**Description**

The SP2504N integrates 4 channels of low capacitance diodes with an additional zener diode to protect sensitive I/O pins against lightning induced surge events and ESD. This robust device can safely absorb up to 20A per IEC 61000-4-5, 2nd edition (t<sub>p</sub>=8/20μs) without performance degradation and a minimum ±30kV ESD per IEC 61000-4-2 international standard. The low loading capacitance makes the SP2504N ideal for protecting high-speed signal pins.

**Features**

- ESD, IEC 61000-4-2, ±30kV contact, ±30kV air
- EFT, IEC 61000-4-4, 40A (t<sub>p</sub>=5/50ns)
- Lightning, IEC 61000-4-5, 2nd edition 20A (t<sub>p</sub>=8/20μs)
- Low capacitance of 3.5pF (TYP) per I/O
- Low leakage current of 1µA (MAX) at 2.5V
- RoHS compliant and lead-free

**Applications**

- 10/100/1000 Ethernet Interfaces
- Customer Premise Equipment (CPE)
- VoIP Phones
- Set Top Boxes
- PBX Systems
- Surveillance Cameras

**Application Example**

![Application Example Diagram]

**Additional Information**

- Datasheet
- Resources
- Samples

*Package is shown as transparent*

**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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Specifications are subject to change without notice.

Revised: 05/12/17
CAUTION: Stresses above those listed in “Absolute Maximum Ratings” may cause permanent damage to the device. This is a stress only rating and operation of the device at these or any other conditions above those indicated in the operational sections of this specification is not implied.

### Absolute Maximum Ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>I_{PP}</td>
<td>Peak Current (t_{p}=8/20µs)</td>
<td>20.0</td>
<td>A</td>
</tr>
<tr>
<td>P_{PK}</td>
<td>Peak Pulse Power (t_{p}=8/20µs)</td>
<td>300</td>
<td>W</td>
</tr>
<tr>
<td>T_{OP}</td>
<td>Operating Temperature</td>
<td>–40 to 125</td>
<td>ºC</td>
</tr>
<tr>
<td>T_{STOR}</td>
<td>Storage Temperature</td>
<td>–55 to 150</td>
<td>ºC</td>
</tr>
</tbody>
</table>

### 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_{RWM}</td>
<td></td>
<td>2.5</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Snap Back Voltage</td>
<td>V_{SB}</td>
<td>I_{SB}=50mA</td>
<td>2.0</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reverse Leakage Current</td>
<td>I_{LEAK}</td>
<td>V_{in}=2.5V, I/O to GND</td>
<td>0.5</td>
<td>1.0</td>
<td>µA</td>
<td></td>
</tr>
<tr>
<td>Clamp Voltage¹</td>
<td>V_{C}</td>
<td></td>
<td>5.0</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{PP}=1A, t_{p}=8/20µs, Fwd</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{PP}=5A, t_{p}=8/20µs, Fwd</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{PP}=10A, t_{p}=8/20µs, Fwd</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{PP}=20A, t_{p}=8/20µs, Fwd</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dynamic Resistance</td>
<td>R_{DYN}</td>
<td></td>
<td>0.35</td>
<td></td>
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</tr>
<tr>
<td>ESD Withstand Voltage¹</td>
<td>V_{ESD}</td>
<td>IEC61000-4-2 (Contact)</td>
<td>±30</td>
<td>kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEC61000-4-2 (Air)</td>
<td>±30</td>
<td>kV</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diode Capacitance¹</td>
<td>C_{I/O-GND}</td>
<td>Reverse Bias=0V</td>
<td>3.5</td>
<td>5.0</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Diode Capacitance¹</td>
<td>C_{I/O-UD}</td>
<td>Reverse Bias=0V</td>
<td>2.0</td>
<td></td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>

Note: ¹ Parameter is guaranteed by design and/or device characterization.

### Pulse Waveform

![Pulse Waveform Graph]

### Clamping Voltage vs. I_{PP}

![Clamping Voltage vs. I_{PP} Graph]
Capacitance vs. Bias

<table>
<thead>
<tr>
<th>DC Bias (V)</th>
<th>Capacitance (pF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.0</td>
<td>5.0</td>
</tr>
<tr>
<td>0.5</td>
<td>4.0</td>
</tr>
<tr>
<td>1.0</td>
<td>3.0</td>
</tr>
<tr>
<td>1.5</td>
<td>2.0</td>
</tr>
<tr>
<td>2.0</td>
<td>1.0</td>
</tr>
<tr>
<td>2.5</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Reflow Condition

- Temperature Min ($T_{min}$) - $150°C$
- Temperature Max ($T_{max}$) - $200°C$
- Time (min to max) ($t_{s}$) - 60 – 180 secs

Average ramp up rate (Liquidus) Temp ($T_{L}$) to peak - $3°C/second max$

$T_{max}$ to $T_{L}$ - Ramp-up Rate - $3°C/second max$

Reflow

- Temperature ($T_{L}$) (Liquidus) - $217°C$
- Temperature ($T_{p}$) - 60 – 150 seconds

Peak Temperature ($T_{p}$) - 260±5°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 260°C

**Notes:**
1. All dimensions are in millimeters
2. Dimensions include solder plating.
3. Dimensions are exclusive of mold flash & metal burr.
4. Blo is facing up for mold and facing down for trim/form, i.e. reverse trim/form.

Ordering Information

<table>
<thead>
<tr>
<th>Part Number</th>
<th>Package</th>
<th>Marking</th>
<th>Min. Order Qty.</th>
</tr>
</thead>
<tbody>
<tr>
<td>SP2504NUTG</td>
<td>µDFN-10</td>
<td>TH4</td>
<td>3000</td>
</tr>
</tbody>
</table>

**Part Numbering System**

**Part Marking System**

- Series
- Package
- U= µDFN-10
- G= Green
- T= Tape & Reel

- Product Series
- T = SP2504N
- Number of Channels
- Assembly Site
Package Dimensions — µDFN-10

Top View

Side View

Seating Plane

Bottom View

Recommended Solder Pads µDFN-10L 2.6x2.6mm

Dimension

Embossed Carrier Tape & Reel Specification — µDFN-10 (2.6x2.6mm)

Reel Size: 7 inches

Pin 1 Location

Disclaimer Notice - Information furnished is believed to be accurate and reliable. However, users should independently evaluate the suitability of and test each product selected for their own applications. Littelfuse products are not designed for, and may not be used in, all applications.

Read complete Disclaimer Notice at www.littelfuse.com/disclaimer-electronics.