

TP5.0SMD-FL Series

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



Maximum Ratings & Thermal Characteristics

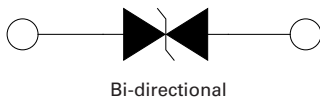
($T_A = 25^\circ\text{C}$ unless otherwise noted)

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:

1. Non-repetitive current pulse per Fig. 4 and derated above $T_A = 25^\circ\text{C}$ per Fig. 3.
2. Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0 mm) to each terminal.
3. 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
- $V_{BR} @ T_J = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha T (T_J - 25))$ (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 48 V battery protection

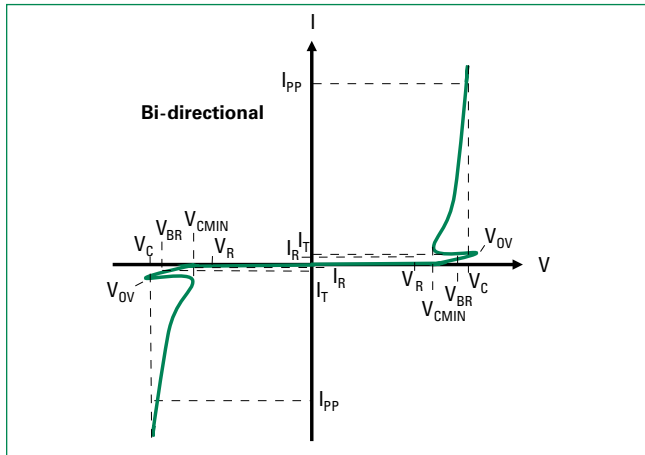
Electrical Characteristics

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							
TP5.0SMD60CA-FL	T60CF	60	66.70	73.70	1	78.6	77.7	51.6	60.8	1	0.09
TP5.0SMD64CA-FL	T64CF	64	71.10	78.60	1	81.4	80.5	48.4	62.9	1	0.09

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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
- 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

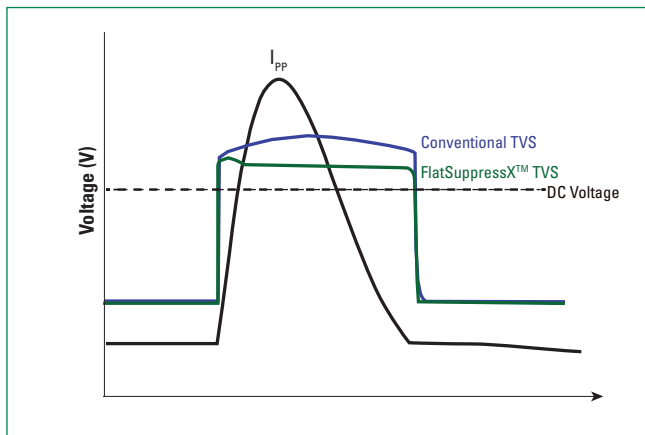


Figure 2 - Peak Pulse Power Rating

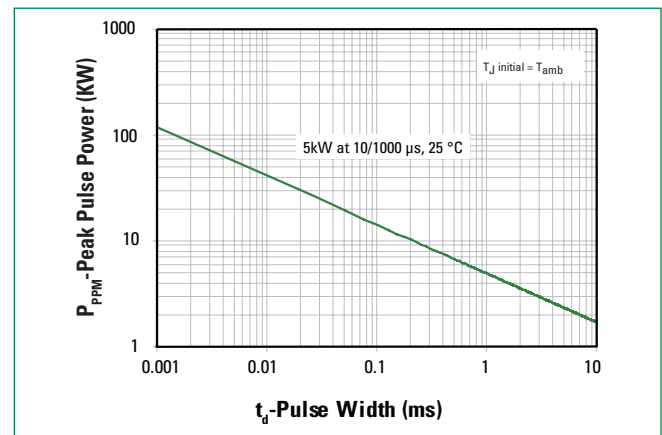


Figure 3 - Peak Pulse Power Derating Curve

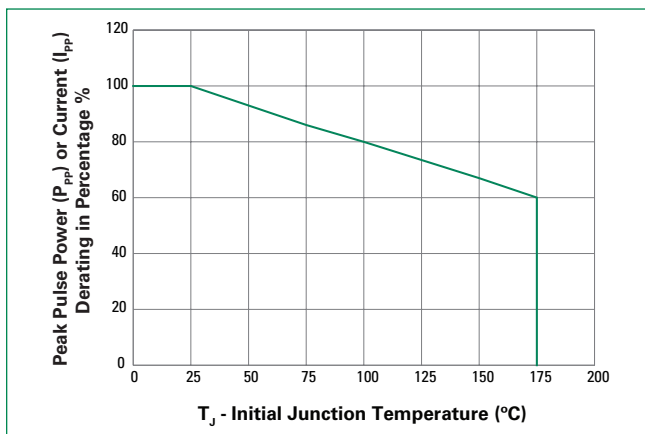
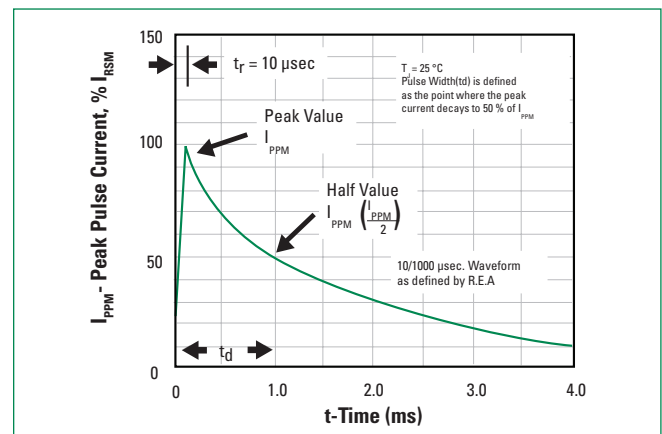


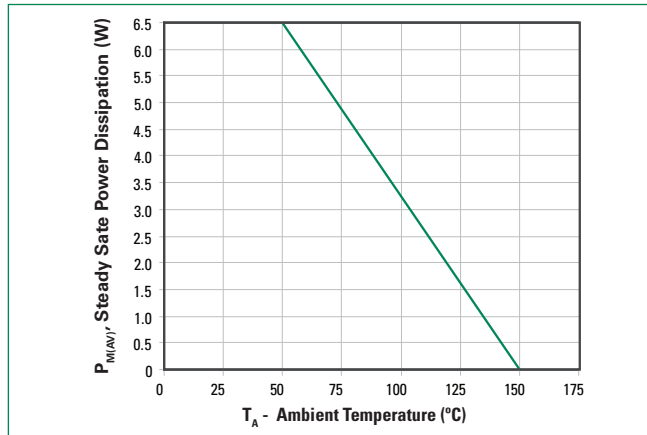
Figure 4 - Pulse Waveform



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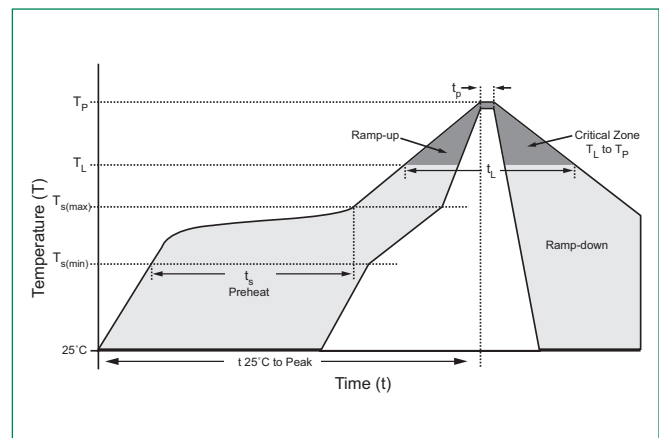
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Figure 5 - Steady State Power Dissipation Derating Curve



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

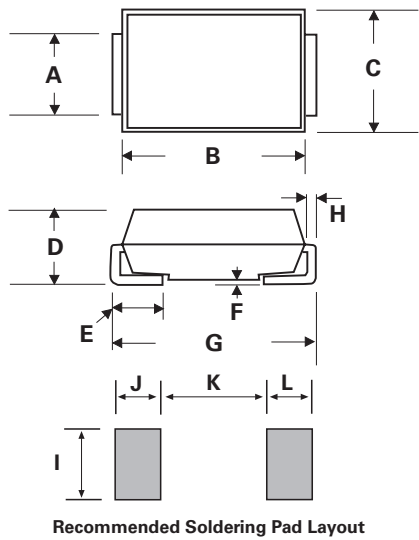
Weight	0.007 ounce, 0.21 grams
Case	JEDEC DO214AB. Molded component over glass passivated junction
Terminal	Matte Tin-plated leads, Solderable per JESD22-B102

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

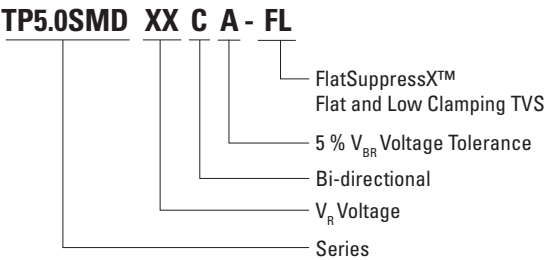
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Dimensions

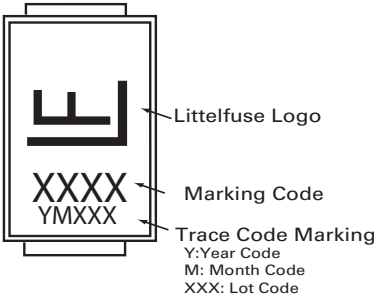


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.114	0.126	2.900	3.200
B	0.260	0.280	6.600	7.110
C	0.220	0.245	5.590	6.220
D	0.079	0.103	2.060	2.620
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.305	0.320	7.750	8.130
H	0.006	0.012	0.152	0.305
I	0.129	-	3.300	-
J	0.094	-	2.400	-
K	-	0.165	-	4.200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

Part Numbering System



Part Marking System



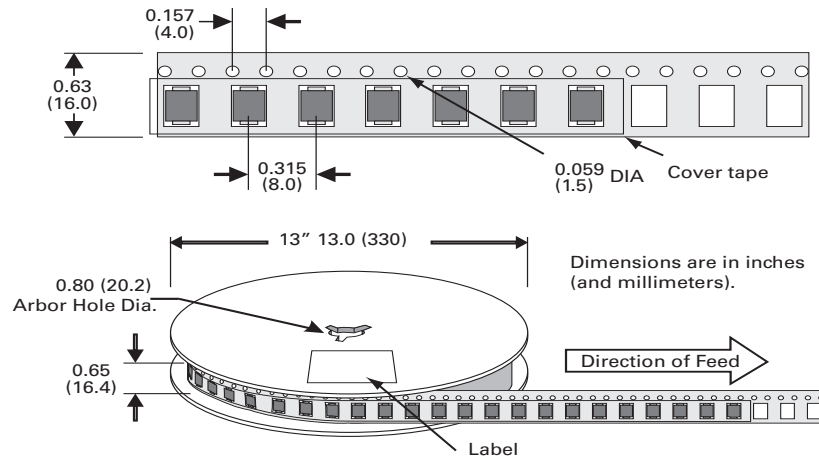
Packaging

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

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Tape and Reel Specification



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