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Team Nexperia
1. Product profile

1.1 General description
Low capacitance unidirectional ElectroStatic Discharge (ESD) protection diode designed to protect one signal line from the damage caused by ESD and other transients. The device is encapsulated in a leadless super small DSN0603-2 (SOD962) Surface-Mounted Device (SMD) package.

1.2 Features and benefits
- ESD protection of one line
- Low diode capacitance $C_d = 12 \text{ pF}$
- Super small SMD package
- Ultra low leakage current $I_{RM} < 1 \text{ nA}$
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61643-321 (surge); $I_{PPM} = 1.2 \text{ A}$

1.3 Applications
- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- Communication systems
- Portable electronics

1.4 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>$- \quad - \quad 5$</td>
<td>V</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 \text{ MHz}; V_R = 0 \text{ V}$</td>
<td>$9 \quad 12 \quad 15$</td>
<td>pF</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1. Quick reference data

$T_{amb} = 25 \text{ °C unless otherwise specified.}$

Rev. 1 — 12 July 2012 Product data sheet
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</td>
<td>[1]</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>anode</td>
<td></td>
<td>[1]</td>
</tr>
</tbody>
</table>

[1] The marking bar indicates the cathode.

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>PESD5V0L1USF</td>
<td>DSN0603-2</td>
<td>leadless ultra small package; 2 terminals; body 0.6 x 0.3 x 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>PESD5V0L1USF</td>
<td>2</td>
</tr>
</tbody>
</table>
5. 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>P_{PPM}</td>
<td>rated peak pulse power</td>
<td>( t_p = 8/20 \mu s )</td>
<td>[1][2]</td>
<td>-</td>
<td>11</td>
</tr>
<tr>
<td>I_{PPM}</td>
<td>rated peak pulse current</td>
<td>( t_p = 8/20 \mu s )</td>
<td>[1][2]</td>
<td>-</td>
<td>1.2</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>

[1] Device stressed with 8/20 \( \mu s \) exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.

**Table 6. ESD maximum ratings**
\( T_{amb} = 25 \ ^\circ \text{C} \) unless otherwise specified.

<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>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEC 61000-4-2 (air discharge)</td>
<td>[1][2]</td>
<td>-</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td></td>
<td>machine model</td>
<td>[2]</td>
<td>-</td>
<td>400</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MIL-STD-883 (human body model)</td>
<td></td>
<td></td>
<td>10</td>
</tr>
</tbody>
</table>


**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); &gt; 8 kV (contact)</td>
</tr>
<tr>
<td>MIL-STD-883; class 3B (human body model)</td>
<td>&gt; 8 kV</td>
</tr>
</tbody>
</table>
6. Characteristics

Table 8. 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>$V_{RWM} = 5 \text{ V}$</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>$I_{RM}$</td>
<td>reverse leakage current</td>
<td>$I_R = 5 \text{ mA}$</td>
<td>-</td>
<td>1</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>$V_{BR}$</td>
<td>breakdown voltage</td>
<td>$I_R = 1 \text{ mA}$</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>V</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 \text{ MHz}; V_R = 0 \text{ V}$</td>
<td>9</td>
<td>12</td>
<td>15</td>
<td>pF</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PP} = 1 \text{ A}$</td>
<td>[1][2]</td>
<td>-</td>
<td>-</td>
<td>10.5 V</td>
</tr>
<tr>
<td>$r_{dyn}$</td>
<td>dynamic resistance</td>
<td>$I_R = 10 \text{ A}$</td>
<td>[3]</td>
<td>-</td>
<td>1.2</td>
<td>Ω</td>
</tr>
</tbody>
</table>

[1] Device stressed with 8/20 μs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.
[3] Non-repetitive current pulse, Transmission Line Pulse (TLP) $t_p = 100 \text{ ns}$; square pulse; ANS/IESD STM5-1-2008.

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
Low capacitance unidirectional ESD protection diode

Fig 3. Relative variation of rated peak pulse power as a function of junction temperature; typical values

Fig 4. Diode capacitance as a function of reverse voltage; typical values

Fig 5. V-I characteristics for a unidirectional ESD protection diode
Low capacitance unidirectional ESD protection diode

Fig 6. ESD clamping test setup

Fig 7. Clamped +8 kV pulse waveform (IEC 61000-4-2 network)

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

The device is designed for the protection of one unidirectional data or signal 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.

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.

Fig 9. Application diagram
8. Package outline

![Package outline DSN0603-2 (SOD962)](image)

Fig 10. Package outline DSN0603-2 (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>PESD5V0L1USF</td>
<td>DSN0603-2</td>
<td>2 mm pitch, 8 mm tape and reel -315</td>
<td>9000</td>
</tr>
</tbody>
</table>

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

Footprint information for reflow soldering of leadless ultra small package; 2 terminals

Fig 11. Reflow soldering footprint DSN0603-2 (SOD962)
11. Revision history

Table 10. 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>
</tr>
</thead>
<tbody>
<tr>
<td>PESD5V0L1USF v.1</td>
<td>20120712</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
12. Legal information

12.1 Data sheet status

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></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.nxp.com.

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