

## 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
- AEC-Q101 qualified



### 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)**

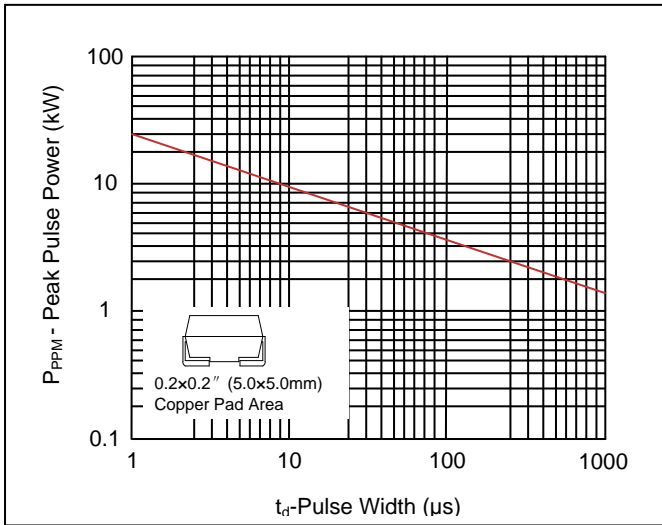
| Part Number    |               | Device Marking Code |     | Reverse Stand-Off Voltage | Breakdown Voltage @ I <sub>T</sub> | Test Current        | Maximum Clamping Voltage @ I <sub>PP</sub> | Peak Pulse Current  | Reverse Leakage @ V <sub>RWM</sub> |
|----------------|---------------|---------------------|-----|---------------------------|--------------------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

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

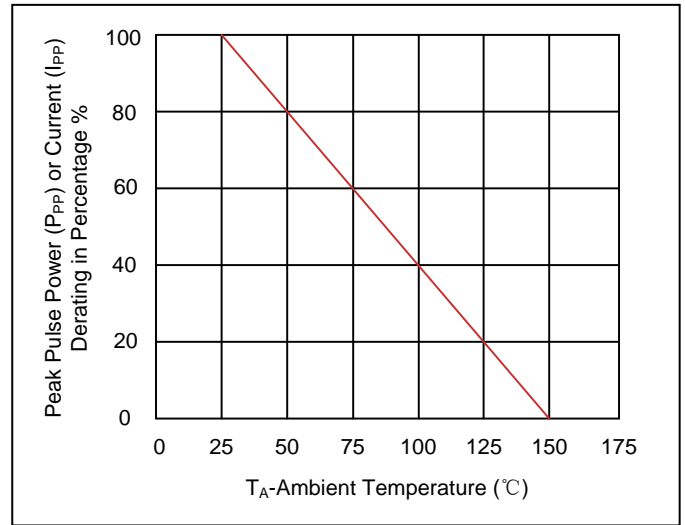
Notes: For bidirectional type having  $V_{RWM}$  of 10V and less, the  $I_R$  limit is double.

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

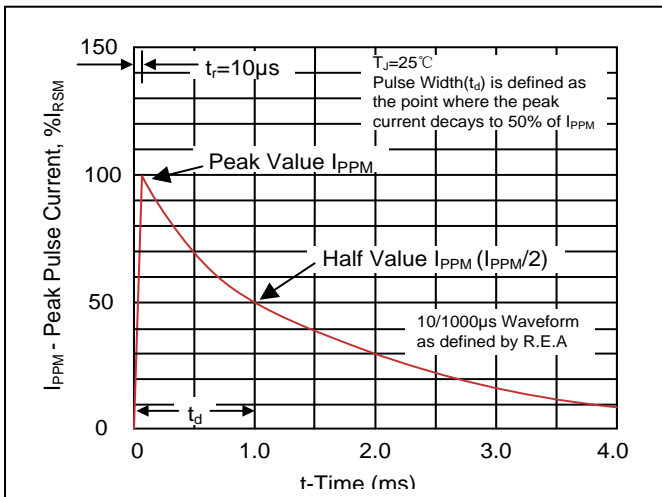
**Figure 1. Peak Pulse Power Rating Curve**



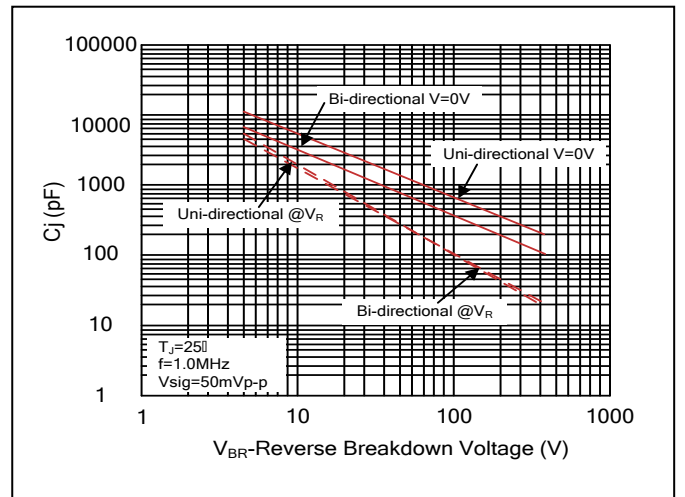
**Figure 2. Pulse Derating Curve**



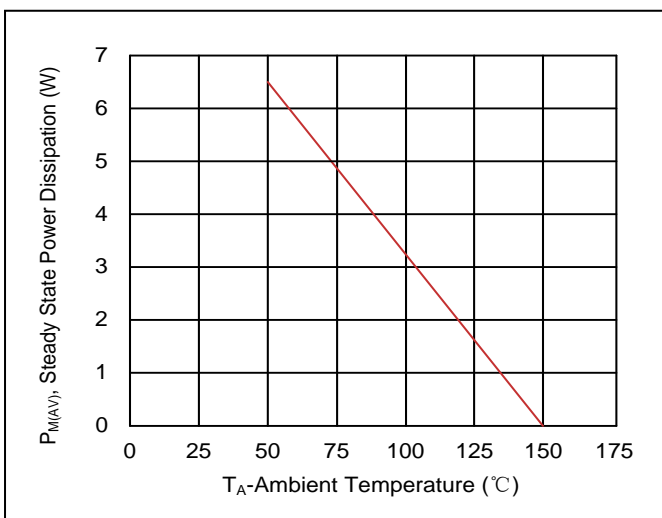
**Figure 3. Pulse Waveform**



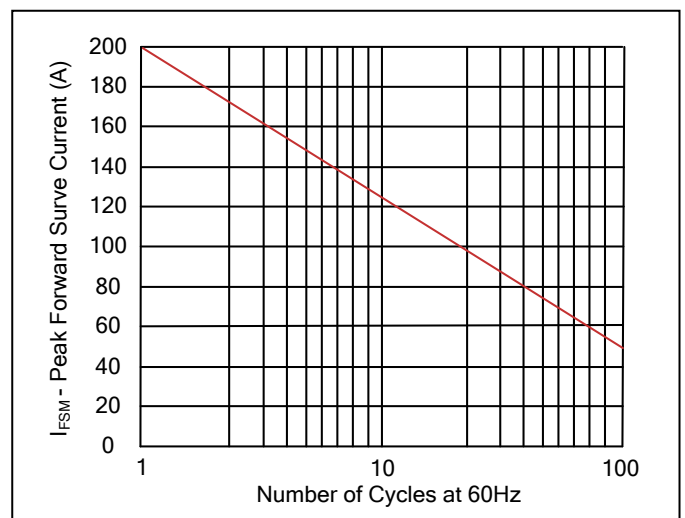
**Figure 4. Typical Junction Capacitance**



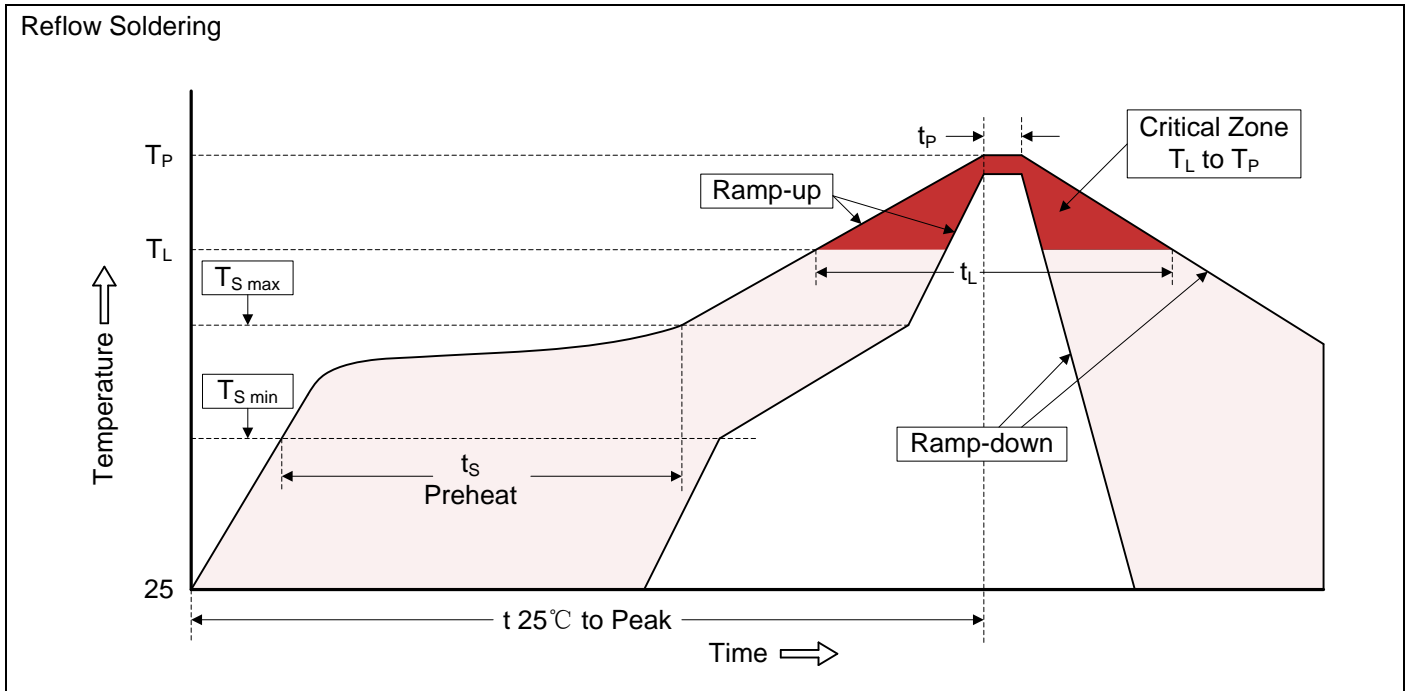
**Figure 5. Steady State Power Dissipation Derating Curve**



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



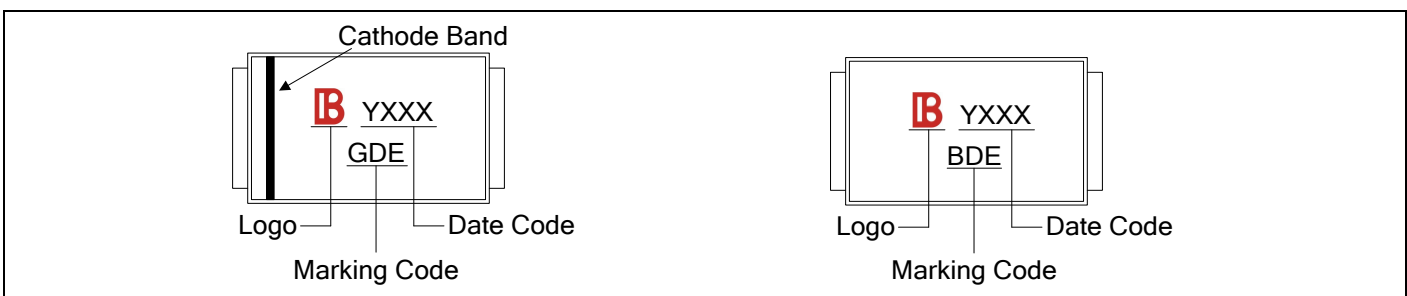
## Recommended Soldering Conditions



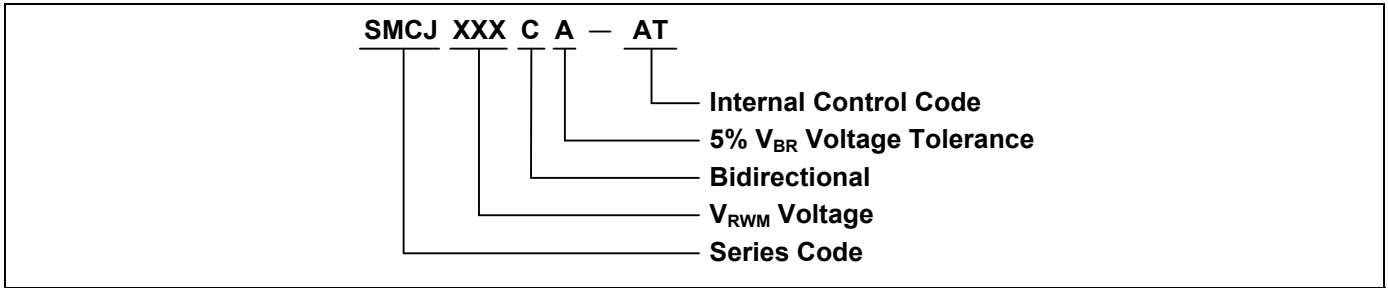
### Recommended Conditions

| Profile Feature   | Pb-Free Assembly                 |
|---|----------------------------------|
| Average ramp-up rate ( $T_L$ 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 SMCJ75A-AT/TR7

13 inch reel package: Add suffix "/TR13" at the end of the part number, such as SMCJ200CA-AT/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      |
|          |  | 7" Reel           |                |
|          |  | D3                | Φ50.0Min.      |
|          |  | D4                | Φ13.0±0.5      |
|          |  | W1                | 20.0 ±2.0      |
|          |  | Quantity: 500PCS  |                |
| 13" Reel |  | D5                | Φ330.0±2.0     |
|          |  | D6                | Φ13.5±0.5      |
|          |  | H                 | 2.5±1.0        |
|          |  | W2                | 20.0±2.0       |
|          |  | Quantity: 3000PCS |                |

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