1. Product profile

1.1 General description

Very low capacitance bidirectional ElectroStatic Discharge (ESD) protection diode in a SOD962 leadless ultra small Surface-Mounted Device (SMD) package designed to protect one signal line from the damage caused by ESD and other transients.

1.2 Features and benefits

- Pb-free, Restriction of Hazardous Substances (RoHS) compliant and free of halogen and antimony (Dark Green compliant)
- Bidirectional ESD protection of one line
- Very low diode capacitance $C_d = 5.3 \, \text{pF}$
- ESD protection up to $\pm 20 \, \text{kV}$ according to IEC 61000-4-2
- Ultra small SMD package
- Symmetrical breakdown voltage

1.3 Applications

- Cellular handsets and accessories
- Portable electronics
- Communication systems
- Computers and peripherals

1.4 Quick reference data

Table 1. Quick reference data

$T_{\text{amb}} = 25\, ^\circ\text{C}$ unless otherwise specified.

<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></td>
<td>$-5$</td>
<td>$-$</td>
<td>$5$</td>
<td>$\text{V}$</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 , \text{MHz}; V_R = 0 , \text{V}$</td>
<td>$4$</td>
<td>$5.3$</td>
<td>$6$</td>
<td>$\text{pF}$</td>
</tr>
</tbody>
</table>

[1] This parameter is guaranteed by design.
2. Pinning information

Table 2. Pinning

<table>
<thead>
<tr>
<th>Pin</th>
<th>Description</th>
<th>Simplified outline</th>
<th>Graphic symbol</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>cathode (diode 1)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>cathode (diode 2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. 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>PESD5V0V1BCSF</td>
<td>-</td>
<td>leadless ultra small package; 2 terminals; body 0.6 × 0.3 × 0.3 mm</td>
<td>SOD962</td>
</tr>
</tbody>
</table>

4. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD5V0V1BCSF</td>
<td>C</td>
</tr>
</tbody>
</table>

5. 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>P_{PP}</td>
<td>peak pulse power</td>
<td>( t_p = 8/20 \mu s )</td>
<td>[1]</td>
<td>8</td>
<td>W</td>
</tr>
<tr>
<td>I_{PP}</td>
<td>peak pulse current</td>
<td>( t_p = 8/20 \mu s )</td>
<td>[1]</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>T_j</td>
<td>junction temperature</td>
<td></td>
<td>150</td>
<td></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>

[1] Non-repetitive current pulse \( 8/20 \mu s \) exponentially decaying waveform according to IEC61000-4-5; see Figure 1.

Table 6. ESD maximum ratings

<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>$V_{ESD}$</td>
<td>electrostatic discharge voltage</td>
<td>IEC 61000-4-2 (contact discharge)</td>
<td>[1][2]</td>
<td>-</td>
<td>20 kV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEC 61000-4-2 (air discharge)</td>
<td></td>
<td>-</td>
<td>20 kV</td>
</tr>
</tbody>
</table>

[2] Device stressed with ten non-repetitive ESD pulses; see Figure 2.

Table 7. ESD standards compliance

<table>
<thead>
<tr>
<th>Standard</th>
<th>Conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>IEC 61000-4-2, level 4 (ESD)</td>
<td>&gt; 15 kV (air)</td>
</tr>
<tr>
<td></td>
<td>&gt; 8 kV (contact)</td>
</tr>
</tbody>
</table>

Fig 1. 8/20 $\mu$s pulse waveform according to IEC 61000-4-5

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

<table>
<thead>
<tr>
<th>Table 8. Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tamb = 25 °C unless otherwise specified.</td>
</tr>
</tbody>
</table>

<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>$V_{RWM} = 5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>$I_{RM}$</td>
<td>reverse leakage current</td>
<td>$V_{RWM} = 5 \text{ V}$</td>
<td>-</td>
<td>1</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PP} = 0.5 \text{ A}$</td>
<td>-</td>
<td>-</td>
<td>11.5</td>
<td>V</td>
</tr>
<tr>
<td>$V_{BR}$</td>
<td>breakdown voltage</td>
<td>$I_{R} = 1 \text{ mA}$</td>
<td>-</td>
<td>-</td>
<td>10</td>
<td>V</td>
</tr>
<tr>
<td>$C_{d}$</td>
<td>diode capacitance</td>
<td>$f = 1 \text{ MHz}$</td>
<td>4</td>
<td>5.3</td>
<td>6</td>
<td>pF</td>
</tr>
<tr>
<td>$L_{S}$</td>
<td>series inductance</td>
<td>-</td>
<td>0.05</td>
<td>-</td>
<td>nH</td>
<td></td>
</tr>
<tr>
<td>$R_{dyn}$</td>
<td>dynamic resistance</td>
<td>-</td>
<td>2.5</td>
<td>-</td>
<td>Ω</td>
<td></td>
</tr>
</tbody>
</table>

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


[3] Breakdown voltage is always symmetrical within the characterized range, which means no difference in breakdown voltage from pin 1 to pin 2 and vice versa.

[4] This parameter is guaranteed by design.


[6] Non-repetitive current pulse, Transmission Line Pulse (TLP) $t_{p} = 100 \text{ ns}$; square pulse; ANSI/ESD STM5.1-2008.
**PESD5V0V1BCSF**

**Bidirectional very low capacitance ESD protection diode**

---

**Fig 3.** Diode capacitance as a function of reverse voltage; typical values

- $f = 1 \text{ MHz}; \quad T_{\text{amb}} = 25 \, ^\circ \text{C}$

**Fig 4.** V-I characteristics for a bidirectional ESD protection diode

**Fig 5.** ESD clamping test setup

---

IEC 61000-4-2 network

$C_Z = 150 \text{ pF}; \quad R_Z = 330 \, \Omega$

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Product data sheet

Rev. 1 — 2 September 2011
Nexperia

PESD5V0V1BCSF

Bidirectional very low capacitance ESD protection diode

Fig 6.  Clamped ±1 kV ESD pulse waveform (IEC 61000-4-2 network)

Fig 7.  Clamped ±8 kV ESD pulse waveform (IEC 61000-4-2 network)
7. Application information

The PESD5V0V1BCSF is designed for the protection of one data or signal line from the damage caused by ESD and/or other surge pulses. The device may be used on lines where the signal polarities are both, positive and negative with respect to ground. It provides protection against surges with up to 8 W per line.

Circuit board layout and protection device placement

Circuit board layout is critical for the suppression of ESD and Electrical Fast Transient (EFT). The following guidelines are recommended:

1. Place the device as close to the input terminal or connector as possible.
2. The path length between the device and the protected line should be minimized.
3. Avoid running protected conductors in parallel with unprotected conductors.
4. Minimize all Printed-Circuit Board (PCB) conductive loops including power and ground loops.
5. Minimize the length of the transient return path to ground.
6. Avoid using shared transient return paths to a common ground point.
7. Ground planes should be used whenever possible. For multilayer PCBs, use ground vias.
8. Package outline

Leadless ultra small package; 2 terminals; body 0.6 x 0.3 x 0.3 mm

SOD962

---

Fig 9. Package outline PESD5V0V1BCSF (SOD962)
9. Packing information

Table 9. Packing methods
The indicated -xxx are the last three digits of the 12NC ordering code.\[1\]

<table>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Description</th>
<th>Packing quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD5V0V1BCSF</td>
<td>SOD962</td>
<td>2 mm pitch, 8 mm tape and reel</td>
<td>-315</td>
</tr>
</tbody>
</table>

[1] For further information and the availability of packing methods, see Section 13.

10. Soldering

Based on results of board mount testing, Nexperia requires the following soldering guidelines:

1. Soldering footprint as indicated in Figure 10: solder paste has to cover the whole solder land area.
2. Non-solder mask defined (copper-defined) solder lands.
3. Minimum stencil thickness of 100 μm.
4. Paste type 4 or smaller sphere size.
5. Pick and placement accuracy of ±50 μm.

Fig 10. Required reflow soldering footprint PESD5V0V1BCSF (SOD962)
## 11. Revision history

<table>
<thead>
<tr>
<th>Document ID</th>
<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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</thead>
<tbody>
<tr>
<td>PESD5V0V1BCSF v.1</td>
<td>20110902</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
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</table>
12. Legal information

12.1 Data sheet status

<table>
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<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
</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 URL http://www.nexperia.com.

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