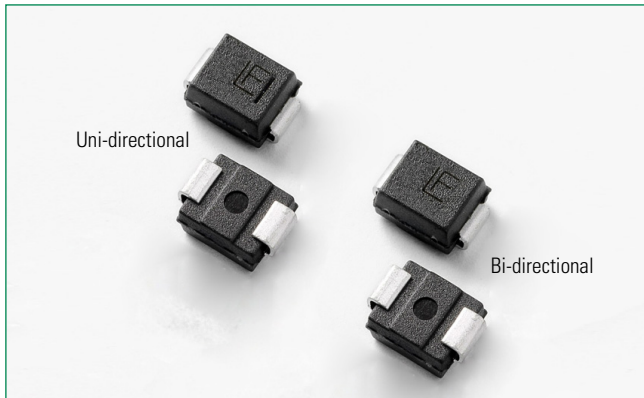




THE DATASHEET OF TPSMB75CA-VR



TPSMB-VR Series



Agency Recognitions

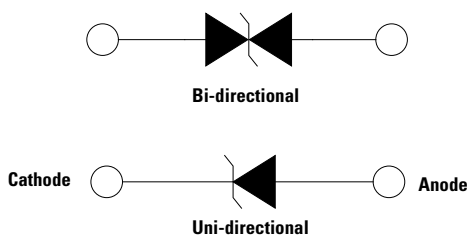
| Agency | Agency File Number |
|--------|--------------------|
| | E230531 |

Maximum Ratings and Thermal Characteristics (T_A=25°C unless otherwise noted)

| Parameter | Symbol | Value | Unit |
|--|--------------------|------------|------|
| Peak Pulse Power Dissipation by 10/1000µs waveform (Fig.1)(Note 1), (Note 2) | P _{PPM} | 600 | W |
| Power Dissipation on infinite heat sink at T _i =50°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 | V _F | 3.5/5 | V |
| Operating Junction Temperature Range (V _R ≤ 78V) | T _J | -65 to 175 | °C |
| Operating Junction Temperature Range (V _R > 78V) | T _J | -65 to 150 | °C |
| Storage Temperature Range | T _{STG} | -65 to 175 | °C |
| Typical Thermal Resistance Junction to Lead | R _{θJL} | 20 | °C/W |
| Typical Thermal Resistance Junction to Ambient | R _{θJA} | 100 | °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 0.2x0.2" (5.0 x 5.0mm) to each terminal.
 3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional component only, duty cycle=4 per minute maximum.
 4. VF<3.5V for part number with Vr<250V, VF<5.0V for part numbers with Vr>=250V.

Functional Diagram



Description

The TPSMB-VR 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 minimize 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 peak pulse power capability at 10/1000µs 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 ≤ 1µA for V_R > 10V
- High temperature soldering guaranteed: 260°C/10 seconds at terminals
- UL Recognized compound meeting flammability rating V-0.
- Meet MSL level1, per J-STD-020, high temperature soldering guaranteed.
- 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)
- Recognized to UL 497B as an Isolated Loop Circuit Protector

Applications

TVS components are ideal for the protection of I/O Interfaces, V_{CC} bus and other vulnerable circuits used in Automotive applications.

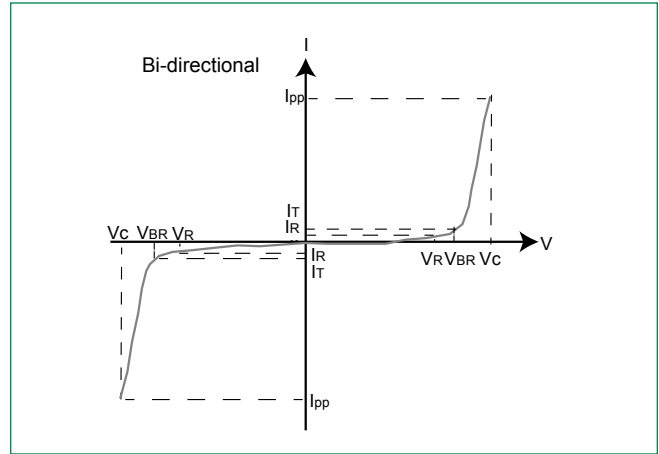
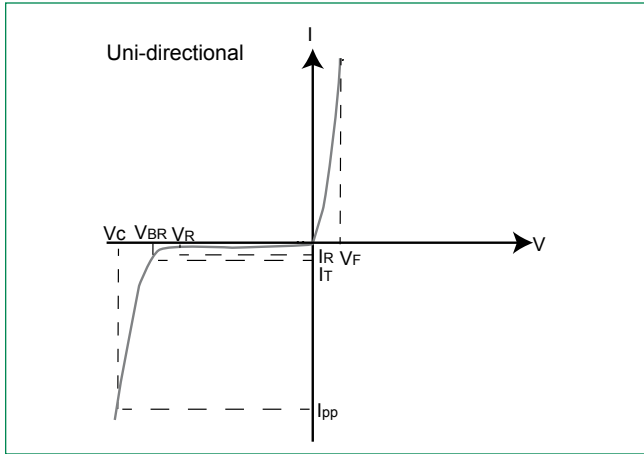
Electrical Characteristics (T_A=25°C unless otherwise noted)

| 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 | | | | | | |
| TPSMB6.5A-VR | - | KKA | - | 500 | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 53.6 | 500 | 0.052 | X |
| TPSMB70A-VR | - | KMA | - | 200 | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 50.0 | 200 | 0.058 | X |
| TPSMB7.5A-VR | - | KPA | - | 100 | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 46.6 | 100 | 0.061 | X |
| TPSMB8.0A-VR | - | KRA | - | 50 | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 44.2 | 50 | 0.064 | X |
| TPSMB8.5A-VR | TPSMB8.5CA-VR | KTA | ATA | 50 | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 41.7 | 20 | 0.066 | X |
| TPSMB9.0A-VR | TPSMB9.0CA-VR | KVA | AVA | 20 | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 39.0 | 10 | 0.069 | X |
| TPSMB10A-VR | TPSMB10CA-VR | KXA | AXA | 8 | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 35.3 | 5 | 0.071 | X |
| TPSMB11A-VR | TPSMB11CA-VR | KZA | AZA | 8 | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 33.0 | 1 | 0.074 | X |
| TPSMB12A-VR | TPSMB12CA-VR | LEA | BEA | 8 | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 30.2 | 1 | 0.075 | X |
| TPSMB13A-VR | TPSMB13CA-VR | LGA | BGA | 8 | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 28.0 | 1 | 0.076 | X |
| TPSMB14A-VR | TPSMB14CA-VR | LKA | BKA | 8 | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 25.9 | 1 | 0.080 | X |
| TPSMB15A-VR | TPSMB15CA-VR | LMA | BMA | 8 | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 24.6 | 1 | 0.083 | X |
| TPSMB16A-VR | TPSMB16CA-VR | LPA | BPA | 8 | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 23.1 | 1 | 0.084 | X |
| TPSMB17A-VR | TPSMB17CA-VR | LRA | BRA | 8 | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 21.8 | 1 | 0.085 | X |
| TPSMB18A-VR | TPSMB18CA-VR | LTA | BTA | 8 | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 20.6 | 1 | 0.088 | X |
| TPSMB20A-VR | TPSMB20CA-VR | LVA | BVA | 8 | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 18.6 | 1 | 0.091 | X |
| TPSMB22A-VR | TPSMB22CA-VR | LXA | BXA | 8 | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 16.9 | 1 | 0.092 | X |
| TPSMB24A-VR | TPSMB24CA-VR | LZA | BZA | 8 | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 15.5 | 1 | 0.092 | X |
| TPSMB26A-VR | TPSMB26CA-VR | MEA | CEA | 8 | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 14.3 | 1 | 0.093 | X |
| TPSMB28A-VR | TPSMB28CA-VR | MGA | CGA | 8 | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 13.3 | 1 | 0.094 | X |
| TPSMB30A-VR | TPSMB30CA-VR | MKA | CKA | 8 | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 12.4 | 1 | 0.096 | X |
| TPSMB33A-VR | TPSMB33CA-VR | MMA | CMA | 8 | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 11.3 | 1 | 0.097 | X |
| TPSMB36A-VR | TPSMB36CA-VR | MPA | CPA | 8 | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 10.4 | 1 | 0.098 | X |
| TPSMB40A-VR | TPSMB40CA-VR | MRA | CRA | 8 | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 9.3 | 1 | 0.099 | X |
| TPSMB43A-VR | TPSMB43CA-VR | MTA | CTA | 8 | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 8.7 | 1 | 0.100 | X |
| TPSMB45A-VR | TPSMB45CA-VR | MVA | CVA | 8 | 45.0 | 50.00 | 55.30 | 1 | 72.7 | 8.3 | 1 | 0.101 | X |
| TPSMB48A-VR | TPSMB48CA-VR | MXA | CXA | 8 | 48.0 | 53.30 | 58.90 | 1 | 77.4 | 7.8 | 1 | 0.101 | X |
| TPSMB51A-VR | TPSMB51CA-VR | MZA | CZA | 8 | 51.0 | 56.70 | 62.70 | 1 | 82.4 | 7.3 | 1 | 0.101 | X |
| TPSMB54A-VR | TPSMB54CA-VR | NEA | DEA | 8 | 54.0 | 60.00 | 66.30 | 1 | 87.1 | 6.9 | 1 | 0.102 | X |
| TPSMB58A-VR | TPSMB58CA-VR | NGA | DGA | 8 | 58.0 | 64.40 | 71.20 | 1 | 93.6 | 6.5 | 1 | 0.103 | X |
| TPSMB60A-VR | TPSMB60CA-VR | NKA | DKA | 8 | 60.0 | 66.70 | 73.70 | 1 | 96.8 | 6.2 | 1 | 0.103 | X |
| TPSMB64A-VR | TPSMB64CA-VR | NMA | DMA | 8 | 64.0 | 71.10 | 78.60 | 1 | 103.0 | 5.9 | 1 | 0.104 | X |
| TPSMB70A-VR | TPSMB70CA-VR | NPA | DPA | 8 | 70.0 | 77.80 | 86.00 | 1 | 113.0 | 5.3 | 1 | 0.105 | X |
| TPSMB75A-VR | TPSMB75CA-VR | NRA | DRA | 8 | 75.0 | 83.30 | 92.10 | 1 | 121.0 | 5.0 | 1 | 0.106 | X |
| TPSMB78A-VR | TPSMB78CA-VR | NTA | DTA | 8 | 78.0 | 86.70 | 95.80 | 1 | 126.0 | 4.8 | 1 | 0.106 | X |
| TPSMB85A-VR | TPSMB85CA-VR | NVA | DVA | - | 85.0 | 94.40 | 104.00 | 1 | 137.0 | 4.4 | 1 | 0.106 | X |
| TPSMB90A-VR | TPSMB90CA-VR | NXA | DXA | - | 90.0 | 100.00 | 111.00 | 1 | 146.0 | 4.1 | 1 | 0.107 | X |
| TPSMB100A-VR | TPSMB100CA-VR | NZA | DZA | - | 100.0 | 111.00 | 123.00 | 1 | 162.0 | 3.7 | 1 | 0.107 | X |
| TPSMB110A-VR | TPSMB110CA-VR | PEA | EEA | - | 110.0 | 122.00 | 135.00 | 1 | 177.0 | 3.4 | 1 | 0.107 | X |
| TPSMB120A-VR | TPSMB120CA-VR | PGA | EGA | - | 120.0 | 133.00 | 147.00 | 1 | 193.0 | 3.1 | 1 | 0.108 | X |
| TPSMB130A-VR | TPSMB130CA-VR | PKA | EKA | - | 130.0 | 144.00 | 159.00 | 1 | 209.0 | 2.9 | 1 | 0.108 | X |
| TPSMB150A-VR | TPSMB150CA-VR | PMA | EMA | - | 150.0 | 167.00 | 185.00 | 1 | 243.0 | 2.5 | 1 | 0.108 | X |
| TPSMB160A-VR | TPSMB160CA-VR | PPA | EPA | - | 160.0 | 178.00 | 197.00 | 1 | 259.0 | 2.3 | 1 | 0.108 | X |
| TPSMB170A-VR | TPSMB170CA-VR | PRA | ERA | - | 170.0 | 189.00 | 209.00 | 1 | 275.0 | 2.2 | 1 | 0.108 | X |
| TPSMB180A-VR | TPSMB180CA-VR | PTA | ETA | - | 180.0 | 201.00 | 222.00 | 1 | 292.0 | 2.1 | 1 | 0.108 | X |
| TPSMB188A-VR | TPSMB188CA-VR | PBA | EBA | - | 188.0 | 209.00 | 231.00 | 1 | 304.0 | 2.0 | 1 | 0.110 | X |
| TPSMB200A-VR | TPSMB200CA-VR | PVA | EVA | - | 200.0 | 224.00 | 247.00 | 1 | 324.0 | 1.9 | 1 | 0.110 | X |
| TPSMB220A-VR | TPSMB220CA-VR | PXA | EXA | - | 220.0 | 246.00 | 272.00 | 1 | 356.0 | 1.7 | 1 | 0.110 | X |
| TPSMB250A-VR | TPSMB250CA-VR | PZA | EZA | - | 250.0 | 279.00 | 309.00 | 1 | 405.0 | 1.5 | 1 | 0.110 | X |
| TPSMB300A-VR | TPSMB300CA-VR | QEA | FEA | - | 300.0 | 335.00 | 371.00 | 1 | 486.0 | 1.3 | 1 | 0.112 | - |
| TPSMB350A-VR | TPSMB350CA-VR | QGA | FGA | - | 350.0 | 391.00 | 432.00 | 1 | 567.0 | 1.1 | 1 | 0.112 | - |
| TPSMB400A-VR | TPSMB400CA-VR | QKA | FKA | - | 400.0 | 447.00 | 494.00 | 1 | 648.0 | 0.9 | 1 | 0.112 | - |
| TPSMB440A-VR | TPSMB440CA-VR | QMA | FMA | - | 440.0 | 492.00 | 543.00 | 1 | 713.0 | 0.9 | 1 | 0.112 | - |

Note:

For bidirectional type having V_R of 10 volts and less, the I_R limit is double.
 V_{BR} @ T_J = V_{BR}@25°C x (1 + αT x (T_J - 25)) (αT: Temperature Coefficient, typical value is 0.1%)

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 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°C unless otherwise noted)

Figure 1 - TVS Transients Clamping Waveform

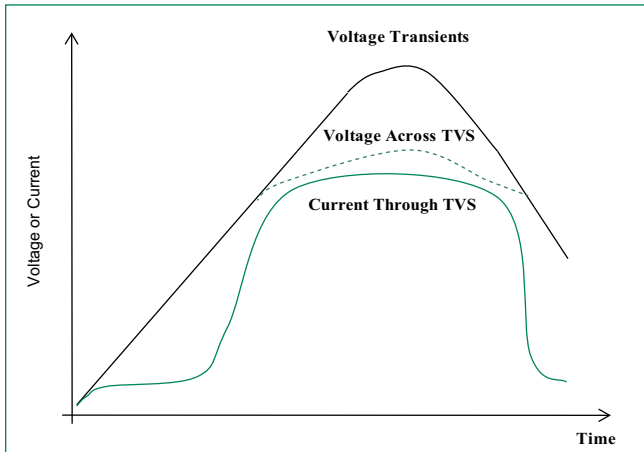
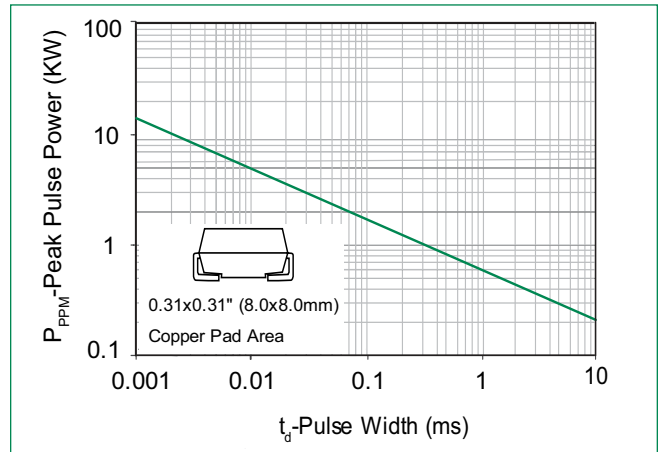


Figure 2 - Peak Pulse Power Rating Curve



continues on next page.

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

Figure 3 - Peak Pulse Power Derating Curve

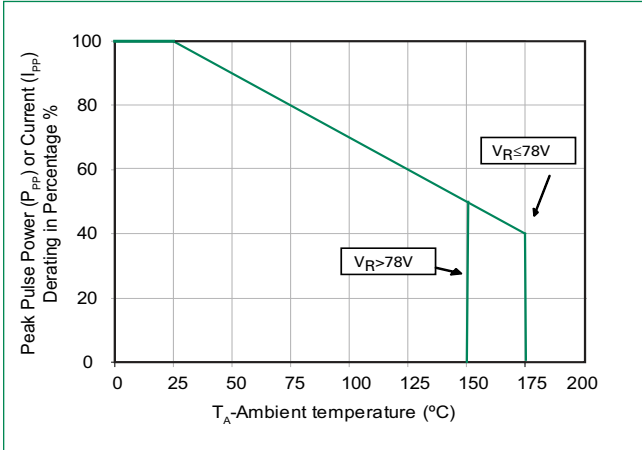


Figure 4 - Pulse Waveform

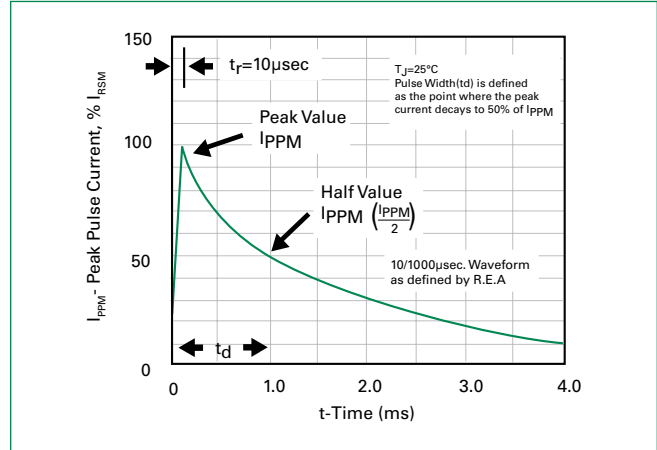


Figure 5 - Typical Junction Capacitance

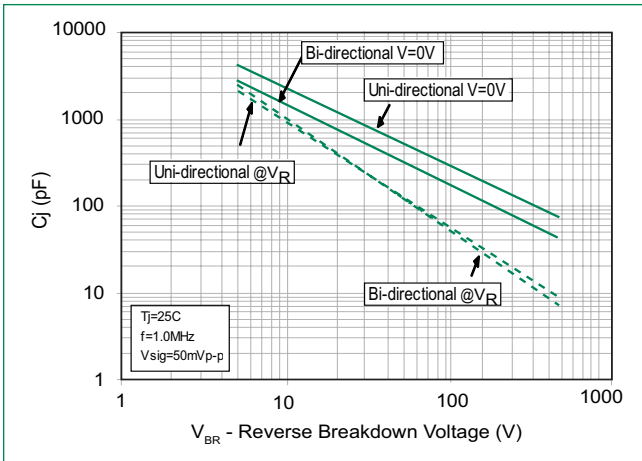
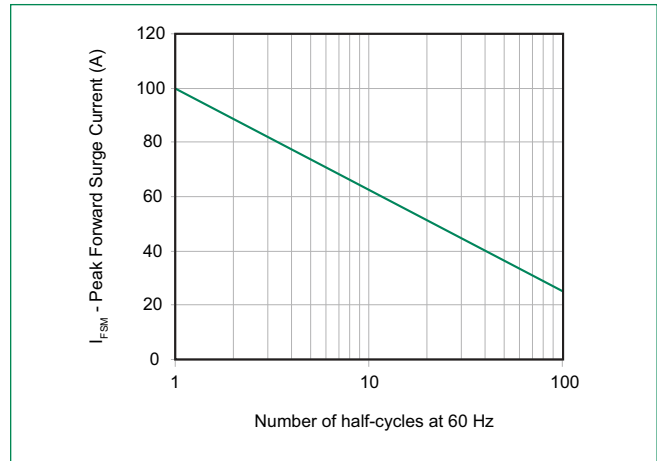
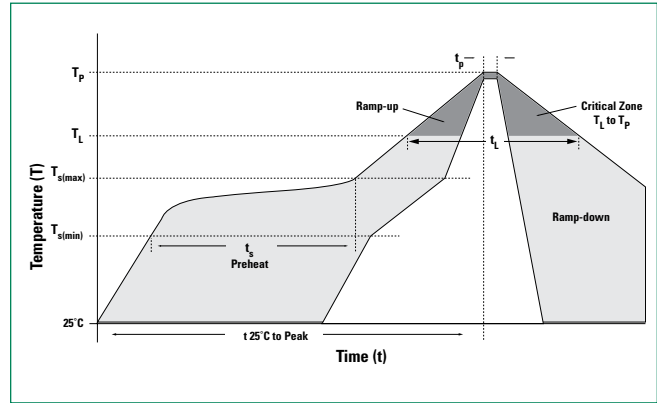


Figure 6 - Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only



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

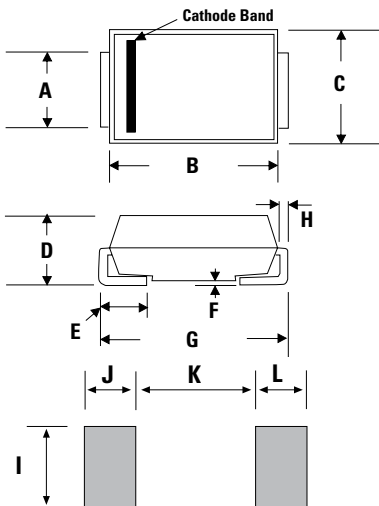
| | |
|-----------------|---|
| Weight | 0.003 ounce, 0.093 grams |
| Case | JEDEC DQ214AA. Molded plastic body over glass passivated junction |
| Polarity | Color band denotes cathode for unidirectional components |
| Terminal | Matte Tin-plated leads, Solderable per JESD22-B102 |

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 |

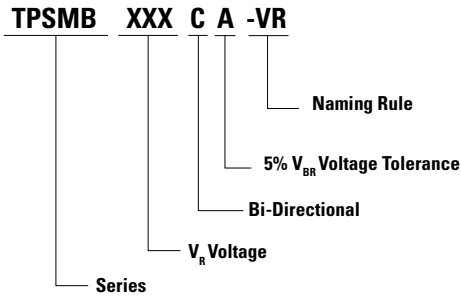
Dimensions

D0-214AA (SMB J-Bend)

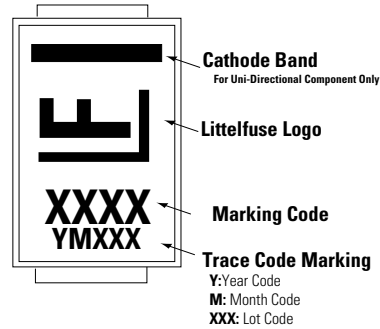


| Dimensions | Inches | | Millimeters | |
|------------|--------|-------|-------------|-------|
| | Min | Max | Min | Max |
| A | 0.077 | 0.086 | 1.950 | 2.200 |
| B | 0.160 | 0.180 | 4.060 | 4.570 |
| C | 0.130 | 0.155 | 3.300 | 3.940 |
| D | 0.084 | 0.096 | 2.130 | 2.440 |
| E | 0.030 | 0.060 | 0.760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

Part Numbering System



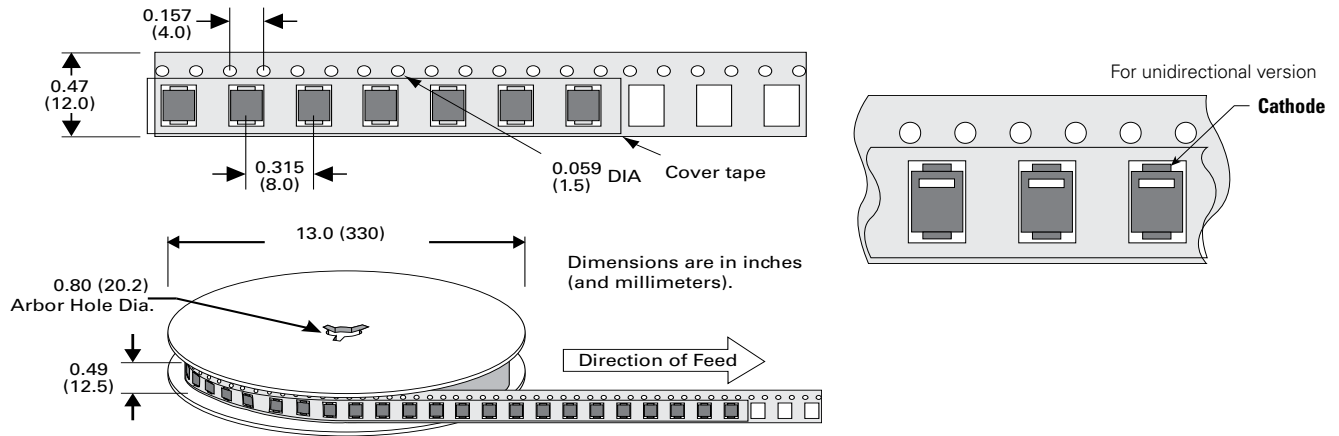
Part Marking System



Packaging

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

Tape and Reel Specification



Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

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 [Littelfuse Inc. Information](#)

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