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.

2. Features and benefits

- ESD protection of one line
- ESD protection up to 23 kV
- Ultra small SMD plastic package
- IEC 61000-4-2; level 4 (ESD)
- Solderable side pads
- IEC 61000-4-5 (surge); I_{PP} = 3A
- Package height typ. 0.37 mm
- Max. peak pulse power: P_{PPM} = 150 W
- Low clamping voltage: V_{CL} = 70 V
- Max. peak pulse power: P_{PPM} = 150 W
- Ultra low leakage current: I_{RM} < 1 nA
- AEC-Q101 qualified

3. Application information

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

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>T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>24</td>
<td>V</td>
</tr>
<tr>
<td>C_{d}</td>
<td>diode capacitance</td>
<td>f = 1 MHz; V_{R} = 0 V; T_{amb} = 25 °C</td>
<td>-</td>
<td>23</td>
<td>50</td>
<td>pF</td>
</tr>
</tbody>
</table>
5. Pinning information

Table 2. Pinning information

<table>
<thead>
<tr>
<th>Pin</th>
<th>Symbol</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>K</td>
<td>cathode[1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</td>
<td>DFN1006D-2</td>
<td>006aaa152</td>
</tr>
</tbody>
</table>

[1] The marking bar indicates the cathode.

6. Ordering information

Table 3. Ordering information

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD24VS1ULD</td>
<td>DFN1006D-2</td>
<td>leadless ultra small plastic package; 2 terminals; 0.65 mm pitch; 1 mm x 0.6 mm x 0.4 mm body</td>
<td>SOD882D</td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD24VS1ULD</td>
<td>0010 0000</td>
</tr>
</tbody>
</table>

Fig. 1. SOD882D binary marking code description
8. 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>PP</td>
<td>rated peak pulse power</td>
<td>$t_p = 8/20 \mu s$</td>
<td></td>
<td>150</td>
<td>W</td>
</tr>
<tr>
<td>IPPM</td>
<td>rated peak pulse current</td>
<td></td>
<td></td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>Tj</td>
<td>junction temperature</td>
<td></td>
<td></td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Tam</td>
<td>ambient temperature</td>
<td></td>
<td>-55</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Tstg</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>150</td>
<td>°C</td>
</tr>
</tbody>
</table>

ESD maximum ratings

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Parameter</th>
<th>Condition</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VESD</td>
<td>electrostatic</td>
<td>IEC 61000-4-2; contact discharge</td>
<td></td>
<td>23</td>
<td>kV</td>
</tr>
<tr>
<td></td>
<td>discharge voltage</td>
<td>MIL-STD-883 (human body model)</td>
<td></td>
<td>10</td>
<td>kV</td>
</tr>
</tbody>
</table>

[1] Non-repetitive current pulse 8/20 μs exponential decay waveform according to IEC61000-4-5.

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

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

Table 6. 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>$T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>24</td>
<td>V</td>
</tr>
<tr>
<td>$V_{BR}$</td>
<td>breakdown voltage</td>
<td>$I_R = 5 , mA; , T_{amb} = 25 , ^\circ C$</td>
<td>26.5</td>
<td>27</td>
<td>27.5</td>
<td>V</td>
</tr>
<tr>
<td>$I_{RM}$</td>
<td>reverse leakage current</td>
<td>$V_{RWM} = 24 , V; , T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>1</td>
<td>50</td>
<td>nA</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 , MHz; , V_R = 0 , V; , T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>23</td>
<td>50</td>
<td>pF</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PP} = 1 , A; , T_{amb} = 25 , ^\circ C$</td>
<td>[1] [2]</td>
<td>-</td>
<td>-</td>
<td>36</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PP} = 3 , A; , T_{amb} = 25 , ^\circ C$</td>
<td>[1] [2]</td>
<td>-</td>
<td>-</td>
<td>70</td>
</tr>
<tr>
<td>$R_{dyn}$</td>
<td>dynamic resistance</td>
<td>$I_R = 10 , A; , T_{amb} = 25 , ^\circ C$</td>
<td>[3] [2]</td>
<td>-</td>
<td>1.6</td>
<td>$\Omega$</td>
</tr>
</tbody>
</table>

[1] Non-repetitive current pulse 8/20 µs exponential decay waveform according to IEC61000-4-5.
[3] Non-repetitive current pulse, Transmission Line Pulse (TLP) $t_p = 100 \, ns$; square pulse; ANSI / ESD STM5.5.1-2008.

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

\[ V_R (V) \]

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

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

**Fig. 7.** Relative variation of reverse leakage current as a function of junction temperature; typical values

\[ T_{\text{j}} (\text{°C}) \]

\[ I_{\text{RM}} \]

\[ I_{\text{RM},25^\circ\text{C}} \]

**Fig. 8.** V-I characteristics for unidirectional ESD protection diode

\[ -V_{\text{CL}} -V_{\text{BR}} -V_{\text{RWM}} \]

\[ +V_{\text{IPP}} \]
Fig. 9. ESD clamping test setup and waveforms
10. Application information

The device is designed for the protection of one unidirectional data line from surge pulses and ESD damage. The device is suitable on lines where the signal polarities are either positive or negative with respect to ground. The device provides a surge capability of 150 W for an 8/20 µs waveform.

Fig. 10. Application diagram

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 device as close to the input terminal or connector as possible.
2. Minimize the path length between the device and the protected line.
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. Use ground planes whenever possible. For multilayer PCBs, use ground vias.

11. Test information

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.
12. Package outline

![Package outline DFN1006D-2 (SOD882D)](image)

**Fig. 11.** Package outline DFN1006D-2 (SOD882D)

13. Soldering

![Reflow soldering footprint for DFN1006D-2 (SOD882D)](image)

**Fig. 12.** Reflow soldering footprint for DFN1006D-2 (SOD882D)
# 14. Revision history

<table>
<thead>
<tr>
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<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<tr>
<td>PESD24VS1ULD v.2</td>
<td>20180822</td>
<td>Product data sheet</td>
<td>-</td>
<td>PESD24VS1ULD v.1</td>
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</table>

**Modifications:**
- Application information: updated.
- Package drawing: updated.
- The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.
- Legal texts have been adapted to the new company name where appropriate.

<table>
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<th>Data sheet ID</th>
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<th>Supersedes</th>
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<tr>
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<td>20101019</td>
<td>Product data sheet</td>
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<td>-</td>
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15. Legal information

Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<td>[1][2]</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
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<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>
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</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 https://www.nexperia.com.

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Contents

1. General description......................................................1
2. Features and benefits.................................................. 1
3. Application information.............................................. 1
4. Quick reference data.................................................. 1
5. Pinning information................................................... 2
6. Ordering information.................................................. 2
7. Marking........................................................................ 2
8. Limiting values.......................................................... 3
9. Characteristics............................................................ 4
10. Application information............................................... 7
11. Test information........................................................ 7
12. Package outline........................................................ 8
13. Soldering.................................................................... 8
14. Revision history.......................................................... 9
15. Legal information.......................................................10

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