**SP3025 Series**

**Lightning Surge Protection**

**Description**

The SP3025 is a low-capacitance, TVS Diode Array designed to provide protection against ESD (electrostatic discharge), CDE (cable discharge events), EFT (electrical fast transients), and lightning induced surges for highspeed, differential data lines. It’s packaged in a SOT23-6L and each device can protect up to 4 channels up to 30A (IEC 61000-4-5 2nd edition,) and up to ±30kV ESD (IEC 61000-4-2).

The SP3025 with its low capacitance and low clamping voltage makes it ideal for high-speed data interfaces such as 1GbE applications found in notebooks, switches, etc.

**Features & Benefits**

- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (5/50ns)
- Lightning, IEC 61000-4-5 2nd edition, 30A (\(t_p=8/20\mu s\))
- Low capacitance of 1.7pF@0V (TYP)
- Low leakage current of 1nA (TYP) at 2.5V
- Low operating and clamping voltage
- Provides protection for two differential data pairs (4 channels) up to 30A
- Halogen free, Lead free and RoHS compliant
- Moisture Sensitivity Level (MSL -1)

**Applications**

- 10/100/1000 Ethernet
- WAN/LAN Equipment
- Desktops, Servers and Notebooks
- LVDS Interfaces
- Integrated Magnetics
- Smart TV
- 2.5G/5G/10G Ethernet

**Life Support Note:**

*Not Intended for Use in Life Support or Life Saving Applications*

The products shown herein are not designed for use in life sustaining or life saving applications unless otherwise expressly indicated.

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Revised: GD. 09/14/21
Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPP</td>
<td>Peak Current (t_p=8/20μs)</td>
<td>30</td>
<td>A</td>
</tr>
<tr>
<td>TDP</td>
<td>Operating Temperature</td>
<td>-40 to 125</td>
<td>°C</td>
</tr>
<tr>
<td>TSTOR</td>
<td>Storage Temperature</td>
<td>-55 to 150</td>
<td>°C</td>
</tr>
</tbody>
</table>

Caution: Stresses above those listed in “Absolute Maximum Ratings” may cause permanent damage to the component. This is a stress only rating and operation of the component at these or any other conditions above those indicated in the operational sections of this specification is not implied.

Electrical Characteristics (T_{OP}=25°C)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Test Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse Standoff Voltage</td>
<td>V_{RWAM}</td>
<td>I_R = 1μA</td>
<td>2.5</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>V_{BR}</td>
<td>I_R = 1mA</td>
<td>5.5</td>
<td>70</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Reverse Leakage Current</td>
<td>I_{LEAK}</td>
<td>V_{L}=2.5V</td>
<td>1</td>
<td>100</td>
<td>nA</td>
<td></td>
</tr>
<tr>
<td>Holding Voltage</td>
<td>V_{HOLD}</td>
<td>I/O to GND</td>
<td>1.6</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clamp Voltage</td>
<td>V_{C}</td>
<td>I_R=30A, t_p=8/20μs</td>
<td>9</td>
<td>11</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>Dynamic Resistance</td>
<td>R_{dyn}</td>
<td>TLP t_p=100ns</td>
<td>0.14</td>
<td>Ω</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ESD Withstand Voltage</td>
<td>V_{ESD}</td>
<td>IEC 61000-4-2 (Contact Discharge)</td>
<td>±30</td>
<td>kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEC 61000-4-2 (Air Discharge)</td>
<td>±30</td>
<td>kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diode Capacitance</td>
<td>C_{IO-GND}</td>
<td>Reverse Bias=0V, f=1MHz</td>
<td>1.7</td>
<td>2.5</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td></td>
<td>C_{IO-I/O}</td>
<td></td>
<td>0.8</td>
<td>1.2</td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

Notes:
1. Parameter is guaranteed by design and/or component characterization.
2. Transmission Line Pulse (TLP) test setting: Std. TDR(50Ω), tp=100ns, t_r=0.2ns TLP and VTL, averaging window: start t1=70ns to end t2=90ns
3. Device stressed with ten non-repetitive ESD pulses.

8/20μs Pulse Waveform

Capacitance vs. Reverse Bias
**SP3025 Series**

**Lightning Surge Protection**

**Positive Transmission Line Pulsing (TLP) Plot**

**Negative Transmission Line Pulsing (TLP) Plot**

**Clamping Voltage vs. Peak Pulse Current**

**IEC 61000-4-2 +8kV Contact ESD Clamping Voltage**

**IEC 61000-4-2 -8kV Contact ESD Clamping Voltage**
SP3025 Series
Lightning Surge Protection

Soldering Parameters

<table>
<thead>
<tr>
<th>Reflow Condition</th>
<th>Pb – Free assembly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Heat</td>
<td>- Temperature Min (T_min) 150°C</td>
</tr>
<tr>
<td></td>
<td>- Temperature Max (T_max) 200°C</td>
</tr>
<tr>
<td>Average ramp up rate (Liquidus) Temp (T_L) to peak</td>
<td>60 – 120 secs</td>
</tr>
<tr>
<td>T_slope to T_L - Ramp-up Rate</td>
<td>3°C/second max</td>
</tr>
<tr>
<td>Reflow</td>
<td>- Temperature (T_L) (Liquidus) 217°C</td>
</tr>
<tr>
<td></td>
<td>- Temperature (T_T) 60 – 150 seconds</td>
</tr>
<tr>
<td>Peak Temperature (T_T)</td>
<td>260 +/- 5 °C</td>
</tr>
<tr>
<td>Time within 5°C of actual peak Temperature (T_P)</td>
<td>30 seconds</td>
</tr>
<tr>
<td>Ramp-down Rate</td>
<td>6°C/second max</td>
</tr>
<tr>
<td>Time 25°C to peak Temperature (T_P)</td>
<td>8 minutes Max.</td>
</tr>
<tr>
<td>Do not exceed</td>
<td>260°C</td>
</tr>
</tbody>
</table>

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
<th>Min. Order Qty.</th>
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</thead>
<tbody>
<tr>
<td>SP3025-04HTG</td>
<td>SOT23-6L</td>
<td>3000</td>
</tr>
</tbody>
</table>

Part Marking System

AD : Part code
D : Assembly code
* : Date code

Product Characteristics

<table>
<thead>
<tr>
<th>Lead Plating</th>
<th>Matte Tin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead Material</td>
<td>Copper Alloy</td>
</tr>
<tr>
<td>Lead Coplanarity</td>
<td>0.004 inches (0.102mm)</td>
</tr>
<tr>
<td>Substrate Material</td>
<td>Silicon</td>
</tr>
<tr>
<td>Body Material</td>
<td>Molded Compound</td>
</tr>
<tr>
<td>Flammability</td>
<td>UL Recognized compound meeting flammability rating V-0</td>
</tr>
</tbody>
</table>

Part Numbering System

SP 3025 - 04 H T G

G = Green
Te = Tape & Reel
H = SOT23-6L

TVS Diode Arrays (SPA Diodes)
Series
Number of Channels
### Package Dimensions — SOT23-6L

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Min</td>
</tr>
<tr>
<td>A1</td>
<td>0.00</td>
</tr>
<tr>
<td>A2</td>
<td>0.90</td>
</tr>
<tr>
<td>b</td>
<td>0.30</td>
</tr>
<tr>
<td>b1</td>
<td>0.30</td>
</tr>
<tr>
<td>c</td>
<td>0.08</td>
</tr>
<tr>
<td>c1</td>
<td>0.08</td>
</tr>
<tr>
<td>D</td>
<td>2.75</td>
</tr>
<tr>
<td>E</td>
<td>2.60</td>
</tr>
<tr>
<td>E1</td>
<td>1.45</td>
</tr>
<tr>
<td>e</td>
<td>0.95</td>
</tr>
<tr>
<td>e1</td>
<td>1.90</td>
</tr>
<tr>
<td>L</td>
<td>0.30</td>
</tr>
<tr>
<td>L1</td>
<td>0.60</td>
</tr>
<tr>
<td>L2</td>
<td>0.25</td>
</tr>
<tr>
<td>θ</td>
<td>0°</td>
</tr>
</tbody>
</table>

Embosed Carrier Tape & Reel Specification — SOT23-6L

8mm TAPE AND REEL

**Access Hole**

- 14.4mm
- 13mm
- 6mm

**General Information**

1. 3000 Pieces per Reel
2. Order in multiples of full reels only
3. Meets EIA-481 Revision “A” Specifications