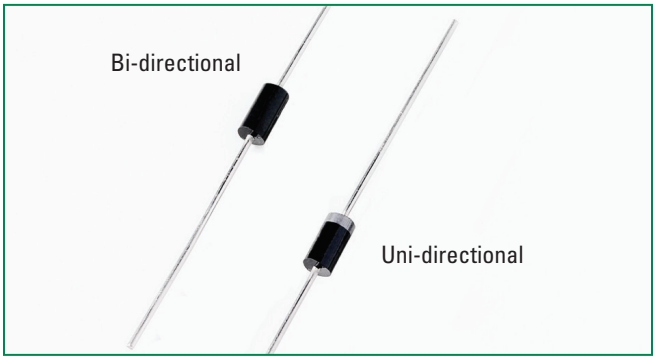
# TP6KE Series




## Agency Approvals

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

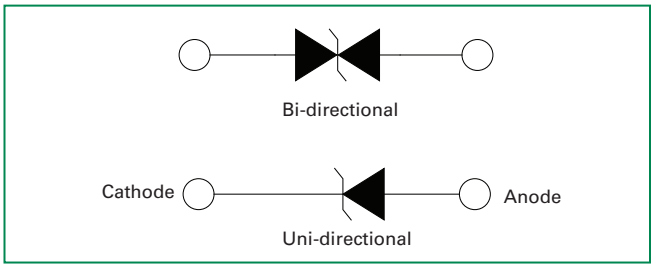
## Maximum Ratings and Thermal Characteristics ($T_A$=25°C unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|---|---|---|---|
| Peak Pulse Power Dissipation by 10/1000µs Test Waveform (Fig.2) (Note 1) | $P_{PPM}$ | 600 | W |
| Steady State Power Dissipation on Infinite Heat Sink at $T_L$=75°C (Fig. 6) | $P_D$ | 5.0 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional Only (Note 2) | $I_{FSM}$ | 100 | A |
| Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only | $V_F$ | 3.5 | V |
| Operating Junction and Storage Temperature Range | $T_J$, $T_{STG}$ | -55 to 175 | °C |
| Typical Thermal Resistance Junction to Lead | $R_{uJL}$ | 20 | °C/W |
| Typical Thermal Resistance Junction to Ambient | $R_{uJA}$ | 75 | °C/W |

**Notes:**

1. Non-repetitive current pulse, per Fig. 4 and derated above $T_J$ (initial) = 25°C per Fig. 3.
2. Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 per minute maximum.

## Functional Diagram




## Description

The AEC-Q101 qualified TP6KE Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

## Features

- Hi reliability application and automotive grade AEC-Q101 qualified
- Glass passivated chip junction in DO-15 Package
- 600W peak pulse capability at 10/1000µs waveform, repetition rate (duty cycles):0.01%
- 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 (IEC801-2)
- EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)
- Low incremental surge resistance
- High temperature to reflow soldering guaranteed: 260°C/40sec / 0.375",(9.5mm) lead length, 5 lbs., (2.3kg) tension
- $V_{BR}$ @ $T_J$= $V_{BR}$@25°C x (1+$\alpha$T x ($T_J$ - 25)) ($\alpha$T:Temperature Coefficient, typical value is 0.1%)
- Plastic package has underwriters laboratory flammability classification 94V-O
- Lead-free matte tin plated package
- Halogen free and RoHS compliant

## Applications

TVS devices are ideal for the protection of I/O interfaces, $V_{CC}$ bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.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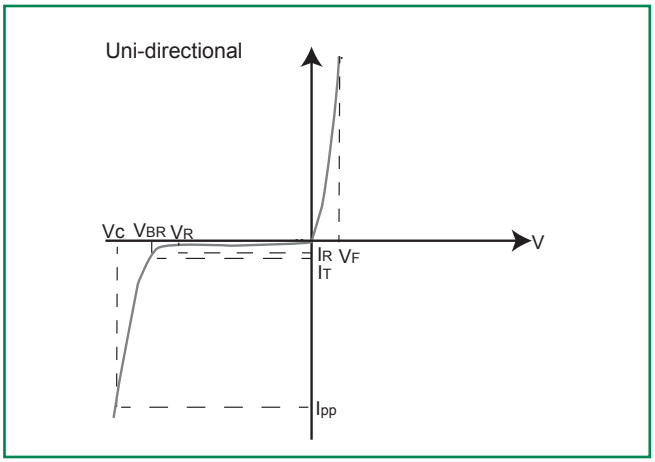
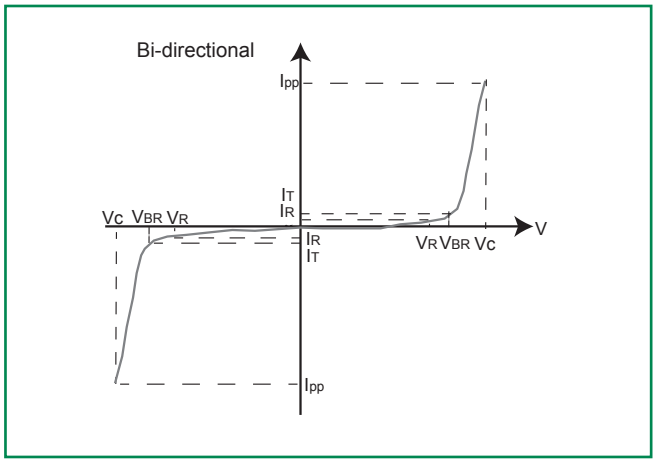
## Electrical Characteristics ($T_A$=25°C unless otherwise noted)

| 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 $I_R$ @ $V_R$ (µA) | Agency Approval |
|---|---|---|---|---|---|---|---|---|---|
| | | | MIN | MAX | | | | | |
| TP6KE13A | TP6KE13CA | 11.10 | 12.40 | 13.70 | 1 | 18.2 | 33.5 | 1 | X |
| TP6KE15A | TP6KE15CA | 12.80 | 14.30 | 15.80 | 1 | 21.2 | 28.8 | 1 | X |
| TP6KE16A | TP6KE16CA | 13.60 | 15.20 | 16.80 | 1 | 22.5 | 27.1 | 1 | X |
| TP6KE18A | TP6KE18CA | 15.30 | 17.10 | 18.90 | 1 | 25.2 | 24.2 | 1 | X |
| TP6KE20A | TP6KE20CA | 17.10 | 19.00 | 21.00 | 1 | 27.7 | 22.0 | 1 | X |
| TP6KE22A | TP6KE22CA | 18.80 | 20.90 | 23.10 | 1 | 30.6 | 19.9 | 1 | X |
| TP6KE24A | TP6KE24CA | 20.50 | 22.80 | 25.20 | 1 | 33.2 | 18.4 | 1 | X |
| TP6KE27A | TP6KE27CA | 23.10 | 25.70 | 28.40 | 1 | 37.5 | 16.3 | 1 | X |
| TP6KE30A | TP6KE30CA | 25.60 | 28.50 | 31.50 | 1 | 41.4 | 14.7 | 1 | X |
| TP6KE33A | TP6KE33CA | 28.20 | 31.40 | 34.70 | 1 | 45.7 | 13.3 | 1 | X |
| TP6KE36A | TP6KE36CA | 30.80 | 34.20 | 37.80 | 1 | 49.9 | 12.2 | 1 | X |
| TP6KE39A | TP6KE39CA | 33.30 | 37.10 | 41.00 | 1 | 53.9 | 11.3 | 1 | X |
| TP6KE43A | TP6KE43CA | 36.80 | 40.90 | 45.20 | 1 | 59.3 | 10.3 | 1 | X |
| TP6KE47A | TP6KE47CA | 40.20 | 44.70 | 49.40 | 1 | 64.8 | 9.4 | 1 | X |
| TP6KE51A | TP6KE51CA | 43.60 | 48.50 | 53.60 | 1 | 70.1 | 8.7 | 1 | X |
| TP6KE56A | TP6KE56CA | 47.80 | 53.20 | 58.80 | 1 | 77.0 | 7.9 | 1 | X |
| TP6KE62A | TP6KE62CA | 53.00 | 58.90 | 65.10 | 1 | 85.0 | 7.2 | 1 | X |
| TP6KE68A | TP6KE68CA | 58.10 | 64.60 | 71.40 | 1 | 92.0 | 6.6 | 1 | X |
| TP6KE75A | TP6KE75CA | 64.10 | 71.30 | 78.80 | 1 | 103.0 | 5.9 | 1 | X |
| TP6KE82A | TP6KE82CA | 70.10 | 77.90 | 86.10 | 1 | 113.0 | 5.4 | 1 | X |
| TP6KE91A | TP6KE91CA | 77.80 | 86.50 | 95.50 | 1 | 125.0 | 4.9 | 1 | X |

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

## I-V Curve Characteristics




**$P_{PPM}$ Peak Pulse Power Dissipation** -- Max power dissipation

**$V_R$ Stand-off Voltage** -- Maximum voltage that can be applied to the TVS without operation

**$V_{BR}$ Breakdown Voltage** -- Maximum voltage that flows though the TVS at a specified test current ($I_T$)

**$V_C$ Clamping Voltage** -- Peak voltage measured across the TVS at a specified Ippm (peak impulse current)

**$I_R$ Reverse Leakage Current** -- Current measured at $V_R$

**$V_F$ Forward Voltage Drop for Uni-directional**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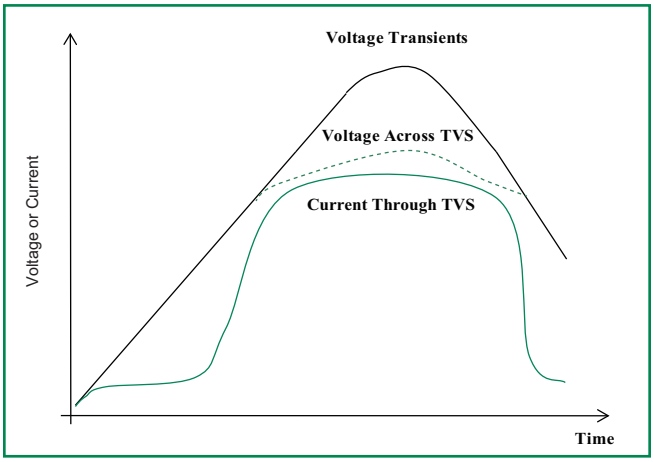
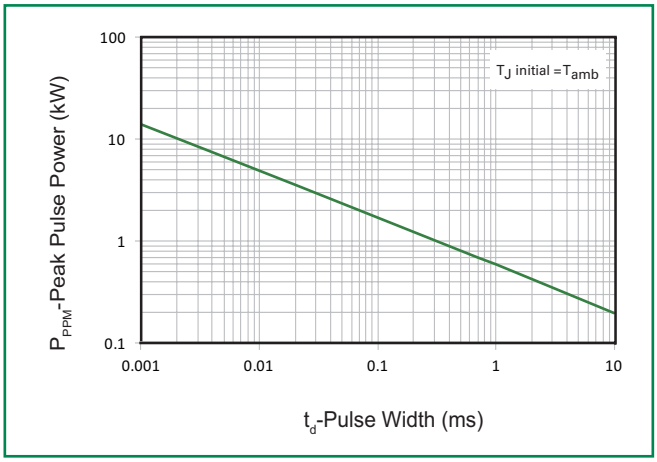
## Ratings and Characteristic Curves ($T_A$=25°C unless otherwise noted)

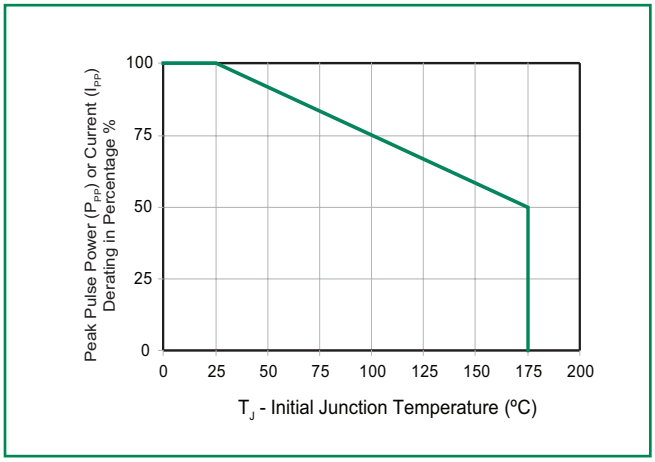
### Figure 1 - TVS Transients Clamping Waveform



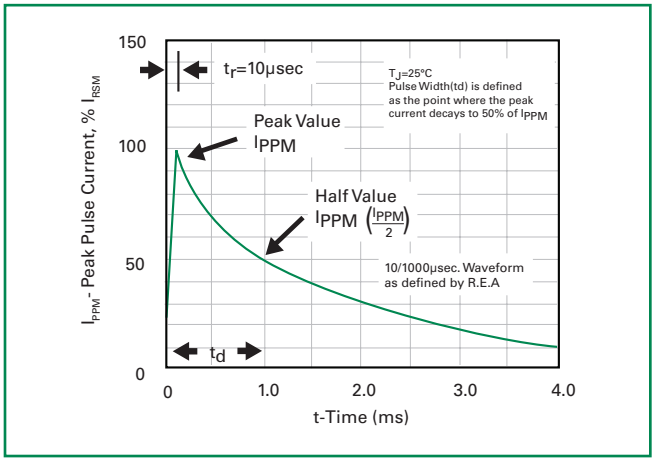

### Figure 2 - Peak Pulse Power Rating



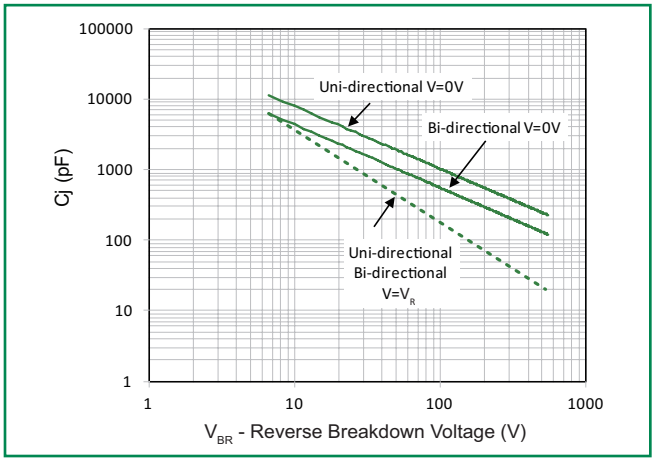

### Figure 3 - Peak Pulse Power Derating Curve



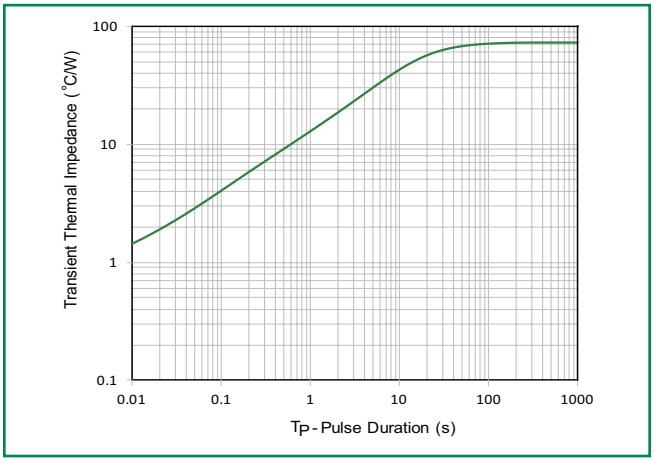

### Figure 4 - Pulse Waveform




### Figure 5 - Typical Junction Capacitance




### Figure 6 - Typical Transient Thermal Impedance





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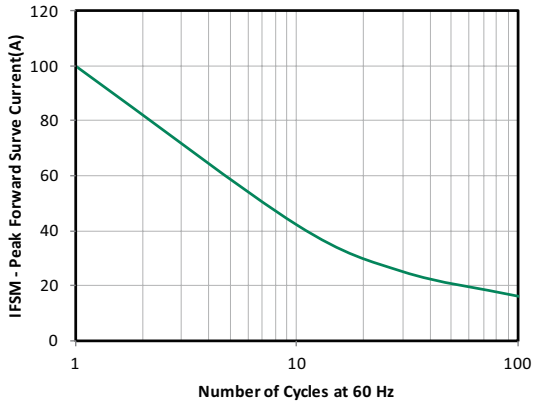
## Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only




## Flow/Wave Soldering (Solder Dipping)

| | |
|---|---|
| **Peak Temperature :** | 265°C |
| **Dipping Time :** | 10 seconds |
| **Soldering :** | 1 time |

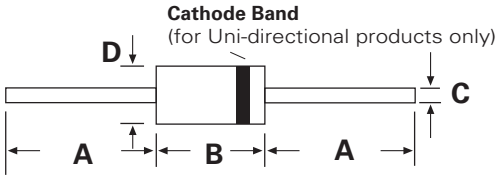
## Physical Specificationst

| | |
|---|---|
| **Weight** | 0.015oz., 0.4g |
| **Case** | JEDEC DO-204AC (DO-15) molded plastic body over passivated junction. |
| **Polarity** | Color band denotes the cathode except Bipolar. |
| **Terminal** | Matte Tin axial leads, solderable per JESD22-B102. |

## Environmental Specifications

| | |
|---|---|
| **High Temp. Storage** | JESD22-A103 |
| **HTRB** | JESD22-A108 |
| **Temperature Cycling** | JESD22-A104 |
| **H3TRB** | JESD22-A101 |
| **RSH** | JESD22-B106 |

## Dimensions




**DO-204AC (DO-15)**

| Dimensions | Inches | | Millimeters | |
|---|---|---|---|---|
| | Min | Max | Min | Max |
| A | 1.000 | - | 25.40 | - |
| B | 0.230 | 0.300 | 5.80 | 7.60 |
| C | 0.028 | 0.034 | 0.71 | 0.86 |
| D | 0.104 | 0.140 | 2.60 | 3.60 |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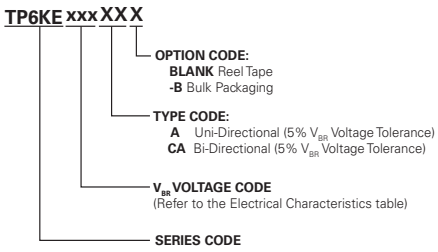
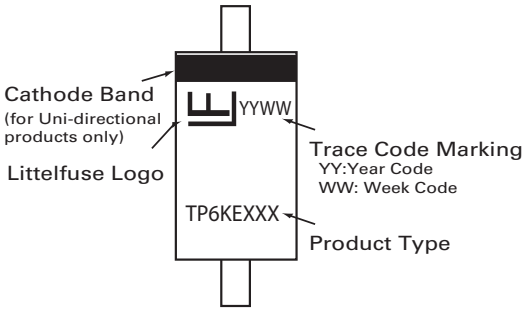
## Part Numbering System



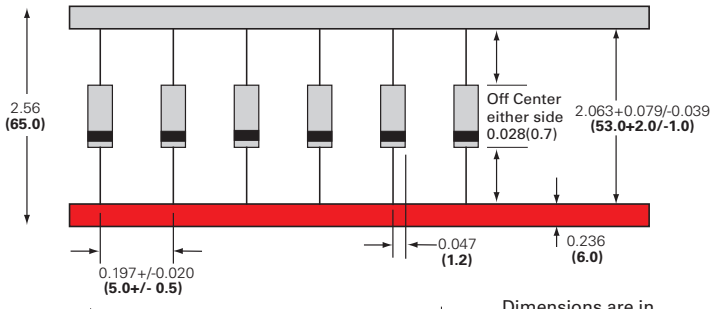

## Part Marking System



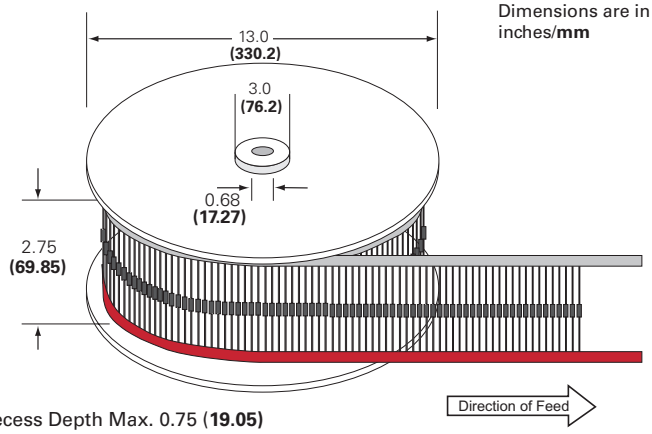

## Packaging

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|---|---|---|---|---|
| TP6KExxxXX | DO-204AC | 4000 | Tape & Reel | EIA STD RS-296 |
| TP6KExxxXX-B | DO-204AC | 1000 | BULK | Littelfuse Spec. |

## Tape and Reel Specification




Dimensions are in inches/**mm**




Recess Depth Max. 0.75 (**19.05**)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