NSP8814, NSP8818

ESD and Surge Protection Device

Low Capacitance Surge Protection for High Speed Data

The NSP8814 and NSP8818 surge protectors are designed specifically to protect 10/100 and GbE Ethernet signals from high levels of surge current. Low clamping voltage under high surge conditions make this device an ideal solution for protecting voltage sensitive lines leading to Ethernet transceiver chips. Low capacitance combined with flow-through style packaging allows for easy PCB layout and matched trace lengths necessary to maintain consistent impedance between high-speed differential lines. The integrated 4 and 8 lines of protection in flow-thru type packages offer a simplified solution with premier performance for 10/100 and GbE Ethernet applications.

Features
- Protection for the Following IEC Standards:
  IEC 61000−4−2 (ESD) ±30 kV (Contact)
  IEC61000−4−5 (Lightning) 35 A (8/20 μs)
- Flow−Thru Routing Scheme
- 2 pF Max, I/O to I/O
- UL Flammability Rating of 94 V−0
- This is a Pb−Free Device

Typical Applications
- 10/100 and GbE Ethernet
- MagJacks® / Integrated Magnetics
- Notebooks/Desktops/Servers

MAXIMUM RATINGS (TJ = 25°C unless otherwise noted)

<table>
<thead>
<tr>
<th>Rating</th>
<th>Symbol</th>
<th>Value</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating Junction Temperature Range</td>
<td>TJ</td>
<td>−55 to +125</td>
<td>°C</td>
</tr>
<tr>
<td>Storage Temperature Range</td>
<td>Tstg</td>
<td>−55 to +150</td>
<td>°C</td>
</tr>
<tr>
<td>Lead Solder Temperature – Maximum (10 Seconds)</td>
<td>TL</td>
<td>260</td>
<td>°C</td>
</tr>
<tr>
<td>IEC 61000−4−2 Contact (ESD)</td>
<td>ESD</td>
<td>±30</td>
<td>kV</td>
</tr>
<tr>
<td>IEC 61000−4−2 Air (ESD)</td>
<td>ESD</td>
<td>±30</td>
<td>kV</td>
</tr>
<tr>
<td>Maximum Peak Pulse Current 8/20 μs @ TA = 25°C</td>
<td>IPP</td>
<td>35 20</td>
<td>A</td>
</tr>
<tr>
<td>10/700 μs @ TA = 25°C</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Stresses exceeding those listed in the Maximum Ratings table may damage the device. If any of these limits are exceeded, device functionality should not be assumed, damage may occur and reliability may be affected.

See Application Note AND8308/D for further description of survivability specs.
**NSP8814, NSP8818**

**ELECTRICAL CHARACTERISTICS**  
(T<sub>A</sub> = 25°C unless otherwise noted)

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>V&lt;sub&gt;RWM&lt;/sub&gt;</td>
<td>Working Peak Voltage</td>
<td>Any I/O to GND (Note 1)</td>
<td>3.0</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I&lt;sub&gt;R&lt;/sub&gt;</td>
<td>Maximum Reverse Leakage Current @ V&lt;sub&gt;RWM&lt;/sub&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V&lt;sub&gt;BR&lt;/sub&gt;</td>
<td>Breakdown Voltage @ I&lt;sub&gt;T&lt;/sub&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I&lt;sub&gt;T&lt;/sub&gt;</td>
<td>Test Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V&lt;sub&gt;HOLD&lt;/sub&gt;</td>
<td>Holding Reverse Voltage</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I&lt;sub&gt;HOLD&lt;/sub&gt;</td>
<td>Holding Reverse Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R&lt;sub&gt;DYN&lt;/sub&gt;</td>
<td>Dynamic Resistance</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I&lt;sub&gt;PP&lt;/sub&gt;</td>
<td>Maximum Peak Pulse Current</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>V&lt;sub&gt;C&lt;/sub&gt;</td>
<td>Clamping Voltage @ I&lt;sub&gt;PP&lt;/sub&gt;</td>
<td>V&lt;sub&gt;C&lt;/sub&gt; = V&lt;sub&gt;HOLD&lt;/sub&gt; + (I&lt;sub&gt;PP&lt;/sub&gt; * R&lt;sub&gt;DYN&lt;/sub&gt;)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ELECTRICAL CHARACTERISTICS**  
(T<sub>A</sub> = 25°C unless otherwise specified)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Symbol</th>
<th>Conditions</th>
<th>Min</th>
<th>Typ</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reverse Working Voltage</td>
<td>V&lt;sub&gt;RWM&lt;/sub&gt;</td>
<td>Any I/O to GND (Note 1)</td>
<td>3.0</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Forward Voltage</td>
<td>V&lt;sub&gt;F&lt;/sub&gt;</td>
<td>I&lt;sub&gt;F&lt;/sub&gt; = 10 mA, GND to All IO Pins</td>
<td>0.5</td>
<td>0.85</td>
<td>1.1</td>
<td>V</td>
</tr>
<tr>
<td>Breakdown Voltage</td>
<td>V&lt;sub&gt;BR&lt;/sub&gt;</td>
<td>I&lt;sub&gt;T&lt;/sub&gt; = 1 mA, I/O to GND</td>
<td>3.2</td>
<td>3.5</td>
<td>5.0</td>
<td>V</td>
</tr>
<tr>
<td>Reverse Leakage Current</td>
<td>I&lt;sub&gt;R&lt;/sub&gt;</td>
<td>V&lt;sub&gt;RWM&lt;/sub&gt; = 3.0 V, I/O to GND</td>
<td>0.5</td>
<td>µA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clamping Voltage</td>
<td>V&lt;sub&gt;C&lt;/sub&gt;</td>
<td>I&lt;sub&gt;PP&lt;/sub&gt; = 1 A, Any I/O to GND (8/20 µs pulse)</td>
<td>5.0</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clamping Voltage</td>
<td>V&lt;sub&gt;C&lt;/sub&gt;</td>
<td>I&lt;sub&gt;PP&lt;/sub&gt; = 10 A, Any I/O to GND (8/20 µs pulse)</td>
<td>6.0</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clamping Voltage</td>
<td>V&lt;sub&gt;C&lt;/sub&gt;</td>
<td>I&lt;sub&gt;PP&lt;/sub&gt; = 25 A, Any I/O to GND (8/20 µs pulse)</td>
<td>10</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clamping Voltage</td>
<td>V&lt;sub&gt;C&lt;/sub&gt;</td>
<td>I&lt;sub&gt;PP&lt;/sub&gt; = 35 A, Any I/O to GND (8/20 µs pulse)</td>
<td>15</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clamping Voltage</td>
<td>V&lt;sub&gt;C&lt;/sub&gt;</td>
<td>IEC61000–4−2, ±8 kV Contact</td>
<td>See Figures 7 and 8</td>
<td>V</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Junction Capacitance</td>
<td>C&lt;sub&gt;J&lt;/sub&gt;</td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 0 V, f = 1 MHz between I/O Pins</td>
<td>1.5</td>
<td>2.0</td>
<td>pF</td>
<td></td>
</tr>
<tr>
<td>Junction Capacitance</td>
<td>C&lt;sub&gt;J&lt;/sub&gt;</td>
<td>V&lt;sub&gt;R&lt;/sub&gt; = 0 V, f = 1 MHz between I/O Pins and GND</td>
<td>5.0</td>
<td>pF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Product parametric performance is indicated in the Electrical Characteristics for the listed test conditions, unless otherwise noted. Product performance may not be indicated by the Electrical Characteristics if operated under different conditions.

1. Surge protection devices are normally selected according to the working peak reverse voltage (V<sub>RWM</sub>), which should be equal or greater than the DC or continuous peak operating voltage level.

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www.onsemi.com  2
Figure 2. IEC61000−4−5 8/20 μs Pulse Waveform

Figure 3. Clamping Voltage vs. Peak Pulse Current ($t_p = 8/20$ μs per Figure 2)

Figure 4. IEC61000−4−5 10/700 μs Pulse Waveform

Figure 5. Clamping Voltage vs. Peak Pulse Current ($t_p = 10/700$ μs per Figure 4)

Figure 6. IEC61000−2−4 +8 kV Contact Clamping Voltage

Figure 7. IEC61000−2−4 −8 kV Contact Clamping Voltage
Figure 8. IV Characteristics

Figure 9. CV Characteristics

Figure 10. RF Insertion Loss

Figure 11. Capacitance Over Frequency
Figure 12. 10/100 Ethernet Layout Diagram and Flow−thru Routing Scheme

Figure 13. GbE Ethernet Layout Diagram and Flow−thru Routing Scheme
NSP8814, NSP8818

PACKAGE DIMENSIONS

UDFN8 2.2x2, 0.575P
CASE 506CV
ISSUE A

NOTES:
2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS b APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.25 MM FROM TERMINAL TIP.

DIMENSIONS: MILLIMETERS

RECOMMENDED MOUNTING FOOTPRINT

*For additional information on our Pb–Free strategy and soldering details, please download the ON Semiconductor Soldering and Mounting Techniques Reference Manual, SOLDERRM/D.
NOTE 4

2X

0.10 C

13X

0.05 C

NOTE 4

SIDE VIEW

1

5

10

2X

0.10 C

TOP VIEW

EXPOSED Cu

MOLD CMPD

DETAIL A

ALTERNATE TERMINAL CONSTRUCTION

DETAIL A

ALTERNATE CONSTRUCTIONS

SIDE VIEW

A1

A

A3

DETAIL A

A1

A3

DETAIL B

ALTERNATE TERMINAL CONSTRUCTION

DETAIL B

ALTERNATE CONSTRUCTIONS

BOTTOM VIEW

13X

0.10 Ø C

0.05 Ø C

NOTE 3

PACKET DIMENSIONS

UDFN10 3.5x2, 0.575P

CASE 506CU

ISSUE O

NOTES:

2. CONTROLLING DIMENSION: MILLIMETERS.
3. DIMENSIONS & APPLIES TO PLATED TERMINAL AND IS MEASURED BETWEEN 0.15 AND 0.25 MM FROM TERMINAL TIP.
4. COPLANARITY APPLIES TO THE EXPOSED PAD AS WELL AS THE TERMINALS.

RECOMMENDED MOUNTING FOOTPRINT*

DIMENSIONS: MILLIMETERS

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