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 leadless ultra small DFN1006BD-2 (SOD882BD) Surface-Mounted Device (SMD) plastic package with side-wettable flanks (SWF).

2. Features and benefits

- Ultra small SMD plastic package
- ESD protection of one line
- Side-wettable flanks
- Low clamping voltage: $V_{CL} = 20$ V
- AEC-Q101 qualified
- Ultra low leakage current: $I_{RM} < 700$ nA
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5; (surge); $I_{PPM}$ up to 15 A

3. Applications

- Computers and peripherals
- Audio and video equipment
- Parallel ports
- Communication systems

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>$T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>3.3</td>
<td>V</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 , MHz; , V_R = 0 , V; , T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>207</td>
<td>300</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>1 K 2</td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</td>
<td></td>
<td>sym035</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>PESD3V3S1ULS</td>
<td>DFN1006BD-2</td>
<td>Leadless ultra small plastic package with side-wettable flanks (SWF); 2 terminals; 0.65 mm pitch; 1 mm x 0.6 mm x 0.47 mm body</td>
<td>SOD882BD</td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
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<th>Type number</th>
<th>Marking code</th>
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</thead>
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<tr>
<td>PESD3V3S1ULS</td>
<td>3R</td>
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</table>
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>I_{PPM}</td>
<td>rated peak pulse current</td>
<td>t_p = 8/20 µs</td>
<td>[1]</td>
<td>-</td>
<td>20 A</td>
</tr>
<tr>
<td>T_j</td>
<td>junction temperature</td>
<td></td>
<td>-150</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>T_{amb}</td>
<td>ambient temperature</td>
<td></td>
<td>-55</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>T_{stg}</td>
<td>storage temperature</td>
<td></td>
<td>-65</td>
<td>150</td>
<td>°C</td>
</tr>
</tbody>
</table>

**ESD maximum ratings**

| V_{ESD} | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) | [2]  | -    | 30 kV |

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

Fig. 1. 8/20 µs pulse waveform according to IEC 61000-4-5

Fig. 2. 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>$V_{\text{RWM}}$</td>
<td>reverse standoff voltage</td>
<td>$T_{\text{amb}} = 25 ^\circ \text{C}$</td>
<td>-</td>
<td>-</td>
<td>3.3</td>
<td>V</td>
</tr>
<tr>
<td>$V_{\text{BR}}$</td>
<td>breakdown voltage</td>
<td>$I_R = 5 \text{ mA}; T_{\text{amb}} = 25 ^\circ \text{C}$</td>
<td>[1]</td>
<td>5.2</td>
<td>5.6</td>
<td>6</td>
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<tr>
<td>$I_{\text{RM}}$</td>
<td>reverse leakage current</td>
<td>$V_{\text{RWM}} = 3.3 \text{ V}; T_{\text{amb}} = 25 ^\circ \text{C}$</td>
<td>-</td>
<td>0.7</td>
<td>1</td>
<td>µA</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 \text{ MHz}; V_R = 0 \text{ V}; T_{\text{amb}} = 25 ^\circ \text{C}$</td>
<td>-</td>
<td>207</td>
<td>300</td>
<td>pF</td>
</tr>
<tr>
<td>$V_{\text{CL}}$</td>
<td>clamping voltage</td>
<td>$I_{\text{PP}} = 1 \text{ A}; T_{\text{amb}} = 25 ^\circ \text{C}$</td>
<td>[2]</td>
<td>-</td>
<td>-</td>
<td>8</td>
</tr>
<tr>
<td>$r_{\text{dif}}$</td>
<td>differential resistance</td>
<td>$I_{\text{PPM}} = 20 \text{ A}; T_{\text{amb}} = 25 ^\circ \text{C}$</td>
<td>[2]</td>
<td>-</td>
<td>-</td>
<td>15.5</td>
</tr>
</tbody>
</table>

[1] Pulse test: $t_p \leq 300 \mu\text{s}$; duty cycle $\leq 0.02$.
[2] Non-repetitive current pulse 8/20 µs exponential decay waveform according to IEC61000-4-5.

Fig. 3. Peak pulse power as a function of exponential pulse duration; typical values

Fig. 4. Relative variation of peak pulse power as a function of junction temperature; typical values

Fig. 5. Diode capacitance as a function of reverse voltage; typical values

Fig. 6. Relative variation of reverse leakage current as a function of junction temperature; typical values
Transmission Line Pulse (TLP); 
$t_p = 100 \text{ ns}; t_r = 1 \text{ ns}$

**Fig. 7.** Dynamic resistance with positive clamping; typical values

Transmission Line Pulse (TLP); 
$t_p = 100 \text{ ns}; t_r = 1 \text{ ns}$

**Fig. 8.** Dynamic resistance with negative clamping; typical values

IEC 61000-4-5; $t_p = 8/20 \mu\text{s}$; positive pulse

**Fig. 9.** Dynamic resistance with positive clamping; typical values

IEC 61000-4-5; $t_p = 8/20 \mu\text{s}$; negative pulse

**Fig. 10.** Dynamic resistance with negative clamping; typical values
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.

线 to be protected
(positive signal polarity)

ESD protection diode

线 to be protected
(negative signal polarity)

Fig. 11. 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

DFN1006BD-2  Leadless ultra small plastic package with side-wettable flanks (SWF); 2 terminals; 0.65 mm pitch; 1 mm x 0.6 mm x 0.47 mm body

Fig. 12. Package outline DFN1006BD-2 (SOD882BD)
13. Soldering

Footprint information for reflow soldering of DFN1006BD-2 package

![Fig. 13. Reflow soldering footprint for DFN1006BD-2 (SOD882BD)](image)

Dimensions in mm

- solder resist
- solder paste
- solder lands

Issue date
- 20-05-01
- 20-12-15

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Product data sheet
15 January 2021

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14. Revision history

Table 7. Revision history

<table>
<thead>
<tr>
<th>Data sheet ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<tr>
<td>PESD3V3S1ULS v.1</td>
<td>20210115</td>
<td>Product data sheet</td>
<td>-</td>
<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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<tbody>
<tr>
<td>[1][2]</td>
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Objective [short] data sheet Development This document contains data from the objective specification for product development.

Preliminary [short] data sheet Qualification This document contains data from the preliminary specification.

Product [short] data sheet Production This document contains the product specification.

[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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