1. General description

Very low capacitance bidirectional ElectroStatic Discharge (ESD) protection diode in a DFN1006-2 (SOD882) leadless ultra small Surface-Mounted Device (SMD) plastic package designed to protect one signal line from the damage caused by ESD and other transients.

2. Features and benefits

- Bidirectional ESD protection of one line
- Ultra small SMD plastic package
- Low clamping voltage $V_{CL} = 13 \text{ V}$
- Ultra low leakage current $I_{RM} < 1 \text{ nA}$
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); $I_{PPM} = 5.5 \text{ A}$

3. Applications

- Portable electronics
- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- 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>$T_{amb} = 25 \text{ °C}$</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 \text{ MHz}; V_R = 0 \text{ V}; T_{amb} = 25 \text{ °C}$</td>
<td>-</td>
<td>11</td>
<td>18</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></td>
</tr>
<tr>
<td>2</td>
<td>K2</td>
<td>cathode (diode 2)</td>
<td></td>
<td></td>
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</table>

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>PESD5V0G1BL</td>
<td>DFN1006-2</td>
<td>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>
</tr>
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7. Marking

Table 4. Marking codes

<table>
<thead>
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<th>Type number</th>
<th>Marking code</th>
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<tr>
<td>PESD5V0G1BL</td>
<td>X1</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 µs</td>
<td>[-]</td>
<td>5.5</td>
<td>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>
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</table>

ESD maximum ratings

<table>
<thead>
<tr>
<th>V_{ESD}</th>
<th>electrostatic discharge voltage</th>
<th>contact discharge</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>30</td>
<td>kV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MM</td>
<td>-</td>
<td>2</td>
<td>kV</td>
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<tr>
<td></td>
<td></td>
<td>HBM (MIL-STD)</td>
<td>-</td>
<td>16</td>
<td>kV</td>
</tr>
</tbody>
</table>

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

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_{RWM} )</td>
<td>reverse standoff voltage</td>
<td>( T_{amb} = 25 , ^\circ C )</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>( V_{BR} )</td>
<td>breakdown voltage</td>
<td></td>
<td>5.8</td>
<td>6.8</td>
<td>7.8</td>
<td>V</td>
</tr>
<tr>
<td>( I_{RM} )</td>
<td>reverse leakage current</td>
<td>( V_{RWM} = 5 , V; T_{amb} = 25 , ^\circ 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 , MHz; V_R = 0 , V; T_{amb} = 25 , ^\circ C )</td>
<td>-</td>
<td>11</td>
<td>18</td>
<td>pF</td>
</tr>
<tr>
<td>( V_{CL} )</td>
<td>clamping voltage</td>
<td>( I_{PPM} = 5.5 , A; T_{amb} = 25 , ^\circ C )</td>
<td>[1]</td>
<td>-</td>
<td>-</td>
<td>13 V</td>
</tr>
<tr>
<td>( R_{dyn} )</td>
<td>dynamic resistance</td>
<td>( I_R = 10 , A; T_{amb} = 25 , ^\circ C )</td>
<td>[2]</td>
<td>0.2</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. Diode capacitance as a function of reverse voltage; typical values

Fig. 4. V-I characteristics for a bidirectional ESD protection diode
Very low capacitance bidirectional ESD protection diode

Transmission Line Pulse (TLP) = 100 ns; rise time = 1 ns

Fig. 5. Dynamic resistance with positive clamping; typical values

Transmission Line Pulse (TLP) = 100 ns; rise time = 1 ns

Fig. 6. Dynamic resistance with negative clamping; typical values

IEC 61000-4-5; \( t_p = 8/20 \ \mu s \); positive pulse

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

IEC 61000-4-5; \( t_p = 8/20 \ \mu s \); negative pulse

Fig. 8. Dynamic resistance with negative clamping; typical values
**ESD clamping test setup and waveforms**

**Fig. 9.**

- **Unclamped +8 kV ESD pulse waveform**
  - (IEC 61000-4-2 network)
  - Vertical scale = 10 A/div
  - Horizontal scale = 15 ns/div

- **Clamped +8 kV ESD pulse waveform**
  - (IEC 61000-4-2 network)
  - Vertical scale = 10 V/div
  - Horizontal scale = 100 ns/div

- **Unclamped -8 kV ESD pulse waveform**
  - (IEC 61000-4-2 network)
  - Vertical scale = 10 A/div
  - Horizontal scale = 15 ns/div

- **Clamped -8 kV ESD pulse waveform**
  - (IEC 61000-4-2 network)
  - Vertical scale = 10 V/div
  - Horizontal scale = 100 ns/div
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. 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. Package outline

![Package outline](image)

**Fig. 11. Package outline DFN1006-2 (SOD882)**
12. Soldering

Fig. 12. Reflow soldering footprint for DFN1006-2 (SOD882)
## 13. Revision history

### Table 7. Revision history

<table>
<thead>
<tr>
<th>Data sheet ID</th>
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<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<td>20180504</td>
<td>Product data sheet</td>
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<td>PESD5V0G1BL v.2</td>
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<td>• The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia.</td>
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<td>• Legal texts have been adapted to the new company name where appropriate.</td>
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<td>• Updated rated peak pulse current $I_{PPM}$ to 5.5 A.</td>
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<td>• Added figures 5 to 8.</td>
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14. Legal information

Data sheet status

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<td>Objective [short] data sheet</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>
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<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".
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