



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

**HALOGEN  
FREE**

### DESCRIPTION

This device clamps dangerous high-voltage short-term transients such as those produced by the 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, induced 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.
- 5% working voltage tolerance.
- Moisture classification is Level 1 with no dry pack required per IPC/JEDEC J-STD-020B.
- RoHS compliant (2002/95/EC), MSL level 1 (J-STD-020).

### APPLICATIONS / BENEFITS

- Protection from transients caused by lightning strikes, switching transients, RFI, and ESD.
- Protection from ESD, and EFT per IEC 61000-4-2 and IEC 61000-4-4.
- Protection from the secondary effects of lightning per IEC61000-4-5.

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

| Parameters/Test Conditions                                                                      | Symbol              | Value                                | Unit |
|-------------------------------------------------------------------------------------------------|---------------------|--------------------------------------|------|
| Junction and Storage Temperature                                                                | $T_J$ and $T_{STG}$ | -55 to +175                          | °C   |
| Thermal Resistance, Junction to Lead @ 3/8 inch (10 mm) lead length from body                   | $R_{\theta JL}$     | 8.0                                  | °C/W |
| Thermal Resistance, Junction to Ambient                                                         | $R_{\theta JA}$     | 77.5                                 | °C/W |
| Non Repetitive Peak Forward Surge Current <sup>(1)</sup>                                        | $I_{FSM}$           | 400                                  | A    |
| Rated Average Power Dissipation @ $T_L = 75$ °C, (0.375 inch (9.5 mm) from body) <sup>(2)</sup> | $P_{M(AV)}$         | 8.0                                  | W    |
| Peak Pulse Power Dissipation with a 10/1000 $\mu$ s waveform (see <a href="#">Figure 1</a> )    | $P_{PP}$            | 15000                                | W    |
| Peak Pulse Current with a 10/1000 $\mu$ s waveform <sup>(3)</sup>                               | $I_{PP}$            | See <a href="#">Electrical Table</a> | A    |
| Solder Temperature @ 10 s                                                                       |                     | 260                                  | °C   |

- Notes:**
1. For Unidirectional devices only. Measured on 8.3 ms single half sine-wave or equivalent square wave, duty cycle = 4 pulses per minute maximum. Also see [Figure 6](#).
  2. Mounted as shown in [Figure 5](#).
  3. Non-repetitive current pulse, per [Figure 3](#) and derated above  $T_A = 25$ °C per [Figure 2](#).



**P600 Package**

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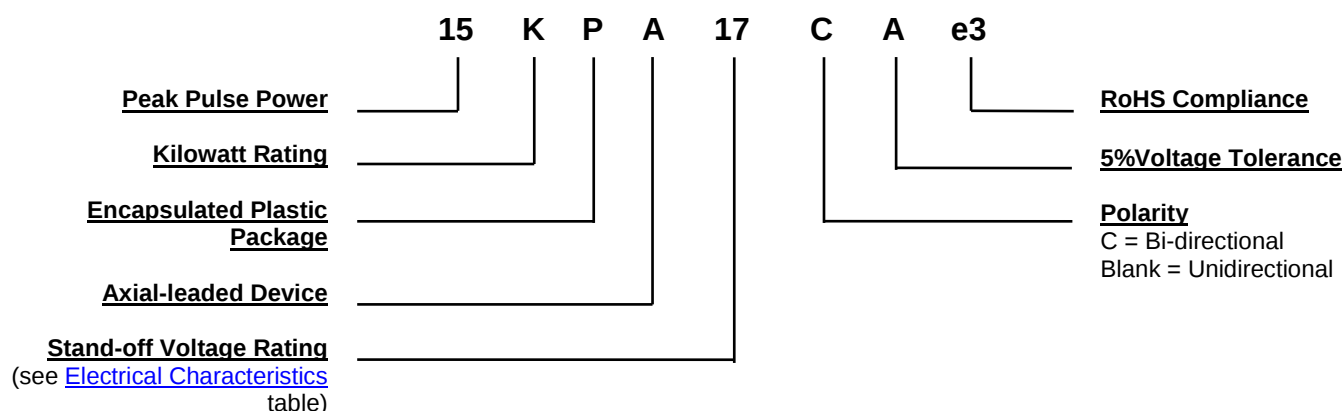
#### Website:

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

### MECHANICAL and PACKAGING

- CASE: Epoxy body meets UL94V-0.
- TERMINALS: Matte-tin plating, fully RoHS compliant. Solderable per MIL-STD-750, method 2026.
- MARKING: Manufacturer ID, date code and part number.
- POLARITY: For unidirectional types the color band denotes the cathode, which is positive with respect to the anode under normal TVS operation.
- TAPE & REEL option: Standard per EIA-296 (add "TR" suffix to part number). Consult factory for quantities.
- WEIGHT: Approximately 0.07 ounce (2.0 grams).
- See [Package Dimensions](#) on last page.

### PART NOMENCLATURE



### SYMBOLS & DEFINITIONS

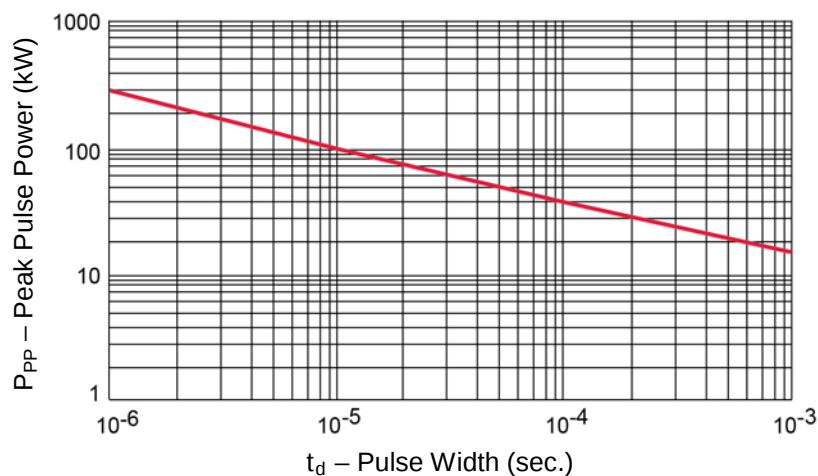
| Symbol           | Definition                                                                                                                                                                                                                                                                                                                                            |
|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $\alpha_{V(BR)}$ | 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.                                                                                                                                                                        |

**ELECTRICAL CHARACTERISTICS @ 25 °C**

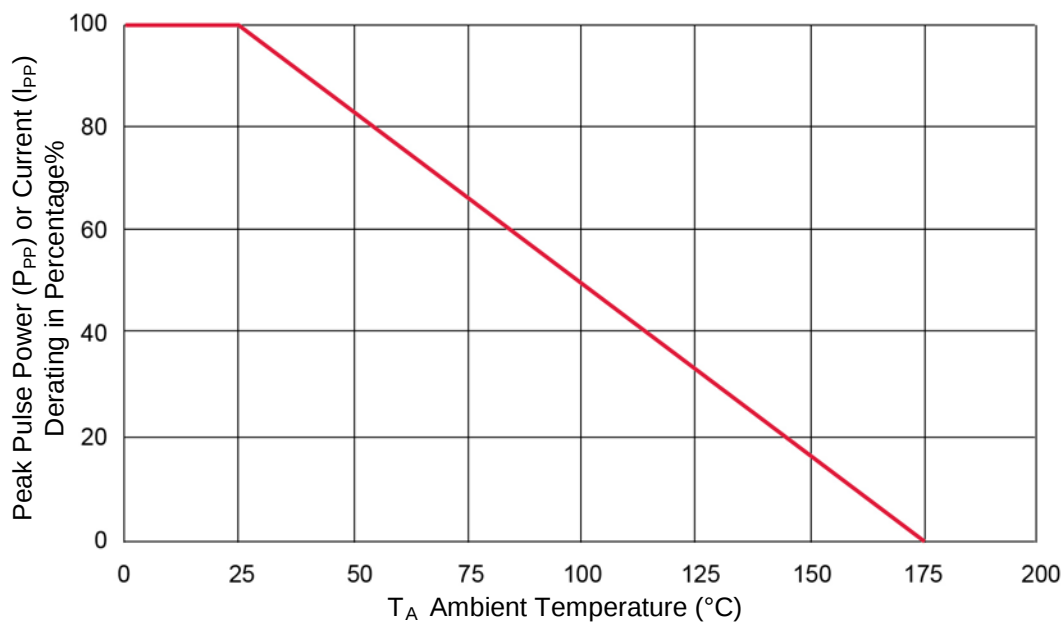
| DEVICE                     | BREAKDOWN VOLTAGE <sup>(2)</sup> , $V_{(BR)}$<br>$V_{(BR)}$ @ $I_{(BR)}$<br>(Volts) |        | TEST CURRENT<br>$I_{(BR)}$<br>(mA) | STAND-OFF VOLTAGE<br>$V_{WM}$<br>(Volts) | MAXIMUM STANDBY CURRENT <sup>(4)</sup><br>$I_D$ @ $V_{WM}$<br>( $\mu$ A) | MAXIMUM PEAK PULSE CURRENT <sup>(3)</sup><br>$I_{PP}$<br>(A) | MAXIMUM CLAMPING VOLTAGE<br>$V_C$ @ $I_{PP}$<br>(Volts) | MAXIMUM TEMPERATURE COEFFICIENT<br>$\alpha V_{(BR)}$<br>(%/ °C) |
|----------------------------|-------------------------------------------------------------------------------------|--------|------------------------------------|------------------------------------------|--------------------------------------------------------------------------|--------------------------------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------|
|                            | Min                                                                                 | Max    |                                    |                                          |                                                                          |                                                              |                                                         |                                                                 |
| 15KPA17Ae3 / 15KPA17CAe3   | 18.99                                                                               | 20.79  | 50                                 | 17                                       | 5000                                                                     | 515.4                                                        | 29.3                                                    | 0.1                                                             |
| 15KPA18Ae3 / 15KPA18CAe3   | 20.11                                                                               | 22.01  | 50                                 | 18                                       | 5000                                                                     | 488.7                                                        | 30.9                                                    | 0.1                                                             |
| 15KPA20Ae3 / 15KPA20CAe3   | 22.34                                                                               | 24.46  | 20                                 | 20                                       | 1500                                                                     | 440.2                                                        | 34.3                                                    | 0.1                                                             |
| 15KPA22Ae3 / 15KPA22CAe3   | 24.57                                                                               | 26.91  | 10                                 | 22                                       | 500                                                                      | 407.0                                                        | 37.1                                                    | 0.1                                                             |
| 15KPA24Ae3 / 15KPA24CAe3   | 26.81                                                                               | 29.35  | 5                                  | 24                                       | 150                                                                      | 371.0                                                        | 40.7                                                    | 0.1                                                             |
| 15KPA26Ae3 / 15KPA26CAe3   | 29.04                                                                               | 31.80  | 5                                  | 26                                       | 50                                                                       | 343.2                                                        | 44.0                                                    | 0.1                                                             |
| 15KPA28Ae3 / 15KPA28CAe3   | 31.28                                                                               | 34.24  | 5                                  | 28                                       | 25                                                                       | 317.9                                                        | 47.5                                                    | 0.1                                                             |
| 15KPA30Ae3 / 15KPA30CAe3   | 33.51                                                                               | 36.70  | 5                                  | 30                                       | 15                                                                       | 297.8                                                        | 50.7                                                    | 0.1                                                             |
| 15KPA33Ae3 / 15KPA33CAe3   | 36.90                                                                               | 40.40  | 5                                  | 33                                       | 2                                                                        | 276.1                                                        | 54.7                                                    | 0.1                                                             |
| 15KPA36Ae3 / 15KPA36CAe3   | 40.20                                                                               | 44.00  | 5                                  | 36                                       | 2                                                                        | 252.5                                                        | 59.8                                                    | 0.1                                                             |
| 15KPA40Ae3 / 15KPA40CAe3   | 44.70                                                                               | 48.90  | 5                                  | 40                                       | 2                                                                        | 229.5                                                        | 65.8                                                    | 0.1                                                             |
| 15KPA43Ae3 / 15KPA43CAe3   | 48.00                                                                               | 52.60  | 5                                  | 43                                       | 2                                                                        | 216.3                                                        | 69.8                                                    | 0.1                                                             |
| 15KPA45Ae3 / 15KPA45CAe3   | 50.30                                                                               | 55.00  | 5                                  | 45                                       | 2                                                                        | 207.4                                                        | 72.8                                                    | 0.1                                                             |
| 15KPA48Ae3 / 15KPA48CAe3   | 53.60                                                                               | 58.70  | 5                                  | 48                                       | 2                                                                        | 194.3                                                        | 77.7                                                    | 0.1                                                             |
| 15KPA51Ae3 / 15KPA51CAe3   | 57.00                                                                               | 62.40  | 5                                  | 51                                       | 2                                                                        | 182.1                                                        | 82.9                                                    | 0.1                                                             |
| 15KPA54Ae3 / 15KPA54CAe3   | 60.30                                                                               | 66.00  | 5                                  | 54                                       | 2                                                                        | 172.2                                                        | 87.7                                                    | 0.1                                                             |
| 15KPA58Ae3 / 15KPA58CAe3   | 64.80                                                                               | 70.90  | 5                                  | 58                                       | 2                                                                        | 161.0                                                        | 93.8                                                    | 0.1                                                             |
| 15KPA60Ae3 / 15KPA60CAe3   | 67.00                                                                               | 73.40  | 5                                  | 60                                       | 2                                                                        | 155.0                                                        | 97.4                                                    | 0.1                                                             |
| 15KPA64Ae3 / 15KPA64CAe3   | 71.50                                                                               | 78.30  | 5                                  | 64                                       | 2                                                                        | 144.9                                                        | 104.2                                                   | 0.1                                                             |
| 15KPA70Ae3 / 15KPA70CAe3   | 78.20                                                                               | 85.60  | 5                                  | 70                                       | 2                                                                        | 132.9                                                        | 113.6                                                   | 0.1                                                             |
| 15KPA75Ae3 / 15KPA75CAe3   | 83.80                                                                               | 91.70  | 5                                  | 75                                       | 2                                                                        | 123.8                                                        | 122.0                                                   | 0.1                                                             |
| 15KPA78Ae3 / 15KPA78CAe3   | 87.10                                                                               | 95.40  | 5                                  | 78                                       | 2                                                                        | 119.7                                                        | 126.1                                                   | 0.1                                                             |
| 15KPA85Ae3 / 15KPA85CAe3   | 94.90                                                                               | 104.00 | 5                                  | 85                                       | 2                                                                        | 109.7                                                        | 137.6                                                   | 0.1                                                             |
| 15KPA90Ae3 / 15KPA90CAe3   | 100.50                                                                              | 110.10 | 5                                  | 90                                       | 2                                                                        | 103.7                                                        | 145.6                                                   | 0.1                                                             |
| 15KPA100Ae3 / 15KPA100CAe3 | 111.70                                                                              | 122.30 | 5                                  | 100                                      | 2                                                                        | 93.6                                                         | 161.3                                                   | 0.1                                                             |
| 15KPA110Ae3 / 15KPA110CAe3 | 122.90                                                                              | 134.50 | 5                                  | 110                                      | 2                                                                        | 84.5                                                         | 178.6                                                   | 0.1                                                             |
| 15KPA120Ae3 / 15KPA120CAe3 | 134.00                                                                              | 146.80 | 5                                  | 120                                      | 2                                                                        | 78.5                                                         | 192.3                                                   | 0.1                                                             |
| 15KPA130Ae3 / 15KPA130CAe3 | 145.20                                                                              | 159.00 | 5                                  | 130                                      | 2                                                                        | 72.5                                                         | 208.3                                                   | 0.1                                                             |
| 15KPA150Ae3 / 15KPA150CAe3 | 167.60                                                                              | 183.50 | 5                                  | 150                                      | 2                                                                        | 62.4                                                         | 241.9                                                   | 0.1                                                             |
| 15KPA160Ae3 / 15KPA160CAe3 | 178.70                                                                              | 195.70 | 5                                  | 160                                      | 2                                                                        | 58.4                                                         | 258.6                                                   | 0.1                                                             |
| 15KPA170Ae3 / 15KPA170CAe3 | 189.90                                                                              | 207.90 | 5                                  | 170                                      | 2                                                                        | 55.4                                                         | 272.7                                                   | 0.1                                                             |
| 15KPA180Ae3 / 15KPA180CAe3 | 201.10                                                                              | 220.10 | 5                                  | 180                                      | 2                                                                        | 52.3                                                         | 288.5                                                   | 0.1                                                             |
| 15KPA200Ae3 / 15KPA200CAe3 | 223.40                                                                              | 244.60 | 5                                  | 200                                      | 2                                                                        | 47.3                                                         | 319.1                                                   | 0.1                                                             |
| 15KPA220Ae3 / 15KPA220CAe3 | 245.70                                                                              | 269.10 | 5                                  | 220                                      | 2                                                                        | 35.2                                                         | 356.0                                                   | 0.1                                                             |
| 15KPA240Ae3 / 15KPA240CAe3 | 268.10                                                                              | 293.50 | 5                                  | 240                                      | 2                                                                        | 39.3                                                         | 384.6                                                   | 0.1                                                             |
| 15KPA260Ae3 / 15KPA260CAe3 | 290.40                                                                              | 318.00 | 5                                  | 260                                      | 2                                                                        | 36.2                                                         | 416.7                                                   | 0.1                                                             |
| 15KPA280Ae3 / 15KPA280CAe3 | 312.80                                                                              | 342.40 | 5                                  | 280                                      | 2                                                                        | 33.2                                                         | 454.5                                                   | 0.1                                                             |

**NOTES:**

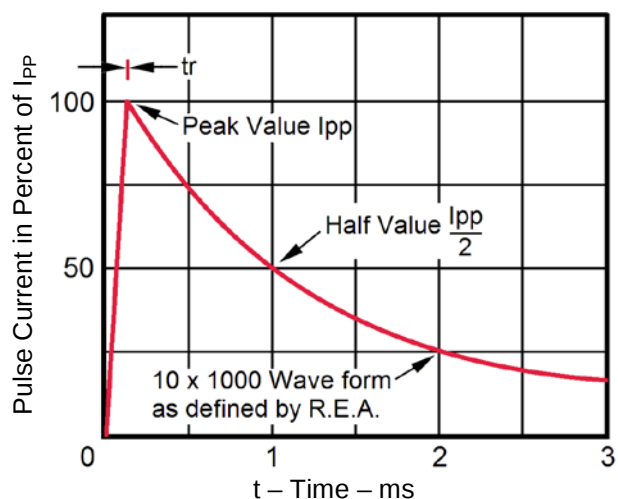
- (1) All ratings at 25 °C unless specified otherwise.
- (2)  $V_{(BR)}$  measured after  $I_{(BR)}$  applied for 300  $\mu$ s,  $I_{(BR)}$  = square wave pulse or equivalent.
- (3) Surge current waveform per [Figure 3](#) and derated per [Figure 2](#).
- (4) For bidirectional types with  $V_{WM}$  of 30 volts and less, the  $I_D$  limit is doubled.

**GRAPHS**


**FIGURE 1**  
Peak Pulse Power Rating Curve



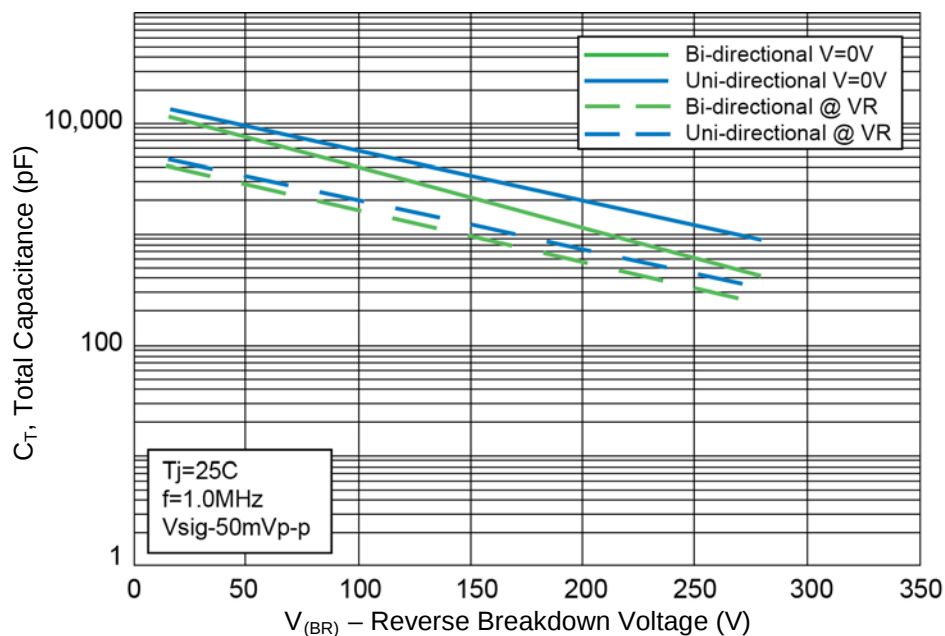
**FIGURE 2**  
Pulse Derating Curve

**GRAPHS (continued)**


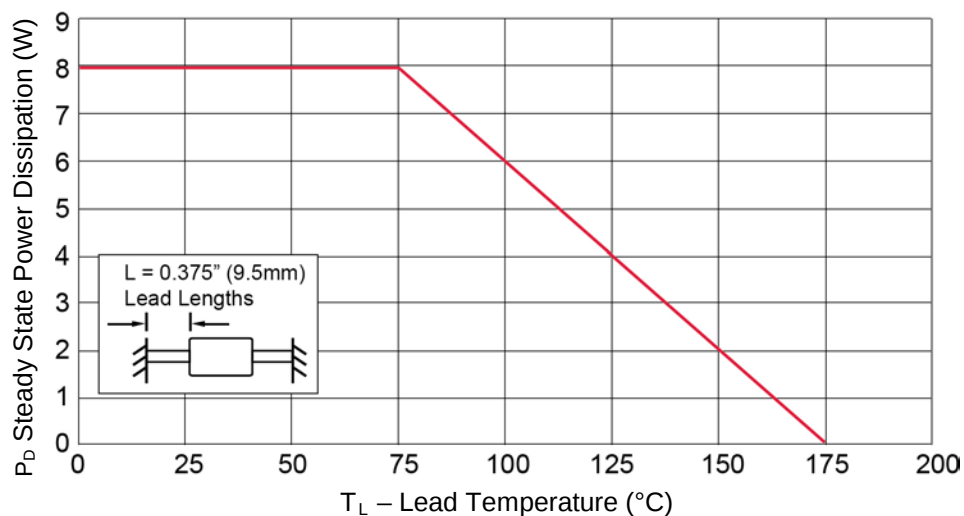
Test waveform parameters:  $t_r=10\ \mu s$ ,  $t_p=1000\ \mu s$

**FIGURE 3**

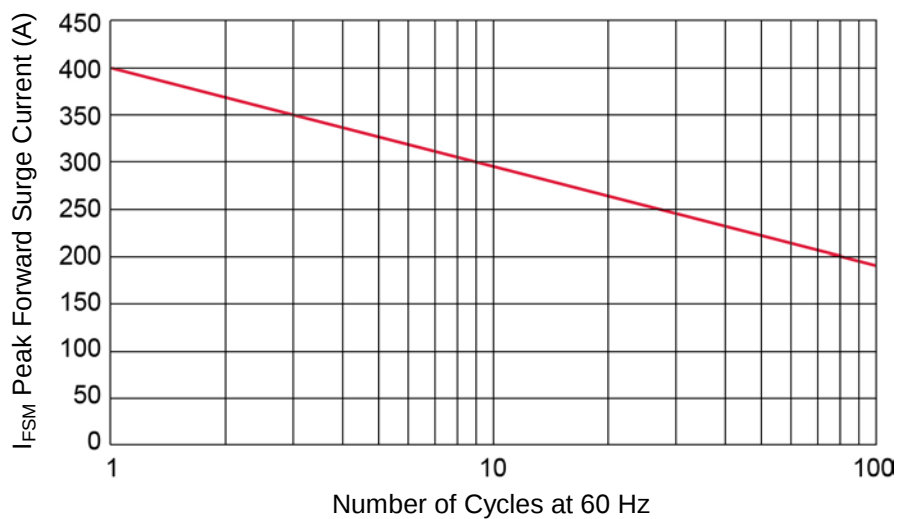
Pulse Waveform for 10/1000 Exponential Surge


**FIGURE 4**

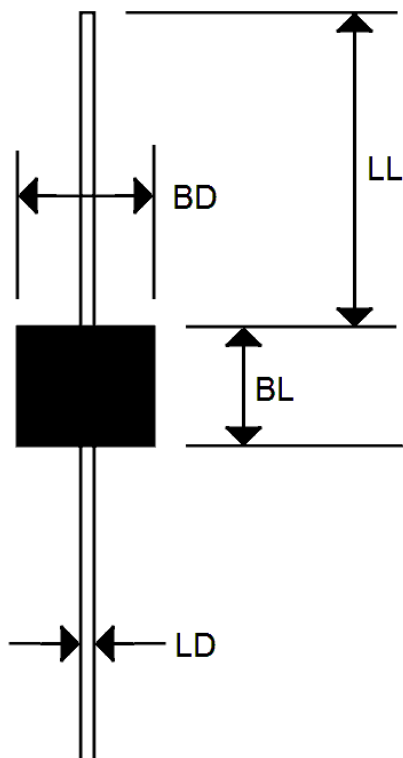
Typical Junction Capacitance

**GRAPHS (continued)**


**FIGURE 5**  
Steady State Power Derating Curve



**FIGURE 6**  
Maximum Non-repetitive Forward Surge Current  
(Unidirectional Devices Only)

**PACKAGE DIMENSIONS**


| Dim       | Dimensions |       |             |       |
|-----------|------------|-------|-------------|-------|
|           | Inch       |       | Millimeters |       |
|           | Min        | Max   | Min         | Max   |
| <b>LL</b> | 0.750      | -     | 19.05       | -     |
| <b>BL</b> | 0.340      | 0.360 | 8.645       | 9.135 |
| <b>BD</b> | 0.340      | 0.360 | 8.645       | 9.135 |
| <b>LD</b> | 0.047      | 0.053 | 1.194       | 1.346 |