

## P4SMA-E Series



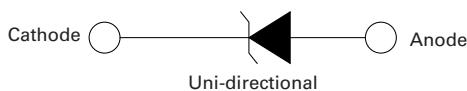
### Maximum Ratings and Thermal Characteristics ( $T_A=25^\circ\text{C}$ unless otherwise noted)

Parameter	Symbol	Value	Unit
Peak Pulse Power Dissipation at $T_A=25^\circ\text{C}$ by 10/1000 $\mu\text{s}$ Waveform (Fig.2)(Note 1), (Note 2)	$P_{\text{PPM}}$	400	W
Power Dissipation on Infinite Heat Sink at $T_L=50^\circ\text{C}$	$P_D$	3.3	W
Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)	$I_{\text{FSM}}$	60	A
Maximum Instantaneous Forward Voltage at 25A for Unidirectional Only	$V_F$	3.5	V
Operating Temperature Range	$T_J$	-65 to 150	$^\circ\text{C}$
Storage Temperature Range	$T_{\text{STG}}$	-65 to 175	$^\circ\text{C}$
Typical Thermal Resistance Junction to Lead	$R_{\text{θJL}}$	30	$^\circ\text{C}/\text{W}$
Typical Thermal Resistance Junction to Ambient	$R_{\text{θJA}}$	120	$^\circ\text{C}/\text{W}$

**Notes:**

1. Non-repetitive current pulse, per Fig.4 and derated above  $T_J$  (initial) =  $25^\circ\text{C}$  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.

### Functional Diagram



### Description

The P4SMA-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
- 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
- 400W peak pulse power capability at 10/1000 $\mu\text{s}$  waveform, repetition rate (duty cycles):0.01%
- Low incremental surge resistance
- Fast response time: typically less than 1.0ps from 0V to BV min
- High temperature to reflow soldering guaranteed:  $260^\circ\text{C}/40\text{sec}$
- $V_{\text{BR}} @ T_J = V_{\text{BR}} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$  ( $\alpha$ : Temperature Coefficient, typical value is 0.1%)
- EPI silicon technology
- Meet MSL level1, per J-STD-020C, 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)

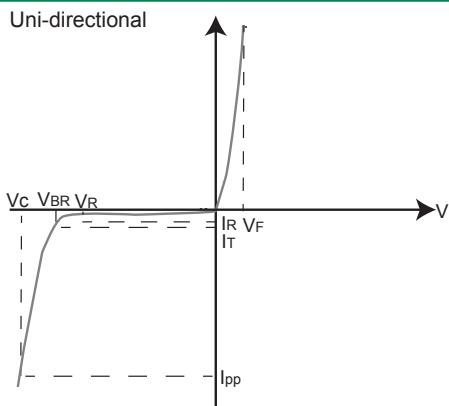
### Applications

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

**Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)**

Part Number (Uni)	Marking	Reverse Stand off Voltage V <sub>R</sub> (Volts)	Breakdown Voltage V <sub>BR</sub> (Volts) @ I <sub>T</sub>		Test Current I <sub>T</sub> (mA)	Maximum Clamping Voltage V <sub>C</sub> @ I <sub>pp</sub> (V)	Maximum Peak Pulse Current I <sub>pp</sub> (A)	Maximum Reverse Leakage I <sub>R</sub> @ V <sub>R</sub> (µA)
			MIN	MAX				
P4SMA350A-E	350S	300	332.0	368.0	1	482.0	0.90	1
P4SMA400A-E	400S	342	380.0	420.0	1	548.0	0.75	1
P4SMA440A-E	440S	376	418.0	462.0	1	602.0	0.68	1
P4SMA480A-E*	480S	408	456.0	504.0	1	658.0	0.61	1
P4SMA510A-E*	510S	434	485.0	535.0	1	698.0	0.57	1
P4SMA530A-E*	530S	451	503.5	556.5	1	725.0	0.55	1
P4SMA540A-E*	540S	460	513.0	567.0	1	740.0	0.54	1
P4SMA550A-E*	550S	468	522.5	577.5	1	760.0	0.53	1
P4SMA600A-E*	600S	510	570.0	630.0	1	822.0	0.49	1
P4SMA650A-E*	650S	553	617.5	682.5	1	891.0	0.45	1
P4SMA700A-E*	700S	595	665.0	735.0	1	959.0	0.42	1
P4SMA800A-E*	800S	680	760.0	840.0	1	1096.0	0.37	1
P4SMA900A-E*	900S	765	855.0	945.0	1	1233.0	0.33	1
P4SMA1000A-E*	1000S	850	950.0	1050.0	1	1365.0	0.30	1

Note: for parts with \* are still under development

**I-V Curve Characteristics**

**P<sub>PPM</sub>** **Peak Pulse Power Dissipation** – Max power dissipation

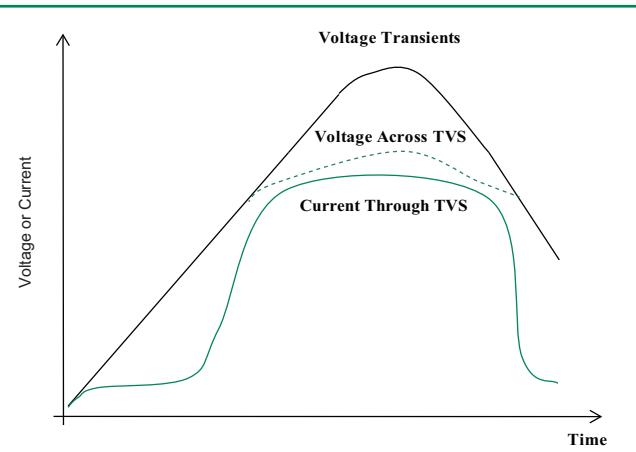
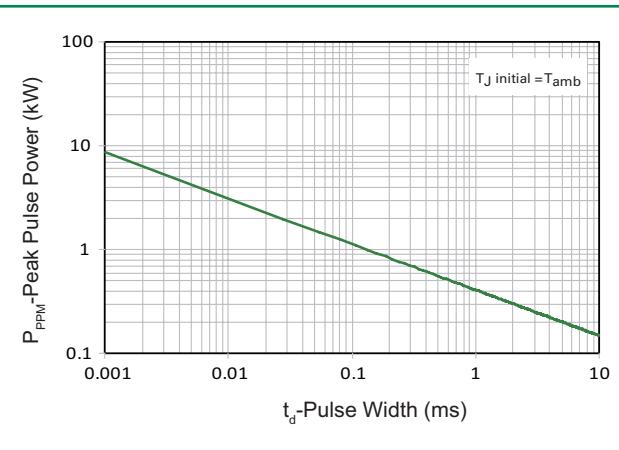
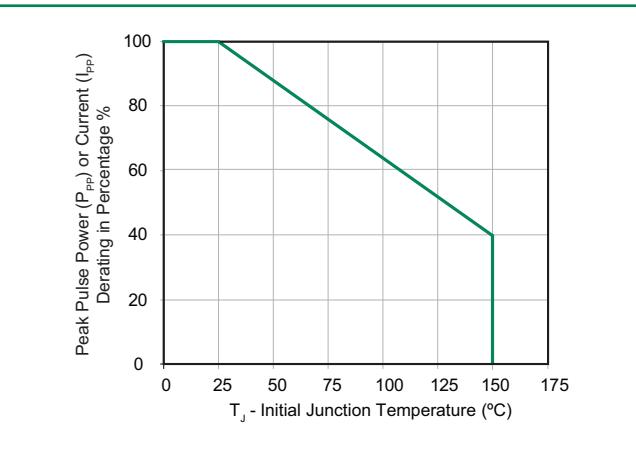
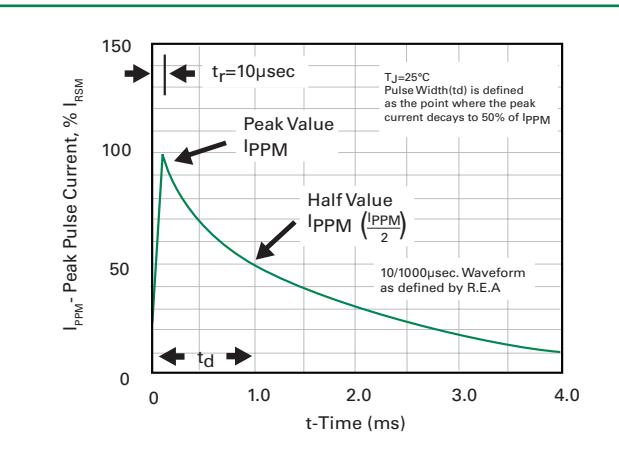
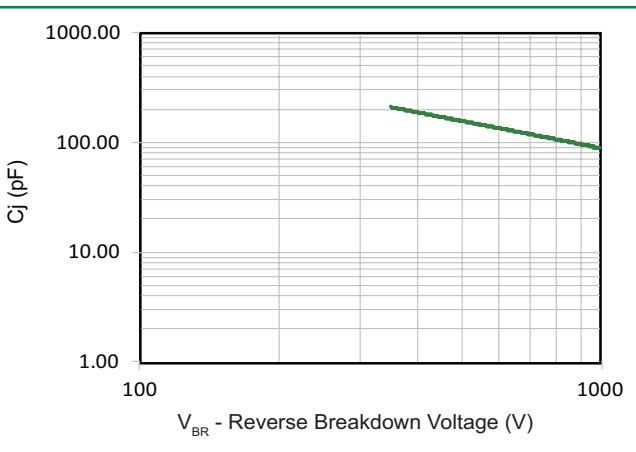
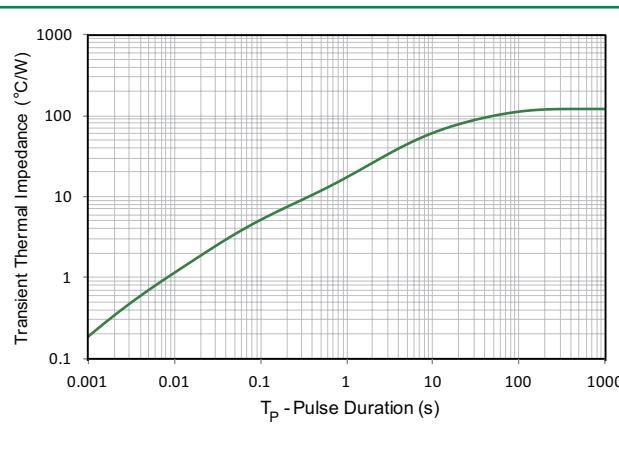
**V<sub>R</sub>** **Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation

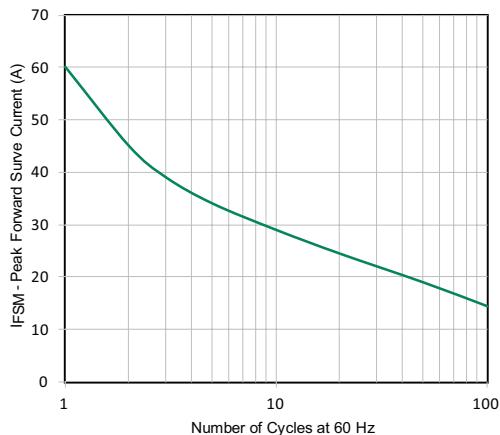
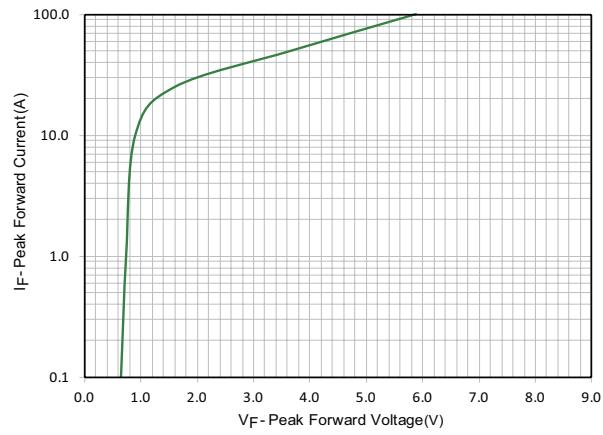
**V<sub>BR</sub>** **Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current (I<sub>T</sub>)

**V<sub>C</sub>** **Clamping Voltage** – Peak voltage measured across the TVS at a specified I<sub>ppm</sub> (peak impulse current)

**I<sub>R</sub>** **Reverse Leakage Current** – Current measured at V<sub>R</sub>
**V<sub>F</sub>** **Forward Voltage Drop for Uni-directional**

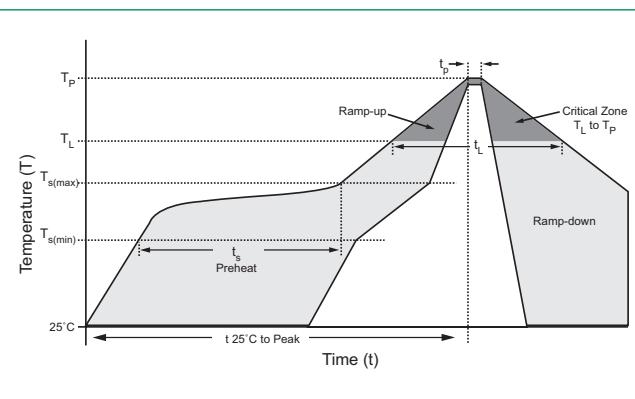
**Ratings and Characteristic Curves** ( $T_A=25^\circ\text{C}$  unless otherwise noted)

**Figure 1 - TVS Transients Clamping Waveform**

**Figure 2 - Peak Pulse Power Rating Curve**

**Figure 3 - Peak Pulse Power Derating Curve**

**Figure 4 - Pulse Waveform**

**Figure 5 - Typical Junction Capacitance**

**Figure 6 - Typical Transient Thermal Impedance**


**Figure 7 - Maximum Non-Repetitive 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 <sup>+0/-5</sup> °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



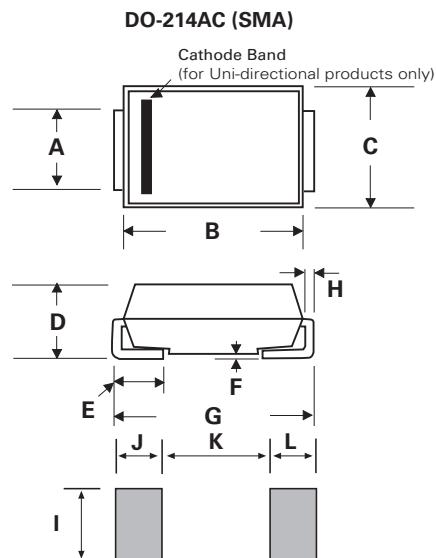
### Physical Specifications

<b>Weight</b>	0.002 ounce, 0.061 gram
<b>Case</b>	JEDEC DO-214AC. Molded plastic body over glass passivated junction
<b>Polarity</b>	Color band denotes positive end (cathode) except bidirectional
<b>Terminal</b>	Matte Tin-plated leads, Solderable per JESD22-B102

### Environmental Specifications

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

### Dimensions



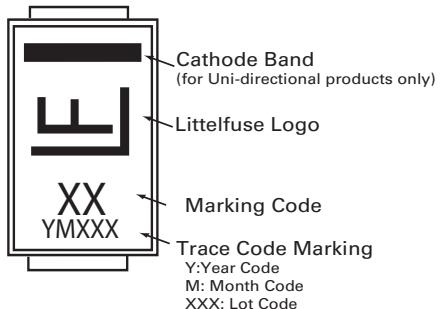
Dimensions	Inches		Millimeters	
	Min	Max	Min	Max
A	0.049	0.065	1.250	1.650
B	0.157	0.181	3.990	4.600
C	0.095	0.110	2.400	2.790
D	0.075	0.090	1.900	2.290
E	0.030	0.060	0.780	1.520
F	-	0.008	-	0.203
G	0.189	0.208	4.800	5.280
H	0.006	0.012	0.152	0.305
I	0.070	-	1.800	-
J	0.082	-	2.100	-
K	-	0.090	-	2.300
L	0.082	-	2.100	-

### Part Numbering System

**P4SMA XXX A-E**

- XXX** EPI SILICON TECHNOLOGY
- A-E** 5%  $V_{BR}$  VOLTAGE TOLERANCE
- $V_{BR}$  VOLTAGE**
- SERIES**

### Part Marking System



### Packaging

Part number	Component Package	Quantity	Packaging Option	Packaging Specification
P4SMAxxxA-E	DO-214AC	5000	Tape & Reel - 12mm tape/13" reel	EIA STD RS-481

### Tape and Reel Specification

