

### SMF Series



#### Agency Approvals

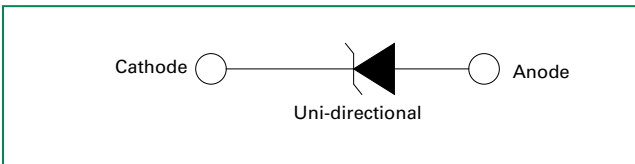
| AGENCY | AGENCY FILE NUMBER |
|--------|--------------------|
|        | E230531            |

#### Maximum Ratings and Thermal Characteristics (T<sub>A</sub> = 25°C unless otherwise noted)

| Parameter   | Symbol           | Value      | Unit |
|---|------------------|------------|------|
| Peak Pulse Power Dissipation at T <sub>A</sub> = 25°C by 10/1000µs (Note 1) | P <sub>PPM</sub> | 200        | W    |
| Thermal Resistance Junction- to-Ambient                                     | R <sub>θJA</sub> | 220        | °C/W |
| Thermal Resistance Junction- to-Lead  | R <sub>θJL</sub> | 100        | °C/W |
| Operating Temperature Range   | T <sub>J</sub>   | -65 to 150 | °C   |
| Storage Temperature Range   | T <sub>STG</sub> | -65 to 175 | °C   |

**Notes:**  
1. Non-repetitive current pulse, per Fig. 4 and derated above T<sub>J</sub> (initial) = 25°C per Fig. 3.

#### Functional Diagram



#### Description

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

SMF package is 50% smaller in footprint when compare to SMA package and delivering one of the low height profiles (1.1mm) in the industry.

#### Features

- 200W peak pulsepower capability at 10/1000µs waveform, repetition rate (duty cycle): 0.01 %
- Compatible with industrial standard package SOD-123FL
- Low profile: maximum height of 1.1mm.
- Low inductance, excellent clamping capability
- For surface mounted applications to optimize board space
- High temperature to reflow soldering guaranteed: 260°C/40sec
- 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 30kV(Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Fast response time: typically less than 1.0ns from 0 Volts to V<sub>BR</sub> min
- Glass passivated junction
- Built-in strain relief
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- Meet MSL level1, per J-STD-020, LF maximum peak of 260°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

SMF devices are ideal for the protection of I/O interfaces, V<sub>CC</sub> bus and other vulnerable circuit used in cellular phones, portable devices, business machines, power supplies and other consumer applications.

#### Additional Information



Datasheet




Resources



Samples

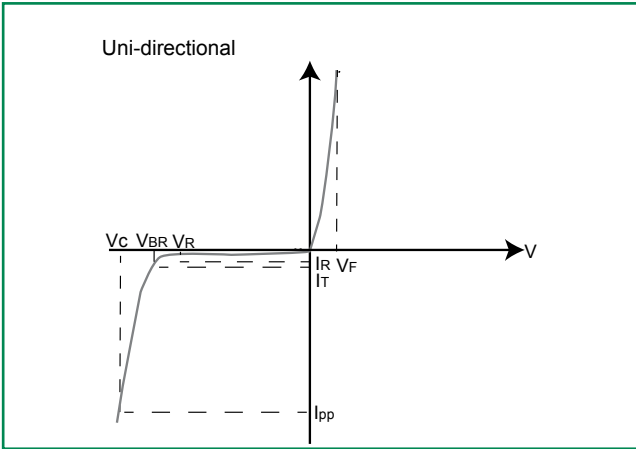
### Electrical Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

| Part Number | Marking Code | Breakdown Voltage $V_{BR}$ (Volts) @ $I_T$ |        | Test Current $I_T$ (mA) | Reverse Stand off Voltage $V_R$ (V) | Maximum Reverse Leakage @ $V_R$ $I_R$ ( $\mu\text{A}$ ) | Maximum Peak Pulse Current $I_{PP}$ (A) | Maximum Clamping Voltage @ $I_{PP}$ $V_C$ (V) | Agency Approval  |
|-------------|--------------|--|--------|-------------------------|-------------------------------------|---|---|---|---|
|             |              | MIN  | MAX    |                         |                                     |   |   |   |   |
| SMF5.0A     | AE           | 6.40                                       | 7.00   | 10                      | 5.0                                 | 400   | 21.7                                    | 9.2   | X   |
| SMF6.0A     | AG           | 6.67                                       | 7.37   | 10                      | 6.0                                 | 400   | 19.4                                    | 10.3  | X   |
| SMF6.5A     | AK           | 7.22                                       | 7.98   | 10                      | 6.5                                 | 250   | 17.9                                    | 11.2  | X   |
| SMF7.0A     | AM           | 7.78                                       | 8.60   | 10                      | 7.0                                 | 100   | 16.7                                    | 12.0  | X   |
| SMF7.5A     | AP           | 8.33                                       | 9.21   | 1                       | 7.5                                 | 50  | 15.5                                    | 12.9  | X   |
| SMF8.0A     | AR           | 8.89                                       | 9.83   | 1                       | 8.0                                 | 25  | 14.7                                    | 13.6  | X   |
| SMF8.5A     | AT           | 9.44                                       | 10.40  | 1                       | 8.5                                 | 10  | 13.9                                    | 14.4  | X   |
| SMF9.0A     | AV           | 10.00                                      | 11.10  | 1                       | 9.0                                 | 5   | 13.0                                    | 15.4  | X   |
| SMF10A      | AX           | 11.10                                      | 12.30  | 1                       | 10                                  | 2.5   | 11.8                                    | 17.0  | X   |
| SMF11A      | AZ           | 12.20                                      | 13.50  | 1                       | 11                                  | 2.5   | 11.0                                    | 18.2  | X   |
| SMF12A      | BE           | 13.30                                      | 14.70  | 1                       | 12                                  | 2.5   | 10.1                                    | 19.9  | X   |
| SMF13A      | BG           | 14.40                                      | 15.90  | 1                       | 13                                  | 1.0   | 9.3                                     | 21.5  | X   |
| SMF14A      | BK           | 15.60                                      | 17.20  | 1                       | 14                                  | 1.0   | 8.6                                     | 23.2  | X   |
| SMF15A      | BM           | 16.70                                      | 18.50  | 1                       | 15                                  | 1.0   | 8.2                                     | 24.4  | X   |
| SMF16A      | BP           | 17.80                                      | 19.70  | 1                       | 16                                  | 1.0   | 7.7                                     | 26.0  | X   |
| SMF17A      | BR           | 18.90                                      | 20.90  | 1                       | 17                                  | 1.0   | 7.2                                     | 27.6  | X   |
| SMF18A      | BT           | 20.00                                      | 22.10  | 1                       | 18                                  | 1.0   | 6.8                                     | 29.2  | X   |
| SMF20A      | BV           | 22.20                                      | 24.50  | 1                       | 20                                  | 1.0   | 6.2                                     | 32.4  | X   |
| SMF22A      | BX           | 24.40                                      | 26.90  | 1                       | 22                                  | 1.0   | 5.6                                     | 35.5  | X   |
| SMF24A      | BZ           | 26.70                                      | 29.50  | 1                       | 24                                  | 1.0   | 5.1                                     | 38.9  | X   |
| SMF26A      | CE           | 28.90                                      | 31.90  | 1                       | 26                                  | 1.0   | 4.8                                     | 42.1  | X   |
| SMF28A      | CG           | 31.10                                      | 34.40  | 1                       | 28                                  | 1.0   | 4.4                                     | 45.4  | X   |
| SMF30A      | CK           | 33.30                                      | 36.80  | 1                       | 30                                  | 1.0   | 4.1                                     | 48.4  | X   |
| SMF33A      | CM           | 36.70                                      | 40.60  | 1                       | 33                                  | 1.0   | 3.8                                     | 53.3  | X   |
| SMF36A      | CP           | 40.00                                      | 44.20  | 1                       | 36                                  | 1.0   | 3.4                                     | 58.1  | X   |
| SMF40A      | CR           | 44.40                                      | 49.10  | 1                       | 40                                  | 1.0   | 3.1                                     | 64.5  | X   |
| SMF43A      | CT           | 47.80                                      | 52.80  | 1                       | 43                                  | 1.0   | 2.9                                     | 69.4  | X   |
| SMF45A      | CV           | 50.00                                      | 55.30  | 1                       | 45                                  | 1.0   | 2.8                                     | 72.7  | X   |
| SMF48A      | CX           | 53.30                                      | 58.90  | 1                       | 48                                  | 1.0   | 2.6                                     | 77.4  | X   |
| SMF51A      | CZ           | 56.70                                      | 62.70  | 1                       | 51                                  | 1.0   | 2.4                                     | 82.4  | X   |
| SMF54A      | DE           | 60.00                                      | 66.30  | 1                       | 54                                  | 1.0   | 2.3                                     | 87.1  | X   |
| SMF58A      | RG           | 64.40                                      | 71.20  | 1                       | 58                                  | 1.0   | 2.1                                     | 93.6  |   |
| SMF60A      | RK           | 66.70                                      | 73.70  | 1                       | 60                                  | 1.0   | 1.8                                     | 96.8  |   |
| SMF64A      | RM           | 71.10                                      | 78.60  | 1                       | 64                                  | 1.0   | 1.7                                     | 103.0   |   |
| SMF70A      | RP           | 77.80                                      | 86.00  | 1                       | 70                                  | 1.0   | 1.5                                     | 113.0   |   |
| SMF75A      | RR           | 83.30                                      | 92.10  | 1                       | 75                                  | 1.0   | 1.4                                     | 121.0   |   |
| SMF78A      | RT           | 86.70                                      | 95.80  | 1                       | 78                                  | 1.0   | 1.4                                     | 126.0   |   |
| SMF85A      | RV           | 94.40                                      | 104.00 | 1                       | 85                                  | 1.0   | 1.3                                     | 137.0   |   |
| SMF90A      | RW           | 100.00                                     | 111.00 | 1                       | 90                                  | 1.0   | 1.2                                     | 146.0   |   |
| SMF100A     | RX           | 111.00                                     | 123.00 | 1                       | 100                                 | 1.0   | 1.1                                     | 162.0   |   |

**Notes:**

- $V_{BR}$  measured after  $I_T$  applied for 300 $\mu\text{s}$ ,  $I_T$  = square wave pulse or equivalent.
- Surge current waveform per 10/1000 $\mu\text{s}$  exponential wave and derated per Fig.2.
- All terms and symbols are consistent with ANSI/IEEE C62.35.

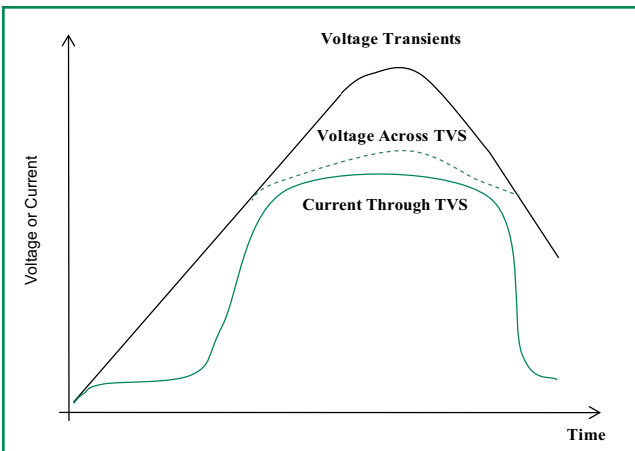
**I-V Curve Characteristics**



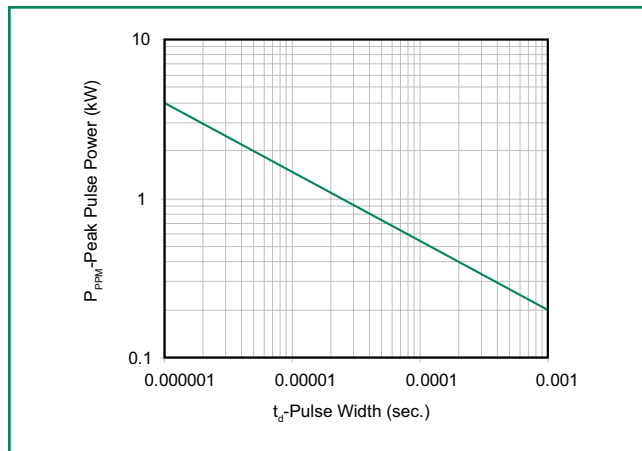
- $P_{PPM}$  Peak Pulse Power Dissipation** – Max power dissipation
- $V_R$  Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current ( $I_T$ )
- $V_C$  Clamping Voltage** – 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**



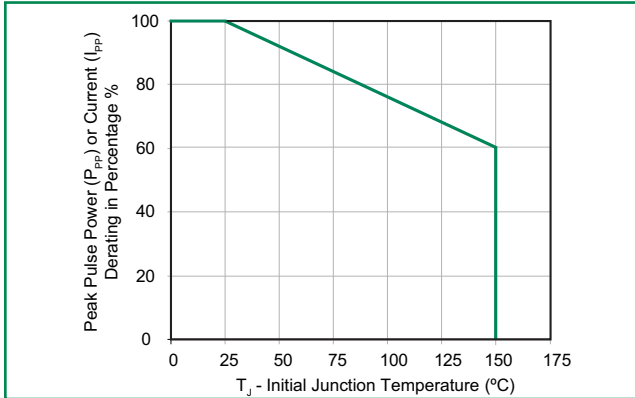
**Figure 2 - Peak Pulse Power Rating Curve**



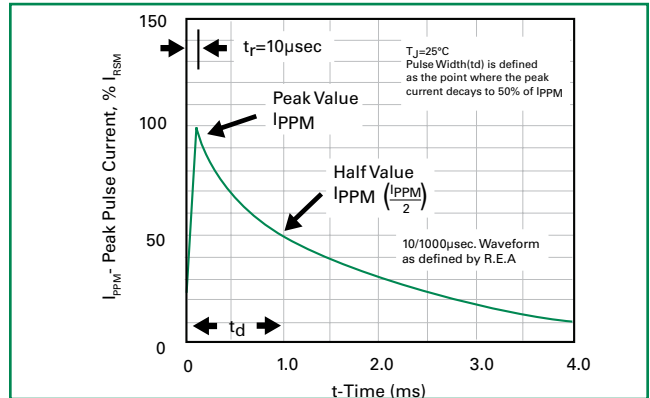
continues on next page.

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

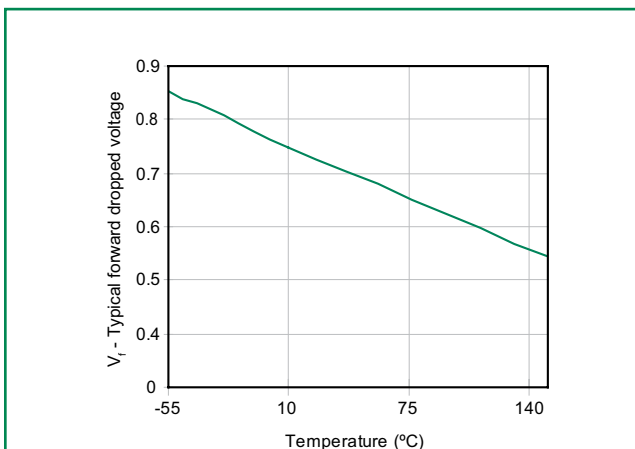
**Figure 3 - Peak Pulse Power Derating Curve**



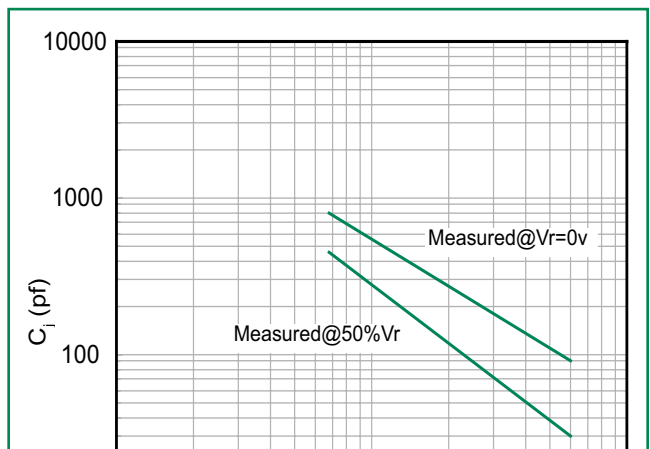
**Figure 4 - Pulse Waveform - 10/1000 $\mu\text{S}$**



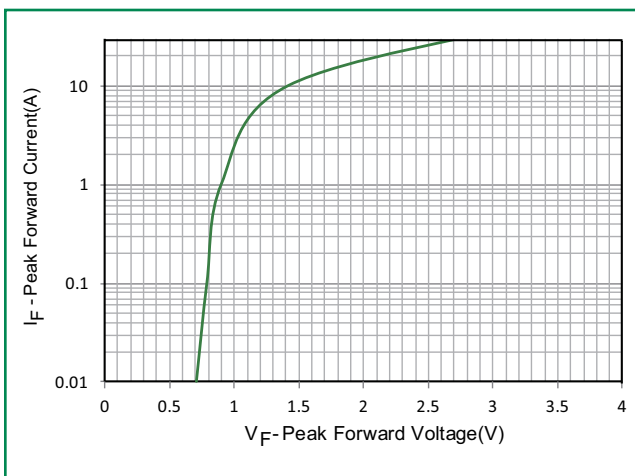
**Figure 5 - Forward Voltage**



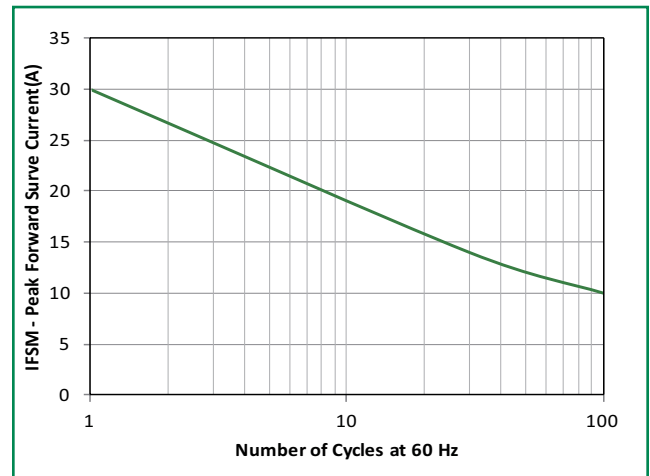
**Figure 6 - Typical Junction Capacitance**



**Figure 7 - Peak Forward Voltage Drop vs. Peak Forward Current**

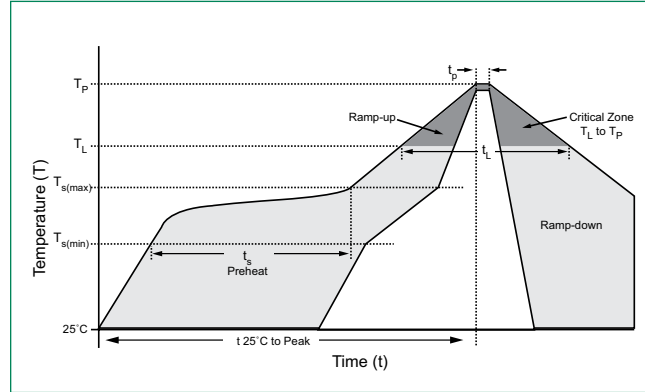


**Figure 8 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only**



**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 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 ( $T_A$ ) (Liquidus) | 217°C                   |
|  | - Time (min to max) ( $t_s$ )      | 60 – 150 seconds        |
| Peak Temperature ( $T_p$ )                             |                                    | 260 <sup>+0/-5</sup> °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                   |



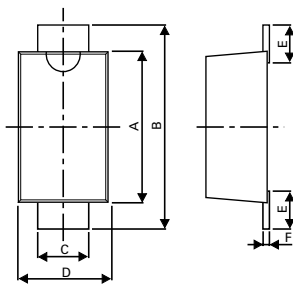
**Physical Specifications**

|                 |  |
|-----------------|--|
| <b>Case</b>     | SOD-123FL plastic over glass passivated junction   |
| <b>Polarity</b> | Color band denotes cathode except bipolar          |
| <b>Terminal</b> | Matte tin-plated leads, solderable per JESD22-B102 |

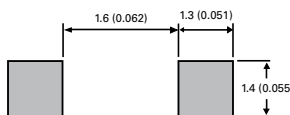
**Environmental Specifications**

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

**Dimensions - SOD-123FL Package**

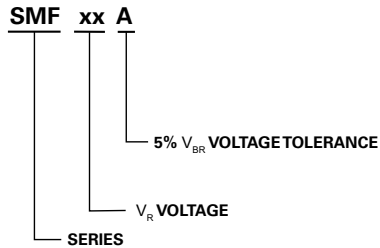


**Mounting Pad Layout**

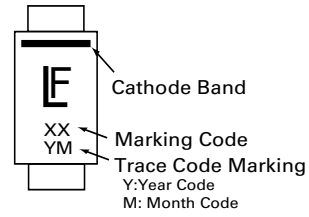


| Dimensions | Millimeters |      | Inches |        |
|------------|-------------|------|--------|--------|
|            | Min         | Max  | Min    | Max    |
| A          | 2.50        | 2.90 | 0.0984 | 0.1142 |
| B          | 3.40        | 3.90 | 0.1339 | 0.1535 |
| C          | 0.70        | 1.20 | 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          | 0.00        | 0.10 | 0.000  | 0.0039 |
| H          | 0.95        | 1.10 | 0.0374 | 0.0433 |

### Part Numbering System



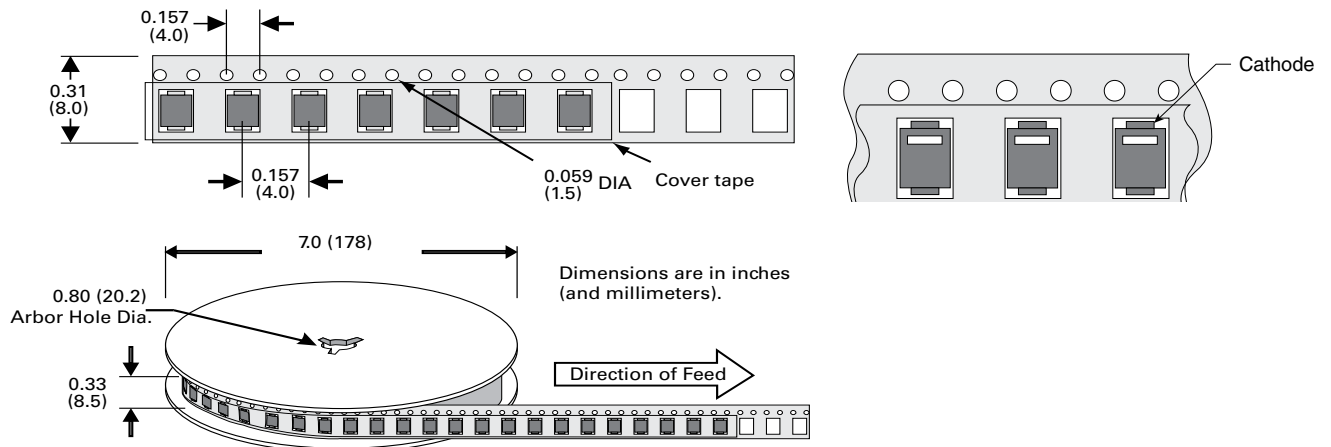
### Part Marking System



### Packaging Options

| Part number | Component Package | Quantity | Packaging Option                | Packaging Specification |
|-------------|-------------------|----------|---------------------------------|-------------------------|
| SMFXXX      | SOD-123FL         | 3000     | Tape & Reel – 8mm tape/7" reel  | EIA RS-481              |
| SMFXXX-T13  | SOD-123FL         | 10000    | Tape & Reel – 8mm tape/13" reel | EIA RS-481              |

### Tape and Reel Specification



**Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications. Read complete Disclaimer Notice at [www.littelfuse.com/disclaimer-electronics](http://www.littelfuse.com/disclaimer-electronics).**

## X-ON Electronics

Largest Supplier of Electrical and Electronic Components

*Click to view similar products for [ESD Suppressors / TVS Diodes](#) category:*

*Click to view products by [Littelfuse](#) manufacturer:*

Other Similar products are found below :

[NTE4902](#) [P4SMAJ15A](#) [P4SMAJ26A](#) [SMAJ400CA-TP](#) [TGL34-47CA](#) [ESDAULC45-1BF4](#) [SM1605E3/TR13](#) [SMF20A-TP](#) [P4SMAJ12A](#)  
[CPDUR24V-HF](#) [CPDQC5V0USP-HF](#) [CPDQC5V0-HF](#) [MPLAD30KP45CAE3](#) [MMBZ27VCLQ-7-F](#) [MMAD1108/TR13](#) [MPLAD30KP24A](#)  
[ACPDQC5V0R-HF](#) [DFLT170A-7](#) [NTE4900](#) [NTE4926](#) [NTE4938](#) [SMF22A-TP](#) [SMF12A-TP](#) [SLVU2.8-TP](#) [SMLJ6.5CA-TP](#) [SMAJ6.5CA-](#)  
[TP](#) [MMAD1108E3/TR13](#) [D5V0M1U2LP3-7](#) [SMAJ400A-TP](#) [AOZ8811DT-03](#) [AOZ8831DI-05](#) [AOZ8831DT-03](#) [SMAJ188CA](#) [3SMC33CA](#)  
[BK](#) [CPDQC3V3C-HF](#) [CPDQC12VE-HF](#) [MPLAD30KP170CA](#) [82357120100](#) [5.0SMLJ15CA-TP](#) [5KP18A-TP](#) [P6KE8.2A-TP](#)  
[MPLAD30KP43CAE3](#) [SMAJ43A-TP](#) [D5V0F6U8LP33-7](#) [TVS5501V10MUT5G](#) [5.0SMLJ24CA-TP](#) [SMAJ110CA-TP](#) [MPLAD15KP75CAE3](#)  
[MMAD1103e3/TR13](#) [DFLT40AQ-7](#)