

Features

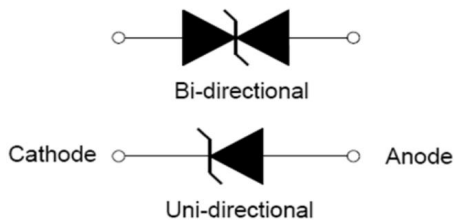
- 1500W peak pulse power capability at 10/1000 μ s waveform, repetition rate (duty cycles):0.01%
- Excellent clamping capability
- Typical failure mode is a short circuit condition for current events exceeding component rating
- Plastic package is flammability rated V-0 per UL-94
- Meet MSL level1, per J-STD-020, lead-frame maximum peak of 260 $^{\circ}$ C
- High reliability application and automotive grade AEC-Q101 qualified




Applications

TVS components 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.

Function Diagram




| 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 μ s Waveform (Fig.3) | P_{PPM} | 1500 | W |
| Power Dissipation on Infinite Heat Sink at $T_L=50^{\circ}\text{C}$ | P_D | 6.5 | W |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 1) | I_{FSM} | 200 | A |
| Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only | V_F | 3.5/5 | V |
| Operating Temperature Range | T_J | -65 to 150 | $^{\circ}\text{C}$ |
| Typical Thermal Resistance Junction to Lead | $R_{\theta JL}$ | 15 | $^{\circ}\text{C}/\text{W}$ |
| Typical Thermal Resistance Junction to Ambient | $R_{\theta JL}$ | 75 | $^{\circ}\text{C}/\text{W}$ |

| AGENCY | AGENCY FILE NUMBER |
|---|--------------------|
|  | Pending |

Notes:

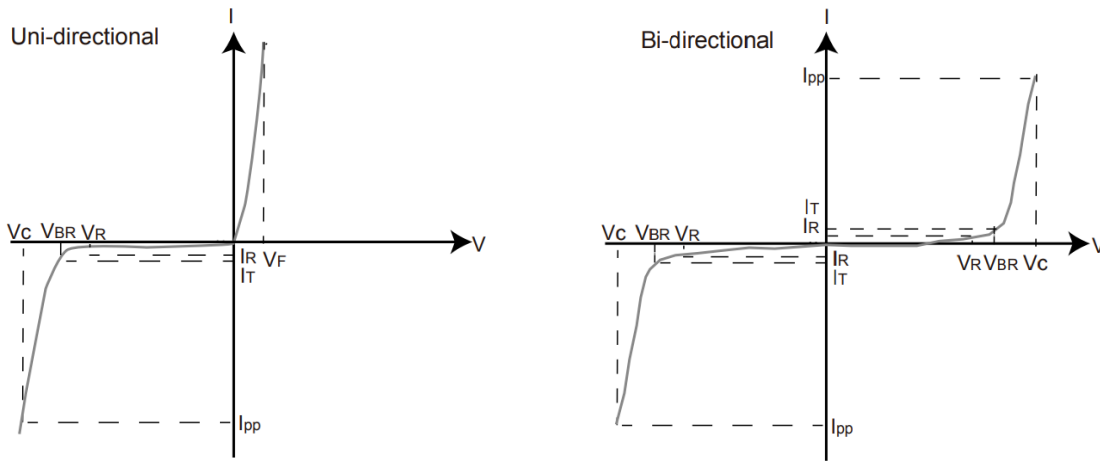
1. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only, duty cycle=4 per minute maximum.

Characteristics (T = 25°C unless otherwise noted)

| Part Number (Uni) | Part Number (Bi) | Key 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 _{nn} (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 | | | | | | |
| TPSMC5.0A-VR | TPSMC5.0CA-VR | AC005 | AC005 | 5.0 | 6.40 | 7.00 | 10 | 9.2 | 163.0 | 800 | 0.060 | |
| TPSMC6.0A-VR | TPSMC6.0CA-VR | AC006 | AC006 | 6.0 | 6.67 | 7.37 | 10 | 10.3 | 145.6 | 800 | 0.064 | |
| TPSMC6.5A-VR | TPSMC6.5CA-VR | AC06F | AC06F | 6.5 | 7.22 | 7.98 | 10 | 11.2 | 134.0 | 500 | 0.066 | |
| TPSMC7.0A-VR | TPSMC7.0CA-VR | AC007 | AC007 | 7.0 | 7.78 | 8.60 | 10 | 12.0 | 125.0 | 200 | 0.068 | |
| TPSMC7.5A-VR | TPSMC7.5CA-VR | AC07F | AC07F | 7.5 | 8.33 | 9.21 | 1 | 12.9 | 116.3 | 100 | 0.069 | |
| TPSMC8.0A-VR | TPSMC8.0CA-VR | AC008 | AC008 | 8.0 | 8.89 | 9.83 | 1 | 13.6 | 110.3 | 50 | 0.070 | |
| TPSMC8.5A-VR | TPSMC8.5CA-VR | AC08F | AC08F | 8.5 | 9.44 | 10.40 | 1 | 14.4 | 104.2 | 20 | 0.071 | |
| TPSMC9.0A-VR | TPSMC9.0CA-VR | AC009 | AC009 | 9.0 | 10.00 | 11.10 | 1 | 15.4 | 97.4 | 10 | 0.072 | |
| TPSMC10A-VR | TPSMC10CA-VR | AC010 | AC010 | 10.0 | 11.10 | 12.30 | 1 | 17.0 | 88.2 | 5 | 0.073 | |
| TPSMC11A-VR | TPSMC11CA-VR | AC011 | AC011 | 11.0 | 12.20 | 13.50 | 1 | 18.2 | 82.5 | 1 | 0.074 | |
| TPSMC12A-VR | TPSMC12CA-VR | AC012 | AC012 | 12.0 | 13.30 | 14.70 | 1 | 19.9 | 75.4 | 1 | 0.075 | |
| TPSMC13A-VR | TPSMC13CA-VR | AC013 | AC013 | 13.0 | 14.40 | 15.90 | 1 | 21.5 | 69.8 | 1 | 0.076 | |
| TPSMC14A-VR | TPSMC14CA-VR | AC014 | AC014 | 14.0 | 15.60 | 17.20 | 1 | 23.2 | 64.7 | 1 | 0.080 | |
| TPSMC15A-VR | TPSMC15CA-VR | AC015 | AC015 | 15.0 | 16.70 | 18.50 | 1 | 24.4 | 61.5 | 1 | 0.083 | |
| TPSMC16A-VR | TPSMC16CA-VR | AC016 | AC016 | 16.0 | 17.80 | 19.70 | 1 | 26.0 | 57.7 | 1 | 0.084 | |
| TPSMC17A-VR | TPSMC17CA-VR | AC017 | AC017 | 17.0 | 18.90 | 20.90 | 1 | 27.6 | 54.4 | 1 | 0.085 | |
| TPSMC18A-VR | TPSMC18CA-VR | AC018 | AC018 | 18.0 | 20.00 | 22.10 | 1 | 29.2 | 51.4 | 1 | 0.088 | |
| TPSMC20A-VR | TPSMC20CA-VR | AC020 | AC020 | 20.0 | 22.20 | 24.50 | 1 | 32.4 | 46.3 | 1 | 0.091 | |
| TPSMC22A-VR | TPSMC22CA-VR | AC022 | AC022 | 22.0 | 24.40 | 26.90 | 1 | 35.5 | 42.3 | 1 | 0.092 | |
| TPSMC24A-VR | TPSMC24CA-VR | AC024 | AC024 | 24.0 | 26.70 | 29.50 | 1 | 38.9 | 38.6 | 1 | 0.092 | |
| TPSMC26A-VR | TPSMC26CA-VR | AC026 | AC026 | 26.0 | 28.90 | 31.90 | 1 | 42.1 | 35.7 | 1 | 0.093 | |
| TPSMC28A-VR | TPSMC28CA-VR | AC028 | AC028 | 28.0 | 31.10 | 34.40 | 1 | 45.4 | 33.1 | 1 | 0.094 | |
| TPSMC30A-VR | TPSMC30CA-VR | AC030 | AC030 | 30.0 | 33.30 | 36.80 | 1 | 48.4 | 31.0 | 1 | 0.096 | |
| TPSMC33A-VR | TPSMC33CA-VR | AC033 | AC033 | 33.0 | 36.70 | 40.60 | 1 | 53.3 | 28.2 | 1 | 0.097 | |
| TPSMC36A-VR | TPSMC36CA-VR | AC036 | AC036 | 36.0 | 40.00 | 44.20 | 1 | 58.1 | 25.9 | 1 | 0.098 | |
| TPSMC40A-VR | TPSMC40CA-VR | AC040 | AC040 | 40.0 | 44.40 | 49.10 | 1 | 64.5 | 23.3 | 1 | 0.099 | |
| TPSMC43A-VR | TPSMC43CA-VR | AC043 | AC043 | 43.0 | 47.80 | 52.80 | 1 | 69.4 | 21.7 | 1 | 0.100 | |
| TPSMC45A-VR | TPSMC45CA-VR | AC045 | AC045 | 45.0 | 50.00 | 55.30 | 1 | 72.7 | 20.6 | 1 | 0.101 | |
| TPSMC48A-VR | TPSMC48CA-VR | AC048 | AC048 | 48.0 | 53.30 | 58.90 | 1 | 77.4 | 19.4 | 1 | 0.101 | |
| TPSMC51A-VR | TPSMC51CA-VR | AC051 | AC051 | 51.0 | 56.70 | 62.70 | 1 | 82.4 | 18.2 | 1 | 0.101 | |
| TPSMC54A-VR | TPSMC54CA-VR | AC054 | AC054 | 54.0 | 60.00 | 66.30 | 1 | 87.1 | 17.3 | 1 | 0.102 | |
| TPSMC58A-VR | TPSMC58CA-VR | AC058 | AC058 | 58.0 | 64.40 | 71.20 | 1 | 93.6 | 16.1 | 1 | 0.103 | |
| TPSMC60A-VR | TPSMC60CA-VR | AC060 | AC060 | 60.0 | 66.70 | 73.70 | 1 | 96.8 | 15.5 | 1 | 0.103 | |
| TPSMC64A-VR | TPSMC64CA-VR | AC064 | AC064 | 64.0 | 71.10 | 78.60 | 1 | 103.0 | 14.6 | 1 | 0.104 | |
| TPSMC70A-VR | TPSMC70CA-VR | AC070 | AC070 | 70.0 | 77.80 | 86.00 | 1 | 113.0 | 13.3 | 1 | 0.105 | |
| TPSMC75A-VR | TPSMC75CA-VR | AC075 | AC075 | 75.0 | 83.30 | 92.10 | 1 | 121.0 | 12.4 | 1 | 0.106 | |
| TPSMC78A-VR | TPSMC78CA-VR | AC078 | AC078 | 78.0 | 86.70 | 95.80 | 1 | 126.0 | 11.9 | 1 | 0.106 | |
| TPSMC85A-VR | TPSMC85CA-VR | AC085 | AC085 | 85.0 | 94.40 | 104.00 | 1 | 137.0 | 11.0 | 1 | 0.106 | |
| TPSMC90A-VR | TPSMC90CA-VR | AC090 | AC090 | 90.0 | 100 | 111 | 1 | 145.4 | 10.3 | 1 | 0.107 | |
| TPSMC100A-VR | TPSMC100CA-VR | AC100 | AC100 | 100.0 | 111 | 123 | 1 | 159.9 | 9.4 | 1 | 0.107 | |
| TPSMC110A-VR | TPSMC110CA-VR | AC110 | AC110 | 110.0 | 122 | 135 | 1 | 175.5 | 8.6 | 1 | 0.107 | |
| TPSMC120A-VR | TPSMC120CA-VR | AC120 | AC120 | 120.0 | 133 | 147 | 1 | 191.1 | 7.9 | 1 | 0.108 | |
| TPSMC130A-VR | TPSMC130CA-VR | AC130 | AC130 | 130.0 | 144 | 159 | 1 | 206.7 | 7.3 | 1 | 0.108 | |

| Part Number (Uni) | Part Number (Bi) | Key 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) | Maximum Temperature coefficient of V_{BR} (%/C) | Agency Approval |
|-------------------|------------------|-------------|-------|---|--|-----|-------------------------|---|---|--|---|-----------------|
| | | UNI | BI | | MIN | MAX | | | | | | |
| TPSMC150A-VR | TPSMC150CA-VR | AC150 | AC150 | 150.0 | 167 | 185 | 1 | 240.5 | 6.2 | 1 | 0.108 | |
| TPSMC160A-VR | TPSMC160CA-VR | AC160 | AC160 | 160.0 | 178 | 197 | 1 | 256.1 | 5.9 | 1 | 0.108 | |
| TPSMC170A-VR | TPSMC170CA-VR | AC170 | AC170 | 170.0 | 189 | 209 | 1 | 271.7 | 5.5 | 1 | 0.108 | |
| TPSMC180A-VR | TPSMC180CA-VR | AC180 | AC180 | 180.0 | 201 | 222 | 1 | 288.6 | 5.2 | 1 | 0.108 | |
| TPSMC188A-VR | TPSMC188CA-VR | AC188 | AC188 | 188.0 | 209 | 231 | 1 | 300.3 | 5.0 | 1 | 0.11 | |
| TPSMC200A-VR | TPSMC200CA-VR | AC200 | AC200 | 200.0 | 224 | 247 | 1 | 321.1 | 4.7 | 1 | 0.11 | |

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)

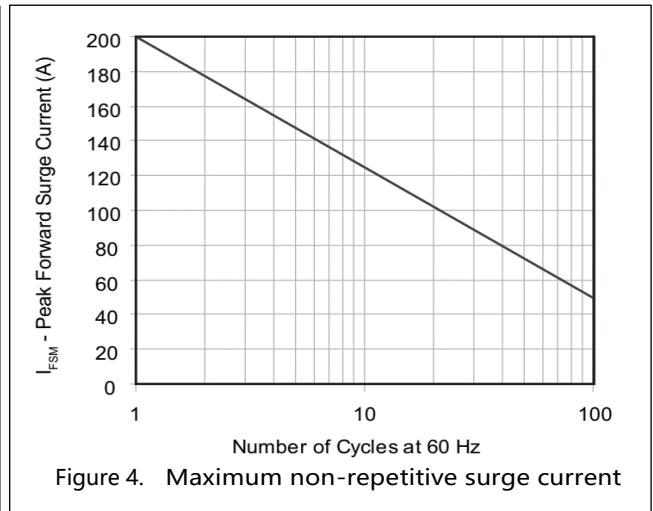
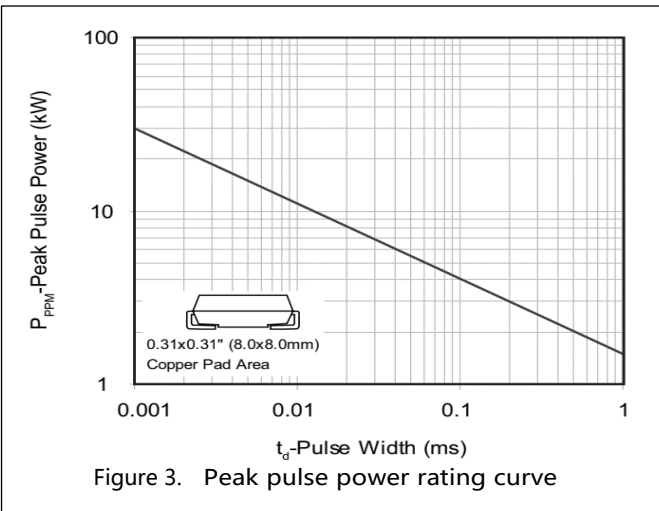
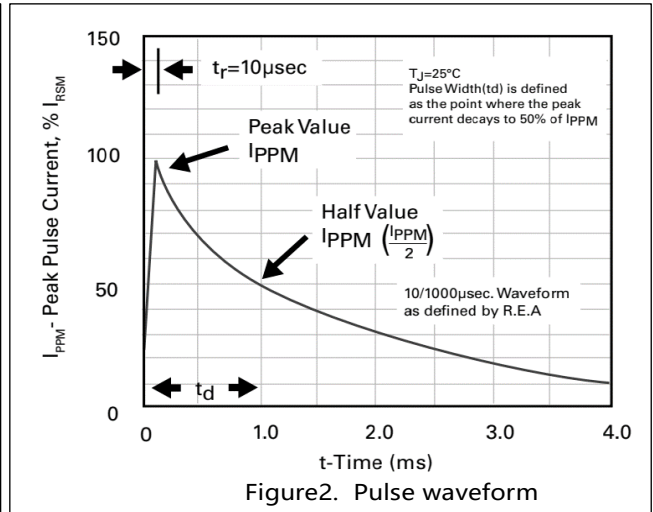
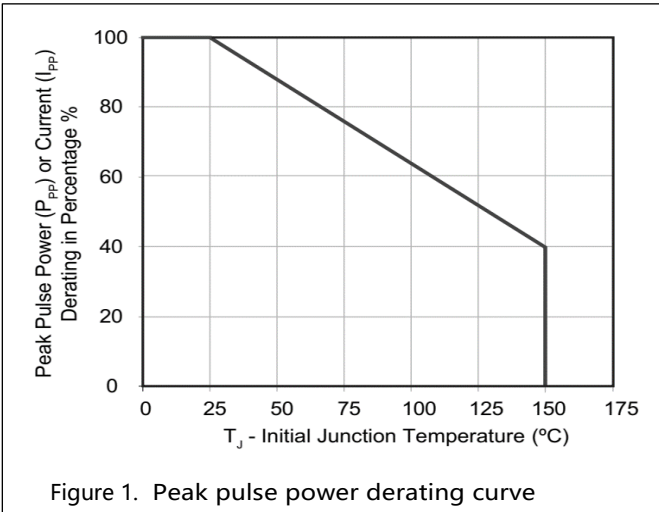
V_C Clamping Voltage -- Peak voltage measured across the TVS at a specified I_{PPM} (peak impulse current)

I_R Reverse Leakage Current -- Current measured at V_R

V_F Forward Voltage Drop for Uni-directional



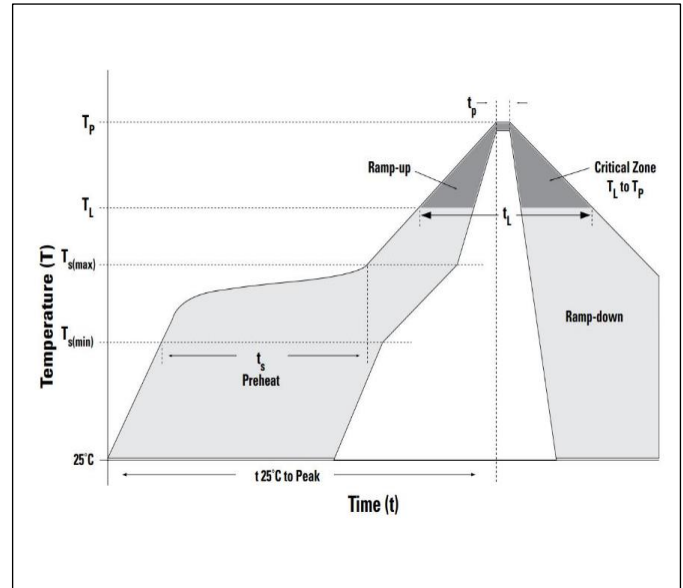
Ratings and Characteristic Curves (T = 25°C unless otherwise noted)



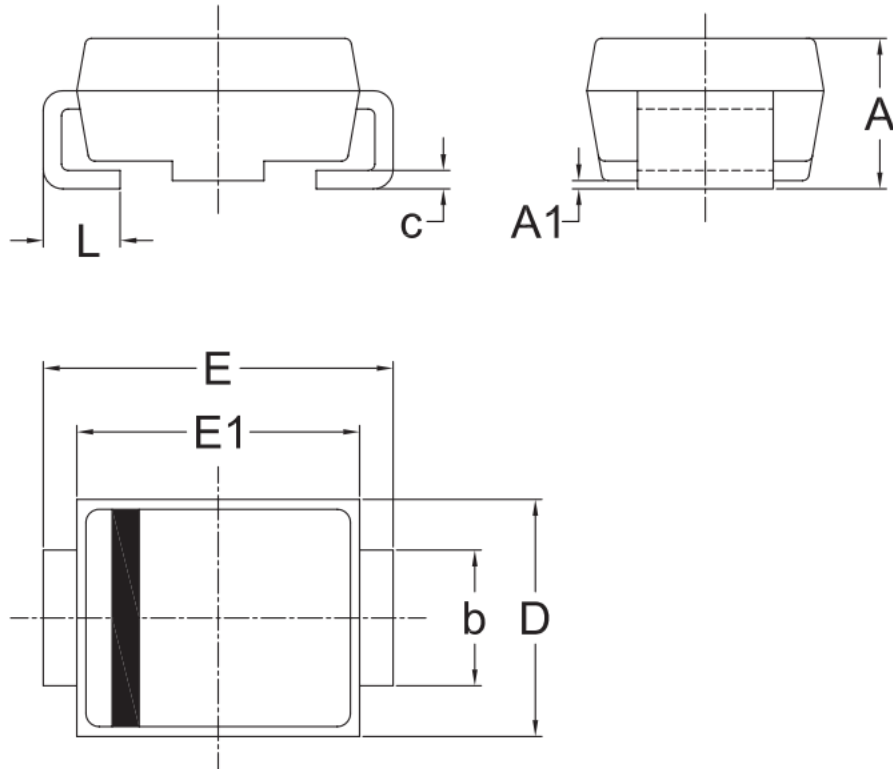
Soldering Parameters

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

Soldering profile



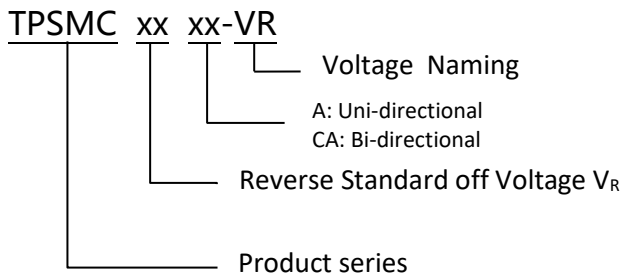
Dimensions



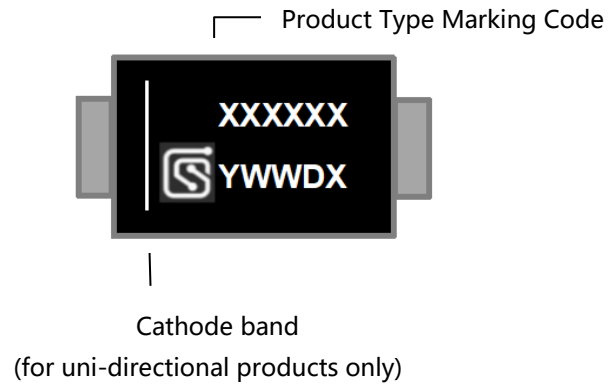
| UNIT | | A | A1 | b | c | D | E | E1 | L |
|------|-----|------|------|------|------|------|------|------|------|
| mm | Max | 2.83 | 0.30 | 3.10 | 0.25 | 6.15 | 8.15 | 7.05 | 1.60 |
| | Min | 2.33 | 0.00 | 2.80 | 0.15 | 5.85 | 7.65 | 6.75 | 0.90 |

Remark: Dimensions D and E1 do not include mold flash & gate remain.

Part Numbering



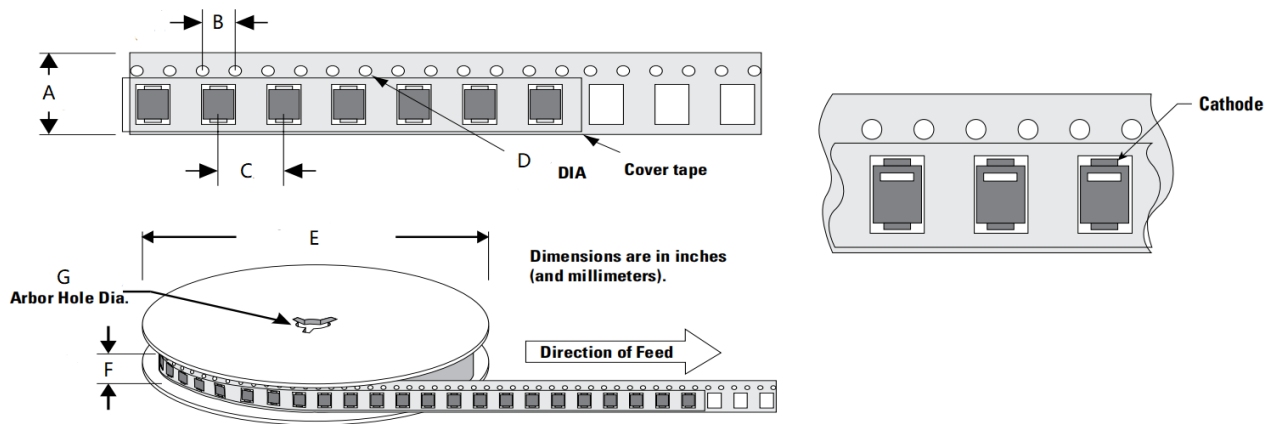
Part Marking



Packing

| Part number | Package name | Small packing quantity | Packing method |
|--------------|--------------|------------------------|----------------|
| TPSMCXXXX-VR | DO-214AB | 3000 | Tape & Reel |

Tape and Reel Specification



| Symbol | Millimeter |
|--------|-------------|
| A | 16.00±0.10 |
| B | 4.00±0.10 |
| C | 8.00±0.10 |
| D | 1.55±0.05 |
| E | 330.20±2.00 |
| F | 19.70±2.00 |
| G | 13.30±0.30 |

Revision history of Specification

| Version | Change Items | Effective Date |
|---------|-----------------|----------------|
| 1.0 | Initial Release | 13-Aug-2021 |

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