

## Transient Voltage Suppressors (TVS) Data Sheet

### Features

- For surface mounted applications in order to optimize board space
- Low profile package
- Built-in strain relief
- Glass passivated junction
- Low inductance
- Excellent clamping capability
- 600W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycle): 0.01%
- Fast response time
- Typical IR less than 1 µ A above 12V
- High Temperature soldering: 260°C/10 seconds at terminals
- Plastic package has underwriters laboratory flammability 94V-0
- Meets MSL level 1, per J-STD-020
- Safety certification: UL: E244458
- IEC61000-4-2 ESD 30KV Air, 30KV contact compliance



### Mechanical Data

- Case: JEDEC DO-214AA. Molded plastic over glass passivated junction
- Terminal: Tin plated, solderable per MIL-STD-750, Method 2026
- Polarity: Color band denotes cathode except bi-directional models
- Standard Packaging: 12mm tape (EIA STD RS-481)
- Weight: 0.10g

### Applications

- I/O interface
- AC/DC power supply
- Low frequency signal transmission line (RS232, RS485, etc.)

### Maximum Ratings and Characteristics

Ratings at 25°C ambient temperature unless otherwise specified.

| Rating  | Symbol                            | Value       | Units |
|---|-----------------------------------|-------------|-------|
| Peak pulse power dissipation at 10/1000µs waveform (Note1, Note2, Fig.1)  | P <sub>PPM</sub>                  | Minimum 600 | Watts |
| Peak pulse current of at 10/1000µs waveform (Note 1, Fig.3)   | I <sub>PPM</sub>                  | See Table   | Amps  |
| Steady state power dissipation at T <sub>A</sub> =50°C (Fig.5)  | P <sub>M(AV)</sub>                | 5.0         | Watts |
| Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load, (JEDEC Method) (Note3, Fig.6) | I <sub>FSM</sub>                  | 100         | Amps  |
| 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.3 and derated above T<sub>A</sub>=25°C per Fig.2.

2. Mounted on 5.0mm×5.0mm (0.03mm thick) copper pads to each terminal.

3. 8.3ms single half sine-wave, or equivalent square wave, duty cycle=4 pulses per minutes maximum.

**Dimensions (SMB/DO-214AA)**

| Symbol | Millimeters |       | Inches |       |
|--------|-------------|-------|--------|-------|
|        | Min.        | Max.  | Min.   | Max.  |
| L      | 4.06        | 4.57  | 0.160  | 0.180 |
| D      | 3.30        | 3.94  | 0.130  | 0.155 |
| D1     | 1.95        | 2.20  | 0.077  | 0.086 |
| T      | 5.21        | 5.59  | 0.205  | 0.220 |
| T1     | 0.76        | 1.52  | 0.030  | 0.060 |
| d      | -           | 0.203 | -      | 0.008 |
| H      | 2.15        | 2.65  | 0.085  | 0.104 |
| H1     | 2.13        | 2.47  | 0.084  | 0.097 |

**Electrical Characteristics (T<sub>A</sub>=25°C)**

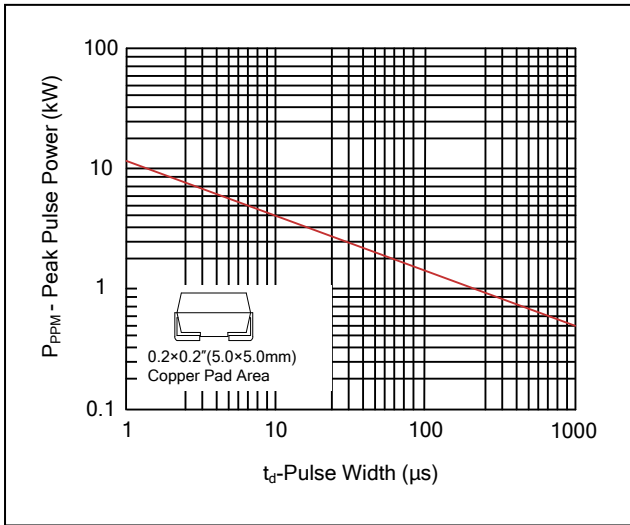
| Part Number    |               | Device Marking Code |      | Reverse Stand-Off Voltage | Breakdown Voltage @I <sub>T</sub> | Test Current        | Maximum Clamping Voltage @I <sub>PP</sub> | Peak Pulse Current  | Reverse Leakage @V <sub>RWM</sub> |
|----------------|---------------|---------------------|------|---------------------------|-----------------------------------|---------------------|---|---------------------|-----------------------------------|
| Unidirectional | Bidirectional | UNI                 | BI   | V <sub>RWM</sub> (V)      | V <sub>BR</sub> (V)               | I <sub>T</sub> (mA) | V <sub>C</sub> (V)                        | I <sub>PP</sub> (A) | I <sub>R</sub> (μA)               |
| P6SMB6.8A      | P6SMB6.8CA    | 6V8A                | 6V8C | 5.80                      | 6.45~7.14                         | 10                  | 10.5                                      | 58.1                | 1000                              |
| P6SMB7.5A      | P6SMB7.5CA    | 7V5A                | 7V5C | 6.40                      | 7.13~7.88                         | 10                  | 11.3                                      | 54.0                | 500                               |
| P6SMB8.2A      | P6SMB8.2CA    | 8V2A                | 8V2C | 7.02                      | 7.79~8.61                         | 10                  | 12.1                                      | 50.4                | 200                               |
| P6SMB9.1A      | P6SMB9.1CA    | 9V1A                | 9V1C | 7.78                      | 8.65~9.55                         | 1                   | 13.4                                      | 45.5                | 50                                |
| P6SMB10A       | P6SMB10CA     | 10A                 | 10C  | 8.55                      | 9.50~10.50                        | 1                   | 14.5                                      | 42.1                | 10                                |
| P6SMB11A       | P6SMB11CA     | 11A                 | 11C  | 9.40                      | 10.50~11.60                       | 1                   | 15.6                                      | 39.1                | 5                                 |
| P6SMB12A       | P6SMB12CA     | 12A                 | 12C  | 10.20                     | 11.40~12.60                       | 1                   | 16.7                                      | 36.5                | 5                                 |
| P6SMB13A       | P6SMB13CA     | 13A                 | 13C  | 11.10                     | 12.40~13.70                       | 1                   | 18.2                                      | 33.5                | 1                                 |
| P6SMB15A       | P6SMB15CA     | 15A                 | 15C  | 12.80                     | 14.30~15.80                       | 1                   | 21.2                                      | 28.8                | 1                                 |
| P6SMB16A       | P6SMB16CA     | 16A                 | 16C  | 13.60                     | 15.20~16.80                       | 1                   | 22.5                                      | 27.1                | 1                                 |
| P6SMB18A       | P6SMB18CA     | 18A                 | 18C  | 15.30                     | 17.10~18.90                       | 1                   | 25.2                                      | 24.2                | 1                                 |
| P6SMB20A       | P6SMB20CA     | 20A                 | 20C  | 17.10                     | 19.00~21.00                       | 1                   | 27.7                                      | 22.0                | 1                                 |
| P6SMB22A       | P6SMB22CA     | 22A                 | 22C  | 18.80                     | 20.90~23.10                       | 1                   | 30.6                                      | 19.9                | 1                                 |
| P6SMB24A       | P6SMB24CA     | 24A                 | 24C  | 20.50                     | 22.80~25.20                       | 1                   | 33.2                                      | 18.4                | 1                                 |
| P6SMB27A       | P6SMB27CA     | 27A                 | 27C  | 23.10                     | 25.70~28.40                       | 1                   | 37.5                                      | 16.3                | 1                                 |
| P6SMB30A       | P6SMB30CA     | 30A                 | 30C  | 25.60                     | 28.50~31.50                       | 1                   | 41.4                                      | 14.7                | 1                                 |
| P6SMB33A       | P6SMB33CA     | 33A                 | 33C  | 28.20                     | 31.40~34.70                       | 1                   | 45.7                                      | 13.3                | 1                                 |

**Electrical Characteristics (T<sub>A</sub>=25°C)**

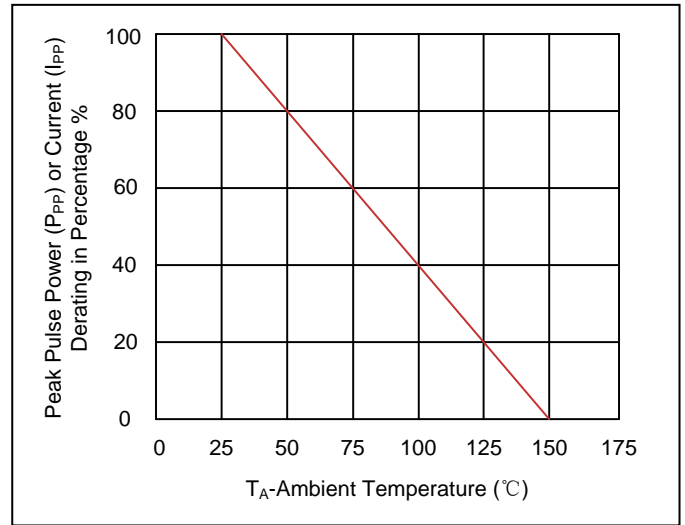
| Part Number    |               | Device Marking Code |      | Reverse Stand-Off Voltage | Breakdown Voltage @I <sub>T</sub> | Test Current        | Maximum Clamping Voltage @I <sub>PP</sub> | Peak Pulse Current  | Reverse Leakage @V <sub>RWM</sub> |
|----------------|---------------|---------------------|------|---------------------------|-----------------------------------|---------------------|---|---------------------|-----------------------------------|
| Unidirectional | Bidirectional | UNI                 | BI   | V <sub>RWM</sub> (V)      | V <sub>BR</sub> (V)               | I <sub>T</sub> (mA) | V <sub>C</sub> (V)                        | I <sub>PP</sub> (A) | I <sub>R</sub> (μA)               |
| P6SMB36A       | P6SMB36CA     | 36A                 | 36C  | 30.80                     | 34.20~37.80                       | 1                   | 49.9                                      | 12.2                | 1                                 |
| P6SMB39A       | P6SMB39CA     | 39A                 | 39C  | 33.30                     | 37.10~41.00                       | 1                   | 53.9                                      | 11.3                | 1                                 |
| P6SMB43A       | P6SMB43CA     | 43A                 | 43C  | 36.80                     | 40.90~45.20                       | 1                   | 59.3                                      | 10.3                | 1                                 |
| P6SMB47A       | P6SMB47CA     | 47A                 | 47C  | 40.20                     | 44.70~49.40                       | 1                   | 64.8                                      | 9.4                 | 1                                 |
| P6SMB51A       | P6SMB51CA     | 51A                 | 51C  | 43.60                     | 48.50~53.60                       | 1                   | 70.1                                      | 8.7                 | 1                                 |
| P6SMB56A       | P6SMB56CA     | 56A                 | 56C  | 47.80                     | 53.20~58.80                       | 1                   | 77.0                                      | 7.9                 | 1                                 |
| P6SMB62A       | P6SMB62CA     | 62A                 | 62C  | 53.00                     | 58.90~65.10                       | 1                   | 85.0                                      | 7.2                 | 1                                 |
| P6SMB68A       | P6SMB68CA     | 68A                 | 68C  | 58.10                     | 64.60~71.40                       | 1                   | 92.0                                      | 6.6                 | 1                                 |
| P6SMB75A       | P6SMB75CA     | 75A                 | 75C  | 64.10                     | 71.30~78.80                       | 1                   | 103.0                                     | 5.9                 | 1                                 |
| P6SMB82A       | P6SMB82CA     | 82A                 | 82C  | 70.10                     | 77.90~86.10                       | 1                   | 113.0                                     | 5.4                 | 1                                 |
| P6SMB91A       | P6SMB91CA     | 91A                 | 91C  | 77.80                     | 86.50~95.50                       | 1                   | 125.0                                     | 4.9                 | 1                                 |
| P6SMB100A      | P6SMB100CA    | 100A                | 100C | 85.50                     | 95.00~105.00                      | 1                   | 137.0                                     | 4.5                 | 1                                 |
| P6SMB110A      | P6SMB110CA    | 110A                | 110C | 94.00                     | 105.00~116.00                     | 1                   | 152.0                                     | 4.0                 | 1                                 |
| P6SMB120A      | P6SMB120CA    | 120A                | 120C | 102.00                    | 114.00~126.00                     | 1                   | 165.0                                     | 3.7                 | 1                                 |
| P6SMB130A      | P6SMB130CA    | 130A                | 130C | 111.00                    | 124.00~137.00                     | 1                   | 179.0                                     | 3.4                 | 1                                 |
| P6SMB150A      | P6SMB150CA    | 150A                | 150C | 128.00                    | 143.00~158.00                     | 1                   | 207.0                                     | 2.9                 | 1                                 |
| P6SMB160A      | P6SMB160CA    | 160A                | 160C | 136.00                    | 152.00~168.00                     | 1                   | 219.0                                     | 2.8                 | 1                                 |
| P6SMB170A      | P6SMB170CA    | 170A                | 170C | 145.00                    | 162.00~179.00                     | 1                   | 234.0                                     | 2.6                 | 1                                 |
| P6SMB180A      | P6SMB180CA    | 180A                | 180C | 154.00                    | 171.00~189.00                     | 1                   | 246.0                                     | 2.5                 | 1                                 |
| P6SMB200A      | P6SMB200CA    | 200A                | 200C | 171.00                    | 190.00~210.00                     | 1                   | 274.0                                     | 2.2                 | 1                                 |
| P6SMB220A      | P6SMB220CA    | 220A                | 220C | 185.00                    | 209.00~231.00                     | 1                   | 328.0                                     | 1.9                 | 1                                 |
| P6SMB250A      | P6SMB250CA    | 250A                | 250C | 214.00                    | 237.00~263.00                     | 1                   | 344.0                                     | 1.8                 | 1                                 |
| P6SMB300A      | P6SMB300CA    | 300A                | 300C | 256.00                    | 285.00~315.00                     | 1                   | 414.0                                     | 1.5                 | 1                                 |
| 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                                     | 1.04                | 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 | 450.00                    | 503.50~556.50                     | 1                   | 725.0                                     | 0.8                 | 1                                 |
| P6SMB540A      | P6SMB540CA    | 540A                | 540C | 459.00                    | 513.00~567.00                     | 1                   | 740.0                                     | 0.8                 | 1                                 |
| P6SMB550A      | P6SMB550CA    | 550A                | 550C | 467.00                    | 522.50~577.50                     | 1                   | 760.0                                     | 0.8                 | 1                                 |
| P6SMB600A      | P6SMB600CA    | 600A                | 600C | 510.00                    | 570.00~630.00                     | 1                   | 828.0                                     | 0.75                | 1                                 |

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

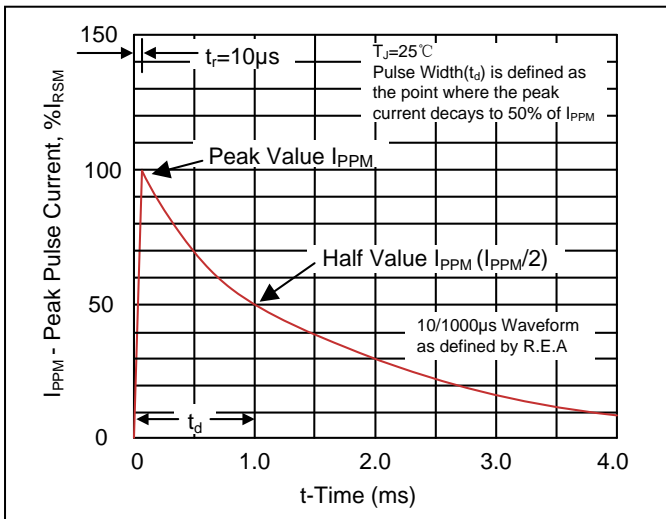
**Figure 1. Peak Pulse Power Rating Curve**



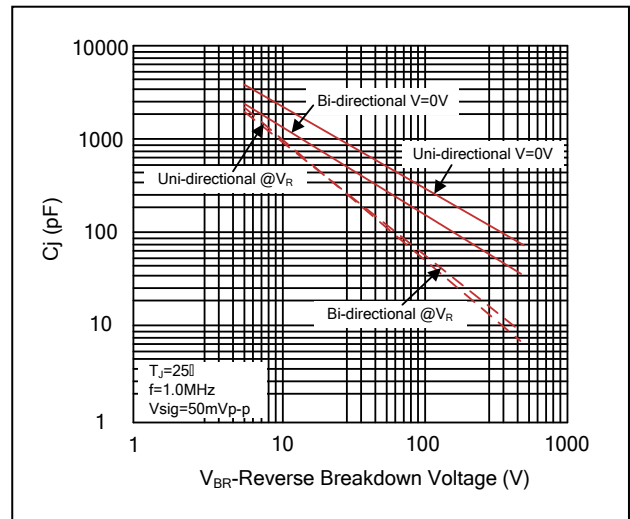
**Figure 2. Pulse Derating Curve**



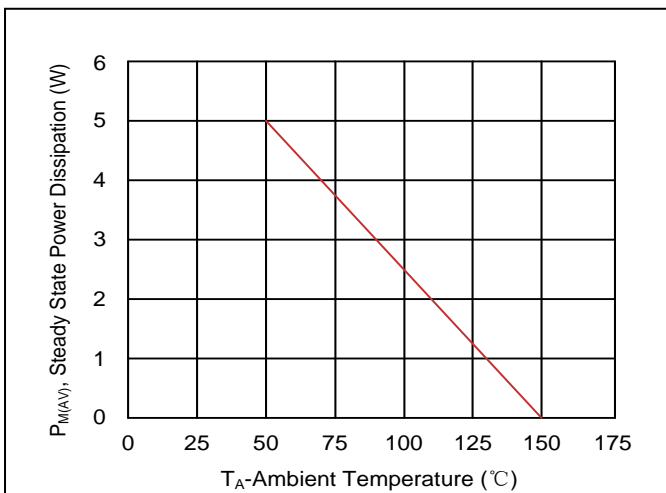
**Figure 3. Pulse Waveform**



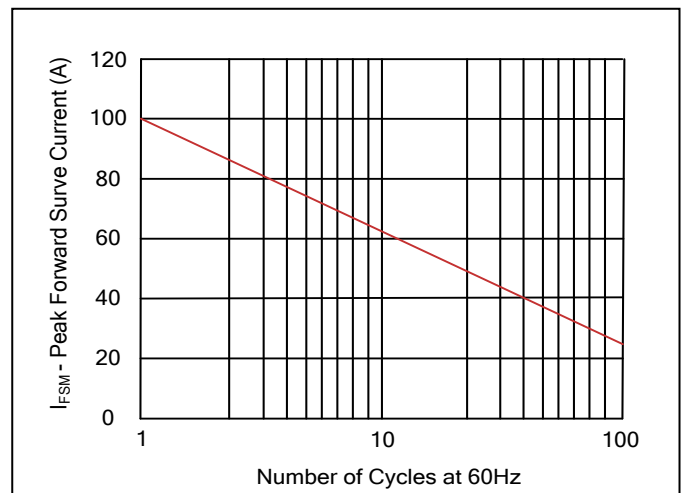
**Figure 4. Typical Junction Capacitance**



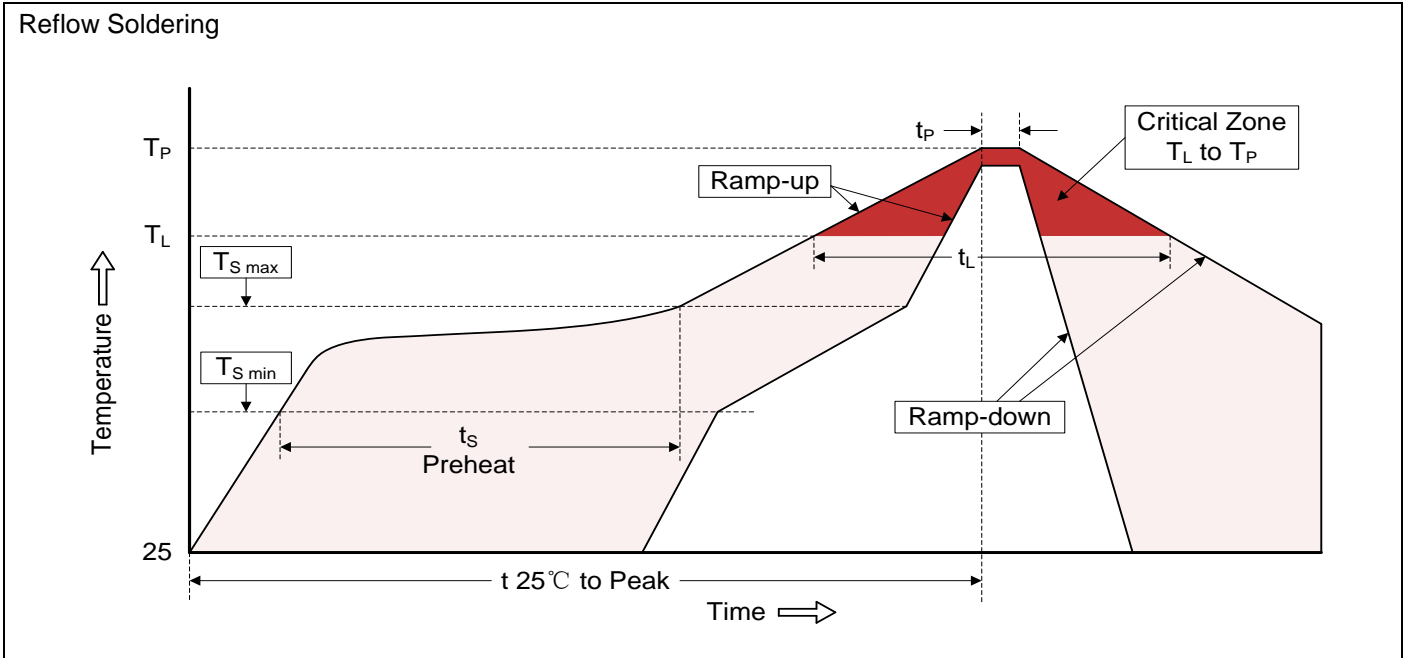
**Figure 5. Steady State Power Dissipation Derating Curve**



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



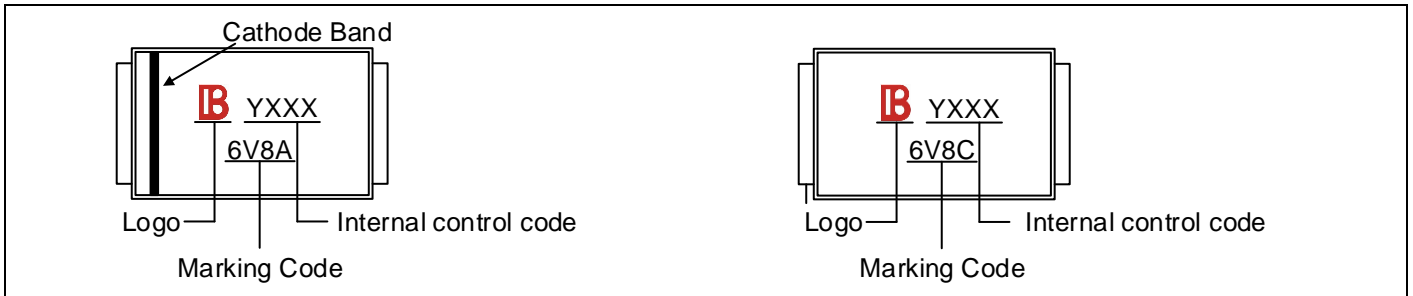
**Recommended Soldering Conditions**



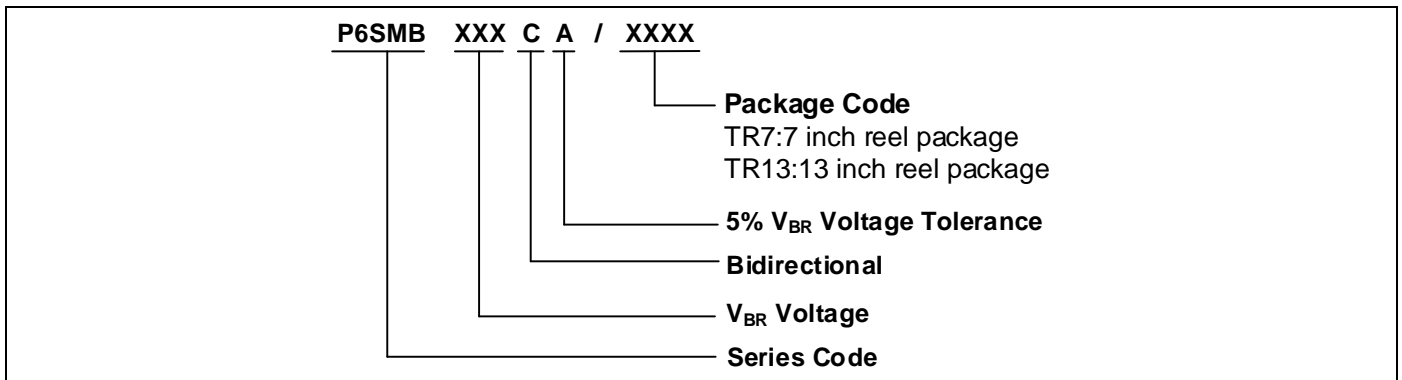
Recommended Conditions

| Profile Feature   | Pb-Free Assembly                 |
|---|----------------------------------|
| Average ramp-up rate ( $T_L$ to $T_P$ )   | 3°C/second max.                  |
| Preheat<br>-Temperature Min ( $T_{S\ min}$ )<br>-Temperature Max ( $T_{S\ max}$ )<br>-Time (min to max) ( $t_s$ ) | 150°C<br>200°C<br>60-180 seconds |
| $T_{S\ max}$ to $T_L$<br>-Ramp-up Rate  | 3°C/second max.                  |
| Time maintained above:<br>-Temperature ( $T_L$ )<br>-Time ( $t_L$ )   | 217°C<br>60-150 seconds          |
| Peak Temperature ( $T_P$ )  | 260°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   | 8 minutes max.                   |

## Marking Code



## Part Number Code

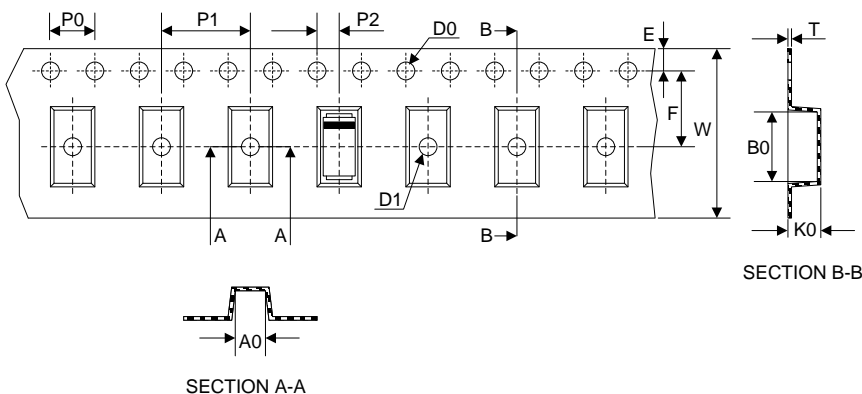
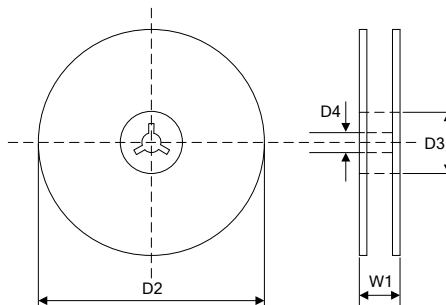
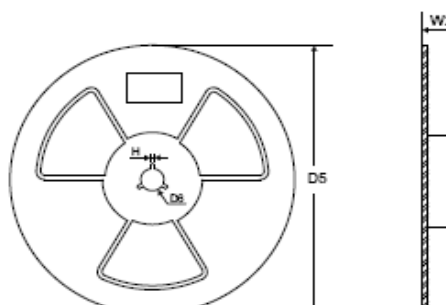


## Ordering Code for Different Package

7 inch reel package: Add suffix “ /TR7” at the end of the part number, such as P6SMBXXXCA/TR7

13 inch reel package: Add suffix “ /TR13” at the end of the part number, such as P6SMBXXXCA/TR13

**Packaging**

| Tape  | Symbol Dimension (mm) |            |
|---|-----------------------|------------|
|                    | W                     | 12.00±0.20 |
|   | P0                    | 4.00±0.10  |
|   | P1                    | 8.00±0.10  |
|   | P2                    | 2.00±0.10  |
|   | D0                    | Φ1.55±0.10 |
|   | D1                    | Φ1.5±0.10  |
|   | E                     | 1.75±0.10  |
|   | F                     | 5.50±0.10  |
|   | A0                    | 3.86±0.15  |
|   | B0                    | 5.65±0.10  |
| K0  | 2.75±0.15             |            |
| T   | 0.25±0.05             |            |
| <p>7" Reel</p>    | D2                    | Φ178.0±2.0 |
|   | D3                    | Φ50.0Min.  |
|   | D4                    | Φ13.0±0.5  |
|   | W1                    | 16.0±2.0   |
|   | Quantity: 500PCS      |            |
| <p>13" Reel</p>  | D5                    | Φ330.0±2.0 |
|   | D6                    | Φ13.5±0.5  |
|   | H                     | 2.5±1.0    |
|   | W2                    | 16.0±2.0   |
|   | Quantity: 3000PCS     |            |