

## 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
- 1500W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycle): 0.01%
- Fast response time
- Typical  $I_R$  less than 1µA above 10V
- 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



### Mechanical Data

- Case: JEDEC DO-214AB. Molded plastic over glass passivated junction
- Terminal: Solder plated, solderable per MIL-STD-750, Method 2026
- Polarity: Color band denotes cathode except bi-directional models
- Standard Packaging: 16mm tape (EIA STD RS-481)
- Weight: 0.26g

### 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)  | $P_{PPM}$       | Minimum 1500 | Watts |
| Peak pulse current of at 10/1000µs waveform (Note 1, Fig.3)   | $I_{PPM}$       | See Table    | Amps  |
| Steady state power dissipation at $T_A=50^\circ\text{C}$ (Fig.5)  | $P_{M(AV)}$     | 6.5          | Watts |
| Peak forward surge current, 8.3ms single half sine-wave superimposed on rated load, (JEDEC Method) (Note3, Fig.6) | $I_{FSM}$       | 200          | Amps  |
| Operating junction and Storage Temperature Range.   | $T_J, T_{STG}$  | -55 to +150  | °C    |
| Typical thermal resistance junction to lead   | $R_{\theta JL}$ | 15           | °C/W  |
| Typical thermal resistance junction to ambient  | $R_{\theta JA}$ | 75           | °C/W  |

Notes: 1. Non-repetitive current pulse, per Fig.3 and derated above  $T_A=25^\circ\text{C}$  per Fig.2.

2. Mounted on 8.0mm×8.0mm copper pads to each terminal.

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

**Dimensions (SMC/DO-214AB)**

|  | Symbol | Millimeters |       | Inches |       |
|--|--------|-------------|-------|--------|-------|
|  |        | Min.        | Max.  | Min.   | Max.  |
|  | L      | 6.60        | 7.11  | 0.260  | 0.280 |
|  | D      | 5.59        | 6.22  | 0.220  | 0.245 |
|  | D1     | 2.90        | 3.20  | 0.114  | 0.126 |
|  | T      | 7.75        | 8.13  | 0.305  | 0.320 |
|  | T1     | 0.76        | 1.52  | 0.030  | 0.060 |
|  | d      | -           | 0.203 | -      | 0.008 |
|  | H      | 2.20        | 2.80  | 0.087  | 0.110 |
|  | H1     | 2.06        | 2.62  | 0.079  | 0.103 |

**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)               |
| SMCJ5.0A       | SMCJ5.0CA     | GDE                 | BDE | 5.0                       | 6.40~7.00                         | 10                  | 9.2                                       | 163.0               | 800                               |
| SMCJ6.0A       | SMCJ6.0CA     | GDG                 | BDG | 6.0                       | 6.67~7.37                         | 10                  | 10.3                                      | 145.7               | 800                               |
| SMCJ6.5A       | SMCJ6.5CA     | GDK                 | BDK | 6.5                       | 7.22~7.98                         | 10                  | 11.2                                      | 134.0               | 500                               |
| SMCJ7.0A       | SMCJ7.0CA     | GDM                 | BDM | 7.0                       | 7.78~8.60                         | 10                  | 12.0                                      | 125.0               | 200                               |
| SMCJ7.5A       | SMCJ7.5CA     | GDP                 | BDP | 7.5                       | 8.33~9.21                         | 1                   | 12.9                                      | 116.3               | 100                               |
| SMCJ8.0A       | SMCJ8.0CA     | GDR                 | BDR | 8.0                       | 8.89~9.83                         | 1                   | 13.6                                      | 110.3               | 50                                |
| SMCJ8.5A       | SMCJ8.5CA     | GDT                 | BDT | 8.5                       | 9.44~10.40                        | 1                   | 14.4                                      | 104.2               | 20                                |
| SMCJ9.0A       | SMCJ9.0CA     | GDV                 | BDV | 9.0                       | 10.00~11.10                       | 1                   | 15.4                                      | 97.4                | 10                                |
| SMCJ10A        | SMCJ10CA      | GDX                 | BDX | 10.0                      | 11.10~12.30                       | 1                   | 17.0                                      | 88.3                | 5                                 |
| SMCJ11A        | SMCJ11CA      | GDZ                 | BDZ | 11.0                      | 12.20~13.50                       | 1                   | 18.2                                      | 82.5                | 1                                 |
| SMCJ12A        | SMCJ12CA      | GEE                 | BEE | 12.0                      | 13.30~14.70                       | 1                   | 19.9                                      | 75.4                | 1                                 |
| SMCJ13A        | SMCJ13CA      | GEG                 | BEG | 13.0                      | 14.40~15.90                       | 1                   | 21.5                                      | 69.8                | 1                                 |
| SMCJ14A        | SMCJ14CA      | GEK                 | BEK | 14.0                      | 15.60~17.20                       | 1                   | 23.2                                      | 64.7                | 1                                 |
| SMCJ15A        | SMCJ15CA      | GEM                 | BEM | 15.0                      | 16.70~18.50                       | 1                   | 24.4                                      | 61.5                | 1                                 |
| SMCJ16A        | SMCJ16CA      | GEP                 | BEP | 16.0                      | 17.80~19.70                       | 1                   | 26.0                                      | 57.7                | 1                                 |
| SMCJ17A        | SMCJ17CA      | GER                 | BER | 17.0                      | 18.90~20.90                       | 1                   | 27.6                                      | 54.4                | 1                                 |
| SMCJ18A        | SMCJ18CA      | GET                 | BET | 18.0                      | 20.00~22.10                       | 1                   | 29.2                                      | 51.4                | 1                                 |
| SMCJ20A        | SMCJ20CA      | GEV                 | BEV | 20.0                      | 22.20~24.50                       | 1                   | 32.4                                      | 46.3                | 1                                 |
| SMCJ22A        | SMCJ22CA      | GEX                 | BEX | 22.0                      | 24.40~26.90                       | 1                   | 35.5                                      | 42.3                | 1                                 |
| SMCJ24A        | SMCJ24CA      | GEZ                 | BEZ | 24.0                      | 26.70~29.50                       | 1                   | 38.9                                      | 38.6                | 1                                 |

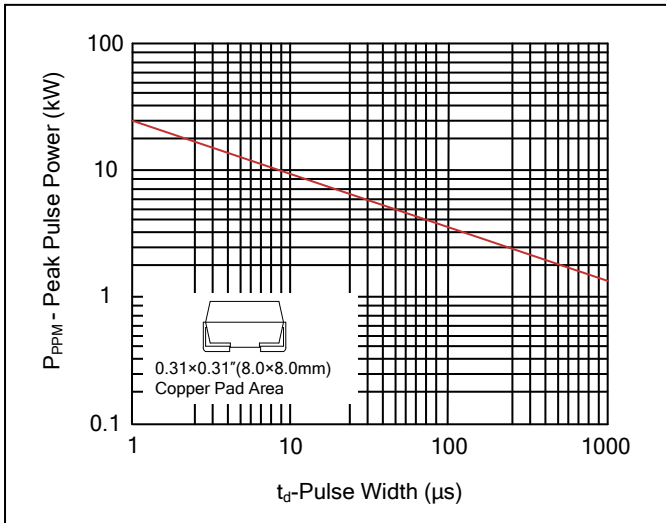
**Electrical Characteristics (T<sub>A</sub>=25°C)**

| 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)               |
| SMCJ26A        | SMCJ26CA      | GFE                 | BFE | 26.0                      | 28.90~31.90                       | 1                   | 42.1                                      | 35.7                | 1                                 |
| SMCJ28A        | SMCJ28CA      | GFG                 | BFG | 28.0                      | 31.10~34.40                       | 1                   | 45.4                                      | 33.1                | 1                                 |
| SMCJ30A        | SMCJ30CA      | GFK                 | BFK | 30.0                      | 33.30~36.80                       | 1                   | 48.4                                      | 31.0                | 1                                 |
| SMCJ33A        | SMCJ33CA      | GFM                 | BFM | 33.0                      | 36.70~40.60                       | 1                   | 53.3                                      | 28.2                | 1                                 |
| SMCJ36A        | SMCJ36CA      | GFP                 | BFP | 36.0                      | 40.00~44.20                       | 1                   | 58.1                                      | 25.9                | 1                                 |
| SMCJ40A        | SMCJ40CA      | GFR                 | BFR | 40.0                      | 44.40~49.10                       | 1                   | 64.5                                      | 23.3                | 1                                 |
| SMCJ43A        | SMCJ43CA      | GFT                 | BFT | 43.0                      | 47.80~52.80                       | 1                   | 69.4                                      | 21.7                | 1                                 |
| SMCJ45A        | SMCJ45CA      | GFV                 | BFV | 45.0                      | 50.00~55.30                       | 1                   | 72.7                                      | 20.6                | 1                                 |
| SMCJ48A        | SMCJ48CA      | GFX                 | BFX | 48.0                      | 53.30~58.90                       | 1                   | 77.4                                      | 19.4                | 1                                 |
| SMCJ51A        | SMCJ51CA      | GFZ                 | BFZ | 51.0                      | 56.70~62.70                       | 1                   | 82.4                                      | 18.2                | 1                                 |
| SMCJ54A        | SMCJ54CA      | GGE                 | BGE | 54.0                      | 60.00~66.30                       | 1                   | 87.1                                      | 17.3                | 1                                 |
| SMCJ58A        | SMCJ58CA      | GGG                 | BGG | 58.0                      | 64.40~71.20                       | 1                   | 93.6                                      | 16.1                | 1                                 |
| SMCJ60A        | SMCJ60CA      | GGK                 | BGK | 60.0                      | 66.70~73.70                       | 1                   | 96.8                                      | 15.5                | 1                                 |
| SMCJ64A        | SMCJ64CA      | GGM                 | BGM | 64.0                      | 71.10~78.60                       | 1                   | 103.0                                     | 14.6                | 1                                 |
| SMCJ70A        | SMCJ70CA      | GGP                 | BGP | 70.0                      | 77.80~86.00                       | 1                   | 113.0                                     | 13.3                | 1                                 |
| SMCJ75A        | SMCJ75CA      | GGR                 | BGR | 75.0                      | 83.30~92.10                       | 1                   | 121.0                                     | 12.4                | 1                                 |
| SMCJ78A        | SMCJ78CA      | GGT                 | BGT | 78.0                      | 86.70~95.80                       | 1                   | 126.0                                     | 11.9                | 1                                 |
| SMCJ85A        | SMCJ85CA      | GGV                 | BGV | 85.0                      | 94.40~104.00                      | 1                   | 137.0                                     | 11.0                | 1                                 |
| SMCJ90A        | SMCJ90CA      | GGX                 | BGX | 90.0                      | 100.00~111.00                     | 1                   | 146.0                                     | 10.3                | 1                                 |
| SMCJ100A       | SMCJ100CA     | GGZ                 | BGZ | 100.0                     | 111.00~123.00                     | 1                   | 162.0                                     | 9.3                 | 1                                 |
| SMCJ110A       | SMCJ110CA     | GHE                 | BHE | 110.0                     | 122.00~135.00                     | 1                   | 177.0                                     | 8.5                 | 1                                 |
| SMCJ120A       | SMCJ120CA     | GHG                 | BHG | 120.0                     | 133.00~147.00                     | 1                   | 193.0                                     | 7.8                 | 1                                 |
| SMCJ130A       | SMCJ130CA     | GHK                 | BHK | 130.0                     | 144.00~159.00                     | 1                   | 209.0                                     | 7.2                 | 1                                 |
| SMCJ150A       | SMCJ150CA     | GHM                 | BHM | 150.0                     | 167.00~185.00                     | 1                   | 243.0                                     | 6.2                 | 1                                 |
| SMCJ160A       | SMCJ160CA     | GHP                 | BHP | 160.0                     | 178.00~197.00                     | 1                   | 259.0                                     | 5.8                 | 1                                 |
| SMCJ170A       | SMCJ170CA     | GHR                 | BHR | 170.0                     | 189.00~209.00                     | 1                   | 275.0                                     | 5.5                 | 1                                 |
| SMCJ180A       | SMCJ180CA     | GHT                 | BHT | 180.0                     | 201.00~222.00                     | 1                   | 292.0                                     | 5.1                 | 1                                 |
| SMCJ190A       | SMCJ190CA     | GHU                 | BHU | 190.0                     | 211.00~233.00                     | 1                   | 308.0                                     | 4.8                 | 1                                 |
| SMCJ200A       | SMCJ200CA     | GHV                 | BHV | 200.0                     | 224.00~247.00                     | 1                   | 324.0                                     | 4.6                 | 1                                 |
| SMCJ210A       | SMCJ210CA     | GHW                 | BHW | 210.0                     | 237.00~263.00                     | 1                   | 340.0                                     | 4.4                 | 1                                 |
| SMCJ220A       | SMCJ220CA     | GHX                 | BHX | 220.0                     | 246.00~272.00                     | 1                   | 356.0                                     | 4.2                 | 1                                 |
| SMCJ250A       | SMCJ250CA     | GHZ                 | BHZ | 250.0                     | 279.00~309.00                     | 1                   | 405.0                                     | 3.7                 | 1                                 |
| SMCJ300A       | SMCJ300CA     | GJE                 | BJE | 300.0                     | 335.00~371.00                     | 1                   | 486.0                                     | 3.1                 | 1                                 |
| SMCJ350A       | SMCJ350CA     | GJG                 | BJG | 350.0                     | 391.00~432.00                     | 1                   | 567.0                                     | 2.6                 | 1                                 |
| SMCJ400A       | SMCJ400CA     | GJK                 | BJK | 400.0                     | 447.00~494.00                     | 1                   | 648.0                                     | 2.3                 | 1                                 |
| SMCJ440A       | SMCJ440CA     | GJM                 | BJM | 440.0                     | 492.00~543.00                     | 1                   | 713.0                                     | 2.1                 | 1                                 |

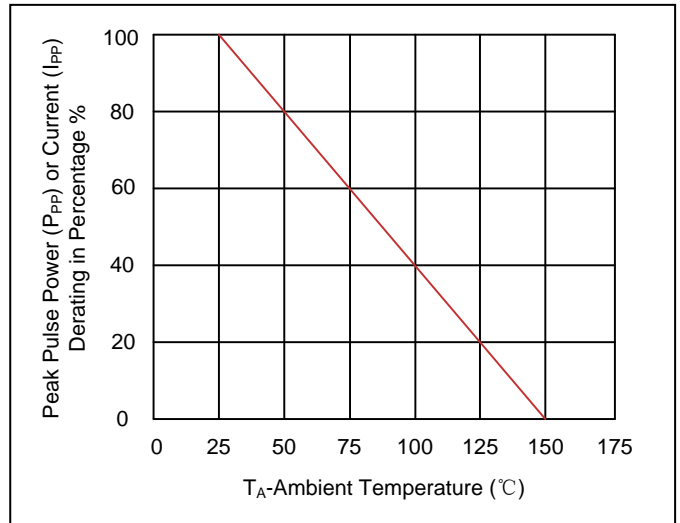
Notes: For bidirectional type having V<sub>RWM</sub> of 10V and less, the I<sub>R</sub> limit is double.

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

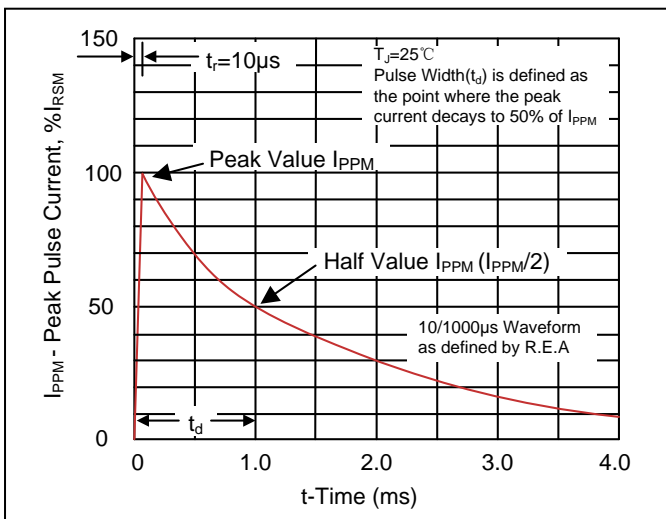
**Figure 1. Peak Pulse Power Rating Curve**



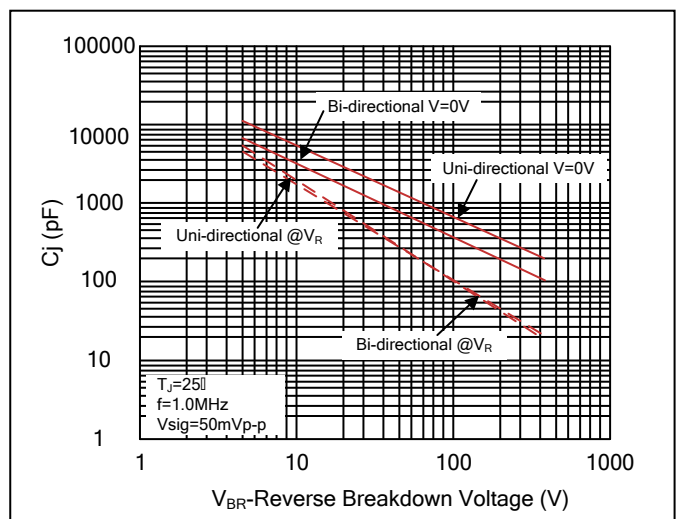
**Figure 2. Pulse Derating Curve**



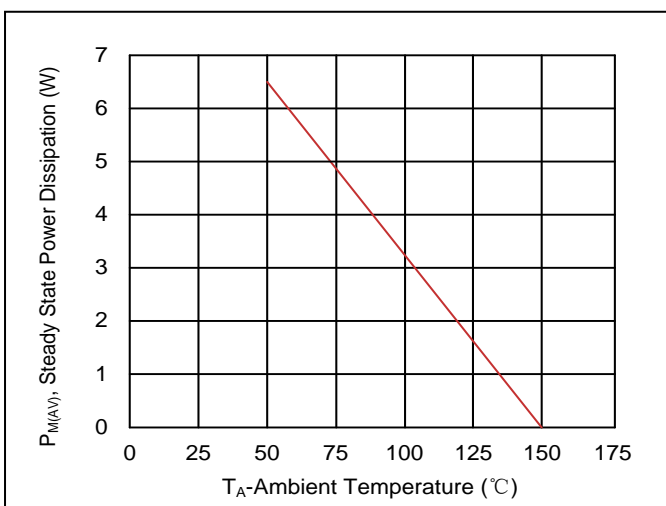
**Figure 3. Pulse Waveform**



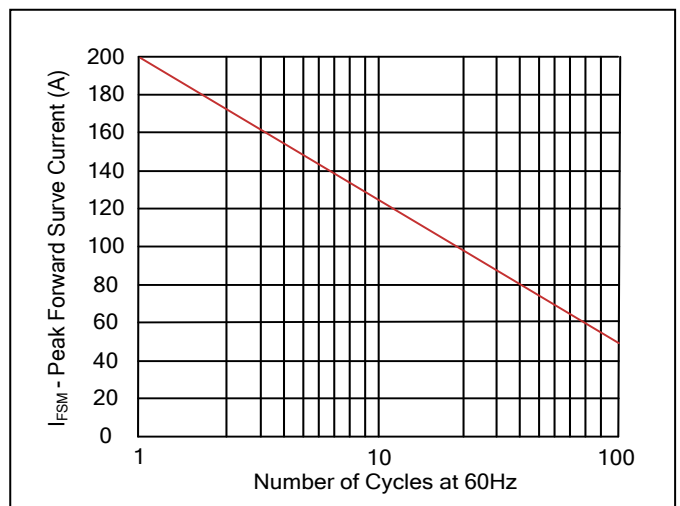
**Figure 4. Typical Junction Capacitance**



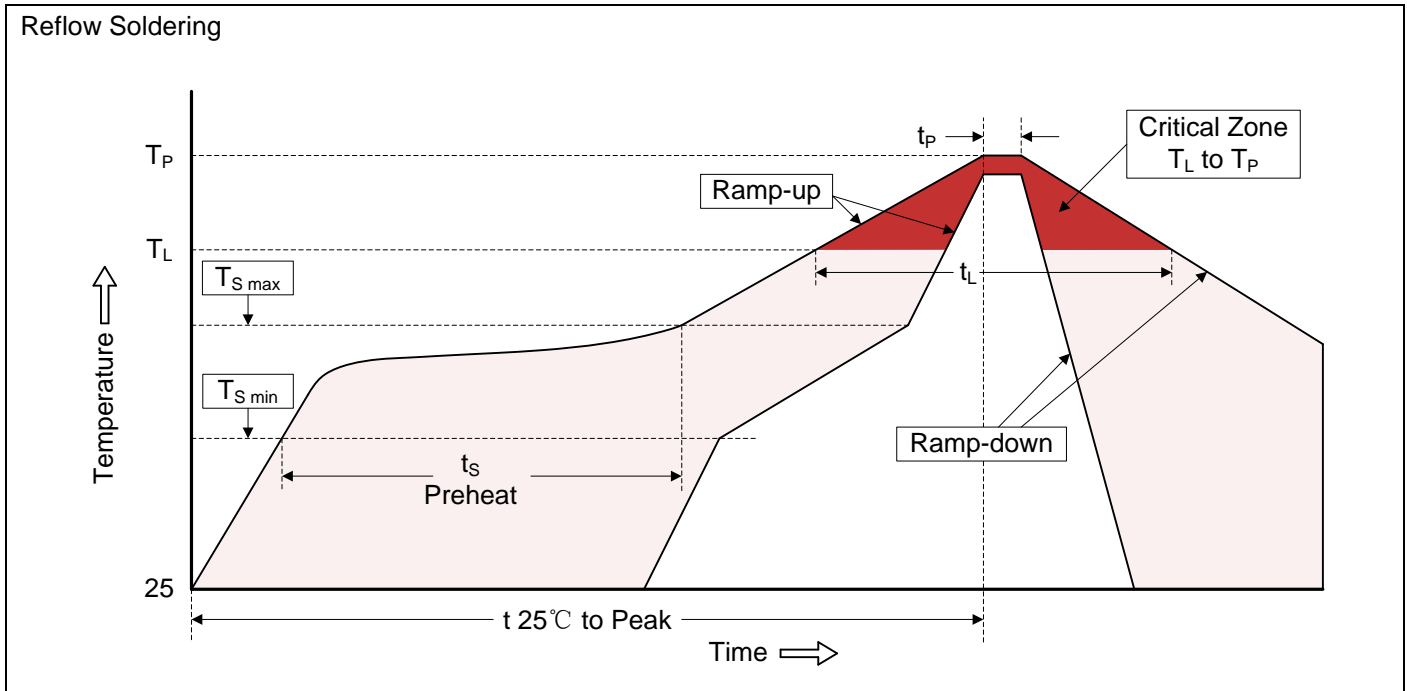
**Figure 5. Steady State Power Dissipation Derating Curve**



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



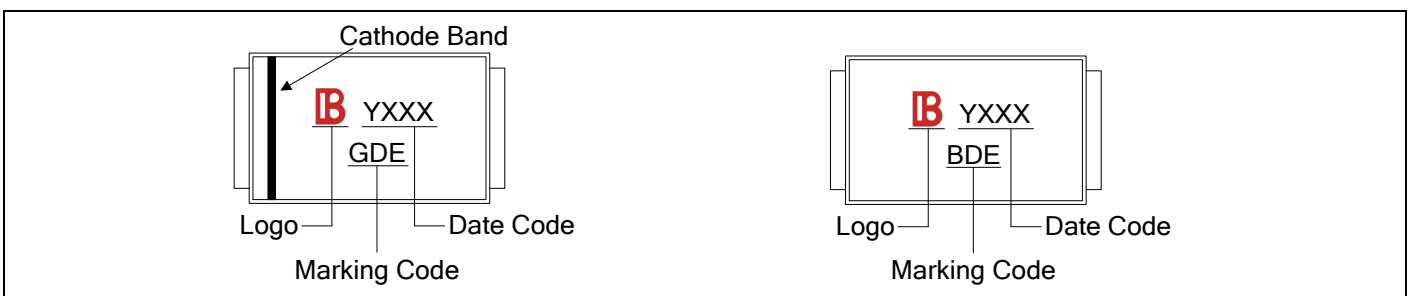
## Recommended Soldering Conditions



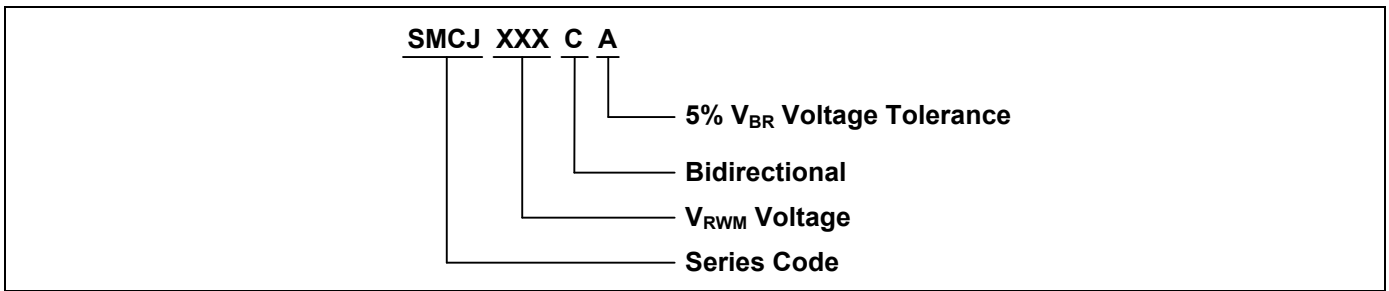
### Recommended Conditions

| Profile Feature   | Pb-Free Assembly                 |
|---|----------------------------------|
| Average ramp-up rate (T <sub>L</sub> to T <sub>P</sub> )  | 3°C/second max.                  |
| Preheat<br>-Temperature Min (T <sub>S min</sub> )<br>-Temperature Max (T <sub>S max</sub> )<br>-Time (min to max) (t <sub>s</sub> ) | 150°C<br>200°C<br>60-180 seconds |
| T <sub>S max</sub> to T <sub>L</sub><br>-Ramp-up Rate   | 3°C/second max.                  |
| Time maintained above:<br>-Temperature (T <sub>L</sub> )<br>-Time (t <sub>L</sub> )   | 217°C<br>60-150 seconds          |
| Peak Temperature (T <sub>P</sub> )  | 260°C                            |
| Time within 5°C of actual Peak Temperature (t <sub>p</sub> )  | 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 SMCJ75A/TR7

13 inch reel package: Add suffix “/TR13” at the end of the part number, such as SMCJ200CA/TR13

**Packaging**

| Tape     |           | Symbol            | Dimension (mm) |
|----------|-----------|-------------------|----------------|
|          |           | W                 | 16.00±0.20     |
|          |           | P0                | 4.00±0.10      |
|          |           | P1                | 8.00±0.10      |
|          |           | P2                | 2.00±0.10      |
|          |           | D0                | Φ1.5±0.10      |
|          |           | D1                | Φ1.5±0.10      |
|          |           | E                 | 1.75±0.10      |
|          |           | F                 | 7.50±0.10      |
|          |           | A0                | 6.27±0.15      |
|          |           | B0                | 8.30±0.10      |
|          |           | K0                | 3.15±0.15      |
|          |           | T                 | 0.30±0.05      |
|          |           | D2                | Φ178.0±2.0     |
|          |           | D3                | Φ50.0Min.      |
| D4       | Φ13.0±0.5 |                   |                |
| W1       | 20.0±2.0  |                   |                |
|          |           | Quantity: 500PCS  |                |
| 7" Reel  |           | D5                | Φ330.0±2.0     |
|          |           | D6                | Φ13.5±0.5      |
|          |           | H                 | 2.5±1.0        |
|          |           | W2                | 20.0±2.0       |
|          |           | Quantity: 3000PCS |                |
| 13" Reel |           |                   |                |
|          |           |                   |                |
|          |           |                   |                |
|          |           |                   |                |
|          |           |                   |                |

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