1. General description

Unidirectional ElectroStatic Discharge (ESD) protection diode in a SOD523 plastic package designed to protect one transmission or data line from the damage caused by ESD and other transients.

2. Features and benefits

- Unidirectional ESD protection of one line
- Low clamping voltage: \( V_{CL} = 40 \text{ V} \) at \( I_{PPM} = 5 \text{ A} \)
- ESD protection > 30 kV
- IEC 61000-4-5 (surge); \( I_{PPM} = 5 \text{ A} \) at \( t_p = 8/20 \mu s \)

3. Application information

- Computers and peripherals
- Communication systems
- Audio and video equipment
- Data lines
- CAN bus protection

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>15</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>32</td>
<td>70</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>K</td>
<td>cathode[1]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>anode</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>PESD15VS1UB</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>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD15VS1UB</td>
<td>N4</td>
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</tbody>
</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>-</td>
<td>160 W</td>
</tr>
<tr>
<td>$I_{PPM}$</td>
<td>rated peak pulse current</td>
<td>$t_p = 8/20 \mu s$</td>
<td>[1]</td>
<td>-</td>
<td>5 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 |
|           |                                  | HBM MIL-STD883                     | -   | 10  | kV    |

## 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>$T_{\text{amb}} = 25 \ ^\circ \text{C}$</td>
<td>-</td>
<td>-</td>
<td>15</td>
<td>V</td>
</tr>
<tr>
<td>$V_{BR}$</td>
<td>breakdown voltage</td>
<td>$I_R = 5 \ mA; \ T_{\text{amb}} = 25 \ ^\circ \text{C}$</td>
<td>17.6</td>
<td>18</td>
<td>18.4</td>
<td>V</td>
</tr>
<tr>
<td>$I_{RM}$</td>
<td>reverse leakage current</td>
<td>$V_{RWM} = 15 \ V; \ T_{\text{amb}} = 25 \ ^\circ \text{C}$</td>
<td>-</td>
<td>1</td>
<td>50</td>
<td>nA</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 \ MHz; \ V_R = 0 \ V; \ T_{\text{amb}} = 25 \ ^\circ \text{C}$</td>
<td>-</td>
<td>32</td>
<td>70</td>
<td>pF</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PPM} = 1 \ A; \ T_{\text{amb}} = 25 \ ^\circ \text{C}$</td>
<td>-</td>
<td>-</td>
<td>23</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{PPM} = 5 \ A; \ T_{\text{amb}} = 25 \ ^\circ \text{C}$</td>
<td>[1]</td>
<td>-</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td>$r_{\text{dif}}$</td>
<td>differential resistance</td>
<td>$I_R = 1 \ mA; \ T_{\text{amb}} = 25 \ ^\circ \text{C}$</td>
<td>-</td>
<td>-</td>
<td>225</td>
<td>Ω</td>
</tr>
</tbody>
</table>


---

**Fig. 3.** Peak pulse power dissipation as a function of pulse time; typical values

**Fig. 4.** Relative variation of peak pulse power as a function of junction temperature; typical values
f = 1 MHz; \( T_{\text{amb}} = 25 \, ^\circ \text{C} \)

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

\[
\begin{align*}
V_R (\text{V}) & \quad C_d \text{ (pF)} \\
0 & \quad 50 \\
5 & \quad 40 \\
10 & \quad 30 \\
15 & \quad 20 \\
20 & \quad 10 \\
25 & \quad 0 \\
\end{align*}
\]

\( V_{R\text{WM}} = 15 \, \text{V} \)

\( I_R \) is less than 10 nA at \( 150 \, ^\circ \text{C} \)

**Fig. 6.** Relative variation of reverse leakage current as a function of junction temperature; typical values

\[
\begin{align*}
T_j (\text{°C}) & \quad \frac{I_R}{I_{R(25^\circ \text{C})}} \\
-100 & \quad 10^{-1} \\
-50 & \quad 1 \\
0 & \quad 10 \\
50 & \quad 10^0 \\
100 & \quad 10^1 \\
150 & \quad 10^2 \\
\end{align*}
\]
Fig. 7. ESD clamping test setup and waveforms

IEC 61000-4-2 network

$C_z = 150 \text{ pF}; R_z = 330 \Omega$

DUT: PESD15VS1UB

RG 223/U

50 Ω coax

40 dB ATTENUATOR

50 Ω

4 GHz DIGITAL OSCILLOSCOPE

vertical scale = 200 V/div
horizontal scale = 50 ns/div

GND

unclamped +1 kV ESD voltage waveform

(vertical scale = 200 V/div, horizontal scale = 50 ns/div)

GND

clamped +1 kV ESD voltage waveform

(vertical scale = 20 V/div, horizontal scale = 50 ns/div)

GND

unclamped -1 kV ESD voltage waveform

(vertical scale = 200 V/div, horizontal scale = 50 ns/div)

GND

clamped -1 kV ESD voltage waveform

(vertical scale = 10 V/div, horizontal scale = 50 ns/div)
10. Application information

The device is designed for unidirectional protection of one single data line from the damage caused by ESD and surge pulses. The device may be used on lines where the signal polarity is above or below ground. It provides a surge capability of up to 160 W per line for a 8/20 µs waveform.

![Diagram](image)

**Fig. 8. Unidirectional protection of one line**

**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

![Diagram](image)

**Fig. 9. Package outline SOD523**
12. Soldering

Fig. 10. Reflow soldering footprint for SOD523
13. 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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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.
- Soldering section added.
- Application information: updated.
- Figure 9: updated.
- $T_{\text{amb}}$ value updated from -65°C to -55°C
14. Legal information

Data sheet status

<table>
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<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
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<tr>
<td>Preliminary</td>
<td>Development</td>
<td>This document contains data from the specific specification for product development.</td>
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<tr>
<td>Objective data sheet</td>
<td>Qualification</td>
<td>This document contains data from the preliminary specification.</td>
</tr>
<tr>
<td>Product data sheet</td>
<td>Production</td>
<td>This document contains the product specification.</td>
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