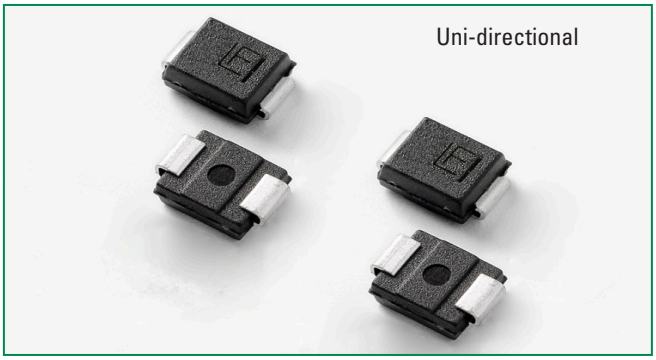
P6SMB-E Series



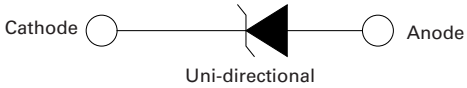
Maximum Ratings and Thermal Characteristics (T_A=25°C unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at T_A=25°C by 10/1000µs Waveform (Fig.2)(Note 1), (Note 2)	P_{PPM}	600	W
Power Dissipation on Infinite Heat Sink at T_L=50°C	P_D	5.0	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	I_{FSM}	100	A
Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only	V_F	3.5	V
Operating Temperature Range	T_J	-65 to 150	°C
Storage Temperature Range	T_{STG}	-65 to 175	°C
Typical Thermal Resistance Junction to Lead	$R_{\theta JL}$	20	°C/W
Typical Thermal Resistance Junction to Ambient	$R_{\theta JA}$	100	°C/W

Notes:

1. Non-repetitive current pulse , per Fig. 4 and derated above T_J (initial) =25°C per Fig. 3.
2. Mounted on copper pad area of 0.2x0.2" (5.0 x 5.0mm) to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.

Functional Diagram



Uni-directional

Description

The P6SMB-E series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

Features

- Excellent clamping capability
- Low incremental surge resistance
- For surface mounted applications to optimize board space
- 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 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
- Built-in strain relief
- Fast response time: typically less than 1.0ps from 0V to BV min
- 600W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycles):0.01%
- High temperature to reflow soldering guaranteed: 260°C/40sec
- V_{BR} @ T_J= V_{BR}@25°C x (1+αT x (T_J - 25)) (αT:Temperature Coefficient, typical value is 0.1%)
- EPI silicon technology
- Meet MSL level1, per J-STD-020C, LF maximun peak of 260°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

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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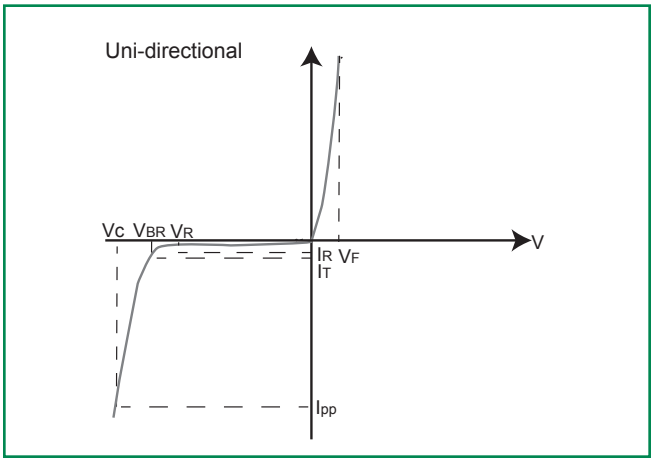
Electrical Characteristics (T_A=25°C unless otherwise noted)

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)
			MIN	MAX				
P6SMB350A-E	350S	300	332.0	368.0	1	482.0	1.30	1
P6SMB400A-E	400S	342	380.0	420.0	1	548.0	1.10	1
P6SMB440A-E	440S	376	418.0	462.0	1	602.0	1.00	1
P6SMB480A-E*	480S	408	456.0	504.0	1	658.0	0.95	1
P6SMB510A-E*	510S	434	485.0	535.0	1	698.0	0.86	1
P6SMB530A-E*	530S	451	503.5	556.5	1	725.0	0.83	1
P6SMB540A-E*	540S	460	513.0	567.0	1	740.0	0.82	1
P6SMB550A-E*	550S	468	522.5	577.5	1	760.0	0.79	1
P6SMB600A-E*	600S	510	570.0	630.0	1	822.0	0.73	1
P6SMB650A-E*	650S	553	617.5	682.5	1	891.0	0.68	1
P6SMB700A-E*	700S	595	665.0	735.0	1	959.0	0.63	1
P6SMB800A-E*	800S	680	760.0	840.0	1	1096.0	0.55	1
P6SMB900A-E*	900S	765	855.0	945.0	1	1233.0	0.50	1
P6SMB1000A-E*	1000S	850	950.0	1050.0	1	1365.0	0.44	1

Note: for parts with * are still under development

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 TVS 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

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

Figure 1 - TVS Transients Clamping Waveform

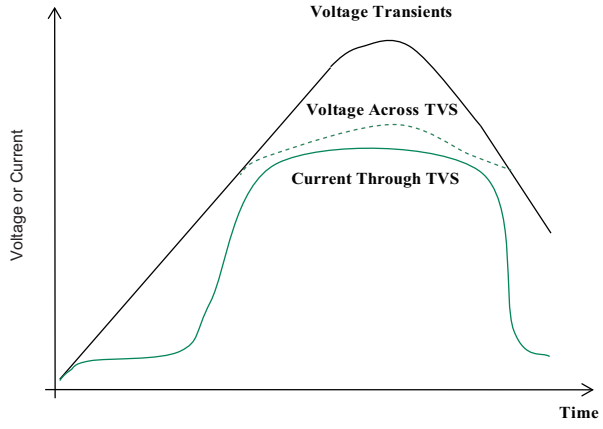

Figure 2 - Peak Pulse Power Rating

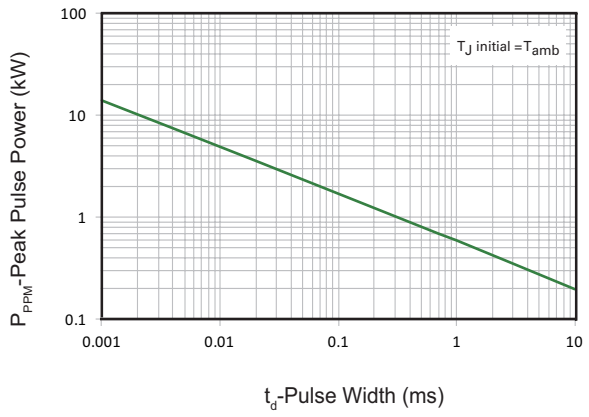

Figure 3 - Peak Pulse Power Derating Curve

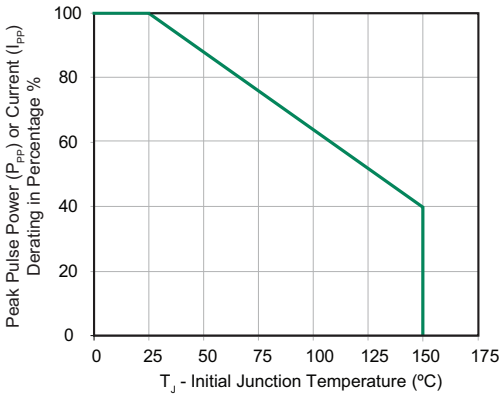

Figure 4 - Pulse Waveform

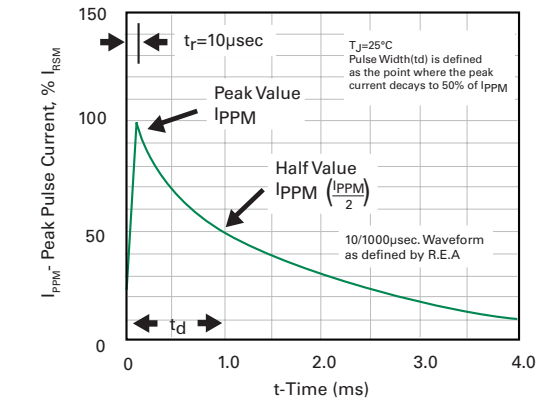

Figure 5 - Typical Junction Capacitance

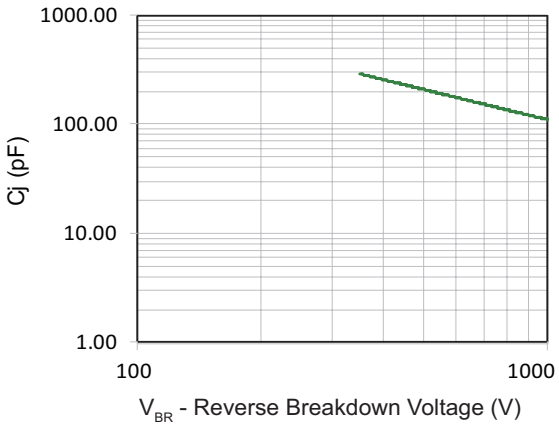

Figure 6 - Typical Transient Thermal Impedance

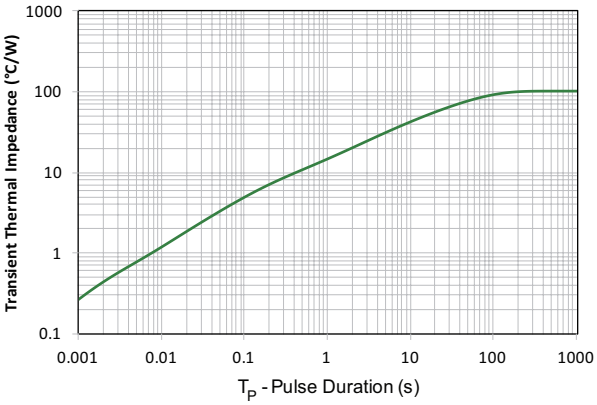

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Figure 7 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only

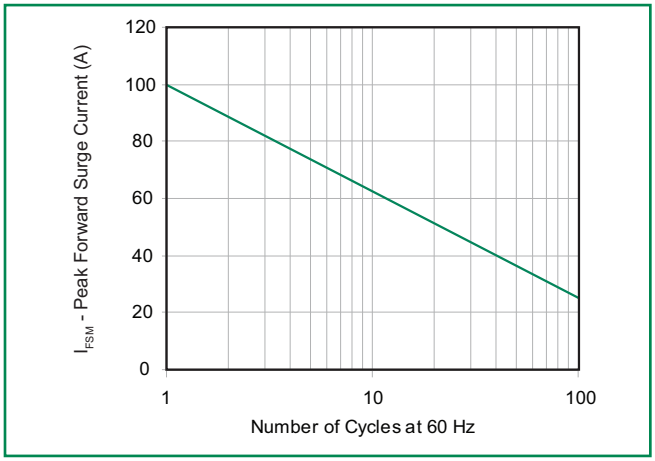
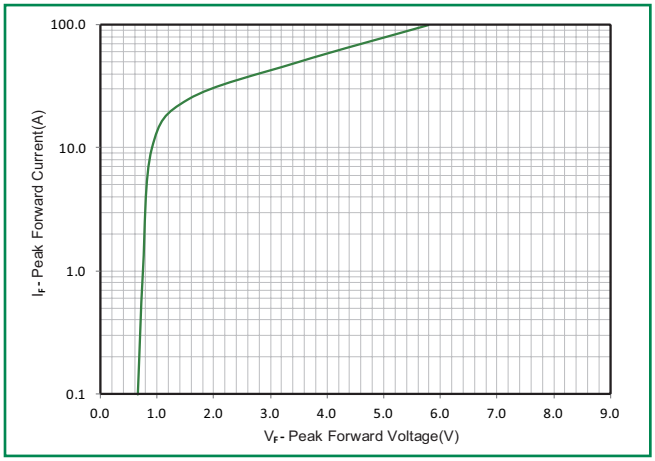
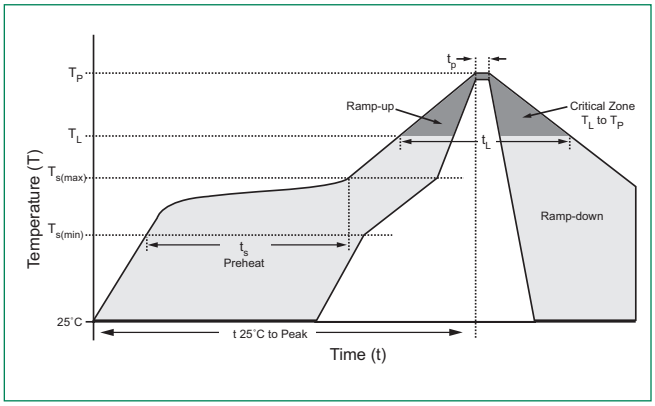


Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



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)		$260^{+0/-5}$ °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

Weight	0.003 ounce, 0.093 grams
Case	JEDEC DO214AA. Molded plastic body over glass passivated junction
Polarity	Color band denotes cathode except Bidirectional
Terminal	Matte Tin-plated leads, Solderable per JESD22-B102

Environmental Specifications

High Temp. Storage	JESD22-A103
HTRB	JESD22-A108
Temperature Cycling	JESD22-A104
MSL	JEDEC-J-STD-020, Level 1
H3TRB	JESD22-A101
RSH	JESD22-A111

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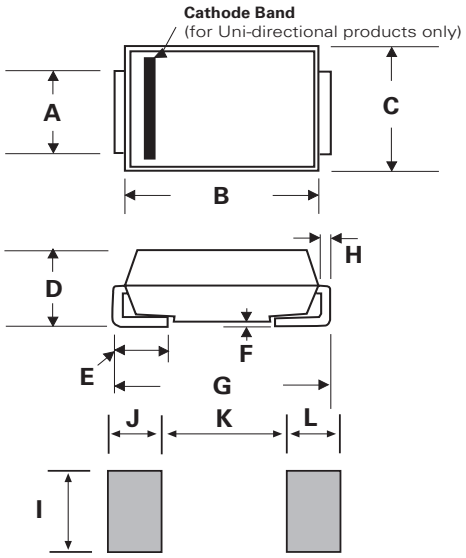
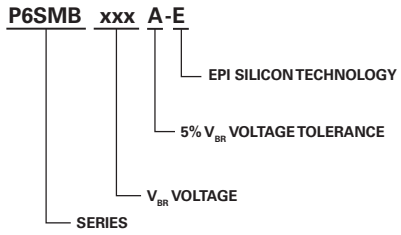
Dimensions

DO-214AA (SMB J-Bend)

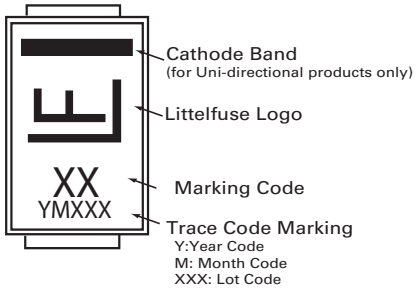


Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.076	0.086	1.930	2.200
B	0.160	0.187	4.060	4.750
C	0.130	0.155	3.300	3.940
D	0.078	0.103	1.990	2.610
E	0.030	0.060	0.760	1.520
F	-	0.008	-	0.203
G	0.205	0.220	5.210	5.590
H	0.006	0.012	0.152	0.305
I	0.089	-	2.260	-
J	0.085	-	2.160	-
K	-	0.107	-	2.740
L	0.085	-	2.160	-

Part Numbering System



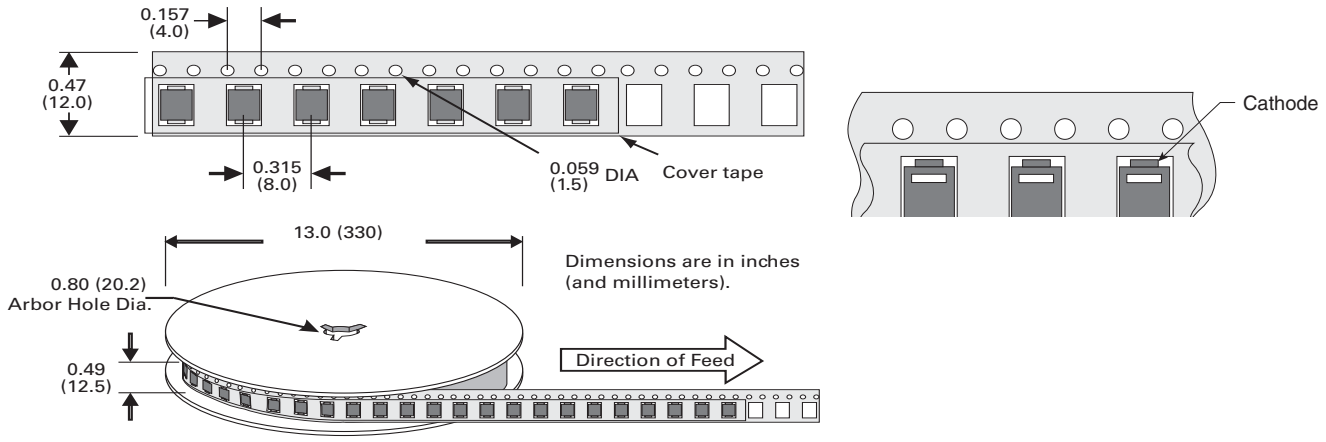
Part Marking System



Packaging

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
P6SMBxxxA-E	DO-214AA	3000	Tape & Reel - 12mm tape/13" reel	EIA STD RS-481

Tape and Reel Specification



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