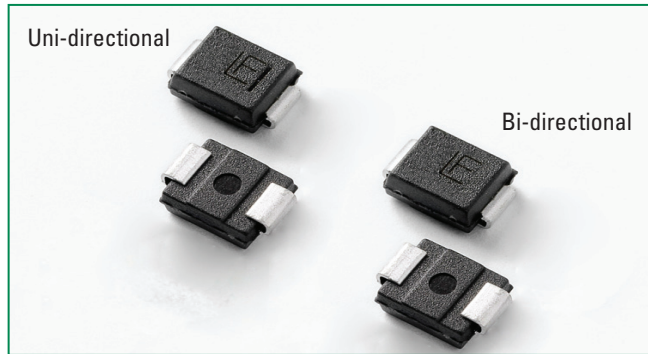


## P6SMB Series



### Agency Approvals

| AGENCY | AGENCY FILE NUMBER |
|--------|--------------------|
|        | E230531            |

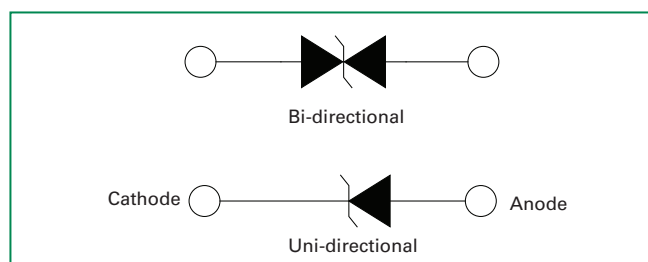
### Maximum Ratings and Thermal Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Parameter                                                                                            | Symbol                            | Value      | Unit |
|------------------------------------------------------------------------------------------------------|-----------------------------------|------------|------|
| Peak Pulse Power Dissipation at T <sub>A</sub> =25°C by 10/1000µs Waveform (Fig.2)(Note 1), (Note 2) | P <sub>PPM</sub>                  | 600        | W    |
| Power Dissipation on Infinite Heat Sink at T <sub>A</sub> =50°C                                      | P <sub>MAV</sub>                  | 5.0        | W    |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)                                     | I <sub>FSM</sub>                  | 100        | A    |
| Maximum Instantaneous Forward Voltage at 50A for Unidirectional Only (Note 4)                        | V <sub>F</sub>                    | 3.5V/5.0   | V    |
| Operating Junction and Storage Temperature Range                                                     | T <sub>J</sub> , T <sub>STG</sub> | -55 to 150 | °C   |
| Typical Thermal Resistance Junction to Lead                                                          | R <sub>θJL</sub>                  | 20         | °C/W |
| Typical Thermal Resistance Junction to Ambient                                                       | R <sub>θJA</sub>                  | 100        | °C/W |

#### Notes:

1. Non-repetitive current pulse, per Fig. 4 and derated above T<sub>A</sub> = 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 device only, duty cycle=4 per minute maximum.
4. V<sub>F</sub><3.5V for V<sub>BR</sub> ≤ 200V and V<sub>F</sub><5.0V for V<sub>BR</sub> ≥ 201V.

### Functional Diagram



### Description

The P6SMB series is designed specifically to protect sensitive electronic equipment from voltage transients induced by lightning and other transient voltage events.

### Features

- Excellent clamping capability
- Low incremental surge resistance
- Typical I<sub>R</sub> less than 1µA above 12V
- For surface mounted applications 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
- 600W 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
- V<sub>BR</sub> @T<sub>J</sub> = V<sub>BR</sub> @25°C x (1 + α T x (T<sub>J</sub> - 25)) (α T: Temperature Coefficient)
- Glass passivated chip junction
- High temperature soldering guaranteed: 260°C/40 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<sub>CC</sub> bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

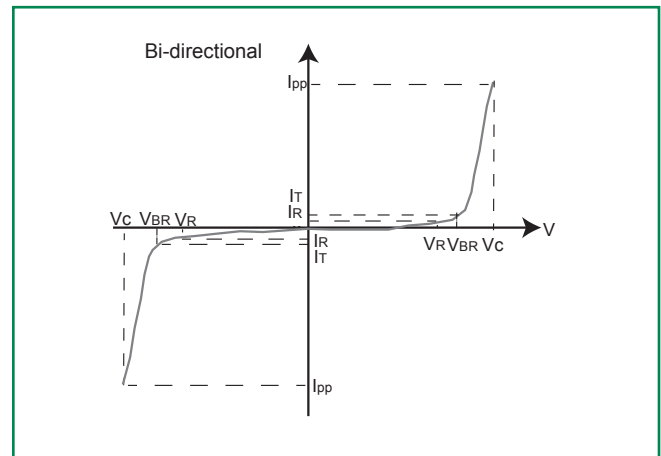
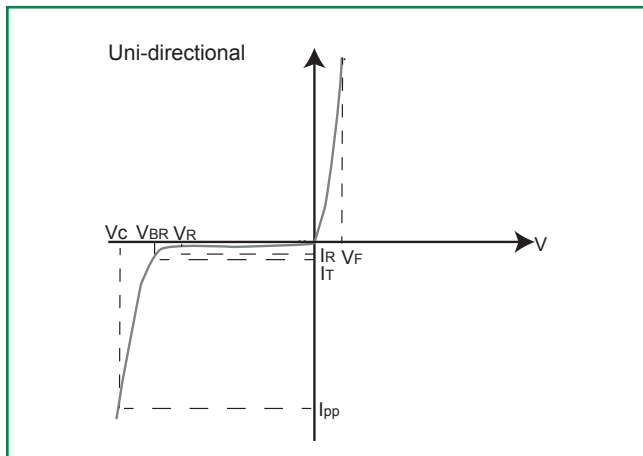
### Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Part Number (Uni) | Part Number (Bi) | Marking |      | Reverse Stand off Voltage V <sub>R</sub> (Volts) | Breakdown Voltage V <sub>BR</sub> (Volts) @ I <sub>T</sub> |        | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage V <sub>C</sub> @ I <sub>pp</sub> (V) | Maximum Peak Pulse Current I <sub>pp</sub> (A) | Maximum Reverse Leakage I <sub>R</sub> @ V <sub>R</sub> (μA) | Agency Approval  |
|-------------------|------------------|---------|------|--------------------------------------------------|------------------------------------------------------------|--------|----------------------------------|---------------------------------------------------------------|------------------------------------------------|--------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
|                   |                  | UNI     | BI   |                                                  | MIN                                                        | MAX    |                                  |                                                               |                                                |                                                              |                                                                                                     |
| P6SMB6.8A         | P6SMB6.8CA       | 6V8A    | 6V8C | 5.80                                             | 6.45                                                       | 7.14   | 10                               | 10.5                                                          | 58.1                                           | 1000                                                         | X                                                                                                   |
| P6SMB7.5A         | P6SMB7.5CA       | 7V5A    | 7V5C | 6.40                                             | 7.13                                                       | 7.88   | 10                               | 11.3                                                          | 54.0                                           | 500                                                          | X                                                                                                   |
| P6SMB8.2A         | P6SMB8.2CA       | 8V2A    | 8V2C | 7.02                                             | 7.79                                                       | 8.61   | 10                               | 12.1                                                          | 50.4                                           | 200                                                          | X                                                                                                   |
| P6SMB9.1A         | P6SMB9.1CA       | 9V1A    | 9V1C | 7.78                                             | 8.65                                                       | 9.55   | 1                                | 13.4                                                          | 45.5                                           | 50                                                           | X                                                                                                   |
| P6SMB10A          | P6SMB10CA        | 10A     | 10C  | 8.55                                             | 9.50                                                       | 10.50  | 1                                | 14.5                                                          | 42.1                                           | 10                                                           | X                                                                                                   |
| P6SMB11A          | P6SMB11CA        | 11A     | 11C  | 9.40                                             | 10.50                                                      | 11.60  | 1                                | 15.6                                                          | 39.1                                           | 5                                                            | X                                                                                                   |
| P6SMB12A          | P6SMB12CA        | 12A     | 12C  | 10.20                                            | 11.40                                                      | 12.60  | 1                                | 16.7                                                          | 36.5                                           | 5                                                            | X                                                                                                   |
| P6SMB13A          | P6SMB13CA        | 13A     | 13C  | 11.10                                            | 12.40                                                      | 13.70  | 1                                | 18.2                                                          | 33.5                                           | 1                                                            | X                                                                                                   |
| P6SMB15A          | P6SMB15CA        | 15A     | 15C  | 12.80                                            | 14.30                                                      | 15.80  | 1                                | 21.2                                                          | 28.8                                           | 1                                                            | X                                                                                                   |
| P6SMB16A          | P6SMB16CA        | 16A     | 16C  | 13.60                                            | 15.20                                                      | 16.80  | 1                                | 22.5                                                          | 27.1                                           | 1                                                            | X                                                                                                   |
| P6SMB18A          | P6SMB18CA        | 18A     | 18C  | 15.30                                            | 17.10                                                      | 18.90  | 1                                | 25.5                                                          | 24.2                                           | 1                                                            | X                                                                                                   |
| P6SMB20A          | P6SMB20CA        | 20A     | 20C  | 17.10                                            | 19.00                                                      | 21.00  | 1                                | 27.7                                                          | 22.0                                           | 1                                                            | X                                                                                                   |
| P6SMB22A          | P6SMB22CA        | 22A     | 22C  | 18.80                                            | 20.90                                                      | 23.10  | 1                                | 30.6                                                          | 19.9                                           | 1                                                            | X                                                                                                   |
| P6SMB24A          | P6SMB24CA        | 24A     | 24C  | 20.50                                            | 22.80                                                      | 25.20  | 1                                | 33.2                                                          | 18.4                                           | 1                                                            | X                                                                                                   |
| P6SMB27A          | P6SMB27CA        | 27A     | 27C  | 23.10                                            | 25.70                                                      | 28.40  | 1                                | 37.5                                                          | 16.3                                           | 1                                                            | X                                                                                                   |
| P6SMB30A          | P6SMB30CA        | 30A     | 30C  | 25.60                                            | 28.50                                                      | 31.50  | 1                                | 41.4                                                          | 14.7                                           | 1                                                            | X                                                                                                   |
| P6SMB33A          | P6SMB33CA        | 33A     | 33C  | 28.20                                            | 31.40                                                      | 34.70  | 1                                | 45.7                                                          | 13.3                                           | 1                                                            | X                                                                                                   |
| P6SMB36A          | P6SMB36CA        | 36A     | 36C  | 30.80                                            | 34.20                                                      | 37.80  | 1                                | 49.9                                                          | 12.2                                           | 1                                                            | X                                                                                                   |
| P6SMB39A          | P6SMB39CA        | 39A     | 39C  | 33.30                                            | 37.10                                                      | 41.00  | 1                                | 53.9                                                          | 11.3                                           | 1                                                            | X                                                                                                   |
| P6SMB43A          | P6SMB43CA        | 43A     | 43C  | 36.80                                            | 40.90                                                      | 45.20  | 1                                | 59.3                                                          | 10.3                                           | 1                                                            | X                                                                                                   |
| P6SMB47A          | P6SMB47CA        | 47A     | 47C  | 40.20                                            | 44.70                                                      | 49.40  | 1                                | 64.8                                                          | 9.4                                            | 1                                                            | X                                                                                                   |
| P6SMB51A          | P6SMB51CA        | 51A     | 51C  | 43.60                                            | 48.50                                                      | 53.60  | 1                                | 70.1                                                          | 8.7                                            | 1                                                            | X                                                                                                   |
| P6SMB56A          | P6SMB56CA        | 56A     | 56C  | 47.80                                            | 53.20                                                      | 58.80  | 1                                | 77.0                                                          | 7.9                                            | 1                                                            | X                                                                                                   |
| P6SMB58A          | P6SMB58CA        | 58A     | 58C  | 52.78                                            | 55.10                                                      | 60.90  | 1                                | 79.8                                                          | 7.7                                            | 1                                                            | X                                                                                                   |
| P6SMB62A          | P6SMB62CA        | 62A     | 62C  | 53.00                                            | 58.90                                                      | 65.10  | 1                                | 85.0                                                          | 7.2                                            | 1                                                            | X                                                                                                   |
| P6SMB68A          | P6SMB68CA        | 68A     | 68C  | 58.10                                            | 64.60                                                      | 71.40  | 1                                | 92.0                                                          | 6.6                                            | 1                                                            | X                                                                                                   |
| P6SMB75A          | P6SMB75CA        | 75A     | 75C  | 64.10                                            | 71.30                                                      | 78.80  | 1                                | 103.0                                                         | 5.9                                            | 1                                                            | X                                                                                                   |
| P6SMB82A          | P6SMB82CA        | 82A     | 82C  | 70.10                                            | 77.90                                                      | 86.10  | 1                                | 113.0                                                         | 5.4                                            | 1                                                            | X                                                                                                   |
| P6SMB91A          | P6SMB91CA        | 91A     | 91C  | 77.80                                            | 86.50                                                      | 95.50  | 1                                | 125.0                                                         | 4.9                                            | 1                                                            | X                                                                                                   |
| P6SMB100A         | P6SMB100CA       | 100A    | 100C | 85.50                                            | 95.00                                                      | 105.00 | 1                                | 137.0                                                         | 4.5                                            | 1                                                            | X                                                                                                   |
| P6SMB110A         | P6SMB110CA       | 110A    | 110C | 94.00                                            | 105.00                                                     | 116.00 | 1                                | 152.0                                                         | 4.0                                            | 1                                                            | X                                                                                                   |
| P6SMB120A         | P6SMB120CA       | 120A    | 120C | 102.00                                           | 114.00                                                     | 126.00 | 1                                | 165.0                                                         | 3.7                                            | 1                                                            | X                                                                                                   |
| P6SMB130A         | P6SMB130CA       | 130A    | 130C | 111.00                                           | 124.00                                                     | 137.00 | 1                                | 179.0                                                         | 3.4                                            | 1                                                            | X                                                                                                   |
| P6SMB150A         | P6SMB150CA       | 150A    | 150C | 128.00                                           | 143.00                                                     | 158.00 | 1                                | 207.0                                                         | 2.9                                            | 1                                                            | X                                                                                                   |
| P6SMB160A         | P6SMB160CA       | 160A    | 160C | 136.00                                           | 152.00                                                     | 168.00 | 1                                | 219.0                                                         | 2.8                                            | 1                                                            | X                                                                                                   |
| P6SMB170A         | P6SMB170CA       | 170A    | 170C | 145.00                                           | 162.00                                                     | 179.00 | 1                                | 234.0                                                         | 2.6                                            | 1                                                            | X                                                                                                   |
| P6SMB180A         | P6SMB180CA       | 180A    | 180C | 154.00                                           | 171.00                                                     | 189.00 | 1                                | 246.0                                                         | 2.5                                            | 1                                                            | X                                                                                                   |
| P6SMB200A         | P6SMB200CA       | 200A    | 200C | 171.00                                           | 190.00                                                     | 210.00 | 1                                | 274.0                                                         | 2.2                                            | 1                                                            | X                                                                                                   |
| P6SMB220A         | P6SMB220CA       | 220A    | 220C | 185.00                                           | 209.00                                                     | 231.00 | 1                                | 328.0                                                         | 1.9                                            | 1                                                            | X                                                                                                   |
| P6SMB250A         | P6SMB250CA       | 250A    | 250C | 214.00                                           | 237.00                                                     | 263.00 | 1                                | 344.0                                                         | 1.8                                            | 1                                                            | X                                                                                                   |
| P6SMB300A         | P6SMB300CA       | 300A    | 300C | 256.00                                           | 285.00                                                     | 315.00 | 1                                | 414.0                                                         | 1.5                                            | 1                                                            | X                                                                                                   |
| P6SMB350A         | P6SMB350CA       | 350A    | 350C | 300.00                                           | 332.00                                                     | 368.00 | 1                                | 482.0                                                         | 1.3                                            | 1                                                            |                                                                                                     |
| P6SMB400A         | P6SMB400CA       | 400A    | 400C | 342.00                                           | 380.00                                                     | 420.00 | 1                                | 548.0                                                         | 1.1                                            | 1                                                            |                                                                                                     |
| P6SMB440A         | P6SMB440CA       | 440A    | 440C | 376.00                                           | 418.00                                                     | 462.00 | 1                                | 602.0                                                         | 1.0                                            | 1                                                            |                                                                                                     |
| P6SMB480A         | P6SMB480CA       | 480A    | 480C | 408.00                                           | 456.00                                                     | 504.00 | 1                                | 658.0                                                         | 0.9                                            | 1                                                            |                                                                                                     |
| P6SMB510A         | P6SMB510CA       | 510A    | 510C | 434.00                                           | 485.00                                                     | 535.00 | 1                                | 698.0                                                         | 0.9                                            | 1                                                            |                                                                                                     |
| P6SMB530A         | P6SMB530CA       | 530A    | 530C | 451.00                                           | 503.50                                                     | 556.50 | 1                                | 725.0                                                         | 0.8                                            | 1                                                            |                                                                                                     |
| P6SMB540A         | P6SMB540CA       | 540A    | 540C | 460.00                                           | 513.00                                                     | 567.00 | 1                                | 740.0                                                         | 0.8                                            | 1                                                            |                                                                                                     |
| P6SMB550A         | P6SMB550CA       | 550A    | 550C | 468.00                                           | 522.50                                                     | 577.50 | 1                                | 760.0                                                         | 0.8                                            | 1                                                            |                                                                                                     |

For bidirectional type having V<sub>R</sub> of 10 volts and less, the I<sub>R</sub> limit is double.

For parts without A V<sub>BR</sub> is ± 10% and V<sub>C</sub> is 5% higher than with A parts.

## I-V Curve Characteristics



**P<sub>PPM</sub>** Peak Pulse Power Dissipation – Max power dissipation

**V<sub>R</sub>** Stand-off Voltage – Maximum voltage that can be applied to the TVS without operation

**V<sub>BR</sub>** Breakdown Voltage – Maximum voltage that flows through the TVS at a specified test current (I<sub>T</sub>)

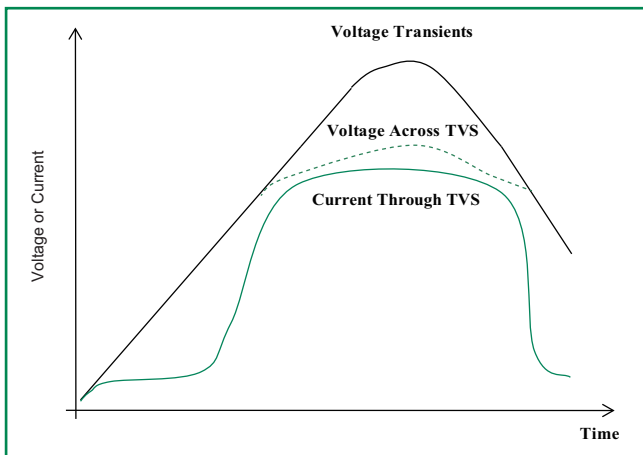
**V<sub>C</sub>** Clamping Voltage – Peak voltage measured across the suppressor at a specified I<sub>ppm</sub> (peak impulse current)

**I<sub>R</sub>** Reverse Leakage Current – Current measured at V<sub>R</sub>

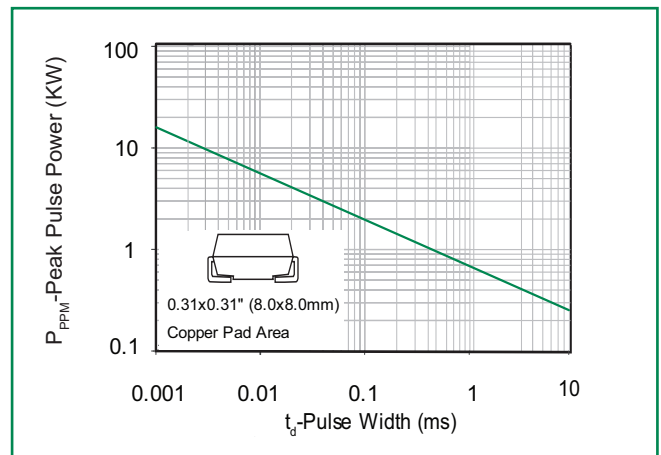
**V<sub>F</sub>** Forward Voltage Drop for Uni-directional

## Ratings and Characteristic Curves (T<sub>A</sub>=25°C unless otherwise noted)

**Figure 1 - TVS Transients Clamping Waveform**



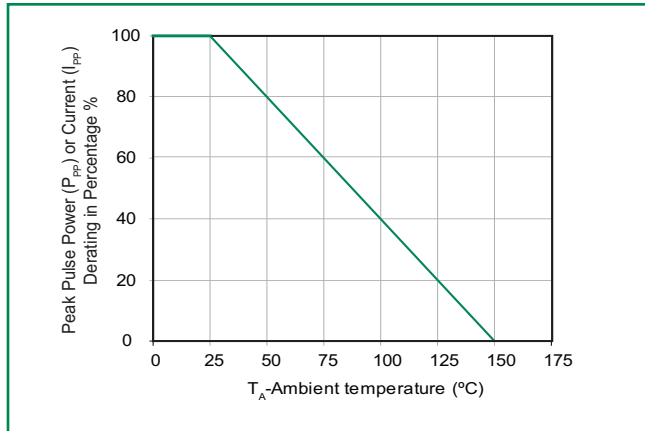
**Figure 2 - Peak Pulse Power Rating**



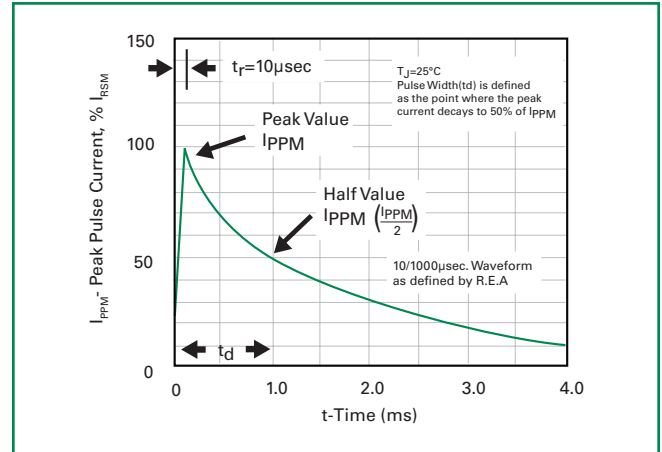
continues on next page.

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

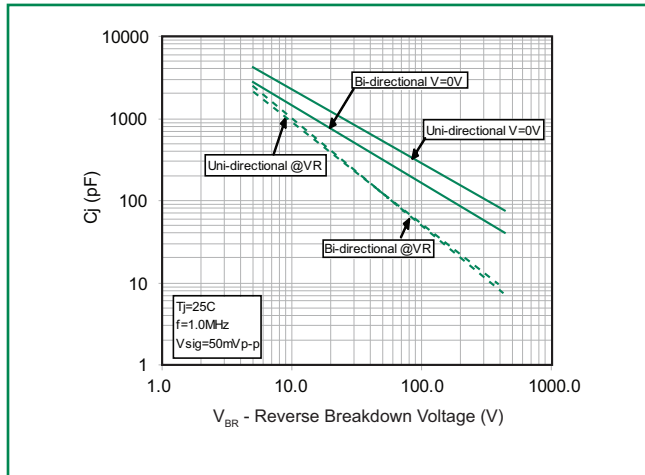
**Figure 3 - Peak Pulse Power or Current Derating Curve vs Initial Junction Temperature**



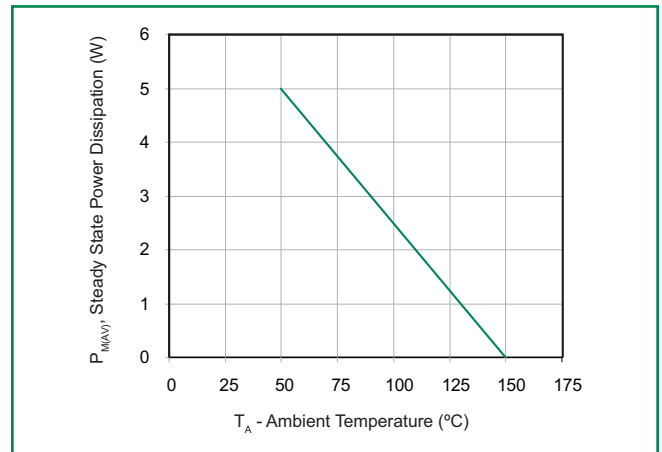
**Figure 4 - Pulse Waveform**



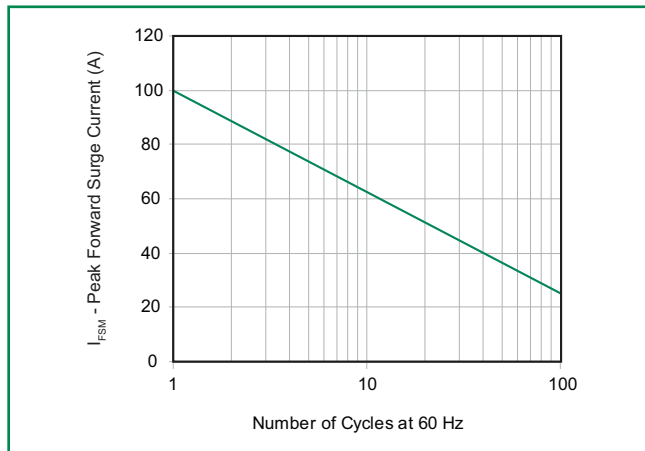
**Figure 5- Typical Junction Capacitance**



**Figure 6 - Steady State Power Dissipation Derating Curve**

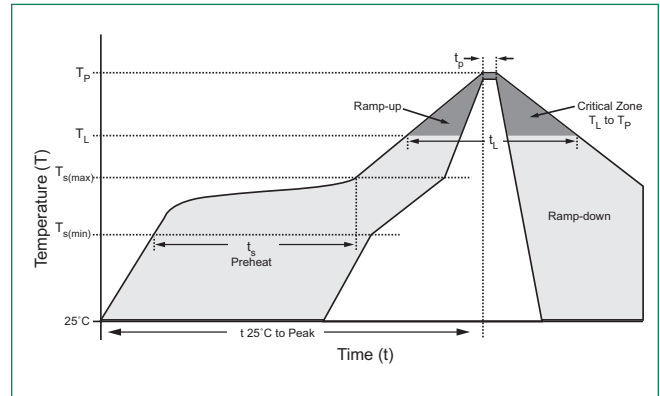


**Figure 7- Maximum Non-Repetitive Peak Forward Surge Current Uni-Directional Only**



### 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 – 180 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 <sup>+0/-5</sup> °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                                          |                                    | 280°C                   |



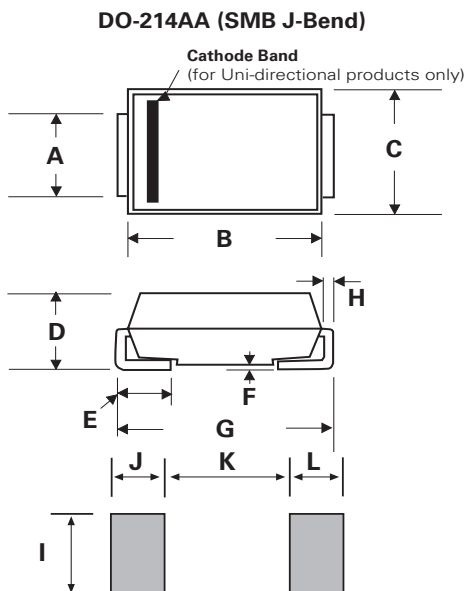
### Physical Specifications

|                 |                                                                   |
|-----------------|-------------------------------------------------------------------|
| <b>Weight</b>   | 0.003 ounce, 0.093 grams                                          |
| <b>Case</b>     | JEDEC DO214AA. Molded plastic body over glass passivated junction |
| <b>Polarity</b> | Color band denotes cathode except Bidirectional.                  |
| <b>Terminal</b> | Matte Tin-plated leads, Solderable per JESD22-B102                |

### Environmental Specifications

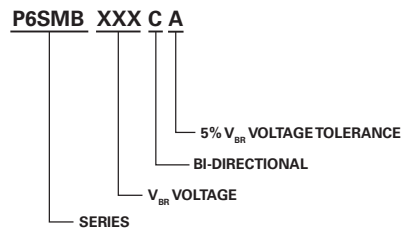
|                            |                          |
|----------------------------|--------------------------|
| <b>High Temp. Storage</b>  | JESD22-A103              |
| <b>HTRB</b>                | JESD22-A108              |
| <b>Temperature Cycling</b> | JESD22-A104              |
| <b>MSL</b>                 | JEDEC-J-STD-020, Level 1 |
| <b>H3TRB</b>               | JESD22-A101              |
| <b>RSH</b>                 | JESD22-B106              |

### Dimensions

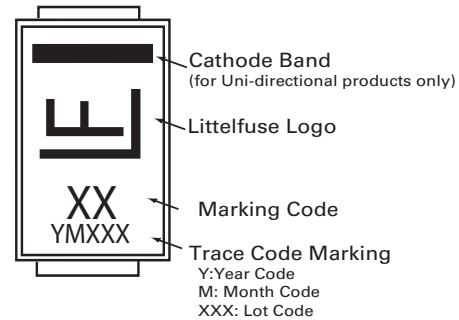


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.077  | 0.086 | 1.950       | 2.200 |
| B          | 0.160  | 0.180 | 4.060       | 4.570 |
| C          | 0.130  | 0.155 | 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  | 0.016 | 0.152       | 0.405 |
| 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 |
|-------------|-------------------|----------|----------------------------------|-------------------------|
| P6SMBxxxXX  | DO-214AA          | 3000     | Tape & Reel - 12mm tape/13" reel | EIA STD RS-481          |

### Tape and Reel Specification

