

# PESD1LIN

LIN-bus ESD protection diode

Rev. 3 — 31 May 2011

Product data sheet

## 1. Product profile

### 1.1 General description

PESD1LIN in a very small SOD323 (SC-76) Surface-Mounted Device (SMD) plastic package designed to protect one automotive Local Interconnect Network (LIN) bus line from the damage caused by ElectroStatic Discharge (ESD) and other transients.

### 1.2 Features and benefits

- ESD protection of one automotive LIN-bus line
- Asymmetrical diode configuration ensures an optimized protection against ElectroMagnetic Interferences (EMI) of a LIN Electronic Control Unit (ECU)
- Max. peak pulse power:  $P_{PP} = 160 \text{ W}$  at  $t_p = 8/20 \mu\text{s}$
- Low clamping voltage:  $V_{CL} = 40 \text{ V}$  at  $I_{PP} = 1 \text{ A}$
- Ultra low leakage current:  $I_{RM} < 1 \text{ nA}$
- ESD protection of up to 23 kV
- IEC 61000-4-2, level 4 (ESD)
- IEC 61000-4-5 (surge);  $I_{PP} = 3 \text{ A}$  at  $t_p = 8/20 \mu\text{s}$
- AEC-Q101 qualified

### 1.3 Applications

- LIN-bus protection
- Automotive applications

### 1.4 Quick reference data



**Table 1. Quick reference data**  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

| Symbol           | Parameter                | Conditions                         | Min | Typ | Max | Unit |
|------------------|--------------------------|------------------------------------|-----|-----|-----|------|
| V <sub>RWM</sub> | reverse standoff voltage |                                    |     |     |     |      |
|                  | PESD1LIN (15 V)          |                                    | -   | -   | 15  | V    |
|                  | PESD1LIN (24 V)          |                                    | -   | -   | 24  | V    |
| C <sub>d</sub>   | diode capacitance        | V <sub>R</sub> = 0 V;<br>f = 1 MHz | -   | 13  | 17  | pF   |



## 2. Pinning information

Table 2. Pinning

| Pin | Description      | Simplified outline  | Graphic symbol  |
|-----|------------------|---|---|
| 1   | cathode 1 (15 V) |  |  |
| 2   | cathode 2 (24 V) |   |   |

## 3. Ordering information

Table 3. Ordering information

| Type number | Package |  | Version |
|-------------|---------|--|---------|
|             | Name    | Description                              |         |
| PESD1LIN    | SC-76   | plastic surface-mounted package; 2 leads | SOD323  |

## 4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PESD1LIN    | AM           |

## 5. Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134).

| Symbol    | Parameter            | Conditions         | Min   | Max  | Unit |
|-----------|----------------------|--------------------|-------|------|------|
| $P_{PP}$  | peak pulse power     | $t_p = 8/20 \mu s$ | [1] - | 160  | W    |
| $I_{PP}$  | peak pulse current   | $t_p = 8/20 \mu s$ | [1] - | 3    | A    |
| $T_j$     | junction temperature |                    | -     | 150  | °C   |
| $T_{amb}$ | ambient temperature  |                    | -65   | +150 | °C   |
| $T_{stg}$ | storage temperature  |                    | -65   | +150 | °C   |

[1] Non-repetitive current pulse 8/20  $\mu s$  exponential decay waveform according to IEC 61000-4-5.

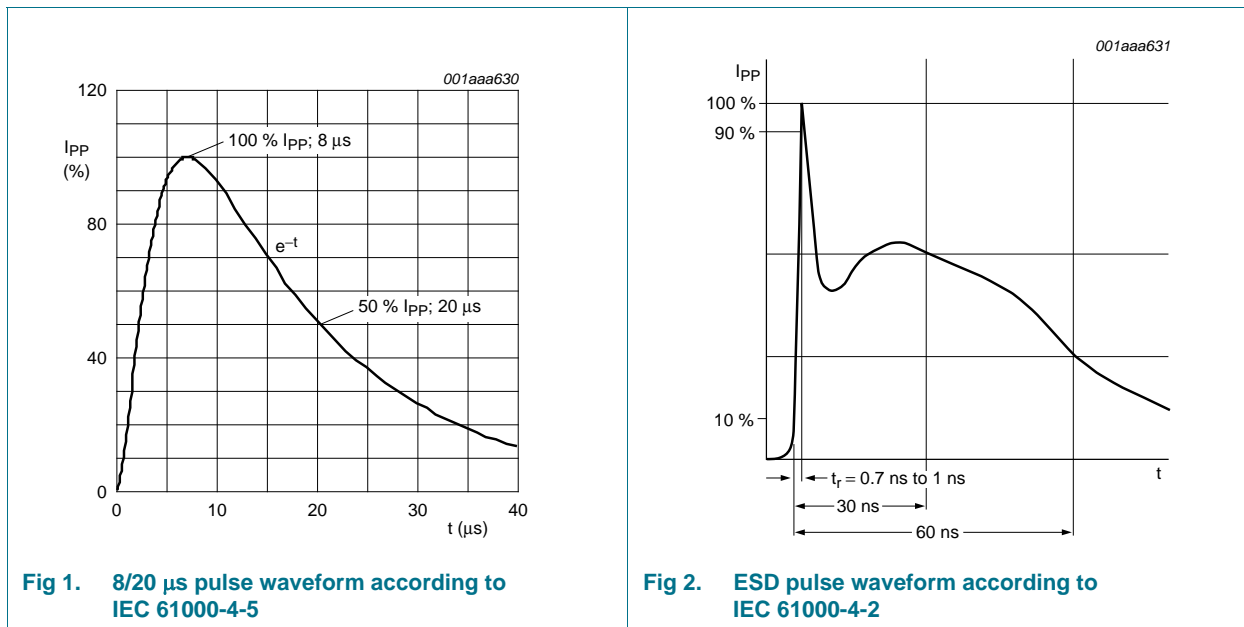
**Table 6. ESD maximum ratings**

| Symbol           | Parameter                       | Conditions                        | Min | Max | Unit |
|------------------|---------------------------------|-----------------------------------|-----|-----|------|
| V <sub>ESD</sub> | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) | [1] | 23  | kV   |
|                  |                                 | MIL-STD-883 (human body model)    | -   | 10  | kV   |

[1] Device stressed with ten non-repetitive ESD pulses.

**Table 7. ESD standards compliance**

| Standard                                | Conditions                      |
|---|---------------------------------|
| IEC 61000-4-2; level 4 (ESD)            | > 15 kV (air); > 8 kV (contact) |
| MIL-STD-883; class 3 (human body model) | > 4 kV                          |

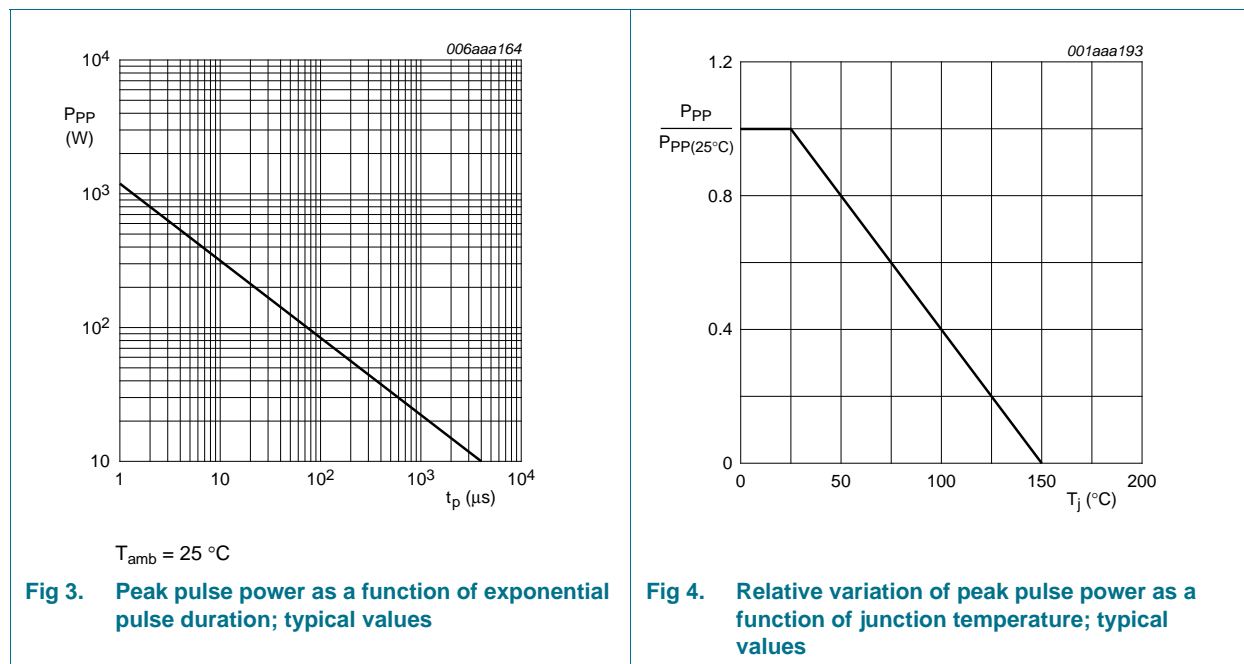


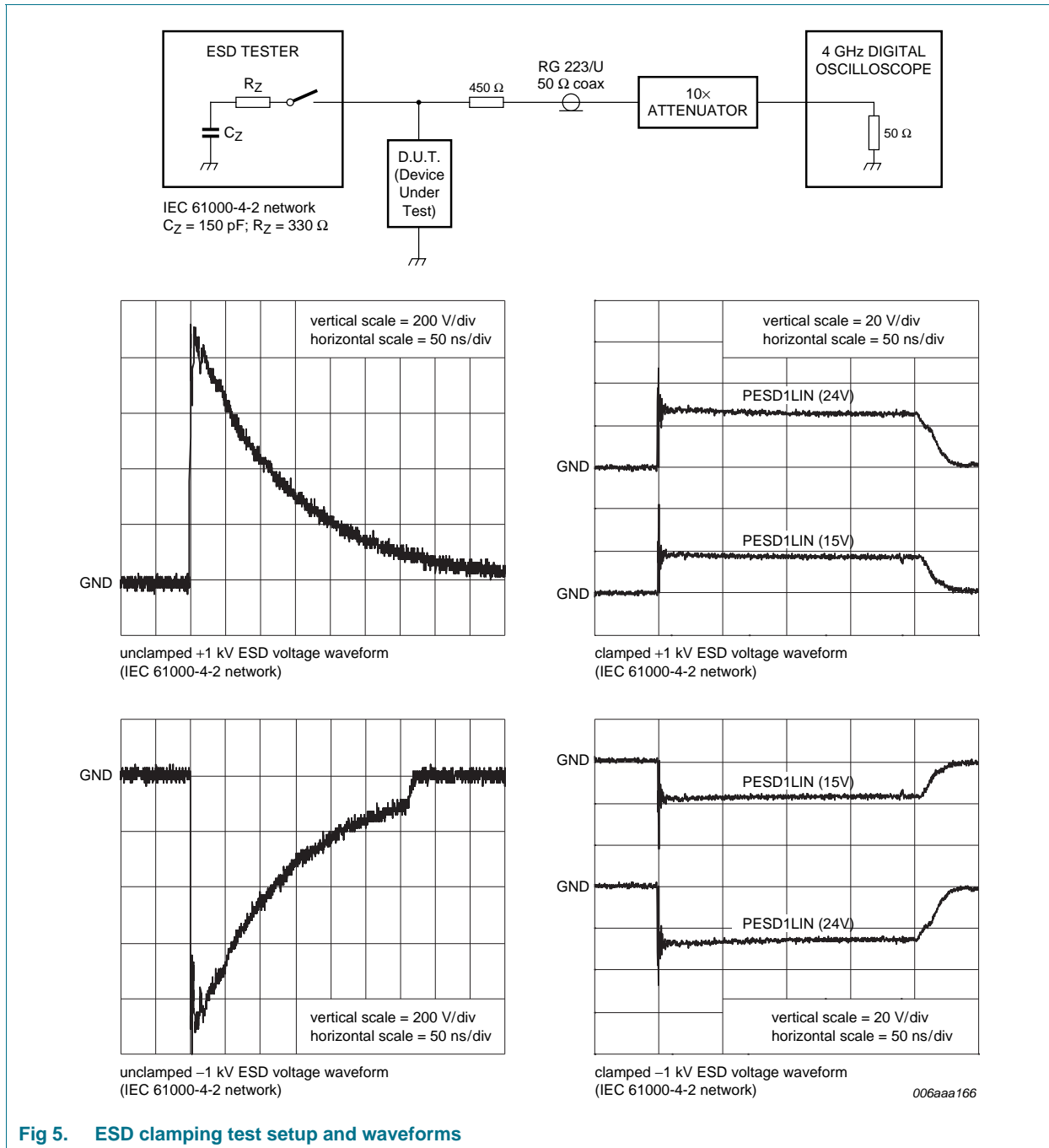
## 6. Characteristics

**Table 8. Characteristics**  
 $T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol    | Parameter                | Conditions                           | Min  | Typ  | Max  | Unit     |
|-----------|--------------------------|--------------------------------------|------|------|------|----------|
| $V_{RWM}$ | reverse standoff voltage |                                      |      |      |      |          |
|           | PESD1LIN (15 V)          |                                      | -    | -    | 15   | V        |
|           | PESD1LIN (24 V)          |                                      | -    | -    | 24   | V        |
| $I_{RM}$  | reverse leakage current  |                                      |      |      |      |          |
|           | PESD1LIN (15 V)          | $V_{RWM} = 15\text{ V}$              | -    | < 1  | 50   | nA       |
|           | PESD1LIN (24 V)          | $V_{RWM} = 24\text{ V}$              | -    | < 1  | 50   | nA       |
| $V_{BR}$  | breakdown voltage        | $I_R = 5\text{ mA}$                  |      |      |      |          |
|           | PESD1LIN (15 V)          |                                      | 17.1 | 18.9 | 20.3 | V        |
|           | PESD1LIN (24 V)          |                                      | 25.4 | 27.8 | 30.3 | V        |
| $C_d$     | diode capacitance        | $V_R = 0\text{ V}; f = 1\text{ MHz}$ | -    | 13   | 17   | pF       |
| $V_{CL}$  | clamping voltage         |                                      | [1]  |      |      |          |
|           | PESD1LIN (15 V)          | $I_{PP} = 1\text{ A}$                | -    | -    | 25   | V        |
|           |                          | $I_{PP} = 5\text{ A}$                | -    | -    | 44   | V        |
|           | PESD1LIN (24 V)          | $I_{PP} = 1\text{ A}$                | -    | -    | 40   | V        |
|           |                          | $I_{PP} = 3\text{ A}$                | -    | -    | 70   | V        |
| $r_{dif}$ | differential resistance  |                                      |      |      |      |          |
|           | PESD1LIN (15 V)          | $I_R = 1\text{ mA}$                  | -    | -    | 225  | $\Omega$ |
|           | PESD1LIN (24 V)          | $I_R = 1\text{ mA}$                  | -    | -    | 300  | $\Omega$ |

[1] Non-repetitive current pulse 8/20  $\mu\text{s}$  exponential decay waveform according to IEC 61000-4-5.





**Fig 5. ESD clamping test setup and waveforms**

## 7. Application information

The PESD1LIN is designed for the protection of one LIN-bus signal line from the damage caused by ESD and surge pulses. The PESD1LIN provides a surge capability of up to 160 W per line for a 8/20  $\mu$ s waveform.

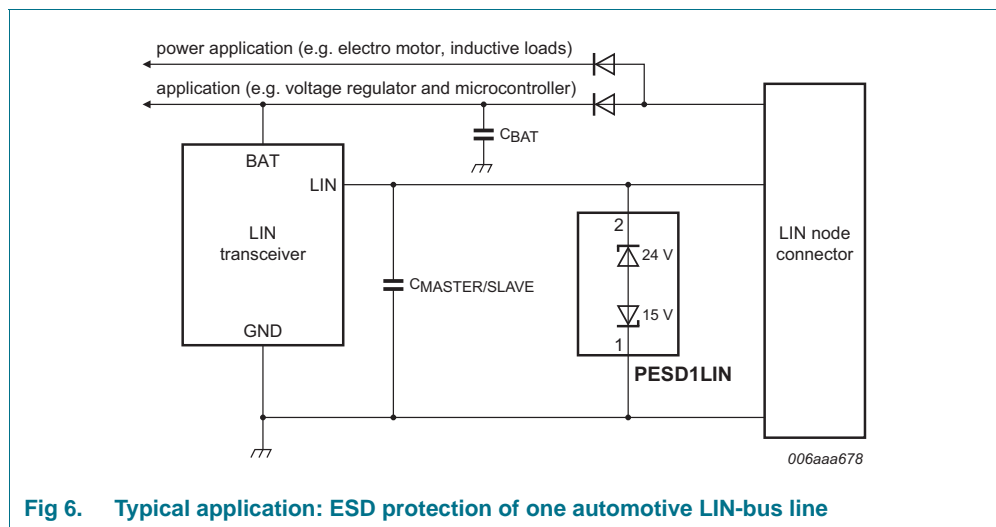


Fig 6. Typical application: ESD protection of one automotive LIN-bus line

### 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:

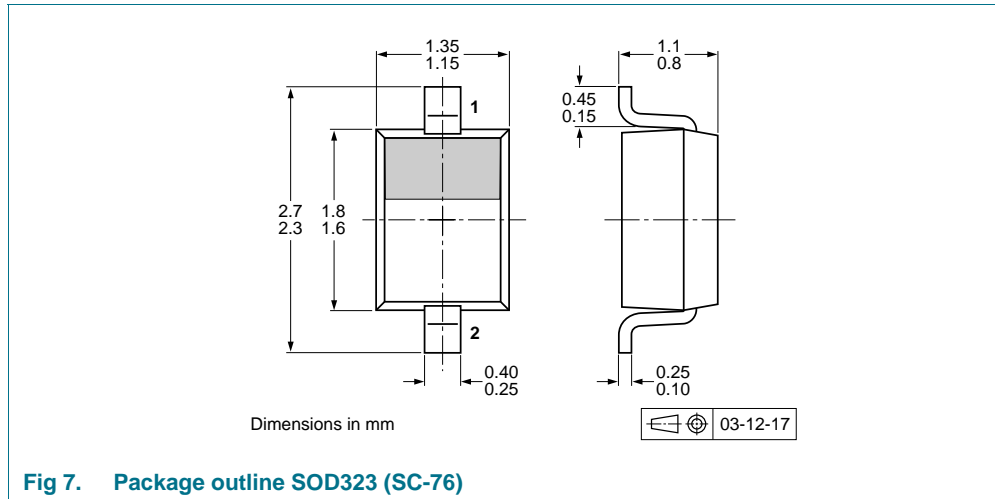
1. Place the PESD1LIN as close to the input terminal or connector as possible.
2. The path length between the PESD1LIN and the protected line should be minimized.
3. Keep parallel signal paths to a minimum.
4. Avoid running protection conductors in parallel with unprotected conductor.
5. Minimize all 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. Ground planes should be used whenever possible. For multilayer PCBs, use ground vias.

## 8. Test information

### 8.1 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.

## 9. Package outline



**Fig 7. Package outline SOD323 (SC-76)**

## 10. Packing information

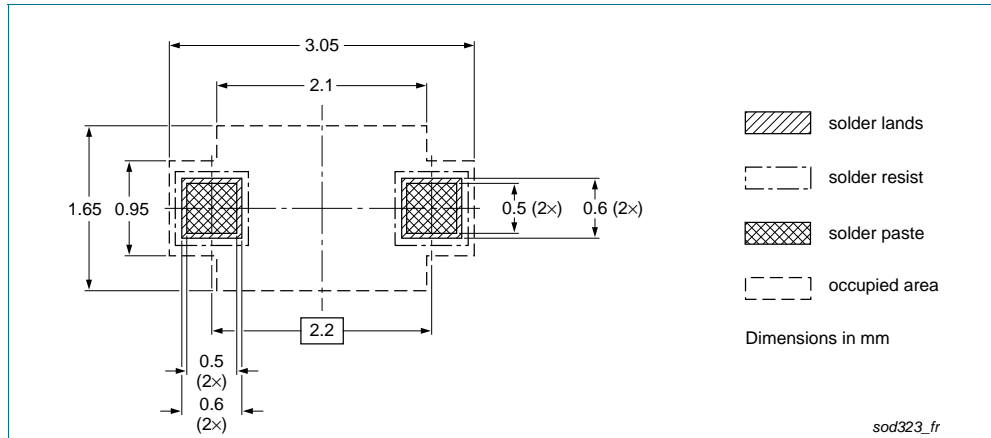
**Table 9. Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

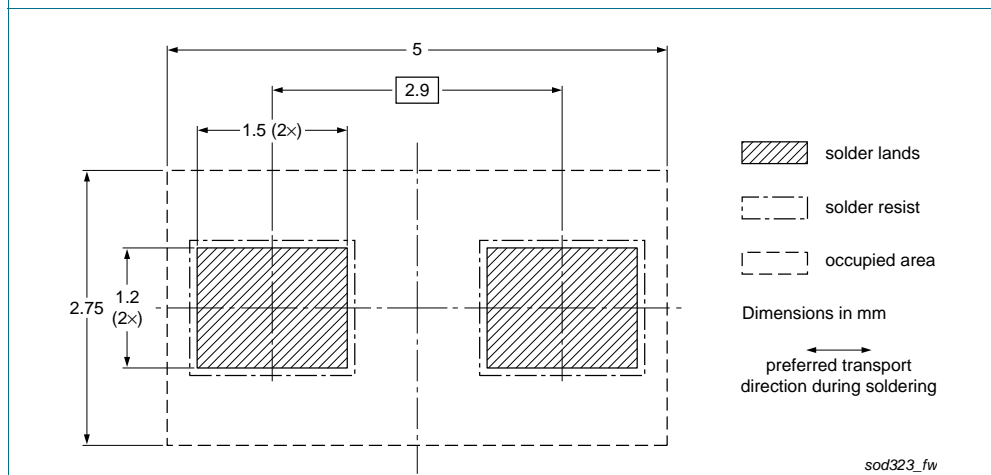
| Type number | Package | Description                    | Packing quantity |       |
|-------------|---------|--------------------------------|------------------|-------|
|             |         |                                | 3000             | 10000 |
| PESD1LIN    | SOD323  | 4 mm pitch, 8 mm tape and reel | -115             | -135  |

[1] For further information and the availability of packing methods, see [Section 14](#).

## 11. Soldering



**Fig 8. Reflow soldering footprint SOD323 (SC-76)**



**Fig 9. Wave soldering footprint SOD323 (SC-76)**



## 12. Revision history

Table 10. Revision history

| Document ID    | Release date   | Data sheet status  | Change notice | Supersedes   |
|----------------|--|--------------------|---------------|--------------|
| PESD1LIN v.3   | 20110531   | Product data sheet | -             | PESD1LIN v.2 |
| Modifications: | <ul style="list-style-type: none"><li>• <a href="#">Section 1.2 "Features and benefits"</a>: updated.</li><li>• <a href="#">Figure 6</a>: updated.</li><li>• <a href="#">Section 8 "Test information"</a>: added.</li><li>• <a href="#">Section 13 "Legal information"</a>: updated.</li></ul> |                    |               |              |
| PESD1LIN v.2   | 20081112   | Product data sheet | -             | PESD1LIN v.1 |
| PESD1LIN v.1   | 20041026   | Product data sheet | -             | -            |

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### 13.1 Data sheet status

| Document status <sup>[1][2]</sup> | Product status <sup>[3]</sup> | Definition  |
|-----------------------------------|-------------------------------|---|
| Objective [short] data sheet      | Development                   | This document contains data from the objective specification for product development. |
| Preliminary [short] data sheet    | Qualification                 | This document contains data from the preliminary specification.                       |
| Product [short] data sheet        | Production                    | This document contains the product specification.                                     |

[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".

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## 15. Contents

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|           |  |           |
|-----------|--|-----------|
| <b>1</b>  | <b>Product profile</b> . . . . .         | <b>1</b>  |
| 1.1       | General description . . . . .            | 1         |
| 1.2       | Features and benefits . . . . .          | 1         |
| 1.3       | Applications . . . . .                   | 1         |
| 1.4       | Quick reference data . . . . .           | 1         |
| <b>2</b>  | <b>Pinning information</b> . . . . .     | <b>2</b>  |
| <b>3</b>  | <b>Ordering information</b> . . . . .    | <b>2</b>  |
| <b>4</b>  | <b>Marking</b> . . . . .                 | <b>2</b>  |
| <b>5</b>  | <b>Limiting values</b> . . . . .         | <b>2</b>  |
| <b>6</b>  | <b>Characteristics</b> . . . . .         | <b>4</b>  |
| <b>7</b>  | <b>Application information</b> . . . . . | <b>6</b>  |
| <b>8</b>  | <b>Test information</b> . . . . .        | <b>6</b>  |
| 8.1       | Quality information . . . . .            | 6         |
| <b>9</b>  | <b>Package outline</b> . . . . .         | <b>7</b>  |
| <b>10</b> | <b>Packing information</b> . . . . .     | <b>7</b>  |
| <b>11</b> | <b>Soldering</b> . . . . .               | <b>8</b>  |
| <b>12</b> | <b>Revision history</b> . . . . .        | <b>9</b>  |
| <b>13</b> | <b>Legal information</b> . . . . .       | <b>10</b> |
| 13.1      | Data sheet status . . . . .              | 10        |
| 13.2      | Definitions . . . . .                    | 10        |
| 13.3      | Disclaimers . . . . .                    | 10        |
| 13.4      | Trademarks . . . . .                     | 11        |
| <b>14</b> | <b>Contact information</b> . . . . .     | <b>11</b> |
| <b>15</b> | <b>Contents</b> . . . . .                | <b>12</b> |

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