

5.0SMDJxxS Series

Single Chip Design



Additional Information



Resources



Accessories



Samples

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 |
|--|-----------------|------------|---------------------------|
| Maximum Peak Pulse Power Dissipation at $T_J=25^\circ\text{C}$ by 10/1000 μs Waveform (Fig.2)(Note 1)(Note 2) | P_{PPM} | 5000 | W |
| Power Dissipation on Infinite Heat Sink at $T_C=50^\circ\text{C}$ (Note 4) | 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 | 3.5 | 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 | $^\circ\text{C}/\text{W}$ |
| Typical Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 75 | $^\circ\text{C}/\text{W}$ |

Notes:

- Non-repetitive current pulse, per Fig. 4 and derated above T_J (initial) $=25^\circ\text{C}$ per Fig. 3.
- Voltage of 6.0V-60V products's peak pulse power dissipation is 5000W, and 64V and 75V is 4500W. Bi-directional products 33V-58V are also 4500W.
- Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional components only, duty cycle=4 per minute maximum.
- Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) to each terminal.

Description

The 5.0SMDJxxS series, single chip design is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Features

- 5000W peak pulse power capability at 10/1000 μs waveform, repetition rate (duty cycles):0.01 %
- Recognized to UL 497B as an Isolated Loop Circuit Protector
- DO214AB SMT package for minimized board space
- Low profile package
- 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, ESD 30kV (Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Built-in strain relief
- Glass passivated chip junction
- Very fast response time
- Excellent clamping capability
- Low incremental surge resistance
- Typical IR less than 2 μA when $V_{BR\ min}>12\text{V}$
- High temperature to reflow soldering guaranteed: 260 $^\circ\text{C}/10\text{sec}$
- $V_{BR} @ T_J = V_{BR}@25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$ (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)

Applications

TVS components 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



Bi-directional



Uni-directional

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

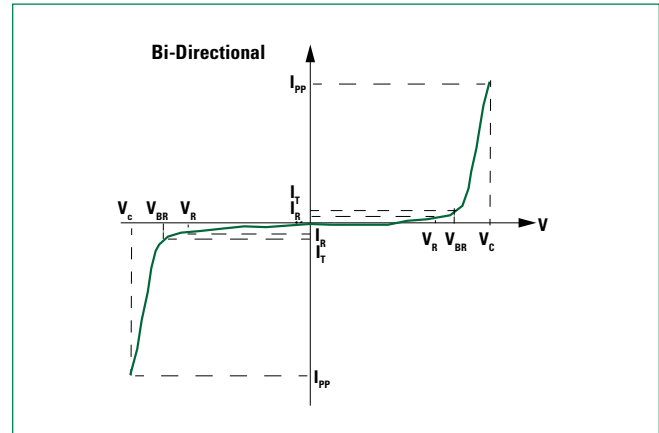
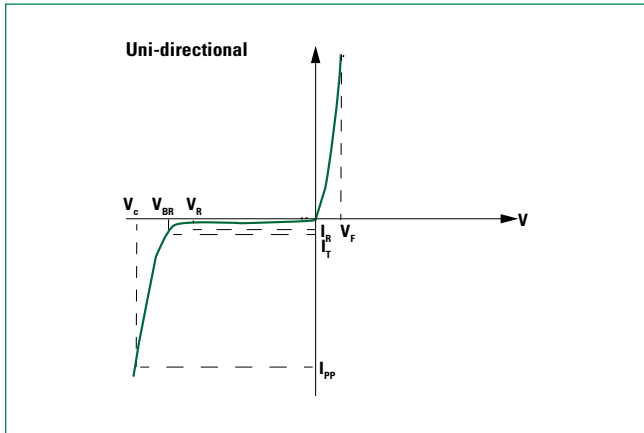
| Part Number (Uni) | Part Number (Bi) | Marking | | Reverse Stand off Voltage V_R (Volts) | Break-down Voltage V_{BR} (Volts) @ I_T | | Test Current I_T (mA) | Maximum Clamping Voltage VC @ I_{PP} (10/1000 μ s) (V) | Maximum Peak Pulse Current I_{PP} (10/1000 μ s) (A) | Maximum Clamping Voltage V_C @ 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) | Agency Approval |
|-------------------|------------------|---------|------|---|---|------|-------------------------|--|---|--|--|--|---|-----------------|
| | | UNI | BI | | Min | Max | | | | | | | | |
| 5.0SMDJ6.0AS | 5.0SMDJ6.0CAS | 5PAB | 5BAB | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 485.4 | 13.3 | 2669.7 | 800.0 | 0.046 | X |
| 5.0SMDJ6.5AS | 5.0SMDJ6.5CAS | 5PAE | 5BAE | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 446.4 | 14.5 | 2455.2 | 500.0 | 0.052 | X |
| 5.0SMDJ7.0AS | 5.0SMDJ7.0CAS | 5PAF | 5BAF | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 416.7 | 15.5 | 2291.9 | 200.0 | 0.058 | X |
| 5.0SMDJ7.5AS | 5.0SMDJ7.5CAS | 5PAG | 5BAG | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 387.6 | 16.7 | 2131.8 | 100.0 | 0.061 | X |
| 5.0SMDJ8.0AS | 5.0SMDJ8.0CAS | 5PAK | 5BAK | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 367.6 | 17.6 | 2021.8 | 50.0 | 0.064 | X |
| 5.0SMDJ8.5AS | 5.0SMDJ8.5CAS | 5PAM | 5BAM | 8.5 | 9.44 | 10.4 | 1 | 14.4 | 347.2 | 18.6 | 1909.6 | 20.0 | 0.066 | X |
| 5.0SMDJ9.0AS | 5.0SMDJ9.0CAS | 5PAP | 5BAP | 9.0 | 10.0 | 11.1 | 1 | 15.4 | 324.7 | 19.9 | 1785.9 | 10.0 | 0.069 | X |
| 5.0SMDJ10AS | 5.0SMDJ10CAS | 5PAR | 5BAR | 10.0 | 11.1 | 12.3 | 1 | 17.0 | 294.1 | 22.0 | 1617.6 | 5.0 | 0.071 | X |
| 5.0SMDJ11AS | 5.0SMDJ11CAS | 5PAT | 5BAT | 11.0 | 12.2 | 13.5 | 1 | 18.2 | 274.7 | 23.5 | 1510.9 | 2.0 | 0.074 | X |
| 5.0SMDJ12AS | 5.0SMDJ12CAS | 5PAV | 5BAV | 12.0 | 13.3 | 14.7 | 1 | 19.9 | 251.3 | 25.7 | 1382.2 | 2.0 | 0.075 | X |
| 5.0SMDJ13AS | 5.0SMDJ13CAS | 5PAX | 5BAX | 13.0 | 14.4 | 15.9 | 1 | 21.5 | 232.6 | 27.8 | 1279.3 | 2.0 | 0.076 | X |
| 5.0SMDJ14AS | 5.0SMDJ14CAS | 5PAZ | 5BAZ | 14.0 | 15.6 | 17.2 | 1 | 23.2 | 215.5 | 30.0 | 1185.3 | 2.0 | 0.080 | X |
| 5.0SMDJ15AS | 5.0SMDJ15CAS | 5PBE | 5BBE | 15.0 | 16.7 | 18.5 | 1 | 24.4 | 204.9 | 31.5 | 1127.0 | 2.0 | 0.083 | X |
| 5.0SMDJ16AS | 5.0SMDJ16CAS | 5PBG | 5BBG | 16.0 | 17.8 | 19.7 | 1 | 26.0 | 192.3 | 33.6 | 1057.7 | 2.0 | 0.084 | X |
| 5.0SMDJ17AS | 5.0SMDJ17CAS | 5PBK | 5BBK | 17.0 | 18.9 | 20.9 | 1 | 27.6 | 181.2 | 35.7 | 996.6 | 2.0 | 0.085 | X |
| 5.0SMDJ18AS | 5.0SMDJ18CAS | 5PBM | 5BBM | 18.0 | 20.0 | 22.1 | 1 | 29.2 | 171.2 | 37.7 | 941.6 | 2.0 | 0.088 | X |
| 5.0SMDJ20AS | 5.0SMDJ20CAS | 5PBP | 5BBP | 20.0 | 22.2 | 24.5 | 1 | 32.4 | 154.3 | 41.9 | 848.7 | 2.0 | 0.091 | X |
| 5.0SMDJ22AS | 5.0SMDJ22CAS | 5PBR | 5BBR | 22.0 | 24.4 | 26.9 | 1 | 35.5 | 140.8 | 45.9 | 774.4 | 2.0 | 0.092 | X |
| 5.0SMDJ24AS | 5.0SMDJ24CAS | 5PBT | 5BBT | 24.0 | 26.7 | 29.5 | 1 | 38.9 | 128.5 | 50.3 | 706.8 | 2.0 | 0.092 | X |
| 5.0SMDJ26AS | 5.0SMDJ26CAS | 5PBV | 5BBV | 26.0 | 28.9 | 31.9 | 1 | 42.1 | 118.8 | 54.4 | 653.4 | 2.0 | 0.093 | X |
| 5.0SMDJ28AS | 5.0SMDJ28CAS | 5PBX | 5BBX | 28.0 | 31.1 | 34.4 | 1 | 45.4 | 110.1 | 58.7 | 605.6 | 2.0 | 0.094 | X |
| 5.0SMDJ30AS | 5.0SMDJ30CAS | 5PBZ | 5BBZ | 30.0 | 33.3 | 36.8 | 1 | 48.4 | 103.3 | 62.5 | 568.2 | 2.0 | 0.096 | X |
| 5.0SMDJ33AS | - | 5PCB | - | 33.0 | 36.7 | 40.6 | 1 | 53.3 | 93.9 | 68.9 | 516.5 | 2.0 | 0.097 | X |
| - | 5.0SMDJ33CAS | - | 5BCB | 33.0 | 36.7 | 40.6 | 1 | 53.3 | 84.4 | 68.9 | 516.5 | 2.0 | 0.097 | X |
| 5.0SMDJ36AS | - | 5PCE | - | 36.0 | 40.0 | 44.2 | 1 | 58.1 | 86.1 | 75.1 | 430.5 | 2.0 | 0.098 | X |
| - | 5.0SMDJ36CAS | - | 5BCE | 36.0 | 40.0 | 44.2 | 1 | 58.1 | 77.5 | 75.1 | 430.5 | 2.0 | 0.098 | X |
| 5.0SMDJ40AS | - | 5PCF | - | 40.0 | 44.4 | 49.1 | 1 | 64.5 | 77.6 | 83.3 | 388.0 | 2.0 | 0.099 | X |
| - | 5.0SMDJ40CAS | - | 5BCF | 40.0 | 44.4 | 49.1 | 1 | 64.5 | 69.8 | 83.3 | 388.0 | 2.0 | 0.099 | X |
| 5.0SMDJ43AS | - | 5PCG | - | 43.0 | 47.8 | 52.8 | 1 | 69.4 | 72.1 | 89.7 | 360.5 | 2.0 | 0.100 | X |
| - | 5.0SMDJ43CAS | - | 5BCG | 43.0 | 47.8 | 52.8 | 1 | 69.4 | 64.8 | 89.7 | 360.5 | 2.0 | 0.100 | X |
| 5.0SMDJ45AS | - | 5PCK | - | 45.0 | 50.0 | 55.3 | 1 | 72.7 | 68.8 | 93.9 | 344.0 | 2.0 | 0.101 | X |
| - | 5.0SMDJ45CAS | - | 5BCK | 45.0 | 50.0 | 55.3 | 1 | 72.7 | 61.9 | 93.9 | 344.0 | 2.0 | 0.101 | X |
| 5.0SMDJ48AS | - | 5PCM | - | 48.0 | 53.3 | 58.9 | 1 | 77.4 | 64.7 | 100.0 | 323.5 | 2.0 | 0.101 | X |
| - | 5.0SMDJ48CAS | - | 5BCM | 48.0 | 53.3 | 58.9 | 1 | 77.4 | 58.1 | 100.0 | 323.5 | 2.0 | 0.101 | X |
| 5.0SMDJ51AS | - | 5PCP | - | 51.0 | 56.7 | 62.7 | 1 | 82.4 | 60.7 | 106.5 | 303.5 | 2.0 | 0.101 | X |
| - | 5.0SMDJ51CAS | - | 5BCP | 51.0 | 56.7 | 62.7 | 1 | 82.4 | 54.6 | 106.5 | 303.5 | 2.0 | 0.101 | X |
| 5.0SMDJ54AS | - | 5PCR | - | 54.0 | 60.0 | 66.3 | 1 | 87.1 | 57.5 | 112.5 | 287.5 | 2.0 | 0.102 | X |
| - | 5.0SMDJ54CAS | - | 5BCR | 54.0 | 60.0 | 66.3 | 1 | 87.1 | 51.7 | 112.5 | 287.5 | 2.0 | 0.102 | X |
| 5.0SMDJ58AS | - | 5PCT | - | 58.0 | 64.4 | 71.2 | 1 | 93.6 | 53.5 | 120.9 | 267.5 | 2.0 | 0.103 | X |
| - | 5.0SMDJ58CAS | - | 5BCT | 58.0 | 64.4 | 71.2 | 1 | 93.6 | 48.1 | 120.9 | 267.5 | 2.0 | 0.103 | X |
| 5.0SMDJ60AS | - | 5PCV | - | 60.0 | 66.7 | 73.7 | 1 | 96.8 | 51.7 | 125.1 | 258.5 | 2.0 | 0.103 | X |
| 5.0SMDJ64AS | - | 5PCX | - | 64.0 | 71.1 | 78.6 | 1 | 103.0 | 43.7 | 133.1 | 243.0 | 2.0 | 0.104 | X |
| 5.0SMDJ70AS | - | 5PCZ | - | 70.0 | 77.8 | 86.0 | 1 | 113.0 | 39.9 | 146.0 | 221.5 | 2.0 | 0.105 | X |

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

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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

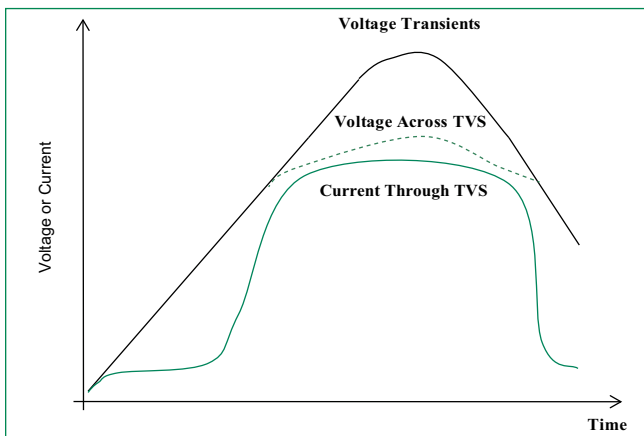
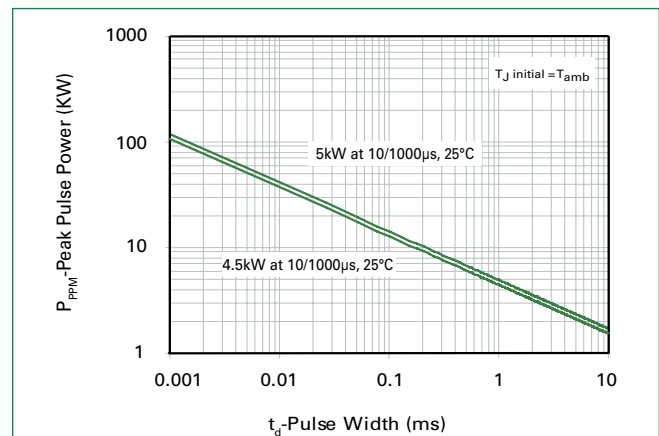


Figure 2:
Peak Pulse Power Rating



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Figure 3:
Peak Pulse Power Derating Curve

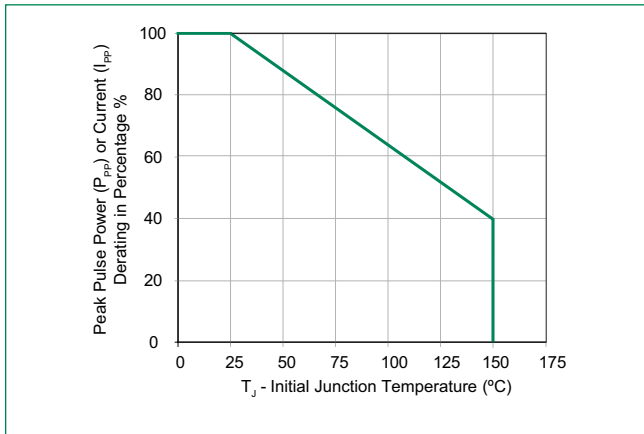


Figure 4:
Pulse Waveform

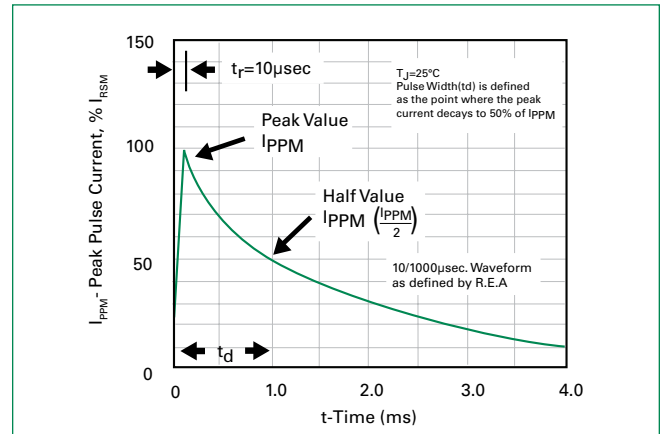


Figure 5:
Typical Junction Capacitance

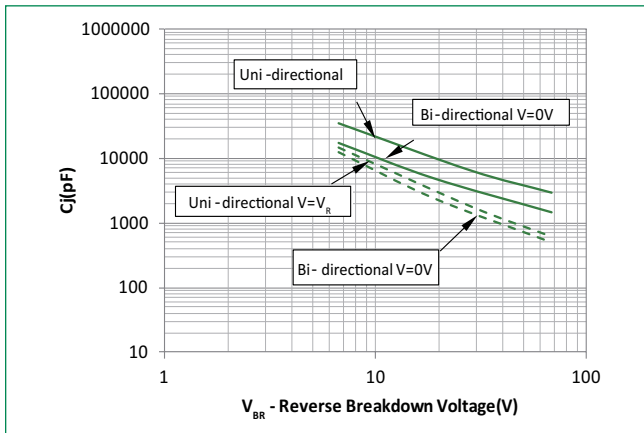


Figure 6:
Typical Transient Thermal Impedance

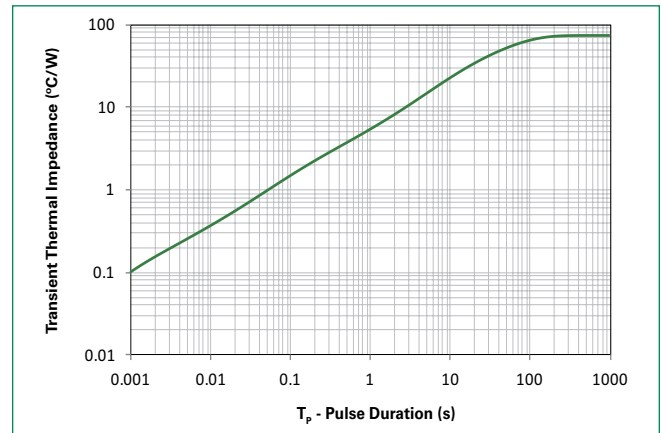


Figure 7:
Maximum Non-Repetitive Peak Forward Surge Current
Uni-Directional Only

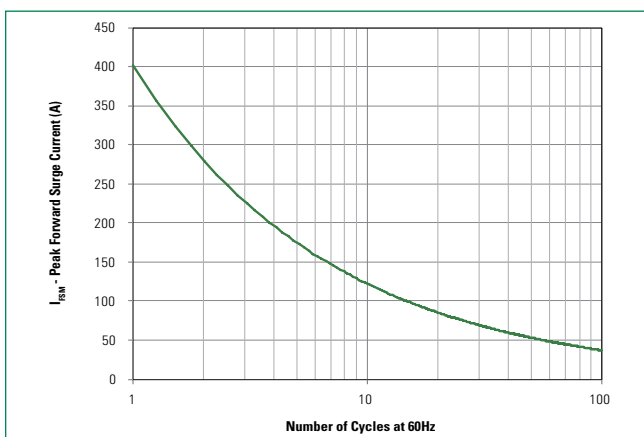
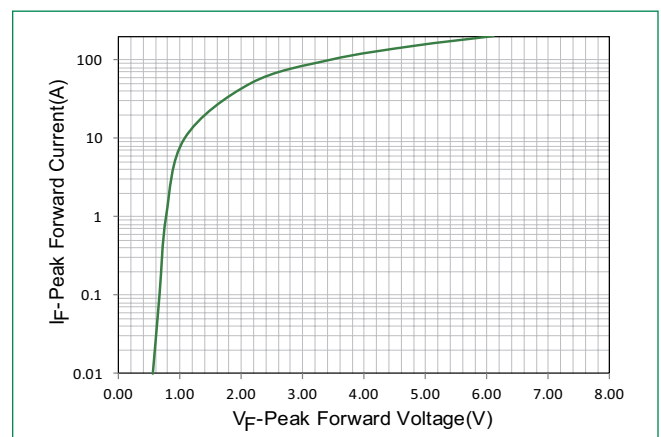


Figure 8:
Peak Forward Voltage Drop vs Peak Forward Current
(Typical Values)

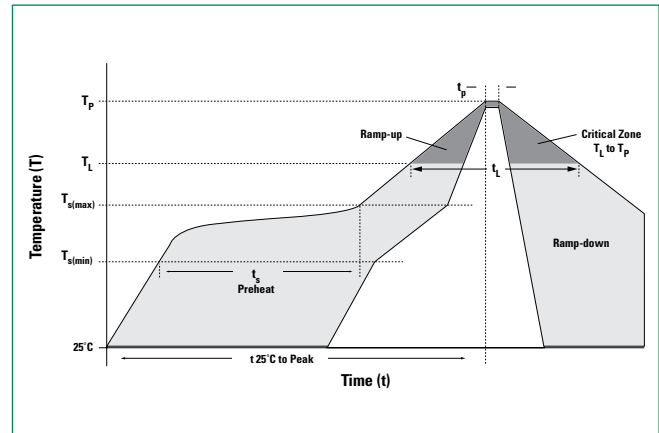


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Soldering Parameters

| | | |
|--|------------------------------------|-------------------------|
| 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_L) | 60 – 180 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_L) | 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 |



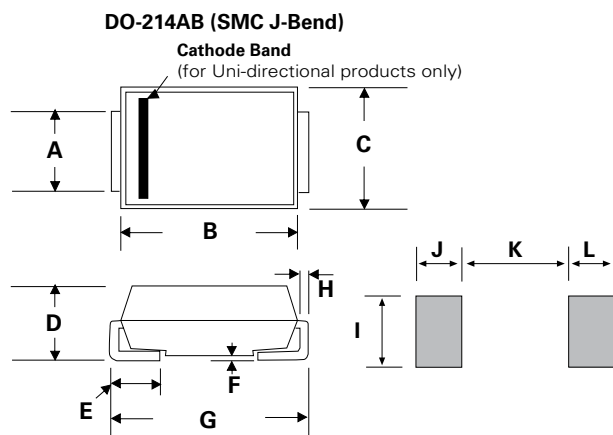
Physical Specifications

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

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 |

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 | - |

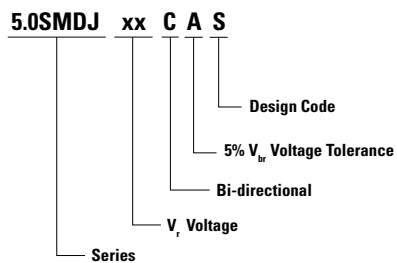
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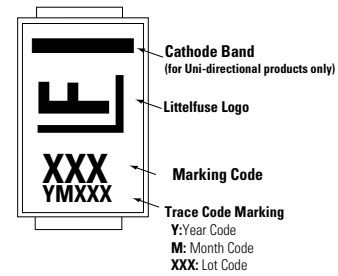
Packaging Options

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

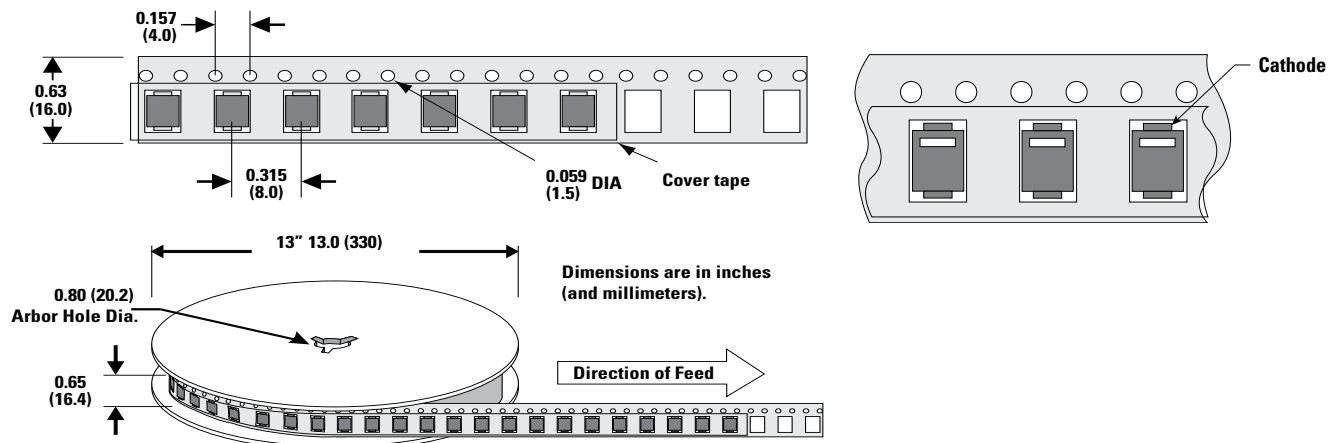
Part Numbering System



Part Marking System



Tape and Reel Specification



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