



# THE DATASHEET OF SMF3.3



**SMF3.3**



**Description**

SMF3.3 is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

**Features**

- 200W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycle): 0.01 %
- 1200W peak pulse power capability at 8/20us waveform
- Excellent clamping capability
- Compatible with industrial standard package SOD-123FL
- Low profile: maximum height of 1.08mm.
- For surface mounted applications to optimize board space
- 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  $V_{BR}$  min
- High temperature soldering: 260°C/40 seconds at terminals
- Built-in strain relief
- Meet MSL level1, per J-STD-020C, LF maximum peak of 260°C
- Matte tin lead-free plated
- Halogen-free and RoHS compliant
- Pb-free E3 means 2<sup>nd</sup> level interconnect is Pb-free and the terminal finish material is tin(Sn) (IPC/JEDEC J-STD-609A.01)

**Agency Approvals**

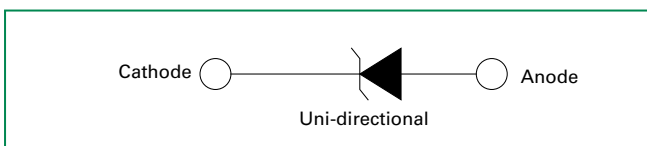
AGENCY	AGENCY FILE NUMBER
	E230531

**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 (Note 1)	P <sub>PPM</sub>	1200	W
		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>	-55 to 150	°C
Storage Temperature Range	T <sub>STG</sub>	-55 to 150	°C

**Notes:**  
1. Non-repetitive current pulse, per Fig. 4 & 6 and derated above T<sub>J</sub> (initial) =25°C per Fig. 3.

**Functional Diagram**



**Applications**

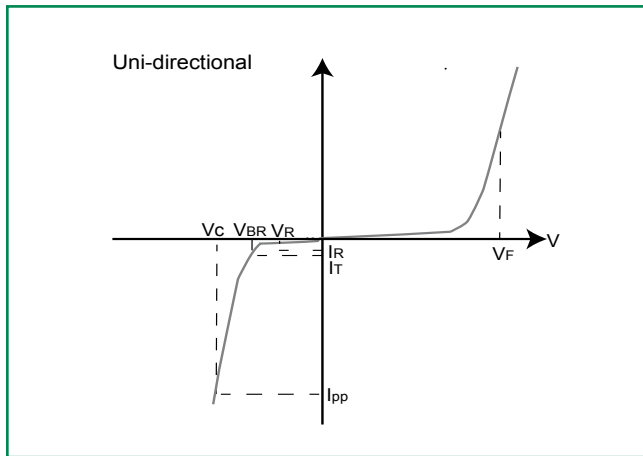
SMF3.3 devices are ideal for the protection of portable devices/hard drives, notebooks, V<sub>CC</sub> busses, POS terminal, SSDs, power supplies, monitors, and vulnerable circuit used in other consumer applications.

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

Part Number	Marking Code	Breakdown Voltage V <sub>BR</sub> (Volts) @ I <sub>T</sub>		Test Current I <sub>T</sub> (mA)	Reverse Stand off Voltage V <sub>R</sub> (V)	Maximum Reverse Leakage @ V <sub>R</sub> I <sub>R</sub> (µA)	Maximum Peak Pulse Current (10/1000µS) I <sub>pp</sub> (A)	Maximum Clamping Voltage @I <sub>pp</sub> (10/1000µS) V <sub>C</sub> (V)	Maximum Peak Pulse Current (8/20µS) I <sub>pp</sub> (A)	Maximum Clamping Voltage @I <sub>pp</sub> (8/20µS) V <sub>C</sub> (V)
		MIN	MAX							
SMF3.3	33	3.4	4.3	10	3.3	0.5	30.0	6.8	120.0	10.0

**Notes:**  
1. V<sub>BR</sub> measured after I<sub>T</sub> applied for 300µs, I<sub>T</sub> = square wave pulse or equivalent.  
2. Surge current waveform per 10/1000µs exponential wave and derated per Fig.2.  
3. All terms and symbols are consistent with ANSI/IEEE C62.35.  
4. Surge current waveform per 8/20µs exponential wave and derated per Fig.6.

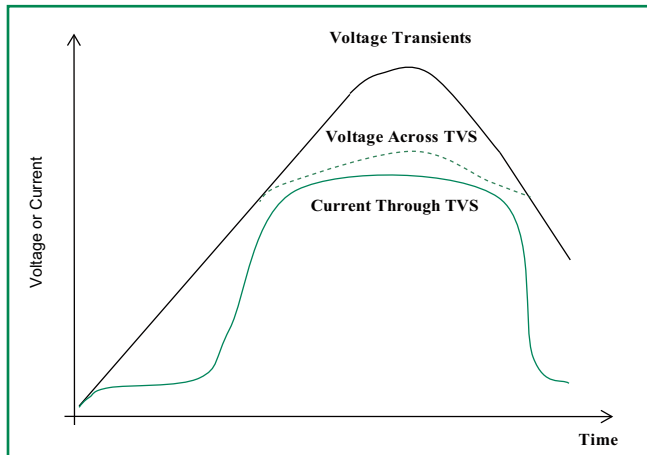
**I-V Curve Characteristics**



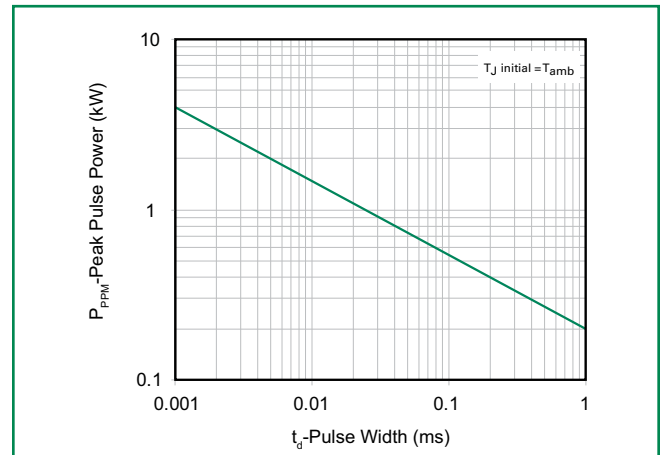
- $P_{PPM}$  Peak Pulse Power Dissipation** – Max power dissipation
- $V_R$  Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current ( $I_T$ )
- $V_C$  Clamping Voltage** – 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**  
note:  $V_F$  distribution range from 10V to 15V

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

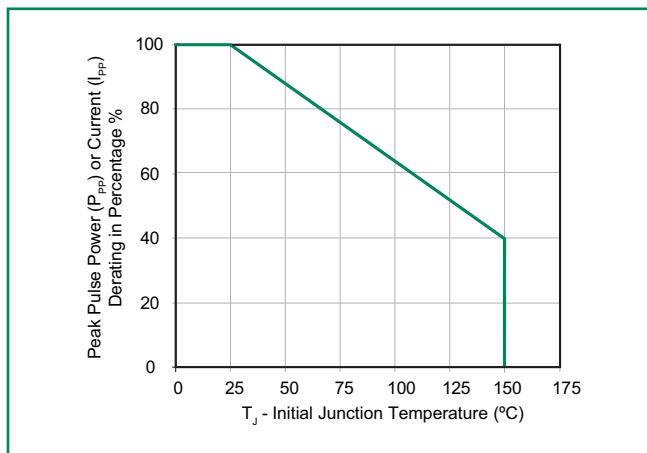
**Figure 1 - TVS Transients Clamping Waveform**



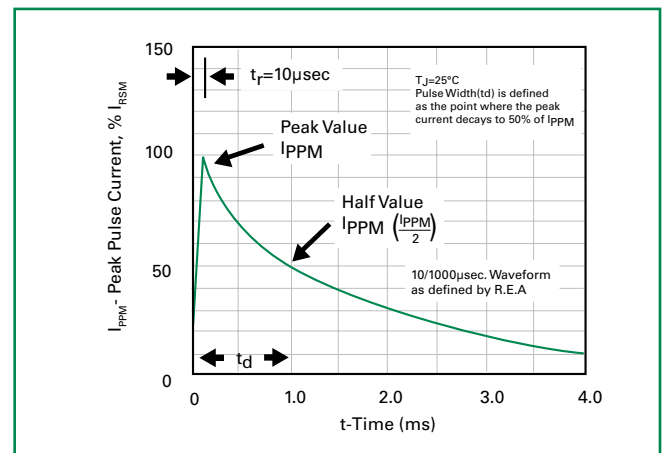
**Figure 2 - Peak Pulse Power Rating Curve**



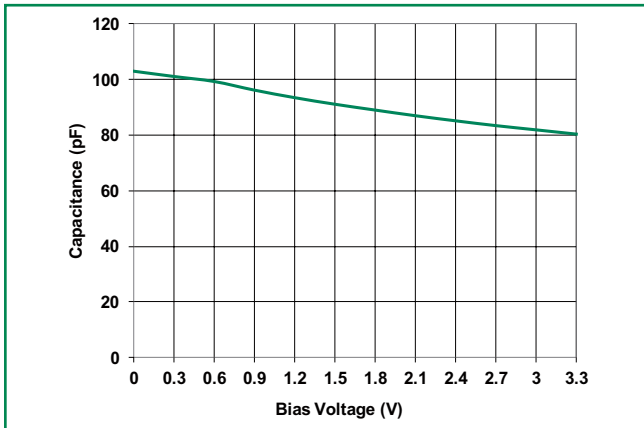
**Figure 3 - Peak Pulse Power Derating Curve**



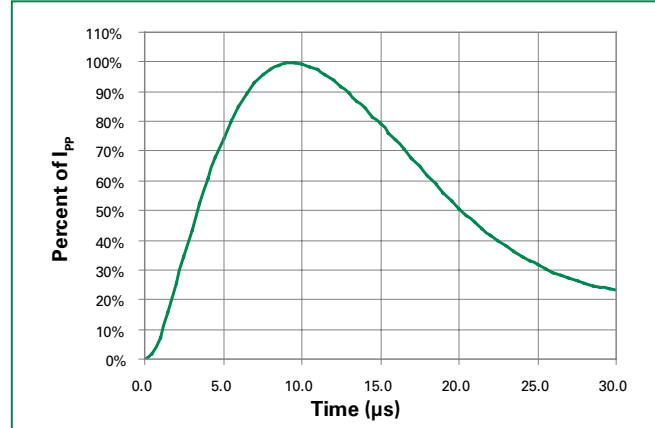
**Figure 4 - 10/1000 $\mu\text{s}$  Pulse Waveform**



**Figure 5 - Capacitance vs. Reverse Bias**

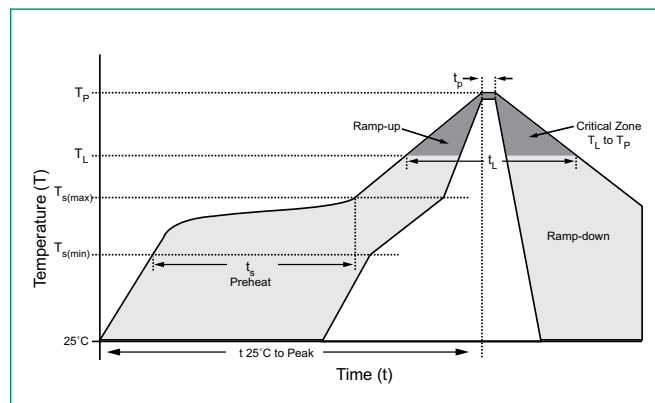


**Figure 6 - 8/20µS Pulse Waveform**



**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



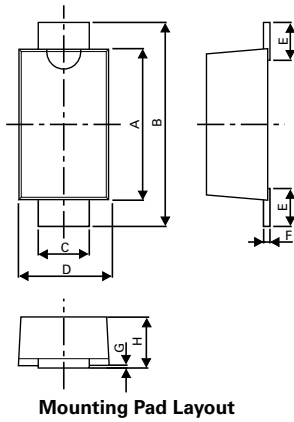
**Physical Specifications**

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

**High Reliability Test Specification**

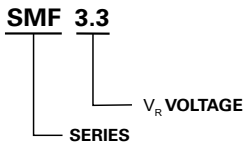
<b>Pre-condition (HTRB/ TC/ PCT/ H3TRB)</b>	(1) Bake 24hrs @150°C (2) 168hrs @85% RH and 85°C (3) $I_R$ reflow, 3 reflows, peak temperature of 260°C
<b>HTRB</b>	JESD 22-108C $V_{CC}$ bias = 80% $V_{DRM}$ & $T_A = 150^\circ\text{C}$ , 1008hrs
<b>Temperature Cycling</b>	MIL-STD-883F, Method 1010.8 Condition C -65°C to 150°C, 1000 cycles
<b>Pressure Cooker</b>	JEDEC 22-A102C 100%RH @121°C @15psi, 96hrs
<b>Bias Humidity (H3TRB)</b>	JESD 22-A101B $V_{CC}$ bias (pin1 to pin3) = $V_{DRM}$ , 85%RH, 85°C, 1008 hours
<b>RSH</b>	JESD 22-A111 260°C, 10 secs.

**Dimensions - SOD-123FL Package**

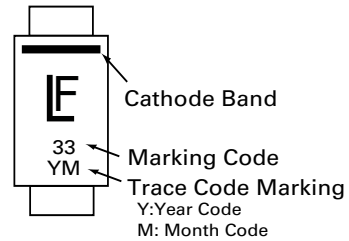


Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	2.90	3.10	0.114	0.122
B	3.50	3.90	0.138	0.154
C	0.85	1.05	0.033	0.041
D	1.70	2.00	0.067	0.079
E	0.43	0.83	0.017	0.033
F	0.10	0.25	0.004	0.010
G	0.00	0.10	0.000	0.004
H	0.90	1.08	0.035	0.043

**Part Numbering System**



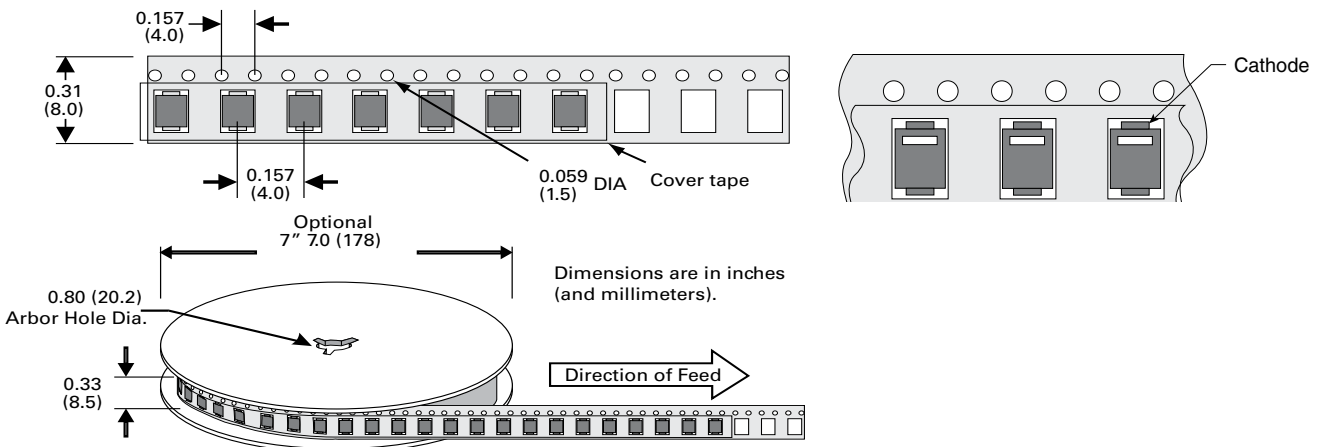
**Part Marking System**



**Packaging Options**



Part number	Component Package	Quantity	Packaging Option	Packaging Specification
SMF3.3	SOD-123FL	3000	Tape & Reel – 8mm tape/7" reel	EIA RS-481

**Tape and Reel Specification**



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