

# PESD1LIN

LIN bus ESD protection diode in SOD323

Rev. 01 — 26 October 2004

Product data sheet

## 1. Product profile

### 1.1 General description

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

### 1.2 Features

- ESD protection of one automotive LIN bus line
- Asymmetrical diode configuration ensures an optimized Electromagnetical Immunity of a LIN Electronic Control Unit (ECU)
- Due to the integrated diode structure only one very small SOD323 package is needed
- Max. peak pulse power:  $P_{PP} = 160 \text{ W}$  at  $t_p = 8/20 \mu\text{s}$
- Low clamping voltage:  $V_{(CL)R} = 40 \text{ V}$  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  $t_p = 8/20 \mu\text{s}$

### 1.3 Applications

- LIN bus protection
- Automotive applications

### 1.4 Quick reference data


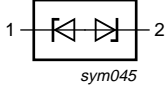
Table 1: Quick reference data

| Symbol    | Parameter                 | Conditions                                  | Min | Typ | Max | Unit |
|-----------|---------------------------|---|-----|-----|-----|------|
| $V_{RWM}$ | reverse stand-off voltage |   |     |     |     |      |
|           | PESD1LIN (15 V)           |   | -   | -   | 15  | V    |
|           | PESD1LIN (24 V)           |   | -   | -   | 24  | V    |
| $C_d$     | diode capacitance         | $V_R = 0 \text{ V};$<br>$f = 1 \text{ MHz}$ | -   | 13  | 17  | pF   |

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## 2. Pinning information

**Table 2: Pinning**

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

## 3. Ordering information

**Table 3: Ordering information**

| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description                              | Version |
| 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     | 8/20 $\mu$ s | [1] - | 160  | W            |
| $I_{PP}$  | peak pulse current   | 8/20 $\mu$ s | [1] - | 3    | A            |
| $T_j$     | junction temperature |              | -     | 150  | $^{\circ}$ C |
| $T_{amb}$ | ambient temperature  |              | -65   | +150 | $^{\circ}$ C |
| $T_{stg}$ | storage temperature  |              | -65   | +150 | $^{\circ}$ C |

[1] Non-repetitive current pulse 8/20  $\mu$ s exponentially decaying waveform; see [Figure 1](#).

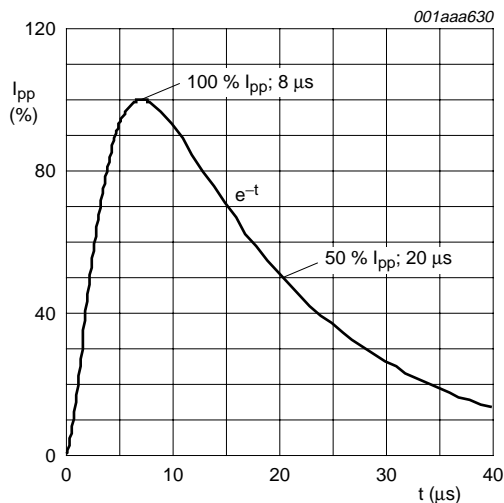
**Table 6: ESD maximum ratings**

| Symbol | Parameter                          | Conditions                        | Min   | Max | Unit |
|--------|------------------------------------|-----------------------------------|-------|-----|------|
| ESD    | electrostatic discharge capability | IEC 61000-4-2 (contact discharge) | [1] - | 23  | kV   |
|        |                                    | HBM MIL-STD883                    | -     | 10  | kV   |

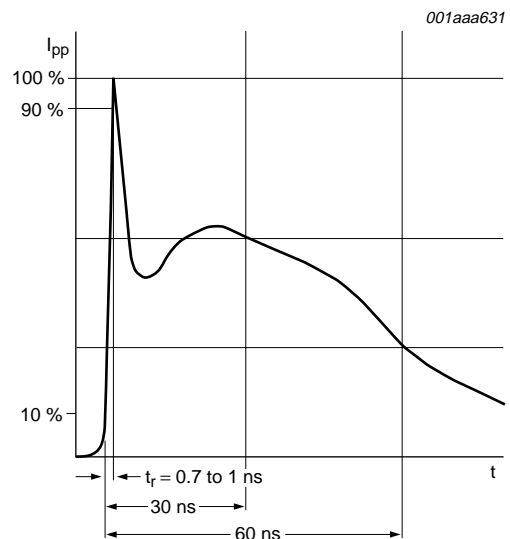
[1] Device stressed with ten non-repetitive ElectroStatic Discharge (ESD) pulses; see [Figure 2](#).

**Table 7: ESD standards compliance**

| ESD Standard   | Conditions                      |
|--|---------------------------------|
| IEC 61000-4-2, level 4 (ESD); see <a href="#">Figure 2</a> | > 15 kV (air); > 8 kV (contact) |
| HBM MIL-STD883, class 3                                    | > 4 kV                          |



**Fig 1. 8/20 μs pulse waveform according to IEC 61000-4-5.**



**Fig 2. ElectroStatic Discharge (ESD) pulse waveform according to IEC 61000-4-2.**

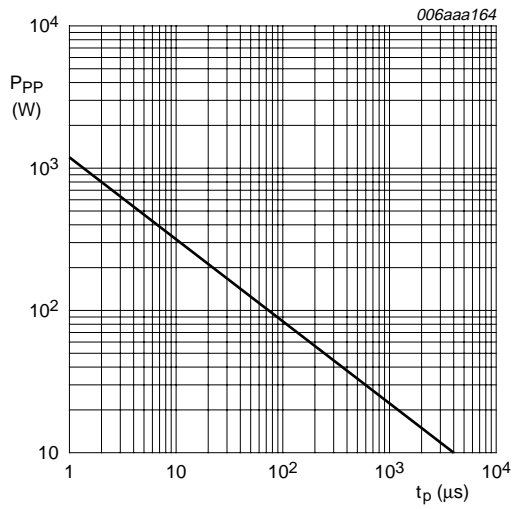
## 6. Characteristics

**Table 8: Characteristics**

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

| Symbol      | Parameter                 | Conditions                           | Min  | Typ  | Max  | Unit     |
|-------------|---------------------------|--------------------------------------|------|------|------|----------|
| $V_{RWM}$   | reverse stand-off 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       |
| $V_{(CL)R}$ | 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  | $\Omega$ |

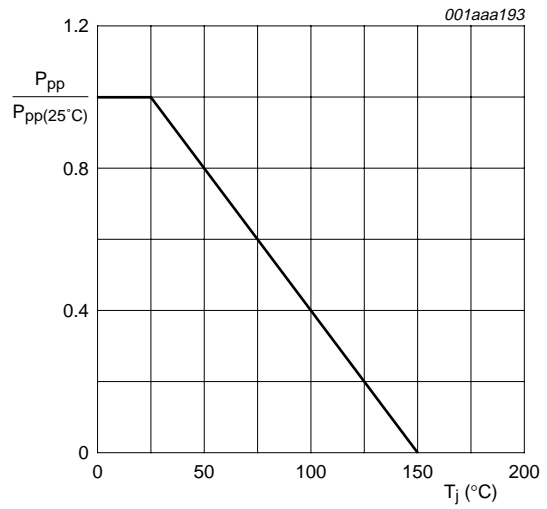
[1] Non-repetitive current pulse 8/20  $\mu\text{s}$  exponentially decaying waveform; see [Figure 1](#).



$T_{amb} = 25\text{ }^\circ\text{C}$ .

$t_p = 8/20\text{ }\mu\text{s}$  exponentially decaying waveform; see [Figure 1](#).

**Fig 3. Peak pulse power dissipation as a function of pulse time; typical values.**



**Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values.**

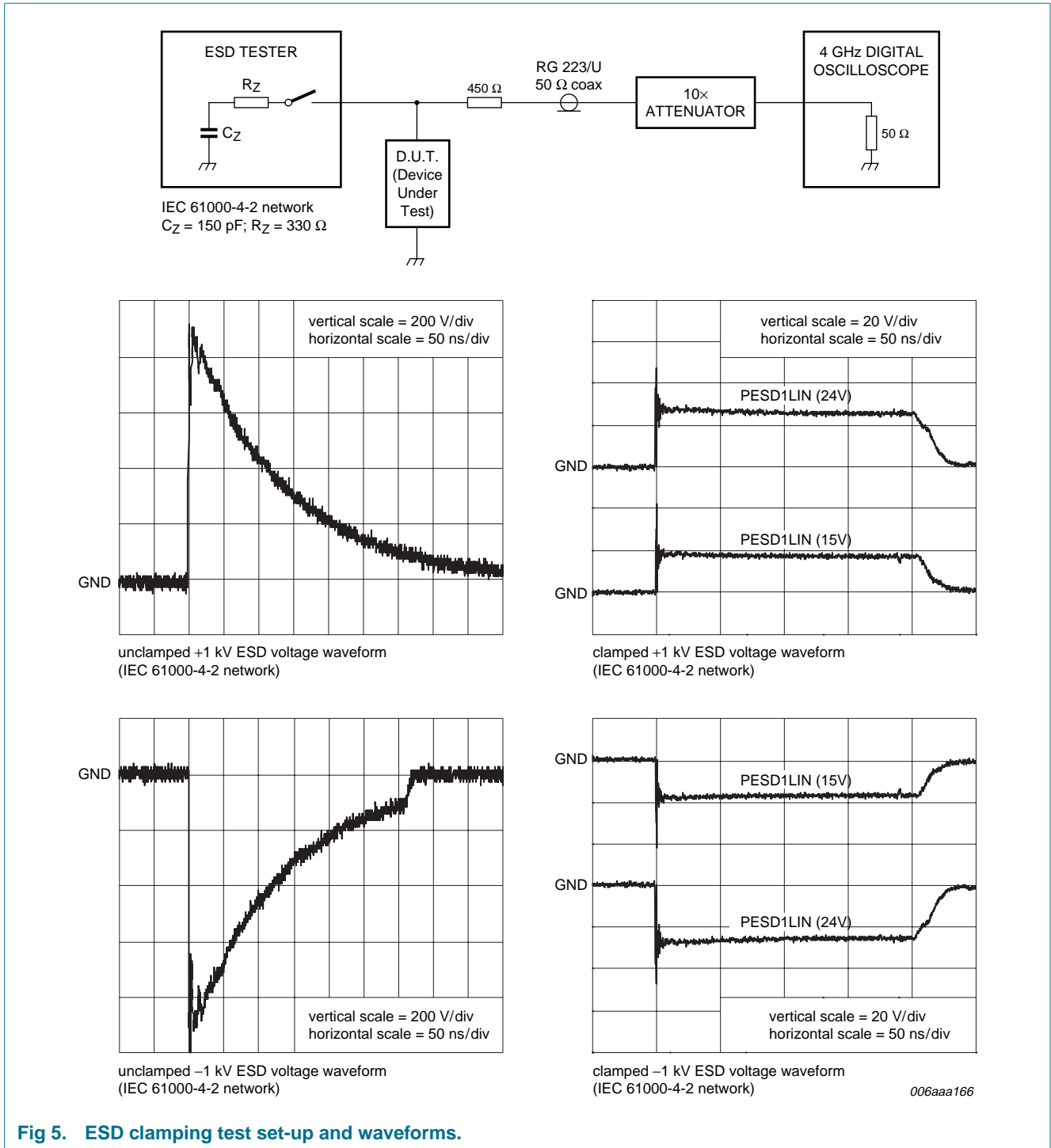


Fig 5. ESD clamping test set-up and waveforms.

## 7. Application information

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

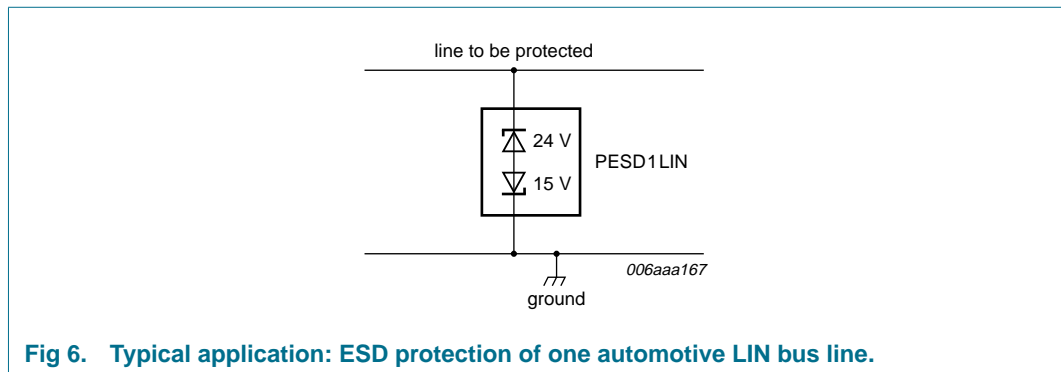


Fig 6. Typical application: ESD protection of one automotive LIN bus line.

### 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 protection device as close to the input terminal or connector as possible.
2. The path length between the protection device 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 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 printed-circuit boards, use ground vias.

8. Package outline

Plastic surface mounted package; 2 leads

SOD323

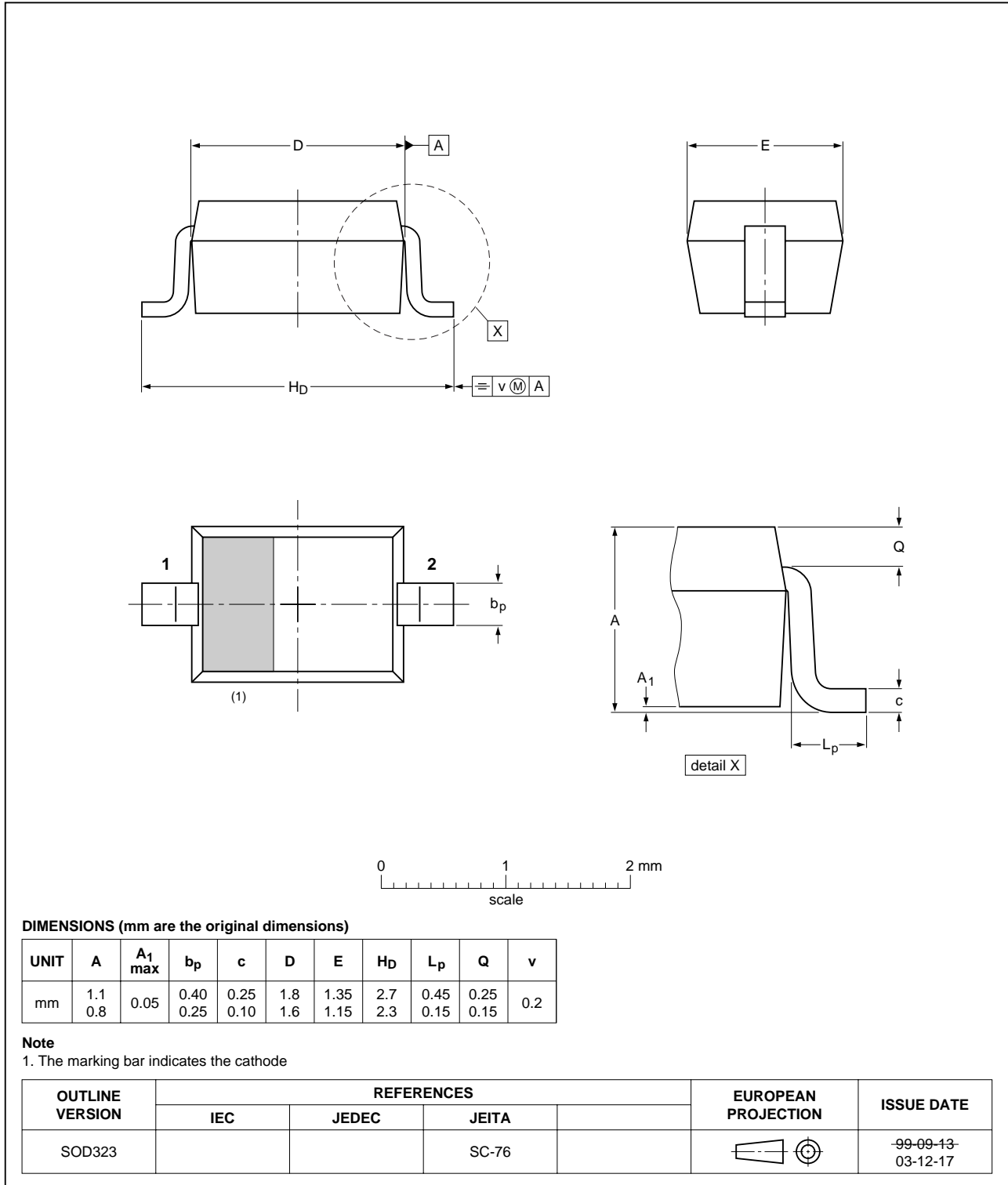


Fig 7. Package outline SOD323 (SC-76).



## 9. Packing information

**Table 9: Packing methods**

The indicated -xxx are the last three digits of the 12NC ordering code. [\[1\]](#)

| 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](#).



## 10. Revision history

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Table 10: Revision history

| Document ID | Release date | Data sheet status  | Change notice | Doc. number    | Supersedes |
|-------------|--------------|--------------------|---------------|----------------|------------|
| PESD1LIN_1  | 20041026     | Product data sheet | -             | 9397 750 14032 | -          |

## 11. Data sheet status

| Level | Data sheet status <sup>[1]</sup> | Product status <sup>[2]</sup> <sup>[3]</sup> | Definition   |
|-------|----------------------------------|--|--|
| I     | Objective data                   | Development                                  | This data sheet contains data from the objective specification for product development. Philips Semiconductors reserves the right to change the specification in any manner without notice.  |
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[3] For data sheets describing multiple type numbers, the highest-level product status determines the data sheet status.

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**Short-form specification** — The data in a short-form specification is extracted from a full data sheet with the same type number and title. For detailed information see the relevant data sheet or data handbook.

**Limiting values definition** — Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 60134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or at any other conditions above those given in the Characteristics sections of the specification is not implied. Exposure to limiting values for extended periods may affect device reliability.

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