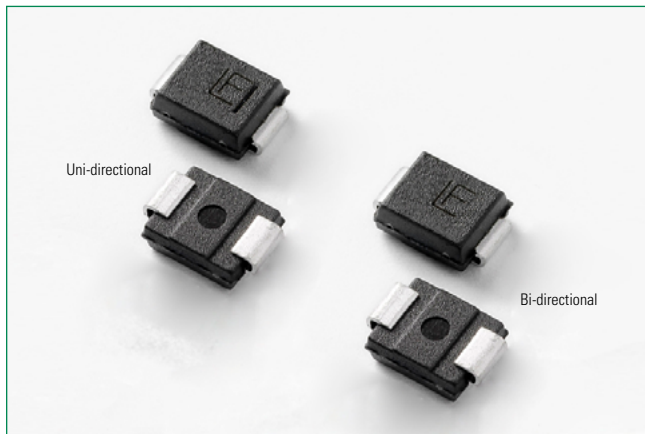


TPSMB Series

Surface Mount – 600W



Agency Approvals

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

Maximum Ratings & Thermal Characteristics

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

| Parameter | Symbol | Value | Unit |
|--|-----------------|------------|------|
| Peak Pulse Power Dissipation by 10/1000 μs waveform (Fig.1)(Note 1), (Note 2) | P_{PPM} | 600 | W |
| Power Dissipation on infinite heat sink at $T_L=50^{\circ}\text{C}$ | $P_{M(AV)}$ | 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 (Note 4) | V_F | 3.5/5 | V |
| Operating Junction Temperature Range ($V_{BR} \leq 91\text{V}$) | T_J | -65 to 175 | °C |
| Operating Junction Temperature Range ($V_{BR} > 91\text{V}$) | T_J | -65 to 150 | |
| Storage Temperature Range | T_{STG} | -65 to 175 | |
| 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:

- Non-repetitive current pulse, per Fig.4 and derated above $T_A=25^{\circ}\text{C}$ per Fig. 3.
- Mounted on copper pad area of 0.2x0.2" (5.0 x 5.0mm) to each terminal.
- Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional component only, duty cycle=4 per minute maximum.
- $V_F < 3.5\text{V}$ for part number with $V_{BR} < 300\text{V}$, $V_F < 5.0\text{V}$ for part number with $V_{BR} \geq 300\text{V}$.

Description

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

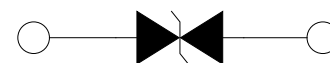
Features

- High reliability application and automotive grade AEC Q101 qualified
- Surface mount component 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
- ESD protection of data lines in accordance with IEC 61000-4-2 30kV(Air), 30kV (Contact)
- EFT protection of data lines in accordance with IEC 61000-4-4
- Glass passivated chip junction
- 600W PPM (peak pulse power) capability at 10/1000 μs waveform, repetition rate (duty cycles):0.01 %
- Fast response time: typically less than 1.0ns from 0V to V_{BR} min
- Excellent clamping capability
- Low incremental surge resistance
- Typical $I_R \leq 1\mu\text{A}$ for $V_R > 10.2\text{V}$
- UL Recognized compound meeting flammability rating V-0
- Meet MSL level1, per J-STD-020, High temperature soldering guaranteed: 260°C/10 seconds at terminals
- 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 components are ideal for the protection of I/O Interfaces, V_{CC} bus and other vulnerable circuits used in Automotive applications.

Functional Diagram



Bi-directional




Uni-directional

TPSMB Series

Surface Mount – 600W

Electrical Characteristics

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

| Part Number (Uni) | Part Number (Bi) | Marking | | Typical I_R @ 150°C (μA) | 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) | Maximum Temperature coefficient of V_{BR} (%/C) | Agency Approval  |
|-------------------|------------------|---------|------|---|---|--|--------|-------------------------|---|---|---|---|---|
| | | Uni | Bi | | | Min | Max | | | | | | |
| TPSMB75A | - | 7V5AA | - | 500 | 6.40 | 7.13 | 7.88 | 10 | 11.3 | 54.0 | 500 | 0.052 | X |
| TPSMB8.2A | - | 8V2AA | - | 200 | 7.02 | 7.79 | 8.61 | 10 | 12.1 | 50.4 | 200 | 0.058 | X |
| TPSMB9.1A | - | 9V1AA | - | 50 | 7.78 | 8.65 | 9.55 | 1 | 13.4 | 45.5 | 50 | 0.063 | X |
| TPSMB10A | TPSMB10CA | 10AA | 10CA | 20 | 8.55 | 9.50 | 10.50 | 1 | 14.5 | 42.1 | 10 | 0.066 | X |
| TPSMB11A | TPSMB11CA | 11AA | 11CA | 8 | 9.40 | 10.50 | 11.60 | 1 | 15.6 | 39.1 | 5 | 0.069 | X |
| TPSMB12A | TPSMB12CA | 12AA | 12CA | 8 | 10.20 | 11.40 | 12.60 | 1 | 16.7 | 36.5 | 5 | 0.071 | X |
| TPSMB13A | TPSMB13CA | 13AA | 13CA | 8 | 11.10 | 12.40 | 13.70 | 1 | 18.2 | 33.5 | 1 | 0.074 | X |
| TPSMB15A | TPSMB15CA | 15AA | 15CA | 8 | 12.80 | 14.30 | 15.80 | 1 | 21.2 | 28.8 | 1 | 0.076 | X |
| TPSMB16A | TPSMB16CA | 16AA | 16CA | 8 | 13.60 | 15.20 | 16.80 | 1 | 22.5 | 27.1 | 1 | 0.080 | X |
| TPSMB18A | TPSMB18CA | 18AA | 18CA | 8 | 15.30 | 17.10 | 18.90 | 1 | 25.5 | 24.2 | 1 | 0.083 | X |
| TPSMB20A | TPSMB20CA | 20AA | 20CA | 8 | 17.10 | 19.00 | 21.00 | 1 | 27.7 | 22.0 | 1 | 0.085 | X |
| TPSMB22A | TPSMB22CA | 22AA | 22CA | 8 | 18.80 | 20.90 | 23.10 | 1 | 30.6 | 19.9 | 1 | 0.088 | X |
| TPSMB24A | TPSMB24CA | 24AA | 24CA | 8 | 20.50 | 22.80 | 25.20 | 1 | 33.2 | 18.4 | 1 | 0.091 | X |
| TPSMB27A | TPSMB27CA | 27AA | 27CA | 8 | 23.10 | 25.70 | 28.40 | 1 | 37.5 | 16.3 | 1 | 0.092 | X |
| TPSMB30A | TPSMB30CA | 30AA | 30CA | 8 | 25.60 | 28.50 | 31.50 | 1 | 41.4 | 14.7 | 1 | 0.093 | X |
| TPSMB33A | TPSMB33CA | 33AA | 33CA | 8 | 28.20 | 31.40 | 34.70 | 1 | 45.7 | 13.3 | 1 | 0.094 | X |
| TPSMB36A | TPSMB36CA | 36AA | 36CA | 8 | 30.80 | 34.20 | 37.80 | 1 | 49.9 | 12.2 | 1 | 0.096 | X |
| TPSMB39A | TPSMB39CA | 39AA | 39CA | 8 | 33.30 | 37.10 | 41.00 | 1 | 53.9 | 11.3 | 1 | 0.097 | X |
| TPSMB43A | TPSMB43CA | 43AA | 43CA | 8 | 36.80 | 40.90 | 45.20 | 1 | 59.3 | 10.3 | 1 | 0.098 | X |
| TPSMB47A | TPSMB47CA | 47AA | 47CA | 8 | 40.20 | 44.70 | 49.40 | 1 | 64.8 | 9.4 | 1 | 0.099 | X |
| TPSMB51A | TPSMB51CA | 51AA | 51CA | 8 | 43.60 | 48.50 | 53.60 | 1 | 70.1 | 8.7 | 1 | 0.100 | X |
| TPSMB56A | TPSMB56CA | 56AA | 56CA | 8 | 47.80 | 53.20 | 58.80 | 1 | 77.0 | 7.9 | 1 | 0.101 | X |
| TPSMB58A | TPSMB58CA | 58AA | 58CA | 8 | 52.78 | 55.10 | 60.90 | 1 | 79.8 | 7.7 | 1 | 0.101 | X |
| TPSMB62A | TPSMB62CA | 62AA | 62CA | 8 | 53.00 | 58.90 | 65.10 | 1 | 85.0 | 7.2 | 1 | 0.102 | X |
| TPSMB64A | TPSMB64CA | 64AA | 64CA | 8 | 54.40 | 60.80 | 67.20 | 1 | 86.90 | 7.0 | 1 | 0.102 | X |
| TPSMB68A | TPSMB68CA | 68AA | 68CA | 8 | 58.10 | 64.60 | 71.40 | 1 | 92.0 | 6.6 | 1 | 0.103 | X |
| TPSMB75A | TPSMB75CA | 75AA | 75CA | 8 | 64.10 | 71.30 | 78.80 | 1 | 103.0 | 5.9 | 1 | 0.104 | X |
| TPSMB82A | TPSMB82CA | 82AA | 82CA | 8 | 70.10 | 77.90 | 86.10 | 1 | 113.0 | 5.4 | 1 | 0.105 | X |
| TPSMB91A | TPSMB91CA | 91AA | 91CA | 8 | 77.80 | 86.50 | 95.50 | 1 | 125.0 | 4.9 | 1 | 0.106 | X |
| TPSMB100A | TPSMB100CA | 100A | 100C | - | 85.50 | 95.00 | 105.00 | 1 | 137.0 | 4.5 | 1 | 0.106 | X |
| TPSMB110A | TPSMB110CA | 110A | 110C | - | 94.00 | 105.00 | 116.00 | 1 | 152.0 | 4.0 | 1 | 0.107 | X |
| TPSMB120A | TPSMB120CA | 120A | 120C | - | 102.00 | 114.00 | 126.00 | 1 | 165.0 | 3.7 | 1 | 0.107 | X |
| TPSMB130A | TPSMB130CA | 130A | 130C | - | 111.00 | 124.00 | 137.00 | 1 | 179.0 | 3.4 | 1 | 0.107 | X |
| TPSMB150A | TPSMB150CA | 150A | 150C | - | 128.00 | 143.00 | 158.00 | 1 | 207.0 | 2.9 | 1 | 0.108 | X |
| TPSMB160A | TPSMB160CA | 160A | 160C | - | 136.00 | 152.00 | 168.00 | 1 | 219.0 | 2.8 | 1 | 0.108 | X |
| TPSMB170A | TPSMB170CA | 170A | 170C | - | 145.00 | 162.00 | 179.00 | 1 | 234.0 | 2.6 | 1 | 0.108 | X |
| TPSMB180A | TPSMB180CA | 180A | 180C | - | 154.00 | 171.00 | 189.00 | 1 | 246.0 | 2.5 | 1 | 0.108 | X |
| TPSMB200A | TPSMB200CA | 200A | 200C | - | 171.00 | 190.00 | 210.00 | 1 | 274.0 | 2.2 | 1 | 0.108 | X |
| TPSMB210A | TPSMB210CA | 210A | 210C | - | 179.60 | 199.50 | 220.50 | 1 | 288.0 | 2.1 | 1 | 0.110 | X |
| TPSMB220A | TPSMB220CA | 220A | 220C | - | 185.00 | 209.00 | 231.00 | 1 | 328.0 | 1.9 | 1 | 0.110 | X |
| TPSMB250A | TPSMB250CA | 250A | 250C | - | 214.00 | 237.00 | 263.00 | 1 | 344.0 | 1.8 | 1 | 0.110 | X |
| TPSMB300A-A | TPSMB300CA-A | 300A | 300C | - | 256.00 | 285.00 | 315.00 | 1 | 414.0 | 1.5 | 1 | 0.110 | X |
| TPSMB350A-A | TPSMB350CA-A | 350A | 350C | - | 300.00 | 332.00 | 368.00 | 1 | 482.0 | 1.3 | 1 | 0.112 | X |
| TPSMB400A-A | TPSMB400CA-A | 400A | 400C | - | 342.00 | 380.00 | 420.00 | 1 | 548.0 | 1.1 | 1 | 0.112 | X |
| TPSMB440A-A | TPSMB440CA-A | 440A | 440C | - | 376.00 | 418.00 | 462.00 | 1 | 602.0 | 1.0 | 1 | 0.112 | X |
| TPSMB480A-A | TPSMB480CA-A | 480A | 480C | - | 408.00 | 456.00 | 504.00 | 1 | 658.0 | 0.9 | 1 | 0.112 | X |
| TPSMB510A-A | TPSMB510CA-A | 510A | 510C | - | 434.00 | 485.00 | 535.00 | 1 | 698.0 | 0.9 | 1 | 0.112 | X |
| TPSMB520A-A | TPSMB520CA-A | 520A | 520C | - | 443.00 | 494.50 | 545.50 | 1 | 718.0 | 0.9 | 1 | 0.112 | X |
| TPSMB530A-A | TPSMB530CA-A | 530A | 530C | - | 451.00 | 503.50 | 556.50 | 1 | 725.0 | 0.8 | 1 | 0.112 | X |
| TPSMB540A-A | TPSMB540CA-A | 540A | 540C | - | 460.00 | 513.00 | 567.00 | 1 | 740.0 | 0.8 | 1 | 0.112 | X |
| TPSMB550A-A | TPSMB550CA-A | 550A | 550C | - | 468.00 | 522.50 | 577.50 | 1 | 760.0 | 0.8 | 1 | 0.112 | X |
| - | TPSMB600CA-A | - | 600C | - | 511.00 | 570.00 | 630.00 | 1 | 828.0 | 0.8 | 1 | 0.112 | - |
| - | TPSMB650CA-A | - | 650C | - | 553.00 | 617.50 | 682.50 | 1 | 897.0 | 0.8 | 1 | 0.112 | - |

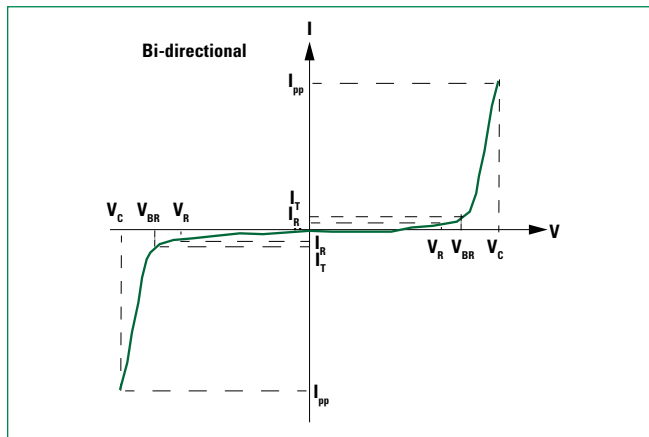
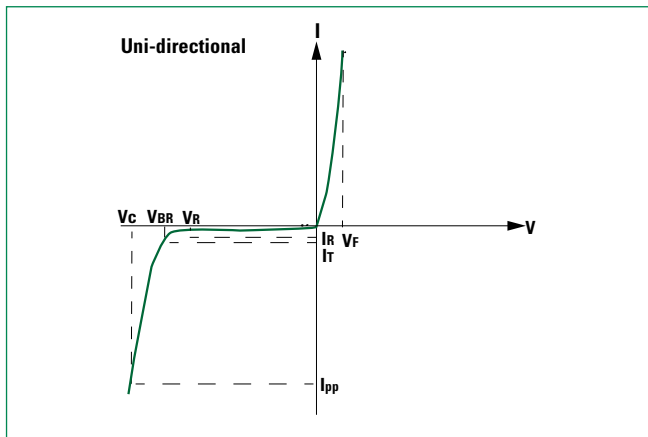
Note:

- For bidirectional type having V_R of 10 volts and less, the I_R limit is double.
- V_{BR} @ $T_A = 25^\circ\text{C} \times (1 + \alpha T \times (T_A - 25))$ (αT : Temperature Coefficient).
- The CTI (Comparative Tracking Index) of TPSMB600CA-A and TPSMB650CA-A is 600 and other parts is 550

TPSMB 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 thogh 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

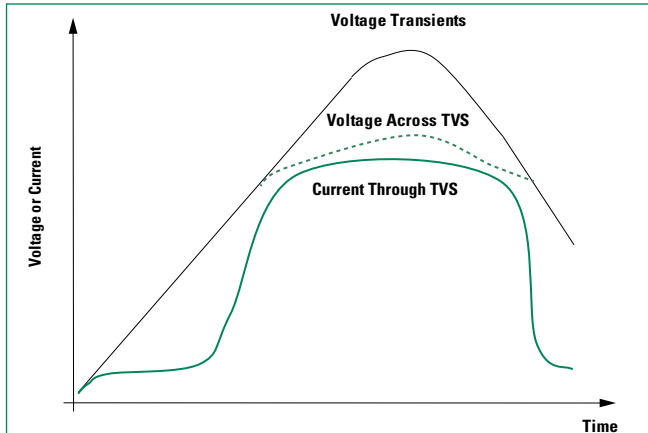


Figure 3 - Peak Pulse Power Derating Curve

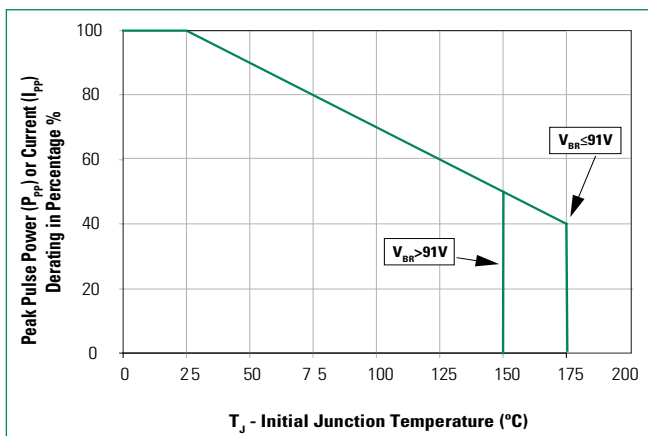


Figure 2 - Peak Power Rating Curve

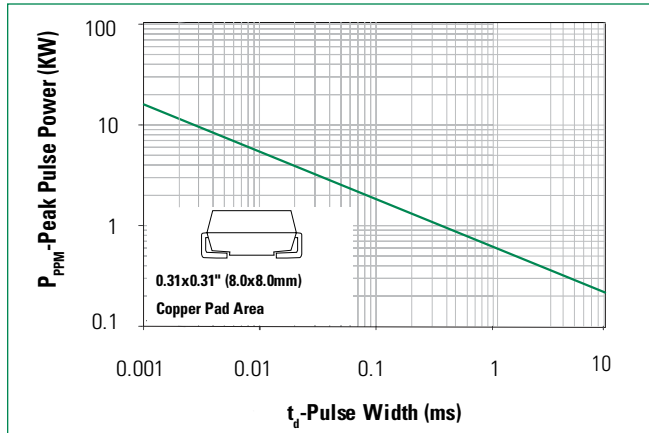
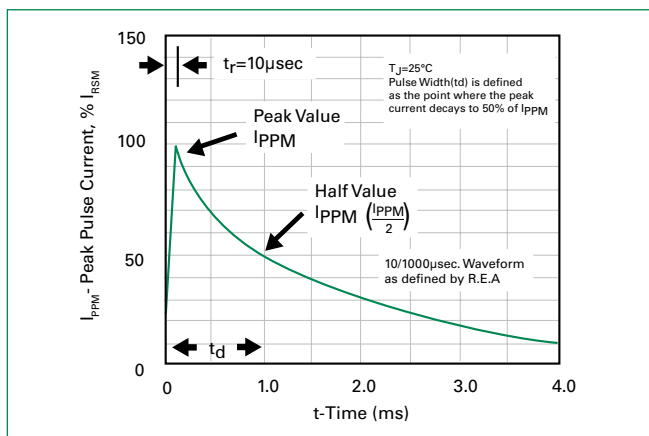


Figure 4 - Pulse Waveform



TPSMB Series

Surface Mount – 600W

Figure 5 - Typical Junction Capacitance

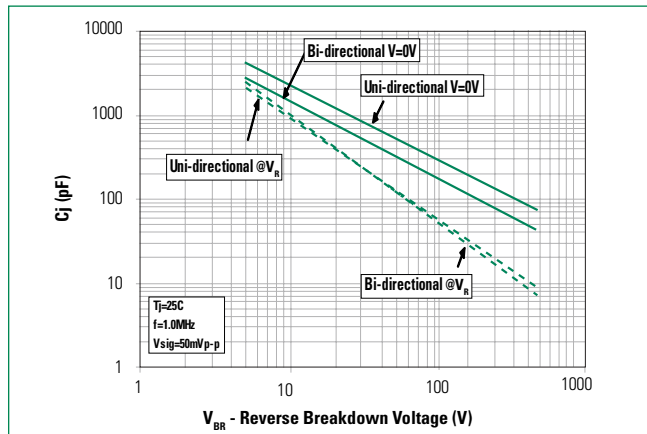
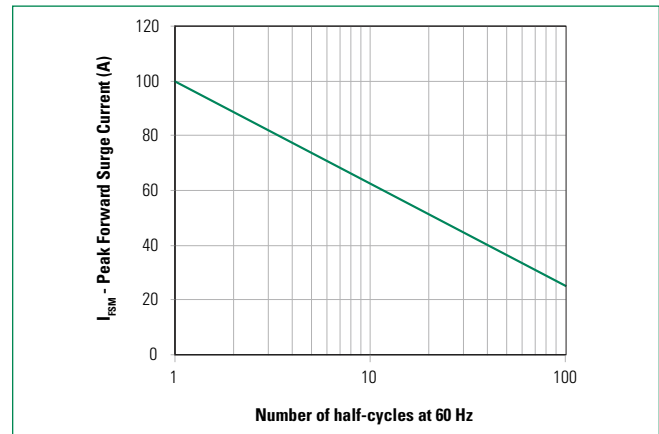
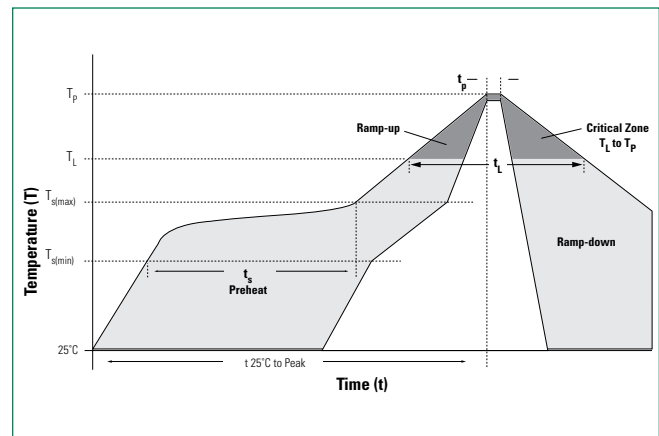


Figure 6 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



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 | 260°C | |



Physical Specifications

| | |
|-----------------|---|
| Weight | 0.003 ounce, 0.093 gram |
| Case | JEDEC DO214AA. Molded plastic body over glass passivated junction |
| Polarity | Color band denotes cathode for unidirectional components. |
| Terminal | Matte Tin-plated leads, Solderable per JESD22-B102 |

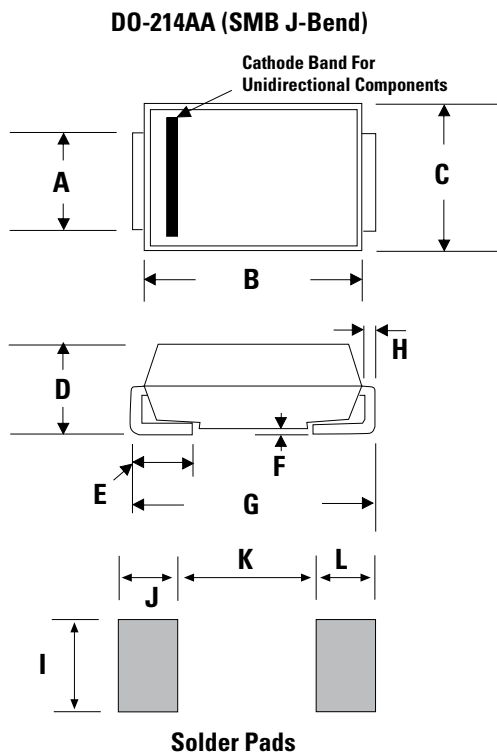
Environmental Specifications

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

TPSMB Series

Surface Mount – 600W

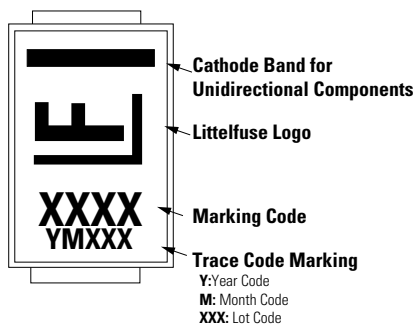
Dimensions



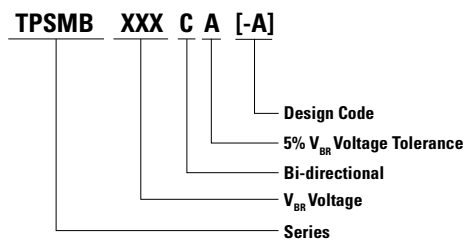
| Dimensions | Inches | | Millimeters | |
|------------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.077 | 0.086 | 1.950 | 2.200 |
| B | 0.160 | 0.180 | 4.060 | 4.570 |
| C | 0.130 | 0.155 | 3.300 | 3.940 |
| D | 0.084 | 0.096 | 2.130 | 2.440 |
| E | 0.030 | 0.060 | 0.760 | 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 | - |

Note: Dimension in inches and (millimeters)

Part Marking System



Part Numbering System



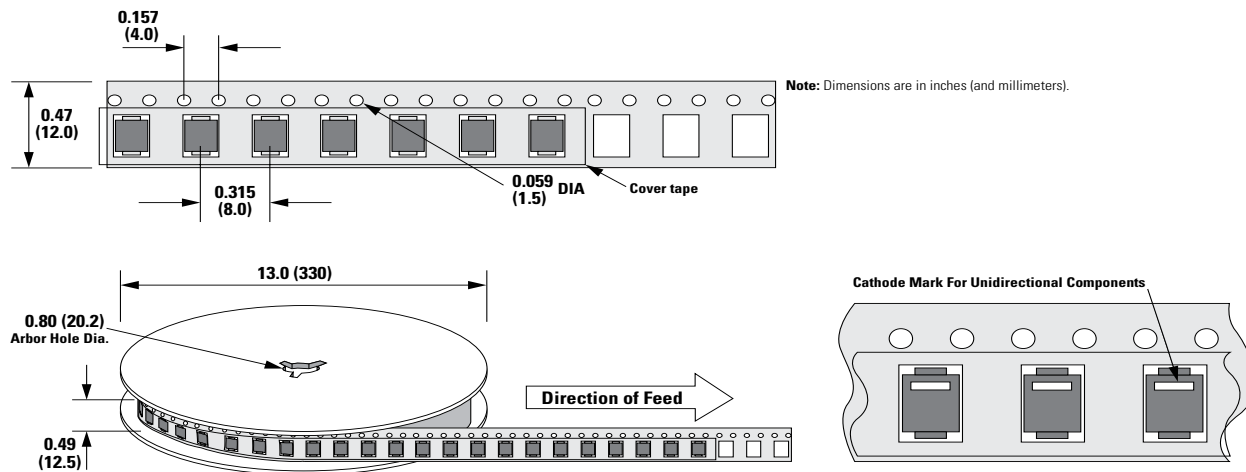
Packaging

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

TPSMB Series

Surface Mount – 600W

Tape and Reel Specification



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