



# THE DATASHEET OF SMCJ58A-T7



## SMCJ Series



### Agency Approvals

| Agency | Agency File Number |
|--------|--------------------|
|        | E230531            |

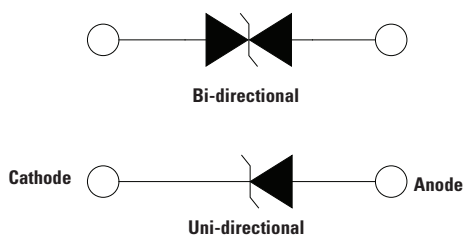
### Maximum Ratings and Thermal Characteristics (T<sub>A</sub> = 25°C unless otherwise noted)

| Parameter   | Symbol           | Value      | Unit |
|---|------------------|------------|------|
| Peak Pulse Power Dissipation(Fig.2) by 10/1000us Test Waveform(Fig.4) (Note 1),(Note 2)-Single Die Parts            | P <sub>PPM</sub> | 1500       | W    |
| Peak Pulse Power Dissipation(Fig.2) by 10/1000us Test Waveform(Fig.4) (Note 1), (Note 2)-Stacked Die Parts (Note 5) | P <sub>PPM</sub> | 2000       | W    |
| Power Dissipation on Infinite Heat Sink at T <sub>L</sub> = 50°C  | P <sub>D</sub>   | 6.5        | W    |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave (Note 3)  | I <sub>FSM</sub> | 200        | A    |
| Maximum Instantaneous Forward Voltage at 100A for Unidirectional Only (Note 4)                                      | V <sub>F</sub>   | 3.5/5.0    | V    |
| Operating Temperature Range   | T <sub>J</sub>   | -65 to 150 | °C   |
| Storage Temperature Range   | T <sub>STG</sub> | -65 to 175 | °C   |
| Typical Thermal Resistance Junction to Lead   | R <sub>θJL</sub> | 15         | °C/W |
| Typical Thermal Resistance Junction to Ambient  | R <sub>θJA</sub> | 75         | °C/W |

**Notes:**

1. Non-repetitive current pulse, per Fig. 4 and derated above T<sub>J</sub> (initial) = 25°C per Fig. 3.
2. Mounted on copper pad area of 0.31x0.31" (8.0 x 8.0mm) 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 single die parts and V<sub>F</sub> < 5.0V for stacked-die parts.
5. For stacked die component details, please refer to part numbers labeled by \* in Electrical Characteristics.

### Functional Diagram



### Description

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

### Features

- 1500W peak pulse power capability at 10/1000µs waveform, repetition rate (duty cycles):0.01%
- Excellent clamping capability
- Low incremental surge resistance
- Typical I<sub>R</sub> less than 1µA when V<sub>BR</sub> min > 12V
- For surface mounted applications to optimize board space
- Low profile package
- Built-in strain relief
- 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 30kV(Air), 30kV (Contact)
- ESD protection of data lines in accordance with IEC 61000-4-2
- EFT protection of data lines in accordance with IEC 61000-4-4
- Fast response time: typically less than 1.0ps from 0V to BV min
- Glass passivated chip junction
- High temperature to reflow soldering guaranteed: 260°C/30sec
- V<sub>BR</sub> @ T<sub>J</sub> = V<sub>BR</sub> @ 25°C x (1 + αT x (T<sub>J</sub> - 25)) (αT: Temperature Coefficient, typical value is 0.1%)
- Plastic package is flammability rated V-0 per Underwriters Laboratories
- Meet MSL level1, per J-STD-020, LF maximum peak of 260°C
- Matte tin lead-free plated
- Halogen free and RoHS compliant
- Pb-free E3 means 2nd level interconnect is Pb-free and the terminal finish material is tin(Sn) (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.

### Additional Information



Datasheet



Resources



Samples

### 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    |                                  |   |  |  |   |
| SMCJ5.0A          | SMCJ5.0CA        | GDE     | BDE | 5.0  | 6.40   | 7.00   | 10                               | 9.2   | 163.0  | 800  | X   |
| SMCJ6.0A          | SMCJ6.0CA        | GDG     | BDG | 6.0  | 6.67   | 7.37   | 10                               | 10.3  | 145.7  | 800  | X   |
| SMCJ6.5A          | SMCJ6.5CA        | GDK     | BDK | 6.5  | 7.22   | 7.98   | 10                               | 11.2  | 134.0  | 500  | X   |
| SMCJ7.0A          | SMCJ7.0CA        | GDM     | BDM | 7.0  | 7.78   | 8.60   | 10                               | 12.0  | 125.0  | 200  | X   |
| SMCJ7.5A          | SMCJ7.5CA        | GDP     | BDP | 7.5  | 8.33   | 9.21   | 1                                | 12.9  | 116.3  | 100  | X   |
| SMCJ8.0A          | SMCJ8.0CA        | GDR     | BDR | 8.0  | 8.89   | 9.83   | 1                                | 13.6  | 110.3  | 50   | X   |
| SMCJ8.5A          | SMCJ8.5CA        | GDT     | BDT | 8.5  | 9.44   | 10.40  | 1                                | 14.4  | 104.2  | 20   | X   |
| SMCJ9.0A          | SMCJ9.0CA        | GDV     | BDV | 9.0  | 10.00  | 11.10  | 1                                | 15.4  | 97.4   | 10   | X   |
| SMCJ10A           | SMCJ10CA         | GDX     | BDX | 10.0   | 11.10  | 12.30  | 1                                | 17.0  | 88.3   | 5  | X   |
| SMCJ11A           | SMCJ11CA         | GDZ     | BDZ | 11.0   | 12.20  | 13.50  | 1                                | 18.2  | 82.5   | 1  | X   |
| SMCJ12A           | SMCJ12CA         | GEE     | BEE | 12.0   | 13.30  | 14.70  | 1                                | 19.9  | 75.4   | 1  | X   |
| SMCJ13A           | SMCJ13CA         | GEG     | BEG | 13.0   | 14.40  | 15.90  | 1                                | 21.5  | 69.8   | 1  | X   |
| SMCJ14A           | SMCJ14CA         | GEK     | BEK | 14.0   | 15.60  | 17.20  | 1                                | 23.2  | 64.7   | 1  | X   |
| SMCJ15A           | SMCJ15CA         | GEM     | BEM | 15.0   | 16.70  | 18.50  | 1                                | 24.4  | 61.5   | 1  | X   |
| SMCJ16A           | SMCJ16CA         | GEP     | BEP | 16.0   | 17.80  | 19.70  | 1                                | 26.0  | 57.7   | 1  | X   |
| SMCJ17A           | SMCJ17CA         | GER     | BER | 17.0   | 18.90  | 20.90  | 1                                | 27.6  | 54.4   | 1  | X   |
| SMCJ18A           | SMCJ18CA         | GET     | BET | 18.0   | 20.00  | 22.10  | 1                                | 29.2  | 51.4   | 1  | X   |
| SMCJ20A           | SMCJ20CA         | GEV     | BEV | 20.0   | 22.20  | 24.50  | 1                                | 32.4  | 46.3   | 1  | X   |
| SMCJ22A           | SMCJ22CA         | GEX     | BEX | 22.0   | 24.40  | 26.90  | 1                                | 35.5  | 42.3   | 1  | X   |
| SMCJ24A           | SMCJ24CA         | GEZ     | BEZ | 24.0   | 26.70  | 29.50  | 1                                | 38.9  | 38.6   | 1  | X   |
| SMCJ26A           | SMCJ26CA         | GFE     | BFE | 26.0   | 28.90  | 31.90  | 1                                | 42.1  | 35.7   | 1  | X   |
| SMCJ28A           | SMCJ28CA         | GFG     | BFG | 28.0   | 31.10  | 34.40  | 1                                | 45.4  | 33.1   | 1  | X   |
| SMCJ30A           | SMCJ30CA         | GFK     | BFK | 30.0   | 33.30  | 36.80  | 1                                | 48.4  | 31.0   | 1  | X   |
| SMCJ33A           | SMCJ33CA         | GFM     | BFM | 33.0   | 36.70  | 40.60  | 1                                | 53.3  | 28.2   | 1  | X   |
| SMCJ36A           | SMCJ36CA         | GFP     | BFP | 36.0   | 40.00  | 44.20  | 1                                | 58.1  | 25.9   | 1  | X   |
| SMCJ40A           | SMCJ40CA         | GFR     | BFR | 40.0   | 44.40  | 49.10  | 1                                | 64.5  | 23.3   | 1  | X   |
| SMCJ43A           | SMCJ43CA         | GFT     | BFT | 43.0   | 47.80  | 52.80  | 1                                | 69.4  | 21.7   | 1  | X   |
| SMCJ45A           | SMCJ45CA         | GFV     | BFV | 45.0   | 50.00  | 55.30  | 1                                | 72.7  | 20.6   | 1  | X   |
| SMCJ48A           | SMCJ48CA         | GFX     | BFX | 48.0   | 53.30  | 58.90  | 1                                | 77.4  | 19.4   | 1  | X   |
| SMCJ51A           | SMCJ51CA         | GFZ     | BFZ | 51.0   | 56.70  | 62.70  | 1                                | 82.4  | 18.2   | 1  | X   |
| SMCJ54A           | SMCJ54CA         | GGE     | BGE | 54.0   | 60.00  | 66.30  | 1                                | 87.1  | 17.3   | 1  | X   |
| SMCJ58A           | SMCJ58CA         | GGG     | BGG | 58.0   | 64.40  | 71.20  | 1                                | 93.6  | 16.1   | 1  | X   |
| SMCJ60A           | SMCJ60CA         | GGK     | BGK | 60.0   | 66.70  | 73.70  | 1                                | 96.8  | 15.5   | 1  | X   |
| SMCJ64A           | SMCJ64CA         | GGM     | BGM | 64.0   | 71.10  | 78.60  | 1                                | 103.0   | 14.6   | 1  | X   |
| SMCJ70A           | SMCJ70CA         | GGP     | BGP | 70.0   | 77.80  | 86.00  | 1                                | 113.0   | 13.3   | 1  | X   |
| SMCJ75A           | SMCJ75CA         | GGR     | BGR | 75.0   | 83.30  | 92.10  | 1                                | 121.0   | 12.4   | 1  | X   |
| SMCJ78A           | SMCJ78CA         | GGT     | BGT | 78.0   | 86.70  | 95.80  | 1                                | 126.0   | 11.9   | 1  | X   |
| SMCJ85A           | SMCJ85CA         | GGV     | BGV | 85.0   | 94.40  | 104.00 | 1                                | 137.0   | 11.0   | 1  | X   |
| SMCJ90A           | SMCJ90CA         | GGX     | BGX | 90.0   | 100.00   | 111.00 | 1                                | 146.0   | 10.3   | 1  | X   |
| SMCJ100A          | SMCJ100CA        | GGZ     | BGZ | 100.0  | 111.00   | 123.00 | 1                                | 162.0   | 9.3  | 1  | X   |
| SMCJ110A          | SMCJ110CA        | GHE     | BHE | 110.0  | 122.00   | 135.00 | 1                                | 177.0   | 8.5  | 1  | X   |
| SMCJ120A          | SMCJ120CA        | GHG     | BHG | 120.0  | 133.00   | 147.00 | 1                                | 193.0   | 7.8  | 1  | X   |
| SMCJ130A          | SMCJ130CA        | GHK     | BHK | 130.0  | 144.00   | 159.00 | 1                                | 209.0   | 7.2  | 1  | X   |
| SMCJ150A          | SMCJ150CA        | GHM     | BHM | 150.0  | 167.00   | 185.00 | 1                                | 243.0   | 6.2  | 1  | X   |
| SMCJ160A          | SMCJ160CA        | GHP     | BHP | 160.0  | 178.00   | 197.00 | 1                                | 259.0   | 5.8  | 1  | X   |
| SMCJ170A          | SMCJ170CA        | GHR     | BHR | 170.0  | 189.00   | 209.00 | 1                                | 275.0   | 5.5  | 1  | X   |
| SMCJ180A          | SMCJ180CA        | GHT     | BHT | 180.0  | 201.00   | 222.00 | 1                                | 292.0   | 5.1  | 1  | X   |
| SMCJ200A          | SMCJ200CA        | GHV     | BHV | 200.0  | 224.00   | 247.00 | 1                                | 324.0   | 4.6  | 1  | X   |
| SMCJ220A          | SMCJ220CA        | GHX     | BHX | 220.0  | 246.00   | 272.00 | 1                                | 356.0   | 4.2  | 1  | X   |
| SMCJ250A          | SMCJ250CA        | GHZ     | BHZ | 250.0  | 279.00   | 309.00 | 1                                | 405.0   | 3.7  | 1  | X   |
| SMCJ300A*         | SMCJ300CA*       | GJE     | BJE | 300.0  | 335.00   | 371.00 | 1                                | 486.0   | 4.1  | 1  | X   |
| SMCJ350A*         | SMCJ350CA*       | GJG     | BJG | 350.0  | 391.00   | 432.00 | 1                                | 567.0   | 3.5  | 1  | X   |
| SMCJ400A*         | SMCJ400CA*       | GJK     | BJK | 400.0  | 447.00   | 494.00 | 1                                | 648.0   | 3.0  | 1  | X   |
| SMCJ440A*         | SMCJ440CA*       | GJM     | BJM | 440.0  | 492.00   | 543.00 | 1                                | 713.0   | 2.8  | 1  | X   |

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

For parts without A, the V<sub>BR</sub> is ± 10% and V<sub>C</sub> is 5% higher than with A parts, the parts without A are currently available, but not recommended for new designs. The parts with A are preferred.

For stack-die parts, use \* to label the part number.

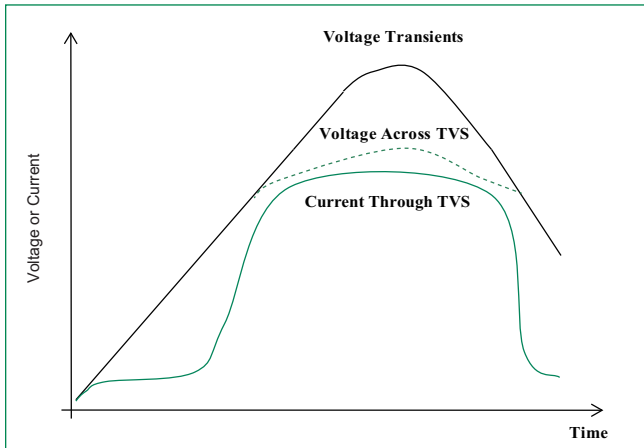
**I-V Curve Characteristics**



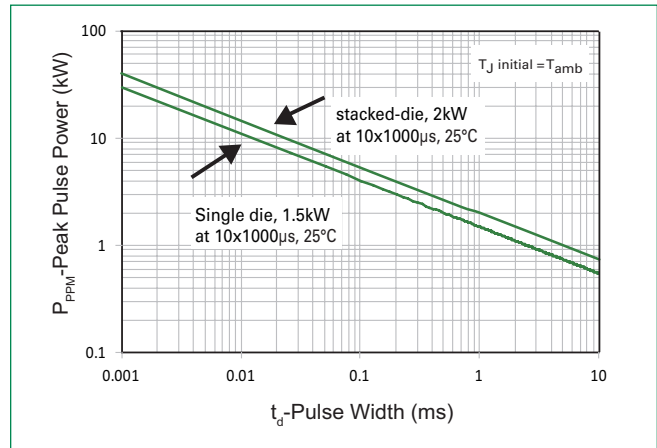
- $P_{PPM}$  Peak Pulse Power Dissipation** – Max power dissipation
- $V_R$  Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- $V_{BR}$  Breakdown Voltage** – Maximum voltage that flows through the TVS at a specified test current ( $I_T$ )
- $V_C$  Clamping Voltage** – Peak voltage measured across the TVS at a specified  $I_{ppm}$  (peak impulse current)
- $I_R$  Reverse Leakage Current** – Current measured at  $V_R$
- $V_F$  Forward Voltage Drop for Uni-directional**

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

**Figure 1 - TVS Transients Clamping Waveform**



**Figure 2 - Peak Pulse Power Rating**



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

**Figure 3 - Peak Pulse Power Derating Curve**



**Figure 4 - Pulse Waveform**



**Figure 5 - Typical Junction Capacitance**



**Figure 6 - Typical Transient Thermal Impedance**



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



**Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)**



### Soldering Parameters

|  |                                    |                         |
|--|------------------------------------|-------------------------|
| <b>Reflow Condition</b>  |                                    | Lead-free assembly      |
| <b>Pre Heat</b>  | - Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|  | - Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|  | - Time (min to max) ( $t_s$ )      | 60 – 120 secs           |
| <b>Average ramp up rate (Liquidus Temp (<math>T_L</math>) to peak)</b> |                                    | 3°C/second max          |
| <b><math>T_{s(max)}</math> to <math>T_L</math> - Ramp-up Rate</b>      |                                    | 3°C/second max          |
| <b>Reflow</b>  | - Temperature ( $T_L$ ) (Liquidus) | 217°C                   |
|  | - Time (min to max) ( $t_L$ )      | 60 – 150 seconds        |
| <b>Peak Temperature (<math>T_p</math>)</b>                             |                                    | 260 <sup>+0/-5</sup> °C |
| <b>Time within 5°C of actual peak Temperature (<math>t_p</math>)</b>   |                                    | 30 seconds max          |
| <b>Ramp-down Rate</b>  |                                    | 6°C/second max          |
| <b>Time 25°C to peak Temperature (<math>T_p</math>)</b>                |                                    | 8 minutes Max.          |
| <b>Do not exceed</b>   |                                    | 260°C                   |



### Physical Specifications

|                 |   |
|-----------------|---|
| <b>Weight</b>   | 0.007 ounce, 0.21 grams   |
| <b>Case</b>     | JEDEC DO214AB. Molded plastic body over glass passivated junction |
| <b>Polarity</b> | Color band denotes positive end (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-A111              |

### Dimensions



| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| <b>A</b>   | 0.114  | 0.126 | 2.900       | 3.200 |
| <b>B</b>   | 0.260  | 0.280 | 6.600       | 7.110 |
| <b>C</b>   | 0.220  | 0.245 | 5.590       | 6.220 |
| <b>D</b>   | 0.079  | 0.103 | 2.060       | 2.620 |
| <b>E</b>   | 0.030  | 0.060 | 0.760       | 1.520 |
| <b>F</b>   | -      | 0.008 | -           | 0.203 |
| <b>G</b>   | 0.305  | 0.320 | 7.750       | 8.130 |
| <b>H</b>   | 0.006  | 0.012 | 0.152       | 0.305 |
| <b>I</b>   | 0.129  | -     | 3.300       | -     |
| <b>J</b>   | 0.094  | -     | 2.400       | -     |
| <b>K</b>   | -      | 0.165 | -           | 4.200 |
| <b>L</b>   | 0.094  | -     | 2.400       | -     |

**Part Numbering System**



**Part Marking System**



**Packaging**

| Part number | Component Package | Quantity | Packaging Option                 | Packaging Specification |
|-------------|-------------------|----------|----------------------------------|-------------------------|
| SMCJxxxXX   | DO-214AB          | 3000     | Tape & Reel - 16mm tape/13" reel | EIA STD RS-481          |

**Tape and Reel Specification**



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