

TPSMD Series



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 10/1000µs Waveform (Fig.2)(Note 1), (Note 2) | P _{PPM} | 3000 | W |
| Power Dissipation on Infinite Heat Sink at T _A =50°C | P _{M(AV)} | 6.5 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3) | I _{FSM} | 300 | A |
| Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only | V _F | 3.5 | V |
| Operating Junction and Storage Temperature Range | T _J , T _{STG} | -55 to 150 | °C |
| Typical Thermal Resistance Junction to Lead | R _{θJL} | 15 | °C/W |
| Typical Thermal Resistance Junction to Ambient | R _{θJA} | 75 | °C/W |

- Notes:**
1. Non-repetitive current pulse, per Fig. 4 and derated above T_A = 25°C per Fig. 3.
 2. Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) 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



Description

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


Features

- Hi reliability application and automotive grade AEC Q101 qualified
- For surface mounted applications in order 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 15kV(Air), 8kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2 (IEC801-2)
- EFT protection of data lines in accordance with IEC 61000-4-4 (IEC801-4)
- Built-in strain relief
- V_{BR} @T_J = V_{BR} @25°C x (1+ α T x (T_J - 25)) (α T: Temperature Coefficient)
- Glass passivated chip junction
- 3000W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycles):0.01%
- Fast response time: typically less than 1.0ps from 0V to BV min
- Excellent clamping capability
- Low incremental surge resistance
- Typical I_R less than 2µA above 12V
- High temperature soldering guaranteed: 160°C/10 seconds at terminals
- Plastic package has underwriters laboratory flammability 94V-0
- Meet MSL level1, per J-STD-020, LF maximum peak of 260°C
- Matte tin lead-free plated
- Halogen free and RoHS compliant
- 2nd level interconnect is Pb-free per IPC/JEDEC J-STD-609A.01

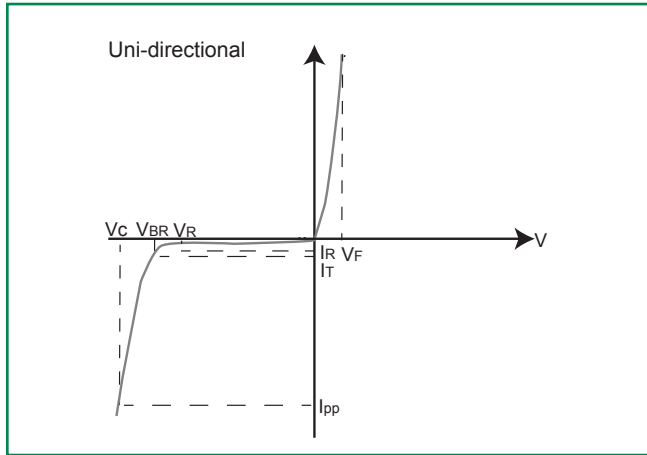
Applications

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

| 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 (μ A) | Agency Approval  |
|-------------------|---------|---|--|-------|-------------------------|---|---|--|---|
| | | | MIN | MAX | | | | | |
| TPSMD10A | PDXA | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 176.5 | 5 | X |
| TPSMD11A | PDZA | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 164.8 | 2 | X |
| TPSMD12A | PEEA | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 150.8 | 2 | X |
| TPSMD13A | PEGA | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 139.5 | 2 | X |
| TPSMD14A | PEKA | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 129.3 | 2 | X |
| TPSMD15A | PEMA | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 123.0 | 2 | X |
| TPSMD16A | PEPA | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 115.4 | 2 | X |
| TPSMD17A | PERA | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 108.7 | 2 | X |
| TPSMD18A | PETA | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 102.7 | 2 | X |
| TPSMD20A | PEVA | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 92.6 | 2 | X |
| TPSMD22A | PEXA | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 84.5 | 2 | X |
| TPSMD24A | PEZA | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 77.1 | 2 | X |
| TPSMD26A | PFEA | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 71.3 | 2 | X |
| TPSMD28A | PFGA | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 66.1 | 2 | X |
| TPSMD30A | PFKA | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 62.0 | 2 | X |
| TPSMD33A | PFMA | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 56.3 | 2 | X |
| TPSMD36A | PFPA | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 51.6 | 2 | X |
| TPSMD40A | PFRA | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 46.5 | 2 | X |
| TPSMD43A | PFTA | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 43.2 | 2 | X |

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 through the TVS at a specified test current (I_T)
- V_C Clamping Voltage** – Peak voltage measured across the suppressor 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°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

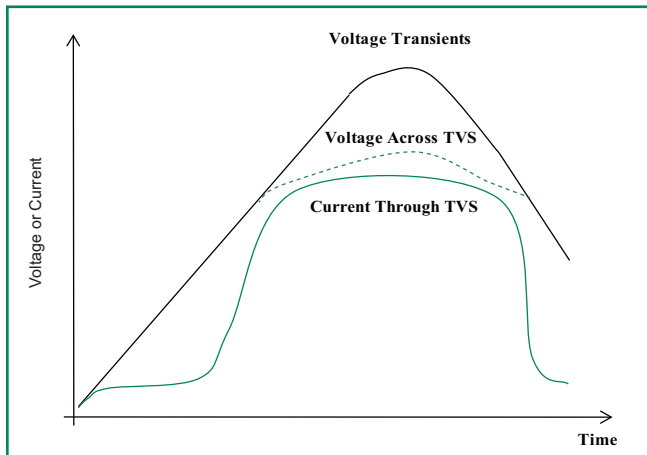
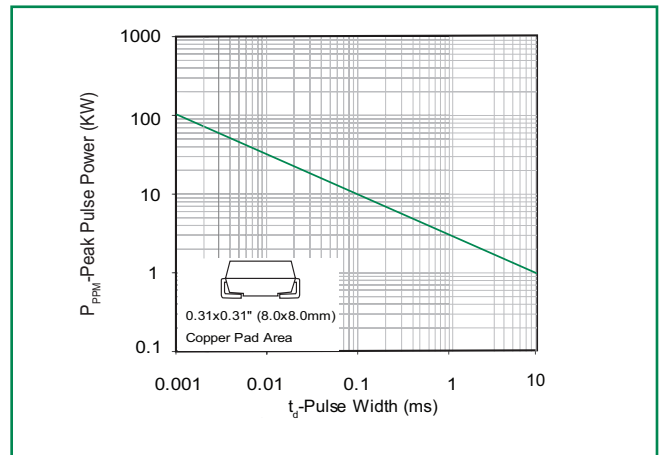


Figure 2 - Peak Pulse Power Rating



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

Figure 3 - Peak Pulse Power or Current Derating Curve vs Initial Junction Temperature

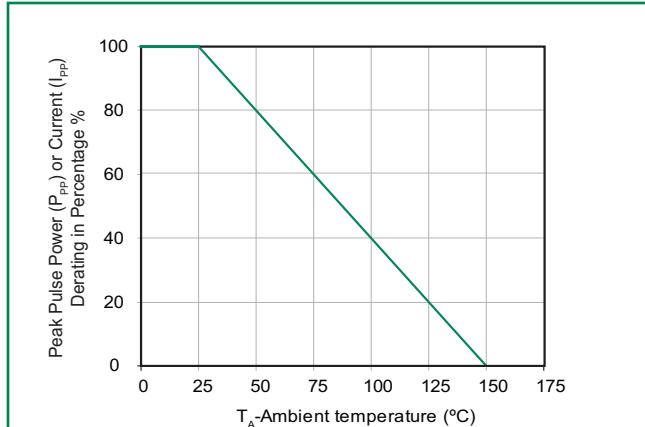


Figure 4 - Pulse Waveform



Figure 5 - Typical Junction Capacitance

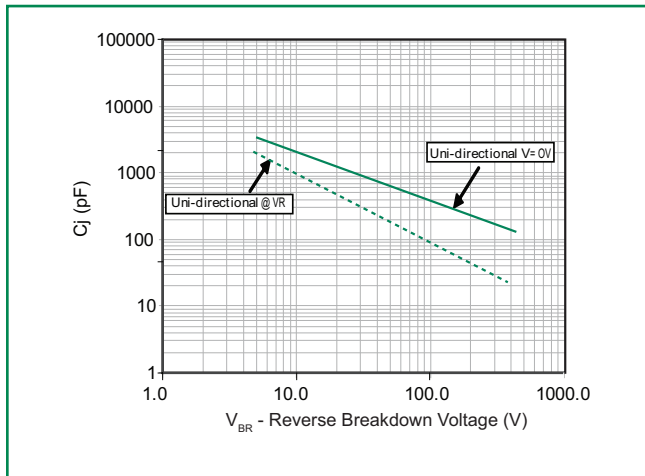
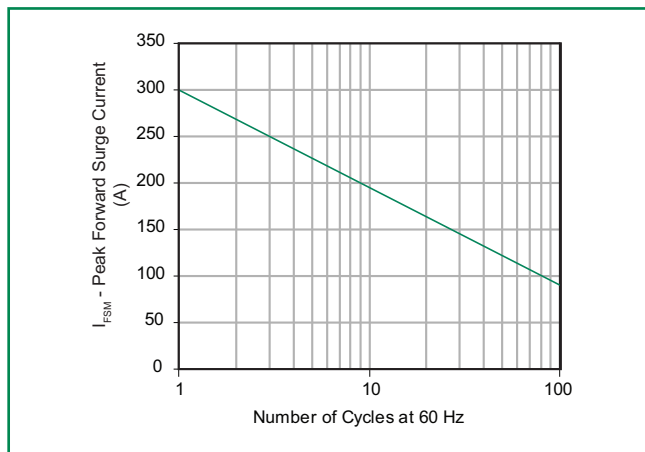


Figure 6 - Steady State Power Derating Curve



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



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_s) | 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 |



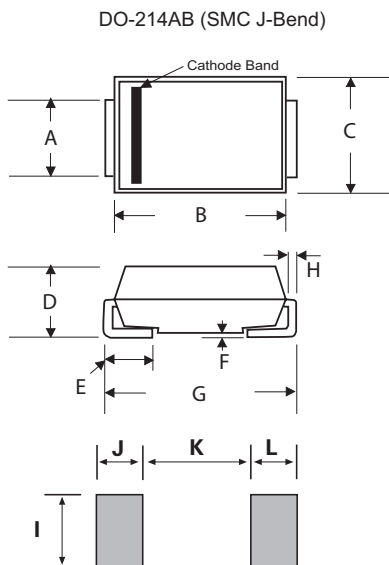
Physical Specifications

| | |
|-----------------|---|
| Weight | 0.007 ounce, 0.21 grams |
| Case | JEDEC DO214AB. 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-B106 |

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 Options

| Part number | Component Package | Quantity | Packaging Option | Packaging Specification |
|--------------|-------------------|----------|----------------------------------|-------------------------|
| TPSMDxxxX | DO-214AB | 3000 | Tape & Reel - 16mm tape/13" reel | EIA STD RS-481 |
| TPSMDxxxX-T7 | DO-214AB | 500 | Tape & Reel - 16mm tape /7" reel | EIA STD RS-481 |

Tape and Reel Specification





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