

P4SMA-E Series



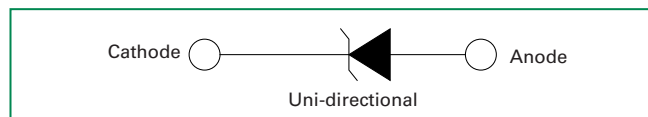
Maximum Ratings and Thermal Characteristics ($T_A = 25^\circ\text{C}$ unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|--|-----------------|------------|--------------------|
| Peak Pulse Power Dissipation at $T_A = 25^\circ\text{C}$ by 10/1000 μs Waveform (Fig.2)(Note 1), (Note 2) | P_{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_{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_{STG} | -65 to 175 | $^\circ\text{C}$ |
| Typical Thermal Resistance Junction to Lead | $R_{\theta JL}$ | 30 | $^\circ\text{C/W}$ |
| Typical Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 120 | $^\circ\text{C/W}$ |

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 μs 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 $^\circ\text{C}$ /40sec
- $V_{BR} @ T_J = V_{BR} @ 25^\circ\text{C} \times (1 + \alpha T \times (T_J - 25))$ (αT :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

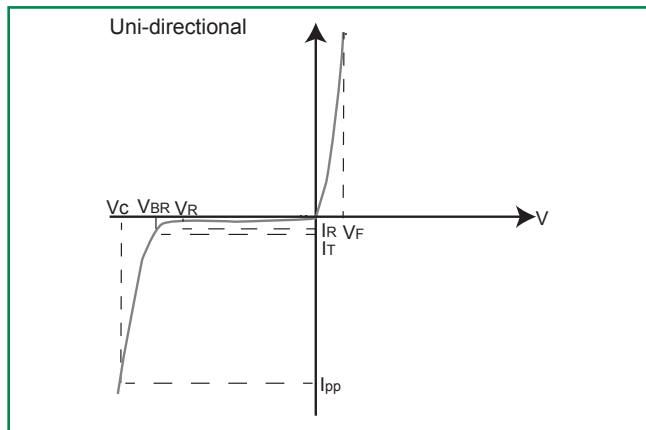
TVS devices are ideal for the protection of I/O Interfaces, V_{CC} bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

Electrical Characteristics ($T_A=25^\circ\text{C}$ 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 | | | | |
| 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_{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 I_{ppm} (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 ($T_A=25^\circ\text{C}$ unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

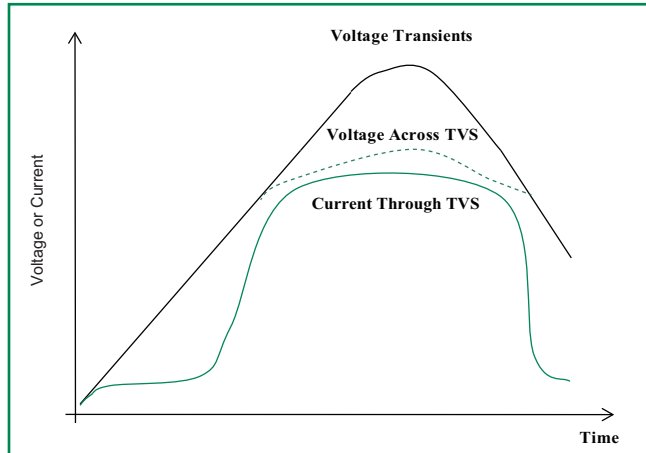


Figure 2 - Peak Pulse Power Rating Curve

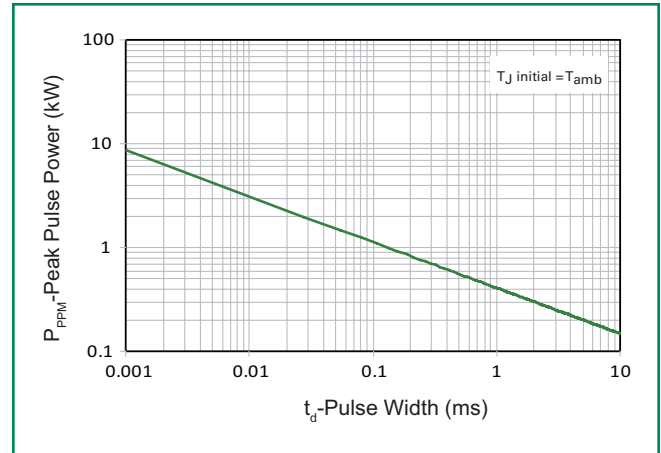


Figure 3 - Peak Pulse Power Derating Curve

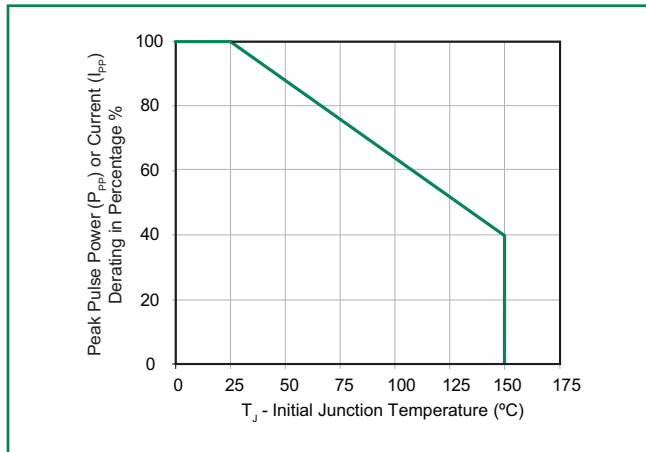


Figure 4 - Pulse Waveform

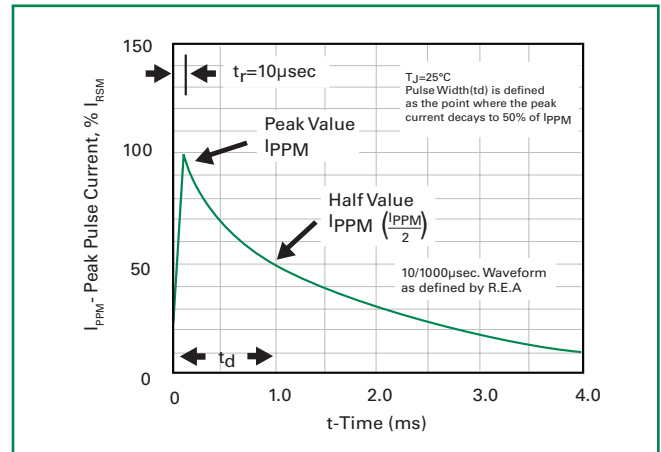


Figure 5 - Typical Junction Capacitance

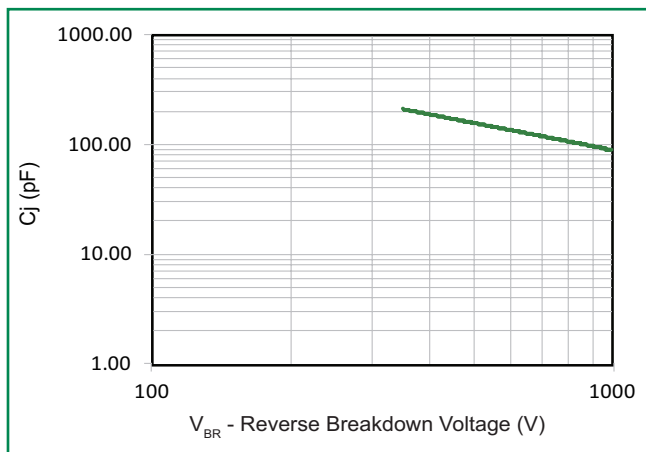


Figure 6 - Typical Transient Thermal Impedance

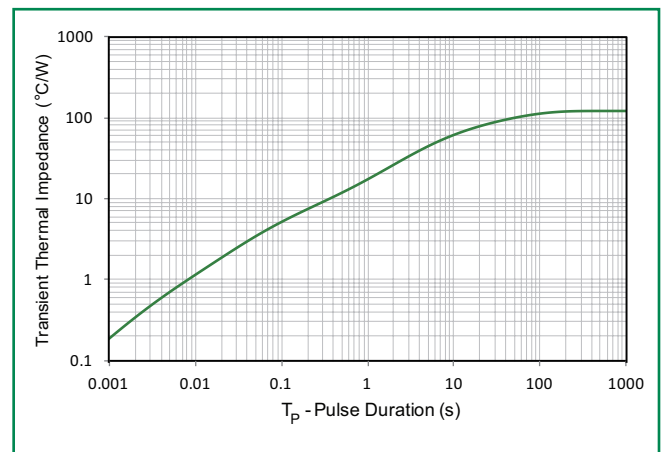


Figure 7 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only

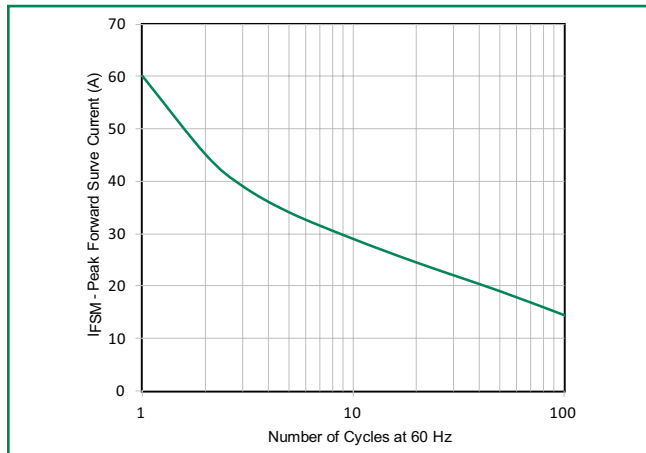
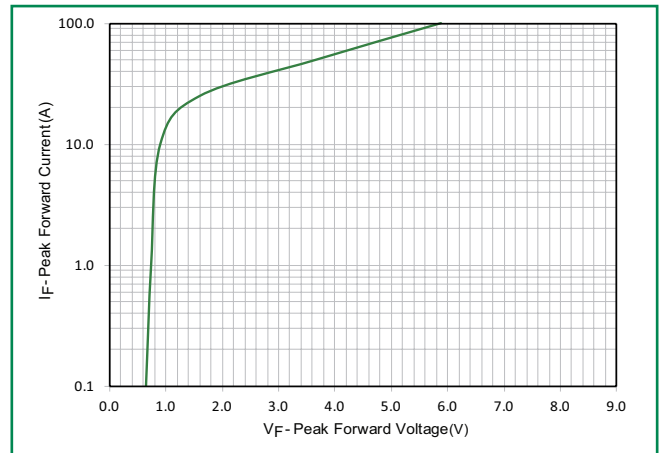
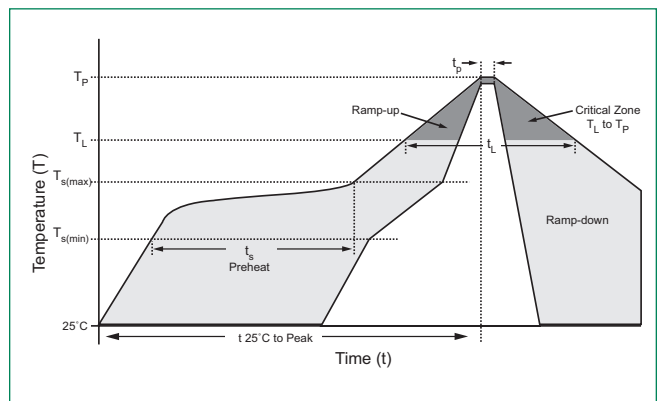


Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)



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 ^{+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 |



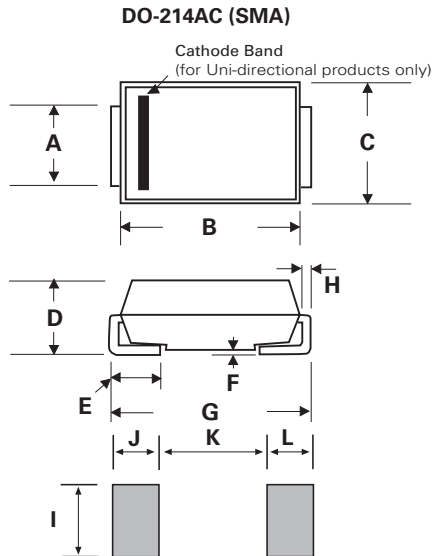
Physical Specifications

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

Environmental Specifications

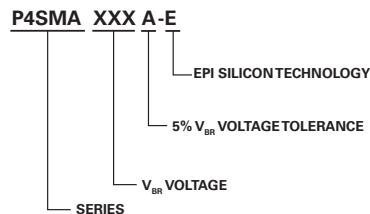
| | |
|----------------------------|--------------------------|
| High Temp. Storage | JESD22-A103 |
| HTRB | JESD22-A108 |
| Temperature Cycling | JESD22-A104 |
| MSL | JEDEC-J-STD-020, Level 1 |
| H3TRB | JESD22-A101 |
| RSH | JESD22-A111 |

Dimensions

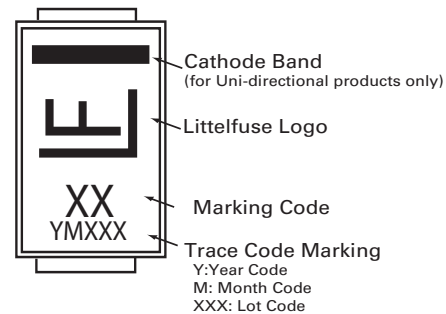


| Dimensions | Inches | | Millimeters | |
|------------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.049 | 0.065 | 1.250 | 1.650 |
| B | 0.157 | 0.181 | 3.990 | 4.600 |
| C | 0.095 | 0.110 | 2.400 | 2.790 |
| D | 0.075 | 0.090 | 1.900 | 2.290 |
| E | 0.030 | 0.060 | 0.780 | 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



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

