

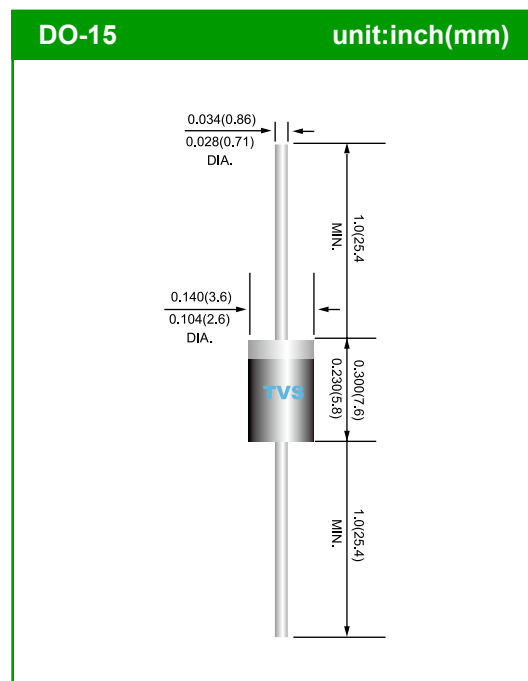


## Axial Leaded - 500W > SA5.0~180CA Series

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

### Features

- Halogen-free
- Rohs compliant
- Typical maximum temperature coefficient
- $\Delta V_{BR} = 0.1\% \times V_{BR}@25^{\circ}\text{C} \times \Delta T$
- Glass passivated Chip junction in DO-15 package
- 500W peak pulse capadility at 10×1000μs waveform, repetition rate(duty cycles):0.01%
- Fast response time:typically less than 1.0ps from 0 Volts to BV min
- Excellent clamping capability
- Low incremental surge resistance
- Typical  $I_R$  less than 5μA above 11V
- High temperature soldering guaranteed: 260°C/40 seconds / 0.375",
- (9.5mm) lead length, 5lbs., (2.3kg) tension
- Plastic package has underwriters laboratory flammability classification 94v-0



### Applications

TVS devices are ideal for the protection of I/O interfaces,  $V_{CC}$  bus and other vulnerable circuits used in telecom,computer, industrial and consumer electronic applications.

### Maximum Ratings And Characteristics (TA=25°C unless otherwise noted)

| Rating                                                                               | Symbol         | Value           | Units |
|--------------------------------------------------------------------------------------|----------------|-----------------|-------|
| Peak Pulse Power Dissipation by 10x1000μs test waveform (Fig.1)(Note 1)              | $P_{PPM}$      | 500             | Watts |
| Steady State Power Dissipation on infinite heat sink at TL=75°C (Fig. 5)             | $P_D$          | 3               | Watts |
| Peak Forward Surge Current, 8.3ms Single Half Sine Wave Unidirectional only (Note 2) | $I_{FSM}$      | 70              | Amps  |
| Maximum Instantaneous Forward Voltage at 25A for Unidirectional only (Note 3)        | $V_F$          | 3.5/5.0         | V     |
| Operating junction and Storage Temperature Range.                                    | $T_J, T_{STG}$ | -55 to 175      | °C    |
| Typical Thermal Resistance Junction to Lead                                          | $R_{uJL}$      | 20              | °C/W  |
| Typical Thermal Resistance Junction to Ambient                                       | $R_{uJA}$      | 75              | °C/W  |
| Operating junction and Storage Temperature Range.                                    | $T_J, T_{STG}$ | -55°C to +175°C | °C    |

Notes:

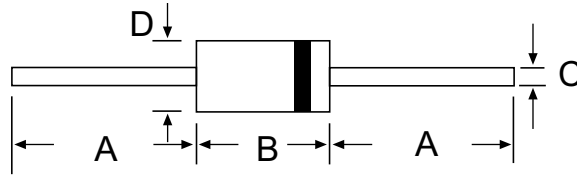
1. Non-repetitive current pulse , per Fig. 3 and derated above  $T_A = 25^{\circ}\text{C}$  per Fig. 2.

2. Measured on 8.3ms single half sine wave or equivalent square wave, duty cycle=4 per minute maximum.



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### Dimensions



DO-204AC (DO-15)

| Dimensions | Inches |       | Millimeters |      |
|------------|--------|-------|-------------|------|
|            | Min    | Max   | Min         | Max  |
| A          | 1.000  | -     | 25.40       | -    |
| B          | 0.230  | 0.300 | 5.80        | 7.60 |
| C          | 0.028  | 0.034 | 0.71        | 0.86 |
| D          | 0.104  | 0.140 | 2.60        | 3.60 |

### Electrical Characteristics

| Part Number |          | Reverse Stand-Off Voltage | Breakdown Voltage NIN.@I <sub>T</sub> | Breakdown Voltage MAX.@I <sub>T</sub> | Test Current        | Maximum Clamping Voltage @I <sub>PP</sub> | Peak Pulse Current  | Reverse Leakage @V <sub>RWM</sub> |
|-------------|----------|---------------------------|---------------------------------------|---------------------------------------|---------------------|-------------------------------------------|---------------------|-----------------------------------|
| UNT-POLAR   | BI-POLAR | V <sub>RWM</sub> (V)      | V <sub>BR</sub> MIN.(V)               | V <sub>BR</sub> MAX.(V)               | I <sub>T</sub> (mA) | V <sub>C</sub> (V)                        | I <sub>PP</sub> (A) | I <sub>R</sub> (μA)               |
| SA5.0A      | SA5.0CA  | 5.0                       | 6.40                                  | 7.00                                  | 10                  | 9.2                                       | 55.4                | 600                               |
| SA6.0A      | SA6.0CA  | 6.0                       | 6.67                                  | 7.37                                  | 10                  | 10.3                                      | 49.5                | 600                               |
| SA6.5A      | SA6.5CA  | 6.5                       | 7.22                                  | 7.98                                  | 10                  | 11.2                                      | 45.5                | 400                               |
| SA7.0A      | SA7.0CA  | 7.0                       | 7.78                                  | 8.60                                  | 10                  | 12.0                                      | 42.5                | 150                               |
| SA7.5A      | SA7.5CA  | 7.5                       | 8.33                                  | 9.21                                  | 1                   | 12.9                                      | 39.5                | 50                                |
| SA8.0A      | SA8.0CA  | 8.0                       | 8.89                                  | 9.83                                  | 1                   | 13.6                                      | 37.5                | 25                                |
| SA8.5A      | SA8.5CA  | 8.5                       | 9.44                                  | 10.40                                 | 1                   | 14.4                                      | 35.4                | 10                                |
| SA9.0A      | SA9.0CA  | 9.0                       | 10.00                                 | 11.10                                 | 1                   | 15.4                                      | 33.1                | 5                                 |
| SA10A       | SA10CA   | 10.0                      | 11.10                                 | 12.30                                 | 1                   | 17.0                                      | 30.0                | 3                                 |
| SA11A       | SA11CA   | 11.0                      | 12.20                                 | 13.50                                 | 1                   | 18.2                                      | 28.0                | 1                                 |
| SA12A       | SA12CA   | 12.0                      | 13.30                                 | 14.70                                 | 1                   | 19.9                                      | 25.6                | 1                                 |
| SA13A       | SA13CA   | 13.0                      | 14.40                                 | 15.90                                 | 1                   | 21.5                                      | 23.7                | 1                                 |
| SA14A       | SA14CA   | 14.0                      | 15.60                                 | 17.20                                 | 1                   | 23.2                                      | 22.0                | 1                                 |
| SA15A       | SA15CA   | 15.0                      | 16.70                                 | 18.50                                 | 1                   | 24.4                                      | 20.9                | 1                                 |
| SA16A       | SA16CA   | 16.0                      | 17.80                                 | 19.70                                 | 1                   | 26.0                                      | 19.6                | 1                                 |



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### Electrical Characteristics

| Part Number |          | Reverse Stand-Off Voltage | Breakdown Voltage MIN.@I <sub>T</sub> | Breakdown Voltage MAX.@I <sub>T</sub> | Test Current        | Maximum Clamping Voltage @I <sub>PP</sub> | Peak Pulse Current  | Reverse Leakage @V <sub>RWM</sub> |
|-------------|----------|---------------------------|---------------------------------------|---------------------------------------|---------------------|-------------------------------------------|---------------------|-----------------------------------|
| UNT-POLAR   | BI-POLAR | V <sub>RWM</sub> (V)      | V <sub>BR</sub> MIN.(V)               | V <sub>BR</sub> MAX.(V)               | I <sub>T</sub> (mA) | V <sub>C</sub> (V)                        | I <sub>PP</sub> (A) | I <sub>R</sub> (μA)               |
| SA17A       | SA17CA   | 17.0                      | 18.90                                 | 20.90                                 | 1                   | 27.6                                      | 18.5                | 1                                 |
| SA18A       | SA18CA   | 18.0                      | 20.00                                 | 22.10                                 | 1                   | 29.2                                      | 17.5                | 1                                 |
| SA20A       | SA20CA   | 20.0                      | 22.20                                 | 24.50                                 | 1                   | 32.4                                      | 15.7                | 1                                 |
| SA22A       | SA22CA   | 22.0                      | 24.40                                 | 26.90                                 | 1                   | 35.5                                      | 14.4                | 1                                 |
| SA24A       | SA24CA   | 24.0                      | 26.70                                 | 29.50                                 | 1                   | 38.9                                      | 13.1                | 1                                 |
| SA26A       | SA26CA   | 26.0                      | 28.90                                 | 31.90                                 | 1                   | 42.1                                      | 12.1                | 1                                 |
| SA28A       | SA28CA   | 28.0                      | 31.10                                 | 34.40                                 | 1                   | 45.4                                      | 11.2                | 1                                 |
| SA30A       | SA30CA   | 30.0                      | 33.30                                 | 36.80                                 | 1                   | 48.4                                      | 10.5                | 1                                 |
| SA33A       | SA33CA   | 33.0                      | 36.70                                 | 40.60                                 | 1                   | 53.3                                      | 9.6                 | 1                                 |
| SA36A       | SA36CA   | 36.0                      | 40.00                                 | 44.20                                 | 1                   | 58.1                                      | 8.8                 | 1                                 |
| SA40A       | SA40CA   | 40.0                      | 44.40                                 | 49.10                                 | 1                   | 64.5                                      | 7.9                 | 1                                 |
| SA43A       | SA43CA   | 43.0                      | 47.80                                 | 52.80                                 | 1                   | 69.4                                      | 7.3                 | 1                                 |
| SA45A       | SA45CA   | 45.0                      | 50.00                                 | 55.30                                 | 1                   | 72.7                                      | 7.0                 | 1                                 |
| SA48A       | SA48CA   | 48.0                      | 53.30                                 | 58.90                                 | 1                   | 77.4                                      | 6.6                 | 1                                 |
| SA51A       | SA51CA   | 51.0                      | 56.70                                 | 62.70                                 | 1                   | 82.4                                      | 6.2                 | 1                                 |
| SA54A       | SA54CA   | 54.0                      | 60.00                                 | 66.30                                 | 1                   | 87.1                                      | 5.9                 | 1                                 |
| SA58A       | SA58CA   | 58.0                      | 64.40                                 | 71.20                                 | 1                   | 93.6                                      | 5.4                 | 1                                 |
| SA60A       | SA60CA   | 60.0                      | 66.70                                 | 73.70                                 | 1                   | 96.8                                      | 5.3                 | 1                                 |
| SA64A       | SA64CA   | 64.0                      | 71.10                                 | 78.60                                 | 1                   | 103.0                                     | 5.0                 | 1                                 |
| SA70A       | SA70CA   | 70.0                      | 77.80                                 | 86.00                                 | 1                   | 113.0                                     | 4.5                 | 1                                 |
| SA75A       | SA75CA   | 75.0                      | 83.30                                 | 92.10                                 | 1                   | 121.0                                     | 4.2                 | 1                                 |
| SA78A       | SA78CA   | 78.0                      | 86.70                                 | 95.80                                 | 1                   | 126.0                                     | 4.0                 | 1                                 |
| SA85A       | SA85CA   | 85.0                      | 94.40                                 | 104.00                                | 1                   | 137.0                                     | 3.7                 | 1                                 |
| SA90A       | SA90CA   | 90.0                      | 100.00                                | 111.00                                | 1                   | 146.0                                     | 3.5                 | 1                                 |
| SA100A      | SA100CA  | 100.0                     | 111.00                                | 123.00                                | 1                   | 162.0                                     | 3.1                 | 1                                 |
| SA110A      | SA110CA  | 110.0                     | 122.00                                | 135.00                                | 1                   | 177.0                                     | 2.9                 | 1                                 |
| SA120A      | SA120CA  | 120.0                     | 133.00                                | 147.00                                | 1                   | 193.0                                     | 2.6                 | 1                                 |
| SA130A      | SA130CA  | 130.0                     | 144.00                                | 159.00                                | 1                   | 209.0                                     | 2.4                 | 1                                 |
| SA150A      | SA150CA  | 150.0                     | 167.00                                | 185.00                                | 1                   | 243.0                                     | 2.1                 | 1                                 |
| SA160A      | SA160CA  | 160.0                     | 178.00                                | 197.00                                | 1                   | 259.0                                     | 2.0                 | 1                                 |
| SA170A      | SA170CA  | 170.0                     | 189.00                                | 209.00                                | 1                   | 275.0                                     | 1.9                 | 1                                 |
| SA180A      | SA180CA  | 180.0                     | 201.00                                | 222.00                                | 1                   | 292.0                                     | 1.7                 | 1                                 |
| SA190A      | SA190CA  | 190.0                     | 211.00                                | 233.00                                | 1                   | 308.0                                     | 1.6                 | 1                                 |
| SA200A      | SA200CA  | 200.0                     | 224.00                                | 247.00                                | 1                   | 324.0                                     | 1.5                 | 1                                 |
| SA210A      | SA210CA  | 210.0                     | 237.00                                | 263.00                                | 1                   | 340.0                                     | 1.5                 | 1                                 |
| SA220A      | SA220CA  | 220.0                     | 246.00                                | 272.00                                | 1                   | 356.0                                     | 1.4                 | 1                                 |

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



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

Figure 1 - Peak Pulse Power Rating Curve

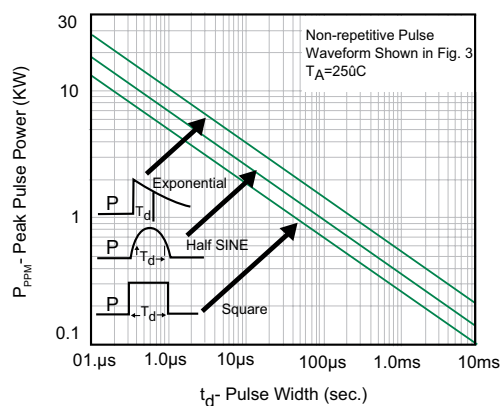


Figure 2 - Pulse Derating Curve

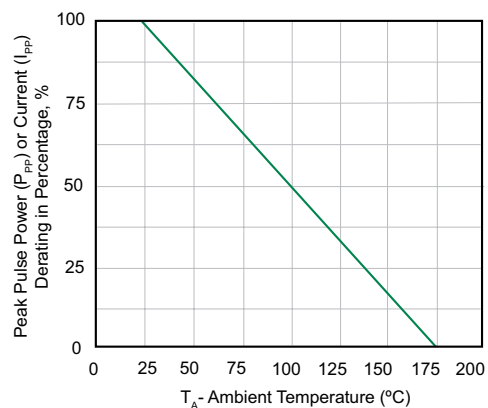


Figure 3 - Pulse Waveform

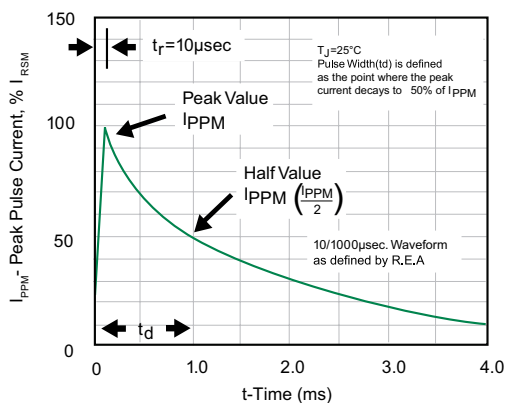


Figure 4 - Typical Junction Capacitance

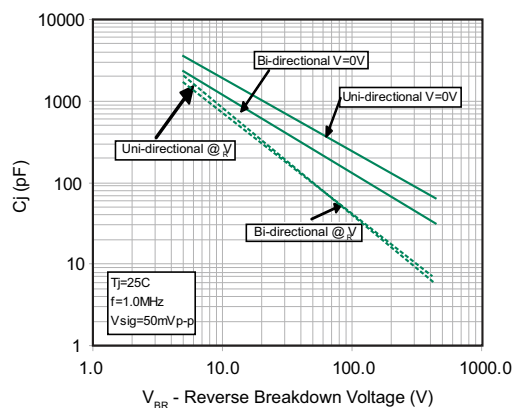


Figure 5 - Steady State Power Derating Curve

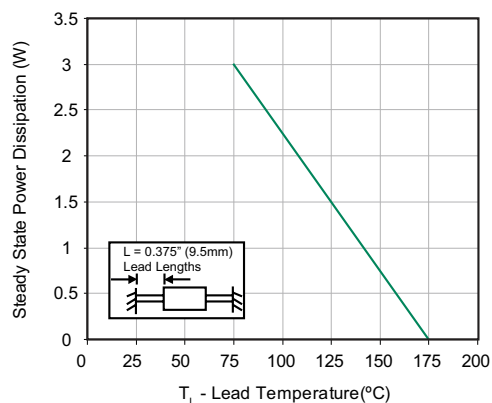
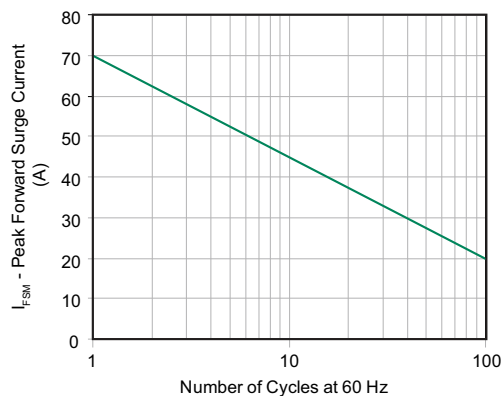


Figure 6 - Maximum Non-Repetitive Forward Surge Current Uni-Directional Only

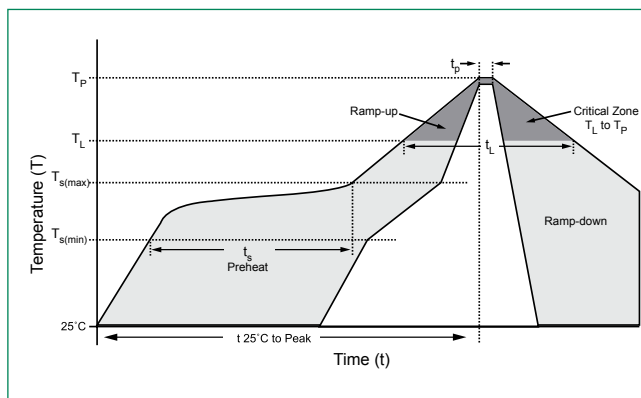




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### Soldering Parameters

|                                                        |                                    |                         |
|--------------------------------------------------------|------------------------------------|-------------------------|
| Reflow Condition                                       |                                    | Lead-free assembly      |
| Pre Heat                                               | - Temperature Min ( $T_{s(min)}$ ) | 150°C                   |
|                                                        | - Temperature Max ( $T_{s(max)}$ ) | 200°C                   |
|                                                        | - Time (min to max) ( $t_s$ )      | 60 – 180 secs           |
| Average ramp up rate (Liquidus Temp ( $T_L$ ) to peak) |                                    | 3°C/second max          |
| $T_{s(max)}$ to $T_L$ - Ramp-up Rate                   |                                    | 3°C/second max          |
| Reflow                                                 | - Temperature ( $T_L$ ) (Liquidus) | 217°C                   |
|                                                        | - Time (min to max) ( $t_s$ )      | 60 – 150 seconds        |
| Peak Temperature ( $T_p$ )                             |                                    | 260 <sup>+0/-5</sup> °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 ( $T_p$ )                |                                    | 8 minutes Max.          |
| Do not exceed                                          |                                    | 280°C                   |



### Flow/Wave Soldering (Solder Dipping)

|                    |            |
|--------------------|------------|
| Peak Temperature : | 265°C      |
| Dipping Time :     | 10 seconds |
| Soldering :        | 1 time     |

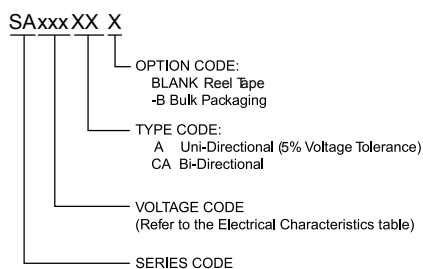
### Physical Specifications

|          |                                                            |
|----------|------------------------------------------------------------|
| Weight   | 0.045oz., 1.2g                                             |
| Case     | JEDEC DO-201 molded plastic body over passivated junction. |
| Polarity | Color band denotes the cathode except Bipolar.             |
| Terminal | Matte Tin axial leads, solderable per JESD22-B102D.        |

### Environmental Specifications

|                    |              |
|--------------------|--------------|
| Temperature Cycle  | JESD22-A104  |
| Pressure Cooker    | JESD 22-A102 |
| High Temp. Storage | JESD22-A103  |
| HTRB               | JESD22-A108  |
| Thermal Shock      | JESD22-A106  |

### Part Numbering System



### Part Marking System

