1. Product profile

1.1 General description

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.

1.2 Features and benefits

- ESD protection of one line
- Ultra small SMD plastic package
- Solderable side pads
- Package height typ. 0.37 mm
- Low clamping voltage: \( V_{CL} = 19 \text{ V} \)
- AEC-Q101 qualified
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); \( I_{PP} = 5 \text{ A} \)
- Max. peak pulse power: \( P_{PP} = 150 \text{ W} \)
- Ultra low leakage current: \( I_{RM} < 1 \text{ nA} \)

1.3 Applications

- Computers and peripherals
- Audio and video equipment
- Communication systems
- Portable electronics

1.4 Quick reference data

Table 1. 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>-</td>
<td>-</td>
<td>12</td>
<td>V</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>-</td>
<td>38</td>
<td>75</td>
<td>pF</td>
</tr>
</tbody>
</table>

\( T_{amb} = 25^\circ \text{ C} \) unless otherwise specified.
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><img src="image" alt="Transparent top view" /></td>
<td>1 006aaa152</td>
</tr>
<tr>
<td>2</td>
<td>anode</td>
<td></td>
<td>2</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</th>
<th>Name</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD12VS1ULD</td>
<td>-</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>PESD12VS1ULD</td>
<td>1010 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>P_{PP}</td>
<td>peak pulse power</td>
<td>t_\text{p} = 8/20 \mu s [1]</td>
<td>-</td>
<td>150</td>
<td>W</td>
</tr>
<tr>
<td>I_{PP}</td>
<td>peak pulse current</td>
<td>t_\text{p} = 8/20 \mu s [1]</td>
<td>-</td>
<td>5</td>
<td>A</td>
</tr>
<tr>
<td>T_J</td>
<td>junction temperature</td>
<td></td>
<td>-55</td>
<td>+150</td>
<td>°C</td>
</tr>
<tr>
<td>T_{amb}</td>
<td>ambient temperature</td>
<td></td>
<td>-65</td>
<td>+150</td>
<td>°C</td>
</tr>
<tr>
<td>T_{stg}</td>
<td>storage temperature</td>
<td></td>
<td>-</td>
<td></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 °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</td>
<td>IEC 61000-4-2 (contact discharge) [1][2]</td>
<td>-</td>
<td>30</td>
<td>kV</td>
</tr>
<tr>
<td></td>
<td>discharge voltage</td>
<td>MIL-STD-883 (human body model) [2]</td>
<td>-</td>
<td>10</td>
<td>kV</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 kV (air); &gt; 8 kV (contact)</td>
</tr>
<tr>
<td>MIL-STD-883; class 3 (human body model)</td>
<td>&gt; 4 kV</td>
</tr>
</tbody>
</table>

Fig 2. 8/20 \mu s pulse waveform according to IEC 61000-4-5

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

<table>
<thead>
<tr>
<th>Table 8. Characteristics</th>
<th>( T_{\text{amb}} = 25 , ^\circ\text{C} ) unless otherwise specified.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Symbol</td>
<td>Parameter</td>
</tr>
<tr>
<td>( V_{\text{RWM}} )</td>
<td>reverse standoff voltage</td>
</tr>
<tr>
<td>( I_{\text{RM}} )</td>
<td>reverse leakage current</td>
</tr>
<tr>
<td>( V_{\text{BR}} )</td>
<td>breakdown voltage</td>
</tr>
<tr>
<td>( C_d )</td>
<td>diode capacitance</td>
</tr>
<tr>
<td>( V_{\text{CL}} )</td>
<td>clamping voltage</td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>( r_{\text{dyn}} )</td>
<td>dynamic resistance</td>
</tr>
</tbody>
</table>

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


[3] Non-repetitive current pulse, Transmission Line Pulse (TLP) \( t_p = 100 \, \text{ns} \); square pulse;
ANS/IESD STM5-1-2008.

**Fig 4.** Peak pulse power as a function of exponential pulse duration; typical values

**Fig 5.** Relative variation of peak pulse power as a function of junction temperature; typical values
Unidirectional ESD protection diode

Fig 6. Diode capacitance as a function of reverse voltage; typical values

\[ V_R (V) \]

\[ C_d (\text{pF}) \]

\[ f = 1 \text{ MHz}; \ T_{\text{amb}} = 25 \ ^\circ\text{C} \]

Fig 7. V-I characteristics for a unidirectional ESD protection diode
Fig 8. ESD clamping test setup and waveforms
7. Application information

The PESD12VS1ULD 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. The PESD12VS1ULD provides a surge capability of 150 W per line for an 8/20 μs waveform.

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 PESD12VS1ULD as close to the input terminal or connector as possible.
2. The path length between the PESD12VS1ULD 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

![Package outline SOD882D](image)

Fig 10. Package outline SOD882D

10. Packing information

Table 9. Packing methods

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Description</th>
<th>Packing quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD12VS1ULD</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 footprint SOD882D](image)

Fig 11. Reflow soldering footprint SOD882D

Reflow soldering is the only recommended soldering method.
## 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>PESD12VS1ULD v.1</td>
<td>20110511</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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