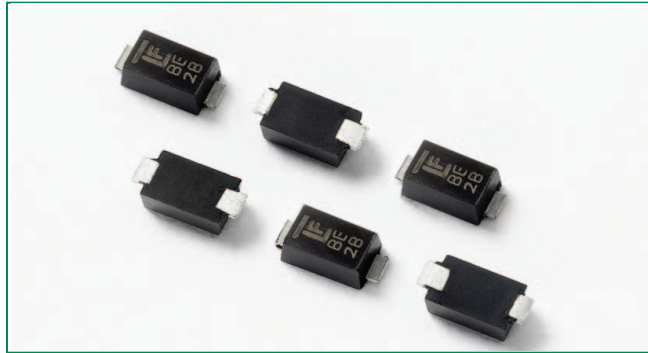


**SMF Series**



**Maximum Ratings and Thermal Characteristics**  
( $T_A=25^\circ\text{C}$  unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at $T_A=25^\circ\text{C}$ by $10 \times 1000\mu\text{s}$ (Note 1)	$P_{PPM}$	200	W
Thermal Resistance Junction- to-Ambient	$R_{THJA}$	220	$^\circ\text{C/W}$
Thermal Resistance Junction- to-Lead	$R_{THJL}$	100	$^\circ\text{C/W}$
Operating and Storage Temperature Range	$T_J, T_{STG}$	-55 to 150	$^\circ\text{C}$

**Notes:**

1. Non-repetitive current pulse, per Fig. 4 and derated above  $T_A=25^\circ\text{C}$  per Fig. 3.

**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 lowest height profiles (1.1mm) in the industry.

**Features**

- Compatible with industrial standard package SOD-123
- For surface mounted applications to optimize board space
- Low profile: maximum height of 1.1mm.
- 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)
- Low inductance, excellent clamping capability
- 200W peak pulsepower capability at  $10 \times 1000\mu\text{s}$  waveform, repetition rate (duty cycle): 0.01%
- Fast response time: typically less than 1.0ns from 0 Volts to  $V_{BR \text{ min}}$
- High temperature soldering:  $260^\circ\text{C}/40$  seconds at terminals
- Glass passivated junction
- Built-in strain relief
- Matte tin lead-free plated
- Halogen-free and RoHS compliant

**Applications**

SMF devices are ideal for the protection of I/O interfaces,  $V_{CC}$  bus and other vulnerable circuit used in cellular phones, portable devices, business machines, power supplies and other consumer applications.

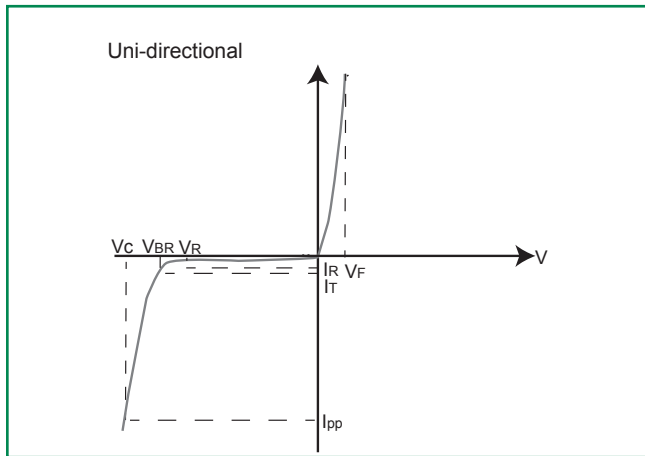
**Electrical Characteristics** ( $T_A=25^\circ\text{C}$  unless otherwise noted)

Part Number	Marking	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)
		MIN	MAX					
SMF5.0A	AE	6.4	7.0	10	5.0	400	21.7	9.2
SMF6.0A	AG	6.67	7.37	10	6.0	400	19.4	10.3
SMF6.5A	AK	7.22	7.98	10	6.5	250	17.9	11.2
SMF7.0A	AM	7.78	8.6	10	7.0	100	16.7	12
SMF7.5A	AP	8.33	9.21	1	7.5	50	15.5	12.9
SMF8.0A	AR	8.89	9.83	1	8.0	25	14.7	13.6
SMF8.5A	AT	9.44	10.4	1	8.5	10	13.9	14.4
SMF9.0A	AV	10.0	11.1	1	9.0	5	13	15.4
SMF10A	AX	11.1	12.3	1	10	2.5	11.8	17
SMF11A	AZ	12.2	13.5	1	11	2.5	11	18.2
SMF12A	BE	13.3	14.7	1	12	2.5	10.1	19.9
SMF13A	BG	14.4	15.9	1	13	1.0	9.3	21.5
SMF14A	BK	15.6	17.2	1	14	1.0	8.6	23.2
SMF15A	BM	16.7	18.5	1	15	1.0	8.2	24.4
SMF16A	BP	17.8	19.7	1	16	1.0	7.7	26
SMF17A	BR	18.9	20.9	1	17	1.0	7.2	27.6
SMF18A	BT	20.0	22.1	1	18	1.0	6.8	29.2
SMF20A	BV	22.2	24.5	1	20	1.0	6.2	32.4
SMF22A	BX	24.4	26.9	1	22	1.0	5.6	35.5
SMF24A	BZ	26.7	29.5	1	24	1.0	5.1	38.9
SMF26A	CE	28.9	31.9	1	26	1.0	4.8	42.1
SMF28A	CG	31.1	34.4	1	28	1.0	4.4	45.4
SMF30A	CK	33.3	36.8	1	30	1.0	4.1	48.4
SMF33A	CM	36.7	40.6	1	33	1.0	3.8	53.3
SMF36A	CP	40.0	44.2	1	36	1.0	3.4	58.1
SMF40A	CR	44.4	49.1	1	40	1.0	3.1	64.5
SMF43A	CT	47.8	52.8	1	43	1.0	2.9	69.4
SMF45A	CV	50.0	55.3	1	45	1.0	2.8	72.7
SMF48A	CX	53.3	58.9	1	48	1.0	2.6	77.4
SMF51A	CZ	56.7	62.7	1	51	1.0	2.4	82.4
SMF54A	DE	60.0	66.3	1	54	1.0	2.3	87.1

**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 x 1000 $\mu\text{s}$  exponential wave and derated per Fig.2.
- All terms and symbols are consistent with ANSI/IEEE C62.35.

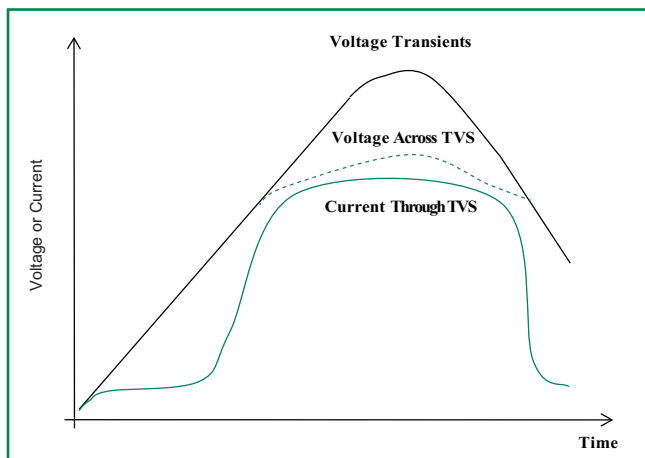
**I-V Curve Characteristics**



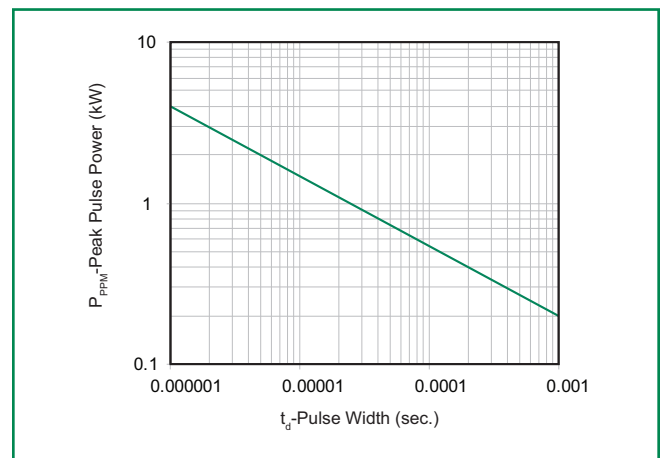
- P<sub>PPM</sub> Peak Pulse Power Dissipation** – Max power dissipation
- V<sub>R</sub> Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- V<sub>BR</sub> Breakdown Voltage** – Maximum current that flows through the TVS at a specified test current (I<sub>T</sub>)
- V<sub>c</sub> Clamping Voltage** – Peak voltage measured across the suppressor at a specified I<sub>ppm</sub> (peak impulse current)
- I<sub>R</sub> Reverse Leakage Current** – Current measured at V<sub>R</sub>
- V<sub>F</sub> Forward Voltage Drop for Uni-directional**

**Ratings and Characteristic Curves (T<sub>A</sub>=25°C unless otherwise noted)**

**Figure 1 - TVS Transients Clamping Waveform**



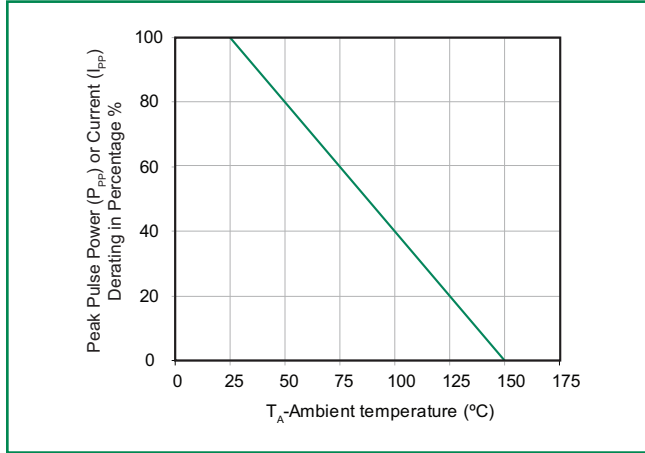
**Figure 2 - Peak Pulse Power Rating Curve**



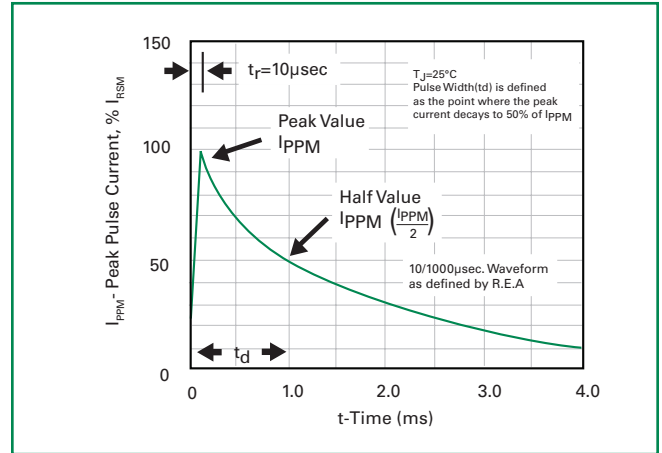
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**Ratings and Characteristic Curves** ( $T_A=25^\circ\text{C}$  unless otherwise noted) (Continued)

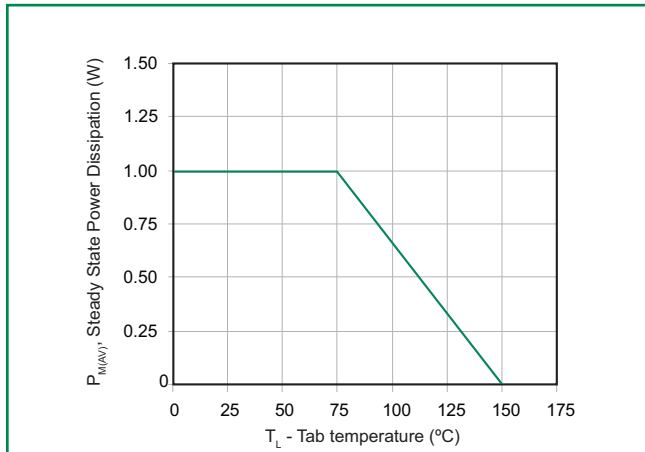
**Figure 3 - Pulse Derating Curve**



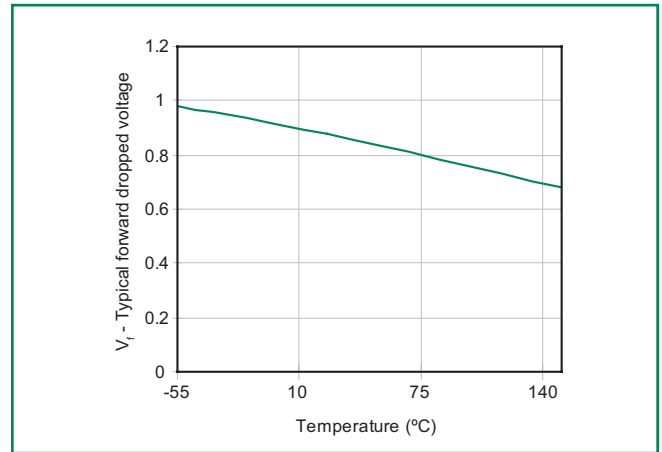
**Figure 4 - Pulse Waveform - 10x1000µS**



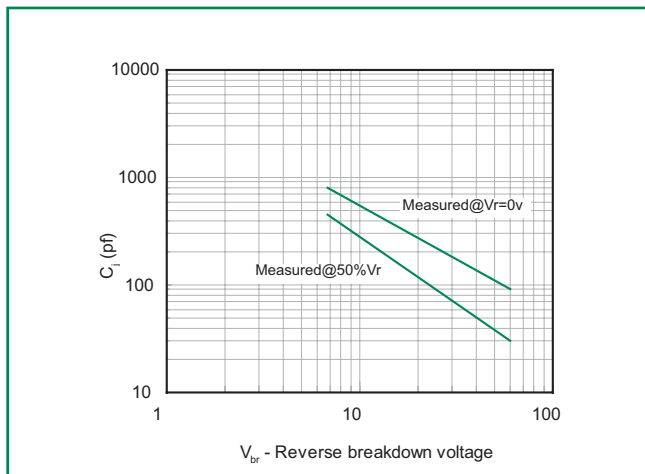
**Figure 5 - Steady State Power Dissipation Derating Curve**



**Figure 6 - Forward Voltage**

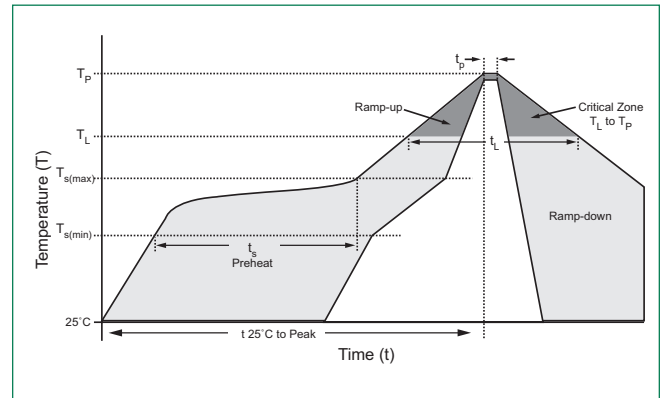


**Figure 7 -  $C_j$  vs. Working Peak Reverse Voltage**



**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 ( $T_L$ ) 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) ( $t_s$ )	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



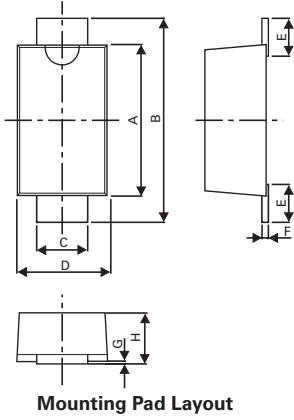
**Physical Specifications**

<b>Case</b>	SOD-123 plastic over glass passivated junction
<b>Polarity</b>	Color band denotes cathode except bipolar
<b>Terminal</b>	Matte tin-plated leads, solderable per JESD22-B102D

**Environmental Specifications**

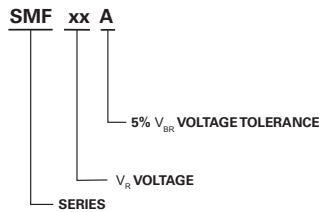
<b>Temperature Cycle</b>	JESD22-A104
<b>Pressure Cooker</b>	JESD22-A102
<b>High Temp. Storage</b>	JESD22-A103
<b>HTRB</b>	JESD22-A108
<b>Thermal Shock</b>	JESD22-A106

### Dimensions - SOD-123 Package

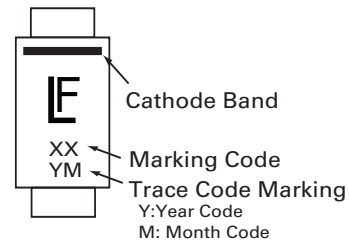


Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	2.50	2.90	0.0984	0.1142
B	3.40	3.90	0.1339	0.1535
C	0.70	1.20	0.0275	0.0472
D	1.50	2.00	0.0591	0.0787
E	0.35	0.90	0.0138	0.0354
F	0.05	0.26	0.0020	0.0102
G	0.00	0.10	0.0000	0.0039
H	0.95	1.10	0.0374	0.0433

### Part Numbering System



### Part Marking System



### Packaging

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

### Tape and Reel Specification

