



## Voidless Hermetically Sealed Bidirectional Transient Voltage Suppressors

*Qualified to MIL-PRF-19500/516*

*Qualified Levels:  
JAN, JANTX, JANTXV  
and JANS*

### DESCRIPTION

This series of industry recognized voidless, hermetically sealed bidirectional Transient Voltage Suppressors (TVS) are military qualified to MIL-PRF-19500/516 and are ideal for high-reliability applications where a failure cannot be tolerated. They provide a working peak “standoff” voltage selection from 5.2 to 152 Volts with a 1500 W rating for a 10/1000  $\mu$ s pulse. They are very robust in hard-glass construction and use internal Category 1 metallurgical bonds for high reliability. These devices are available as both a non-suffix part and an “A” version part involving different voltage tolerances as described in the [nomenclature](#) section. These devices are also available in a surface mount MELF package configuration.

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

### FEATURES

- High surge current and peak pulse power provides transient voltage protection for sensitive circuits
- Triple-layer passivation
- Internal “Category 1” metallurgical bonds
- Voidless hermetically sealed glass package
- JAN, JANTX, JANTXV and JANS qualified versions are available per MIL-PRF-19500/516. (See [part nomenclature](#) for all available options.)
- RoHS compliant versions available (commercial grade only)

### APPLICATIONS / BENEFITS

- Military and other high-reliability applications
- Extremely robust construction
- Extensive range in working peak “standoff” voltage ( $V_{WM}$ ) from 5.2 to 152 volts
- 1500 watt peak pulse power ( $P_{PP}$ ) for a 10/1000  $\mu$ s test pulse
- ESD and EFT protection per IEC6100-4-2 and IEC61000-4-4 respectively
- Protection from the secondary effects of lightning per select levels in IEC61000-4-5.
- Flexible axial-leaded mounting terminals
- Non-sensitive to ESD per MIL-STD-750 method 1020
- Inherently radiation hard as described in Microsemi “[MicroNote 050](#)”

### MAXIMUM RATINGS @ $T_A = 25^\circ\text{C}$ unless otherwise noted.

| Parameters/Test Conditions                                | Symbol              | Value       | Unit               |
|-----------------------------------------------------------|---------------------|-------------|--------------------|
| Junction and Storage Temperature                          | $T_J$ and $T_{STG}$ | -55 to +175 | $^\circ\text{C}$   |
| Thermal Resistance Junction-to-Lead <sup>(1)</sup>        | $R_{\theta JL}$     | 20          | $^\circ\text{C/W}$ |
| Peak Pulse Power @ $25^\circ\text{C}$                     | $P_{PP}$            | 1500        | W                  |
| Off-State Power @ $T_L = 75^\circ\text{C}$ <sup>(1)</sup> | $P_D$               | 5.0         | W                  |
| Off-State Power @ $T_A = 25^\circ\text{C}$ <sup>(2)</sup> | $P_D$               | 3.0         | W                  |
| Impulse Repetition Rate                                   | df                  | 0.01        | %                  |
| Solder Temperature @ 10 s                                 | $T_{SP}$            | 260         | $^\circ\text{C}$   |

- Notes:**
1. At 3/8 inch lead length from body (see [figure 4](#)).
  2. Steady-state power ratings with reference to ambient are for PC boards where thermal resistance from mounting point to ambient is sufficiently controlled where  $T_{OP}$  or  $T_{J(MAX)}$  is not exceeded (also see [figure 6](#)).



**“C” Package**

Also available in:

**“C” SQ-MELF  
Package**  
(surface mount)



[1N6138US – 1N6173US](#)

#### **MSC – Lawrence**

6 Lake Street,  
Lawrence, MA 01841  
Tel: 1-800-446-1158 or  
(978) 620-2600  
Fax: (978) 689-0803

#### **MSC – Ireland**

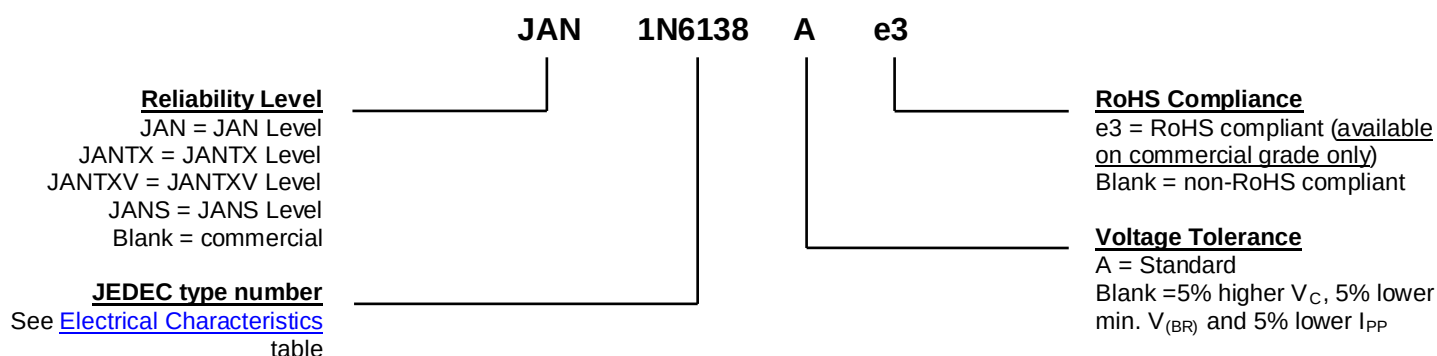
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#### **Website:**

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

**MECHANICAL and PACKAGING**

- CASE: Hermetically sealed voidless hard glass with tungsten slugs
- TERMINALS: Axial-leads are tin/lead over copper. RoHS compliant matte-tin is available on commercial grade only.
- MARKING: Body paint and part number
- POLARITY: No polarity marking for these bidirectional TVSs
- TAPE & REEL option: Standard per EIA-296. Consult factory for quantities.
- WEIGHT: Approximately 1270 milligrams
- See [package dimensions](#) on last page.

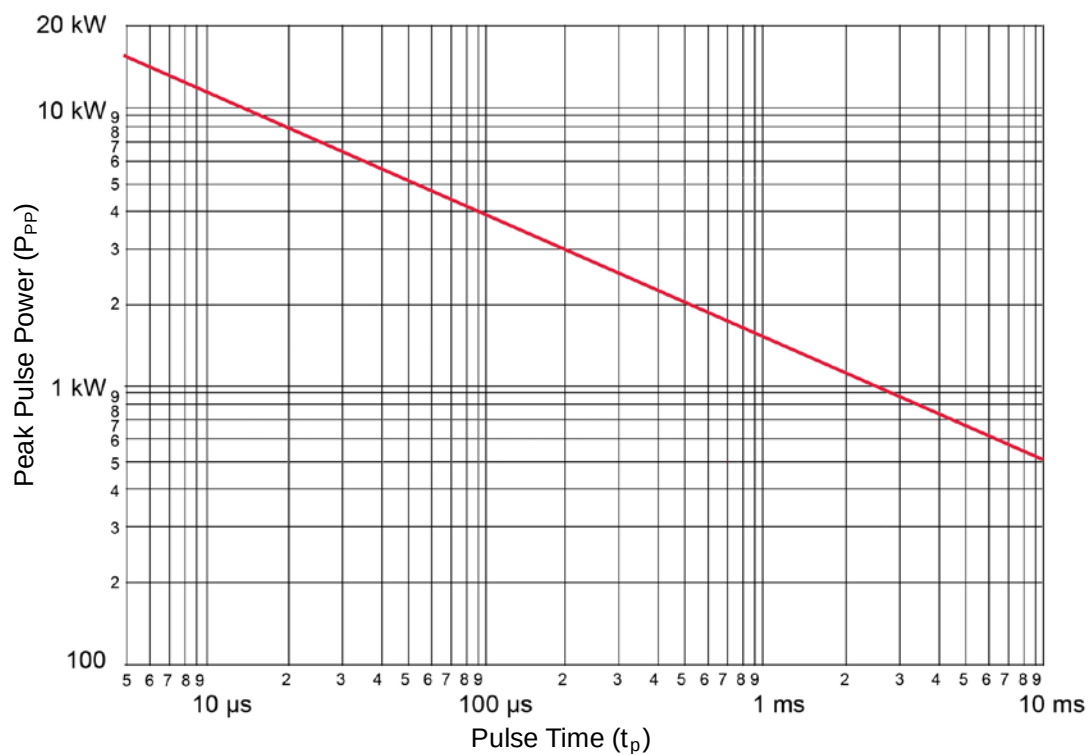
**PART NOMENCLATURE**

**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.                                  |
| $V_{(BR)}$       | Breakdown Voltage: The voltage across the device at a specified current $I_{(BR)}$ in the breakdown region.                                                                                    |
| $V_{WM}$         | 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.         |
| $I_D$            | Standby Current: The current through the device at rated stand-off voltage.                                                                                                                    |
| $V_C$            | 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.                 |
| $P_{PP}$         | 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 $V_C$ . |

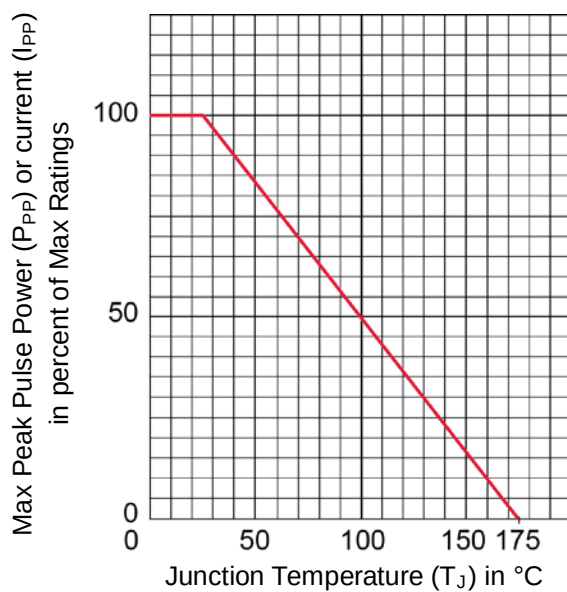
**ELECTRICAL CHARACTERISTICS**

| INDUSTRY<br>TYPE<br>NUMBER<br>(Note 1) | MINIMUM<br>BREAKDOWN<br>VOLTAGE<br>(Note 1) |              | RATED<br>STANDOFF<br>VOLTAGE<br><br>$V_{WM}$ | MAXIMUM<br>STANDBY<br>CURRENT<br><br>$I_D @ V_{WM}$ | MAXIMUM<br>CLAMPING<br>VOLTAGE<br>(Note 1)<br>$V_C @ I_{PP}$ | MAXIMUM<br>PEAK PULSE<br>CURRENT<br>(Note 1)<br>$I_{PP}$ | MAXIMUM<br>TEMP.<br>COEF. OF<br>$V_{(BR)}$<br>$\alpha V_{(BR)}$ |
|----------------------------------------|---------------------------------------------|--------------|----------------------------------------------|-----------------------------------------------------|--------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------------------------------|
|                                        | $V_{(BR)}$                                  | @ $I_{(BR)}$ |                                              |                                                     |                                                              |                                                          |                                                                 |
|                                        | Volts                                       | mA           |                                              |                                                     |                                                              |                                                          |                                                                 |
| 1N6138A                                | 6.46                                        | 175          | 5.2                                          | 500                                                 | 10.5                                                         | 142.8                                                    | 0.05                                                            |
| 1N6139A                                | 7.13                                        | 175          | 5.7                                          | 300                                                 | 11.2                                                         | 133.9                                                    | .06                                                             |
| 1N6140A                                | 7.79                                        | 150          | 6.2                                          | 100                                                 | 12.1                                                         | 124.0                                                    | .06                                                             |
| 1N6141A                                | 8.65                                        | 150          | 6.9                                          | 100                                                 | 13.4                                                         | 111.9                                                    | .06                                                             |
| 1N6142A                                | 9.50                                        | 125          | 7.6                                          | 100                                                 | 14.5                                                         | 103.4                                                    | .07                                                             |
| 1N6143A                                | 10.45                                       | 125          | 8.4                                          | 20                                                  | 15.6                                                         | 96.2                                                     | .07                                                             |
| 1N6144A                                | 11.40                                       | 100          | 9.1                                          | 20                                                  | 16.9                                                         | 88.8                                                     | .07                                                             |
| 1N6145A                                | 12.35                                       | 100          | 9.9                                          | 20                                                  | 18.2                                                         | 82.4                                                     | .08                                                             |
| 1N6146A                                | 14.25                                       | 75           | 11.4                                         | 20                                                  | 21.0                                                         | 71.4                                                     | .08                                                             |
| 1N6147A                                | 15.20                                       | 75           | 12.2                                         | 20                                                  | 22.3                                                         | 67.3                                                     | .08                                                             |
| 1N6148A                                | 17.10                                       | 65           | 13.7                                         | 10                                                  | 25.1                                                         | 59.8                                                     | .085                                                            |
| 1N6149A                                | 19.0                                        | 65           | 15.2                                         | 5                                                   | 27.7                                                         | 54.2                                                     | .085                                                            |
| 1N6150A                                | 20.9                                        | 50           | 16.7                                         | 5                                                   | 30.5                                                         | 49.2                                                     | .085                                                            |
| 1N6151A                                | 22.8                                        | 50           | 18.2                                         | 5                                                   | 33.3                                                         | 45.0                                                     | .09                                                             |
| 1N6152A                                | 25.7                                        | 50           | 20.6                                         | 5                                                   | 37.4                                                         | 40.1                                                     | .09                                                             |
| 1N6153A                                | 28.5                                        | 40           | 22.8                                         | 5                                                   | 41.6                                                         | 36.0                                                     | .09                                                             |
| 1N6154A                                | 31.4                                        | 40           | 25.1                                         | 5                                                   | 45.7                                                         | 32.8                                                     | .095                                                            |
| 1N6155A                                | 34.2                                        | 30           | 27.4                                         | 5                                                   | 49.9                                                         | 30.1                                                     | .095                                                            |
| 1N6156A                                | 37.1                                        | 30           | 29.7                                         | 5                                                   | 53.6                                                         | 28.0                                                     | .095                                                            |
| 1N6157A                                | 40.9                                        | 30           | 32.7                                         | 5                                                   | 59.1                                                         | 25.4                                                     | .095                                                            |
| 1N6158A                                | 44.7                                        | 25           | 35.8                                         | 5                                                   | 64.6                                                         | 23.2                                                     | .095                                                            |
| 1N6159A                                | 48.5                                        | 25           | 38.8                                         | 5                                                   | 70.1                                                         | 21.4                                                     | .095                                                            |
| 1N6160A                                | 53.2                                        | 20           | 42.6                                         | 5                                                   | 77.0                                                         | 19.5                                                     | .095                                                            |
| 1N6161A                                | 58.9                                        | 20           | 47.1                                         | 5                                                   | 85.3                                                         | 17.6                                                     | .100                                                            |
| 1N6162A                                | 64.6                                        | 20           | 51.7                                         | 5                                                   | 97.1                                                         | 15.4                                                     | .100                                                            |
| 1N6163A                                | 71.3                                        | 20           | 56.0                                         | 5                                                   | 103.1                                                        | 14.5                                                     | .100                                                            |
| 1N6164A                                | 77.9                                        | 15           | 62.2                                         | 5                                                   | 112.8                                                        | 13.3                                                     | .100                                                            |
| 1N6165A                                | 86.5                                        | 15           | 69.2                                         | 5                                                   | 125.1                                                        | 12.0                                                     | .100                                                            |
| 1N6166A                                | 95.0                                        | 12           | 76.0                                         | 5                                                   | 137.6                                                        | 10.9                                                     | .100                                                            |
| 1N6167A                                | 104.5                                       | 12           | 86.6                                         | 5                                                   | 151.3                                                        | 9.9                                                      | .100                                                            |
| 1N6168A                                | 114.0                                       | 10           | 91.2                                         | 5                                                   | 165.1                                                        | 9.1                                                      | .100                                                            |
| 1N6169A                                | 123.5                                       | 10           | 98.8                                         | 5                                                   | 178.8                                                        | 8.4                                                      | .105                                                            |
| 1N6170A                                | 142.5                                       | 8            | 114.0                                        | 5                                                   | 206.3                                                        | 7.3                                                      | .105                                                            |
| 1N6171A                                | 152.0                                       | 8            | 121.6                                        | 5                                                   | 218.4                                                        | 6.9                                                      | .105                                                            |
| 1N6172A                                | 171.0                                       | 5            | 136.8                                        | 5                                                   | 245.7                                                        | 6.1                                                      | .110                                                            |
| 1N6173A                                | 190.0                                       | 5            | 152.0                                        | 5                                                   | 273.0                                                        | 5.5                                                      | .110                                                            |

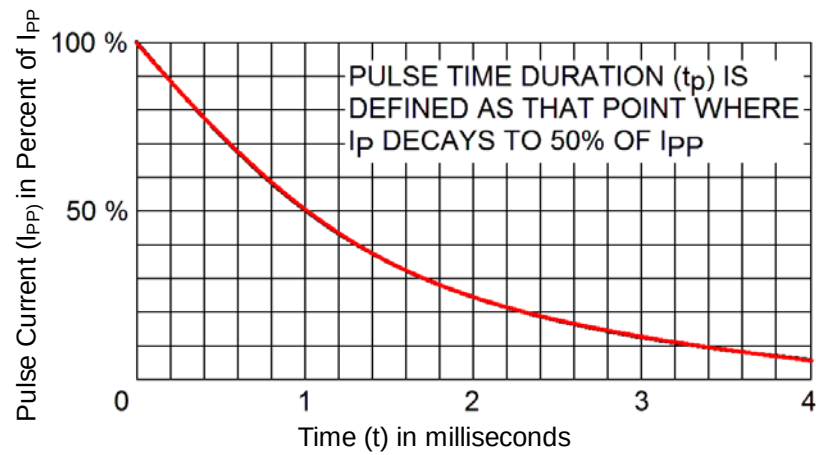
**Notes:** 1. Part number without the A suffix has 5% higher  $V_C$ , 5% lower minimum  $V_{(BR)}$ , and 5% lower  $I_{PP}$ .

**GRAPHS**


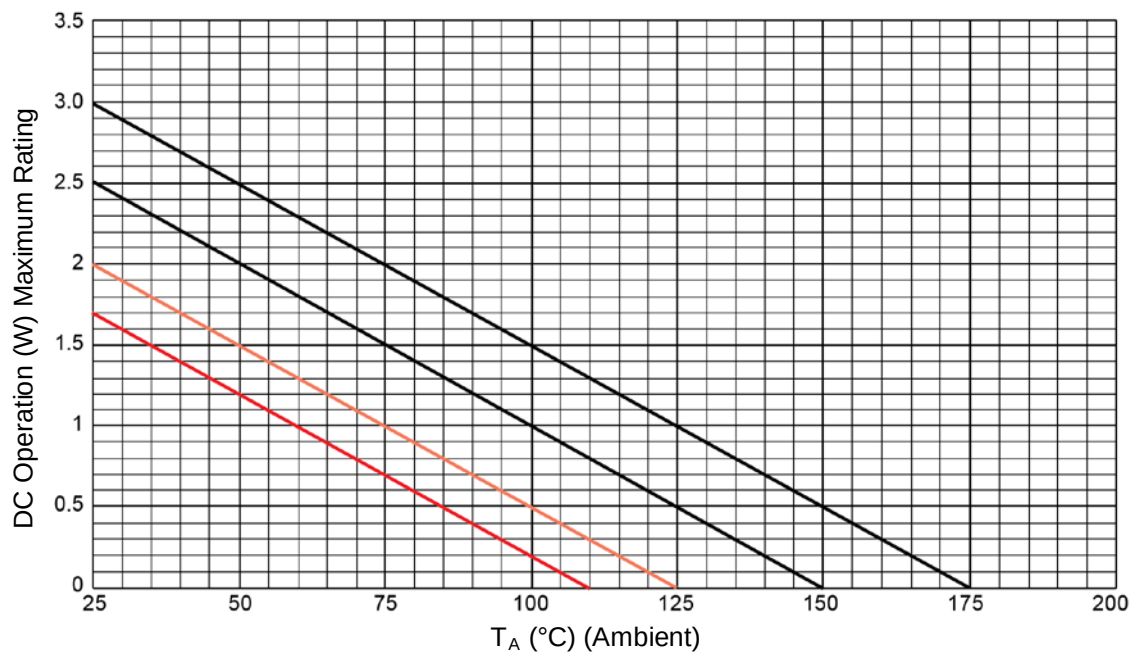
**FIGURE 1**  
Peak Pulse Power vs. Pulse Time



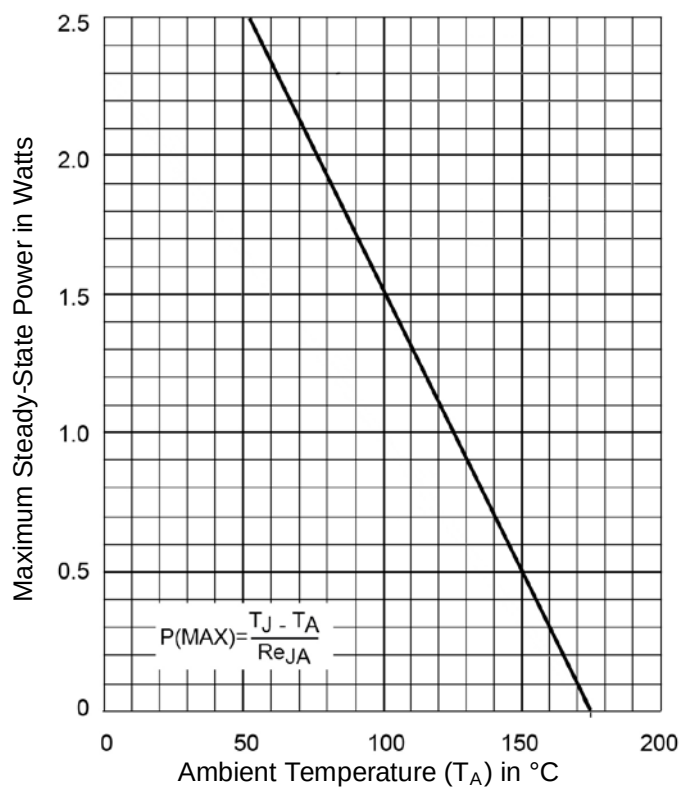
**FIGURE 2**  
Peak Pulse Power vs  $T_J$  (prior to impulse)

**GRAPHS**


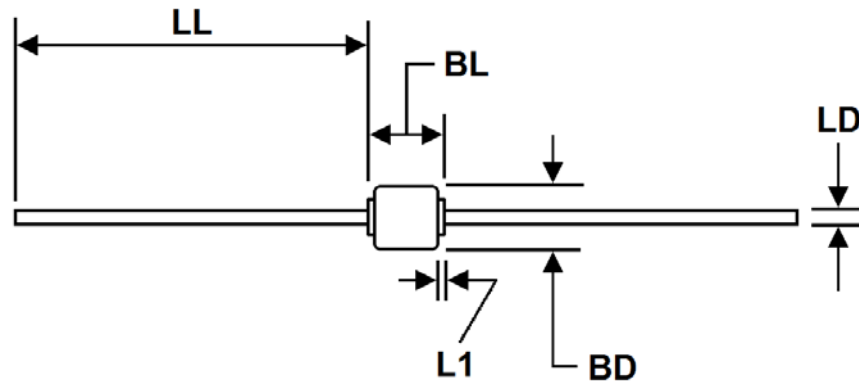
**FIGURE 3**  
Pulse Wave Form



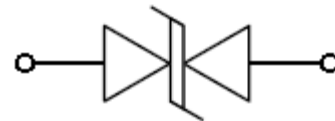
**FIGURE 4**  
Temperature-Power Derating Curve

**GRAPHS**


**FIGURE 5**  
Steady-State Derating Curve for Free-Air Mounting ( $R_{\theta JA} = 50\text{ }^{\circ}\text{C/W}$ )

**PACKAGE DIMENSIONS**


| Ltr | Dimensions |       |             |       | Notes |
|-----|------------|-------|-------------|-------|-------|
|     | Inches     |       | Millimeters |       |       |
|     | Min        | Max   | Min         | Max   |       |
| BD  | 0.135      | 0.185 | 3.43        | 4.70  | 3     |
| BL  | 0.140      | 0.195 | 3.56        | 4.95  |       |
| LD  | 0.036      | 0.042 | 0.91        | 1.07  |       |
| LL  | 1.00       | 1.30  | 25.4        | 33.02 |       |
| L1  | -          | 0.030 | -           | 0.76  | 4     |



Schematic Symbol

**NOTES:**

1. Dimensions are in inches.
2. Millimeters are given for general information only.
3. Dimension BD shall be measured at the largest diameter.
4. Dimension L1 lead diameter uncontrolled in this area.
5. In accordance with ASME Y14.5M, diameters are equivalent to  $\Phi$ x symbology.