1. General description

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

2. Features and benefits

- One very small SOT323 package to protect two in-vehicle network lines
- Low clamping voltage: $V_{CL} = 38$ V at $I_{PP} = 1$ A
- Typical diode capacitance matching $\Delta C_d/C_d = 0.1\%$
- ESD protection up to 18 kV; IEC 61000-4-2, level 4
- IEC 61000-4-5 (surge); $I_{PP} = 3$ A at $t_p = 8/20$ µs
- AEC-Q101 qualified

3. Applications

- In-vehicle network ESD protection for CAN, LIN, FlexRay and Single Edge Nibble Transmission (SENT) interfaces
- Generic automotive applications

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>26.5</td>
<td>V</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>8.5</td>
<td>11</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</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>K</td>
<td>cathode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>CC</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>PESD2IVN-U</td>
<td>SC-70</td>
<td>plastic</td>
<td>surface-mounted package; 3 leads</td>
<td>SOT323</td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
<th>[1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD2IVN-U</td>
<td>3Y%</td>
<td></td>
</tr>
</tbody>
</table>

[1] % = placeholder for manufacturing site code
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&lt;sub&gt;PPM&lt;/sub&gt;</td>
<td>rated peak pulse power</td>
<td>t&lt;sub&gt;p&lt;/sub&gt; = 8/20 µs</td>
<td>1[2]</td>
<td>-</td>
<td>150</td>
</tr>
<tr>
<td>I&lt;sub&gt;PPM&lt;/sub&gt;</td>
<td>rated peak pulse current</td>
<td>1[2]</td>
<td>-</td>
<td>3</td>
<td>A</td>
</tr>
<tr>
<td>T&lt;sub&gt;j&lt;/sub&gt;</td>
<td>junction temperature</td>
<td>-</td>
<td>150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>T&lt;sub&gt;amb&lt;/sub&gt;</td>
<td>ambient temperature</td>
<td>-55</td>
<td>150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>T&lt;sub&gt;stg&lt;/sub&gt;</td>
<td>storage temperature</td>
<td>-65</td>
<td>150</td>
<td>°C</td>
<td></td>
</tr>
</tbody>
</table>

**ESD maximum ratings**

| V<sub>ESD</sub> | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) | 2[3] | - | 18 | kV |

[1] Non-repetitive current pulse 8/20 µs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.
[2] Measured from pin 1 or 2 to 3.

![Fig. 1. 8/20 µs pulse waveform according to IEC 61000-4-5 and IEC 61643-321](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>$T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>26.5</td>
<td>V</td>
</tr>
<tr>
<td>$I_{RM}$</td>
<td>reverse leakage current</td>
<td>$V_{RWM} = 26.5 , V$; $T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>1</td>
<td>50</td>
<td>nA</td>
</tr>
<tr>
<td>$V_{BR}$</td>
<td>breakdown voltage</td>
<td>$I_{R} = 5 , mA$; $T_{amb} = 25 , ^\circ C$</td>
<td>28</td>
<td>30</td>
<td>32</td>
<td>V</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>8.5</td>
<td>11</td>
<td>pF</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$f = 1 , MHz$; $V_{R} = 2.5 , V$; $T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>6.6</td>
<td>-</td>
<td>pF</td>
</tr>
<tr>
<td>$\Delta C_{d}/C_{d}$</td>
<td>diode capacitance matching</td>
<td>$f = 1 , MHz$; $V_{R} = 0 , V$; $T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>0.1</td>
<td>-</td>
<td>%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$f = 1 , MHz$; $V_{R} = 2.5 , V$; $T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>0.1</td>
<td>-</td>
<td>%</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PP} = 1 , A$; $T_{amb} = 25 , ^\circ C$</td>
<td>[1][2]</td>
<td>-</td>
<td>38</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$I_{PPM} = 3 , A$; $T_{amb} = 25 , ^\circ C$</td>
<td>[1][2]</td>
<td>-</td>
<td>53</td>
<td>V</td>
</tr>
<tr>
<td>$R_{dyn}$</td>
<td>dynamic resistance</td>
<td>$I_{R} = 20 , A$; $T_{amb} = 25 , ^\circ C$</td>
<td>[3]</td>
<td>-</td>
<td>2</td>
<td>Ω</td>
</tr>
</tbody>
</table>

[1] Non-repetitive current pulse 8/20 µs exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.
[2] Measured from pin 1 or 2 to 3.
Fig. 4. Rated peak pulse power as a function of square pulse duration; typical values

\[ P_{\text{PPM}} (W) \]
\[ t_p (\mu s) \]

\[ T_{\text{amb}} = 25 ^\circ C \]

Fig. 5. Relative variation of rated peak pulse power as a function of junction temperature; typical values

\[ \frac{P_{\text{PPM}}}{P_{\text{PPM}_{25^\circ C}}} \]
\[ T_j ^\circ C \]

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

Fig. 6. Diode capacitance as a function of reverse voltage; typical values

\[ C_d (pF) \]
\[ V_R (V) \]
EOD TESTER

Rd

Cg

DUT (DEVICE UNDER TEST)

IEC 61000-4-2 ed.2
Cg = 150 pF; Rd = 330 Ω

RG 223/U
50 Ω coax

40 dB ATTENUATOR

50 Ω

Fig. 7. ESD clamping test setup and waveforms

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

Fig. 9. Clamped -8 kV pulse waveform (IEC 61000-4-2 network)
10. Application information

The device is designed for the protection of two automotive in-vehicle network bus lines from surge pulses and ESD damage. The device provides a surge capability of up to 3 A for an 8/20 \( \mu s \) waveform.

![Diagram of ESD protection](image)

**Fig. 10.** Typical application: ESD protection of one automotive CAN bus 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

![Package outline SC-70 (SOT323)](image)

Fig. 11. Package outline SC-70 (SOT323)

12. Soldering

![Reflow soldering footprint for SC-70 (SOT323)](image)

Fig. 12. Reflow soldering footprint for SC-70 (SOT323)
Fig. 13. Wave soldering footprint for SC-70 (SOT323)
13. 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>
<tr>
<td>PESD2IVN-U v.1</td>
<td>20150715</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
</tr>
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</table>
14. Legal information

14.1 Data sheet status

<table>
<thead>
<tr>
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<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 URL http://www.nexperia.com.

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Date of release: 15 July 2015