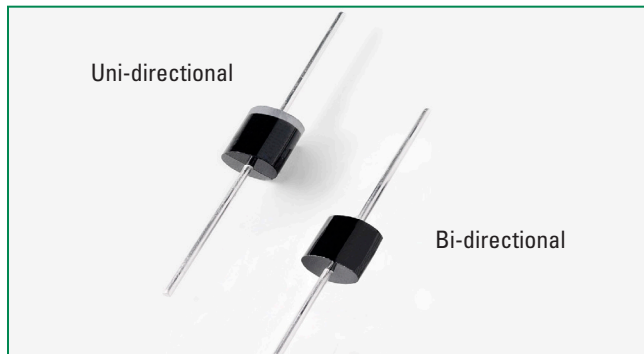


5KP-HRA Series



Agency Approvals

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

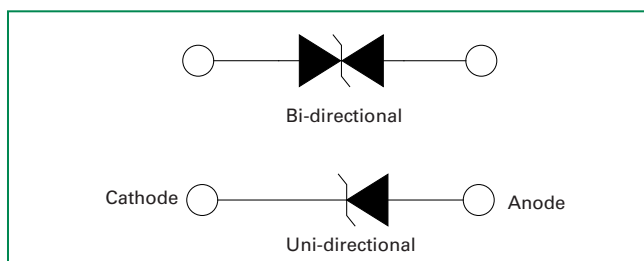
Maximum Ratings and Thermal Characteristics (T_A=25°C unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|--|-----------------------------------|------------|------|
| Peak Pulse Power Dissipation by 10/1000µs Test Waveform (Fig.2) (Note 1) | P _{PPM} | 5000 | W |
| 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 | 3.5/5.0 | V |
| Operating Junction and Storage Temperature Range | T _J , T _{STG} | -55 to 175 | °C |
| Typical Thermal Resistance Junction to Lead | R _{wJL} | 8.0 | °C/W |
| Typical Thermal Resistance Junction to Ambient | R _{wJA} | 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.
3. V_F < 3.5V for single die parts and V_F < 5.0V for stacked-die parts.

Functional Diagram



Description

The 5KP-HRA High Reliability Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Features

- 5000W 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_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%)
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- Lead-free matte tin plated package
- 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_{CC} bus and other vulnerable circuits used in telecom, computer, industrial and consumer electronic applications.

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 | | | | | |
| 5KP5.0A-HRA | 5KP5.0CA-HRA | 5.0 | 6.40 | 7.00 | 50 | 9.2 | 554.3 | 5000 | X |
| 5KP6.0A-HRA | 5KP6.0CA-HRA | 6.0 | 6.67 | 7.37 | 50 | 10.3 | 495.1 | 5000 | X |
| 5KP6.5A-HRA | 5KP6.5CA-HRA | 6.5 | 7.22 | 7.98 | 50 | 11.2 | 455.4 | 2000 | X |
| 5KP7.0A-HRA | 5KP7.0CA-HRA | 7.0 | 7.78 | 8.60 | 50 | 12.0 | 425.0 | 1000 | X |
| 5KP7.5A-HRA | 5KP7.5CA-HRA | 7.5 | 8.33 | 9.21 | 5 | 12.9 | 395.3 | 250 | X |
| 5KP8.0A-HRA | 5KP8.0CA-HRA | 8.0 | 8.89 | 9.83 | 5 | 13.6 | 375.0 | 150 | X |
| 5KP8.5A-HRA | 5KP8.5CA-HRA | 8.5 | 9.44 | 10.40 | 5 | 14.4 | 354.2 | 50 | X |
| 5KP9.0A-HRA | 5KP9.0CA-HRA | 9.0 | 10.00 | 11.10 | 5 | 15.4 | 331.2 | 20 | X |
| 5KP10A-HRA | 5KP10CA-HRA | 10.0 | 11.10 | 12.30 | 5 | 17.0 | 300.0 | 15 | X |
| 5KP11A-HRA | 5KP11CA-HRA | 11.0 | 12.20 | 13.50 | 5 | 18.2 | 280.2 | 2 | X |
| 5KP12A-HRA | 5KP12CA-HRA | 12.0 | 13.30 | 14.70 | 5 | 19.9 | 256.3 | 2 | X |
| 5KP13A-HRA | 5KP13CA-HRA | 13.0 | 14.40 | 15.90 | 5 | 21.5 | 237.2 | 2 | X |
| 5KP14A-HRA | 5KP14CA-HRA | 14.0 | 15.60 | 17.20 | 5 | 23.2 | 219.8 | 2 | X |
| 5KP15A-HRA | 5KP15CA-HRA | 15.0 | 16.70 | 18.50 | 5 | 24.4 | 209.0 | 2 | X |
| 5KP16A-HRA | 5KP16CA-HRA | 16.0 | 17.80 | 19.70 | 5 | 26.0 | 196.2 | 2 | X |
| 5KP17A-HRA | 5KP17CA-HRA | 17.0 | 18.90 | 20.90 | 5 | 27.6 | 184.8 | 2 | X |
| 5KP18A-HRA | 5KP18CA-HRA | 18.0 | 20.00 | 22.10 | 5 | 29.2 | 174.7 | 2 | X |
| 5KP20A-HRA | 5KP20CA-HRA | 20.0 | 22.20 | 24.50 | 5 | 32.4 | 157.4 | 2 | X |
| 5KP22A-HRA | 5KP22CA-HRA | 22.0 | 24.00 | 26.90 | 5 | 35.5 | 143.7 | 2 | X |
| 5KP24A-HRA | 5KP24CA-HRA | 24.0 | 26.70 | 29.50 | 5 | 38.9 | 131.1 | 2 | X |
| 5KP26A-HRA | 5KP26CA-HRA | 26.0 | 28.90 | 31.90 | 5 | 42.1 | 121.1 | 2 | X |
| 5KP28A-HRA | 5KP28CA-HRA | 28.0 | 31.10 | 34.40 | 5 | 45.4 | 112.3 | 2 | X |
| 5KP30A-HRA | 5KP30CA-HRA | 30.0 | 33.30 | 36.80 | 5 | 48.4 | 105.4 | 2 | X |
| 5KP33A-HRA | 5KP33CA-HRA | 33.0 | 36.70 | 40.60 | 5 | 53.3 | 95.7 | 2 | X |
| 5KP36A-HRA | 5KP36CA-HRA | 36.0 | 40.00 | 44.20 | 5 | 58.1 | 87.8 | 2 | X |
| 5KP40A-HRA | 5KP40CA-HRA | 40.0 | 44.40 | 49.10 | 5 | 64.5 | 79.1 | 2 | X |
| 5KP43A-HRA | 5KP43CA-HRA | 43.0 | 47.80 | 52.80 | 5 | 69.4 | 73.5 | 2 | X |
| 5KP45A-HRA | 5KP45CA-HRA | 45.0 | 50.00 | 55.30 | 5 | 72.7 | 70.2 | 2 | X |
| 5KP48A-HRA | 5KP48CA-HRA | 48.0 | 53.30 | 58.90 | 5 | 77.4 | 65.9 | 2 | X |
| 5KP51A-HRA | 5KP51CA-HRA | 51.0 | 56.70 | 62.70 | 5 | 82.4 | 61.9 | 2 | X |
| 5KP54A-HRA | 5KP54CA-HRA | 54.0 | 60.00 | 66.30 | 5 | 87.1 | 58.6 | 2 | X |
| 5KP58A-HRA | 5KP58CA-HRA | 58.0 | 64.40 | 71.20 | 5 | 93.6 | 54.5 | 2 | X |
| 5KP60A-HRA | 5KP60CA-HRA | 60.0 | 66.70 | 73.70 | 5 | 96.8 | 52.7 | 2 | X |
| 5KP64A-HRA | 5KP64CA-HRA | 64.0 | 71.10 | 78.60 | 5 | 103.0 | 49.5 | 2 | X |
| 5KP70A-HRA | 5KP70CA-HRA | 70.0 | 77.80 | 86.00 | 5 | 113.0 | 45.1 | 2 | X |
| 5KP75A-HRA | 5KP75CA-HRA | 75.0 | 83.30 | 92.10 | 5 | 121.0 | 42.1 | 2 | X |
| 5KP78A-HRA | 5KP78CA-HRA | 78.0 | 86.70 | 95.80 | 5 | 126.0 | 40.5 | 2 | X |
| 5KP85A-HRA | 5KP85CA-HRA | 85.0 | 94.40 | 104.00 | 5 | 137.0 | 37.2 | 2 | X |
| 5KP90A-HRA | 5KP90CA-HRA | 90.0 | 100.00 | 111.00 | 5 | 146.0 | 34.9 | 2 | X |
| 5KP100A-HRA | 5KP100CA-HRA | 100.0 | 110.00 | 123.00 | 5 | 162.0 | 31.5 | 2 | X |
| 5KP110A-HRA | 5KP110CA-HRA | 110.0 | 122.00 | 135.00 | 5 | 177.0 | 28.8 | 2 | X |
| 5KP120A-HRA | 5KP120CA-HRA | 120.0 | 133.00 | 147.00 | 5 | 193.0 | 26.4 | 2 | X |
| 5KP130A-HRA | 5KP130CA-HRA | 130.0 | 144.00 | 159.00 | 5 | 209.0 | 24.4 | 2 | X |
| 5KP150A-HRA | 5KP150CA-HRA | 150.0 | 167.00 | 185.00 | 5 | 243.0 | 21.0 | 2 | X |
| 5KP160A-HRA | 5KP160CA-HRA | 160.0 | 178.00 | 197.00 | 5 | 259.0 | 19.7 | 2 | X |
| 5KP170A-HRA | 5KP170CA-HRA | 170.0 | 189.00 | 209.00 | 5 | 275.0 | 18.5 | 2 | X |
| 5KP180A-HRA | 5KP180CA-HRA | 180.0 | 200.00 | 221.00 | 5 | 292.0 | 17.5 | 2 | X |
| 5KP190A-HRA | 5KP190CA-HRA | 190.0 | 211.00 | 233.00 | 5 | 310.0 | 16.5 | 2 | X |
| 5KP200A-HRA | 5KP200CA-HRA | 200.0 | 222.00 | 246.00 | 5 | 329.2 | 15.5 | 2 | X |
| 5KP210A-HRA | 5KP210CA-HRA | 210.0 | 233.00 | 258.00 | 5 | 349.5 | 14.6 | 2 | X |
| 5KP220A-HRA | 5KP220CA-HRA | 220.0 | 244.00 | 270.00 | 5 | 371.1 | 13.7 | 2 | X |

Note:

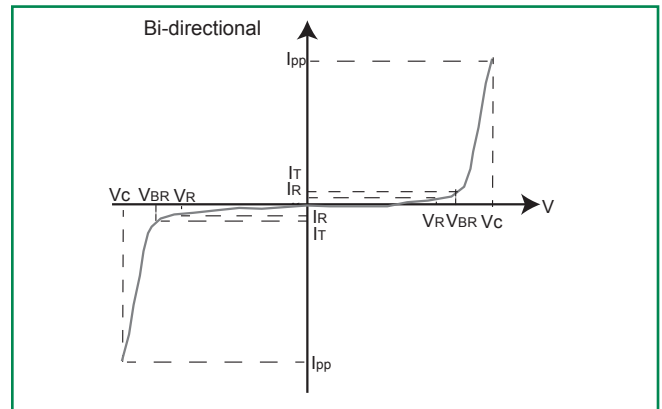
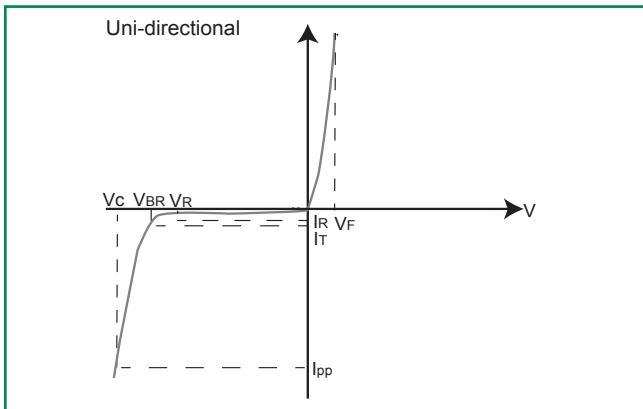
1. For bidirectional type having V_R of 10 volts and less, the I_T limit is double.

Screen Process

| | |
|--|-----------------------------------|
| 100% Vision Inspection | MIL-STD-750 method 2074 |
| 100% High Temperature Storage Life (168hrs,175°C) | MIL-STD-750 method 1031 |
| 100% Temperature Cycle Test (-55 to 150°C, 20 cycles, dwell time 15 min) | MIL-STD-750 method 1051 |
| 100% Surge Test (2x) | MIL-STD-750 method 4066 |
| 100% HTRB 150°C Bias=VR(80% breakdown voltage, 96hrs, and each direction at 96 hrs for Bi-directional products) | MIL-STD-750 method 1038 |
| Final Electrical Test(100% 3 sigma limit, 100% dynamic test and PAT limit) | MIL-STD-750 method 4016.4021.4011 |

Note: Up-screen program can be specified by customer's request via contacting Littelfuse service

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

Ratings and Characteristic Curves (T_A=25°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

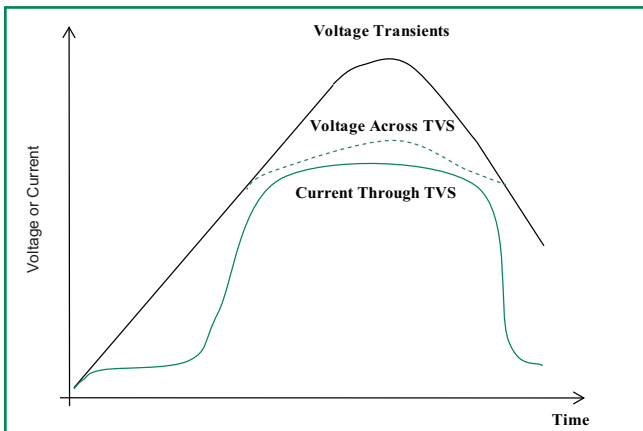


Figure 2 - Peak Pulse Power Rating Curve

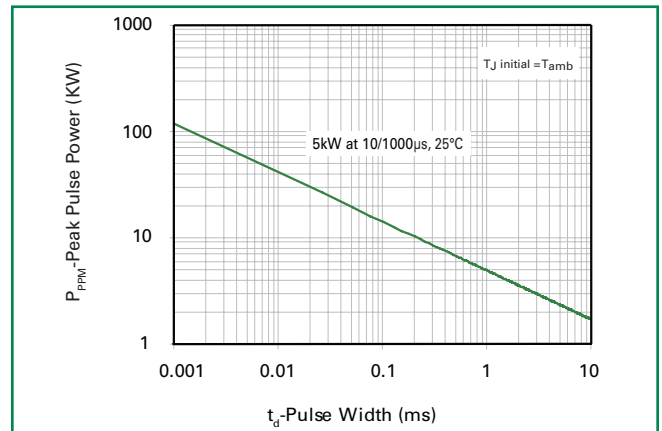


Figure 3 - Peak Pulse Power Derating Curve

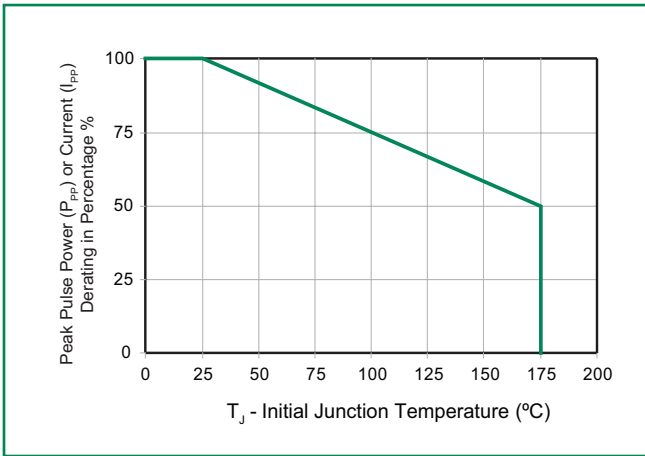


Figure 4 - Pulse Waveform

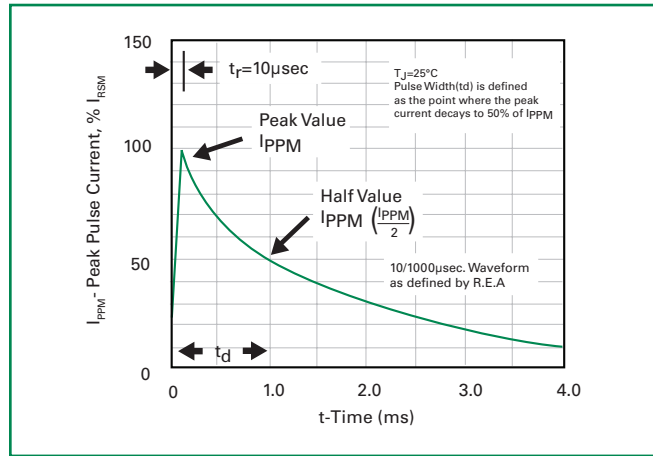


Figure 5 - Typical Junction Capacitance

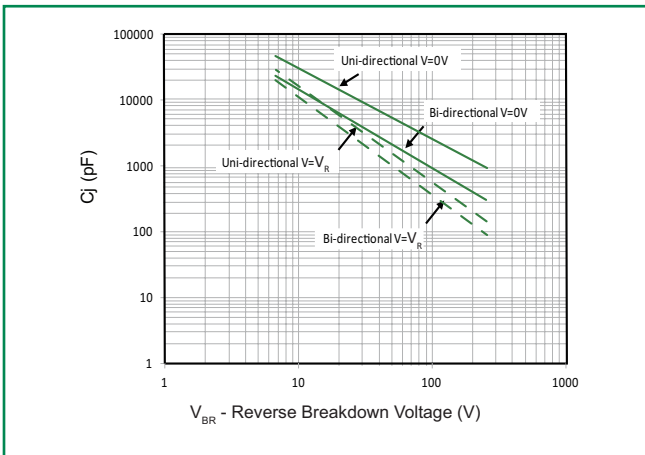


Figure 6 - Typical Transient Thermal Impedance

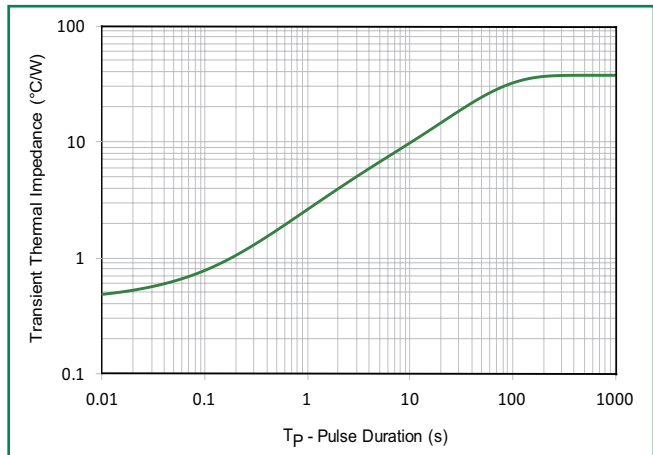


Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only

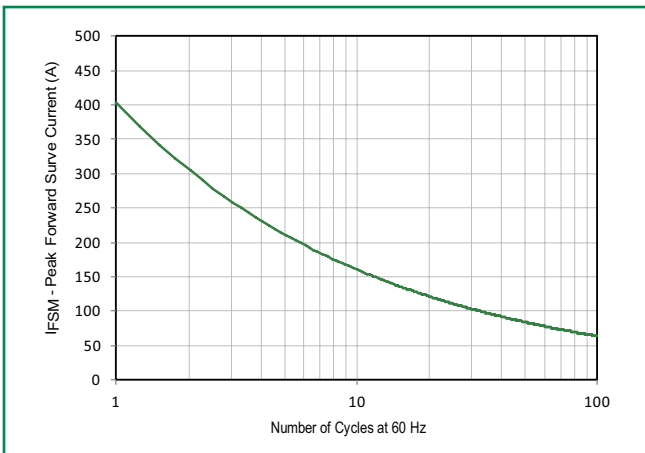
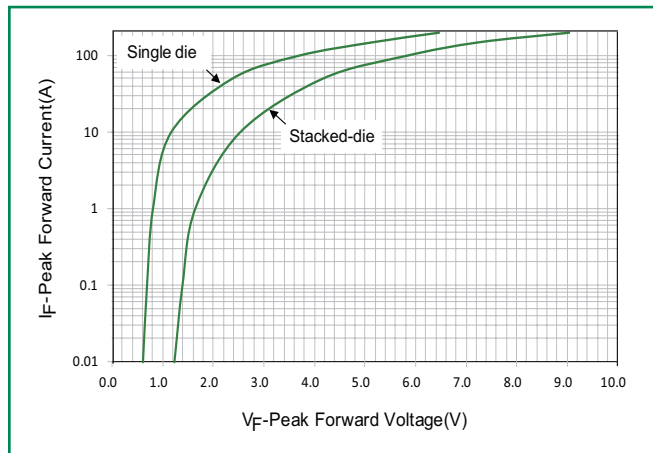


Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



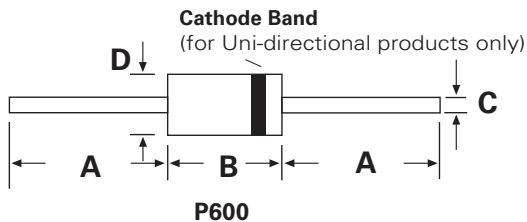
Physical Specifications

| | |
|-----------------|--|
| 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

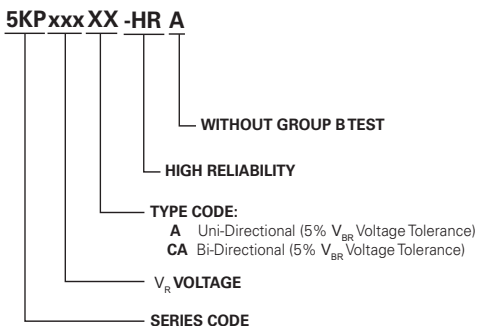
| | |
|----------------------------|-------------|
| High Temp. Storage | JESD22-A103 |
| HTRB | JESD22-A108 |
| Temperature Cycling | JESD22-A104 |
| H3TRB | JESD22-A101 |
| RSH | JESD22-B106 |

Dimensions

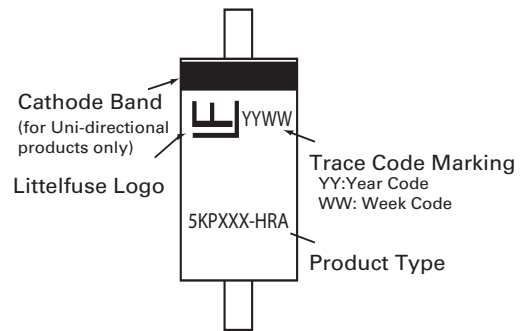


| Dimensions | Inches | | Millimeters | |
|------------|--------|-------|-------------|------|
| | Min | Max | Min | Max |
| A | 1.000 | - | 25.40 | - |
| B | 0.340 | 0.360 | 8.60 | 9.10 |
| C | 0.048 | 0.052 | 1.22 | 1.32 |
| D | 0.340 | 0.360 | 8.60 | 9.10 |

Part Numbering System



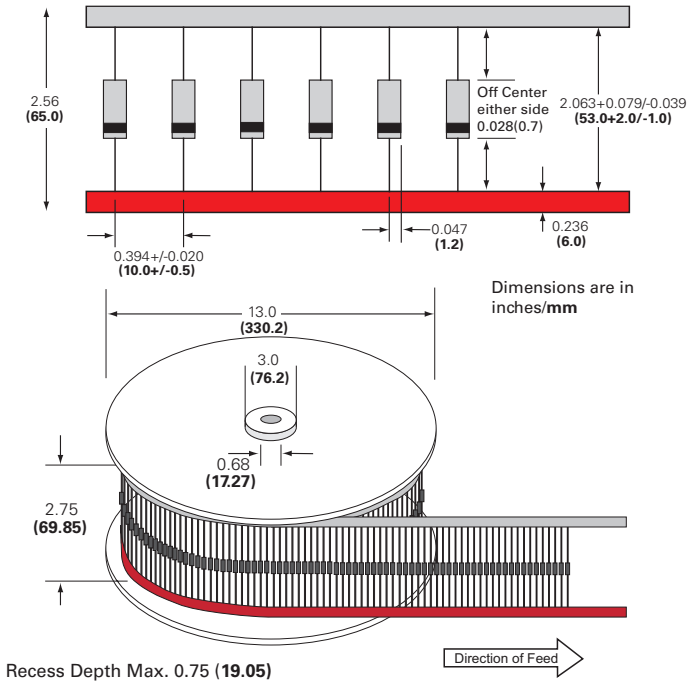
Part Marking System



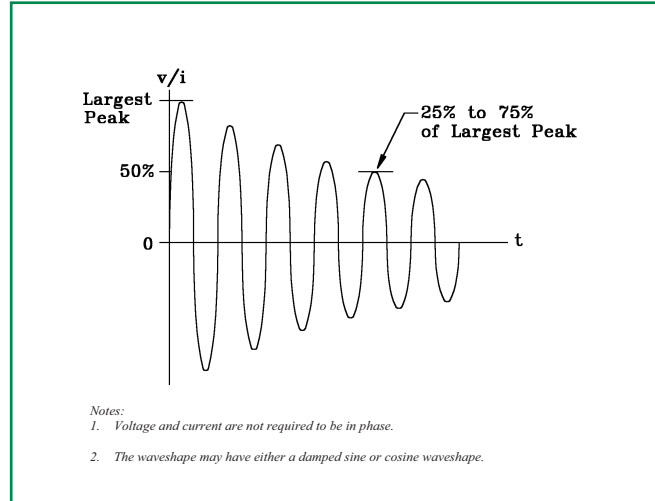
Packing Options

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|--------------|-------------------|----------|------------------|-------------------------|
| 5KPxxxXX-HRA | P600 | 800 | Tape & Reel | EIA STD RS-296 |

Tape and Reel Specification



RTCA/DO-160G Wave 3



RTCA/DO-160G Wave 4 and Wave 5

