1. General description

Low capacitance bidirectional 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 SOD882 (DFN1006-2) Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Bidirectional ESD protection of one line
- Ultra small SMD plastic package
- Reverse standoff voltage $V_{RWM} = 3.3$ V
- Low clamping voltage: $V_{CL} = 9.3$ V @ 15 A 8/20 µs
- Ultra low leakage current: $I_{RM} < 1$ nA
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); $I_{PPM} = 15$ A
- IEC 61000-4-5 (surge); $I_{PPM} = 17.5$ A (average measured)
- AEC-Q101 qualified

3. Applications

ESD and surge protection for:

- very sensitive interface lines
- generic interface lines

in portable electronics, communication, consumer and computing devices.

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>3.3</td>
<td>V</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1$ MHz; $V_R = 0$ V; $T_{amb} = 25$ °C</td>
<td>-</td>
<td>35</td>
<td>40</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>K1</td>
<td>cathode (diode 1)</td>
<td></td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>K2</td>
<td>cathode (diode 2)</td>
<td></td>
<td>2</td>
</tr>
</tbody>
</table>

6. 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>PESD3V3S1BL</td>
<td>DFN1006-2</td>
<td>plastic, leadless</td>
<td>plastic, leadless ultra small package; 2 terminals; 0.65 mm pitch;</td>
<td>SOD882</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ultra small</td>
<td>1 mm x 0.6 mm x 0.48 mm body</td>
<td></td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
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<tbody>
<tr>
<td>PESD3V3S1BL</td>
<td>F1</td>
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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>$t_p = 8/20 , \mu s$</td>
<td>[1]</td>
<td>-</td>
<td>15 A</td>
</tr>
<tr>
<td>$T_j$</td>
<td>junction temperature</td>
<td></td>
<td></td>
<td>-</td>
<td>150 °C</td>
</tr>
<tr>
<td>$T_{amb}$</td>
<td>ambient temperature</td>
<td></td>
<td></td>
<td>-55</td>
<td>150 °C</td>
</tr>
<tr>
<td>$T_{stg}$</td>
<td>storage temperature</td>
<td></td>
<td></td>
<td>-65</td>
<td>150 °C</td>
</tr>
</tbody>
</table>

**ESD maximum ratings**

| $V_{ESD}$ | electrostatic discharge voltage | IEC 61000-4-2; contact discharge | [2] [3] | - | 30 kV |


**Fig. 1.** 8/20 µs pulse waveform according to IEC 61000-4-5 and IEC 61643-321

**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>$V_{RWM}$</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>$V_{BR}$</td>
<td>breakdown voltage</td>
<td>$I_R = 1 , \text{mA}; T_{\text{amb}} = 25 , ^\circ\text{C}$</td>
<td>4.5</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$I_R$</td>
<td>reverse current</td>
<td>$T_{\text{amb}} = 25 , ^\circ\text{C}$</td>
<td>-</td>
<td>1</td>
<td>-</td>
<td>A</td>
</tr>
<tr>
<td>$I_{RM}$</td>
<td>reverse leakage current</td>
<td>$V_{RWM} = 3.3 , \text{V}; T_{\text{amb}} = 25 , ^\circ\text{C}$</td>
<td>-</td>
<td>1</td>
<td>100</td>
<td>nA</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>35</td>
<td>40</td>
<td>pF</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PP} = 1 , \text{A}; T_{\text{amb}} = 25 , ^\circ\text{C}$</td>
<td>6.5</td>
<td>-</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$R_{dyn}$</td>
<td>dynamic resistance</td>
<td>$I_R = 10 , \text{A}; T_{\text{amb}} = 25 , ^\circ\text{C}$</td>
<td>0.1</td>
<td>11.5</td>
<td>V</td>
<td></td>
</tr>
<tr>
<td>$R_{PP}$</td>
<td>dynamic resistance</td>
<td>$I_R = -10 , \text{A}$</td>
<td>0.15</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. 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

\[ C_d (\text{pF}) = f = 1 \text{ MHz}; T_{\text{amb}} = 25 \, ^\circ\text{C} \]

Fig. 6. Relative variation of reverse leakage current as a function of junction temperature; typical values

Fig. 7. V-I characteristics for a bidirectional ESD protection diode
Fig. 8. ESD clamping test setup and waveforms
Fig. 9. Dynamic resistance with positive clamping; typical values

Fig. 10. Dynamic resistance with negative clamping; typical values
10. Application information

The device is designed for the protection of one bidirectional data line from surge pulses and ESD damage. The device is suitable on lines where the signal polarities are both positive and negative with respect to ground.

![Application diagram](image)

**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

DFN1006-2: Leadless ultra small plastic package; 2 terminals; body 1.0 x 0.6 x 0.5 mm

Fig. 12. Package outline DFN1006-2 (SOD882)
13. Soldering

Fig. 13. Reflow soldering footprint for DFN1006-2 (SOD882)
14. Revision history

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<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>PESD3V3S1BL v.1</td>
<td>20170531</td>
<td>Product data sheet</td>
<td>-</td>
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15. Legal information

Data sheet status

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<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<td>Development</td>
<td>Development</td>
<td>This document contains data from the objective specification for product development.</td>
</tr>
<tr>
<td>Qualification</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Production</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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