

TPSMF Series

Automotive, Surface Mount 200 W in SOD-123FL



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

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at $T_A = 25^\circ\text{C}$ ¹	P_{PPM}	1000	W
		200	
Power Dissipation On Infinite Heat Sink at $T_L = 50^\circ\text{C}$	P_D	1	W
Thermal Resistance Junction- to- Ambient	$R_{\theta JA}$	220	$^\circ\text{C/W}$
Thermal Resistance Junction- to- Lead	$R_{\theta JL}$	100	$^\circ\text{C/W}$
Operating Temperature Range	T_J	-65 to 150	$^\circ\text{C}$
Storage Temperature Range	T_{STG}	-65 to 175	$^\circ\text{C}$

Notes:

1. Non-repetitive current pulse, per Fig. 4 and derated above T_J (initial) = 25°C per Fig. 3.

Functional Diagram



Bi-directional

Description

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

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

Features & Benefits

- High reliability application and automotive grade AEC-Q101 qualified
- 200 W peak pulsepower capability at 10/1000 μs waveform, repetition rate (duty cycle): 0.01 %
- Compatible with industrial standard package SOD-123FL
- Low profile: maximum height of 1.1 mm.
- Low inductance, excellent clamping capability
- For surface mounted applications to optimize board space
- High temperature to reflow soldering guaranteed: 260 $^\circ\text{C}/30$ sec
- 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 30 kV(Air), 30 kV (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 1.0 ns from 0 volts to V_{BR} min
- Glass passivated junction
- Built-in strain relief
- Plastic package is flammability rated V-0 per UL 94
- Meet MSL level1, per J-STD-020, LF maximum peak of 260 $^\circ\text{C}$
- 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

TPSMF series is ideal for the protection of I/O interfaces, V_{CC} bus and other vulnerable circuit used in automotive applications.

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

Part Number	Marking Code	Breakdown Voltage @ I_T V_{BR} (V)		Test Current I_T (mA)	Reverse Stand off Voltage V_R (V)	Maximum Reverse Leakage @ V_R I_R (μA)	Maximum Peak Pulse Current I_{PP} (A) 10*1000 μs	Maximum Clamping Voltage @ I_{PP} , V_C (V) 10*1000 μs
		Min	Max					
TPSMF70CA	KPA	77.80	86.00	1	70	1.0	1.7	113.0

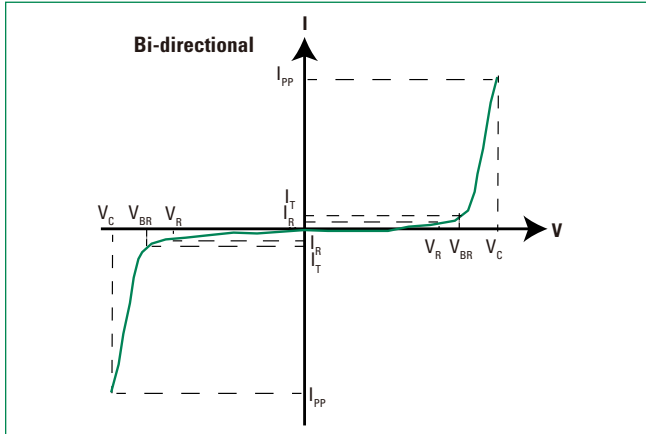
Notes:

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

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I-V Curve Characteristics



- P_{PPM} **Peak Pulse Power Dissipation** ($I_{PP} \times V_C$) – 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

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

Figure 1: TVS Transients Clamping Waveform

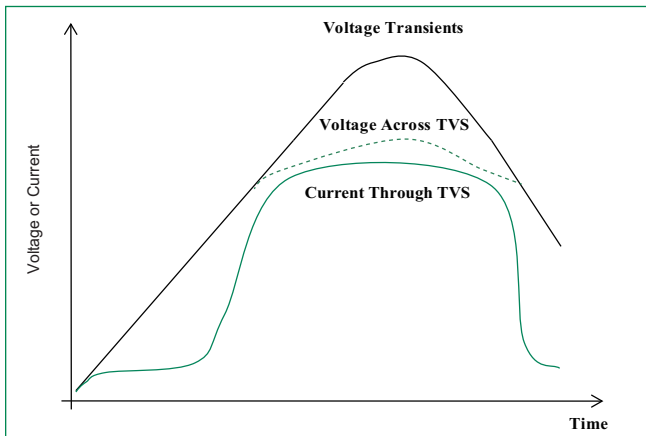


Figure 2: Peak Pulse Power Rating Curve

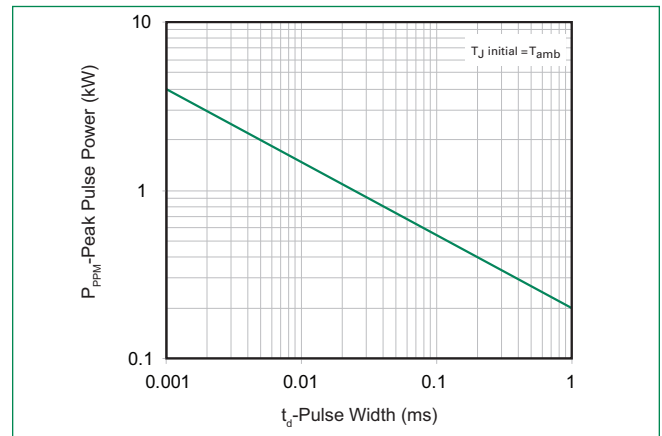


Figure 3: Peak Pulse Power Derating Curve

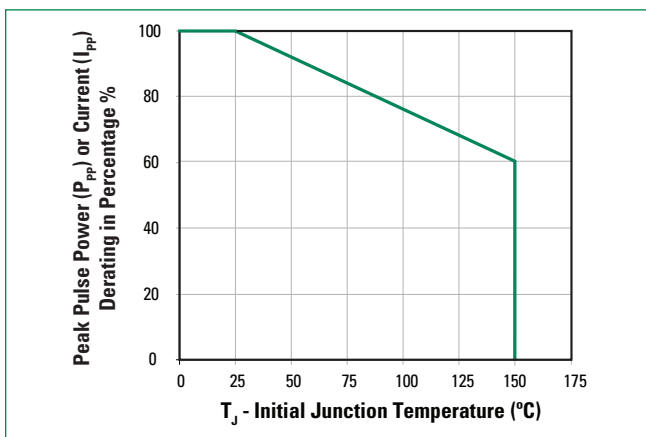
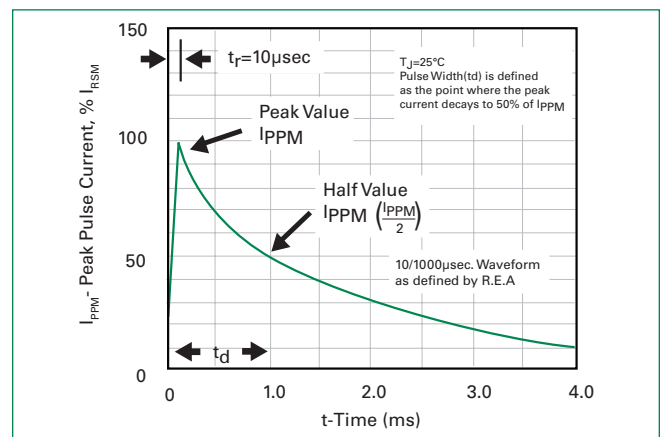


Figure 4: Pulse Waveform - 10/1000 μS



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Figure 5: Forward Voltage

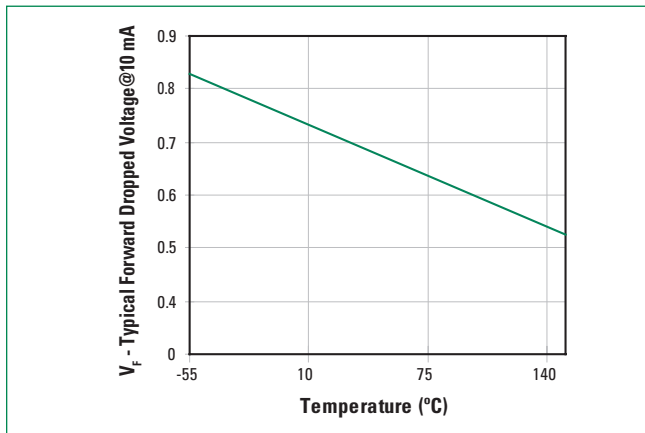
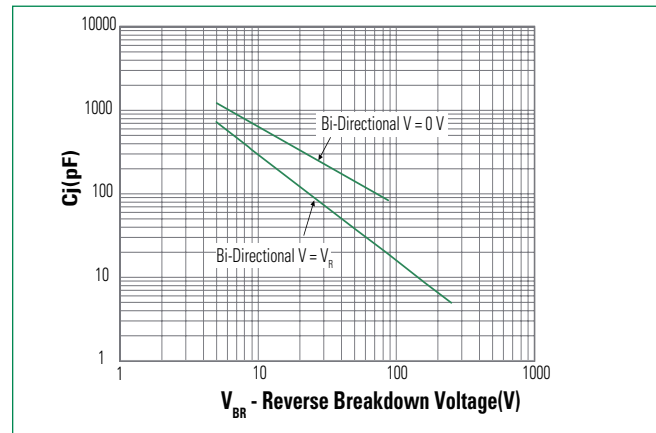
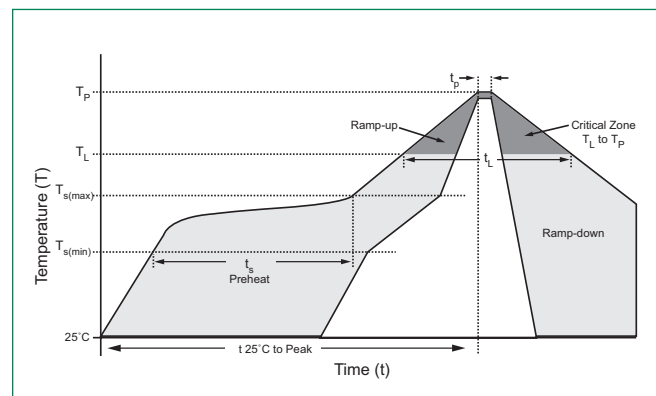


Figure 6: Typical Junction Capacitance



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 – 120 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 _s)	60 – 150 seconds
Peak Temperature (T_p)		260 ^{+0/-5} °C
Time Within 5 °C of Actual Peak Temperature (t_p)		30 seconds max
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

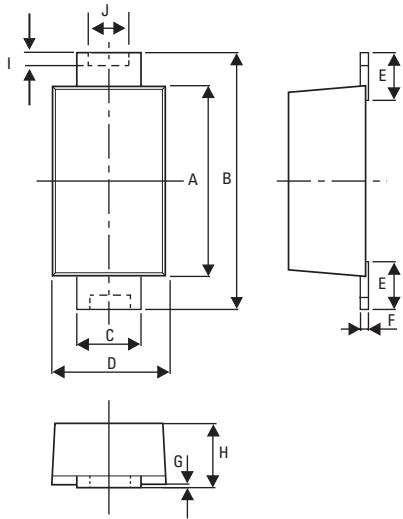
Case	SOD-123FL plastic over glass passivated junction
Terminal	Matte tin-plated leads, solderable per JESD22-B102

Environmental Specifications

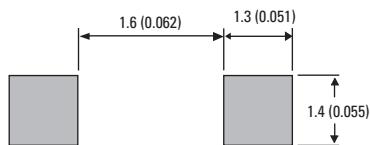
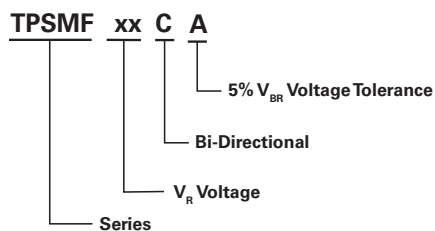
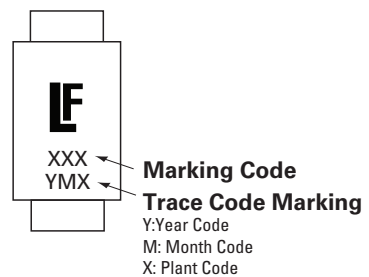
High Temp Voltage Blocking (HTRB)	100 % DC reverse voltage rated 150 °C, 1008 hours. JEDEC, JESD22-A-108
Biased Temp & Humidity (H3TRB)	80 % breakdown voltage (+85 °C) 85 %RH, 1008 hours. JEDEC, JESD22-A-101
Unbiased Highly Accelerated Stress Test (UHAST)	96 hours at T _A = 130 °C/85 %RH. JEDEC, JESD22-A-118
Temp Cycling (TC)	-55 °C to +150 °C, 15 min. dwell, 1000 cycles. JEDEC, JESD22-A104 85 %RH, +85 °C, 168 hours, 3 reflow cycles (+260 °C Peak). JEDEC, JEDEC-J-STD-020, Level 1
Moisture Sensitivity Level (MSL)	Level 1
Resistance to Solder Heat (RSH)	+260 °C, 30 seconds. JEDEC, JEDEC JESD22-A-111

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Dimensions - SOD-123FL Package

Dimensions	Millimeters		Inches	
	Min	Max	Min	Max
A	2.50	3.10	0.0984	0.1220
B	3.40	3.90	0.1339	0.1535
C	0.70	1.20	0.0275	0.0472
D	1.50	2.08	0.0591	0.0819
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	0.90	1.10	0.0354	0.0433
I	0.00	0.20	0.000	0.008
J	0.40	0.60	0.016	0.024

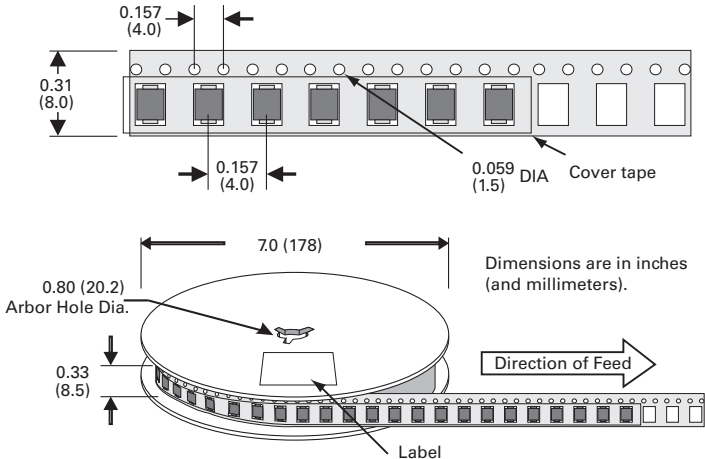
**Mounting Pad Layout****Part Numbering System****Part Marking System****Packaging Options**

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

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Tape and Reel Specification



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