

5.0SMDJ Series

Surface Mount – 5000W



Web Resources



Download ECAD models, order samples, and find technical resources at www.littelfuse.com

Agency Approvals

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

Maximum Ratings and 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_D | 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 | $R_{\theta\text{JL}}$ | 15 | $^{\circ}\text{C}/\text{W}$ |
| Typical Thermal Resistance Junction to Ambient | $R_{\theta\text{JA}}$ | 75 | $^{\circ}\text{C}/\text{W}$ |

Notes:

- Non-repetitive current pulse, per Fig. 4 and derated above T_J (initial) = 25°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 component only, duty cycle = 4 per minute maximum.

Description

The 5.0SMDJ series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

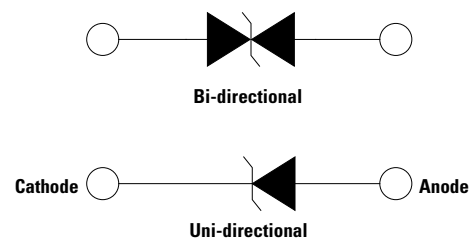
Features & Benefits

- 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 pass class 1/2
- IEC 61000-4-2 ESD 30kV(Air), 30kV (Contact)
- Built-in strain relief
- Glass passivated chip junction
- Fast response time: typically less than 1.0ps from 0V to BV min
- Low dynamic resistance
- $V_{\text{BR}} @ T_J = V_{\text{BR}} @ 25^{\circ}\text{C} \times (1 + \alpha_T \times (T_J - 25))$ (α_T : Temperature Coefficient,)
- UL Recognized compound meeting flammability rating V-0
- 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 devices are ideal for the protection of I/O Interfaces, VCC bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.


Functional Diagram



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Surface Mount – 5000W

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

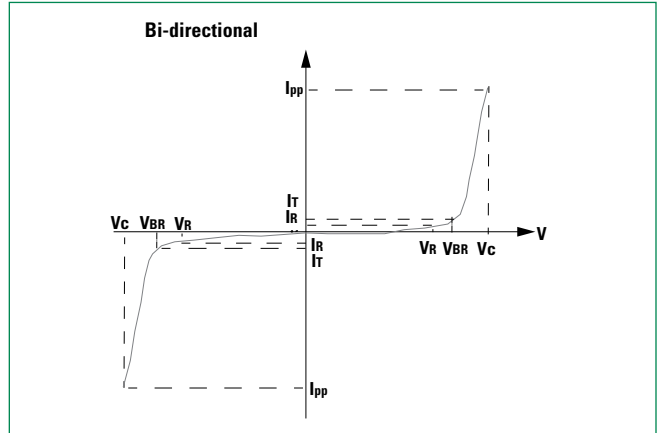
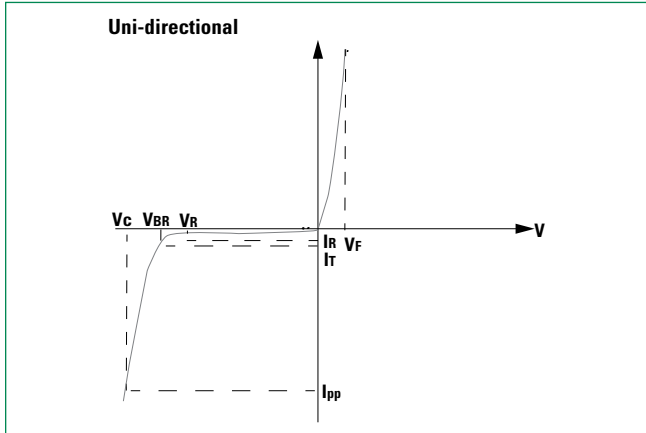
| Part Number (Uni) | Part Number (Bi) | Marking | | Reverse Stand off Voltage V_R (Volts) | Breakdown Voltage V_{BR} (Volts) @ I_T | | Test Current I_T (mA) | Maximum Clamping Voltage V_C @ I_{PP} (10/1000 μ s) (V) | Maximum Peak Pulse Current I_{PP} (10/1000 μ s) (A) | Maximum Reverse Leakage I_R @ V_R (μ A) | Maximum Temperature Coefficient of V_{BR} (%/C) | Agency Approval  |
|-------------------|------------------|---------|------|---|--|-------|-------------------------|---|---|--|---|---|
| | | Uni | Bi | | Min. | Max. | | | | | | |
| 5.0SMDJ12A | 5.0SMDJ12CA | 5PEP | 5BEP | 12.0 | 13.3 | 14.7 | 10 | 19.9 | 252.0 | 5 | 0.075 | X |
| 5.0SMDJ13A | 5.0SMDJ13CA | 5PEQ | 5BEQ | 13.0 | 14.4 | 15.9 | 10 | 21.5 | 233.0 | 5 | 0.076 | X |
| 5.0SMDJ14A | 5.0SMDJ14CA | 5PER | 5BER | 14.0 | 15.6 | 17.2 | 10 | 23.2 | 216.0 | 5 | 0.08 | X |
| 5.0SMDJ15A | 5.0SMDJ15CA | 5PES | 5BES | 15.0 | 16.7 | 18.5 | 1 | 24.4 | 205.0 | 5 | 0.083 | X |
| 5.0SMDJ16A | 5.0SMDJ16CA | 5PET | 5BET | 16.0 | 17.8 | 19.7 | 1 | 26.0 | 193.0 | 5 | 0.084 | X |
| 5.0SMDJ17A | 5.0SMDJ17CA | 5PEU | 5BEU | 17.0 | 18.9 | 20.9 | 1 | 27.6 | 181.0 | 5 | 0.085 | X |
| 5.0SMDJ18A | 5.0SMDJ18CA | 5PEV | 5BEV | 18.0 | 20.0 | 22.1 | 1 | 29.2 | 172.0 | 5 | 0.088 | X |
| 5.0SMDJ20A | 5.0SMDJ20CA | 5PEW | 5BEW | 20.0 | 22.2 | 24.5 | 1 | 32.4 | 155.0 | 5 | 0.091 | X |
| 5.0SMDJ22A | 5.0SMDJ22CA | 5PEX | 5BEX | 22.0 | 24.4 | 26.9 | 1 | 35.5 | 141.0 | 5 | 0.092 | X |
| 5.0SMDJ24A | 5.0SMDJ24CA | 5PEZ | 5BEZ | 24.0 | 26.7 | 29.5 | 1 | 38.9 | 129.0 | 5 | 0.092 | X |
| 5.0SMDJ26A | 5.0SMDJ26CA | 5PFE | 5BFE | 26.0 | 28.9 | 31.9 | 1 | 42.1 | 119.0 | 5 | 0.093 | X |
| 5.0SMDJ28A | 5.0SMDJ28CA | 5PFG | 5BFG | 28.0 | 31.1 | 34.4 | 1 | 45.4 | 110.0 | 5 | 0.094 | X |
| 5.0SMDJ30A | 5.0SMDJ30CA | 5PFK | 5BFK | 30.0 | 33.3 | 36.8 | 1 | 48.4 | 103.0 | 5 | 0.096 | X |
| 5.0SMDJ33A | 5.0SMDJ33CA | 5PFM | 5BFM | 33.0 | 36.7 | 40.6 | 1 | 53.3 | 93.9 | 5 | 0.097 | X |
| 5.0SMDJ36A | 5.0SMDJ36CA | 5PFP | 5BFP | 36.0 | 40.0 | 44.2 | 1 | 58.1 | 86.1 | 5 | 0.098 | X |
| 5.0SMDJ40A | 5.0SMDJ40CA | 5PFR | 5BFR | 40.0 | 44.4 | 49.1 | 1 | 64.5 | 77.6 | 5 | 0.099 | X |
| 5.0SMDJ43A | 5.0SMDJ43CA | 5PFT | 5BFT | 43.0 | 47.8 | 52.8 | 1 | 69.4 | 72.1 | 5 | 0.1 | X |
| 5.0SMDJ45A | 5.0SMDJ45CA | 5PFV | 5BFV | 45.0 | 50.0 | 55.3 | 1 | 72.7 | 68.8 | 5 | 0.101 | X |
| 5.0SMDJ48A | 5.0SMDJ48CA | 5PFX | 5BFX | 48.0 | 53.3 | 58.9 | 1 | 77.4 | 64.7 | 5 | 0.101 | X |
| 5.0SMDJ51A | 5.0SMDJ51CA | 5PFZ | 5BFZ | 51.0 | 56.7 | 62.7 | 1 | 82.4 | 60.7 | 5 | 0.101 | X |
| 5.0SMDJ54A | 5.0SMDJ54CA | 5PGE | 5BGE | 54.0 | 60.0 | 66.3 | 1 | 87.1 | 57.5 | 5 | 0.102 | X |
| 5.0SMDJ58A | 5.0SMDJ58CA | 5PGG | 5BGG | 58.0 | 64.4 | 71.2 | 1 | 93.6 | 53.5 | 5 | 0.103 | X |
| 5.0SMDJ60A | 5.0SMDJ60CA | 5PGK | 5BGK | 60.0 | 66.7 | 73.7 | 1 | 96.8 | 51.7 | 5 | 0.103 | X |
| 5.0SMDJ64A | 5.0SMDJ64CA | 5PGM | 5BGM | 64.0 | 71.1 | 78.6 | 1 | 103.0 | 48.6 | 5 | 0.104 | X |
| 5.0SMDJ70A | 5.0SMDJ70CA | 5PGP | 5BGP | 70.0 | 77.8 | 86.0 | 1 | 113.0 | 44.3 | 5 | 0.105 | X |
| 5.0SMDJ75A | 5.0SMDJ75CA | 5PGR | 5BGR | 75.0 | 83.3 | 92.1 | 1 | 121.0 | 41.4 | 5 | 0.106 | X |
| 5.0SMDJ78A | 5.0SMDJ78CA | 5PGT | 5BGT | 78.0 | 86.7 | 95.8 | 1 | 126.0 | 39.7 | 5 | 0.106 | X |
| 5.0SMDJ85A | 5.0SMDJ85CA | 5PGV | 5BGV | 85.0 | 94.4 | 104.0 | 1 | 137.0 | 36.5 | 5 | 0.106 | X |
| 5.0SMDJ90A | 5.0SMDJ90CA | 5PGX | 5BGX | 90.0 | 100.0 | 111.0 | 1 | 146.0 | 34.3 | 5 | 0.107 | X |
| 5.0SMDJ100A | 5.0SMDJ100CA | 5PGZ | 5BGZ | 100.0 | 111.0 | 123.0 | 1 | 162.0 | 30.9 | 5 | 0.107 | X |
| 5.0SMDJ110A | 5.0SMDJ110CA | 5PHE | 5BHE | 110.0 | 122.0 | 135.0 | 1 | 177.0 | 28.3 | 5 | 0.107 | X |
| 5.0SMDJ120A | 5.0SMDJ120CA | 5PHG | 5BHG | 120.0 | 133.0 | 147.0 | 1 | 193.0 | 26.0 | 5 | 0.108 | X |
| 5.0SMDJ130A | 5.0SMDJ130CA | 5PHK | 5BHK | 130.0 | 144.0 | 159.0 | 1 | 209.0 | 24.0 | 5 | 0.108 | X |
| 5.0SMDJ140A | 5.0SMDJ140CA | 5PHL | 5BHL | 140.0 | 156.0 | 172.0 | 1 | 226.1 | 22.2 | 5 | 0.108 | X |
| 5.0SMDJ150A | 5.0SMDJ150CA | 5PHM | 5BHM | 150.0 | 167.0 | 185.0 | 1 | 243.0 | 20.6 | 5 | 0.108 | X |
| 5.0SMDJ160A | 5.0SMDJ160CA | 5PHP | 5BHB | 160.0 | 178.0 | 197.0 | 1 | 259.0 | 19.3 | 5 | 0.108 | X |
| 5.0SMDJ170A | 5.0SMDJ170CA | 5PHR | 5BHR | 170.0 | 189.0 | 209.0 | 1 | 275.0 | 18.2 | 5 | 0.108 | X |
| 5.0SMDJ180A | 5.0SMDJ180CA | 5PHT | 5BHT | 180 | 200 | 221 | 1 | 292.0 | 17.5 | 5 | 0.108 | - |
| 5.0SMDJ200A | 5.0SMDJ200CA | 5PHV | 5BHV | 200 | 224 | 247 | 1 | 325.0 | 15.4 | 5 | 0.11 | - |
| 5.0SMDJ220A | 5.0SMDJ220CA | 5PHX | 5BHX | 220 | 244 | 270 | 1 | 357.0 | 14.1 | 5 | 0.11 | - |
| 5.0SMDJ250A | 5.0SMDJ250CA | 5PHZ | 5BHZ | 250 | 279 | 309 | 1 | 406.0 | 12.4 | 5 | 0.11 | - |
| 5.0SMDJ300A | 5.0SMDJ300CA | 5PIE | 5BIE | 300 | 335 | 371 | 1 | 487.0 | 10.3 | 5 | 0.112 | - |
| 5.0SMDJ350A | 5.0SMDJ350CA | 5PIG | 5BIG | 350 | 391 | 432 | 1 | 568.0 | 8.9 | 5 | 0.112 | - |
| 5.0SMDJ400A | 5.0SMDJ400CA | 5PIK | 5BIK | 400 | 447 | 494 | 1 | 649.0 | 7.8 | 5 | 0.112 | - |
| 5.0SMDJ440A | 5.0SMDJ440CA | 5PIM | 5BIM | 440 | 492 | 544 | 1 | 714.0 | 7.1 | 5 | 0.112 | - |

V_R 12–30V bi & uni direction and 33–60V uni is single die and the rest is stack die.

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I-V Curve Characteristics



- P_{PPM}** Peak Pulse Power Dissipation $I_{pp} \times V_c$ – 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_r)
- V_c** Clamping Voltage – Peak voltage measured across the TVS at a specified I_{PPM} (peak impulse current)
- I_{Rr}** Reverse Leakage Current – Current measured at V_R
- V_F** Forward Voltage Drop for Uni-directional

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

Figure 1:
TVS Transients Clamping Waveform

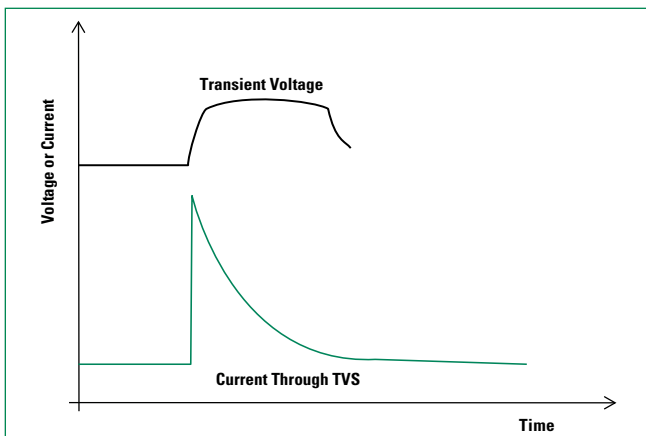


Figure 2:
Peak Pulse Power Rating



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

Figure 3:
Peak Pulse Power Derating Curve

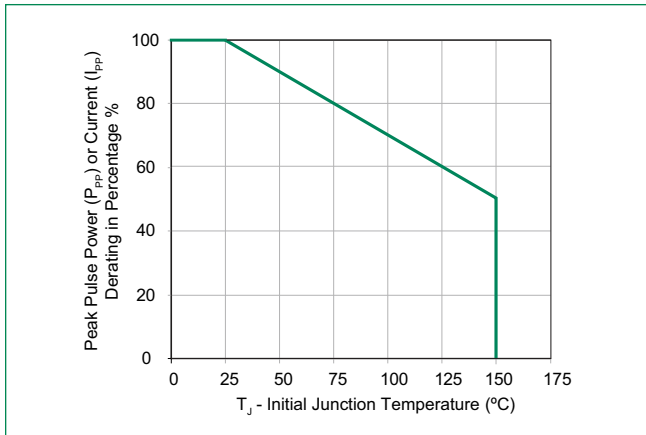


Figure 4:
Pulse Waveform

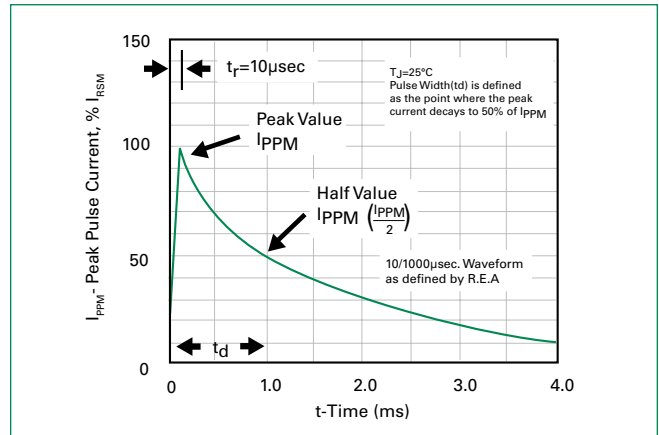


Figure 5:
Typical Junction Capacitance

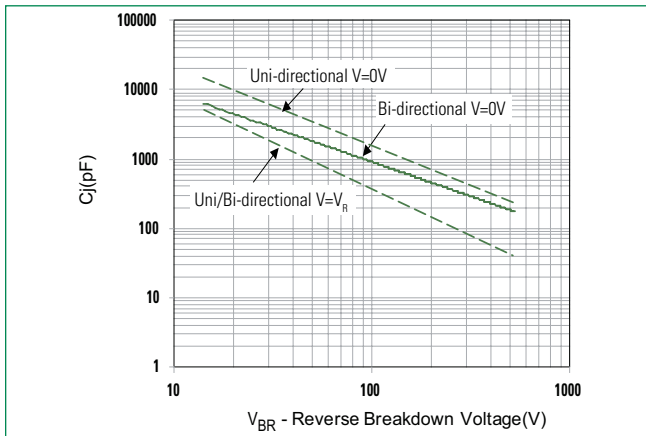


Figure 6:
Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only

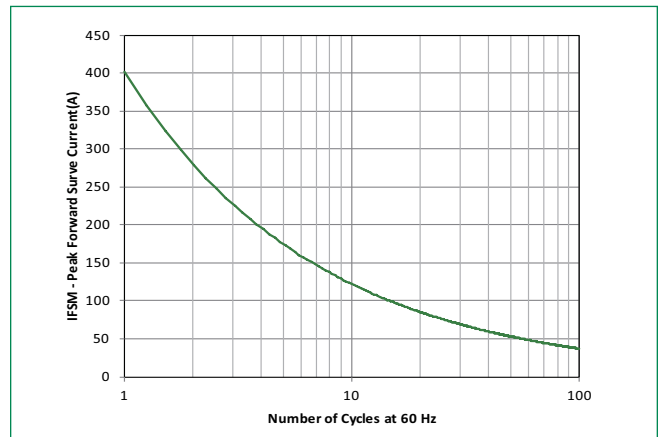
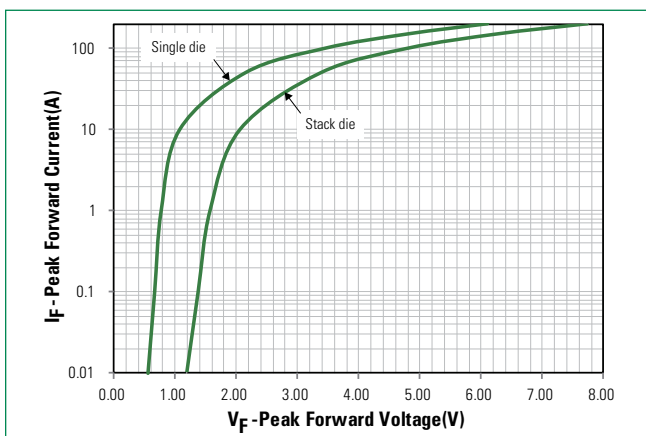


Figure 7:
Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)

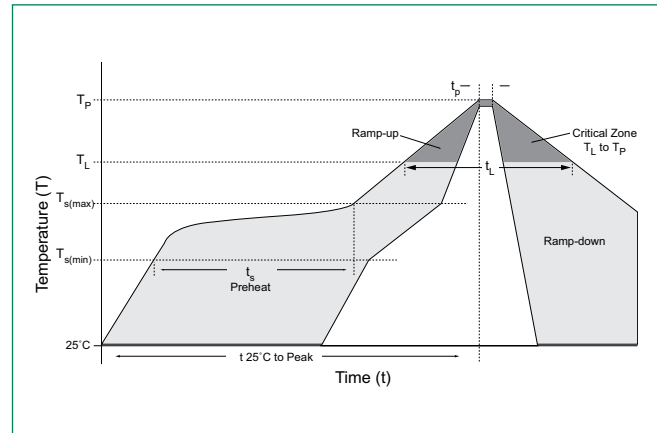


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Soldering Parameters

| | | |
|--|------------------------------------|-------------------------|
| 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_A) to peak) | | 3°C/second max |
| $T_{s(max)}$ to T_A - Ramp-up Rate | | 3°C/second max |
| Reflow | - Temperature (T_L) (Liquidus) | 217°C |
| | - Time (min to max) (t_L) | 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 |



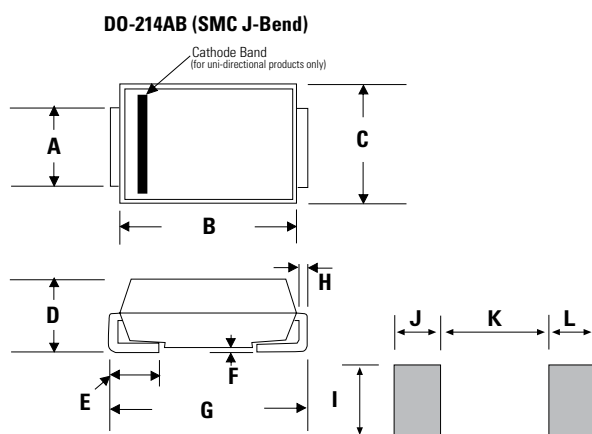
Physical Specifications

| | |
|-----------------|--|
| Weight | 0.007 ounce, 0.21 grams |
| Case | JEDEC DO214AB. Molded component over glass passivated junction |
| Polarity | Uni-directional products are denoted with a cathode band |
| Terminal | Matte Tin-plated leads, Solderable per JESD22-B102 |

Environmental Specifications

| | |
|--|--|
| High Temp Voltage Blocking (HTRB) | 100 % DC reverse voltage rated 150 °C, 1008 hours JEDEC, JESD22-A-108 |
| Biased Temp & Humidity (H3TRB) | 80 % breakdown voltage (+85 °C) 85 %RH, 1008 hours JEDEC, JESD22-A-101 |
| Unbiased Highly Accelerated Stress Test (UHASt) | 96 hours at $T_A = 130$ °C/85 %RH. JEDEC, JESD22-A-118 |
| Temp Cycling (TC) | -55 °C to +150 °C, 15 min. dwell, 1000 cycles. JEDEC, JESD22-A104 |
| Moisture Sensitivity Level (MSL) | 85 %RH, +85 °C, 168 hours, 3 reflow cycles (+260 °C Peak). JEDEC, JEDEC-J-STD-020, Level 1 |
| Resistance to Solder Heat (RSH) | +260 °C, 30 seconds JEDEC, JEDEC JESD22-A-111 |

Dimensions



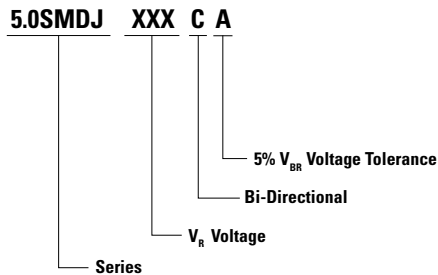
Dimensions in inches and (millimeters)

| 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 | - |

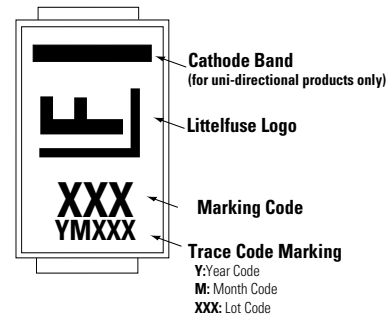
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Part Numbering System



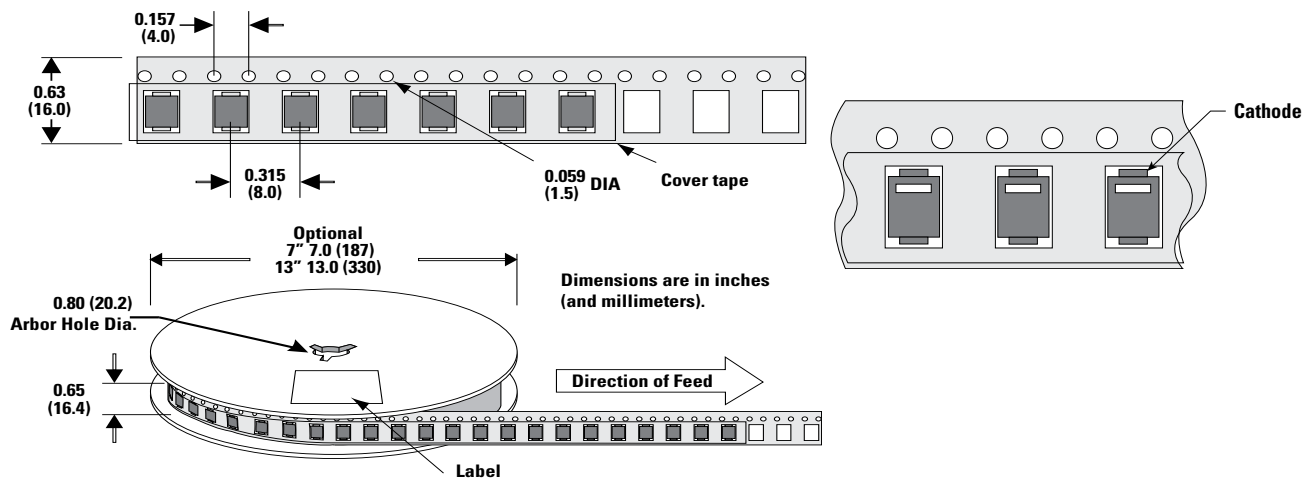
Part Marking System



Packaging Options

| Part number | Component Package | Quantity | Packaging Option | Packaging Specification |
|-----------------|-------------------|----------|----------------------------------|-------------------------|
| 5.0SMDJxxxXX | DO-214AB | 3000 | Tape & Reel - 16mm tape/13" reel | EIA STD RS-481 |
| 5.0SMDJxxxXX-T7 | DO-214AB | 500 | Tape & Reel - 16mm tape/7" reel | EIA STD RS-481 |

Tape and Reel Specification



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