1. General description

ESD protection device in a small SOT323 (SC-70) Surface-Mounted Device (SMD) plastic package designed to protect two automotive In-vehicle network bus lines from the damage caused by ElectroStatic discharge (ESD) and other transients.

2. Features and benefits

- Reverse stand-off voltage: $V_{RWM} = 24$ V
- Low clamping voltage: $V_{CL} = 33$ V at $I_{PP} = 3.5$A
- ESD protection up to 30 kV (IEC 61000-4-2)
- ESD protection up to 30 kV (ISO 10605: C = 330 pF, R = 330 Ω)
- ISO 7637-3: Pulse a: $V_S = -150$ V / Pulse b: $V_S = +100$ V
- Ultra low leakage current: $I_{RM} < 1$ nA
- Qualified according to AEC-Q101 / Automotive grade

3. Applications

ESD protection for In-vehicle network lines in automotive enviroments

- CAN
- LIN
- FlexRay
- SENT

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>$T_{amb} = 25$ °C</td>
<td>-</td>
<td>-</td>
<td>24</td>
<td>V</td>
</tr>
<tr>
<td>$I_{PPM}$</td>
<td>rated peak pulse current</td>
<td>$t_p = 8/20$ μs</td>
<td></td>
<td>[1]</td>
<td>-</td>
<td>3.5</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PPM} = 3.5$ A; $t_p = 8/20$ μs; $T_{amb} = 25$ °C</td>
<td>[1]</td>
<td>[2]</td>
<td>33</td>
<td>42</td>
</tr>
</tbody>
</table>

[1] Device stressed with 8/20 μs exponential decay waveform according to IEC 61000-4-5.
[2] Measured from pin 1 or 2 to pin 3.
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>3</td>
</tr>
<tr>
<td>2</td>
<td>K2</td>
<td>cathode (diode 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>K</td>
<td>common cathode</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>PESD2IVN24-U</td>
<td>SC-70</td>
<td>plastic, surface-mounted package; 3 leads; 1.3 mm pitch; 2 mm x 1.25 mm x 0.95 mm body</td>
<td>SOT323</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>PESD2IVN24-U</td>
<td>A8</td>
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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>I_{PPM}</td>
<td>rated peak pulse current</td>
<td>t_p = 8/20 μs</td>
<td>[1]</td>
<td>3.5</td>
<td>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**

<table>
<thead>
<tr>
<th>V_{ESD}</th>
<th>electrostatic discharge voltage</th>
<th>IEC 61000-4-2 (contact discharge)</th>
<th>[2]</th>
<th>30</th>
<th>kV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ISO 10605: contact discharge; C = 150 pF, R = 330 Ω</td>
<td>[2]</td>
<td>30</td>
<td>kV</td>
<td></td>
</tr>
</tbody>
</table>

[1] Device stressed with 8/20 μs exponential decay waveform according to IEC 61000-4-5.
[2] Measured from pin 1 or 2 to pin 3.

![Fig. 1. 8/20 μs pulse waveform according to IEC 61000-4-5](image1)

![Fig. 2. ESD pulse waveform according to IEC 61000-4-2](image2)
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>24</td>
<td>V</td>
</tr>
<tr>
<td>V_BR</td>
<td>breakdown voltage</td>
<td>I_R = 10 mA; T_amb = 25 °C</td>
<td>25.5</td>
<td>30.5</td>
<td>35.5</td>
<td>V</td>
</tr>
<tr>
<td>I_RM</td>
<td>reverse leakage current</td>
<td>V_RWM = 24 V; T_amb = 25 °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_amb = 25 °C</td>
<td>-</td>
<td>14</td>
<td>17</td>
<td>pF</td>
</tr>
<tr>
<td>V_CL</td>
<td>clamping voltage</td>
<td>I_{PPM} = 1 A; t_p = 8/20 μs; T_amb = 25 °C</td>
<td>-</td>
<td>31</td>
<td>40</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>I_{PPM} = 3.5 A; t_p = 8/20 μs; T_amb = 25 °C</td>
<td>-</td>
<td>33</td>
<td>42</td>
<td>V</td>
</tr>
<tr>
<td>R_dyn</td>
<td>dynamic resistance</td>
<td>I_R = 10 A; T_amb = 25 °C</td>
<td>-</td>
<td>0.2</td>
<td>-</td>
<td>Ω</td>
</tr>
</tbody>
</table>

[1] Measured from pin 1 or 2 to pin 3.
[2] Device stressed with 8/20 μs exponential decay waveform according to IEC 61000-4-5.
[3] Non-repetitive current pulse, Transmission Line Pulse (TLP); square pulse; ANSI / ESD STM5.5.1-2008

Fig. 3. V-I characteristics for a bidirectional ESD protection diode

Fig. 4. Diode capacitance as a function of reverse voltage; typical values
ESD protection for In-vehicle networks

**Fig. 5.** Positive clamping voltage (TLP); typical values

**Fig. 6.** Negative clamping voltage (TLP); typical values

**Fig. 7.** Peak pulse power as a function of exponential pulse duration; typical values

**Fig. 8.** Relative variation of peak pulse power as a function of junction temperature; typical values
ESD protection for In-vehicle networks

Fig. 9. ESD clamping test setup and waveforms

Fig. 10. Clamped +8 kV pulse waveform (IEC61000-4-2 network)

Fig. 11. Clamped -8 kV pulse waveform (IEC61000-4-2 network)
10. Application information

The PESD2IVN24-U is designed for the protection of two automotive IVN bus lines from the damage caused by ESD and surge pulses.

![Circuit diagram showing ESD protection for two automotive CAN bus lines](image)

**Fig. 12. Typical application: ESD protection of two automotive CAN bus lines**

**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

Plastic surface-mounted package; 3 leads

SOT323

Fig. 13. Package outline SC-70 (SOT323)
12. Soldering

Fig. 14. Reflow soldering footprint for SC-70 (SOT323)

Fig. 15. Wave soldering footprint for SC-70 (SOT323)
13. Revision history

Table 7. Revision history

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<th>Release date</th>
<th>Data sheet status</th>
<th>Change notice</th>
<th>Supersedes</th>
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<td>20171229</td>
<td>Product data sheet</td>
<td>-</td>
<td>PESD2IVN24-U v.1</td>
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<td>Modifications:</td>
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<td></td>
<td></td>
<td>• Change status from preliminary data sheet to product data sheet</td>
<td></td>
<td></td>
</tr>
<tr>
<td>PESD2IVN24-U v.1</td>
<td>20171116</td>
<td>Preliminary data sheet</td>
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<td>-</td>
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14. Legal information

Data sheet status

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<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>
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<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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