TPSMA6L Series

AUTOMOTIVE GRADE HF RoHS

Description

The TPSMA6L series is designed specifically to protect sensitive electronic equipment from voltage transients induced by load dump and other transient voltage events, and it's especially suitable for high reliability and automotive application.

SMA low profile package (DO221-AC) has the same electronical performance as the SMB package but with low height profiles (1.1mm).

Agency Approvals

Agency	Agency File Number
	E230531

Maximum Ratings and Thermal Characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at T_A=25°C by 10x1000µs Waveform (Fig.2)(Note 1), (Note 2)	P_{PPM}	600	W
Power Dissipation on Infinite Heat Sink at T_A=50°C	$P_{M(AV)}$	3	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	60	A
Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only	V_F	3.5V	V
Operating Junction and Storage Temperature Range	T_J, T_{STG}	-65 to 150	°C
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	35	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	200	°C/W

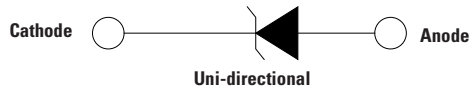
Notes:

1. Non-repetitive current pulse, per Fig.4 and derated above T_A=25°C per Fig. 3.
2. Mounted on 5.0x5.0mm copper pad to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only.

Features

- Same power as standard SMB devices (600 W)
- Hi reliability application and automotive grade AEC Q101 qualified
- SMA low profile package: less than 1.1 mm
- Footprint compatibility with standard SMA and SMB products (easy to layout)
- 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 (IEC801-4)
- Low inductance, excellent clamping capability
- Fast response time: typically less than 1.0ns from 0 Volts to V_{BR} min
- Built-in strain relief
- Glass passivated junction
- High temperature soldering: 260°C/10 seconds at terminals
- Plastic package has underwriters laboratory flammability V-0
- Typical maximum temperature coefficient ΔV_{BR} = 0.1% x V_{BR}@25°C x ΔT
- Matte tin lead–free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal

Functional Diagram



Applications

TVS devices are ideal for the protection of I/O Interfaces, V_{CC} bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

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Electrical Characteristics

Part Number (Uni)	Marking	Reverse Stand off Voltage V_R (Volts)	Breakdown Voltage V_{BR} (Volts) @ I_T		Test Current I_T (mA)	Maximum Clamping Voltage V_C @ I_{PP} (V)	Maximum Peak Pulse Current I_{PP} (A)	Maximum Reverse Leakage I_R @ V_R (µA)	Agency Approval
			MIN	MAX					
TPSMA6L5.0A	AEA	5.0	6.40	7.00	10	9.2	65.3	800	X
TPSMA6L6.0A	AGA	6.0	6.67	7.37	10	10.3	58.3	800	X
TPSMA6L6.5A	AKA	6.5	7.22	7.98	10	11.2	53.6	500	X
TPSMA6L7.0A	AMA	7.0	7.78	8.60	10	12.0	50.0	200	X
TPSMA6L7.5A	APA	7.5	8.33	9.21	1	12.9	46.6	100	X
TPSMA6L8.0A	ARA	8.0	8.89	9.83	1	13.6	44.2	50	X
TPSMA6L8.5A	ATA	8.5	9.44	10.40	1	14.4	41.7	20	X
TPSMA6L9.0A	AVA	9.0	10.00	11.10	1	15.4	39.0	10	X
TPSMA6L10A	AXA	10.0	11.10	12.30	1	17.0	35.3	5	X
TPSMA6L11A	AZA	11.0	12.20	13.50	1	18.2	33.0	1	X
TPSMA6L12A	BEA	12.0	13.30	14.70	1	19.9	30.2	1	X
TPSMA6L13A	BGA	13.0	14.40	15.90	1	21.5	28.0	1	X
TPSMA6L14A	BKA	14.0	15.60	17.20	1	23.2	25.9	1	X
TPSMA6L15A	BMA	15.0	16.70	18.50	1	24.4	24.6	1	X
TPSMA6L16A	BPA	16.0	17.80	19.70	1	26.0	23.1	1	X
TPSMA6L17A	BRA	17.0	18.90	20.90	1	27.6	21.8	1	X
TPSMA6L18A	BTA	18.0	20.00	22.10	1	29.2	20.6	1	X
TPSMA6L20A	BVA	20.0	22.20	24.50	1	32.4	18.6	1	X
TPSMA6L22A	BXA	22.0	24.40	26.90	1	35.5	16.9	1	X
TPSMA6L24A	BZA	24.0	26.70	29.50	1	38.9	15.5	1	X
TPSMA6L26A	CEA	26.0	28.90	31.90	1	42.1	14.3	1	X
TPSMA6L28A	CGA	28.0	31.10	34.40	1	45.4	13.3	1	X
TPSMA6L30A	CKA	30.0	33.30	36.80	1	48.4	12.4	1	X
TPSMA6L33A	CMA	33.0	36.70	40.60	1	53.3	11.3	1	X
TPSMA6L36A	CPA	36.0	40.00	44.20	1	58.1	10.4	1	X
TPSMA6L40A	CRA	40.0	44.40	49.10	1	64.5	9.3	1	X
TPSMA6L43A	CTA	43.0	47.80	52.80	1	69.4	8.7	1	X
TPSMA6L45A	CVA	45.0	50.00	55.30	1	72.7	8.3	1	X
TPSMA6L48A	CXA	48.0	53.30	58.90	1	77.4	7.8	1	X
TPSMA6L51A	CZA	51.0	56.70	62.70	1	82.4	7.3	1	X
TPSMA6L54A	REA	54.0	60.00	66.30	1	87.1	6.9	1	X
TPSMA6L58A	RGA	58.0	64.40	71.20	1	93.6	6.5	1	X
TPSMA6L60A	RKA	60.0	66.70	73.70	1	96.8	6.2	1	X
TPSMA6L64A	RMA	64.0	71.10	78.60	1	103.0	5.9	1	X
TPSMA6L70A	RPA	70.0	77.80	86.00	1	113.0	5.3	1	X
TPSMA6L75A	RRA	75.0	83.30	92.10	1	121.0	5.0	1	X
TPSMA6L78A	RTA	78.0	86.70	95.80	1	126.0	4.8	1	X
TPSMA6L85A	RVA	85.0	94.40	104.00	1	137.0	4.4	1	X

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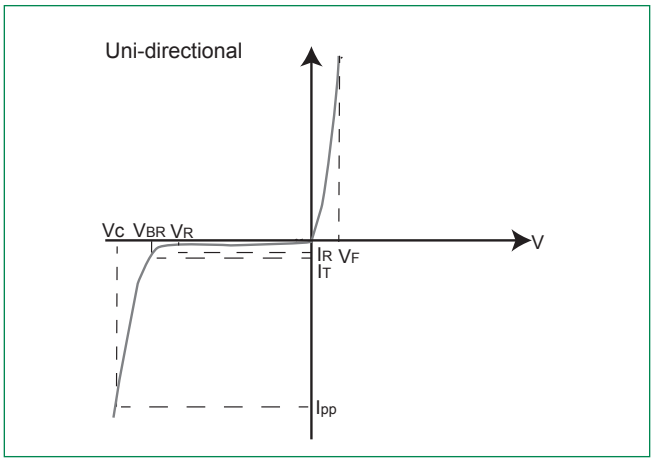
I-V Curve Characteristics



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 though the TVS at a specified test current (I_T)
V_C **Clamping Voltage** - Peak voltage measured across the suppressor at a specified Ippm (peak impulse current)
I_R **Reverse Leakage Current** - Current measured at V_R
V_F **Forward Voltage Drop for Uni-directional**

Ratings and Characteristic Curves (T_A=25°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

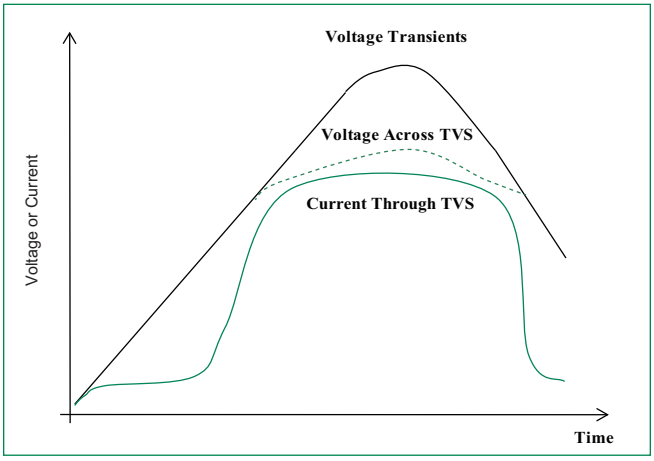
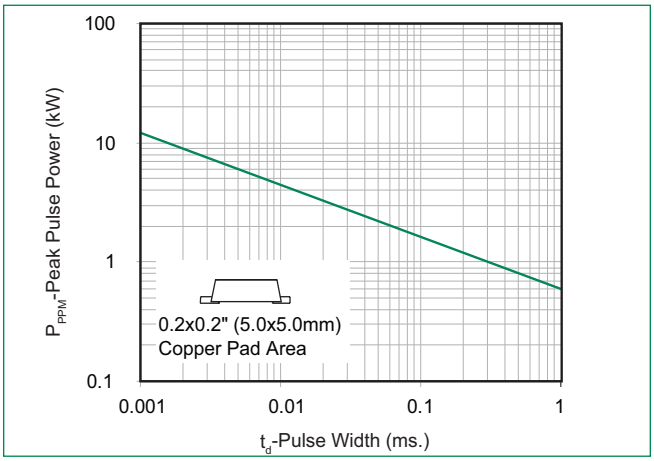


Figure 2 - Peak Pulse Power Rating Curve



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Ratings and Characteristic Curves (T_A=25°C unless otherwise noted) (Continued)

Figure 3 - Pulse Derating Curve

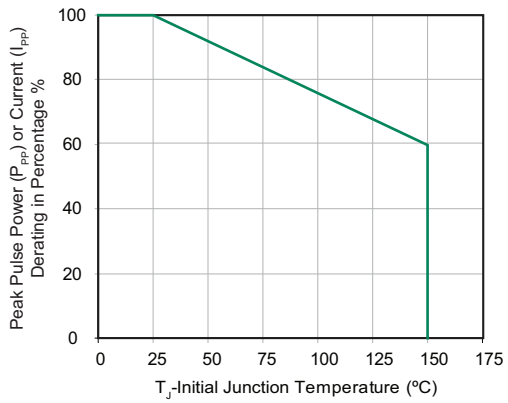


Figure 4 - Pulse Waveform

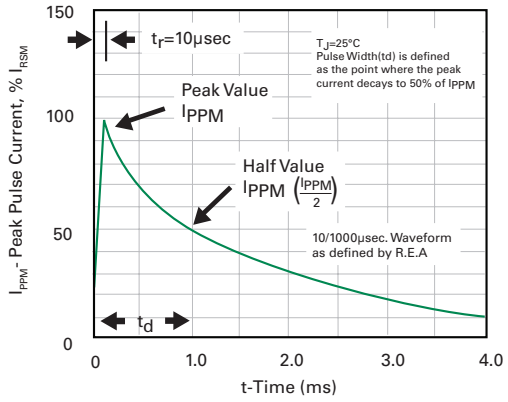


Figure 5 - Typical Junction Capacitance

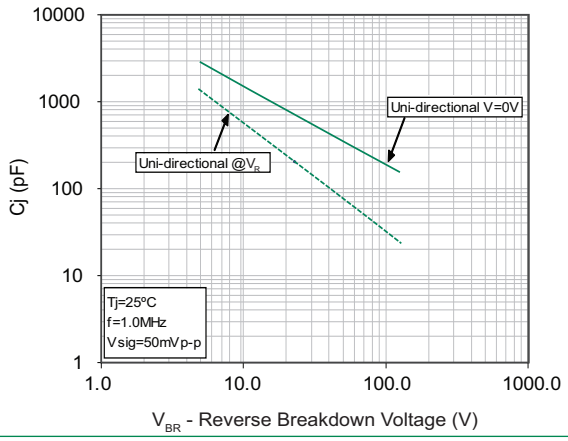
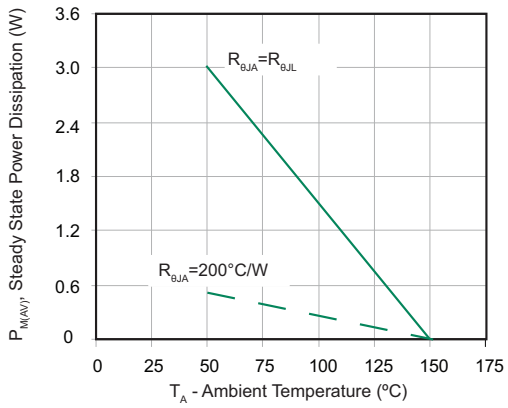
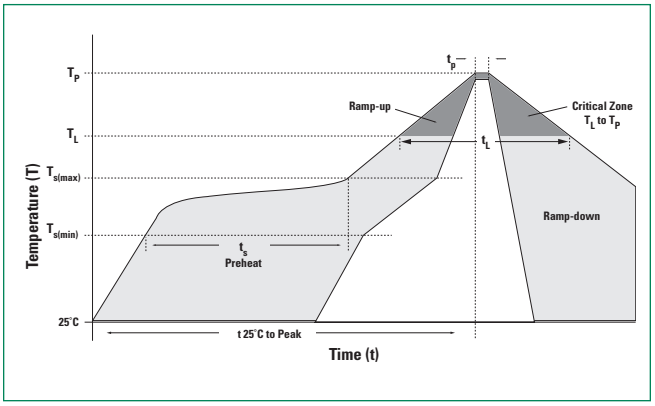


Figure 6 - Steady State Power Dissipation Derating Curve



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 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_L)	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		280°C



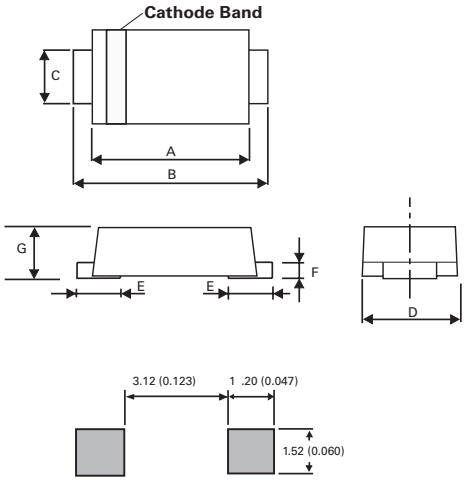
Physical Specifications

Weight	0.002 ounce, 0.061 gram
Case	JEDEC DO-221AC Molded Plastic over glass passivated junction
Polarity	Color band denotes cathode except Bipolar
Terminal	Matte Tin-plated leads, Solderable per JESD22-B102D

Environmental Specifications

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

Dimensions



Mounting Pad Layout

Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.156	0.181	3.950	4.600
B	0.189	0.220	4.800	5.600
C	0.049	0.069	1.250	1.750
D	0.088	0.116	2.250	2.950
E	0.030	0.059	0.750	1.500
F	0.005	0.010	0.125	0.250
G	0.035	0.043	0.900	1.100

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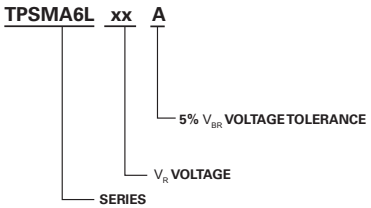
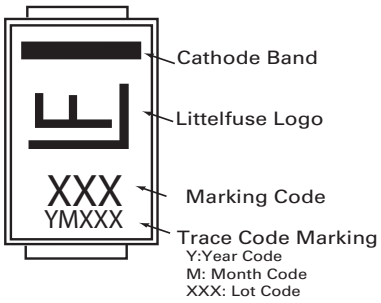
Part Numbering System



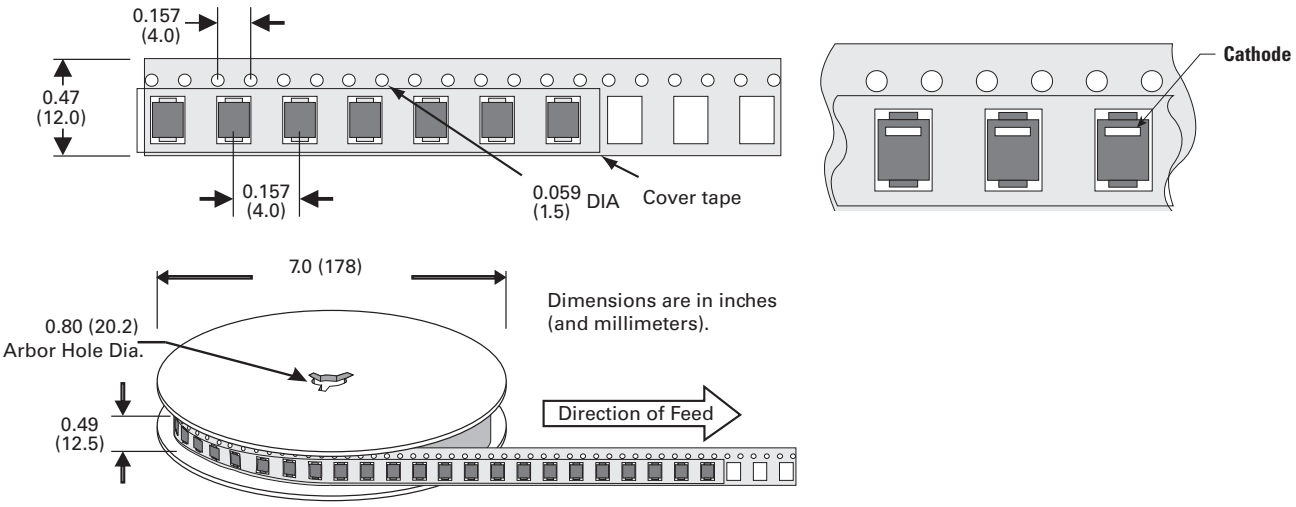
Part Marking System



Packaging

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
TPSMA6LxxA	DO-221AC	3000	Tape & Reel – 12mm/7" tape	EIA RS-481

Tape and Reel Specification



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