

## 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
- 3000W peak pulse power capability at 10/1000 $\mu$ s waveform, repetition rate (duty cycle): 0.01%
- Fast response time
- Typical  $I_R$  less than 2 $\mu$ A above 10V
- High Temperature soldering: 260 $^{\circ}$ 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 $^{\circ}$ C ambient temperature unless otherwise specified.

| Rating  | Symbol          | Value        | Units          |
|---|-----------------|--------------|----------------|
| Peak pulse power dissipation at 10/1000 $\mu$ s waveform (Note1, Note2, Fig.1)                                    | $P_{PPM}$       | Minimum 3000 | Watts          |
| Peak pulse current of at 10/1000 $\mu$ s waveform (Note 1, Fig.3)   | $I_{PPM}$       | See Table    | Amps           |
| Steady state power dissipation at $T_A=50^{\circ}$ 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) | $I_{FSM}$       | 300          | Amps           |
| Operating junction and Storage Temperature Range.   | $T_J, T_{STG}$  | -55 to +150  | $^{\circ}$ C   |
| Typical thermal resistance junction to lead   | $R_{\theta JL}$ | 15           | $^{\circ}$ C/W |
| Typical thermal resistance junction to ambient  | $R_{\theta JA}$ | 75           | $^{\circ}$ C/W |

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

2. Mounted on 8.0mm $\times$ 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)               |
| SMDJ5.0A-AT    | SMDJ5.0CA-AT  | RDE                 | DDE | 5.0                       | 6.40~7.00                         | 10                  | 9.2                                       | 326.1               | 800                               |
| SMDJ6.0A-AT    | SMDJ6.0CA-AT  | RDG                 | DDG | 6.0                       | 6.67~7.37                         | 10                  | 10.3                                      | 291.3               | 800                               |
| SMDJ6.5A-AT    | SMDJ6.5CA-AT  | RDK                 | DDK | 6.5                       | 7.22~7.98                         | 10                  | 11.2                                      | 267.9               | 500                               |
| SMDJ7.0A-AT    | SMDJ7.0CA-AT  | PDM                 | DDM | 7.0                       | 7.78~8.60                         | 10                  | 12.0                                      | 250.0               | 200                               |
| SMDJ7.5A-AT    | SMDJ7.5CA-AT  | PDP                 | DDP | 7.5                       | 8.33~9.21                         | 1                   | 12.9                                      | 232.6               | 100                               |
| SMDJ8.0A-AT    | SMDJ8.0CA-AT  | PDR                 | DDR | 8.0                       | 8.89~9.83                         | 1                   | 13.6                                      | 220.6               | 50                                |
| SMDJ8.5A-AT    | SMDJ8.5CA-AT  | PDT                 | DDT | 8.5                       | 9.44~10.40                        | 1                   | 14.4                                      | 208.3               | 20                                |
| SMDJ9.0A-AT    | SMDJ9.0CA-AT  | PDV                 | DDV | 9.0                       | 10.00~11.10                       | 1                   | 15.4                                      | 194.8               | 10                                |
| SMDJ10A-AT     | SMDJ10CA-AT   | PDX                 | DDX | 10.0                      | 11.10~12.30                       | 1                   | 17.0                                      | 176.5               | 5                                 |
| SMDJ11A-AT     | SMDJ11CA-AT   | PDZ                 | DDZ | 11.0                      | 12.20~13.50                       | 1                   | 18.2                                      | 164.8               | 2                                 |
| SMDJ12A-AT     | SMDJ12CA-AT   | PEE                 | DEE | 12.0                      | 13.30~14.70                       | 1                   | 19.9                                      | 150.8               | 2                                 |
| SMDJ13A-AT     | SMDJ13CA-AT   | PEG                 | DEG | 13.0                      | 14.40~15.90                       | 1                   | 21.5                                      | 139.5               | 2                                 |
| SMDJ14A-AT     | SMDJ14CA-AT   | PEK                 | DEK | 14.0                      | 15.60~17.20                       | 1                   | 23.2                                      | 129.3               | 2                                 |
| SMDJ15A-AT     | SMDJ15CA-AT   | PEM                 | DEM | 15.0                      | 16.70~18.50                       | 1                   | 24.4                                      | 123.0               | 2                                 |
| SMDJ16A-AT     | SMDJ16CA-AT   | PEP                 | DEP | 16.0                      | 17.80~19.70                       | 1                   | 26.0                                      | 115.4               | 2                                 |
| SMDJ17A-AT     | SMDJ17CA-AT   | PER                 | DER | 17.0                      | 18.90~20.90                       | 1                   | 27.6                                      | 108.7               | 2                                 |
| SMDJ18A-AT     | SMDJ18CA-AT   | PET                 | DET | 18.0                      | 20.00~22.10                       | 1                   | 29.2                                      | 102.7               | 2                                 |
| SMDJ20A-AT     | SMDJ20CA-AT   | PEV                 | DEV | 20.0                      | 22.20~24.50                       | 1                   | 32.4                                      | 92.6                | 2                                 |
| SMDJ22A-AT     | SMDJ22CA-AT   | PEX                 | DEX | 22.0                      | 24.40~26.90                       | 1                   | 35.5                                      | 84.5                | 2                                 |

| 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  | $V_{RWM}(V)$              | $V_{BR}(V)$               | $I_T(mA)$    | $V_C(V)$                            | $I_{PP}(A)$        | $I_R(\mu A)$                |
| SMDJ24A-AT     | SMDJ24CA-AT   | PEZ                 | DEZ | 24.0                      | 26.70~29.50               | 1            | 38.9                                | 77.1               | 2                           |
| SMDJ26A-AT     | SMDJ26CA-AT   | PFE                 | DFE | 26.0                      | 28.90~31.90               | 1            | 42.1                                | 71.3               | 2                           |
| SMDJ28A-AT     | SMDJ28CA-AT   | PFG                 | DFG | 28.0                      | 31.10~34.40               | 1            | 45.4                                | 66.1               | 2                           |
| SMDJ30A-AT     | SMDJ30CA-AT   | PFK                 | DFK | 30.0                      | 33.30~36.80               | 1            | 48.4                                | 62.0               | 2                           |
| SMDJ33A-AT     | SMDJ33CA-AT   | PFM                 | DFM | 33.0                      | 36.70~40.60               | 1            | 53.3                                | 56.3               | 2                           |
| SMDJ36A-AT     | SMDJ36CA-AT   | PFP                 | DFP | 36.0                      | 40.00~44.20               | 1            | 58.1                                | 51.6               | 2                           |
| SMDJ40A-AT     | SMDJ40CA-AT   | PFR                 | DFR | 40.0                      | 44.40~49.10               | 1            | 64.5                                | 46.5               | 2                           |
| SMDJ43A-AT     | SMDJ43CA-AT   | PFT                 | DFT | 43.0                      | 47.80~52.80               | 1            | 69.4                                | 43.2               | 2                           |
| SMDJ45A-AT     | SMDJ45CA-AT   | PFV                 | DFV | 45.0                      | 50.00~55.30               | 1            | 72.7                                | 41.3               | 2                           |
| SMDJ48A-AT     | SMDJ48CA-AT   | PFX                 | DFX | 48.0                      | 53.30~58.90               | 1            | 77.4                                | 38.8               | 2                           |
| SMDJ51A-AT     | SMDJ51CA-AT   | PFZ                 | DFZ | 51.0                      | 56.70~62.70               | 1            | 82.4                                | 36.4               | 2                           |
| SMDJ54A-AT     | SMDJ54CA-AT   | PGE                 | DGE | 54.0                      | 60.00~66.30               | 1            | 87.1                                | 34.4               | 2                           |
| SMDJ58A-AT     | SMDJ58CA-AT   | PGG                 | DGG | 58.0                      | 64.40~71.20               | 1            | 93.6                                | 32.1               | 2                           |
| SMDJ60A-AT     | SMDJ60CA-AT   | PGK                 | DGK | 60.0                      | 66.70~73.70               | 1            | 96.8                                | 31.0               | 2                           |
| SMDJ64A-AT     | SMDJ64CA-AT   | PGM                 | DGM | 64.0                      | 71.10~78.60               | 1            | 103.0                               | 29.1               | 2                           |
| SMDJ70A-AT     | SMDJ70CA-AT   | PGP                 | DGP | 70.0                      | 77.80~86.00               | 1            | 113.0                               | 26.5               | 2                           |
| SMDJ75A-AT     | SMDJ75CA-AT   | PGR                 | DGR | 75.0                      | 83.30~92.10               | 1            | 121.0                               | 24.8               | 2                           |
| SMDJ78A-AT     | SMDJ78CA-AT   | PGT                 | DGT | 78.0                      | 86.70~95.80               | 1            | 126.0                               | 23.8               | 2                           |
| SMDJ85A-AT     | SMDJ85CA-AT   | PGV                 | DGV | 85.0                      | 94.40~104.00              | 1            | 137.0                               | 21.9               | 2                           |
| SMDJ90A-AT     | SMDJ90CA-AT   | PGX                 | DGX | 90.0                      | 100.00~111.00             | 1            | 146.0                               | 20.5               | 2                           |
| SMDJ100A-AT    | SMDJ100CA-AT  | PGZ                 | DGZ | 100.0                     | 111.00~123.00             | 1            | 162.0                               | 18.5               | 2                           |
| SMDJ110A-AT    | SMDJ110CA-AT  | PHE                 | DHE | 110.0                     | 122.00~135.00             | 1            | 177.0                               | 16.9               | 2                           |
| SMDJ120A-AT    | SMDJ120CA-AT  | PHG                 | DHG | 120.0                     | 133.00~147.00             | 1            | 193.0                               | 15.5               | 2                           |
| SMDJ130A-AT    | SMDJ130CA-AT  | PHK                 | DHK | 130.0                     | 144.00~159.00             | 1            | 209.0                               | 14.4               | 2                           |
| SMDJ150A-AT    | SMDJ150CA-AT  | PHM                 | DHM | 150.0                     | 167.00~185.00             | 1            | 243.0                               | 12.3               | 2                           |
| SMDJ160A-AT    | SMDJ160CA-AT  | PHP                 | DHP | 160.0                     | 178.00~197.00             | 1            | 259.0                               | 11.6               | 2                           |
| SMDJ170A-AT    | SMDJ170CA-AT  | PHR                 | DHR | 170.0                     | 189.00~209.00             | 1            | 275.0                               | 10.9               | 2                           |
| SMDJ180A-AT    | SMDJ180CA-AT  | HHT                 | IHT | 180.0                     | 201.00~222.00             | 1            | 292.0                               | 10.3               | 2                           |
| SMDJ190A-AT    | SMDJ190CA-AT  | HHV                 | IHV | 190.0                     | 211.00~233.00             | 1            | 308.0                               | 9.7                | 2                           |
| SMDJ200A-AT    | SMDJ200CA-AT  | HHX                 | IHX | 200.0                     | 224.00~247.00             | 1            | 324.0                               | 9.3                | 2                           |
| SMDJ210A-AT    | SMDJ210CA-AT  | HHZ                 | IHZ | 210.0                     | 237.00~263.00             | 1            | 340.0                               | 8.8                | 2                           |
| SMDJ220A-AT    | SMDJ220CA-AT  | HIE                 | IIE | 220.0                     | 246.00~272.00             | 1            | 356.0                               | 8.4                | 2                           |

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**



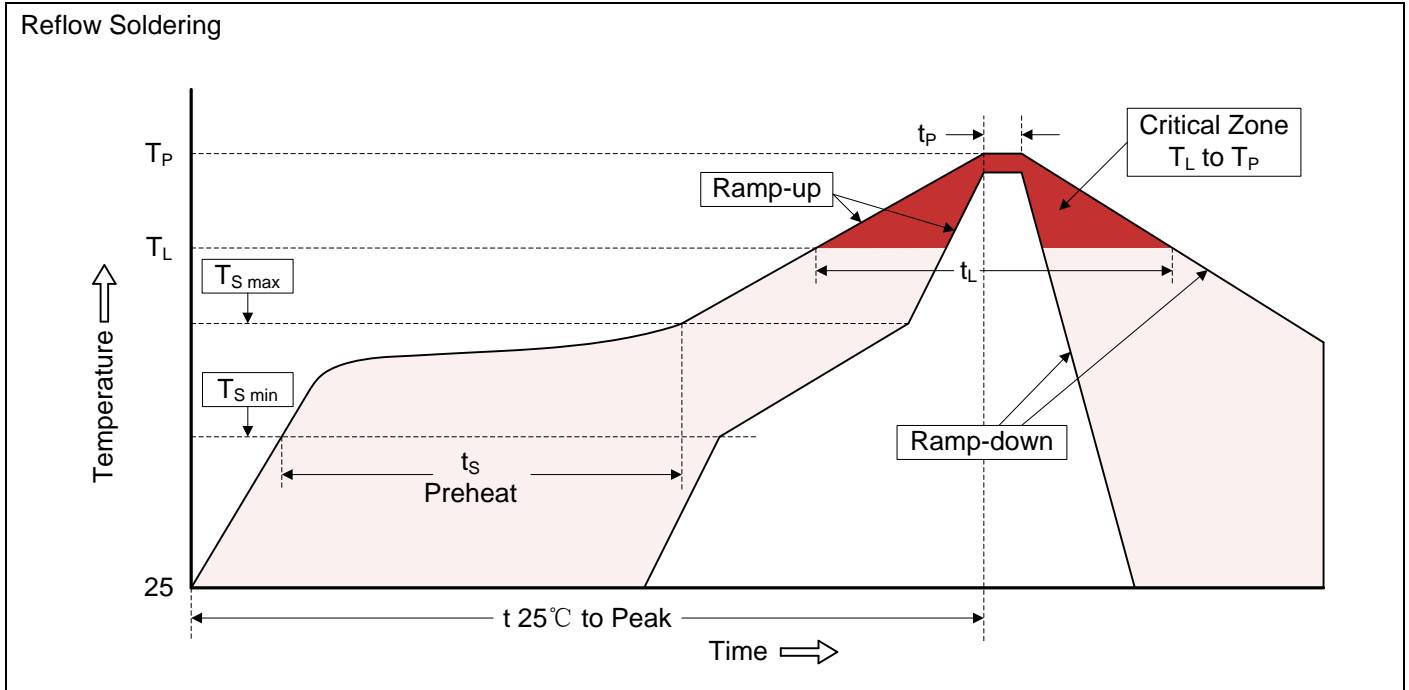
**Figure 5. Steady State Power Dissipation Derating Curve**



**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 SMDJ5.0A-AT/TR7

13 inch reel package: Add suffix “/TR13” at the end of the part number, such as SMDJ120CA-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      |    |            |
|      |           |                   |                | D2 | Φ178.0±2.0 |
|      |           |                   |                | D3 | Φ50.0Min.  |
| D4   | Φ13.0±0.5 |                   |                |    |            |
| W1   | 20.0 ±2.0 |                   |                |    |            |
|      |           | Quantity: 500PCS  |                |    |            |
|      |           | 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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