

TVS Diode – SMF Series

Features

- Plastic package, excellent insulation strength.
- Glass passivated chip junction in SOD-123 package.
- Excellent voltage clamping capability.
- Low Zener impedance.
- 200W peak pulse power capability on 10/1000 μ s waveform.
- Typical leakage current less than 1 μ A above 13V.
- Very fast response time, typically less than 1.0ps from 0 volt to V_{BR} minimum.
- High temperature soldering guaranteed: 265°C/10 sec.
- MSL: JEDEC-J-STD-020, Level 1

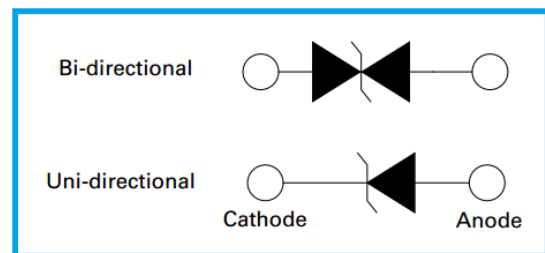


Applications

- I/O interface, V_{CC} bus
- Telecom
- Industrial and consumer electronic applications.
- Relay and electromagnetic valve surge absorption.

Agency Approval

- Pending



Mechanical and Physical Data

- Case: JEDEC SMF molded plastic.
- Axial leaded, solderable per MIL-STD-750, Method 2026
- Polarity: Color band denoted cathode except bidirectional.

Maximum Ratings and Thermal Characteristics

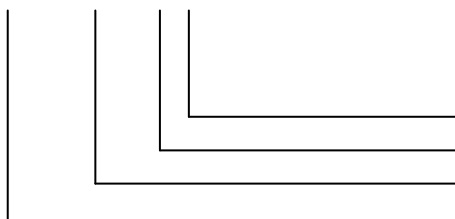
| Parameter | Symbol | Value | Unit |
|--|----------------|-----------|------|
| Peak Pulse Power Dissipation on 10/1000 μ s waveform (Note 1, Fig.1). | P_{PPM} | Min 200 | W |
| Peak Pulse Current of 10/1000 μ s waveform (Note 1, Fig.3). | I_{PPM} | See Table | A |
| Peak Forward Surge Current, 8.3 ms Single Half Sine Wave Superimposed on Rated Load (Note 2, Fig.6). | I_{FSM} | 20 | A |
| Operating Junction and Storage Temperature Range. | T_J, T_{STG} | -55~150 | °C |

Note:

1. Non-repetitive current pulse, per Fig.3 and derated above $T_A = 25^\circ\text{C}$ per Fig.2.
2. 8.3ms single half sine wave, or equivalent square wave, Duty cycle = 4 pulses per minutes maximum.

Part Number Code

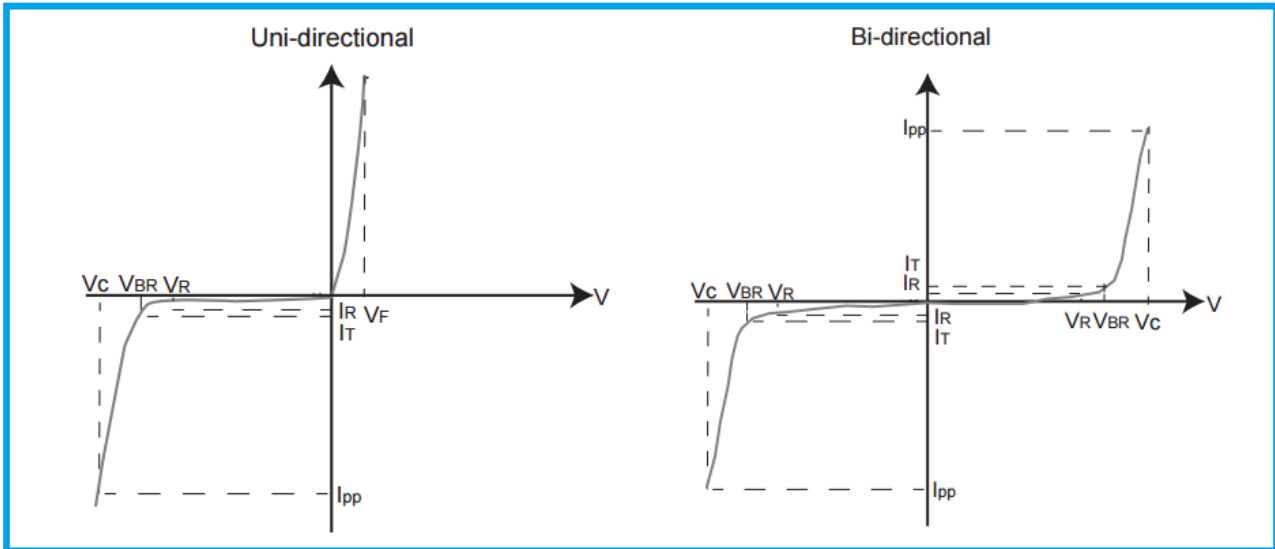
SMF □□□ C A



- V_{BR} Voltage tolerance (A: 5%; Blank: 10%)
- C: Bi-directional; Blank: Uni-directional
- Reverse Stand-Off Voltage or Typical Breakdown Voltage
- SMF Series (200W)

TVS Diode – SMF Series

I-V Curve Characteristics



- I_{PPM} Peak Pulse Power Dissipation – Maximum 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

Electrical Characteristics

| Part Number | | Marking | | Reverse Stand Off Voltage V_R (V) | Breakdown Voltage V_{BR} (V) @ I_T | | Test Current I_T (mA) | Maximum Clamping Voltage V_C (V) @ I_{PP} | Maximum Peak Pulse Current I_{PP} (A) | Maximum Reverse Leakage I_R (μ A) @ V_R | UL |
|-------------|----------|---------|----|-------------------------------------|--|-------|-------------------------|---|---|--|---------|
| Uni | Bi | Uni | Bi | | Min. | Max. | | | | | |
| SMF5.0A | SMF5.0CA | FE | KE | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 21.74 | 400 | Pending |
| SMF6.0A | SMF6.0CA | FG | KG | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 19.42 | 400 | Pending |
| SMF6.5A | SMF6.5CA | FK | KK | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 17.86 | 250 | Pending |
| SMF7.0A | SMF7.0CA | FM | KM | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 16.67 | 100 | Pending |
| SMF7.5A | SMF7.5CA | FP | KP | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 15.50 | 50 | Pending |
| SMF8.0A | SMF8.0CA | FR | KR | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 14.71 | 25 | Pending |
| SMF8.5A | SMF8.5CA | FT | KT | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 13.89 | 10 | Pending |
| SMF9.0A | SMF9.0CA | FV | KV | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 12.99 | 5.0 | Pending |
| SMF10A | SMF10CA | FX | KX | 10 | 11.10 | 12.30 | 1 | 17.0 | 11.76 | 2.5 | Pending |
| SMF11A | SMF11CA | FZ | KZ | 11 | 12.20 | 13.50 | 1 | 18.2 | 10.99 | 2.5 | Pending |
| SMF12A | SMF12CA | HE | LE | 12 | 13.30 | 14.70 | 1 | 19.9 | 10.05 | 2.5 | Pending |
| SMF13A | SMF13CA | HG | LG | 13 | 14.40 | 15.90 | 1 | 21.5 | 9.30 | 1 | Pending |
| SMF14A | SMF14CA | HK | LK | 14 | 15.60 | 17.20 | 1 | 23.2 | 8.62 | 1 | Pending |
| SMF15A | SMF15CA | HM | LM | 15 | 16.70 | 18.50 | 1 | 24.4 | 8.20 | 1 | Pending |
| SMF16A | SMF16CA | HP | LP | 16 | 17.80 | 19.70 | 1 | 26.0 | 7.69 | 1 | Pending |
| SMF17A | SMF17CA | HR | LR | 17 | 18.90 | 20.90 | 1 | 27.6 | 7.25 | 1 | Pending |
| SMF18A | SMF18CA | HT | LT | 18 | 20.00 | 22.10 | 1 | 29.2 | 6.85 | 1 | Pending |

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| Part Number | | Marking | | Reverse Stand Off Voltage V_R (V) | Breakdown Voltage V_{BR} (V) @ I_T | | Test Current I_T (mA) | Maximum Clamping Voltage V_C (V) @ I_{PP} | Maximum Peak Pulse Current I_{PP} (A) | Maximum Reverse Leakage I_R (μ A) @ V_R | UL |
|-------------|----------|---------|----|-------------------------------------|--|-------|-------------------------|---|---|--|---------|
| Uni | Bi | Uni | Bi | | Min. | Max. | | | | | |
| SMF19A | SMF19CA | HB | LB | 19 | 21.10 | 23.30 | 1 | 30.6 | 6.54 | 1 | Pending |
| SMF20A | SMF20CA | HV | LV | 20 | 22.20 | 24.50 | 1 | 32.4 | 6.17 | 1 | Pending |
| SMF22A | SMF22CA | HX | LX | 22 | 24.40 | 26.90 | 1 | 35.5 | 5.63 | 1 | Pending |
| SMF24A | SMF24CA | HZ | LZ | 24 | 26.70 | 29.50 | 1 | 38.9 | 5.14 | 1 | Pending |
| SMF26A | SMF26CA | JE | ME | 26 | 28.90 | 31.90 | 1 | 42.1 | 4.75 | 1 | Pending |
| SMF28A | SMF28CA | JG | MG | 28 | 31.10 | 34.40 | 1 | 45.4 | 4.41 | 1 | Pending |
| SMF30A | SMF30CA | JK | MK | 30 | 33.30 | 36.80 | 1 | 48.4 | 4.13 | 1 | Pending |
| SMF33A | SMF33CA | JM | MM | 33 | 36.70 | 40.60 | 1 | 53.3 | 3.75 | 1 | Pending |
| SMF36A | SMF36CA | JP | MP | 36 | 40.00 | 44.20 | 1 | 58.1 | 3.44 | 1 | Pending |
| SMF40A | SMF40CA | JR | MR | 40 | 44.40 | 49.10 | 1 | 64.5 | 3.10 | 1 | Pending |
| SMF43A | SMF43CA | JT | MT | 43 | 47.80 | 52.80 | 1 | 69.4 | 2.88 | 1 | Pending |
| SMF45A | SMF45CA | JV | MV | 45 | 50.00 | 55.30 | 1 | 72.7 | 2.75 | 1 | Pending |
| SMF48A | SMF48CA | JX | MX | 48 | 53.30 | 58.90 | 1 | 77.4 | 2.58 | 1 | Pending |
| SMF51A | SMF51CA | JZ | MZ | 51 | 56.70 | 62.70 | 1 | 82.4 | 2.43 | 1 | Pending |
| SMF54A | SMF54CA | XE | NE | 54 | 60.00 | 66.30 | 1 | 87.1 | 2.30 | 1 | Pending |
| SMF58A | SMF58CA | XG | NG | 58 | 64.40 | 71.20 | 1 | 93.6 | 2.14 | 1 | Pending |
| SMF60A | SMF60CA | XK | NK | 60 | 66.70 | 73.70 | 1 | 96.8 | 2.07 | 1 | Pending |
| SMF64A | SMF64CA | XM | NM | 64 | 71.10 | 78.60 | 1 | 103.0 | 1.94 | 1 | Pending |
| SMF70A | SMF70CA | XP | NP | 70 | 77.80 | 86.00 | 1 | 113.0 | 1.77 | 1 | Pending |
| SMF75A | SMF75CA | XR | NR | 75 | 83.30 | 92.10 | 1 | 121.0 | 1.65 | 1 | Pending |
| SMF78A | SMF78CA | XT | NT | 78 | 86.70 | 95.80 | 1 | 126.0 | 1.59 | 1 | Pending |
| SMF80A | SMF80CA | XB | NB | 80 | 88.80 | 97.60 | 1 | 129.0 | 1.55 | 1 | Pending |
| SMF85A | SMF85CA | XV | NV | 85 | 94.40 | 104.0 | 1 | 137.0 | 1.46 | 1 | Pending |
| SMF90A | SMF90CA | XX | NX | 90 | 100.0 | 111.0 | 1 | 146.0 | 1.37 | 1 | Pending |
| SMF100A | SMF100CA | XZ | NZ | 100 | 111.0 | 123.0 | 1 | 162.0 | 1.23 | 1 | Pending |
| SMF110A | SMF110CA | TE | PE | 110 | 122.0 | 135.0 | 1 | 177.0 | 1.13 | 1 | Pending |
| SMF120A | SMF120CA | TG | PG | 120 | 133.0 | 147.0 | 1 | 193.0 | 1.04 | 1 | Pending |
| SMF130A | SMF130CA | TK | PK | 130 | 144.0 | 159.0 | 1 | 209.0 | 0.96 | 1 | Pending |
| SMF140A | SMF140CA | TB | PB | 140 | 155.0 | 171.0 | 1 | 224.0 | 0.89 | 1 | Pending |
| SMF150A | SMF150CA | TM | PM | 150 | 167.0 | 185.0 | 1 | 243.0 | 0.82 | 1 | Pending |
| SMF160A | SMF160CA | TP | PP | 160 | 178.0 | 197.0 | 1 | 259.0 | 0.77 | 1 | Pending |
| SMF170A | SMF170CA | TR | PR | 170 | 189.0 | 209.0 | 1 | 275.0 | 0.73 | 1 | Pending |
| SMF180A | SMF180CA | TT | PT | 180 | 200.0 | 220.0 | 1 | 292.0 | 0.68 | 1 | Pending |
| SMF190A | SMF190CA | TV | PV | 190 | 211.0 | 232.0 | 1 | 308.0 | 0.65 | 1 | Pending |
| SMF200A | SMF200CA | TX | PX | 200 | 224.0 | 247.0 | 1 | 324.0 | 0.62 | 1 | Pending |
| SMF220A | SMF220CA | TZ | PZ | 220 | 246.0 | 272.0 | 1 | 356.0 | 0.56 | 1 | Pending |

Note:

1. For bi-directional type having V_R of 10 volts and less, the I_R limit is double.

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Ratings and Characteristic Curves

Fig 1 - Peak Pulse Power Rating Curve

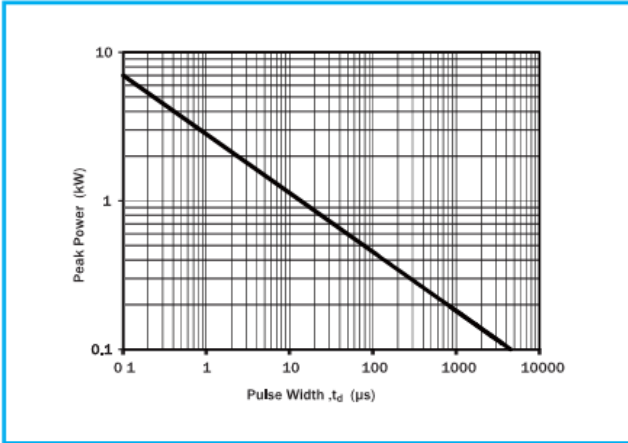


Fig 2 - Pulse Derating Curve

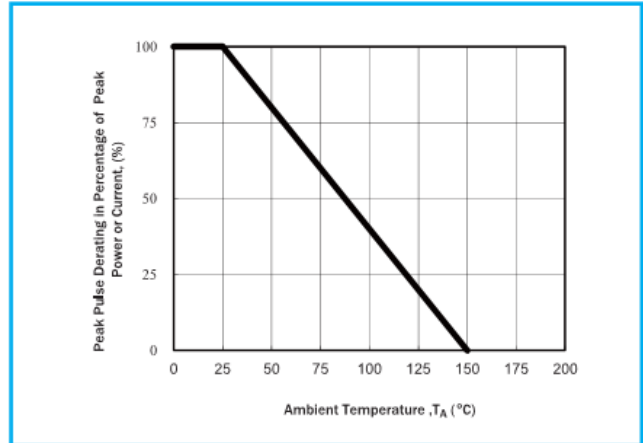


Fig 3 - Pulse Waveform

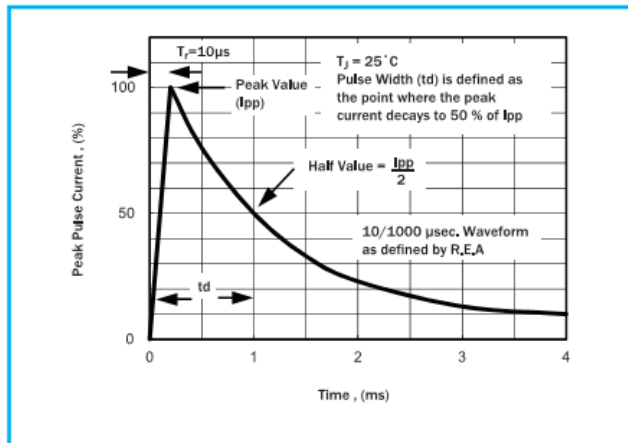


Fig 4 - Typical Junction Capacitance Uni-directional

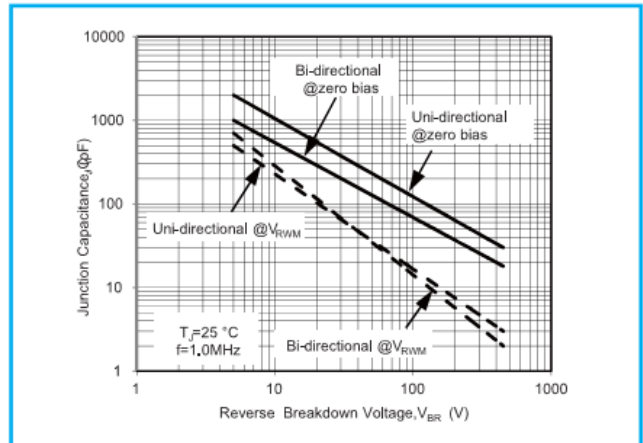


Fig 5 - Steady State Power Dissipation Derating Curve

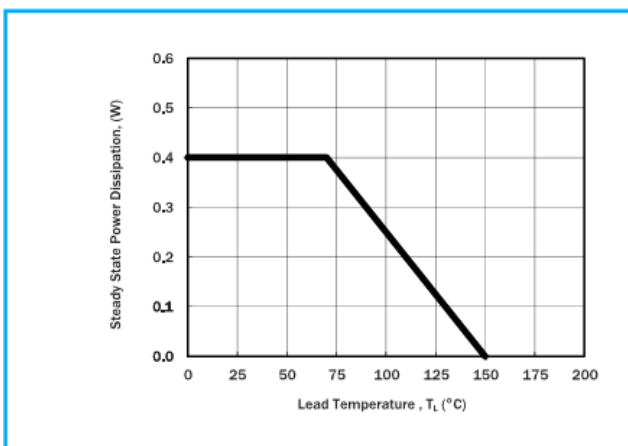
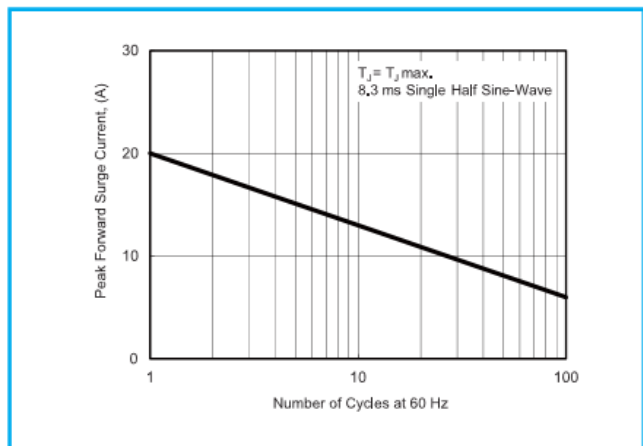
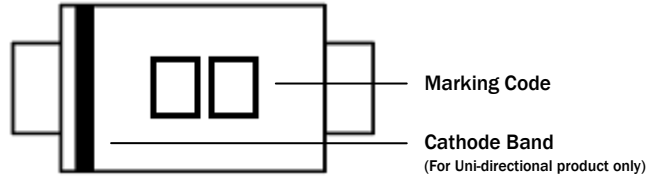


Fig 6 - Maximum Non-Repetitive Forward Surge Current (Uni-directional Only)

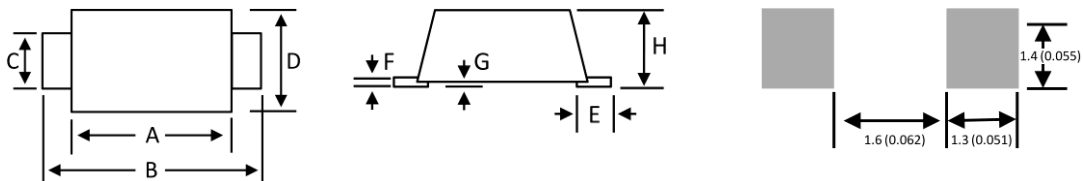


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Marking Definitions



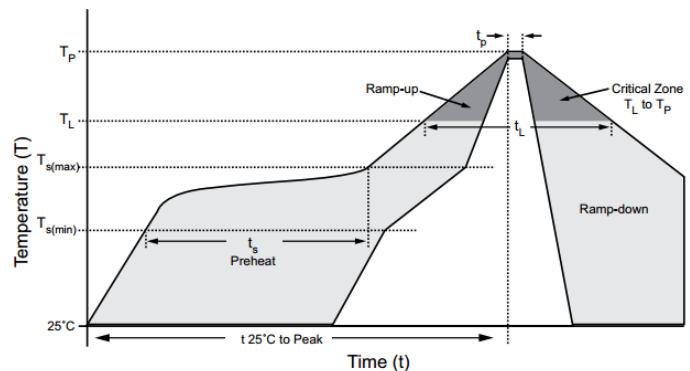
Physical Dimensions



| Dimension | Millimeters | | Inches | |
|-----------|-------------|------|--------|--------|
| | Min | Max | Min | Max |
| A | 2.50 | 2.90 | 0.0984 | 0.1142 |
| B | 3.40 | 3.90 | 0.1339 | 0.1535 |
| C | 0.70 | 1.20 | 0.0275 | 0.0472 |
| D | 1.50 | 2.00 | 0.0591 | 0.0787 |
| E | 0.35 | 0.90 | 0.0138 | 0.0354 |
| F | 0.05 | 0.26 | 0.0020 | 0.0102 |
| G | - | 0.10 | - | 0.0039 |
| H | 0.95 | 1.30 | 0.0374 | 0.0512 |

Lead Free Reflow Soldering Recommendations

| | |
|--|-------------------|
| Preheat | |
| - Temperature Min (T_{s_min}) | 150°C |
| - Temperature Max (T_{s_max}) | 200°C |
| - Time (T_{s_min} to T_{s_max}) | 60-180 seconds |
| - Average Ramp-Up Rate | 1~3°C/second |
| Peak Temperature | 260°C max. |
| Time within 5°C of actual Peak Temperature (t_p) | 40 seconds max. |
| Ramp-Down Rate | 6 °C /second max. |



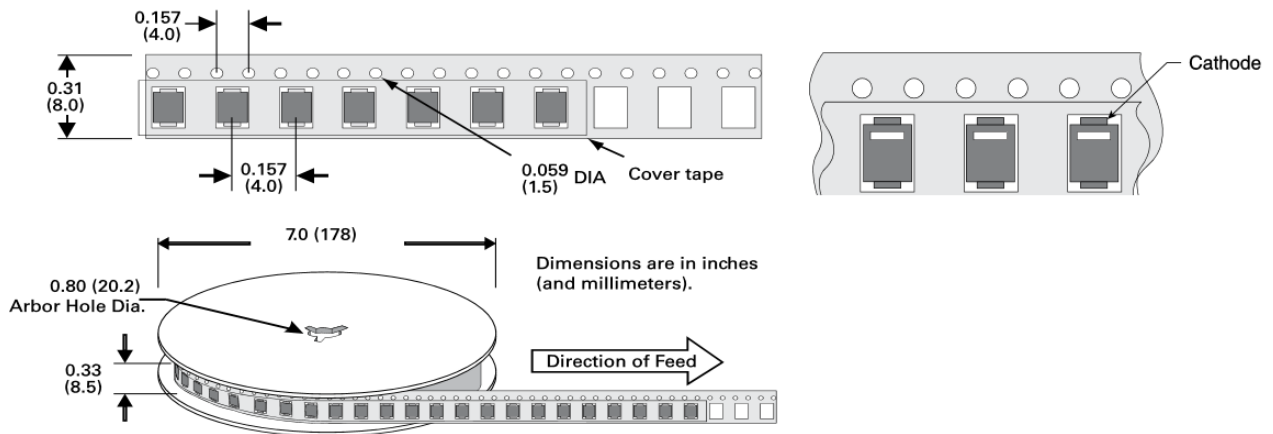
Note: If the soldering temperatures exceed the recommended profile, devices may not meet the performance requirements.

TVS Diode – SMF Series

Packaging Information

| Part Number | Component Package | Quantity | Packaging Option | Packaging Specification |
|-------------|-------------------|----------|--------------------------------|-------------------------|
| SMF Series | SOD-123 | 3000 | Tape & Reel – 8mm tape/7" reel | EIA STD RS-481 |

Tape and Reel Specifications



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