1. General description

4-fold unidirectional ElectroStatic Discharge (ESD) protection array designed to protect up to four lines from the damage caused by ESD and other transients. The device is housed in a leadless extremely thin small DFN1308-6 (SOT8006B) Surface-Mounted Device (SMD) plastic package.

2. Features and benefits

- Unidirectional ESD protection of up to 4 lines
- Very high surge robustness; $I_{PPM} = 14.2$ A (average measured) for $8/20$ $\mu$s pulse
- Very low clamping voltage: $V_{CL} = 3.7$ V typ. for $11$ A $8/20$ $\mu$s pulse
- ESD protection up to $25$ kV
- Very low dynamic resistance $R_{dyn} = 0.15$ $\Omega$ (TLP)

3. Applications

ESD protection for SD-card in portable communication, consumer devices and computing devices.

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</td>
<td>$T_{amb} = 25$ °C</td>
<td>-</td>
<td>-</td>
<td>3.3</td>
<td>V</td>
</tr>
<tr>
<td>$I_{PPM}$</td>
<td>rated peak pulse</td>
<td>$t_p = 8/20$ $\mu$s; $T_{amb} = 25$ °C</td>
<td>[1]</td>
<td>-</td>
<td>11</td>
<td>A</td>
</tr>
<tr>
<td>$V_{CL}$</td>
<td>clamping voltage</td>
<td>$I_{PPM} = 11$ $A$; $t_p = 8/20$ $\mu$s; $T_{amb} = 25$ °C</td>
<td>[1]</td>
<td>3.7</td>
<td>4.5</td>
<td>V</td>
</tr>
</tbody>
</table>

[1] Non-repetitive current pulse $8/20$ $\mu$s exponential decay waveform according to IEC 61000-4-5.
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>CA</td>
<td>common anode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>K2</td>
<td>cathode (diode 2)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>K3</td>
<td>cathode (diode 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>CA</td>
<td>common anode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>K4</td>
<td>cathode (diode 4)</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>PESD3V3X4UHM</td>
<td>DFN1308-6</td>
<td>plastic, leadless extremely thin small package; 6 terminals; body 1.3 x 0.8 x 0.38 mm</td>
<td>SOT8006B</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>PESD3V3X4UHM</td>
<td>X4</td>
</tr>
</tbody>
</table>

8. 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>IPPM</td>
<td>rated peak pulse current</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>tp = 8/20 µs; Tamb = 25 °C</td>
<td>[1] -</td>
<td>11</td>
<td>A</td>
<td></td>
</tr>
<tr>
<td>Tj</td>
<td>junction temperature</td>
<td></td>
<td>-150</td>
<td>°C</td>
<td></td>
</tr>
<tr>
<td>Tamb</td>
<td>ambient temperature</td>
<td></td>
<td>-55</td>
<td>150</td>
<td>°C</td>
</tr>
<tr>
<td>Tstg</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>Symbol</th>
<th>Parameter</th>
<th>Conditions</th>
<th>Min</th>
<th>Max</th>
<th>Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>VESD</td>
<td>electrostatic discharge voltage</td>
<td>IEC 61000-4-2 (contact discharge)</td>
<td>[2]</td>
<td>25</td>
<td>kV</td>
</tr>
<tr>
<td></td>
<td></td>
<td>IEC 61000-4-2 (air discharge)</td>
<td>[2]</td>
<td>25</td>
<td>kV</td>
</tr>
</tbody>
</table>

[1] Non-repetitive current pulse 8/20 µs exponential decay waveform according to IEC 61000-4-5.
4-fold ESD protection array for SD-card protection

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>3.3</td>
<td>V</td>
</tr>
<tr>
<td>(V_{BR})</td>
<td>breakdown voltage</td>
<td>(I_R = 1 , \text{mA}; , T_{\text{amb}} = 25 , ^\circ\text{C})</td>
<td>5</td>
<td>6.2</td>
<td>7</td>
<td>V</td>
</tr>
<tr>
<td>(I_{RM})</td>
<td>reverse leakage current</td>
<td>(V_{RWM} = 3.3 , \text{V}; , T_{\text{amb}} = 25 , ^\circ\text{C})</td>
<td>-</td>
<td>1</td>
<td>100</td>
<td>nA</td>
</tr>
<tr>
<td>(C_d)</td>
<td>diode capacitance</td>
<td>(f = 1 , \text{MHz}; , V_R = 0 , \text{V}; , T_{\text{amb}} = 25 , ^\circ\text{C})</td>
<td>-</td>
<td>0.8</td>
<td>0.9</td>
<td>pF</td>
</tr>
<tr>
<td>(V_{CL})</td>
<td>clamping voltage</td>
<td>(I_{PP} = 1 , \text{A}; , t_p = 8/20 , \mu\text{s}; , T_{\text{amb}} = 25 , ^\circ\text{C}) [1]</td>
<td>-</td>
<td>2</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(I_{PPM} = 11 , \text{A}; , t_p = 8/20 , \mu\text{s}; , T_{\text{amb}} = 25 , ^\circ\text{C}) [1]</td>
<td>-</td>
<td>3.7</td>
<td>4.5</td>
<td>V</td>
</tr>
<tr>
<td></td>
<td></td>
<td>(I_{PP} = 16 , \text{A}; , I_R = 100 , \text{ns}; , T_{\text{amb}} = 25 , ^\circ\text{C}) [2]</td>
<td>-</td>
<td>3.8</td>
<td>-</td>
<td>V</td>
</tr>
<tr>
<td>(R_{dyn})</td>
<td>dynamic resistance</td>
<td>(I_R = 10 , \text{A}; , T_{\text{amb}} = 25 , ^\circ\text{C}) [2]</td>
<td>-</td>
<td>0.15</td>
<td>-</td>
<td>Ω</td>
</tr>
<tr>
<td>(V_{t1})</td>
<td>trigger voltage</td>
<td>(T_{\text{amb}} = 25 , ^\circ\text{C})</td>
<td>-</td>
<td>8.1</td>
<td>-</td>
<td>V</td>
</tr>
</tbody>
</table>

[1] Non-repetitive current pulse 8/20 \(\mu\text{s}\) exponential decay waveform according to IEC 61000-4-5.
[2] Non-repetitive current pulse, Transmission Line Pulse (TLP) \(t_p = 100 \, \text{ns}\); square pulse; ANSI/ESD STM5.5.1-2008.
Nexperia

PESD3V3X4UHM

4-fold ESD protection array for SD-card protection

Fig. 3. V-I characteristics

Fig. 4. Diode capacitance as a function of reverse voltage; typical values

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

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

f = 1 MHz; $T_{amb} = 25 \, ^{\circ}\text{C}$

$t_p = 100 \, \text{ns}; \, \text{Transmission Line Pulse (TLP)}$

$t_p = 100 \, \text{ns}; \, \text{Transmission Line Pulse (TLP)}$

R$_{dyn} = 0.15 \, \Omega$

R$_{dyn} = 0.15 \, \Omega$

aaa-029086

aaa-029513

aaa-029514

aaa-029515
4-fold ESD protection array for SD-card protection

IEC 61000-4-2 ed.2
$C_s = 150 \text{ pF}$; $R_d = 330 \Omega$

DUT
(DEVICE UNDER TEST)

ESD TESTER

RG 223/U
50 Ω coax

40 dB ATTENUATOR

4 GHz DIGITAL OSCILLOSCOPE

RG 223/U
50 Ω coax

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 protection of up to 4 unidirectional data lines from the damage caused by ESD and surge pulses. The device is suitable on lines where the signal polarities are above or below ground.

Fig. 10. Application diagram

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:

• 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. Package outline

DFN1308-6, plastic, leadless extremely thin small package; 6 terminals; body 1.3 x 0.8 x 0.38 mm  

<table>
<thead>
<tr>
<th>Unit</th>
<th>A</th>
<th>A₁</th>
<th>A₂</th>
<th>b</th>
<th>D</th>
<th>E</th>
<th>e</th>
<th>L</th>
<th>u</th>
<th>v</th>
<th>y</th>
<th>y₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>max</td>
<td>0.43</td>
<td>0.05</td>
<td>0.18</td>
<td>0.23</td>
<td>1.40</td>
<td>0.90</td>
<td>0.30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>nom</td>
<td>0.38</td>
<td>0.02</td>
<td>0.13</td>
<td>0.18</td>
<td>1.30</td>
<td>0.80</td>
<td>0.45</td>
<td>0.25</td>
<td>0.1</td>
<td>0.1</td>
<td>0.05</td>
<td>0.05</td>
</tr>
<tr>
<td>min</td>
<td>0.33</td>
<td>0.00</td>
<td>0.08</td>
<td>0.13</td>
<td>1.20</td>
<td>0.70</td>
<td>0.20</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dimensions (mm are the original dimensions)

Fig. 11. Package outline DFN1308-6 (SOT8006B)
12. Soldering

Footprint information for reflow soldering of DFN1308-6 package

Fig. 12. Reflow soldering footprint for DFN1308-6 (SOT8006B)

recommend stencil thickness: 0.1 mm

Dimensions in mm

occupied area
solder lands
solder resist
solder paste

Issue date 18-12-14

sot8006b_fr
## 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>
</tr>
</thead>
<tbody>
<tr>
<td>PESD3V3X4UHM v.1</td>
<td>20190212</td>
<td>Product data sheet</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
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Date of release: 12 February 2019