SMAJ Series
Surface Mount – 400W

Description

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

Features

- 400W Peak Pulse Power capability at 10/1000µs waveform, repetition rate (duty cycle): 0.01%
- Excellent clamping capability
- Typical IR less than 1µA when VBR min>12V
- Surface mount footprint for compact PCB layout
- 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
- Fast response time: typically less than 1.0ps from 0 Volts to VBR min
- Glass passivated junction
- Low inductance
- High temperature to reflow soldering guaranteed: 260°C/30sec
- VBR @ TJ= VBR@25°C x (1+αT x (TJ - 25)) (α:Temperature Coefficient, typical value is 0.1%)
- Plastic package is flammability rated V-0 per UL94.
- 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)
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Applications

TVS devices are ideal for the protection of I/O Interfaces, VCC bus and other vulnerable circuits used in Telecom, Computer, Industrial and Consumer electronic applications.

Agency Approvals

<table>
<thead>
<tr>
<th>Agency</th>
<th>Agency File Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>UL</td>
<td>E230531</td>
</tr>
</tbody>
</table>

Functional Diagram

![Bi-directional Functional Diagram](image_url)

Notes:
1. Non-repetitive current pulse, per Fig 4 and derated above TJ (initial) =25°C per Fig 3.
2. Mounted on 5.0x5.0mm copper pad to each terminal.
3. Measured on 8.3ms single half sine wave or equivalent square wave for unidirectional device only.
4. VF < 3.5V for single die parts and VF< 5.0V for stacked-die parts.
5. For stacked die component details, please refer to part numbers labeled by * in Electrical Characteristics.
### SMAJ Series

**Surface Mount – 400W**

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

<table>
<thead>
<tr>
<th>Part Number (Uni)</th>
<th>Part Number (Bi)</th>
<th>Marking</th>
<th>Reverse Stand off Voltage V&lt;sub&gt;SR&lt;/sub&gt; (Volts)</th>
<th>Breakdown Voltage V&lt;sub&gt;BR&lt;/sub&gt; (Volts) @ I&lt;sub&gt;T&lt;/sub&gt;</th>
<th>Test Current I&lt;sub&gt;T&lt;/sub&gt; (mA)</th>
<th>Maximum Clamping Voltage V&lt;sub&gt;CM&lt;/sub&gt; @ I&lt;sub&gt;P&lt;/sub&gt; (V)</th>
<th>Maximum Peak Pulse Current I&lt;sub&gt;PP&lt;/sub&gt; (A)</th>
<th>Maximum Reverse Leakage I&lt;sub&gt;RL&lt;/sub&gt; @ V&lt;sub&gt;SR&lt;/sub&gt; (µA)</th>
<th>Agency Approval</th>
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<tbody>
<tr>
<td>SMAJ5.0A</td>
<td>SMAJ5.0CA</td>
<td>AE WE</td>
<td>5.0</td>
<td>6.40</td>
<td>700</td>
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<td>SMAJ6.0A</td>
<td>SMAJ6.0CA</td>
<td>AG WG</td>
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<td>6.67</td>
<td>737</td>
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<td>SMAJ6.5A</td>
<td>SMAJ6.5CA</td>
<td>AK WK</td>
<td>6.5</td>
<td>7.22</td>
<td>798</td>
<td>10</td>
<td>11.2</td>
<td>35.7</td>
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<td>SMAJ7.0A</td>
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<td>AM WM</td>
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<td>7.78</td>
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<td>12.0</td>
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<td>200</td>
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<tr>
<td>SMAJ7.5A</td>
<td>SMAJ7.5CA</td>
<td>AP WP</td>
<td>7.5</td>
<td>8.33</td>
<td>9.21</td>
<td>10</td>
<td>12.9</td>
<td>31.0</td>
<td>100</td>
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<tr>
<td>SMAJ8.0A</td>
<td>SMAJ8.0CA</td>
<td>AR WR</td>
<td>8.0</td>
<td>8.89</td>
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<td>SMAJ8.5A</td>
<td>SMAJ8.5CA</td>
<td>AT WT</td>
<td>8.5</td>
<td>9.44</td>
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<td>14.4</td>
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<td>AV WV</td>
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<td>26.0</td>
<td>10</td>
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<td>SMAJ10A</td>
<td>SMAJ10CA</td>
<td>AX WX</td>
<td>10.0</td>
<td>11.10</td>
<td>12.30</td>
<td>10</td>
<td>17.0</td>
<td>23.5</td>
<td>5</td>
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**Notes:**
- For bidirectional type having V<sub>SR</sub> of 10 volts and less, the I<sub>T</sub> limit is double.
- For stack-die parts, use * to label the part number.
SMAJ Series
Surface Mount – 400W

I-V Curve Characteristics

Figure 1: TVS Transients Clamping Waveform
Figure 2: Peak Pulse Power Rating Curve

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

- **$P_{PM}$**: 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 $I_{PP}$ (peak impulse current)
- **$I_R$**: Reverse Leakage Current – Current measured at $V_R$
- **$V_F$**: Forward Voltage Drop for Uni-directional

*TJ initial = Tamb*
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 Forward Surge Current
Uni-Directional Only

**Figure 8:**
Peak Forward Voltage Drop vs Peak Forward Current
(Typical Values)
**SMAJ Series**

**Surface Mount – 400W**

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### Soldering Parameters

<table>
<thead>
<tr>
<th>Reflow Condition</th>
<th>Lead-free assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Heat</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Temperature Min ($T_{\text{min}}$) 150°C</td>
</tr>
<tr>
<td></td>
<td>- Temperature Max ($T_{\text{max}}$) 200°C</td>
</tr>
<tr>
<td></td>
<td>- Time (min to max) ($t_{\text{i}}$) 60 – 120 secs</td>
</tr>
<tr>
<td>Average ramp up rate (Liquidus Temp ($T_{L}$) to peak</td>
<td>3°C/second max</td>
</tr>
<tr>
<td>$T_{\text{max}}$ to $T_{L}$ - Ramp-up Rate</td>
<td>3°C/second max</td>
</tr>
<tr>
<td>Reflow</td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Temperature ($T_{L}$) (Liquidus) 217°C</td>
</tr>
<tr>
<td></td>
<td>- Time (min to max) ($t_{\text{i}}$) 60 – 150 seconds</td>
</tr>
<tr>
<td>Peak Temperature ($T_{L}$)</td>
<td>260°C</td>
</tr>
<tr>
<td>Time within 5°C of actual peak Temperature ($t_{\text{i}}$)</td>
<td>30 seconds Max</td>
</tr>
<tr>
<td>Ramp-down Rate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>6°C/second Max</td>
</tr>
<tr>
<td>Time 25°C to peak Temperature ($T_{L}$)</td>
<td>8 minutes Max.</td>
</tr>
<tr>
<td>Do not exceed</td>
<td>260°C</td>
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### Physical Specifications

- **Weight**: 0.002 ounce, 0.061 gram
- **Case**: JEDEC DO-214AC Molded Plastic over glass passivated junction
- **Polarity**: Color band denotes cathode except Bipolar
- **Terminal**: Matte Tin-plated leads, Solderable per JESD22-B102

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### Environmental Specifications

- **High Temp. Storage**: JESD22-A103
- **HTRB**: JESD22-A108
- **Temperature Cycling**: JESD22-A104
- **MSL**: JEDEC-J-STD-020, Level 1
- **H3TRB**: JESD22-A101
- **RSH**: JESD22-A111

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### Dimensions

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<th>Min</th>
<th>Max</th>
<th>Min</th>
<th>Max</th>
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<td>0.065</td>
<td>1.250</td>
<td>1.650</td>
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<tr>
<td>B</td>
<td>0.157</td>
<td>0.181</td>
<td>3.990</td>
<td>4.600</td>
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<tr>
<td>C</td>
<td>0.095</td>
<td>0.110</td>
<td>2.400</td>
<td>2.790</td>
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<tr>
<td>D</td>
<td>0.075</td>
<td>0.090</td>
<td>1.900</td>
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<tr>
<td>E</td>
<td>0.030</td>
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<td>0.780</td>
<td>1.520</td>
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<tr>
<td>F</td>
<td>-</td>
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<td>0.189</td>
<td>0.208</td>
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<td>I</td>
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<td>J</td>
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<td>L</td>
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**Solder Pads**

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Specifications are subject to change without notice.
Revised: GD. 07/22/22
SMAJ Series
Surface Mount – 400W

Part Numbering System

SMAJ XXX CA

- 5% $V_{BR}$ Voltage Tolerance
- Bi-directional
- $V_{BR}$ Voltage
- Series

Part Marking System

- Cathode Band (for uni-directional products only)
- Littelfuse Logo
- Marking Code
- Trace Code Marking
  - Y: Year Code
  - M: Month Code
  - XXX: Lot Code

Packaging

<table>
<thead>
<tr>
<th>Part number</th>
<th>Component Package</th>
<th>Quantity</th>
<th>Packaging Option</th>
<th>Packaging Specification</th>
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<tbody>
<tr>
<td>SMAJ-xxxXX</td>
<td>DO-214AC</td>
<td>5000</td>
<td>Tape &amp; Reel - 12mm tape/13” reel</td>
<td>EIA STD RS-481</td>
</tr>
</tbody>
</table>

Tape and Reel Specification

- 0.47 (12.0)
- 0.157 (4.0)
- 0.80 (20.2) Arbor Hole Dia.
- 0.49 (12.5)
- 13.0 (330) Dimensions are in inches (and millimeters).
- 0.059 DIA Cover tape
- Direction of Feed

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