1. General description

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 SOD882 leadless ultra small Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Bidirectional ESD protection of one line
- Ultra small SMD plastic package 1 x 0.6 x 0.48 mm
- ESD protection up to 30 kV
- Very high surge robustness; \( I_{PP} = 12 \, \text{A} \) for 8/20 µs; average measured
- AEC-Q101 qualified

3. Applications

- ESD and surge protection for interface lines

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 \text{C} )</td>
<td>-</td>
<td>-</td>
<td>3.3</td>
<td>V</td>
</tr>
<tr>
<td>( I_{PPM} )</td>
<td>rated peak pulse current</td>
<td>( t_p = 8/20 , \mu\text{s} )</td>
<td>[1]</td>
<td>-</td>
<td>10</td>
<td>A</td>
</tr>
<tr>
<td>( V_{CL} )</td>
<td>clamping voltage</td>
<td>( I_{PPM} = 10 , \text{A}; , t_p = 8/20 , \mu\text{s}; , T_{amb} = 25 , ^\circ \text{C} )</td>
<td>[1]</td>
<td>9.3</td>
<td>11</td>
<td>V</td>
</tr>
</tbody>
</table>

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

5. 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 1[1]</td>
<td>( 1 )( 2 )</td>
<td>K1 K2 sym045</td>
</tr>
<tr>
<td>2</td>
<td>K2</td>
<td>cathode 2</td>
<td>( 1 )( 2 )</td>
<td>DFN1006-2 (SOD882)</td>
</tr>
</tbody>
</table>

[1] The marking band indicates the cathode
6. 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>PESD3V3T1BL</td>
<td>DFN1006-2 plastic, leadless ultra small package; 2 terminals; 0.65 mm pitch; 1 mm x 0.6 mm x 0.48 mm body</td>
<td>SOD882</td>
<td></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>PESD3V3T1BL</td>
<td>L6</td>
</tr>
</tbody>
</table>

8. Limiting values

Table 5. Limiting values

<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>10 A</td>
</tr>
<tr>
<td>( T_j )</td>
<td>junction temperature</td>
<td></td>
<td>-</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 IEC 61000-4-5.

---

![Fig. 1. 8/20 µs pulse waveform according to IEC 61000-4-5](image1.png)

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

![Fig. 2. ESD pulse waveform according to IEC 61000-4-2](image2.png)

**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>$T_{amb} = 25 , ^\circ\mathrm{C}$</td>
<td>-</td>
<td>-</td>
<td>3.3</td>
<td>V</td>
</tr>
<tr>
<td>$V_{BR}$</td>
<td>breakdown voltage</td>
<td>$I_R = 5 , \text{mA}; , T_{amb} = 25 , ^\circ\mathrm{C}$</td>
<td>-</td>
<td>4.7</td>
<td>5.5</td>
<td>8.7</td>
</tr>
<tr>
<td>$I_{RM}$</td>
<td>reverse leakage current</td>
<td>$V_{RWM} = 3.3 , \text{V}; , T_{amb} = 25 , ^\circ\mathrm{C}$</td>
<td>-</td>
<td>0.1</td>
<td>50</td>
<td>nA</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 , \text{MHz}; , V_R = 0 , \text{V}; , T_{amb} = 25 , ^\circ\mathrm{C}$</td>
<td>-</td>
<td>20</td>
<td>25</td>
<td>pF</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{pp} = 1 , \text{A}; , t_p = 8/20 , \mu\text{s}; , T_{amb} = 25 , ^\circ\mathrm{C}$</td>
<td>[1]</td>
<td>6.5</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{PPM} = 10 , \text{A}; , t_p = 8/20 , \mu\text{s}; , T_{amb} = 25 , ^\circ\mathrm{C}$</td>
<td>[1]</td>
<td>9.3</td>
<td>11</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{PP} = 16 , \text{A}; , t_p = 100 , \text{ns}; , T_{amb} = 25 , ^\circ\mathrm{C}$</td>
<td>[2]</td>
<td>9.5</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>$R_{dyn}$</td>
<td>dynamic resistance</td>
<td>$I_R = 10 , \text{A}; , T_{amb} = 25 , ^\circ\mathrm{C}$</td>
<td>[2]</td>
<td>0.12</td>
<td>-</td>
<td>Ω</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_R = -10 , \text{A}; , T_{amb} = 25 , ^\circ\mathrm{C}$</td>
<td>[2]</td>
<td>0.21</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.


![V-I characteristics for a bidirectional ESD protection diode](image1)

![Diode capacitance as a function of reverse voltage; typical values](image2)
Bidirectional ESD protection diode

Figs. 5-8: Typical values for positive and negative clamping voltages.
Fig. 9. ESD clamping test setup and waveforms

Fig. 10. Clamped +8 kV pulse waveform (IEC 61000-4-2 network)

Fig. 11. Clamped -8 kV pulse waveform (IEC 61000-4-2 network)
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]

**Fig. 12. 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

### Dimensions (mm are the original dimensions)

<table>
<thead>
<tr>
<th>Unit</th>
<th>A(1)</th>
<th>A1</th>
<th>b</th>
<th>D</th>
<th>E</th>
<th>e1</th>
<th>L</th>
</tr>
</thead>
<tbody>
<tr>
<td>max mm</td>
<td>0.50</td>
<td>0.03</td>
<td>0.55</td>
<td>0.62</td>
<td>1.02</td>
<td>0.65</td>
<td>0.30</td>
</tr>
<tr>
<td>min mm</td>
<td>0.46</td>
<td>0.47</td>
<td>0.55</td>
<td>0.95</td>
<td>0.22</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note**
1. Including plating thickness
2. The marking bar indicates the cathode (if applicable)

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

Fig. 14. Reflow soldering footprint for DFN1006-2 (SOD882)
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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<tbody>
<tr>
<td>PESD3V3T1BL v.1</td>
<td>20181121</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>
15. Legal information

Data sheet status

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<thead>
<tr>
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<th></th>
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</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 https://www.nexperia.com.

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