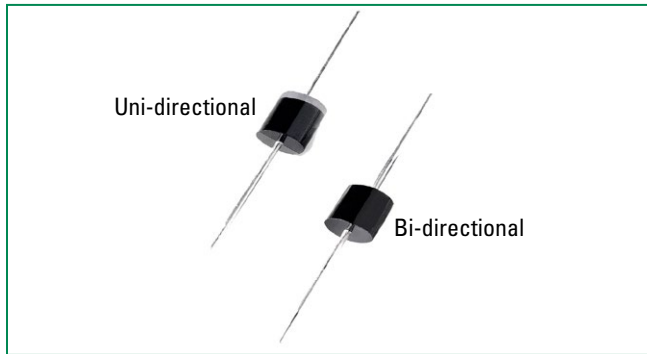




THE DATASHEET OF TP5KP40CA



TP5KP Series



Agency Approvals

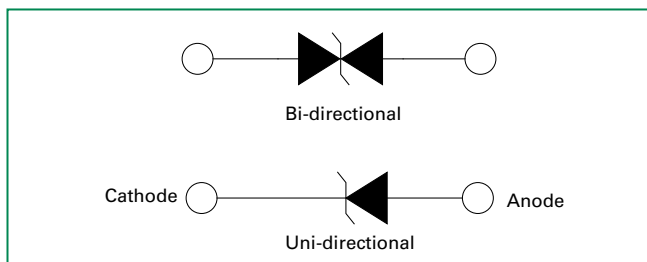
| AGENCY | AGENCY FILE NUMBER |
|--------|--------------------|
| | E230531 |

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} | 5 | kW |
| Steady State Power Dissipation on Infinite Heat Sink at T _L =75°C | P _D | 8.0 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional Only (Note 2) | I _{FSM} | 400 | A |
| Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only (Note 3) | V _F | 3.5 | V |
| Operating Junction Temperature Range | T _J | -55 to 150 | °C |
| Storage Temperature Range | T _{STG} | -55 to 175 | °C |
| Typical Thermal Resistance Junction to Lead | R _{θJL} | 8.0 | °C/W |
| Typical Thermal Resistance Junction to Ambient | R _{θJA} | 40 | °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 TP5KP 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 P600 package
- 5 kW 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 V_{BR} 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)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Low incremental surge resistance
- Typical I_R less than 2µA when V_{BR} min>12V
- High temperature to reflow soldering guaranteed: 260°C/10sec / 0.375" (9.5mm) lead length, 5 lbs., (2.3kg) tension
- V_{BR} @ T_J = V_{BR} @ 25°C x (1 + α T x (T_J - 25)) (α T: Temperature Coefficient, typical value is 0.1%)
- UL Recognized compound meeting flammability rating V-0
- 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)

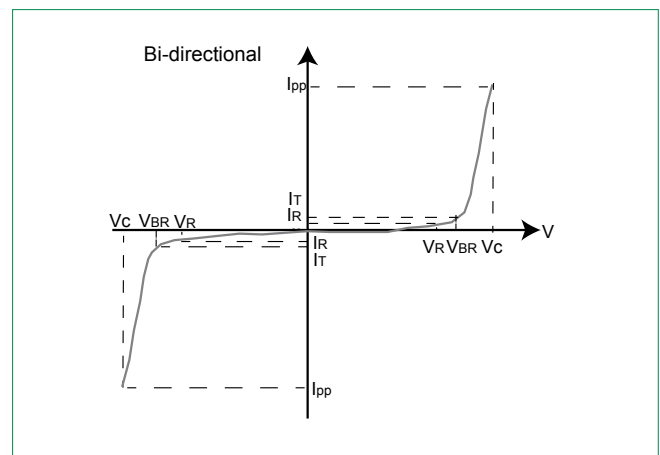
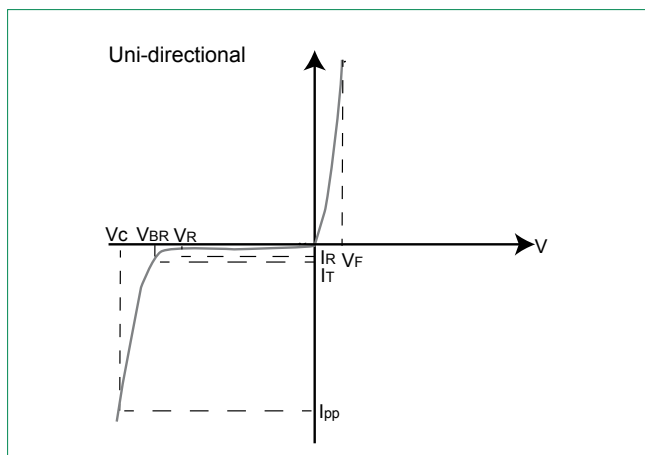
Applications

TVS Components 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.

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 $I_R @ V_R$ (μA) | Agency Recognition  |
|-------------------|------------------|---|--|-------|-------------------------|---|---|---|--|
| | | | MIN | MAX | | | | | |
| TP5KP11A | TP5KP11CA | 11.0 | 12.20 | 13.50 | 5 | 18.2 | 280.2 | 2 | X |
| TP5KP12A | TP5KP12CA | 12.0 | 13.30 | 14.70 | 5 | 19.9 | 256.3 | 2 | X |
| TP5KP13A | TP5KP13CA | 13.0 | 14.40 | 15.90 | 5 | 21.5 | 237.2 | 2 | X |
| TP5KP14A | TP5KP14CA | 14.0 | 15.60 | 17.20 | 5 | 23.2 | 219.8 | 2 | X |
| TP5KP15A | TP5KP15CA | 15.0 | 16.70 | 18.50 | 5 | 24.4 | 209.0 | 2 | X |
| TP5KP16A | TP5KP16CA | 16.0 | 17.80 | 19.70 | 5 | 26.0 | 196.2 | 2 | X |
| TP5KP17A | TP5KP17CA | 17.0 | 18.90 | 20.90 | 5 | 27.6 | 184.8 | 2 | X |
| TP5KP18A | TP5KP18CA | 18.0 | 20.00 | 22.10 | 5 | 29.2 | 174.7 | 2 | X |
| TP5KP20A | TP5KP20CA | 20.0 | 22.20 | 24.50 | 5 | 32.4 | 157.4 | 2 | X |
| TP5KP22A | TP5KP22CA | 22.0 | 24.00 | 26.90 | 5 | 35.5 | 143.7 | 2 | X |
| TP5KP24A | TP5KP24CA | 24.0 | 26.70 | 29.50 | 5 | 38.9 | 131.1 | 2 | X |
| TP5KP26A | TP5KP26CA | 26.0 | 28.90 | 31.90 | 5 | 42.1 | 121.1 | 2 | X |
| TP5KP28A | TP5KP28CA | 28.0 | 31.10 | 34.40 | 5 | 45.4 | 112.3 | 2 | X |
| TP5KP30A | TP5KP30CA | 30.0 | 33.30 | 36.80 | 5 | 48.4 | 105.4 | 2 | X |
| TP5KP33A | TP5KP33CA | 33.0 | 36.70 | 40.60 | 5 | 53.3 | 95.7 | 2 | X |
| TP5KP36A | TP5KP36CA | 36.0 | 40.00 | 44.20 | 5 | 58.1 | 87.8 | 2 | X |
| TP5KP40A | TP5KP40CA | 40.0 | 44.40 | 49.10 | 5 | 64.5 | 79.1 | 2 | X |
| TP5KP43A | TP5KP43CA | 43.0 | 47.80 | 52.80 | 5 | 69.4 | 73.5 | 2 | X |
| TP5KP45A | TP5KP45CA | 45.0 | 50.00 | 55.30 | 5 | 72.7 | 70.2 | 2 | X |
| TP5KP48A | TP5KP48CA | 48.0 | 53.30 | 58.90 | 5 | 77.4 | 65.9 | 2 | X |
| TP5KP51A | TP5KP51CA | 51.0 | 56.70 | 62.70 | 5 | 82.4 | 61.9 | 2 | X |
| TP5KP54A | TP5KP54CA | 54.0 | 60.00 | 66.30 | 5 | 87.1 | 58.6 | 2 | X |
| TP5KP58A | TP5KP58CA | 58.0 | 64.40 | 71.20 | 5 | 93.6 | 54.5 | 2 | X |
| TP5KP60A | TP5KP60CA | 60.0 | 66.70 | 73.70 | 5 | 96.8 | 52.7 | 2 | X |

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 through the TVS at a specified test current (I_T)
- V_C Clamping Voltage** – Peak voltage measured across the TVS at a specified I_{ppm} (peak impulse current)
- I_R Reverse Leakage Current** – Current measured at V_R
- V_F Forward Voltage Drop for Uni-directional**

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

Figure 1 - TVS Transients Clamping Waveform

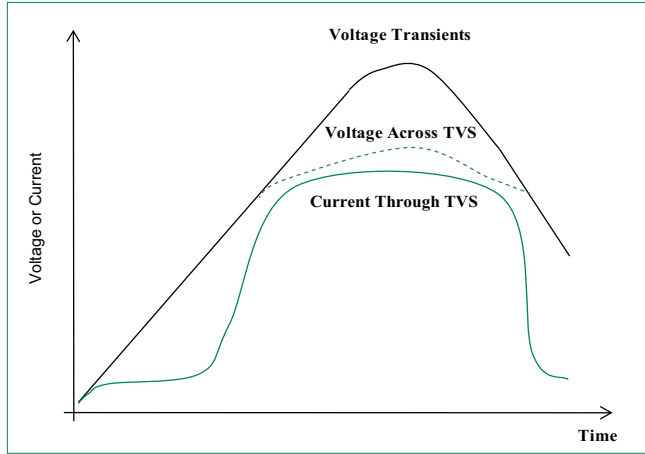


Figure 2 - Peak Pulse Power Rating Curve

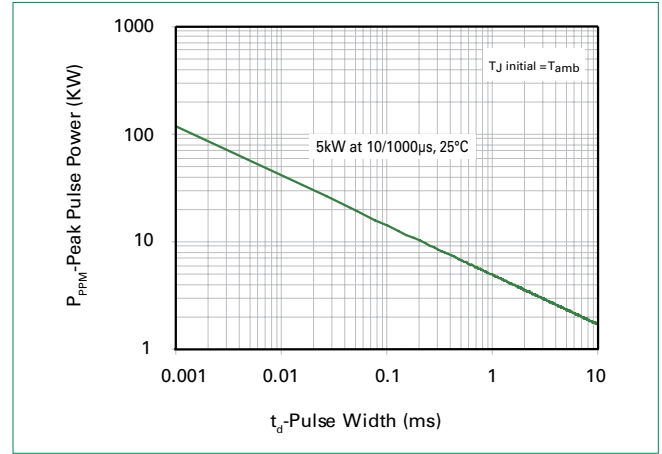


Figure 3 - Peak Pulse Power Derating Curve

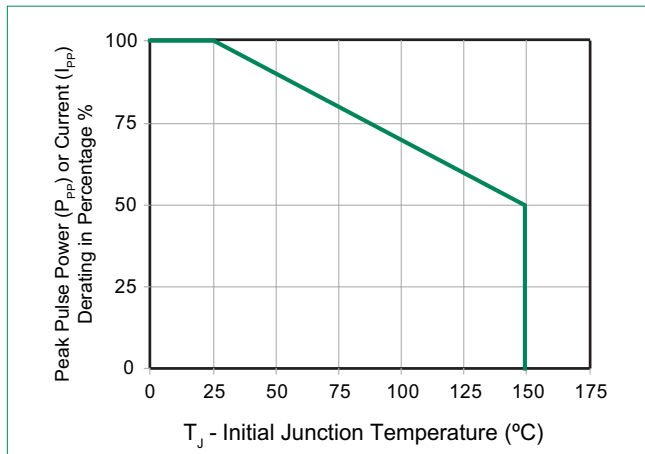


Figure 4 - Pulse Waveform

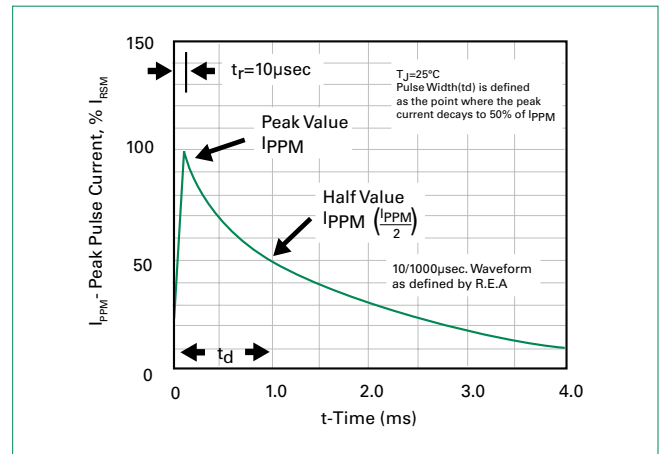


Figure 5 - Typical Junction Capacitance

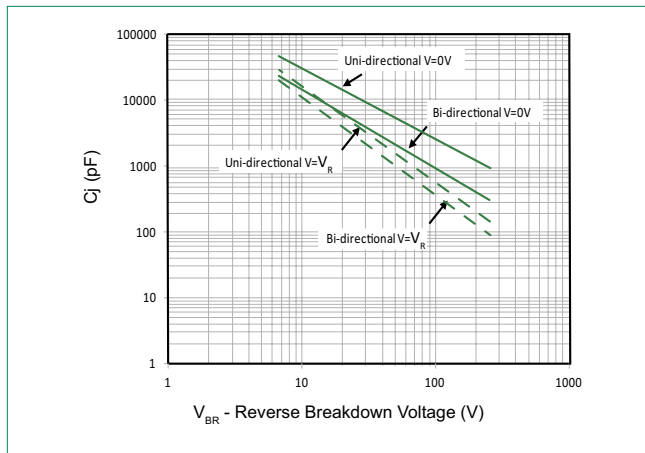


Figure 6 - Typical Transient Thermal Impedance

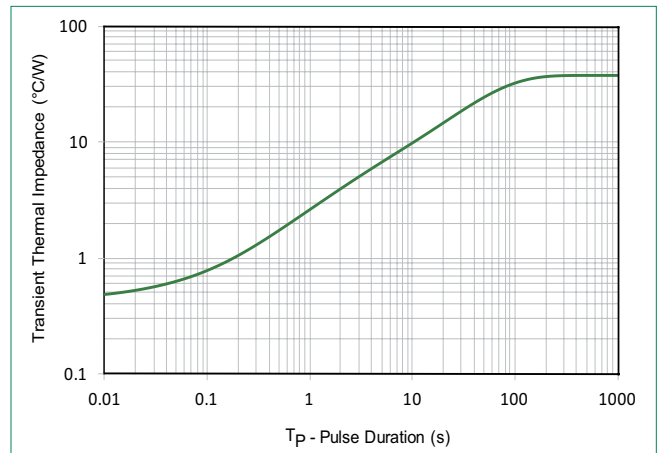


Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only

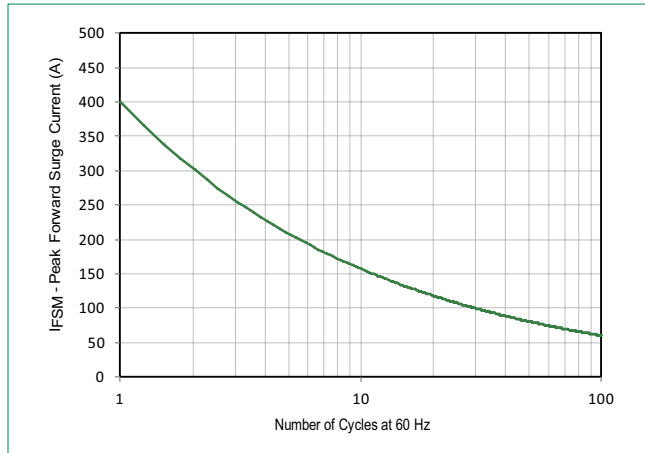
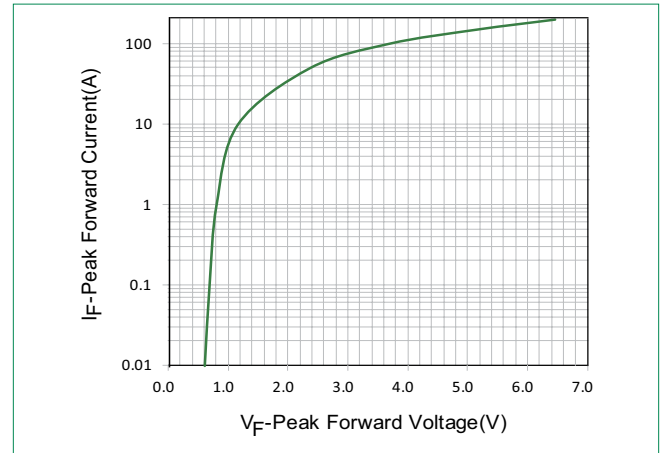
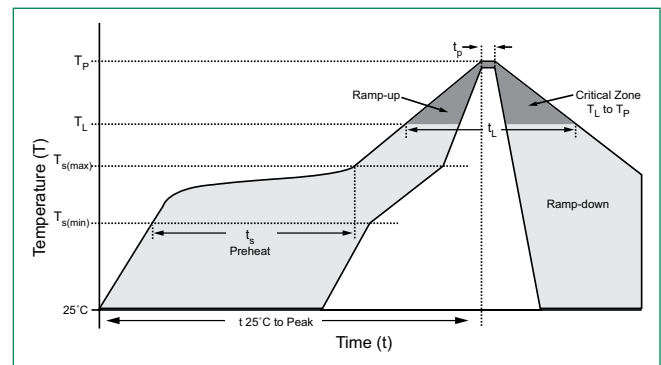


Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



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 ^{+0/-5} °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)

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

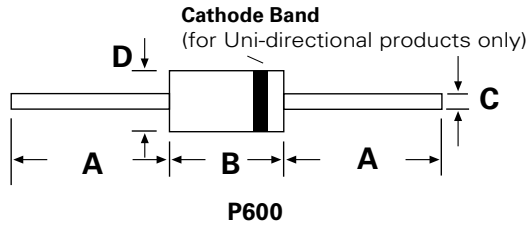
Physical Specifications

| | |
|-----------------|--|
| Weight | 0.07oz., 2.1g |
| Case | P600 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 |

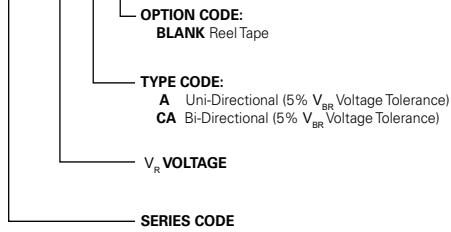
Dimensions



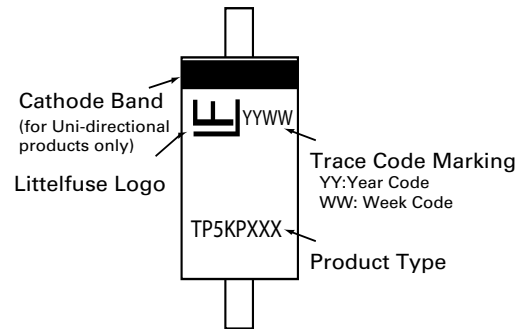
| Dimensions | Inches | | Millimeters | |
|------------|--------|-------|-------------|------|
| | Min | Max | Min | Max |
| A | 1.000 | - | 25.40 | - |
| B | 0.340 | 0.360 | 8.60 | 9.10 |
| C | 0.048 | 0.054 | 1.22 | 1.36 |
| D | 0.340 | 0.360 | 8.60 | 9.10 |

Part Numbering System

TP5KPxxxXXX



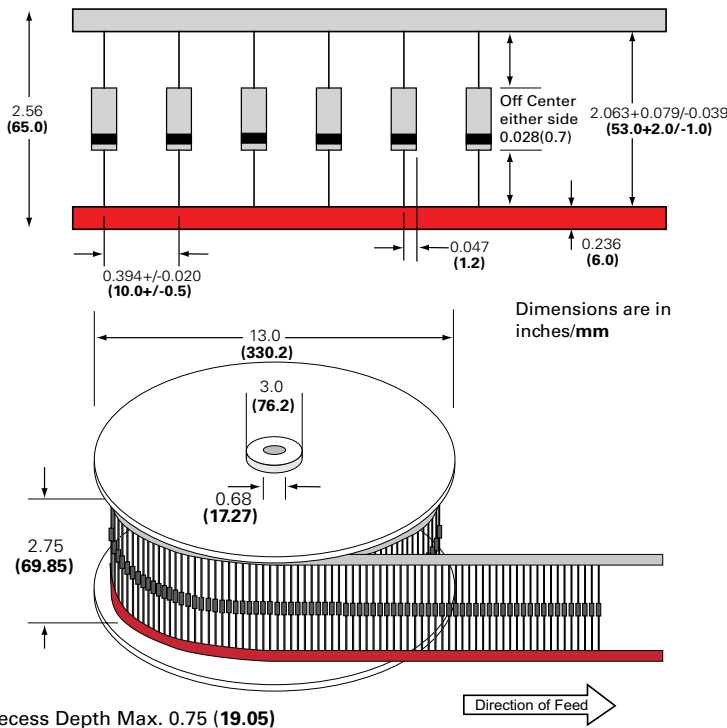
Part Marking System



Packing Options

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|-------------|-------------------|----------|------------------|-------------------------|
| TP5KPxxxXX | P600 | 800 | Tape & Reel | EIA STD RS-296 |

Tape and Reel Specification



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