

TPSMA6L Series

Surface Mount – 600W



Additional Information



Resources



Accessories



Samples

Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
| | E230531 |

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 10x1000 μs Waveform (Fig.2)(Note 1), (Note 2) | P_{PPM} | 600 | W |
| Power Dissipation on Infinite Heat Sink at $T_A=50^\circ\text{C}$ | $P_{M(AV)}$ | 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 | $^\circ\text{C}$ |
| Typical Thermal Resistance Junction to Lead | $R_{\theta JL}$ | 35 | $^\circ\text{C/W}$ |
| Typical Thermal Resistance Junction to Ambient | $R_{\theta JA}$ | 200 | $^\circ\text{C/W}$ |

Notes:

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

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 electrical performance as the SMB package but with low height profiles (1.1mm).

Features & Benefits

- 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 VBR min
- Built-in strain relief
- Glass passivated junction
- High temperature soldering: 260 $^\circ\text{C}$ /10 seconds at terminals
- Plastic package has underwriters laboratory flammability V-0
- Typical maximum temperature coefficient $\Delta V_{BR} = 0.1\% \times V_{BR} @ 25^\circ\text{C} \times \Delta T$
- Matte tin lead-free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal

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.


Functional Diagram



TPSMA6L Series

Surface Mount – 600W

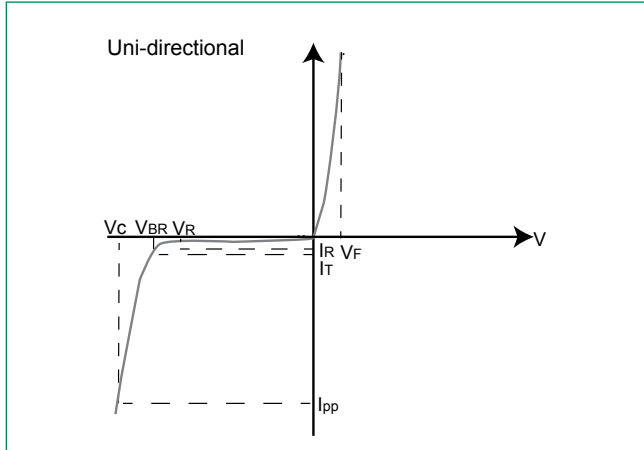
Electrical Characteristics

| 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 | | | | | |
| 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 |

TPSMA6L Series

Surface Mount – 600W

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 ($T_A=25^\circ\text{C}$ unless otherwise noted)

Figure 1: TVS Transients Clamping Waveform

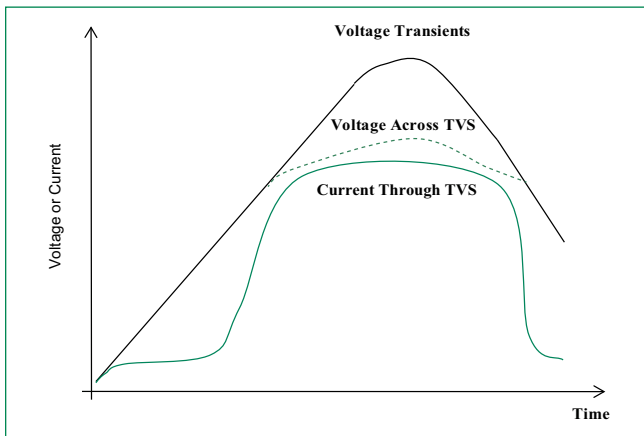
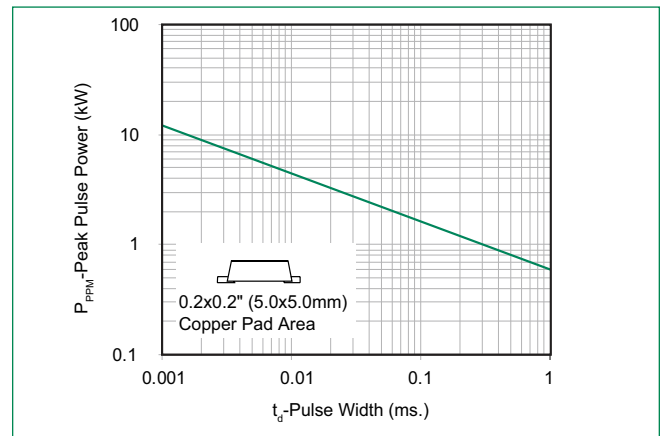


Figure 2: Peak Pulse Power Rating Curve



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

Figure 3: Pulse Derating Curve

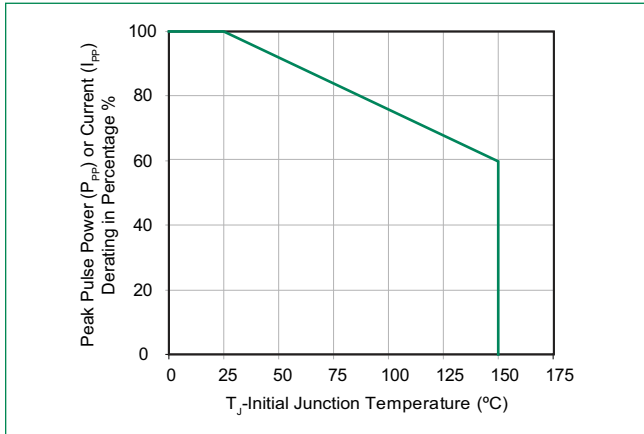


Figure 4: Pulse Waveform

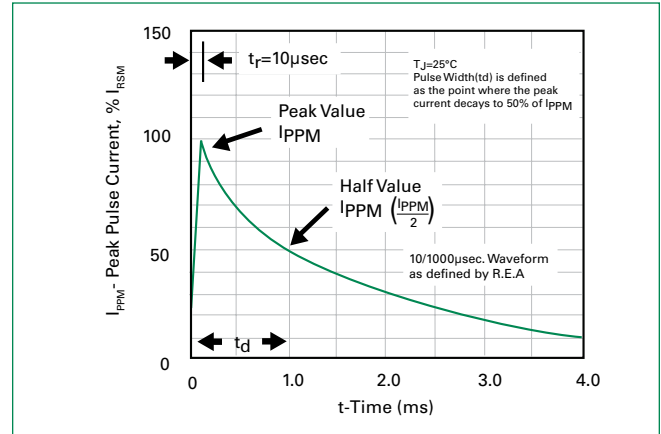


Figure 5: Typical Junction Capacitance

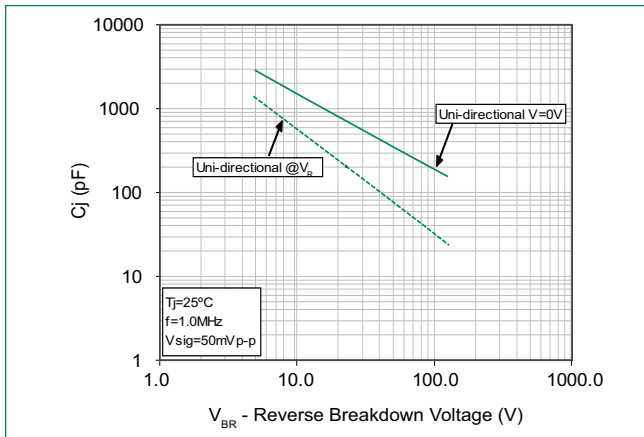


Figure 6: Steady State Power Dissipation Derating Curve

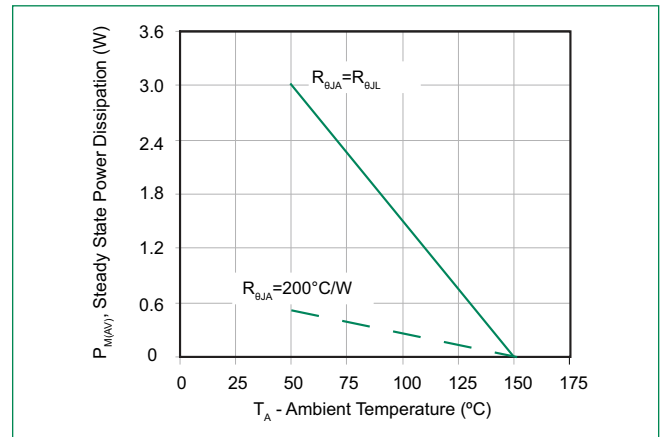
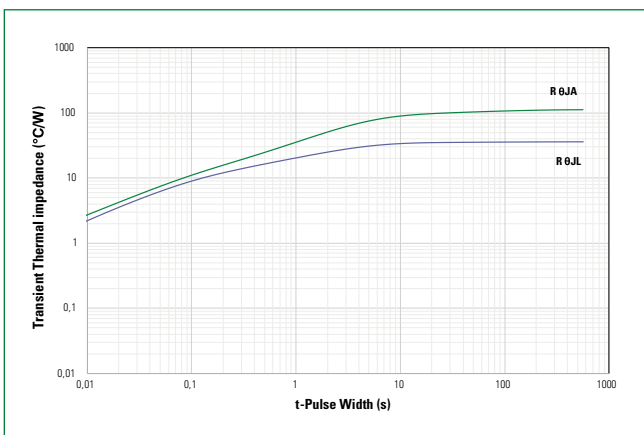


Figure 6: Typical Transient Thermal Impedance

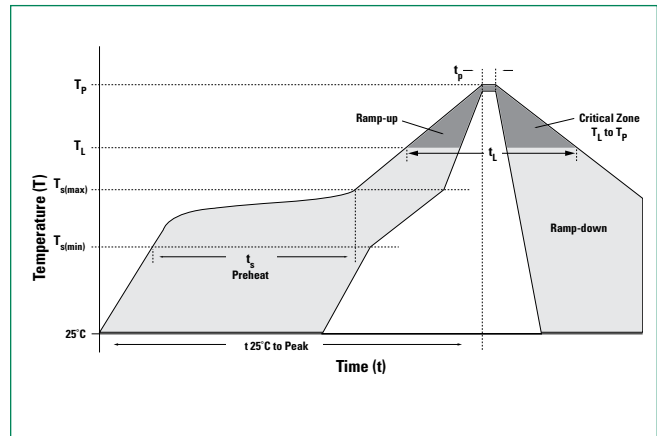


TPSMA6L Series

Surface Mount – 600W

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 |



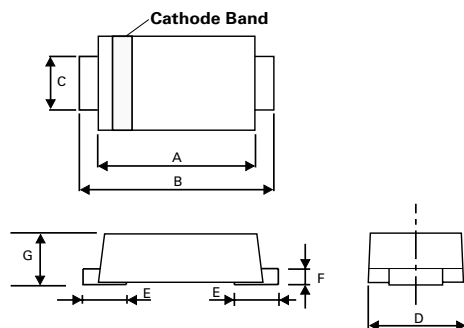
Physical Specifications

| | |
|-----------------|--|
| 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



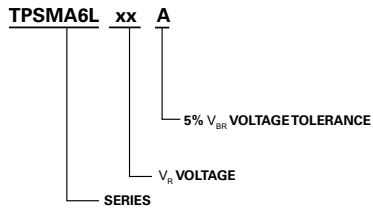
Mounting Pad Layout

| 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 |

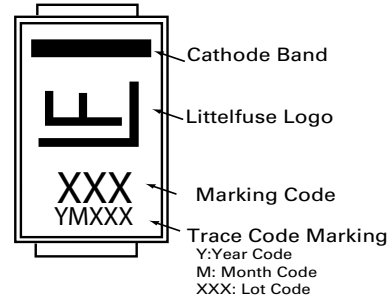
TPSMA6L Series

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Part Numbering System



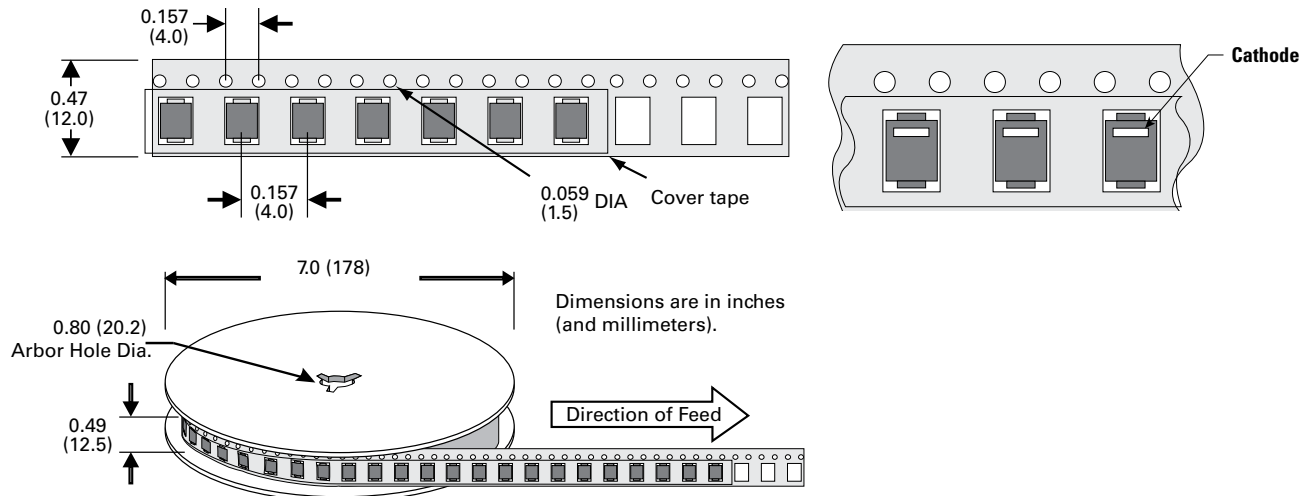
Part Marking System



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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