

TP5.0SMD-FL Series

Surface Mount - FlatSuppressX™ Low Clamping Voltage TVS Series - 5000 W



Maximum Ratings & Thermal Characteristics

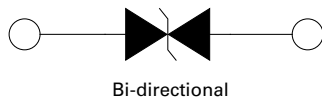
($T_A = 25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation by 10/1000 μs Waveform (Fig.2)(Note 1), (Note 2) (Note 3)	P_{PPM}	5000	W
Power Dissipation on Infinite Heat Sink at $T_J = 50^\circ\text{C}$	$P_{M(AV)}$	6.5	W
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to 175	$^\circ\text{C}$
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	15	$^\circ\text{C/W}$
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	75	$^\circ\text{C/W}$

Notes:

- Non-repetitive current pulse per Fig. 4 and derated above $T_A = 25^\circ\text{C}$ per Fig. 3.
- Mounted on copper pad area of $0.31 \times 0.31"$ ($8.0 \times 8.0 \text{ mm}$) to each terminal.
- Equivalent with conventional 5 kW TVS

Functional Diagram



Description

The TP5.0SMD-FL Series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Features

- FlatSuppressX™ TVS provides superior surge protection, maintaining a flat and stable clamping voltage through its advanced foldback I-V characteristics.
- High reliability application and automotive grade AEC-Q101 qualified
- 5000 W peak pulse power capability
- For surface mounted applications to optimize board space
- Excellent clamping capability with low clamping voltage
- Low profile package
- 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
- Built-in strain relief
- $V_{BR} @ T_J = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$ (α : Temperature Coefficient)
- Glass passivated chip junction
- Fast response time: typically less than 1.0 ps from 0 V to $V_{BR \text{ min}}$
- Low incremental surge resistance
- High temperature soldering guaranteed: $260^\circ\text{C}/10$ seconds at terminals
- UL recognized body that meets flammability rating V-0
- Meet MSL level1, per J-STD-020, high temperature soldering guaranteed
- 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

TVS components are ideal for the protection of I/O Interfaces, V_{CC} bus and other vulnerable circuits used in Automotive electronic applications.

- 48 V battery protection

Electrical Characteristics

Part Number (Bi)	Marking	Reverse Stand off Voltage V_R (V)	Breakdown Voltage V_{BR} (V) @ I_T		Test Current I_T (mA)	Overshoot Voltage V_{OV} (V)	Maximum Clamping Voltage V_C (V)	Maximum Peak Pulse Current I_{PP} (A)	Minimum Clamping Voltage @ $0.1 I_{PP}$ (V)	Maximum Reverse Leakage $I_R @ V_R$ (μA)	Maximum Temp. Coefficient of V_{BR} (%/ $^\circ\text{C}$)
			Min	Max							
TP5.0SMD54CA-FL	T54CF	54	60.10	66.40	1	68.5	68.5	57.5	52.9 ¹	1	0.09
TP5.0SMD58CA-FL	T58CF	58	64.50	71.30	1	72.4	72.4	53.5	57.1 ¹	1	0.09
TP5.0SMD60CA-FL	T60CF	60	66.70	73.70	1	78.6	77.7	51.6	60.8 ²	1	0.09
TP5.0SMD64CA-FL	T64CF	64	71.10	78.60	1	81.4	80.5	48.4	62.9 ²	1	0.09

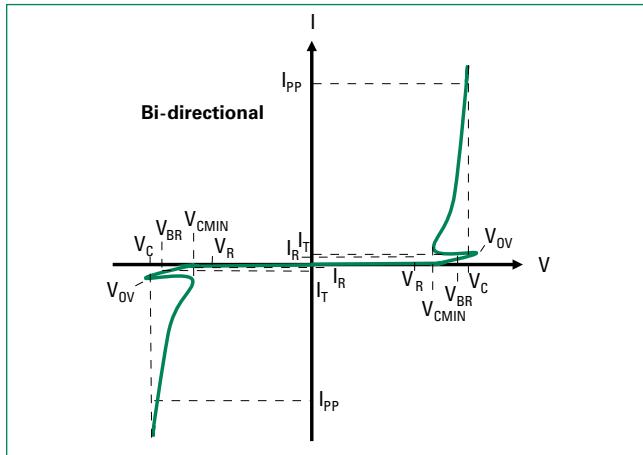
Notes:

- Minimum Clamping Voltage @ I_{PP}
- Minimum Clamping Voltage @ $0.1 I_{PP}$

TP5.0SMD-FL Series

Surface Mount - FlatSuppressX™ Low Clamping Voltage TVS Series - 5000 W

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
 V_{OV} Overshoot Voltage
 V_{CM} Snap Voltage for Bi-directional

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

Figure 1 - TVS Transients Clamping Waveform

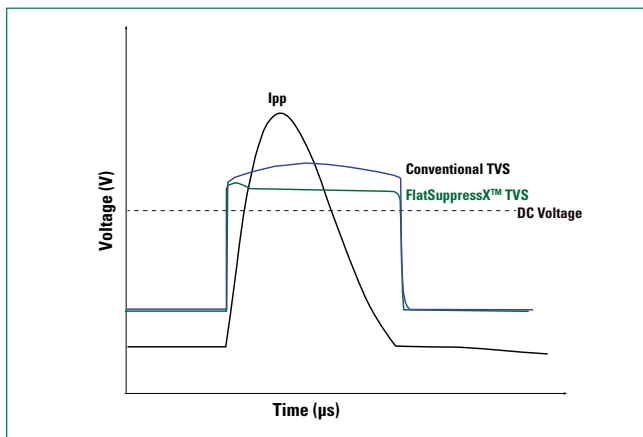


Figure 2 - Peak Pulse Power Rating

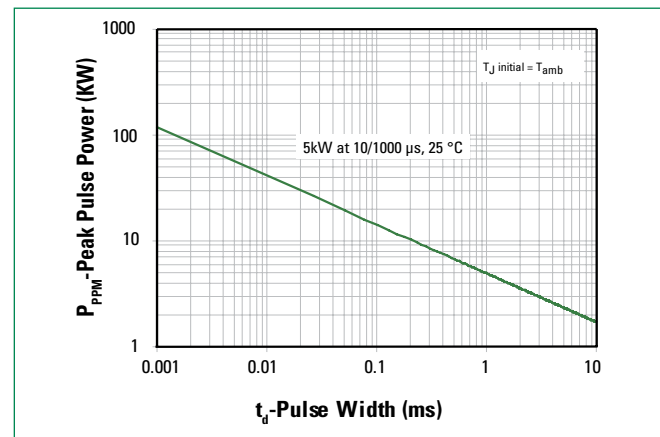


Figure 3 - Peak Pulse Power Derating Curve

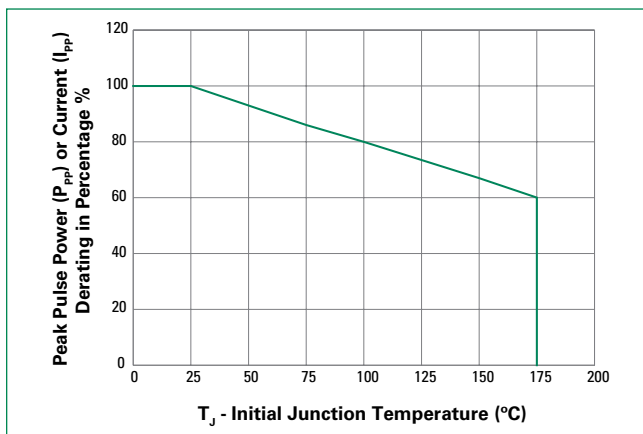
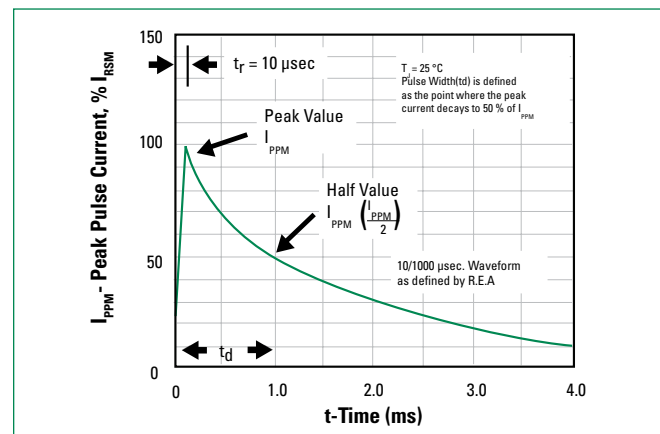


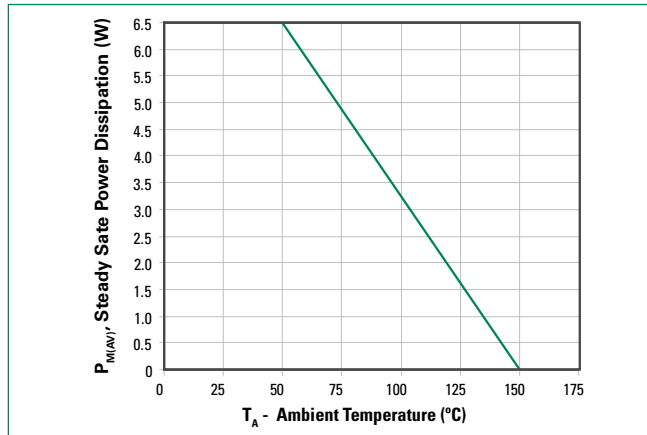
Figure 4 - Pulse Waveform



TP5.0SMD-FL Series

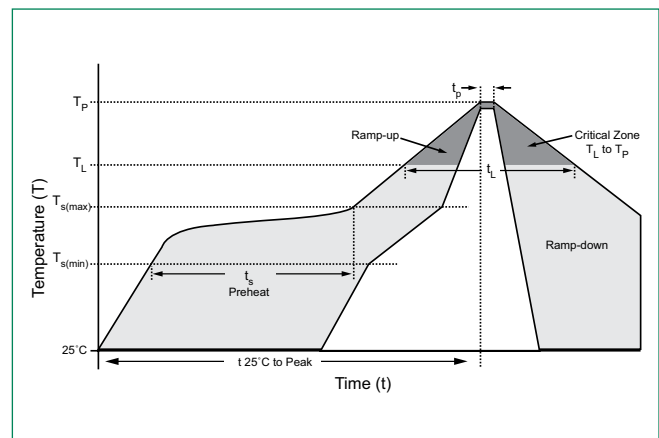
Surface Mount - FlatSuppressX™ Low Clamping Voltage TVS Series - 5000 W

Figure 5 - Steady State Power Dissipation Derating Curve



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 $\pm 0/5$ °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 °



Physical Specifications

Weight	0.007 ounce, 0.21 grams
Case	JEDEC DO214AB. Molded component over glass passivated junction
Terminal	Matte Tin-plated leads, Solderable per JESD22-B102

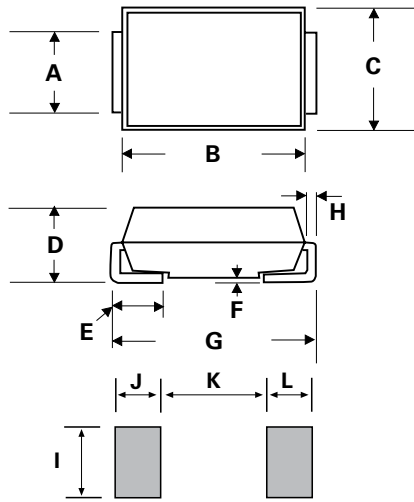
Environmental Specifications

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 (UHAIST)	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
Moisture Sensitivity Level (MSL)	85 %RH, +85 °C, 168 hours, 3 reflow cycles (+260 °C Peak). JEDEC, JEDEC-J-STD-020, Level 1
Resistance to Solder Heat (RSH)	+260 °C, 30 seconds. JEDEC, JEDEC JESD22-A-111

TP5.0SMD-FL Series

Surface Mount - FlatSuppressX™ Low Clamping Voltage TVS Series - 5000 W

Dimensions

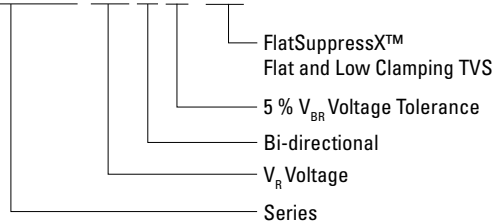


Recommended Soldering Pad Layout

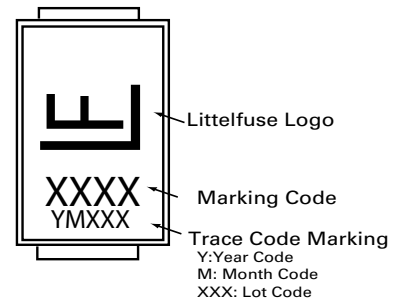
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.114	0.126	2.900	3.200
B	0.260	0.280	6.600	7.110
C	0.220	0.245	5.590	6.220
D	0.079	0.103	2.060	2.620
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.305	0.320	7.750	8.130
H	0.006	0.012	0.152	0.305
I	0.129	-	3.300	-
J	0.094	-	2.400	-
K	-	0.165	-	4.200
L	0.094	-	2.400	-

Part Numbering System

TP5.0SMD XX C A - FL



Part Marking System



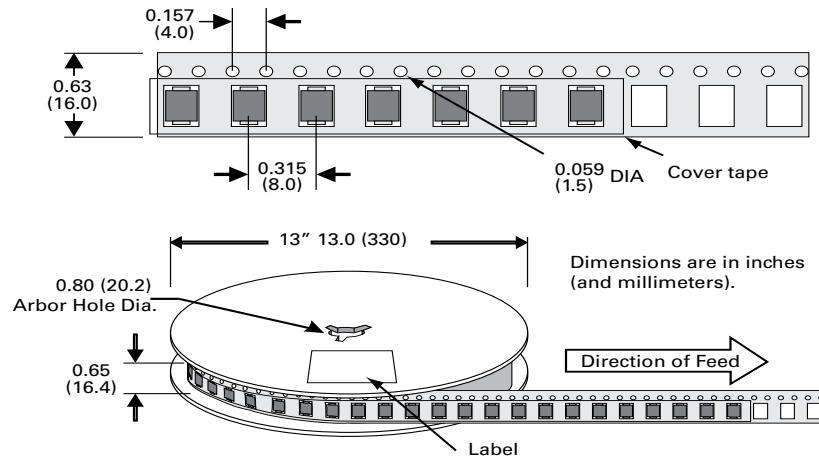
Packaging

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
TP5.0SMDxxCA-FL	DO-214AB	3000	Tape & Reel - 16 mm tape/13" reel	EIA STD RS-481

TP5.0SMD-FL Series

Surface Mount - FlatSuppressX™ Low Clamping Voltage TVS Series - 5000 W

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 <http://www.littelfuse.com/disclaimer-electronics>.