



## 400 Watt Transient Voltage Suppressors

*Screening in  
reference to  
MIL-PRF-19500  
available*

### DESCRIPTION

This family of high-reliability, plastic packaged Transient Voltage Suppressors offer high reliability at an affordable price. Standoff voltage values range from 5.8 to 342 volts and 5% or 10% tolerance options are available. Source control is standard and three increasingly stringent screening options for enhanced reliability are available.

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

### FEATURES

- High reliability controlled devices with wafer fabrication and assembly lot traceability.
- All devices 100% surge tested.
- Optional screening in reference to MIL-PRF-19500 is also available. Refer to [High Reliability Non-Hermetic Product](#) portfolio for more details on Microsemi screening options.
- Moisture classification is level 1 with no dry pack required per IPC/JEDEC J-STD-020B.
- 3 $\sigma$  lot norm screening performed on standby current ( $I_D$ ).
- RoHS compliant versions available.

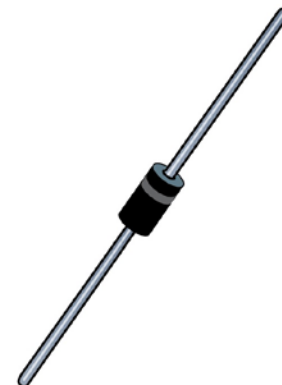
### APPLICATIONS / BENEFITS

- Suppresses transients up to 400 watts @ 10/1000  $\mu$ s (see [Figure 1](#)).
- Protects sensitive components such as IC's, CMOS, Bipolar, BiCMOS, ECL, DTL, T<sup>2</sup>L, etc.
- Protection from switching transients & induced RF.
- Compliant to IEC 61000-4-2 and IEC 61000-4-4 for ESD and EFT protection respectively.
- Secondary lightning protection per IEC 61000-4-5 with 42 ohms source impedance:
  - Class 1: MP4KE5.0A to MP4KE91CA
  - Class 2: MP4KE5.0A to MP4KE47ACA
  - Class 3: MP4KE5.0A to MP4KE24CA
  - Class 4: MP4KE5.0A to MP4KE12CA
- Secondary lightning protection per IEC 61000-4-5 with 12 ohms source impedance:
  - Class 1: MP4KE5.0A to MP4KE30CA
  - Class 2: MP4KE5.0A to MP4KE15CA

### MAXIMUM RATINGS

| Parameters/Test Conditions                                                                                   | Symbol              | Value       | Unit           |
|--------------------------------------------------------------------------------------------------------------|---------------------|-------------|----------------|
| Junction and Storage Temperature                                                                             | $T_J$ and $T_{STG}$ | -65 to +150 | $^{\circ}$ C   |
| Thermal Resistance, Junction to Leads<br>@ 3/8 inch (10 mm) from body <sup>(1)</sup>                         | $R_{\theta JL}$     | 50          | $^{\circ}$ C/W |
| Peak Pulse Power Dissipation @ 10/1000 $\mu$ s <sup>(2)</sup>                                                | $P_{PP}$            | 400         | W              |
| Off-State Power Dissipation @ $T_L = +25^{\circ}$ C <sup>(3)</sup><br>@ $T_A = +25^{\circ}$ C <sup>(4)</sup> | $P_D$               | 2.5<br>1.13 | W              |
| Forward Voltage @ 25 $^{\circ}$ C with 8.3 ms half-sine wave<br>(unidirectional only)                        | $V_F$               | 3.5         | V              |
| Solder Temperature @ 10 s                                                                                    | $T_{SP}$            | 260         | $^{\circ}$ C   |

- Notes:**
1. Or 110  $^{\circ}$ C/W junction to ambient 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 (see [Figures 1, 2 and 3](#) for  $t_w$ , waveform and derating effects).
  3. At 3/8 (10 mm) lead length from body.
  4. On FR4 PC board with 110C/W junction to ambient with 4 mm<sup>2</sup> copper pads (1 oz) and track width 1 mm and length 25 mm.



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

Also available in:



**J-bend Package**  
(surface mount)

[MSMBJ5.0A – MSMBJ170A](#)



**Gull-wing Package**  
(surface mount)

[MSMBG5.0A – MSMBG170A](#)

#### **MSC – Lawrence**

6 Lake Street,  
Lawrence, MA 01841  
Tel: 1-800-446-1158 or  
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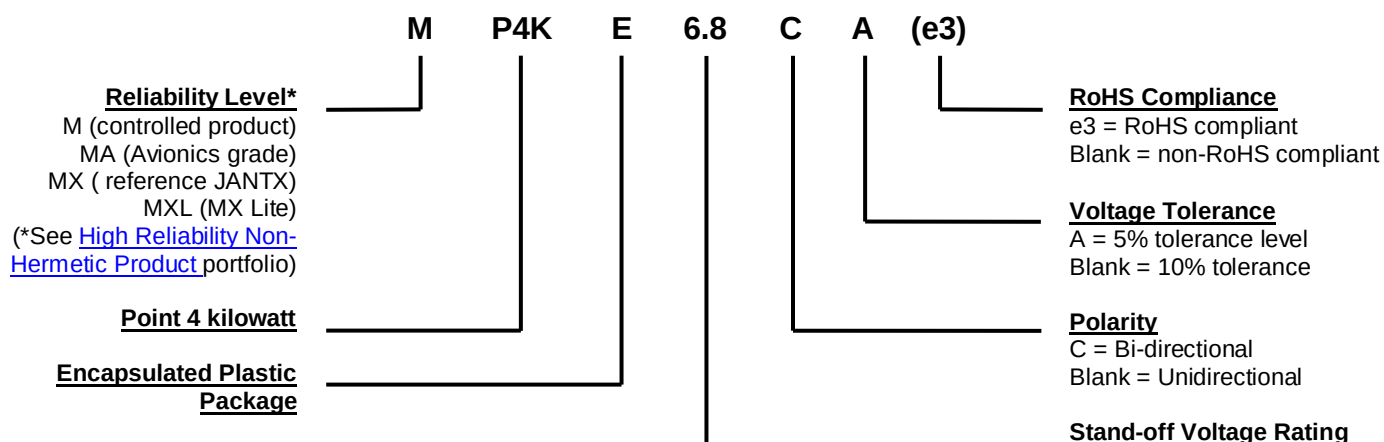
#### **Website:**

[www.microsemi.com](http://www.microsemi.com)

### 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. Bi-directional 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 %/°C or mV/°C.                                                                                                                                                                                         |
| C                | Capacitance: The capacitance in pF at a frequency of 1 MHz and specified voltage                                                                                                                                                                                                                                                                      |
| $I_{(BR)}$       | 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.                                                                                                                                                                                                                                                                           |
| $I_{PP}$         | 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<br>NUMBER<br>(Note 2) | WORKING<br>STAND OFF<br>VOLTAGE<br>V <sub>WM</sub> | BREAKDOWN<br>VOLTAGE<br>V(BR) @<br>I(BR) |       |    | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>V <sub>C</sub> @ I <sub>PP</sub> | MAXIMUM<br>STANDBY<br>CURRENT I <sub>D</sub><br>@ V <sub>WM</sub> | PEAK PULSE<br>CURRENT<br>(see Fig. 2)<br>I <sub>PP</sub> | MAXIMUM<br>TEMPERATURE<br>COEFFICIENT<br>of V(BR)<br>$\alpha V(BR)$ |
|----------------------------|----------------------------------------------------|------------------------------------------|-------|----|--------------------------------------------------------------------|-------------------------------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------|
|                            | Volts                                              | MIN                                      | MAX   | mA | Volts                                                              | μA                                                                | Amps                                                     | % / °C                                                              |
| MP4KE6.8A                  | 5.80                                               | 6.45                                     | 7.14  | 10 | 10.5                                                               | 500                                                               | 38                                                       | 0.057                                                               |
| MP4KE7.5A                  | 6.40                                               | 7.13                                     | 7.88  | 10 | 11.3                                                               | 200                                                               | 35                                                       | 0.061                                                               |
| MP4KE8.2A                  | 7.02                                               | 7.79                                     | 8.61  | 10 | 12.1                                                               | 100                                                               | 33                                                       | 0.065                                                               |
| MP4KE9.1A                  | 7.78                                               | 8.65                                     | 9.55  | 1  | 13.4                                                               | 20                                                                | 30                                                       | 0.068                                                               |
| MP4KE10A                   | 8.55                                               | 9.50                                     | 10.5  | 1  | 14.5                                                               | 5                                                                 | 28                                                       | 0.073                                                               |
| MP4KE11A                   | 9.40                                               | 10.5                                     | 11.6  | 1  | 15.6                                                               | 2                                                                 | 26                                                       | 0.075                                                               |
| MP4KE12A                   | 10.2                                               | 11.4                                     | 12.6  | 1  | 16.7                                                               | 1                                                                 | 24                                                       | 0.078                                                               |
| MP4KE13A                   | 11.1                                               | 12.4                                     | 13.7  | 1  | 18.2                                                               | 1                                                                 | 22                                                       | 0.081                                                               |
| MP4KE15A                   | 12.8                                               | 14.3                                     | 15.8  | 1  | 21.2                                                               | 1                                                                 | 19                                                       | 0.084                                                               |
| MP4KE16A                   | 13.6                                               | 15.2                                     | 16.8  | 1  | 22.5                                                               | 1                                                                 | 18                                                       | 0.086                                                               |
| MP4KE18A                   | 15.3                                               | 17.1                                     | 18.0  | 1  | 25.2                                                               | 1                                                                 | 16                                                       | 0.088                                                               |
| MP4KE20A                   | 17.1                                               | 19.0                                     | 21.0  | 1  | 27.7                                                               | 1                                                                 | 14.5                                                     | 0.090                                                               |
| MP4KE22A                   | 18.8                                               | 20.9                                     | 23.1  | 1  | 30.6                                                               | 1                                                                 | 13                                                       | 0.092                                                               |
| MP4KE24A                   | 20.5                                               | 22.8                                     | 25.2  | 1  | 33.2                                                               | 1                                                                 | 12                                                       | 0.094                                                               |
| MP4KE27A                   | 23.1                                               | 25.7                                     | 28.4  | 1  | 37.5                                                               | 1                                                                 | 11                                                       | 0.096                                                               |
| MP4KE30A                   | 25.6                                               | 28.5                                     | 31.5  | 1  | 41.4                                                               | 1                                                                 | 9.5                                                      | 0.097                                                               |
| MP4KE33A                   | 28.2                                               | 31.4                                     | 34.7  | 1  | 45.7                                                               | 1                                                                 | 9.0                                                      | 0.098                                                               |
| MP4KE36A                   | 30.8                                               | 34.2                                     | 37.8  | 1  | 49.9                                                               | 1                                                                 | 8.0                                                      | 0.099                                                               |
| MP4KE39A                   | 33.3                                               | 37.1                                     | 41.0  | 1  | 53.9                                                               | 1                                                                 | 7.5                                                      | 0.100                                                               |
| MP4KE43A                   | 36.8                                               | 40.9                                     | 45.2  | 1  | 59.3                                                               | 1                                                                 | 7.0                                                      | 0.101                                                               |
| MP4KE47A                   | 40.2                                               | 44.7                                     | 49.4  | 1  | 64.8                                                               | 1                                                                 | 6.2                                                      | 0.101                                                               |
| MP4KE51A                   | 43.6                                               | 48.5                                     | 53.6  | 1  | 70.1                                                               | 1                                                                 | 5.7                                                      | 0.102                                                               |
| MP4KE56A                   | 47.8                                               | 53.2                                     | 58.8  | 1  | 77.0                                                               | 1                                                                 | 5.2                                                      | 0.103                                                               |
| MP4KE62A                   | 53.0                                               | 58.9                                     | 65.1  | 1  | 85.0                                                               | 1                                                                 | 4.7                                                      | 0.104                                                               |
| MP4KE68A                   | 58.1                                               | 64.6                                     | 71.4  | 1  | 92.0                                                               | 1                                                                 | 4.4                                                      | 0.104                                                               |
| MP4KE75A                   | 64.1                                               | 71.3                                     | 78.8  | 1  | 103.0                                                              | 1                                                                 | 3.9                                                      | 0.105                                                               |
| MP4KE82A                   | 70.1                                               | 77.9                                     | 86.1  | 1  | 113.0                                                              | 1                                                                 | 3.5                                                      | 0.105                                                               |
| MP4KE91A                   | 77.8                                               | 86.5                                     | 95.5  | 1  | 125.0                                                              | 1                                                                 | 3.2                                                      | 0.106                                                               |
| MP4KE100A                  | 85.5                                               | 95.0                                     | 105.0 | 1  | 137.0                                                              | 1                                                                 | 2.9                                                      | 0.106                                                               |
| MP4KE110A                  | 94.0                                               | 105.0                                    | 116.0 | 1  | 152.0                                                              | 1                                                                 | 2.6                                                      | 0.107                                                               |
| MP4KE120A                  | 102.0                                              | 114.0                                    | 126.0 | 1  | 165.0                                                              | 1                                                                 | 2.4                                                      | 0.107                                                               |
| MP4KE130A                  | 111.0                                              | 124.0                                    | 137.0 | 1  | 179.0                                                              | 1                                                                 | 2.2                                                      | 0.107                                                               |
| MP4KE150A                  | 128.0                                              | 143.0                                    | 158.0 | 1  | 207.0                                                              | 1                                                                 | 1.95                                                     | 0.108                                                               |
| MP4KE160A                  | 136.0                                              | 152.0                                    | 168.0 | 1  | 219.0                                                              | 1                                                                 | 1.8                                                      | 0.108                                                               |
| MP4KE170A                  | 145.0                                              | 162.0                                    | 179.0 | 1  | 234.0                                                              | 1                                                                 | 1.7                                                      | 0.108                                                               |
| MP4KE180A                  | 154.0                                              | 171.0                                    | 189.0 | 1  | 246.0                                                              | 1                                                                 | 1.6                                                      | 0.108                                                               |
| MP4KE200A                  | 171.0                                              | 190.0                                    | 210.0 | 1  | 274.0                                                              | 1                                                                 | 1.5                                                      | 0.108                                                               |
| MP4KE220A                  | 185.0                                              | 209.0                                    | 231.0 | 1  | 328.0                                                              | 1                                                                 | 1.0                                                      | 0.110                                                               |
| MP4KE250A                  | 214.0                                              | 237.0                                    | 263.0 | 1  | 344.0                                                              | 1                                                                 | 1.0                                                      | 0.110                                                               |
| MP4KE300A                  | 256.0                                              | 285.0                                    | 315.0 | 1  | 414.0                                                              | 1                                                                 | 1.0                                                      | 0.110                                                               |
| MP4KE350A                  | 300.0                                              | 333.0                                    | 368.0 | 1  | 482.0                                                              | 1                                                                 | 1.0                                                      | 0.110                                                               |
| MP4KE400A                  | 342.0                                              | 380.0                                    | 420.0 | 1  | 548.0                                                              | 1                                                                 | 1.0                                                      | 0.110                                                               |

**NOTE 1:** Forward Voltage (V<sub>F</sub>) @ 30 amps peak, 8.3 ms sine wave equal to 3.5 volts maximum for MP4KE6.8A to 200A (excluding bidirectional).

**NOTE 2:** For bidirectional construction, indicate a CA suffix after part number. Bidirectional capacitance is half that shown in [Figure 4](#) at zero volts.

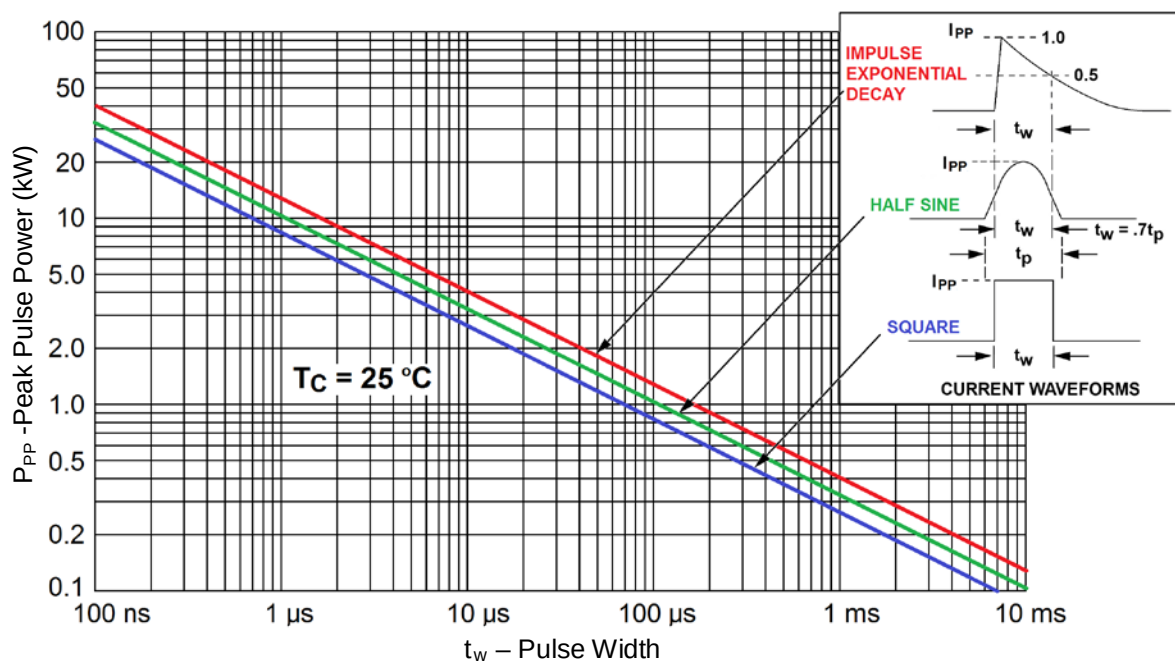
**GRAPHS**


**FIGURE 1**  
Peak Pulse Power vs. Pulse Time

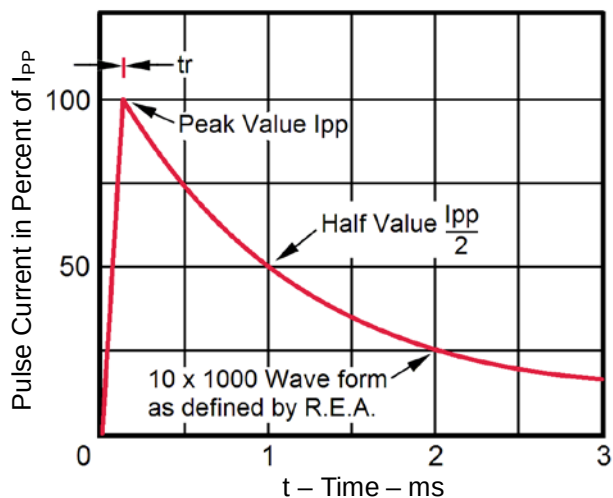


**FIGURE 2**  
Pulse Waveform for Exponential Surge

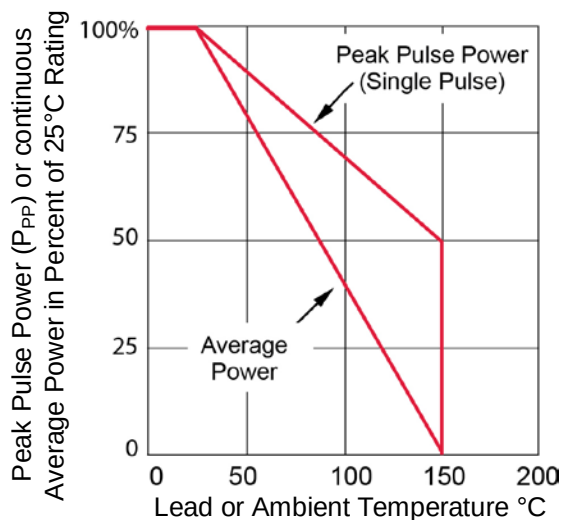
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**FIGURE 3**  
Derating Curve

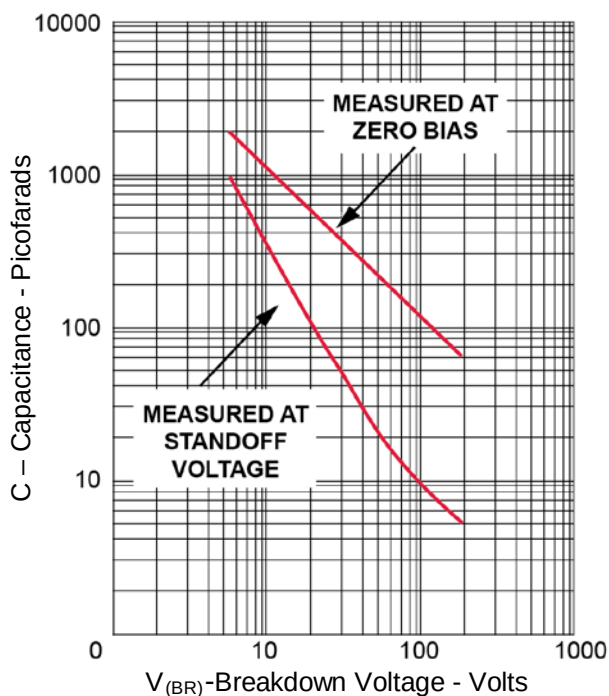
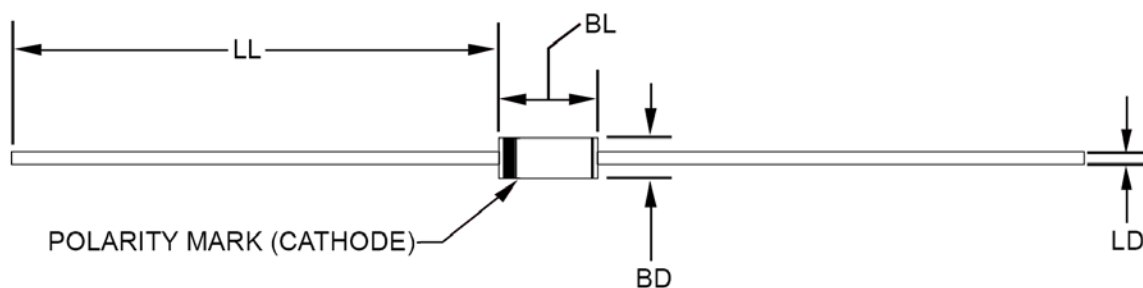


**FIGURE 4**  
MP4KE Typical Capacitance vs. Breakdown Voltage (Unipolar)

**PACKAGE DIMENSIONS**


**NOTES:** Cathode indicated by band.

| Dim       | Dimensions |       |             |       |
|-----------|------------|-------|-------------|-------|
|           | Inches     |       | Millimeters |       |
|           | Min        | Max   | Min         | Max   |
| <b>LL</b> | 1.00       | -     | 25.4        | -     |
| <b>BL</b> | -          | 0.205 | -           | 5.207 |
| <b>BD</b> | -          | 0.107 | -           | 2.72  |
| <b>LD</b> | 0.030      | 0.034 | 0.76        | 0.86  |