1. General description

ESD protection device in a small SOT23 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: $V_{RWM} = 36$ V
- Low clamping voltage: $V_{CL} = 48$ V at $I_{PP} = 1$ A
- ESD protection up to 15 kV (IEC 61000-4-2)
- Low capacitance: $C_d = 4.3$ pF
- Qualified according to AEC-Q101 and recommended for use in automotive applications

3. Applications

ESD protection for in-vehicle network lines in automotive environments

- 24 V board net / truck systems
- CAN / CAN-FD
- 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>36</td>
<td>V</td>
</tr>
<tr>
<td>$I_{PPM}$</td>
<td>rated peak pulse current</td>
<td>$t_p = 8/20$ µs</td>
<td>[1] [2]</td>
<td>-</td>
<td>1.5</td>
<td>A</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PP} = 16$ A; $t_p = 100$ ns; $T_{amb} = 25$ °C</td>
<td>[3] [2]</td>
<td>65</td>
<td>-</td>
<td>V</td>
</tr>
</tbody>
</table>

[2] Measured from pin 1 or 2 to pin 3.
[3] Non-repetitive current pulse, Transmission Line Pulse (TLP); square pulse; ANSI / ESD STM5.5.1-2008
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>
<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>PESD36VU2BT-Q</td>
<td>SOT23</td>
<td>plastic, surface-mounted package; 3 terminals; 1.9 mm pitch; 2.9 mm x 1.3 mm x 1 mm body</td>
<td>SOT23</td>
<td></td>
</tr>
</tbody>
</table>

7. Marking

Table 4. Marking codes

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code[1]</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD36VU2BT-Q</td>
<td>8Y%</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>$I_{PPM}$</td>
<td>rated peak pulse current</td>
<td>$t_p = 8/20 , \mu s$</td>
<td></td>
<td>1.5</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] [3]</th>
<th>15</th>
<th>kV</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>ISO 10605; contact discharge; C = 330 pF, R = 330 Ω</td>
<td>[2] [3]</td>
<td>15</td>
<td>kV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ISO 10605; contact discharge; C = 150 pF, R = 330 Ω</td>
<td>[2] [3]</td>
<td>15</td>
<td>kV</td>
</tr>
</tbody>
</table>

[2] Measured from pin 1 or 2 to pin 3.

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</td>
<td>$T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>-</td>
<td>36</td>
<td>V</td>
</tr>
<tr>
<td>$V_{BR}$</td>
<td>breakdown voltage</td>
<td>$I_R = 10 , mA; \ T_{amb} = 25 , ^\circ C$</td>
<td>37</td>
<td>41</td>
<td>47</td>
<td>V</td>
</tr>
<tr>
<td>$I_{RM}$</td>
<td>reverse leakage current</td>
<td>$V_{RWM} = 36 , V; \ T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>1</td>
<td>50</td>
<td>nA</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1 , MHz; \ V_R = 2.5 , V; \ T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>3.9</td>
<td>4.3</td>
<td>pF</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PP} = 1 , A; \ t_p = 8/20 , \mu s; \ T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>3.9</td>
<td>4.3</td>
<td>pF</td>
</tr>
<tr>
<td>$R_{dyn}$</td>
<td>dynamic resistance</td>
<td>$I_R = 10 , A; \ t_p = 100 , ns; \ T_{amb} = 25 , ^\circ C$</td>
<td>-</td>
<td>1.3</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.

Fig. 3. Transient characteristics for a bidirectional ESD protection device

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

Transmission Line Pulse (TLP);
\( t_p = 100 \text{ ns}; t_r = 1 \text{ ns}; \)

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

Transmission Line Pulse (TLP);
\( t_p = 100 \text{ ns}; t_r = 1 \text{ ns}; \)

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

Relative variation of peak pulse power as a function of junction temperature; typical values

Fig. 7.
10. Application information

The device is designed for the protection of two automotive in-vehicle bus lines, e.g. CAN (FD), from the damage caused by ESD and surge pulses.

![Diagram of ESD protection of two automotive CAN bus lines]

**Circuit board layout and protection device placement**

- Place the device as close to the input terminal or connector as possible.
- Minimize the path length between the device and the protected line.
- Keep parallel signal paths to a minimum.
- Avoid running protected conductors in parallel with unprotected conductors.
- Minimize all Printed-Circuit Board (PCB) conductive loops including power and ground loops.
- Minimize the length of the transient return path to ground.
- Avoid using shared transient return paths to a common ground point.
- 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

Plastic surface-mounted package; 3 leads SOT23

Dimensions (mm are the original dimensions)

<table>
<thead>
<tr>
<th>Unit</th>
<th>A</th>
<th>A₁</th>
<th>bₚ</th>
<th>c</th>
<th>D</th>
<th>E</th>
<th>e₁</th>
<th>Hₑ</th>
<th>Lₚ</th>
<th>Q</th>
<th>v</th>
<th>w</th>
</tr>
</thead>
<tbody>
<tr>
<td>mm</td>
<td>1.1</td>
<td>0.1</td>
<td>0.48</td>
<td>0.15</td>
<td>3.0</td>
<td>1.4</td>
<td>1.9</td>
<td>0.95</td>
<td>2.5</td>
<td>0.45</td>
<td>0.55</td>
<td></td>
</tr>
<tr>
<td>nom</td>
<td>0.9</td>
<td>0.38</td>
<td>0.08</td>
<td>2.8</td>
<td>1.2</td>
<td>1.9</td>
<td>0.95</td>
<td>2.5</td>
<td>0.15</td>
<td>0.45</td>
<td>0.2</td>
<td>0.1</td>
</tr>
</tbody>
</table>

Fig. 9. Package outline SOT23
13. Soldering

Fig. 10. Reflow soldering footprint for SOT23

Fig. 11. Wave soldering footprint for SOT23
## 14. 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>
</tr>
</thead>
<tbody>
<tr>
<td>PESD36VU2BT-Q v.1</td>
<td>20231123</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
15. Legal information

Data sheet status

<table>
<thead>
<tr>
<th>Document status</th>
<th>Product status</th>
<th>Definition</th>
</tr>
</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>

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