1. **Product profile**

1.1 **General description**

Ultra low capacitance unidirectional ElectroStatic Discharge (ESD) protection diode designed to protect one signal line from the damage caused by ESD and other transients. The device is housed in a SOD882D leadless ultra small Surface-Mounted Device (SMD) plastic package with visible and solderable side pads.

The combination of extremely low capacitance and ultra low clamping voltage makes the device ideal for high-speed data line protection applications.

1.2 **Features and benefits**

- ESD protection of one line
- Ultra low capacitance: $C_d = 0.95 \text{ pF}$
- Ultra low clamping voltage: $V_{CL} = 8 \text{ V}$
- Ultra low leakage current: $I_{RM} = 1 \text{ nA}$
- ESD protection up to 8 kV
- IEC 61000-4-2; level 4 (ESD)
- Ultra low diode capacitance
- Ultra small SMD plastic package
- Ultra low clamping voltage: $V_{CL} = 8 \text{ V}$
- Solderable tin-plated side pads
- Ultra low leakage current: $I_{RM} = 1 \text{ nA}$
- AEC-Q101 qualified

1.3 **Applications**

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- 10/100/1000 Mbit/s Ethernet
- Communication systems
- Portable electronics
- Subscriber Identity Module (SIM) card protection
- USB, High-Definition Multimedia Interface (HDMI), FireWire
- High-speed data lines

1.4 **Quick reference data**

<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>$V_{RWM}$</td>
<td>reverse standoff voltage</td>
<td>- - 5.5</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 \text{ MHz}; V_R = 0 \text{ V}$</td>
<td>- 0.95</td>
<td>1.1</td>
<td>pF</td>
<td></td>
</tr>
</tbody>
</table>
2. Pinning information

Table 2. Pinning

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>cathode</td>
<td></td>
<td><img src="image1" alt="Simplified outline" /></td>
</tr>
<tr>
<td>2</td>
<td>anode</td>
<td></td>
<td><img src="image2" alt="Graphic symbol" /></td>
</tr>
</tbody>
</table>

[1] The marking bar indicates the cathode.

3. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package Name</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD5V0X1ULD</td>
<td>-</td>
<td>leadless ultra small plastic package; 2 terminals; body 1 × 0.6 × 0.4 mm</td>
<td>SOD882D</td>
</tr>
</tbody>
</table>

4. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code[1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD5V0X1ULD</td>
<td>1111 0000</td>
</tr>
</tbody>
</table>

[1] For SOD882D binary marking code description, see Figure 1.

4.1 Binary marking code description

Fig 1. SOD882D binary marking code description
5. Limiting values

Table 5. Limiting values
*In accordance with the Absolute Maximum Rating System (IEC 60134).*

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>IPP</td>
<td>peak pulse current</td>
<td>$t_p = 8/20 \mu s$</td>
<td>1 [1][2]</td>
<td>1.5</td>
<td>A</td>
</tr>
<tr>
<td>$T_J$</td>
<td>junction temperature</td>
<td>-</td>
<td>150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>$T_{amb}$</td>
<td>ambient temperature</td>
<td>-55</td>
<td>+150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>storage temperature</td>
<td>-65</td>
<td>+150</td>
<td>°C</td>
<td></td>
</tr>
</tbody>
</table>

[1] Non-repetitive current pulse $8/20 \mu s$ exponential decay waveform according to IEC 61000-4-5.

Table 6. ESD maximum ratings
$T_{amb} = 25 ^\circ C$ unless otherwise specified.

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>$V_{ESD}$</td>
<td>electrostatic discharge voltage</td>
<td>IEC 61000-4-2 (contact discharge)</td>
<td>8 [1][2]</td>
<td></td>
<td>kV</td>
</tr>
<tr>
<td></td>
<td>machine model</td>
<td>-</td>
<td>400</td>
<td>V</td>
<td></td>
</tr>
</tbody>
</table>


Table 7. ESD standards compliance

<table>
<thead>
<tr>
<th>Standard</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 61000-4-2; level 4 (ESD)</td>
<td>$&gt; 15 \text{kV (air)}$; $&gt; 8 \text{kV (contact)}$</td>
</tr>
<tr>
<td>MIL-STD-883; class 3 (human body model)</td>
<td>$&gt; 4 \text{kV}$</td>
</tr>
</tbody>
</table>
Ultra low capacitance unidirectional ESD protection diode

Fig 2. 8/20 µs pulse waveform according to IEC 61000-4-5

Fig 3. ESD pulse waveform according to IEC 61000-4-2
6. Characteristics

Table 8. Characteristics

<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_{RWM}</td>
<td>reverse standoff voltage</td>
<td></td>
<td>-</td>
<td>-</td>
<td>5.5</td>
<td>V</td>
</tr>
<tr>
<td>I_{RM}</td>
<td>reverse leakage current</td>
<td>V_{RWM} = 5 V</td>
<td>-</td>
<td>1</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>V_{BR}</td>
<td>breakdown voltage</td>
<td>I_R = 10 mA</td>
<td>5.8</td>
<td>7.5</td>
<td>10</td>
<td>V</td>
</tr>
<tr>
<td>C_d</td>
<td>diode capacitance</td>
<td>f = 1 MHz; V_R = 0 V</td>
<td>0.95</td>
<td>1.1</td>
<td></td>
<td>pF</td>
</tr>
<tr>
<td>V_{CL}</td>
<td>clamping voltage</td>
<td>I_{PP} = 1.5 A [1][2]</td>
<td>-</td>
<td>8</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>r_{dyn}</td>
<td>dynamic resistance</td>
<td>I_R = 10 A [3]</td>
<td>0.25</td>
<td>-</td>
<td>-</td>
<td>Ω</td>
</tr>
</tbody>
</table>

[1] Non-repetitive current pulse 8/20 µs exponential decay waveform according to IEC 61000-4-5.

Fig 4. Diode capacitance as a function of reverse voltage; typical values

Fig 5. V-I characteristics for a unidirectional ESD protection diode
Nexperia

PESD5V0X1ULD
Ultra low capacitance unidirectional ESD protection diode

Fig 6. ESD clamping test setup and waveforms
7. Application information

The PESD5V0X1ULD is designed for the protection of one unidirectional data or signal line from the damage caused by ESD and surge pulses. The device may be used on lines where the signal polarities are either positive or negative with respect to ground.

Circuit board layout and protection device placement

Circuit board layout is critical for the suppression of ESD, Electrical Fast Transient (EFT) and surge transients. The following guidelines are recommended:

1. Place the PESD5V0X1ULD as close to the input terminal or connector as possible.
2. The path length between the PESD5V0X1ULD and the protected line should be minimized.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit Board (PCB) conductive loops including power and ground loops.
6. Minimize the length of the transient return path to ground.
7. Avoid using shared transient return paths to a common ground point.
8. Ground planes should be used whenever possible. For multilayer PCBs, use ground vias.

8. Test information

8.1 Quality information

This product has been qualified in accordance with the Automotive Electronics Council (AEC) standard Q101 - Stress test qualification for discrete semiconductors, and is suitable for use in automotive applications.
9. Package outline

10. Packing information

Table 9. Packing methods
The indicated -xxx are the last three digits of the 12NC ordering code.[1]

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Description</th>
<th>Packing quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD5V0X1ULD</td>
<td>SOD882D</td>
<td>2 mm pitch, 8 mm tape and reel</td>
<td>-315</td>
</tr>
</tbody>
</table>

[1] For further information and the availability of packing methods, see Section 14.

11. Soldering

Reflow soldering is the only recommended soldering method.

Fig 8. Package outline SOD882D

Fig 9. Reflow soldering footprint SOD882D
12. Revision history

Table 10. Revision history

<table>
<thead>
<tr>
<th>Document ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD5V0X1ULD v.1</td>
<td>20110215</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
13. Legal information

13.1 Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective [short] data sheet</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Preliminary [short] data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product [short] data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
</tr>
</tbody>
</table>

[1] Please consult the most recently issued document before initiating or completing a design.
[2] The term ‘short data sheet’ is explained in section “Definitions”.
[3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the Internet at URL http://www.nexperia.com.

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14. Contact information

For more information, please visit: http://www.nexperia.com

For sales office addresses, please send an email to: salesaddresses@nexperia.com
15. Contents

1  Product profile . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1
1.1 General description . . . . . . . . . . . . . . . . . . . . . . . . . . 1
1.2 Features and benefits . . . . . . . . . . . . . . . . . . . . . . . . . 1
1.3 Applications . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 1
1.4 Quick reference data . . . . . . . . . . . . . . . . . . . . . . . . . 1
2  Pinning information . . . . . . . . . . . . . . . . . . . . . . . . . . . 2
3  Ordering information . . . . . . . . . . . . . . . . . . . . . . . . . . 2
4  Marking . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 2
  4.1 Binary marking code description . . . . . . . . . . . . . . . . . 2
5  Limiting values . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 3
6  Characteristics . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 5
7  Application information . . . . . . . . . . . . . . . . . . . . . . . . 7
8  Test information . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 7
  8.1 Quality information . . . . . . . . . . . . . . . . . . . . . . . . . . 7
9  Package outline . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 8
10 Packing information . . . . . . . . . . . . . . . . . . . . . . . . . . . 8
11 Soldering . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 8
12 Revision history . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 9
13 Legal information . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10
  13.1 Data sheet status . . . . . . . . . . . . . . . . . . . . . . . . . . . 10
  13.2 Definitions . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10
  13.3 Disclaimers . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 10
  13.4 Trademarks . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 11
14 Contact information . . . . . . . . . . . . . . . . . . . . . . . . . . 11
15 Contents . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 12