Ultra low capacitance bidirectional ElectroStatic Discharge (ESD) protection diode in a DFN1006-2 (SOD882) ultra small and leadless Surface-Mounted Device (SMD) plastic package designed to protect one signal line from the damage caused by ESD and other transients.

2. Features and benefits

- Ultra low diode capacitance $C_d = 0.30 \text{ pF}$
- High reverse standoff voltage $V_{RWM} = 24 \text{ V}$
- Ultra low leakage current: $I_{RM} = 1 \text{ nA}$
- ESD protection up to 10 kV; IEC 61000-4-2
- AEC-Q101 qualified

3. Applications

- NFC antenna protection
- Protection of high-speed data lines

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>$f = 1 \text{ MHz}; V_R = 0 \text{ V}$</td>
<td>0.23</td>
<td>0.3</td>
<td>0.45</td>
<td>pF</td>
</tr>
<tr>
<td>$V_{RWM}$</td>
<td>reverse standoff voltage</td>
<td>-</td>
<td>-</td>
<td>24</td>
<td>V</td>
<td></td>
</tr>
</tbody>
</table>

5. 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>1 2</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>
<thead>
<tr>
<th>Type number</th>
<th>Package</th>
<th>Description</th>
<th>Version</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD24VF1BL</td>
<td>DFN1006-2</td>
<td>DFN1006-2: leadless ultra small plastic package; 2 terminals</td>
<td>SOD882</td>
</tr>
</tbody>
</table>

7. Marking

<table>
<thead>
<tr>
<th>Type number</th>
<th>Marking code</th>
</tr>
</thead>
<tbody>
<tr>
<td>PESD24VF1BL</td>
<td>7L</td>
</tr>
</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>I_{PPM}</td>
<td>peak pulse current</td>
<td>( t_p = 8/20 \mu s )</td>
<td>-1</td>
<td>1</td>
<td>A</td>
</tr>
<tr>
<td>( T_j )</td>
<td>junction temperature</td>
<td></td>
<td>-150</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 (air discharge) | [1][3] | 15  | kV   |
|               |                                 | IEC 61000-4-2 (contact discharge) | [1][3] | 10  | kV   |
|               |                                 | MIL-STD-883 (human body model)  | [1]    | 10  | kV   |


![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>$V_R = 24$ V</td>
<td>-</td>
<td>-</td>
<td>24</td>
<td>V</td>
</tr>
<tr>
<td>$I_{RM}$</td>
<td>reverse leakage current</td>
<td>$I_R = 10$ mA</td>
<td>1</td>
<td>30</td>
<td>nA</td>
<td></td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PP} = 1$ A</td>
<td>-</td>
<td>-</td>
<td>17</td>
<td>V</td>
</tr>
<tr>
<td>$V_{BR}$</td>
<td>breakdown voltage</td>
<td>$I_R = 10$ mA</td>
<td>24.5</td>
<td>28</td>
<td>31.5</td>
<td>V</td>
</tr>
<tr>
<td>$C_d$</td>
<td>diode capacitance</td>
<td>$f = 1$ MHz; $V_R = 0$ V</td>
<td>0.23</td>
<td>0.3</td>
<td>0.45</td>
<td>pF</td>
</tr>
<tr>
<td>$R_{dyn}$</td>
<td>dynamic resistance</td>
<td>$I_R = 7.5$ A</td>
<td>0.8</td>
<td>-</td>
<td>-</td>
<td>Ω</td>
</tr>
</tbody>
</table>

[3] Non-repetitive current pulse; Transmission Line Pulse (TLP); square pulse; ANSI / ESD STM5.5.1-2008.

Fig. 3. Diode capacitance as a function of reverse voltage; typical values

Fig. 4. V-I characteristics for a bidirectional ESD protection diode
Ultra low capacitance bidirectional ESD protection diode

Fig. 5. Dynamic resistance

$t_p = 100$ ns; Transmission Line Pulse (TLP)
Fig. 6. ESD clamping test setup and waveforms
10. Test information

10.1 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.

11. Application information

The device is designed for the protection of one bidirectional data line from surge pulses and ESD damage. The device is suitable on lines where the signal polarities are both positive and negative with respect to ground.

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.
12. Package outline

Fig. 8. Package outline DFN1006-2 (SOD882)

13. Soldering

Fig. 9. Reflow soldering footprint for DFN1006-2 (SOD882)
## 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>
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<tbody>
<tr>
<td>PESD24VF1BL v.1</td>
<td>20140214</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
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</table>
15. Legal information

15.1 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] 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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