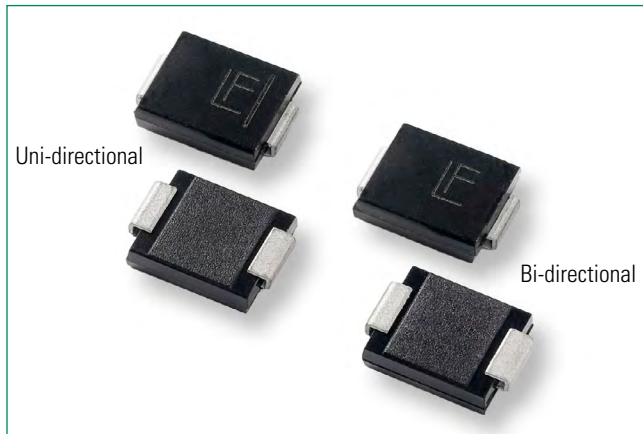


TP5.0SMDJ Series

Surface Mount - 5000W



Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
| | E230531 |

Maximum Ratings & Thermal Characteristics

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

| Parameter | Symbol | Value | Unit |
|--|-----------------|------------|--------------------|
| Peak Pulse Power Dissipation at $T_L = 25^\circ\text{C}$ by 10/1000 μs Waveform (Fig.2)(Note 1), (Note 2) | P_{PPM} | 5000 | W |
| Power Dissipation on Infinite Heat Sink at $T_L = 50^\circ\text{C}$ | $P_{M(AV)}$ | 6.5 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3) | I_{FSM} | 300 | A |
| Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only | V_F | 5.0 | V |
| Operating Temperature Range | T_J | -65 to 150 | $^\circ\text{C}$ |
| Storage Temperature Range | T_{STG} | -65 to 175 | $^\circ\text{C}$ |
| Typical Thermal Resistance Junction to Lead | $R_{\theta JL}$ | 15 | $^\circ\text{C/W}$ |
| Typical Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 75 | $^\circ\text{C/W}$ |

Notes:

- Non-repetitive current pulse per Fig. 4 and derated above $T_A = 25^\circ\text{C}$ per Fig. 3.
- Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.
- Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.

Description

The TP5.0SMDJ series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

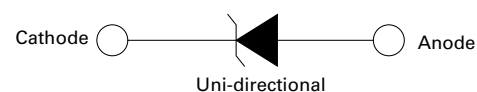
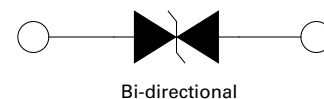
Features & Benefits

- High reliability application and automotive grade AEC-Q101 qualified
- 5000W peak pulse power capability at 10/1000 μs waveform, repetition rate (duty cycles):0.01 %
- SMD low profile surface mount package minimizing PCB footprint
- 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
- ESD protection of data lines in accordance with IEC 61000-4-2, 30kV(Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- Glass passivated chip junction
- Fast response time: typically less than 1.0ps from 0V to V_{BR} min
- Excellent clamping capability
- Low incremental surge resistance
- Typical I_R less than 5 μA when $V_{BR \text{ min}} > 22\text{V}$
- High temperature reflow soldering guaranteed: 260 $^\circ\text{C}$ /40sec
- $V_{BR} @ T_J = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$ (αT : Temperature Coefficient)
- UL Recognized compound meeting flammability rating V-0
- Meet MSL level1, per J-STD-020, LF maximum peak of 260 $^\circ\text{C}$
- 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)
- Recognized to UL 497B as an Isolated Loop Circuit Protector

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.

Functional Diagram



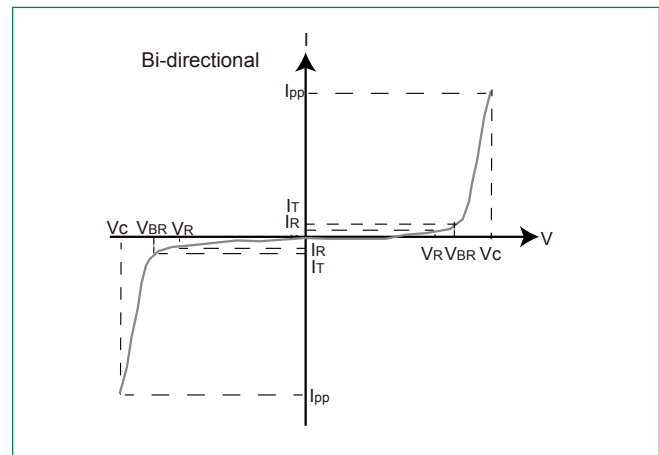
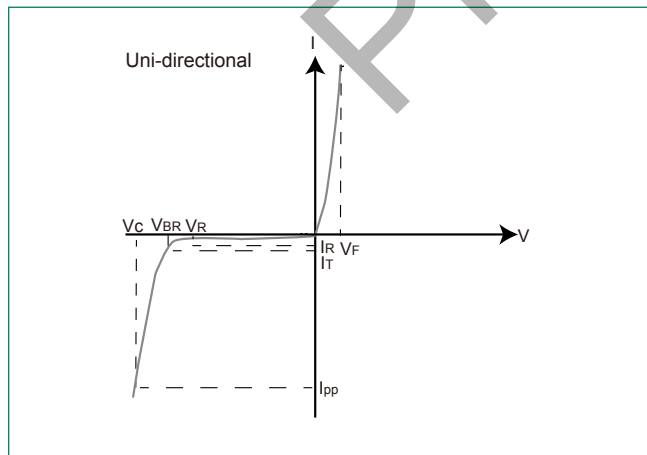
TP5.0SMDJ Series

Surface Mount - 5000W

Electrical Characteristics

| Part Number (Uni) | Part Number (Bi) | Marking | | 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} (10/1000 μ s) (V) | Maximum Peak Pulse Current I_{PP} (10/1000 μ s) (A) | Maximum Clamping Voltage V_C @ I_{PP} (8/20 μ s) (V) | Maximum Peak Pulse Current I_{PP} (8/20 μ s) (A) | Maximum Reverse Leakage I_R @ V_R (μ A) | Maximum Temperature coefficient of V_{BR} (%/C) | Littelfuse Logo |
|-------------------|------------------|---------|-------|---|--|-------|-------------------------|---|---|--|--|--|---|-----------------|
| | | UNI | BI | | MIN | MAX | | | | | | | | |
| TP5.0SMDJ40A | TP5.0SMDJ40CA | T5PFR | T5BFR | 40 | 44.4 | 49.1 | 1 | 64.5 | 77.6 | 83.3 | 582.0 | 5 | 0.099 | X |
| TP5.0SMDJ43A | TP5.0SMDJ43CA | T5PFT | T5BFT | 43 | 47.8 | 52.8 | 1 | 69.4 | 72.1 | 89.7 | 540.0 | 5 | 0.100 | X |
| TP5.0SMDJ45A | TP5.0SMDJ45CA | T5PFV | T5BFV | 45 | 50.0 | 55.3 | 1 | 72.7 | 68.8 | 93.9 | 516.0 | 5 | 0.101 | X |
| TP5.0SMDJ48A | TP5.0SMDJ48CA | T5PFX | T5BFX | 48 | 53.3 | 58.9 | 1 | 77.4 | 64.7 | 100.0 | 485.3 | 5 | 0.101 | X |
| TP5.0SMDJ51A | TP5.0SMDJ51CA | T5PFZ | T5BFZ | 51 | 56.0 | 62.7 | 1 | 82.4 | 60.7 | 106.5 | 455.3 | 5 | 0.101 | X |
| TP5.0SMDJ54A | TP5.0SMDJ54CA | T5PGE | T5BGE | 54 | 60.0 | 66.3 | 1 | 87.1 | 57.5 | 112.5 | 431.3 | 5 | 0.102 | X |
| TP5.0SMDJ58A | TP5.0SMDJ58CA | T5PGG | T5BGG | 58 | 64.4 | 71.2 | 1 | 93.6 | 53.5 | 120.9 | 401.3 | 5 | 0.103 | X |
| TP5.0SMDJ60A | TP5.0SMDJ60CA | T5PGK | T5BGK | 60 | 66.7 | 73.7 | 1 | 96.8 | 51.7 | 125.1 | 387.8 | 5 | 0.103 | X |
| TP5.0SMDJ64A | TP5.0SMDJ64CA | T5PGM | T5BGM | 64 | 71.1 | 78.6 | 1 | 103.0 | 48.6 | 133.1 | 364.5 | 5 | 0.104 | X |
| TP5.0SMDJ70A | TP5.0SMDJ70CA | T5PGP | T5BGP | 70 | 77.8 | 86.0 | 1 | 113.0 | 44.3 | 146.0 | 332.2 | 5 | 0.105 | X |
| TP5.0SMDJ75A | TP5.0SMDJ75CA | T5PGR | T5BGR | 75 | 83.3 | 92.1 | 1 | 121.0 | 41.4 | 156.3 | 310.5 | 5 | 0.106 | X |
| TP5.0SMDJ78A | TP5.0SMDJ78CA | T5PGT | T5BGT | 78 | 86.7 | 95.8 | 1 | 126.0 | 39.7 | 162.8 | 297.8 | 5 | 0.106 | X |
| TP5.0SMDJ85A | TP5.0SMDJ85CA | T5PGV | T5BGV | 85 | 94.4 | 104.0 | 1 | 137.0 | 36.5 | 177.0 | 273.8 | 5 | 0.106 | X |
| TP5.0SMDJ90A | TP5.0SMDJ90CA | T5PGX | T5BGX | 90 | 100.0 | 111.0 | 1 | 146.0 | 34.3 | 188.6 | 257.3 | 5 | 0.107 | X |
| TP5.0SMDJ100A | TP5.0SMDJ100CA | T5PGZ | T5BGZ | 100 | 111 | 123 | 1 | 162 | 30.9 | 209.3 | 231.8 | 5 | 0.107 | X |
| TP5.0SMDJ110A | TP5.0SMDJ110CA | T5PHE | T5BHE | 110 | 122 | 135 | 1 | 177 | 28.3 | 228.7 | 212.3 | 5 | 0.107 | X |
| TP5.0SMDJ120A | TP5.0SMDJ120CA | T5PHG | T5BHG | 120 | 133 | 147 | 1 | 193 | 26 | 249.4 | 195 | 5 | 0.108 | X |
| TP5.0SMDJ130A | TP5.0SMDJ130CA | T5PHK | T5BHK | 130 | 144 | 159 | 1 | 209 | 24 | 270 | 180 | 5 | 0.108 | X |
| TP5.0SMDJ140A | TP5.0SMDJ140CA | T5PHL | T5BHL | 140 | 156 | 172 | 1 | 226.1 | 22.2 | 292.1 | 166.5 | 5 | 0.108 | X |
| TP5.0SMDJ150A | TP5.0SMDJ150CA | T5PHM | T5BHM | 150 | 167 | 185 | 1 | 243 | 20.6 | 314 | 154.5 | 5 | 0.108 | X |
| TP5.0SMDJ160A | TP5.0SMDJ160CA | T5PHP | T5BHB | 160 | 178 | 197 | 1 | 259 | 19.3 | 334.6 | 144.8 | 5 | 0.108 | X |
| TP5.0SMDJ170A | TP5.0SMDJ170CA | T5PHR | T5BHR | 170 | 189 | 209 | 1 | 275 | 18.2 | 355.3 | 136.5 | 5 | 0.108 | X |
| TP5.0SMDJ180A | TP5.0SMDJ180CA | T5PHT | T5BHT | 180 | 200.0 | 221.0 | 1 | 292.0 | 17.5 | 370.0 | 131.3 | 5 | 0.108 | - |
| TP5.0SMDJ200A | TP5.0SMDJ200CA | T5PHV | T5BHV | 200 | 224.0 | 247.0 | 1 | 325.0 | 15.4 | 325.0 | 115.5 | 5 | 0.110 | - |
| TP5.0SMDJ220A | TP5.0SMDJ220CA | T5PHX | T5BHX | 220 | 244.0 | 270.0 | 1 | 357.0 | 14.1 | 357.0 | 105.8 | 5 | 0.110 | - |
| TP5.0SMDJ250A | TP5.0SMDJ250CA | T5PHZ | T5BHZ | 250 | 279.0 | 309.0 | 1 | 406.0 | 12.4 | 406.0 | 93.0 | 5 | 0.112 | - |
| TP5.0SMDJ300A | TP5.0SMDJ300CA | T5PIE | T5BIE | 300 | 335.0 | 371.0 | 1 | 487.0 | 10.3 | 487.0 | 77.3 | 5 | 0.112 | - |
| TP5.0SMDJ350A | TP5.0SMDJ350CA | T5PIG | T5BIG | 350 | 391.0 | 432.0 | 1 | 568.0 | 8.9 | 568.0 | 66.8 | 5 | 0.112 | - |
| TP5.0SMDJ400A | TP5.0SMDJ400CA | T5PIK | T5BIK | 400 | 447.0 | 494.0 | 1 | 649.0 | 7.8 | 649.0 | 58.5 | 5 | 0.112 | - |

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 I_{PPM} (peak impulse current)
 I_R Reverse Leakage Current -- Current measured at V_R
 V_F Forward Voltage Drop for Uni-directional

TP5.0SMDJ Series

Surface Mount - 5000W

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

Figure 1 - TVS Transients Clamping Waveform

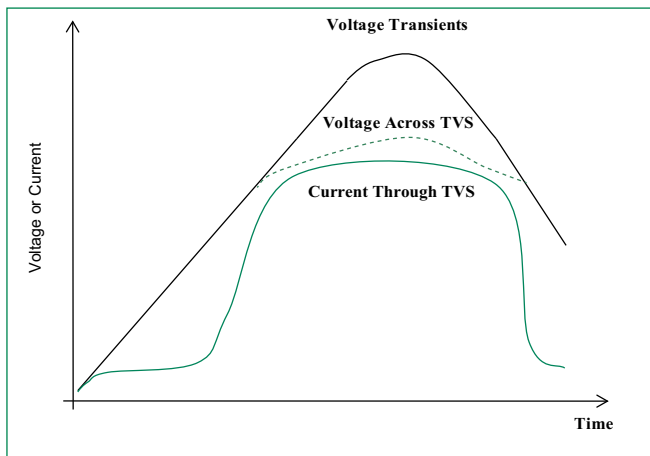


Figure 2 - Peak Pulse Power Rating

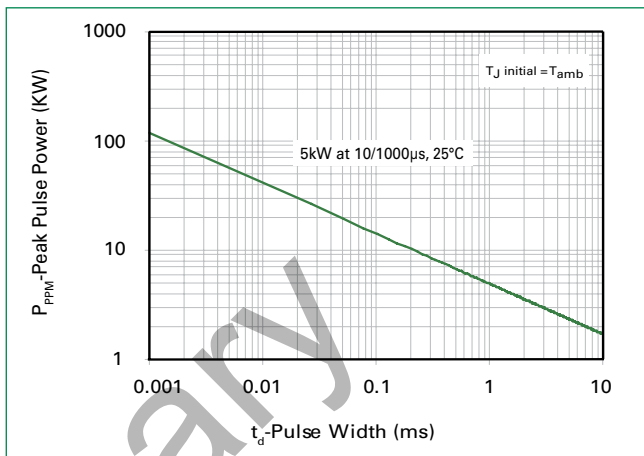


Figure 3 - Peak Pulse Power Derating Curve

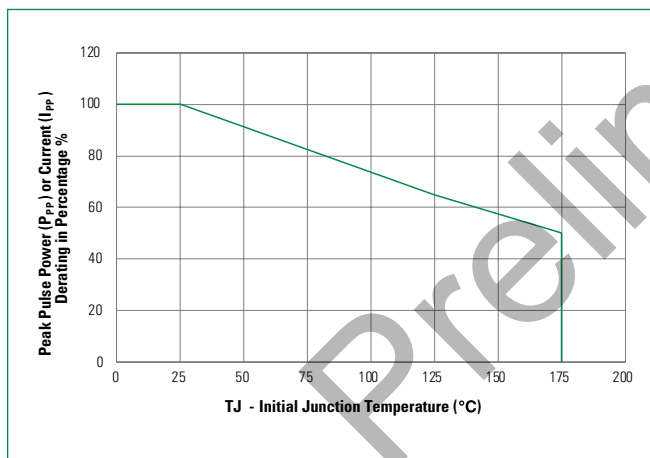


Figure 4 - Pulse Waveform

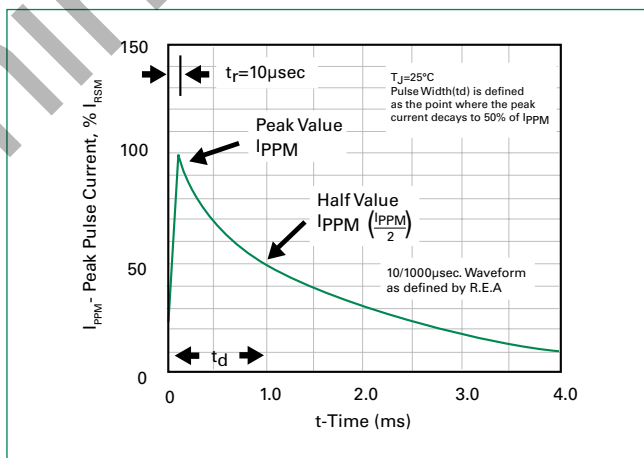


Figure 5 - Typical Junction Capacitance

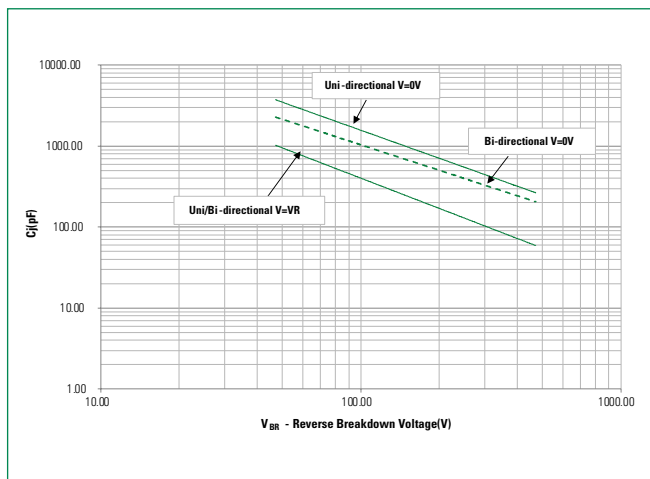
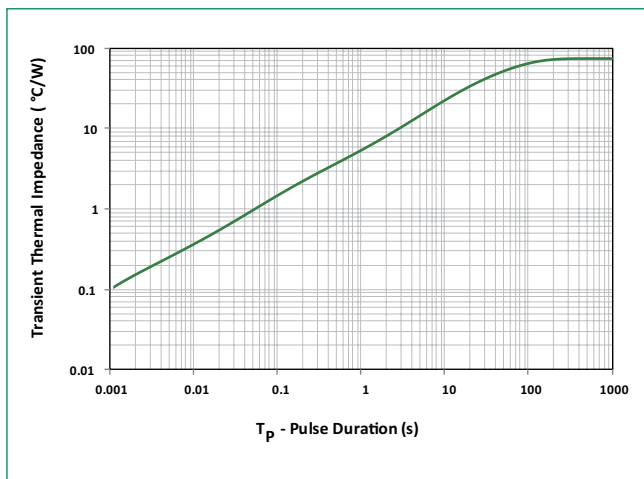


Figure 6 - Typical Transient Thermal Impedance



TP5.0SMDJ Series

Surface Mount - 5000W

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

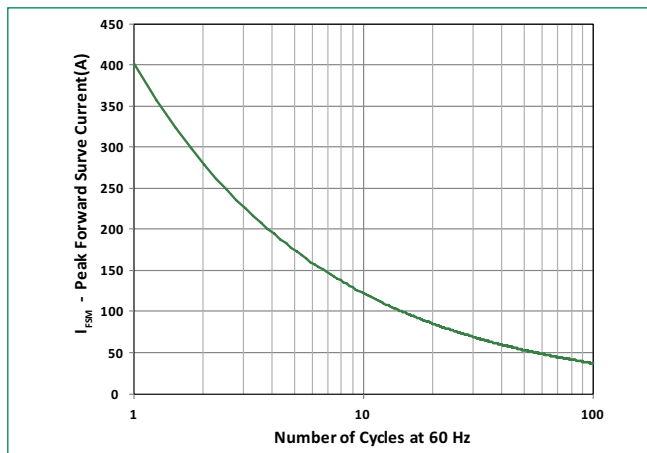
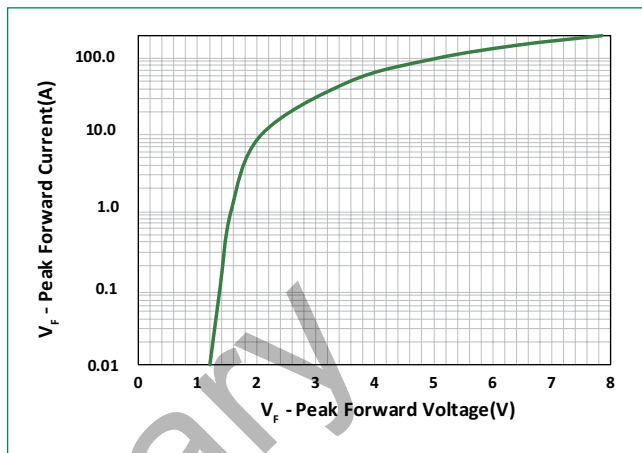
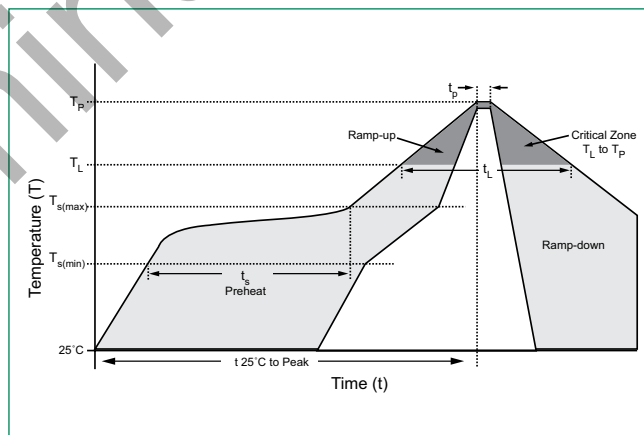


Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



Soldering Parameters

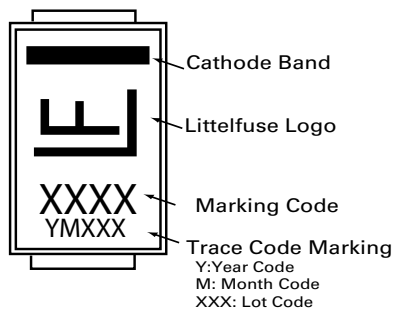
| | | |
|--|------------------------------------|------------------------|
| Reflow Condition | | Lead-free assembly |
| Pre Heat | - Temperature Min ($T_{s(min)}$) | 150°C |
| | - Temperature Max ($T_{s(max)}$) | 200°C |
| | - Time (min to max) (t_s) | 60 – 120 secs |
| Average ramp up rate (Liquidus Temp (T_L) to peak) | | 3°C/second max |
| $T_{s(max)}$ to T_L - Ramp-up Rate | | 3°C/second max |
| Reflow | - Temperature (T_L) (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) | | 30 seconds |
| Ramp-down Rate | | 6°C/second max |
| Time 25°C to peak Temperature (T_p) | | 8 minutes max. |
| Do not exceed | | 260°C |



Physical Specifications

| | |
|-----------------|---|
| Weight | 0.007 ounce, 0.21 grams |
| Case | JEDEC DO214AB. Molded plastic body over glass passivated junction |
| Polarity | Color band denotes positive end (cathode) except Bidirectional. |
| Terminal | Matte Tin-plated leads, Solderable per JESD22-B102 |

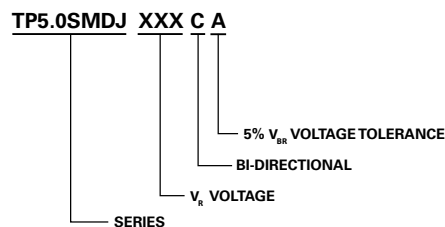
Part Marking System



Environmental Specifications

| | |
|----------------------------|--------------------------|
| High Temp. Storage | JESD22-A103 |
| HTRB | JESD22-A108 |
| Temperature Cycling | JESD22-A104 |
| MSL | JEDEC-J-STD-020, Level 1 |
| H3TRB | JESD22-A101 |
| RSH | JESD22-A111 |

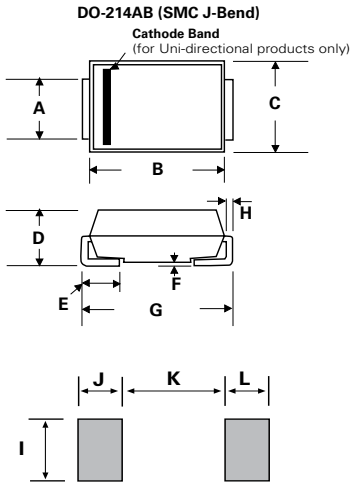
Part Numbering System



TP5.0SMDJ Series

Surface Mount - 5000W

Dimensions

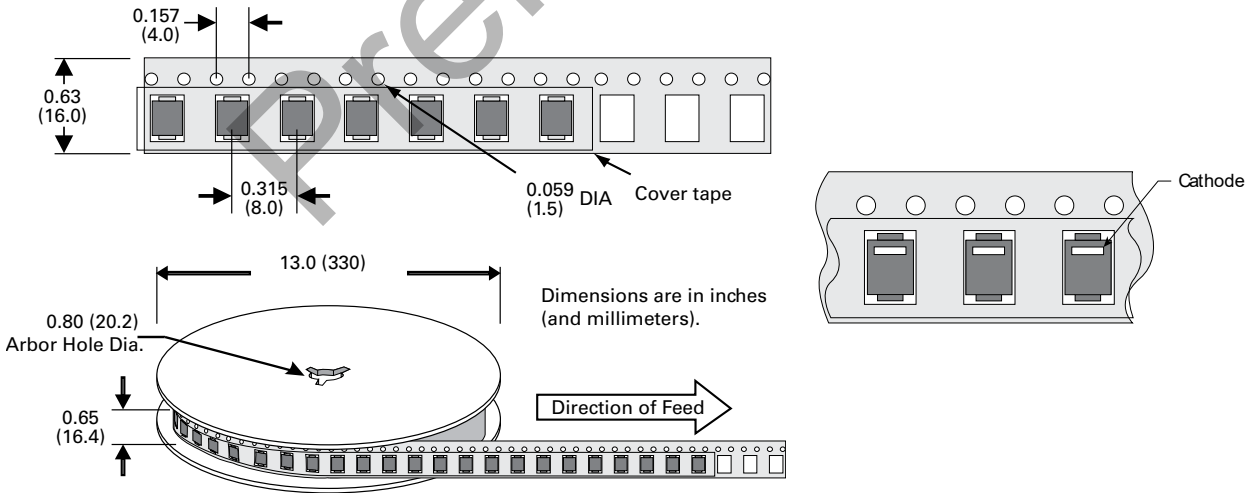


| Dimensions | Inches | | Millimeters | |
|------------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.114 | 0.126 | 2.900 | 3.200 |
| B | 0.260 | 0.280 | 6.600 | 7.110 |
| C | 0.220 | 0.245 | 5.590 | 6.220 |
| D | 0.079 | 0.103 | 2.060 | 2.620 |
| E | 0.030 | 0.060 | 0.760 | 1.520 |
| F | - | 0.008 | - | 0.203 |
| G | 0.305 | 0.320 | 7.750 | 8.130 |
| H | 0.006 | 0.012 | 0.152 | 0.305 |
| I | 0.129 | - | 3.300 | - |
| J | 0.094 | - | 2.400 | - |
| K | - | 0.165 | - | 4.200 |
| L | 0.094 | - | 2.400 | - |

Packaging

| Part number | Component Package | Quantity | Packaging Option | Packaging Specification |
|----------------|-------------------|----------|----------------------------------|-------------------------|
| TP5.0SMDJxxxXX | DO-214AB | 3000 | Tape & Reel - 16mm tape/13" reel | EIA STD RS-481 |

Tape and Reel Specification



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