



# THE DATASHEET OF SMDJ60A



**SMDJ Series**



**Agency Approvals**

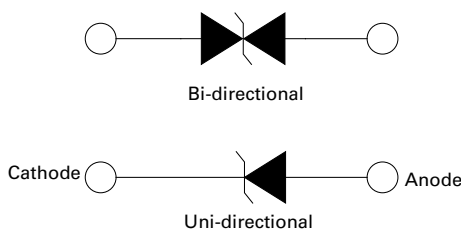
| Agency | Agency File Number |
|--------|--------------------|
|        | E230531            |

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

| Parameter  | Symbol           | Value      | Unit |
|--|------------------|------------|------|
| Peak Pulse Power Dissipation at T <sub>A</sub> =25°C by 10/1000µs Waveform (Fig. 2.4) (Note 1,2,5) | P <sub>PPM</sub> | 3000       | 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> | 300        | 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 component 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. The P<sub>PPM</sub> of stacked-die parts is 4000W and please contact Littelfuse for stacked-die part details.

**Functional Diagram**



**Description**

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

**Features**

- 3000W P<sub>PPM</sub> capability at 10/1000µs waveform, repetition rate (duty cycles):0.01%
- For surface mounted applications in order to optimize board space
- Low profile package
- 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
- Built-in strain relief
- Glass passivated chip junction
- Fast response time: typically less than 1.0ps from 0V to BV min
- Excellent clamping capability
- Low incremental surge resistance
- Typical I<sub>r</sub> less than 2µA when V<sub>BR</sub> min > 12V
- High temperature to reflow soldering guaranteed: 260°C/40sec
- V<sub>BR</sub> @ T<sub>J</sub> = V<sub>BR</sub> @ 25°C x (1 + α T x (T<sub>J</sub> - 25)) (α T: Temperature Coefficient, typical value is 0.1%)
- UL Recognized compound meeting flammability rating V-0
- 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 components 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.

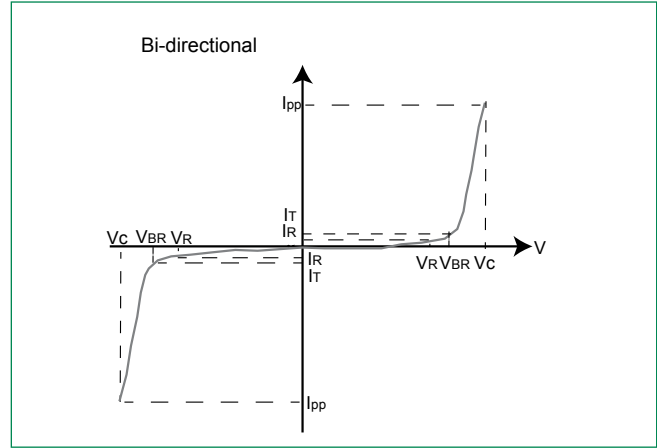
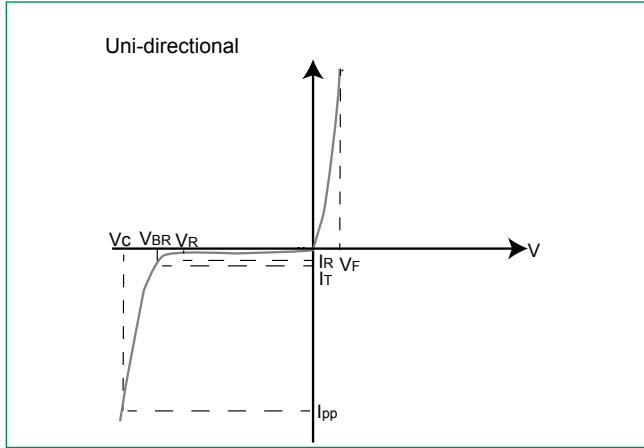
**Additional Information**



### Electrical Characteristics (T<sub>A</sub>=25°C unless otherwise noted)

| Part Number (Uni) | Part Number (Bi) | Marking |     | Reverse Stand off Voltage V | Breakdown Voltage V |        | Test Current I <sub>T</sub> (mA) | Maximum Clamping Voltage VC @ I <sub>pp</sub> (10/1000µs) (V) | Maximum Peak Pulse Current I <sub>pp</sub> (10/1000µs) (A) | Maximum Clamping Voltage VC @ I <sub>pp</sub> (8/20µs) (V) | Maximum Peak Pulse Current I <sub>pp</sub> (8/20µs) (A) | Maximum Reverse Leakage IR @ VR (µA) | Maximum Temperature coefficient of VBR (%/C) | Agency Approval  |
|-------------------|------------------|---------|-----|-----------------------------|---------------------|--------|----------------------------------|---|--|--|---|--------------------------------------|--|---|
|                   |                  | UNI     | BI  |                             | MIN                 | MAX    |                                  |   |  |  |   |                                      |  |   |
| SMDJ5.0A          | SMDJ5.0CA        | RDE     | DDE | 5.0                         | 6.40                | 7.00   | 10                               | 9.2   | 326.1  | 11.89  | 1630.5  | 800                                  | 0.041  | X   |
| SMDJ6.0A          | SMDJ6.0CA        | RDG     | DDG | 6.0                         | 6.67                | 7.37   | 10                               | 10.3  | 291.3  | 13.31  | 1456.5  | 800                                  | 0.046  | X   |
| SMDJ6.5A          | SMDJ6.5CA        | RDK     | DDK | 6.5                         | 7.22                | 7.98   | 10                               | 11.2  | 267.9  | 14.47  | 1339.5  | 500                                  | 0.052  | X   |
| SMDJ7.0A          | SMDJ7.0CA        | PDM     | DDM | 7.0                         | 7.78                | 8.60   | 10                               | 12.0  | 250.0  | 15.50  | 1250.0  | 200                                  | 0.058  | X   |
| SMDJ7.5A          | SMDJ7.5CA        | PDP     | DDP | 7.5                         | 8.33                | 9.21   | 1                                | 12.9  | 232.6  | 16.67  | 1163.0  | 100                                  | 0.061  | X   |
| SMDJ8.0A          | SMDJ8.0CA        | PDR     | DDR | 8.0                         | 8.89                | 9.83   | 1                                | 13.6  | 220.6  | 17.57  | 1103.0  | 50                                   | 0.064  | X   |
| SMDJ8.5A          | SMDJ8.5CA        | PDT     | DDT | 8.5                         | 9.44                | 10.40  | 1                                | 14.4  | 208.3  | 18.60  | 1041.5  | 20                                   | 0.066  | X   |
| SMDJ9.0A          | SMDJ9.0CA        | PDV     | DDV | 9.0                         | 10.00               | 11.10  | 1                                | 15.4  | 194.8  | 19.90  | 974.0   | 10                                   | 0.069  | X   |
| SMDJ10A           | SMDJ10CA         | PDX     | DDX | 10.0                        | 11.10               | 12.30  | 1                                | 17.0  | 176.5  | 21.96  | 882.5   | 5                                    | 0.071  | X   |
| SMDJ11A           | SMDJ11CA         | PDZ     | DDZ | 11.0                        | 12.20               | 13.50  | 1                                | 18.2  | 164.8  | 23.51  | 824.0   | 2                                    | 0.074  | X   |
| SMDJ12A           | SMDJ12CA         | PEE     | DEE | 12.0                        | 13.30               | 14.70  | 1                                | 19.9  | 150.8  | 25.71  | 754.0   | 2                                    | 0.075  | X   |
| SMDJ13A           | SMDJ13CA         | PEG     | DEG | 13.0                        | 14.40               | 15.90  | 1                                | 21.5  | 139.5  | 27.78  | 697.5   | 2                                    | 0.076  | X   |
| SMDJ14A           | SMDJ14CA         | PEK     | DEK | 14.0                        | 15.60               | 17.20  | 1                                | 23.2  | 129.3  | 29.97  | 646.5   | 2                                    | 0.08   | X   |
| SMDJ15A           | SMDJ15CA         | PEM     | DEM | 15.0                        | 16.70               | 18.50  | 1                                | 24.4  | 123.0  | 31.52  | 615.0   | 2                                    | 0.083  | X   |
| SMDJ16A           | SMDJ16CA         | PEP     | DEP | 16.0                        | 17.80               | 19.70  | 1                                | 26.0  | 115.4  | 33.59  | 577.0   | 2                                    | 0.084  | X   |
| SMDJ17A           | SMDJ17CA         | PER     | DER | 17.0                        | 18.90               | 20.90  | 1                                | 27.6  | 108.7  | 35.66  | 543.5   | 2                                    | 0.085  | X   |
| SMDJ18A           | SMDJ18CA         | PET     | DET | 18.0                        | 20.00               | 22.10  | 1                                | 29.2  | 102.7  | 37.73  | 513.5   | 2                                    | 0.088  | X   |
| SMDJ20A           | SMDJ20CA         | PEV     | DEV | 20.0                        | 22.20               | 24.50  | 1                                | 32.4  | 92.6   | 41.86  | 463.0   | 2                                    | 0.091  | X   |
| SMDJ22A           | SMDJ22CA         | PEX     | DEX | 22.0                        | 24.40               | 26.90  | 1                                | 35.5  | 84.5   | 45.87  | 422.5   | 2                                    | 0.092  | X   |
| SMDJ24A           | SMDJ24CA         | PEZ     | DEZ | 24.0                        | 26.70               | 29.50  | 1                                | 38.9  | 77.1   | 50.26  | 385.5   | 2                                    | 0.092  | X   |
| SMDJ26A           | SMDJ26CA         | PFE     | DFE | 26.0                        | 28.90               | 31.90  | 1                                | 42.1  | 71.3   | 54.39  | 356.5   | 2                                    | 0.093  | X   |
| SMDJ28A           | SMDJ28CA         | PFG     | DFG | 28.0                        | 31.10               | 34.40  | 1                                | 45.4  | 66.1   | 58.66  | 330.5   | 2                                    | 0.094  | X   |
| SMDJ30A           | SMDJ30CA         | PFK     | DFK | 30.0                        | 33.30               | 36.80  | 1                                | 48.4  | 62.0   | 62.53  | 310.0   | 2                                    | 0.096  | X   |
| SMDJ33A           | SMDJ33CA         | PFM     | DFM | 33.0                        | 36.70               | 40.60  | 1                                | 53.3  | 56.3   | 68.86  | 281.5   | 2                                    | 0.097  | X   |
| SMDJ36A           | SMDJ36CA         | PFP     | DFP | 36.0                        | 40.00               | 44.20  | 1                                | 58.1  | 51.6   | 75.06  | 258.0   | 2                                    | 0.098  | X   |
| SMDJ40A           | SMDJ40CA         | PFR     | DFR | 40.0                        | 44.40               | 49.10  | 1                                | 64.5  | 46.5   | 83.33  | 232.5   | 2                                    | 0.099  | X   |
| SMDJ43A           | SMDJ43CA         | PFT     | DFT | 43.0                        | 47.80               | 52.80  | 1                                | 69.4  | 43.2   | 89.66  | 216.0   | 2                                    | 0.1  | X   |
| SMDJ45A           | SMDJ45CA         | PFV     | DFV | 45.0                        | 50.00               | 55.30  | 1                                | 72.7  | 41.3   | 93.93  | 206.5   | 2                                    | 0.101  | X   |
| SMDJ48A           | SMDJ48CA         | PFX     | DFX | 48.0                        | 53.30               | 58.90  | 1                                | 77.4  | 38.8   | 100.00   | 194.0   | 2                                    | 0.101  | X   |
| SMDJ51A           | SMDJ51CA         | PFZ     | DFZ | 51.0                        | 56.70               | 62.70  | 1                                | 82.4  | 36.4   | 106.46   | 182.0   | 2                                    | 0.101  | X   |
| SMDJ54A           | SMDJ54CA         | RGE     | DGE | 54.0                        | 60.00               | 66.30  | 1                                | 87.1  | 34.4   | 112.53   | 172.0   | 2                                    | 0.102  | X   |
| SMDJ58A           | SMDJ58CA         | PGG     | DGG | 58.0                        | 64.40               | 71.20  | 1                                | 93.6  | 32.1   | 120.93   | 160.5   | 2                                    | 0.103  | X   |
| SMDJ60A           | SMDJ60CA         | PGK     | DGK | 60.0                        | 66.70               | 73.70  | 1                                | 96.8  | 31.0   | 125.06   | 155.0   | 2                                    | 0.103  | X   |
| SMDJ64A           | SMDJ64CA         | PGM     | DGM | 64.0                        | 71.10               | 78.60  | 1                                | 103.0   | 29.1   | 133.07   | 145.5   | 2                                    | 0.104  | X   |
| SMDJ70A           | SMDJ70CA         | PGP     | DGP | 70.0                        | 77.80               | 86.00  | 1                                | 113.0   | 26.5   | 145.99   | 132.5   | 2                                    | 0.105  | X   |
| SMDJ75A           | SMDJ75CA         | PGR     | DGR | 75.0                        | 83.30               | 92.10  | 1                                | 121.0   | 24.8   | 156.33   | 124.0   | 2                                    | 0.106  | X   |
| SMDJ78A           | SMDJ78CA         | PGT     | DGT | 78.0                        | 86.70               | 95.80  | 1                                | 126.0   | 23.8   | 162.79   | 119.0   | 2                                    | 0.106  | X   |
| SMDJ85A           | SMDJ85CA         | PGV     | DGV | 85.0                        | 94.40               | 104.00 | 1                                | 137.0   | 21.9   | 177.00   | 109.5   | 2                                    | 0.106  | X   |
| SMDJ90A           | SMDJ90CA         | PGX     | DGX | 90.0                        | 100.00              | 111.00 | 1                                | 146.0   | 20.5   | 188.63   | 102.5   | 2                                    | 0.107  | X   |
| SMDJ100A          | SMDJ100CA        | PGZ     | DGZ | 100.0                       | 111.00              | 123.00 | 1                                | 162.0   | 18.5   | 209.30   | 92.5  | 2                                    | 0.107  | X   |
| SMDJ110A          | SMDJ110CA        | PHE     | DHE | 110.0                       | 122.00              | 135.00 | 1                                | 177.0   | 16.9   | 228.68   | 84.5  | 2                                    | 0.107  | X   |
| SMDJ120A          | SMDJ120CA        | PHG     | DHG | 120.0                       | 133.00              | 147.00 | 1                                | 193.0   | 15.5   | 249.35   | 77.5  | 2                                    | 0.108  | X   |
| SMDJ130A          | SMDJ130CA        | PHK     | DHK | 130.0                       | 144.00              | 159.00 | 1                                | 209.0   | 14.4   | 270.03   | 72.0  | 2                                    | 0.108  | X   |
| SMDJ150A          | SMDJ150CA        | PHM     | DHM | 150.0                       | 167.00              | 185.00 | 1                                | 243.0   | 12.3   | 313.95   | 61.5  | 2                                    | 0.108  | X   |
| SMDJ160A          | SMDJ160CA        | PHP     | DHP | 160.0                       | 178.00              | 197.00 | 1                                | 259.0   | 11.6   | 334.63   | 58.0  | 2                                    | 0.108  | X   |
| SMDJ170A          | SMDJ170CA        | PHR     | DHR | 170.0                       | 189.00              | 209.00 | 1                                | 275.0   | 10.9   | 355.30   | 54.5  | 2                                    | 0.108  | X   |
| SMDJ180A          | SMDJ180CA        | PHT     | DHT | 180.0                       | 200.00              | 221.00 | 1                                | 292.0   | 10.3   | 377.26   | 51.5  | 2                                    | 0.108  | X   |
| SMDJ200A          | SMDJ200CA        | PHV     | DHV | 200.0                       | 224.00              | 247.00 | 1                                | 324.0   | 9.3  | 418.60   | 46.5  | 3                                    | 0.11   | X   |
| SMDJ220A          | SMDJ220CA        | PKE     | DKE | 220.0                       | 244.00              | 270.00 | 1                                | 356.0   | 8.4  | 459.95   | 42.0  | 2                                    | 0.11   | X   |
| SMDJ250A          | SMDJ250CA        | PKG     | DKG | 250.0                       | 279.00              | 309.00 | 1                                | 405.0   | 7.5  | 523.26   | 37.5  | 2                                    | 0.11   | X   |
| SMDJ300A          | SMDJ300CA        | PKI     | DKI | 300.0                       | 335.00              | 371.00 | 1                                | 486.0   | 6.2  | 627.91   | 31.0  | 2                                    | 0.112  | X   |
| SMDJ350A          | SMDJ350CA        | PKJ     | DKJ | 350.0                       | 391.00              | 432.00 | 1                                | 567.0   | 5.3  | 732.56   | 26.5  | 2                                    | 0.112  | X   |
| SMDJ400A          | SMDJ400CA        | PKL     | DKL | 400.0                       | 447.00              | 494.00 | 1                                | 648.0   | 4.7  | 837.21   | 23.5  | 2                                    | 0.112  | X   |
| SMDJ440A          | SMDJ440CA        | PKN     | DKN | 440.0                       | 492.00              | 543.00 | 1                                | 713.0   | 4.3  | 921.19   | 21.5  | 2                                    | 0.112  | X   |

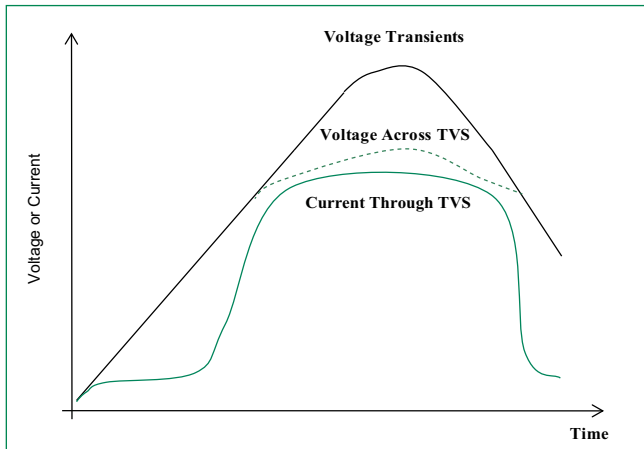
**I-V Curve Characteristics**



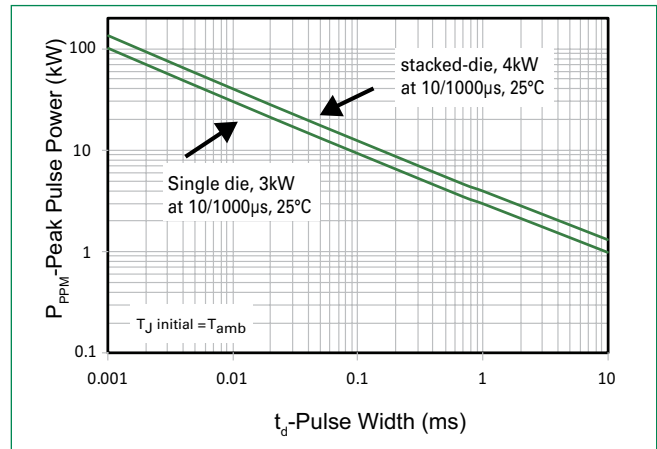
- P<sub>PPM</sub> Peak Pulse Power Dissipation** – Max power dissipation
- V<sub>R</sub> Stand-off Voltage** – Maximum voltage that can be applied to the TVS without operation
- V<sub>BR</sub> Breakdown Voltage** – Maximum voltage that flows thogh the TVS at a specified test current (I<sub>T</sub>)
- V<sub>C</sub> Clamping Voltage** – Peak voltage measured across the TVS at a specified I<sub>ppm</sub> (peak impulse current)
- I<sub>R</sub> Reverse Leakage Current** – Current measured at V<sub>R</sub>
- V<sub>F</sub> Forward Voltage Drop for Uni-directional**

**Ratings and Characteristic Curves** (T<sub>A</sub>=25°C unless otherwise noted)

**Figure 1 - TVS Transients Clamping Waveform**



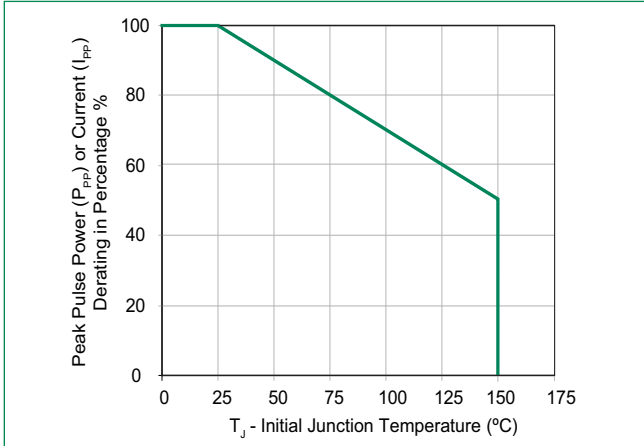
**Figure 2 - Peak Pulse Power Rating**



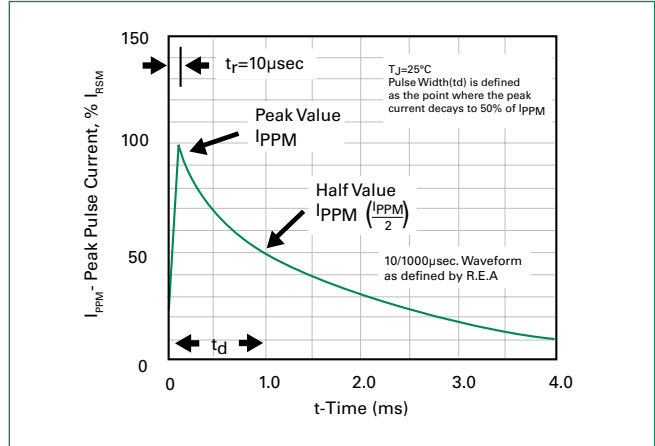
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**Ratings and Characteristic Curves** ( $T_A=25^{\circ}\text{C}$  unless otherwise noted) (Continued)

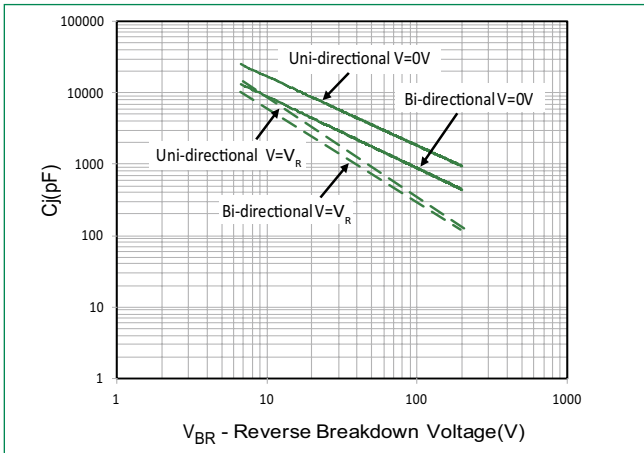
**Figure 3 - Peak Pulse Power Derating Curve**



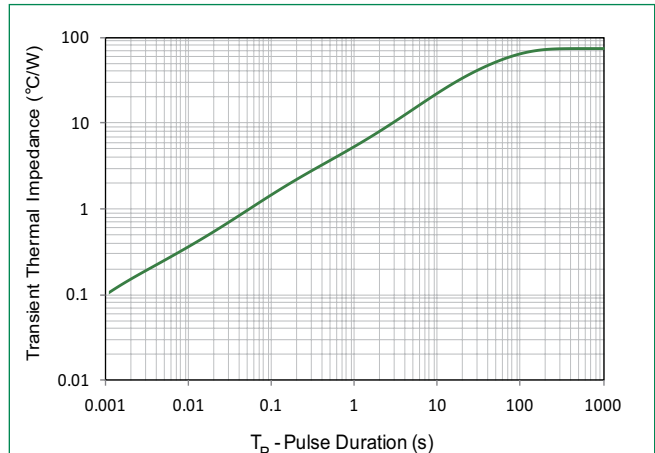
**Figure 4 - Pulse Waveform**



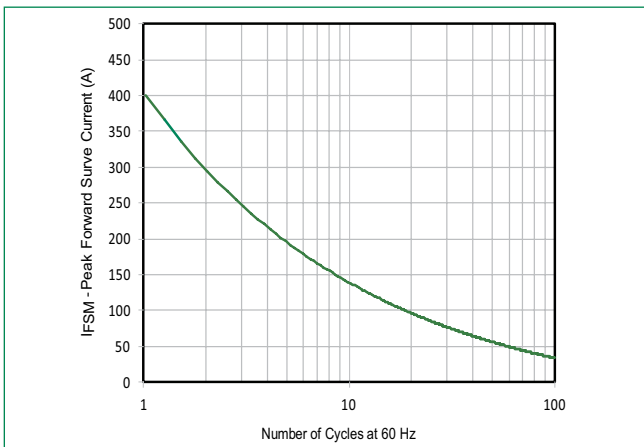
**Figure 5 - Typical Junction Capacitance**



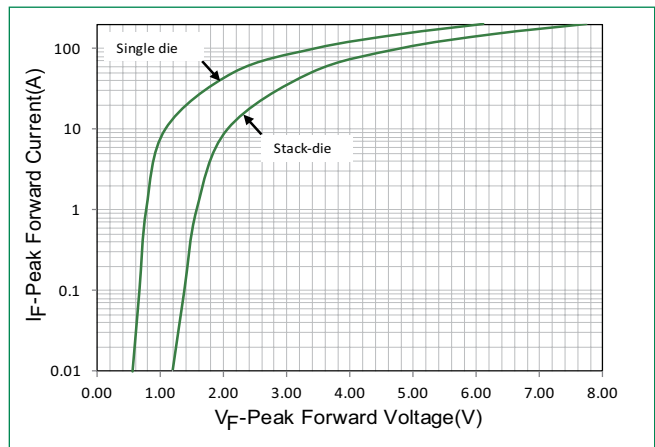
**Figure 6 - Typical Transient Thermal Impedance**



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

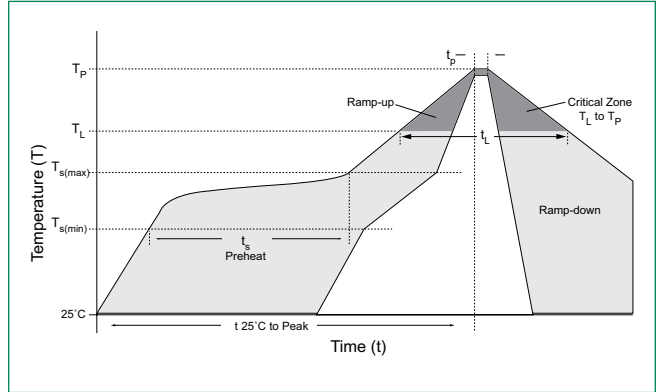


**Figure 8 - Peak Forward Voltage Drop vs Peak Forward Current (Typical Values)**



**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 – 180 secs           |
| <b>Average ramp up rate (Liquidus Temp (<math>T_A</math>) to peak)</b> |                                    | 3°C/second max          |
| <b><math>T_{s(max)}</math> to <math>T_A</math> - Ramp-up Rate</b>      |                                    | 3°C/second max          |
| <b>Reflow</b>  | - Temperature ( $T_A$ ) (Liquidus) | 217°C                   |
|  | - Time (min to max) ( $t_s$ )      | 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>   |                                    | 20 – 40 seconds         |
| <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**

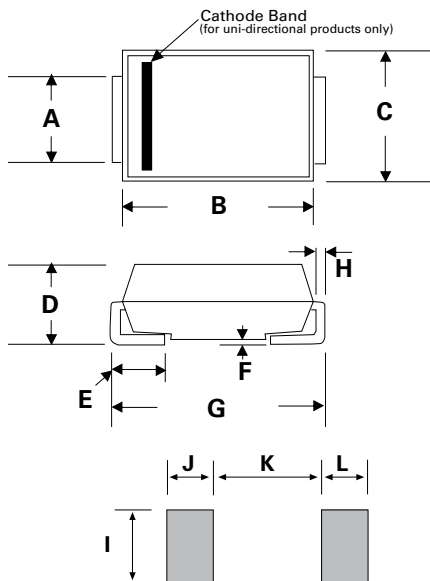
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|-----------------|--|
| <b>Weight</b>   | 0.007 ounce, 0.21 grams  |
| <b>Case</b>     | JEDEC DQ214AB. Molded plastic body over glass passivated junction            |
| <b>Polarity</b> | Color band denotes positive end (cathode) except for bidirectional versions. |
| <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              |

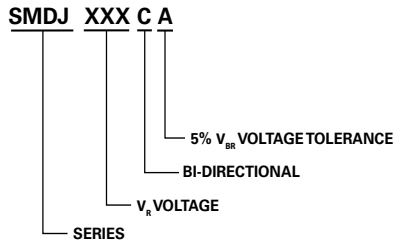
**Dimensions**

**DO-214AB (SMC J-Bend)**

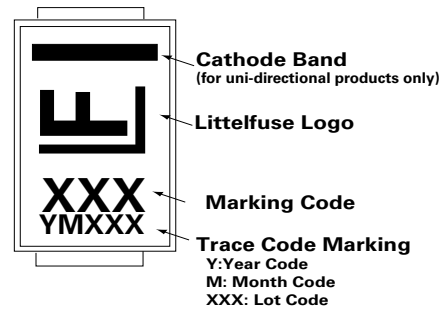


| Dimensions | Inches |       | Millimeters |       |
|------------|--------|-------|-------------|-------|
|            | Min    | Max   | Min         | Max   |
| A          | 0.114  | 0.126 | 2.900       | 3.200 |
| B          | 0.260  | 0.280 | 6.600       | 7.110 |
| C          | 0.220  | 0.245 |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

**Part Numbering System**



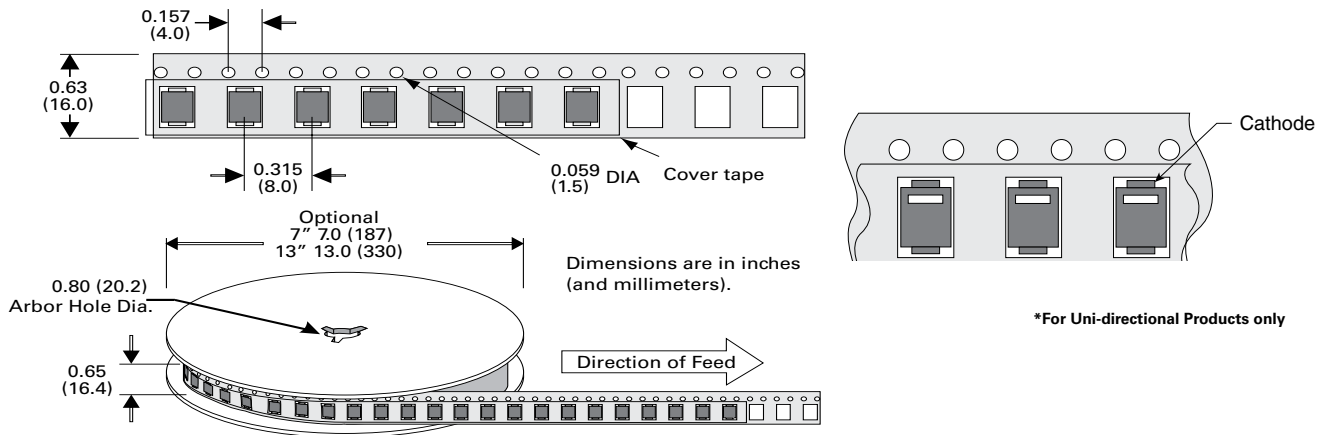
**Part Marking System**



**Packaging Options**

| Part number  | Component Package | Quantity | Packaging Option                 | Packaging Specification |
|--------------|-------------------|----------|----------------------------------|-------------------------|
| SMDJxxxXX    | DO-214AB          | 3000     | Tape & Reel - 16mm tape/13" reel | EIA STD RS-481          |
| SMDJxxxXX-T7 | DO-214AB          | 500      | Tape & Reel - 16mm tape/7" reel  | EIA STD RS-481          |



**Tape and Reel Specification**



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