

Surface Mount Transient Voltage Suppressors (TVS)

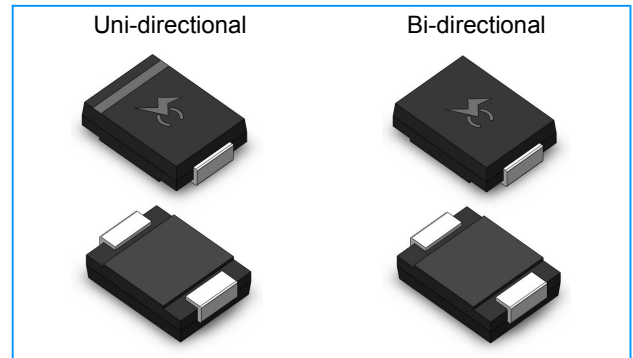
SMCJ Series 5.0 To 440 V 1500W

Description

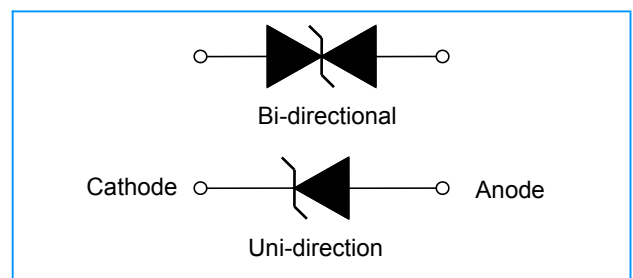
The SMCJ series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Features

- ◆ For surface mounted applications in order to optimize board space
- ◆ Low leakage
- ◆ Uni and Bidirectional unit
- ◆ Glass passivated junction
- ◆ Low inductance
- ◆ Excellent clamping capability
- ◆ 1500W Peak power capability at 10 × 1000μs waveform Repetition rate (duty cycle):0.01%
- ◆ Fast response time: typically less than 1.0ps from 0 Volts to V_{BR} min
- ◆ Typical I_R less than 5μA above 12V.
- ◆ High Temperature soldering: 260°C/40 seconds at terminals
- ◆ Typical maximum temperature coefficient $\Delta V_{BR} = 0.1\% \times V_{BR@25^{\circ}C} \times \Delta T$
- ◆ Plastic package has Underwriters Laboratory Flammability 94V-0
- ◆ Matte tin lead-free Plated
- ◆ Halogen free and RoHS compliant
- ◆ 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 15kV(Air), 8kV (Contact)
- ◆ ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- ◆ EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)



Functional Diagram



Agency Approvals

| AGENCY | AGENCY FILE NUMBER |
|--------|--------------------|
| | E341027 |

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 .

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

| Parameter | Symbol | Value | Unit |
|--|-----------------------------------|----------------|---------|
| Peak Pulse Power Dissipation with a 10/1000μs waveform (Fig.1)(Note 1), (Note 2) | P _{PPM} | 1500 | Watts |
| Peak Pulse Current with a 10/1000μs waveform.(Note1, Fig.3) | I _{PP} | See Next Table | Amps |
| Power Dissipation on Infinite Heat Sink at T _L =75°C | P _{M(AV)} | 6.5 | Watt |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3) | I _{FSM} | 200 | Amps |
| Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only (Note 4) | V _F | 3.5/5.0 | Voltage |
| Operating junction and Storage Temperature Range. | T _J , T _{STG} | -55 to +150 | °C |

Notes:

1. Non-repetitive current pulse, per Fig. 3 and derated above T_A = 25°C per Fig. 2.
2. Mounted on 5.0mm x 5.0mm (0.03mm thick) Copper Pads to each terminal.
3. 8.3ms single half sine-wave, or equivalent square wave, Duty cycle = 4 pulses per minutes maximum.
4. V_F < 3.5V for V_{BR} < 200V and V_F < 6.5V for V_{BR} > 201V.

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Electrical Characteristics (T_A=25°C unless otherwise noted)

| Part Number | | Marking | | Reverse Stand-Off Voltage V _{RWM} (V) | Breakdown Voltage V _{BR} (V) @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 _{RWM} (μA) |
|-------------|-----------|---------|-----|--|---|-------|----------------------------------|--|--|---|
| Uni | Bi | Uni | Bi | | MIN | MAX | | | | |
| SMCJ5.0A | SMCJ5.0CA | GDE | BDE | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 163.04 | 1000 |
| SMCJ6.0A | SMCJ6.0CA | GDG | BDG | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 145.63 | 1000 |
| SMCJ6.5A | SMCJ6.5CA | GDK | BDK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 133.93 | 500 |
| SMCJ7.0A | SMCJ7.0CA | GDM | BDM | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 125.00 | 200 |
| SMCJ7.5A | SMCJ7.5CA | GDP | BDP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 116.28 | 100 |
| SMCJ8.0A | SMCJ8.0CA | GDR | BDR | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 110.29 | 50 |
| SMCJ8.5A | SMCJ8.5CA | GDT | BDT | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 104.17 | 20 |
| SMCJ9.0A | SMCJ9.0CA | GDV | BDV | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 97.40 | 10 |
| SMCJ10A | SMCJ10CA | GDX | BDX | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 88.24 | 5 |
| SMCJ11A | SMCJ11CA | GDZ | BDZ | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 82.42 | 5 |
| SMCJ12A | SMCJ12CA | GEE | BEE | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 75.38 | 5 |
| SMCJ13A | SMCJ13CA | GEG | BEG | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 69.77 | 5 |
| SMCJ14A | SMCJ14CA | GEK | BEK | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 64.66 | 5 |
| SMCJ15A | SMCJ15CA | GEM | BEM | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 61.48 | 5 |
| SMCJ16A | SMCJ16CA | GEP | BEP | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 57.69 | 5 |
| SMCJ17A | SMCJ17CA | GER | BER | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 54.35 | 5 |
| SMCJ18A | SMCJ18CA | GET | BET | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 51.37 | 5 |
| SMCJ19A | SMCJ19CA | GEB | BEB | 19.0 | 21.10 | 23.30 | 1 | 30.8 | 48.73 | 5 |
| SMCJ20A | SMCJ20CA | GEV | BEV | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 46.30 | 5 |
| SMCJ22A | SMCJ22CA | GEX | BEX | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 42.25 | 5 |
| SMCJ24A | SMCJ24CA | GEZ | BEZ | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 38.56 | 5 |
| SMCJ26A | SMCJ26CA | GFE | BFE | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 35.63 | 5 |
| SMCJ28A | SMCJ28CA | GFG | BFG | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 33.04 | 5 |
| SMCJ30A | SMCJ30CA | GFK | BFK | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 30.99 | 5 |
| SMCJ33A | SMCJ33CA | GFM | BFM | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 28.14 | 5 |
| SMCJ36A | SMCJ36CA | GFP | BFP | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 25.82 | 5 |
| SMCJ40A | SMCJ40CA | GFR | BFR | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 23.26 | 5 |
| SMCJ43A | SMCJ43CA | GFT | BFT | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 21.61 | 5 |

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Electrical Characteristics (T_A=25°C unless otherwise noted) (Continue)

| Part Number | | Marking | | Reverse Stand-Off Voltage V _{RWM} (V) | Breakdown Voltage V _{BR} (V) @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 _{RWM} (μA) |
|-------------|-----------|---------|------|--|---|--------|----------------------------------|--|--|---|
| Uni | Bi | Uni | Bi | | MIN | MAX | | | | |
| SMCJ45A | SMCJ45CA | GFV | BFV | 45.0 | 50.00 | 55.30 | 1 | 72.7 | 20.63 | 5 |
| SMCJ48A | SMCJ48CA | GFX | BFX | 48.0 | 53.30 | 58.90 | 1 | 77.4 | 19.38 | 5 |
| SMCJ51A | SMCJ51CA | GFZ | BFZ | 51.0 | 56.70 | 62.70 | 1 | 82.4 | 18.20 | 5 |
| SMCJ54A | SMCJ54CA | GGE | BGE | 54.0 | 60.00 | 66.30 | 1 | 87.1 | 17.22 | 5 |
| SMCJ58A | SMCJ58CA | GGG | BGG | 58.0 | 64.40 | 71.20 | 1 | 93.6 | 16.03 | 5 |
| SMCJ60A | SMCJ60CA | G GK | B GK | 60.0 | 66.70 | 73.70 | 1 | 96.8 | 15.50 | 5 |
| SMCJ64A | SMCJ64CA | G GM | B GM | 64.0 | 71.10 | 78.60 | 1 | 103.0 | 14.56 | 5 |
| SMCJ70A | SMCJ70CA | G GP | B GP | 70.0 | 77.80 | 86.00 | 1 | 113.0 | 13.27 | 5 |
| SMCJ75A | SMCJ75CA | G GR | B GR | 75.0 | 83.30 | 92.10 | 1 | 121.0 | 12.40 | 5 |
| SMCJ78A | SMCJ78CA | G GT | B GT | 78.0 | 86.70 | 95.80 | 1 | 126.0 | 11.90 | 5 |
| SMCJ80A | SMCJ80CA | G GB | B GB | 80.0 | 88.80 | 97.60 | 1 | 129.6 | 11.57 | 5 |
| SMCJ85A | SMCJ85CA | G GV | B GV | 85.0 | 94.40 | 104.00 | 1 | 137.0 | 10.95 | 5 |
| SMCJ90A | SMCJ90CA | G GX | B GX | 90.0 | 100.00 | 111.00 | 1 | 146.0 | 10.27 | 5 |
| SMCJ100A | SMCJ100CA | G GZ | B GZ | 100.0 | 111.00 | 123.00 | 1 | 162.0 | 9.26 | 5 |
| SMCJ110A | SMCJ110CA | G HE | B HE | 110.0 | 122.00 | 135.00 | 1 | 177.0 | 8.47 | 5 |
| SMCJ120A | SMCJ120CA | G HG | B HG | 120.0 | 133.00 | 147.00 | 1 | 193.0 | 7.77 | 5 |
| SMCJ130A | SMCJ130CA | G HK | B HK | 130.0 | 144.00 | 159.00 | 1 | 209.0 | 7.18 | 5 |
| SMCJ140A | SMCJ140CA | G HB | B HB | 140.0 | 155.00 | 171.00 | 1 | 226.8 | 6.61 | 5 |
| SMCJ150A | SMCJ150CA | G HM | B HM | 150.0 | 167.00 | 185.00 | 1 | 243.0 | 6.17 | 5 |
| SMCJ160A | SMCJ160CA | G HP | B HP | 160.0 | 178.00 | 197.00 | 1 | 259.0 | 5.79 | 5 |
| SMCJ170A | SMCJ170CA | G HR | B HR | 170.0 | 189.00 | 209.00 | 1 | 275.0 | 5.45 | 5 |
| SMCJ180A | SMCJ180CA | G HT | B HT | 180.0 | 201.00 | 220.00 | 1 | 291.6 | 5.14 | 5 |
| SMCJ190A | SMCJ190CA | G HV | B HV | 190.0 | 211.00 | 232.00 | 1 | 307.8 | 4.87 | 5 |
| SMCJ200A | SMCJ200CA | G HW | B HW | 200.0 | 224.00 | 247.00 | 1 | 324.0 | 4.60 | 5 |
| SMCJ220A | SMCJ220CA | G HX | B HX | 220.0 | 246.00 | 272.00 | 1 | 356.0 | 4.20 | 5 |
| SMCJ250A | SMCJ250CA | G HZ | B HZ | 250.0 | 279.00 | 309.00 | 1 | 405.0 | 3.70 | 5 |
| SMCJ300A | SMCJ300CA | G JE | B JE | 300.0 | 335.00 | 371.00 | 1 | 486.0 | 3.10 | 5 |
| SMCJ350A | SMCJ350CA | G JG | B JG | 350.0 | 391.00 | 432.00 | 1 | 567.0 | 2.60 | 5 |
| SMCJ400A | SMCJ400CA | G JK | B JK | 400.0 | 447.00 | 494.00 | 1 | 648.0 | 2.30 | 5 |
| SMCJ440A | SMCJ440CA | G JM | B JM | 440.0 | 492.00 | 543.00 | 1 | 713.0 | 2.10 | 5 |

Note:

1. Suffix 'A' denotes 5% tolerance device.
2. Add suffix 'CA' after part number to specify Bi-directional devices.
3. For Bi-Directional devices having V_R of 10 volts and under, the I_R limit is doubl.

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

Figure 1 - Peak Pulse Power Rating Curve

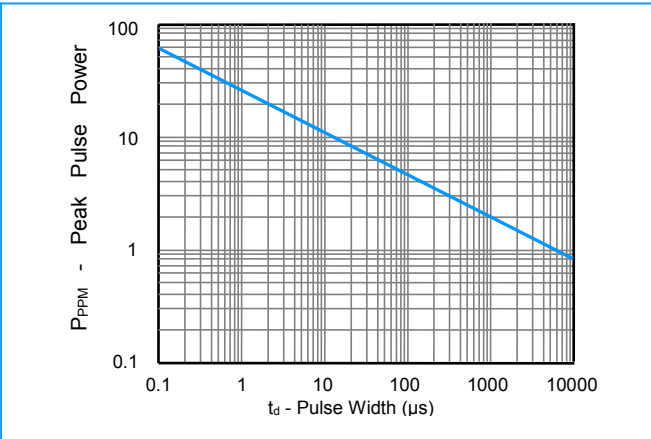


Figure 2 - Pulse Derating Curve

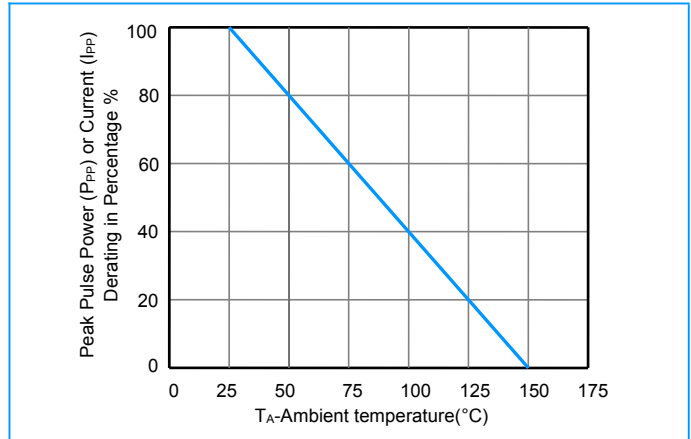


Figure 3 - Pulse Waveform

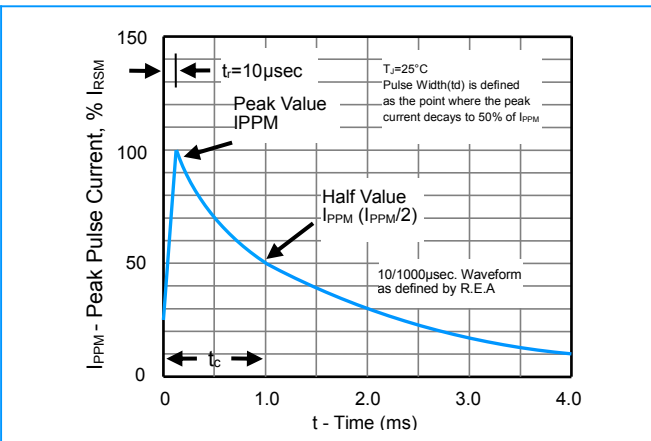


Figure 4 - Typical Junction Capacitance

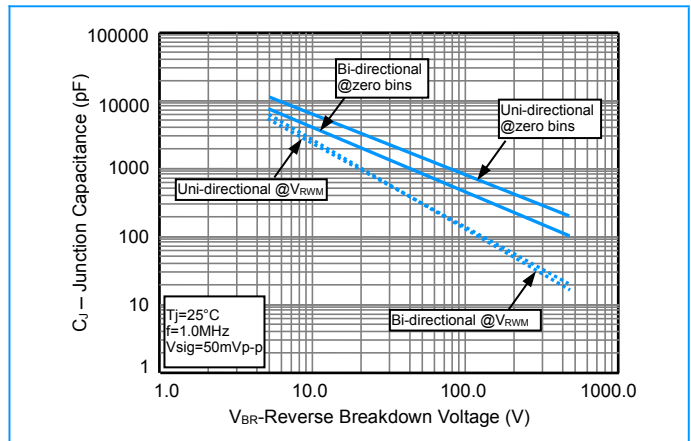


Figure 5 - Steady State Power Derating Curve

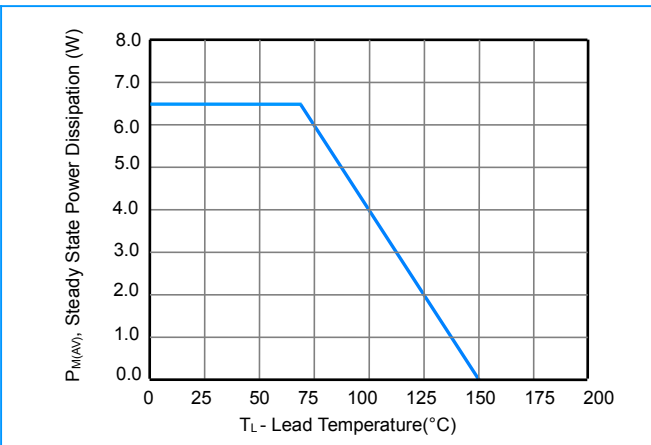
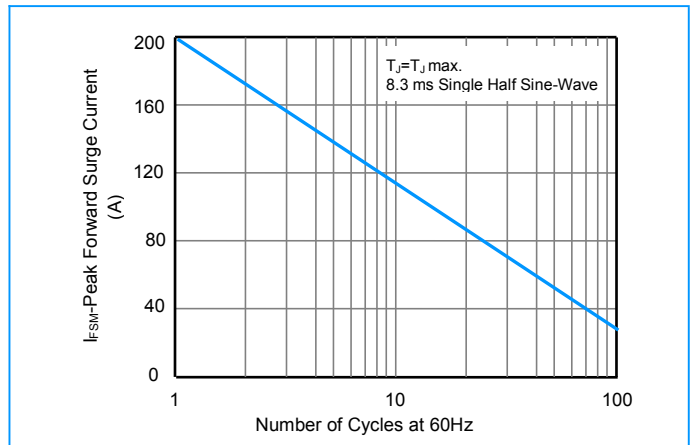


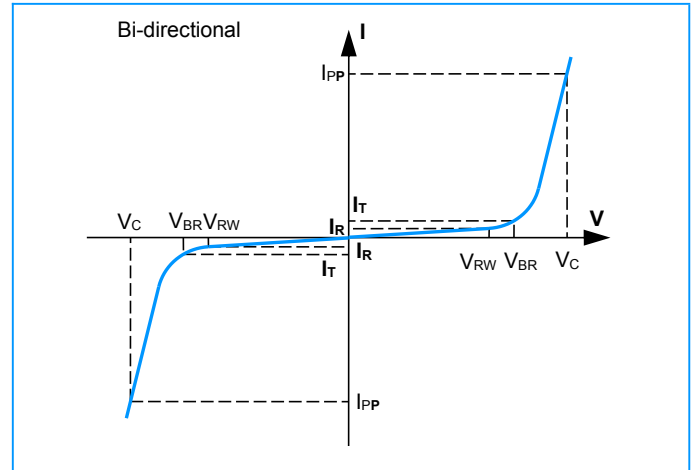
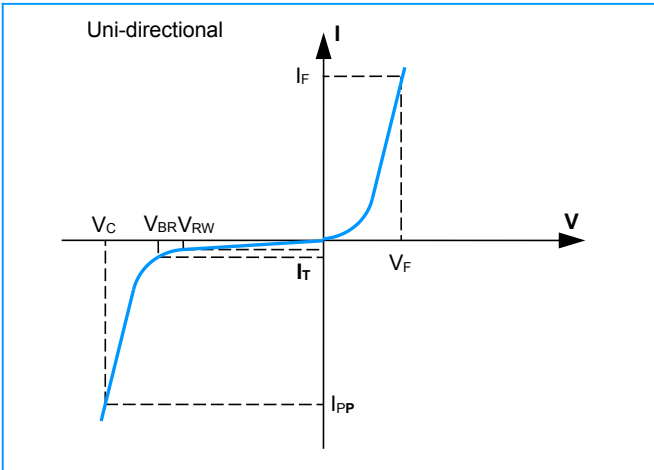
Figure 6 - Maximum Non-Repetitive Surge Current



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I-V Curve Characteristics



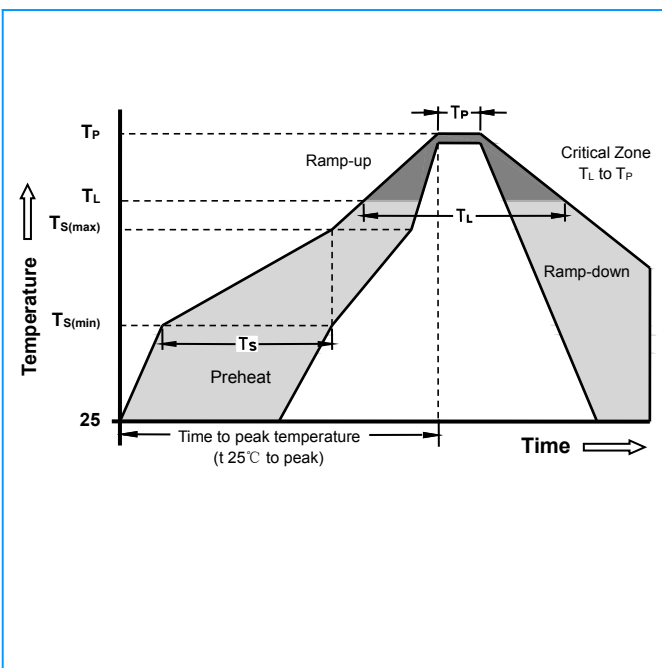
Physical Specifications

| | |
|-----------------|--|
| Weight | 0.007 ounce, 0.21 gram |
| Case | JEDEC DO-214AB Molded Plastic over glass passivated junction |
| Polarity | Color band denotes cathode except Bipolar |
| Terminal | Matte Tin-plated leads, Solderable per JESD22-B102D |

Environmental Specifications

| | |
|---------------------------|-------------|
| Temperature Cycle | JESD22-A104 |
| Pressure Cooker | JESD22-A102 |
| High Temp. Storage | JESD22-A103 |
| HTRB | JESD22-A108 |
| Thermal Shock | JESD22-A106 |

Soldering Parameters

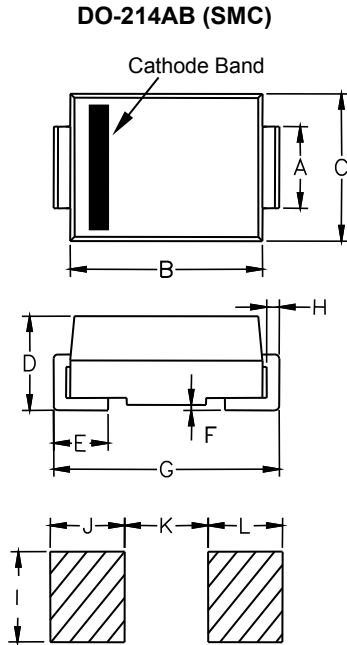


| | | |
|---|------------------------------------|--------------------|
| Reflow Condition | | Lead-free assembly |
| Pre Heat | -Temperature Min ($T_{S(min)}$) | 150°C |
| | -Temperature Max ($T_{S(max)}$) | 200°C |
| | - Time (min to max) (T_S) | 60 -180 Seconds |
| Average ramp up rate (Liquidus Temp 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 | | 280°C |

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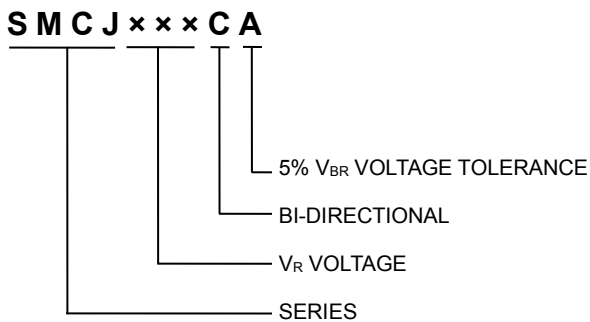
SMCJ Series 5.0 To 440 V 1500W

Dimensions

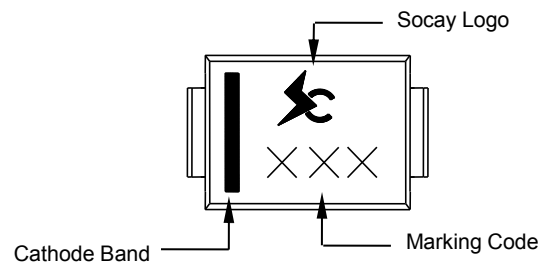


| Dimensions | Inches | | Millimeters | |
|------------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.108 | 0.126 | 2.75 | 3.20 |
| B | 0.260 | 0.280 | 6.60 | 7.11 |
| C | 0.220 | 0.244 | 5.59 | 6.20 |
| D | 0.085 | 0.103 | 2.15 | 2.62 |
| E | 0.030 | 0.060 | 0.76 | 1.52 |
| F | 0.002 | 0.008 | 0.051 | 0.203 |
| G | 0.305 | 0.320 | 7.74 | 8.13 |
| H | 0.006 | 0.012 | 0.15 | 0.31 |
| I | 0.121 | - | 3.07 | - |
| J | 0.068 | - | 1.715 | - |
| K | - | 0.185 | - | 4.69 |
| L | 0.068 | - | 1.715 | - |

Part Numbering



Part Marking



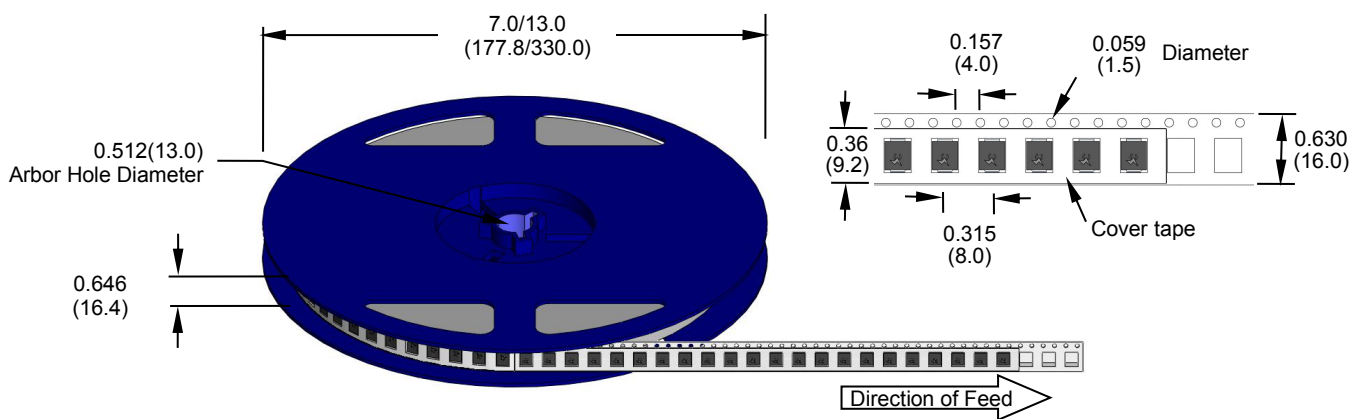
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Packaging

| Part Number | Component Package | Quantity | Packaging Option | Reel Diameters (mm) |
|-------------|-------------------|----------|---------------------------|---------------------|
| SMCJXXXXX | DO-214AB (SMC) | 500 pcs | Tape & Reel -16mm/7"tape | 177.8 |
| SMCJXXXXX | DO-214AB (SMC) | 3000 pcs | Tape & Reel -16mm/13"tape | 330.0 |

Tape and Reel Specifications



Dimensions are in inches
(and millimeters)

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[MPLAD30KP43CAE3](#) [SMAJ43A-TP](#) [D5V0F6U8LP33-7](#) [TVS5501V10MUT5G](#) [5.0SMLJ24CA-TP](#) [SMAJ110CA-TP](#) [MPLAD15KP75CAE3](#)
[MMAD1103e3/TR13](#) [DFLT40AQ-7](#)