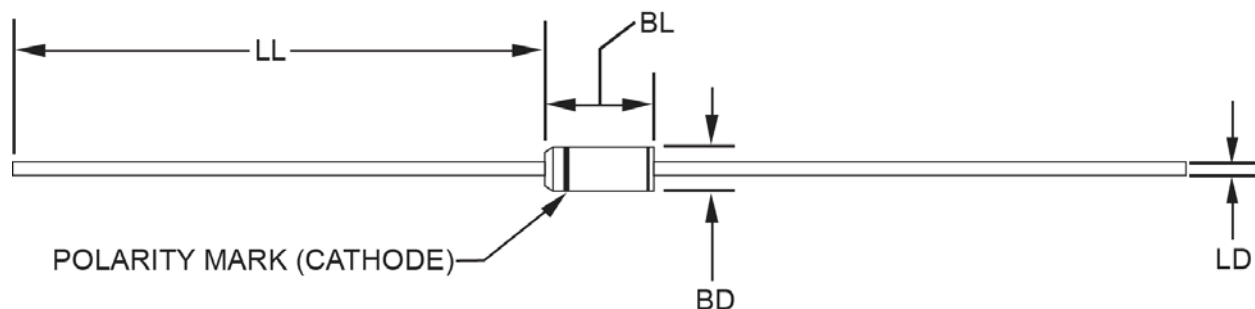
**FIGURE 2**  
Pulse Waveform for 10/1000 Exponential Surge

**GRAPHS (continued)**


**FIGURE 3**  
Derating Curve



**FIGURE 4**  
Typical Capacitance vs. Breakdown Voltage

**PACKAGE DIMENSIONS**

**NOTES:**

1. Dimensions are in inches.
2. Millimeters are given for information only.
3. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.

| Ltr       | DIMENSIONS |       |             |       |
|-----------|------------|-------|-------------|-------|
|           | INCH       |       | MILLIMETERS |       |
|           | Min        | Max   | Min         | Max   |
| <b>BD</b> | -          | 0.107 | -           | 2.718 |
| <b>BL</b> | -          | 0.205 | -           | 5.207 |
| <b>LD</b> | 0.030      | 0.034 | 0.762       | 0.864 |
| <b>LL</b> | 1.10       | -     | 27.940      | -     |
|           |            |       |             |       |

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