1. General description

Very low capacitance bidirectional ElectroStatic Discharge (ESD) protection diode in an ultra-small and flat lead SOD523 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
- Very low diode capacitance: \( C_d = 11 \, \text{pF} \)
- Max. peak pulse power: \( P_{\text{PPM}} = 45 \, \text{W} \)
- Low clamping voltage: \( V_{\text{CL}} = 12.5 \, \text{V} \)
- Ultra low leakage current: \( I_{\text{RM}} < 1 \, \text{nA} \)
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge); \( I_{\text{PPM}} = 4.8 \, \text{A} \)
- AEC-Q101 qualified

3. Applications

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- SIM card protection
- Communication systems
- Portable electronics
- 10/100 Mbit/s Ethernet

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_{\text{RWM}} )</td>
<td>reverse standoff voltage</td>
<td>( T_{\text{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_{\text{amb}} = 25 , \text{°C} )</td>
<td>-</td>
<td>11</td>
<td>13</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>
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</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>PESD5V0V1BB</td>
<td>SOD523</td>
<td>plastic, surface-mounted package; 2 leads; 1.2 mm x 0.8 mm x 0.6 mm body</td>
<td>SOD523</td>
<td></td>
</tr>
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7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD5V0V1BB</td>
<td>Z9</td>
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</table>
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>$P_{PPM}$</td>
<td>rated peak power</td>
<td>$t_p = 8/20 \mu s$</td>
<td>[1]</td>
<td>-</td>
<td>45 W</td>
</tr>
<tr>
<td>$I_{PPM}$</td>
<td>rated peak pulse current</td>
<td></td>
<td>[1]</td>
<td>-</td>
<td>4.8 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 |
| $V_{ESD}$ | electrostatic discharge machine model | | - | 2 | kV |
| $V_{ESD}$ | electrostatic discharge MIL-STD-883 (human body model) | | - | 16 | kV |

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

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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 °C</td>
<td>-</td>
<td>-</td>
<td>5</td>
<td>V</td>
</tr>
<tr>
<td>V_{BR}</td>
<td>breakdown voltage</td>
<td>I_R = 5 mA; T_{amb} = 25 °C</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 °C</td>
<td>-</td>
<td>1</td>
<td>10</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 °C</td>
<td>-</td>
<td>11</td>
<td>13</td>
<td>pF</td>
</tr>
<tr>
<td>V_{CL}</td>
<td>clamping voltage</td>
<td>I_{PP} = 4.8 A; T_{amb} = 25 °C</td>
<td>[1]</td>
<td>-</td>
<td>-</td>
<td>12.5 V</td>
</tr>
<tr>
<td>R_{dyn}</td>
<td>dynamic resistance</td>
<td>I_R = 10 A; T_{amb} = 25 °C</td>
<td>[2]</td>
<td>-</td>
<td>0.2</td>
<td>Ω</td>
</tr>
<tr>
<td>r_{dif}</td>
<td>differential resistance</td>
<td>I_R = 5 mA; T_{amb} = 25 °C</td>
<td>-</td>
<td>-</td>
<td>35</td>
<td>Ω</td>
</tr>
</tbody>
</table>

[1] Non-repetitive current pulse 8/20 μs exponentially decaying waveform according to IEC 61000-4-5
[2] Non-repetitive current pulse, Transmission Line Pulse (TLP) t_p = 100 ns; square pulse; ANSI/ESD STM5.5.1-2008

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
Very low capacitance bidirectional ESD protection diode

Fig. 5. Diode capacitance as a function of reverse voltage; typical values

\[ f = 1 \text{ MHz}; \ T_{\text{amb}} = 25^\circ \text{C} \]

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
10. Application information

The device is designed for the protection of one bidirectional 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 a surge capability of 45 W per line for an 8/20 μs waveform.

![Application diagram](aaa-002737)

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. 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. 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

Fig. 10. Package outline SOD523

13. Soldering

Fig. 11. Reflow soldering footprint for SOD523
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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<td>PESD5V0V1BB v.1</td>
<td>20180705</td>
<td>Product data sheet</td>
<td>-</td>
<td>PESD5V0V1BA</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>_BB_BL v.2</td>
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</table>

Modifications:
- The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia
- Legal texts have been adapted to the new company name where appropriate
15. Legal information

Data sheet status

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<thead>
<tr>
<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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