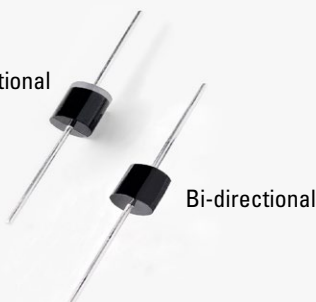


### 3KP Series

**OBSOLETE** DATE: 03/31/2017 PCN/ECN#\_LFPCN21244  
REPLACED BY: 5KP Series



Uni-directional



Bi-directional

#### Agency Approvals

| AGENCY                                                                            | AGENCY FILE NUMBER |
|-----------------------------------------------------------------------------------|--------------------|
|  | E230531            |

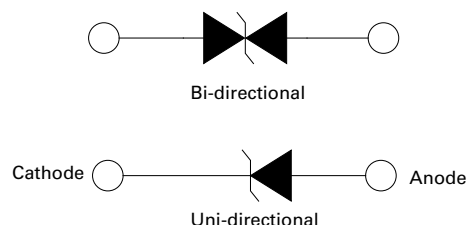
#### Maximum Ratings and Thermal Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Parameter                                                                            | Symbol                            | Value      | Unit |
|--------------------------------------------------------------------------------------|-----------------------------------|------------|------|
| Peak Pulse Power Dissipation by 10/1000µs Test Waveform (Fig.2) (Note 1), (Note 4)   | P <sub>PPM</sub>                  | 3000       | W    |
| Steady State Power Dissipation on Infinite Heat Sink at T <sub>L</sub> =75°C         | P <sub>D</sub>                    | 7.0        | W    |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional Only (Note 2) | I <sub>FSM</sub>                  | 300        | A    |
| Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only (Note 3)       | V <sub>F</sub>                    | 3.5/5.0    | V    |
| Operating Junction and Storage Temperature Range                                     | T <sub>J</sub> , T <sub>STG</sub> | -55 to 175 | °C   |
| Typical Thermal Resistance Junction to Lead                                          | R <sub>θJL</sub>                  | 8.0        | °C/W |
| Typical Thermal Resistance Junction to Ambient                                       | R <sub>θJA</sub>                  | 40         | °C/W |

#### Notes:

- Non-repetitive current pulse, per Fig. 4 and derated above T<sub>J</sub> (initial) = 25°C per Fig. 3.
- Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 per minute maximum.
- V<sub>F</sub> < 3.5V for single die parts and V<sub>F</sub> < 5.0V for stacked-die parts.
- The P<sub>PPM</sub> of stacked-die parts is 4kW and please contact littelfuse for the detail stacked-die parts.

#### Functional Diagram



#### Description

The 3KP Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

#### Features

- 3000W peak pulse capability at 10/1000µs waveform, repetition rate (duty cycles):0.01 %
- Glass passivated chip junction in P600 package
- Fast response time: typically less than 1.0ps from 0 Volts to BV min
- Excellent clamping capability
- Typical failure mode is short from over-specified voltage or current
- Whisker test is conducted based on JEDEC JESD201A per its table 4a and 4c
- IEC-61000-4-2 ESD 30kV(Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Low incremental surge resistance
- Typical I<sub>R</sub> less than 2µA when V<sub>BR</sub> min>12V
- High temperature to reflow soldering guaranteed: 260°C/40sec / 0.375" (9.5mm) lead length, 5 lbs., (2.3kg) tension
- V<sub>BR</sub> @ T<sub>J</sub> = V<sub>BR</sub> @ 25°C x (1 + α T x (T<sub>J</sub> - 25)) (α T: Temperature Coefficient, typical value is 0.1%)
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- Matte tin lead-free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

#### Applications

TVS devices are ideal for the protection of I/O interfaces, V<sub>CC</sub> bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.

#### Additional Information



Datasheet



Resources



Samples

# Transient Voltage Suppression Diodes

Axial Leaded – 3000W > 3KP series

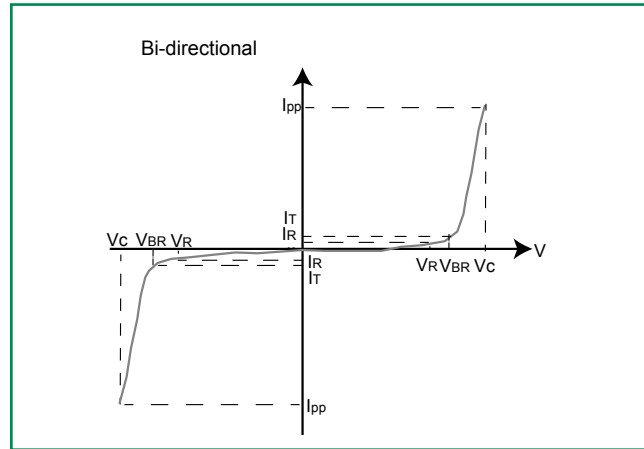
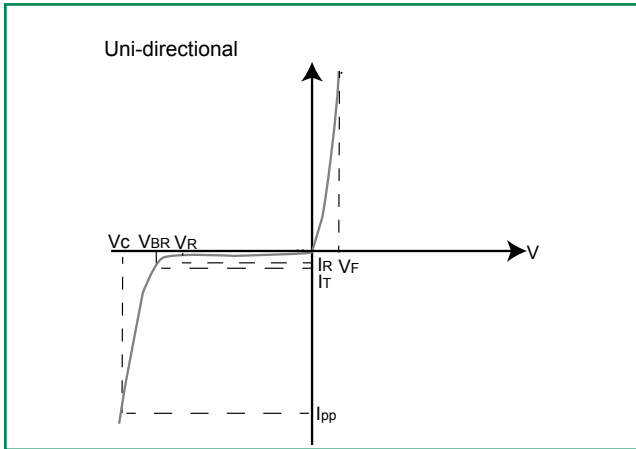
## Electrical Characteristics ( $T_A=25^{\circ}\text{C}$ unless otherwise noted)

| Part Number (Uni) | Part Number (Bi) | Reverse Stand off Voltage $V_R$ (Volts) | Breakdown Voltage $V_{BR}$ (Volts) @ $I_T$ |        | Test Current $I_T$ (mA) | Maximum Clamping Voltage $V_C$ @ $I_{PP}$ (V) | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Reverse Leakage $I_R$ @ $V_R$ ( $\mu\text{A}$ ) | Agency Approval  |
|-------------------|------------------|-----------------------------------------|--------------------------------------------|--------|-------------------------|-----------------------------------------------|-----------------------------------------|---------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|                   |                  |                                         | MIN                                        | MAX    |                         |                                               |                                         |                                                         |                                                                                                     |
| 3KP5.0A           | 3KP5.0CA         | 5.0                                     | 6.40                                       | 7.00   | 50                      | 9.2                                           | 326.1                                   | 5000                                                    | X                                                                                                   |
| 3KP6.0A           | 3KP6.0CA         | 6.0                                     | 6.67                                       | 7.37   | 50                      | 10.3                                          | 291.3                                   | 5000                                                    | X                                                                                                   |
| 3KP6.5A           | 3KP6.5CA         | 6.5                                     | 7.22                                       | 7.98   | 50                      | 11.2                                          | 267.9                                   | 2000                                                    | X                                                                                                   |
| 3KP7.0A           | 3KP7.0CA         | 7.0                                     | 7.78                                       | 8.60   | 50                      | 12.0                                          | 250.0                                   | 1000                                                    | X                                                                                                   |
| 3KP7.5A           | 3KP7.5CA         | 7.5                                     | 8.33                                       | 9.21   | 5                       | 12.9                                          | 232.6                                   | 250                                                     | X                                                                                                   |
| 3KP8.0A           | 3KP8.0CA         | 8.0                                     | 8.89                                       | 9.83   | 5                       | 13.6                                          | 220.6                                   | 150                                                     | X                                                                                                   |
| 3KP8.5A           | 3KP8.5CA         | 8.5                                     | 9.44                                       | 10.40  | 5                       | 14.4                                          | 208.3                                   | 50                                                      | X                                                                                                   |
| 3KP9.0A           | 3KP9.0CA         | 9.0                                     | 10.00                                      | 11.10  | 5                       | 15.4                                          | 194.8                                   | 20                                                      | X                                                                                                   |
| 3KP10A            | 3KP10CA          | 10.0                                    | 11.10                                      | 12.30  | 5                       | 17.0                                          | 176.5                                   | 15                                                      | X                                                                                                   |
| 3KP11A            | 3KP11CA          | 11.0                                    | 12.20                                      | 13.50  | 5                       | 18.2                                          | 164.8                                   | 2                                                       | X                                                                                                   |
| 3KP12A            | 3KP12CA          | 12.0                                    | 13.30                                      | 14.70  | 5                       | 19.9                                          | 150.8                                   | 2                                                       | X                                                                                                   |
| 3KP13A            | 3KP13CA          | 13.0                                    | 14.40                                      | 15.90  | 5                       | 21.5                                          | 139.5                                   | 2                                                       | X                                                                                                   |
| 3KP14A            | 3KP14CA          | 14.0                                    | 15.60                                      | 17.20  | 5                       | 23.2                                          | 129.3                                   | 2                                                       | X                                                                                                   |
| 3KP15A            | 3KP15CA          | 15.0                                    | 16.70                                      | 18.50  | 5                       | 24.4                                          | 123.0                                   | 2                                                       | X                                                                                                   |
| 3KP16A            | 3KP16CA          | 16.0                                    | 17.80                                      | 19.70  | 5                       | 26.0                                          | 115.4                                   | 2                                                       | X                                                                                                   |
| 3KP17A            | 3KP17CA          | 17.0                                    | 18.90                                      | 20.90  | 5                       | 27.6                                          | 108.7                                   | 2                                                       | X                                                                                                   |
| 3KP18A            | 3KP18CA          | 18.0                                    | 20.00                                      | 22.10  | 5                       | 29.2                                          | 102.7                                   | 2                                                       | X                                                                                                   |
| 3KP20A            | 3KP20CA          | 20.0                                    | 22.20                                      | 24.50  | 5                       | 32.4                                          | 92.6                                    | 2                                                       | X                                                                                                   |
| 3KP22A            | 3KP22CA          | 22.0                                    | 24.40                                      | 26.90  | 5                       | 35.5                                          | 84.5                                    | 2                                                       | X                                                                                                   |
| 3KP24A            | 3KP24CA          | 24.0                                    | 26.70                                      | 29.50  | 5                       | 38.9                                          | 77.1                                    | 2                                                       | X                                                                                                   |
| 3KP26A            | 3KP26CA          | 26.0                                    | 28.90                                      | 31.90  | 5                       | 42.1                                          | 71.3                                    | 2                                                       | X                                                                                                   |
| 3KP28A            | 3KP28CA          | 28.0                                    | 31.10                                      | 34.40  | 5                       | 45.4                                          | 66.1                                    | 2                                                       | X                                                                                                   |
| 3KP30A            | 3KP30CA          | 30.0                                    | 33.30                                      | 36.80  | 5                       | 48.4                                          | 62.0                                    | 2                                                       | X                                                                                                   |
| 3KP33A            | 3KP33CA          | 33.0                                    | 36.70                                      | 40.60  | 5                       | 53.3                                          | 56.3                                    | 2                                                       | X                                                                                                   |
| 3KP36A            | 3KP36CA          | 36.0                                    | 40.00                                      | 44.20  | 5                       | 58.1                                          | 51.6                                    | 2                                                       | X                                                                                                   |
| 3KP40A            | 3KP40CA          | 40.0                                    | 44.40                                      | 49.10  | 5                       | 64.5                                          | 46.5                                    | 2                                                       | X                                                                                                   |
| 3KP43A            | 3KP43CA          | 43.0                                    | 47.80                                      | 52.80  | 5                       | 69.4                                          | 43.2                                    | 2                                                       | X                                                                                                   |
| 3KP45A            | 3KP45CA          | 45.0                                    | 50.00                                      | 55.30  | 5                       | 72.7                                          | 41.3                                    | 2                                                       | X                                                                                                   |
| 3KP48A            | 3KP48CA          | 48.0                                    | 53.30                                      | 58.90  | 5                       | 77.4                                          | 38.8                                    | 2                                                       | X                                                                                                   |
| 3KP51A            | 3KP51CA          | 51.0                                    | 56.70                                      | 62.70  | 5                       | 82.4                                          | 36.4                                    | 2                                                       | X                                                                                                   |
| 3KP54A            | 3KP54CA          | 54.0                                    | 60.00                                      | 66.30  | 5                       | 87.1                                          | 34.4                                    | 2                                                       | X                                                                                                   |
| 3KP58A            | 3KP58CA          | 58.0                                    | 64.40                                      | 71.20  | 5                       | 93.6                                          | 32.1                                    | 2                                                       | X                                                                                                   |
| 3KP60A            | 3KP60CA          | 60.0                                    | 66.70                                      | 73.70  | 5                       | 96.8                                          | 31.0                                    | 2                                                       | X                                                                                                   |
| 3KP64A            | 3KP64CA          | 64.0                                    | 71.10                                      | 78.60  | 5                       | 103.0                                         | 29.1                                    | 2                                                       | X                                                                                                   |
| 3KP70A            | 3KP70CA          | 70.0                                    | 77.80                                      | 86.00  | 5                       | 113.0                                         | 26.5                                    | 2                                                       | X                                                                                                   |
| 3KP75A            | 3KP75CA          | 75.0                                    | 83.30                                      | 92.10  | 5                       | 121.0                                         | 24.8                                    | 2                                                       | X                                                                                                   |
| 3KP78A            | 3KP78CA          | 78.0                                    | 86.70                                      | 95.80  | 5                       | 126.0                                         | 23.8                                    | 2                                                       | X                                                                                                   |
| 3KP85A            | 3KP85CA          | 85.0                                    | 94.40                                      | 104.00 | 5                       | 137.0                                         | 21.9                                    | 2                                                       | X                                                                                                   |
| 3KP90A            | 3KP90CA          | 90.0                                    | 100.00                                     | 111.00 | 5                       | 146.0                                         | 20.5                                    | 2                                                       | X                                                                                                   |
| 3KP100A           | 3KP100CA         | 100.0                                   | 111.00                                     | 123.00 | 5                       | 162.0                                         | 18.5                                    | 2                                                       | X                                                                                                   |
| 3KP110A           | 3KP110CA         | 110.0                                   | 122.00                                     | 135.00 | 5                       | 177.0                                         | 16.9                                    | 2                                                       | X                                                                                                   |
| 3KP120A           | 3KP120CA         | 120.0                                   | 133.00                                     | 147.00 | 5                       | 193.0                                         | 15.5                                    | 2                                                       | X                                                                                                   |
| 3KP130A           | 3KP130CA         | 130.0                                   | 144.00                                     | 159.00 | 5                       | 209.0                                         | 14.4                                    | 2                                                       | X                                                                                                   |
| 3KP150A           | 3KP150CA         | 150.0                                   | 167.00                                     | 185.00 | 5                       | 243.0                                         | 12.3                                    | 2                                                       | X                                                                                                   |
| 3KP160A           | 3KP160CA         | 160.0                                   | 178.00                                     | 197.00 | 5                       | 259.0                                         | 11.6                                    | 2                                                       | X                                                                                                   |
| 3KP170A           | 3KP170CA         | 170.0                                   | 189.00                                     | 209.00 | 5                       | 275.0                                         | 10.9                                    | 2                                                       | X                                                                                                   |
| 3KP180A           | 3KP180CA         | 180.0                                   | 200.00                                     | 221.00 | 5                       | 289.0                                         | 10.4                                    | 2                                                       | X                                                                                                   |
| 3KP190A           | 3KP190CA         | 190.0                                   | 211.00                                     | 233.00 | 5                       | 310.0                                         | 9.7                                     | 2                                                       | X                                                                                                   |
| 3KP200A           | 3KP200CA         | 200.0                                   | 222.00                                     | 246.00 | 5                       | 329.2                                         | 9.1                                     | 2                                                       | X                                                                                                   |
| 3KP210A           | 3KP210CA         | 210.0                                   | 233.00                                     | 258.00 | 5                       | 349.5                                         | 8.6                                     | 2                                                       | X                                                                                                   |
| 3KP220A           | 3KP220CA         | 220.0                                   | 244.00                                     | 270.00 | 5                       | 371.1                                         | 8.1                                     | 2                                                       | X                                                                                                   |

For parts without A, the  $V_{BR}$  is  $\pm 10\%$  and  $V_C$  is 5% higher than with A parts

For bidirectional type having  $V_R$  of 10 volts and less, the  $I_R$  limit is double.

### I-V Curve Characteristics



**P<sub>PPM</sub>** Peak Pulse Power Dissipation – Max power dissipation

**V<sub>S</sub>** Stand-off Voltage – Maximum voltage that can be applied to the TVS without operation

**V<sub>BR</sub>** Breakdown Voltage – Maximum voltage that flows through the TVS at a specified test current (I<sub>T</sub>)

**V<sub>C</sub>** Clamping Voltage – Peak voltage measured across the TVS at a specified I<sub>ppm</sub> (peak impulse current)

**I<sub>R</sub>** Reverse Leakage Current – Current measured at V<sub>R</sub>

**V<sub>F</sub>** Forward Voltage Drop for Uni-directional

### Ratings and Characteristic Curves (T<sub>A</sub>=25°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

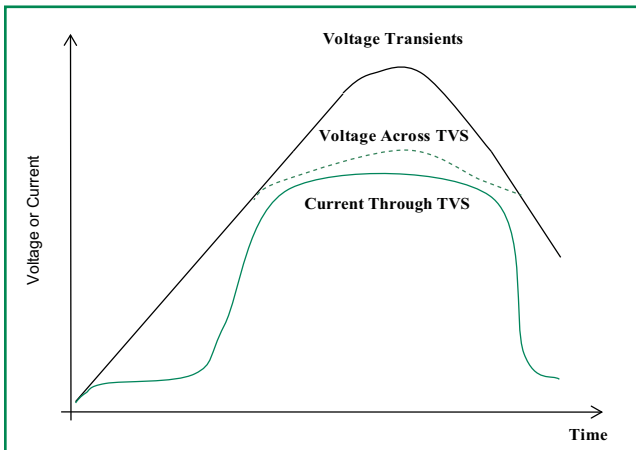
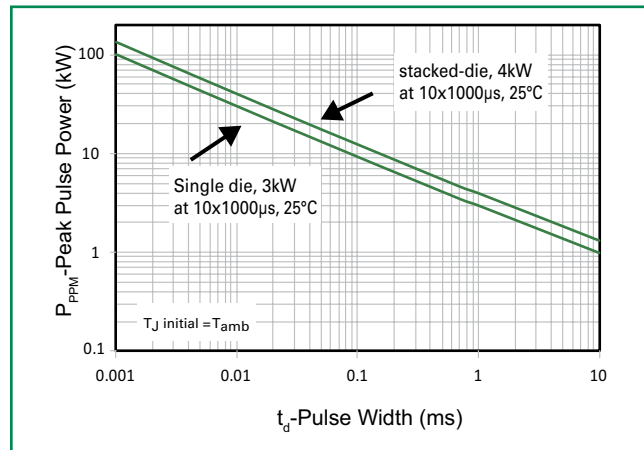


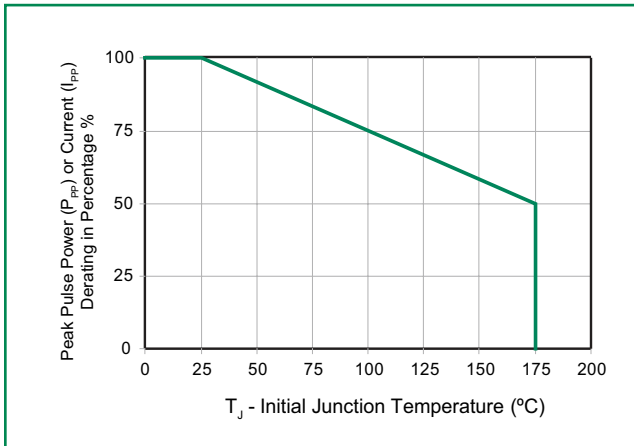
Figure 2 - Peak Pulse Power Rating Curve



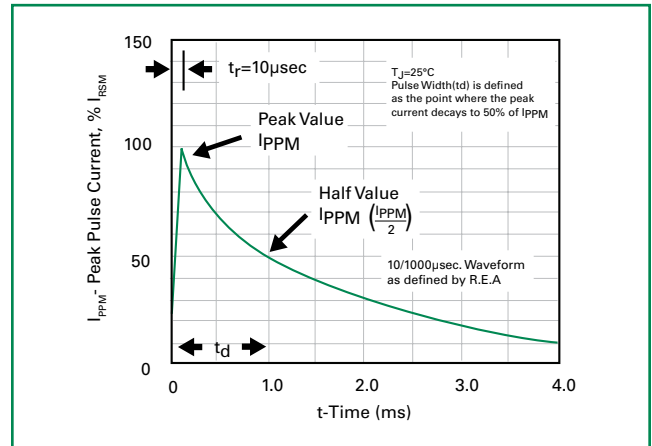
continues on next page.

### Ratings and Characteristic Curves ( $T_A=25^\circ\text{C}$ unless otherwise noted) (Continued)

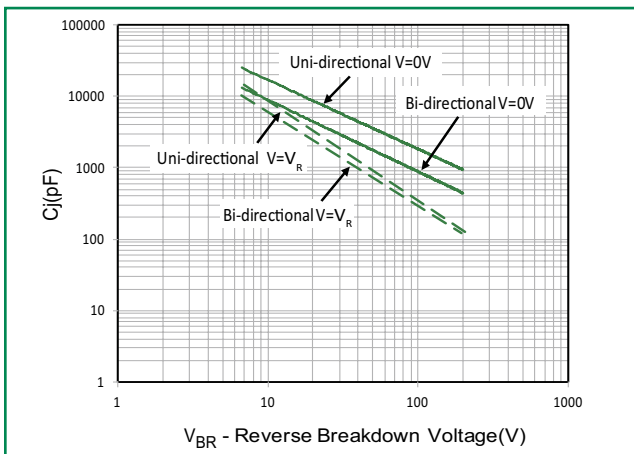
**Figure 3 - Peak Pulse Power Derating Curve**



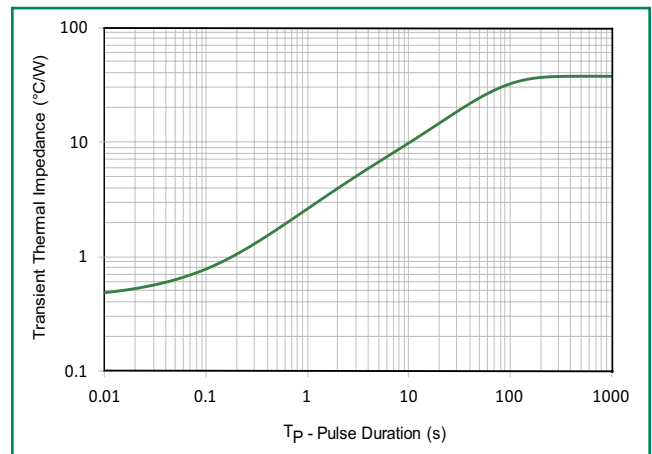
**Figure 4 - Pulse Waveform**



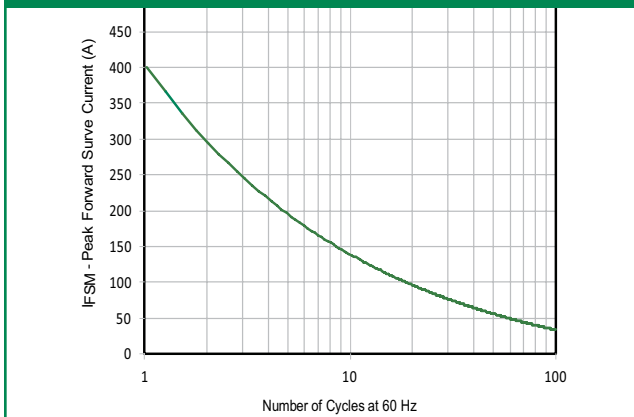
**Figure 5 - Typical Junction Capacitance**



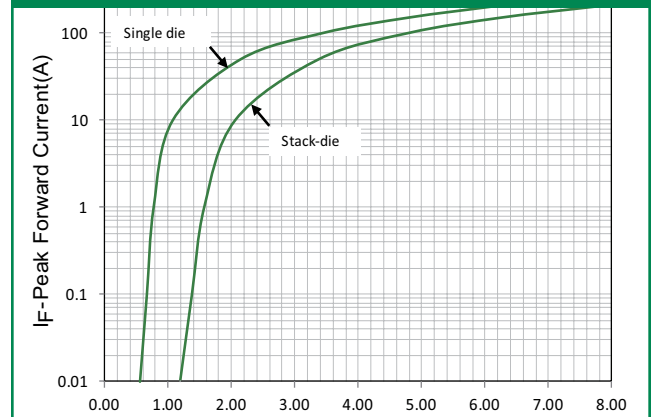
**Figure 6 - Typical Transient Thermal Impedance**



**Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only**

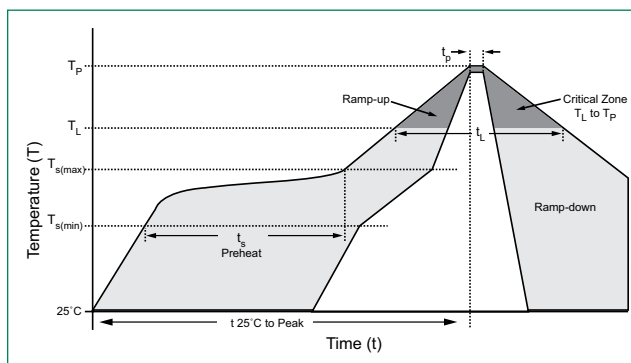


**Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)**



### Soldering Parameters

|                                                        |                                    |                         |
|--------------------------------------------------------|------------------------------------|-------------------------|
| Reflow Condition                                       |                                    | Lead-free assembly      |
| Pre Heat                                               | - Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|                                                        | - Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|                                                        | - Time (min to max) ( $t_s$ )      | 60 – 180 secs           |
| Average ramp up rate (Liquidus Temp ( $T_A$ ) to peak) |                                    | 3°C/second max          |
| $T_{s(max)}$ to $T_A$ - Ramp-up Rate                   |                                    | 3°C/second max          |
| Reflow                                                 | - Temperature ( $T_A$ ) (Liquidus) | 217°C                   |
|                                                        | - Time (min to max) ( $t_s$ )      | 60 – 150 seconds        |
| Peak Temperature ( $T_p$ )                             |                                    | 260 <sup>+0/-5</sup> °C |
| Time within 5°C of actual peak Temperature ( $t_p$ )   |                                    | 20 – 40 seconds         |
| Ramp-down Rate                                         |                                    | 6°C/second max          |
| Time 25°C to peak Temperature ( $T_p$ )                |                                    | 8 minutes Max.          |
| Do not exceed                                          |                                    | 260°C                   |



### Flow/Wave Soldering (Solder Dipping)

|                           |            |
|---------------------------|------------|
| <b>Peak Temperature :</b> | 265°C      |
| <b>Dipping Time :</b>     | 10 seconds |
| <b>Soldering :</b>        | 1 time     |

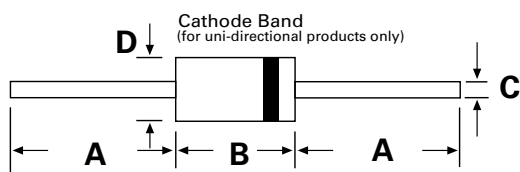
### Physical Specifications

|                 |                                                    |
|-----------------|----------------------------------------------------|
| <b>Weight</b>   | 0.07oz., 2.1g                                      |
| <b>Case</b>     | P600 molded plastic body over passivated junction. |
| <b>Polarity</b> | Color band denotes the cathode except Bipolar.     |
| <b>Terminal</b> | Matte Tin axial leads, solderable per JESD22-B102. |

### Environmental Specifications

|                            |             |
|----------------------------|-------------|
| <b>High Temp. Storage</b>  | JESD22-A103 |
| <b>HTRB</b>                | JESD22-A108 |
| <b>Temperature Cycling</b> | JESD22-A104 |
| <b>H3TRB</b>               | JESD22-A101 |
| <b>RSH</b>                 | JESD22-B106 |

### Dimensions



**P600**

| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| A          | 1.000  | -     | 25.40       | -    |
| B          | 0.340  | 0.360 | 8.60        | 9.10 |
| C          | 0.048  | 0.052 | 1.22        | 1.32 |
| D          | 0.340  | 0.360 | 8.60        | 9.10 |

# Transient Voltage Suppression Diodes

Axial Leaded – 3000W > 3KP series

## Part Numbering System

**3KPxxxXXX**

**OPTION CODE:**

**BLANK** Reel Tape

**-B** Bulk Packaging

**TYPE CODE:**

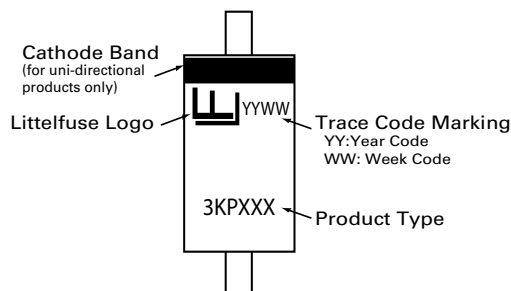
**A** Uni-Directional (5%  $V_{BR}$  Voltage Tolerance)

**CA** Bi-Directional (5%  $V_{BR}$  Voltage Tolerance)

$V_R$  VOLTAGE

**SERIES CODE**

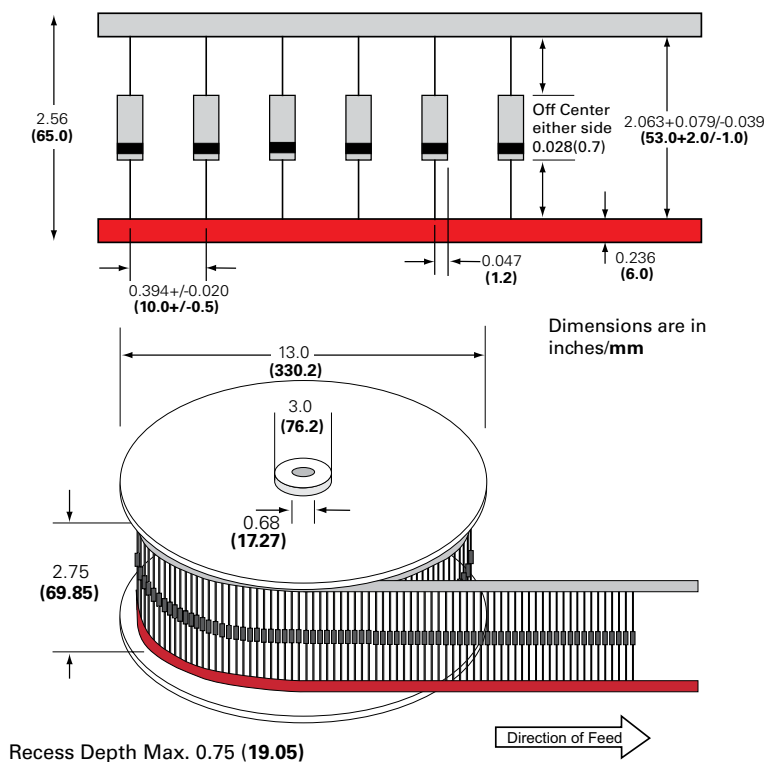
## Part Marking System



## Packing Options

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|-------------|-------------------|----------|------------------|-------------------------|
| 3KPxxxXX    | P600              | 800      | Tape & Reel      | EIA STD RS-296          |
| 3KPxxxXX-B  | P600              | 100      | BULK             | Littelfuse Spec.        |

## Tape and Reel Specification



**Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).**