1. General description

Bidirectional ElectroStatic Discharge (ESD) protection diode in an ultra-small and flat lead SOD523 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
- Max. peak pulse power: $P_{PPM} = 130$ W
- Low clamping voltage: $V_{CLR} = 14$ V
- Ultra low leakage current: $I_{RM} = 5$ nA
- ESD protection > 30 kV
- IEC 61000-4-2, level 4 (ESD)
- IEC 61000-4-5 (surge): $I_{PPM} = 12$ A
- Ultra small SMD plastic package
- AEC-Q101 qualified

3. Applications

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

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>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1$ MHz; $V_R = 0$ V; $T_{amb} = 25$ °C</td>
<td>-</td>
<td>35</td>
<td>45</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>
</tr>
</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>PESD5V0S1BB</td>
<td>SOD523</td>
<td>plastic, surface-mounted</td>
<td>plastic, surface-mounted package; 2 leads; 1.2 mm x 0.8 mm x 0.6 mm body</td>
<td>SOD523</td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
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</thead>
<tbody>
<tr>
<td>PESD5V0S1BB</td>
<td>L7</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 pulse power</td>
<td>$t_p = 8/20 \mu s$</td>
<td>[1]</td>
<td>[2]</td>
<td>-</td>
</tr>
<tr>
<td>$I_{PPM}$</td>
<td>rated peak pulse current</td>
<td></td>
<td>[1]</td>
<td>[2]</td>
<td>-</td>
</tr>
<tr>
<td>$T_j$</td>
<td>junction temperature</td>
<td></td>
<td>-</td>
<td></td>
<td>150 °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] [3] | -     | 30 kV |
|           |                                | HBM MIL-Std 883                 | -      | 10 kV |

[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>$I_R = 1 , mA; T_{amb} = 25 , ^\circ C$</td>
<td>5.5</td>
<td>-</td>
<td>9.5</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>5</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>35</td>
<td>45</td>
<td>pF</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{pp} = 1 , A; T_{amb} = 25 , ^\circ C$</td>
<td>[1]</td>
<td>[2]</td>
<td>-</td>
<td>10</td>
</tr>
<tr>
<td>$I_{PPM}$</td>
<td>clamping current</td>
<td>$I_{PPM} = 12 , A; T_{amb} = 25 , ^\circ C$</td>
<td>[1]</td>
<td>[2]</td>
<td>-</td>
<td>14</td>
</tr>
<tr>
<td>$r_{dif}$</td>
<td>differential resistance</td>
<td>$I_R = 1 , mA; T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>50</td>
<td>Ω</td>
</tr>
</tbody>
</table>

[1] Non-repetitive current pulse 8/20 µs exponentially decaying waveform according to IEC61000-4-5.

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

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

Fig. 6. Relative variation of reverse leakage current as a function of junction temperature; typical values
Fig. 7. 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 130 W per line for an 8/20 μs waveform.

![Fig. 8. Bidirectional protection of one signal line](image)

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. 9. Package outline SOD523](image)
13. Soldering

Fig. 10. 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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</thead>
<tbody>
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<td>20180823</td>
<td>Product data sheet</td>
<td>-</td>
<td>PESD5V0S1BA _BB_BL_4</td>
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**Modifications:**
- Features and benefit AEC-Q101 qualified added.
- AEC-Q101 quality information added.
- Limiting values; $T_{amb}$ updated to -55°C.
- Application information: updated.
- Soldering section added.
- The format of this data sheet had been redesigned to comply with the identity guidelines of Nexperia.
- Legal texts have been adapted to the new company name where appropriate.

<table>
<thead>
<tr>
<th>Data sheet ID</th>
<th>Release date</th>
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<td>20041217</td>
<td>Product data sheet</td>
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<td>PESD5V0S1BA _BB_BL_2</td>
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<td>PESD5V0S1BA _BB_BL_1</td>
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<td>20040304</td>
<td>Product specification</td>
<td>-</td>
<td>-</td>
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</table>
15. Legal information

Data sheet status

Table: Document status vs. Product status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<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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Date of release: 23 August 2018