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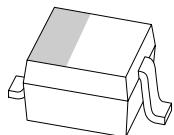
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PESDxL1BA series

Low capacitance bidirectional ESD protection diodes in SOD323

Rev. 02 — 20 August 2009

Product data sheet

1. Product profile

1.1 General description

Bidirectional ElectroStatic Discharge (ESD) protection diodes in a very small SOD323 (SC-76) SMD plastic package designed to protect one signal line from the damage caused by ESD and other transients.

1.2 Features

- Bidirectional ESD protection of one line
- Max. peak pulse power: $P_{pp} = 500$ W
- Low clamping voltage: $V_{(CL)R} = 26$ V
- Ultra low leakage current: $I_{RM} < 0.09$ μ A
- ESD protection > 23 kV
- IEC 61000-4-2, level 4 (ESD)
- IEC 61000-4-5 (surge); $I_{pp} = 18$ A
- Very small SMD plastic package

1.3 Applications

- Computers and peripherals
- Communication systems
- Audio and video equipment
- Data lines
- CAN bus protection

1.4 Quick reference data

Table 1. Quick reference data

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|---------------------------|-----------------------------|-----|-----|-----|------|
| V_{RWM} | reverse stand-off voltage | $V_R = 0$ V; $f = 1$ MHz | - | - | 3.3 | V |
| | PESD3V3L1BA | | - | - | 5.0 | V |
| | PESD12VL1BA | | - | - | 12 | V |
| | PESD15VL1BA | | - | - | 15 | V |
| | PESD24VL1BA | | - | - | 24 | V |
| | C_d | | - | - | - | - |
| C_d | diode capacitance | $V_R = 0$ V; $f = 1$ MHz | - | 101 | - | pF |
| | PESD3V3L1BA | | - | 75 | - | pF |
| | PESD12VL1BA | | - | 19 | - | pF |
| | PESD15VL1BA | | - | 16 | - | pF |
| | PESD24VL1BA | | - | 11 | - | pF |

2. Pinning information

Table 2. Pinning

| Pin | Description | Simplified outline | Symbol |
|-----|-------------|---|---|
| 1 | cathode 1 | | |
| 2 | cathode 2 |  |  sym045 |

3. Ordering information

Table 3. Ordering information

| Type number | Package | | | Version |
|------------------|---------|--|--|---------|
| | Name | Description | | |
| PESDxL1BA series | SC-76 | plastic surface mounted package; 2 leads | | SOD323 |

4. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PESD3V3L1BA | AB |
| PESD5V0L1BA | AC |
| PESD12VL1BA | AD |
| PESD15VL1BA | AE |
| PESD24VL1BA | AF |

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 μ s | [1] | | |
| | PESD3V3L1BA | | - | 500 | W |
| | PESD5V0L1BA | | - | 500 | W |
| | PESD12VL1BA | | - | 200 | W |
| | PESD15VL1BA | | - | 200 | W |
| | PESD24VL1BA | | - | 200 | W |
| I_{pp} | peak pulse current | 8/20 μ s | [1] | | |
| | PESD3V3L1BA | | - | 18 | A |
| | PESD5V0L1BA | | - | 15 | A |
| | PESD12VL1BA | | - | 5 | A |
| | PESD15VL1BA | | - | 5 | A |
| | PESD24VL1BA | | - | 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 μ s exponential decay 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] | | |
| | PESD3V3L1BA | | - | 30 | kV |
| | PESD5V0L1BA | | - | 30 | kV |
| | PESD12VL1BA | | - | 30 | kV |
| | PESD15VL1BA | | - | 30 | kV |
| | PESD24VL1BA | | - | 23 | kV |
| PESDxL1BA series | | HBM MIL-Std 883 | - | 10 | kV |

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

Table 7. ESD standards compliance

| Standard | Conditions |
|--|---------------------------------|
| IEC 61000-4-2; level 4 (ESD); Figure 2 | > 15 kV (air); > 8 kV (contact) |
| HBM MIL-Std 883; class 3 | > 4 kV |

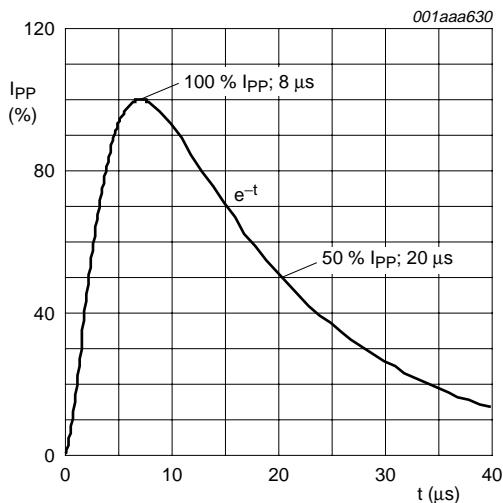


Fig 1. 8/20 μ s pulse waveform according to IEC 61000-4-5

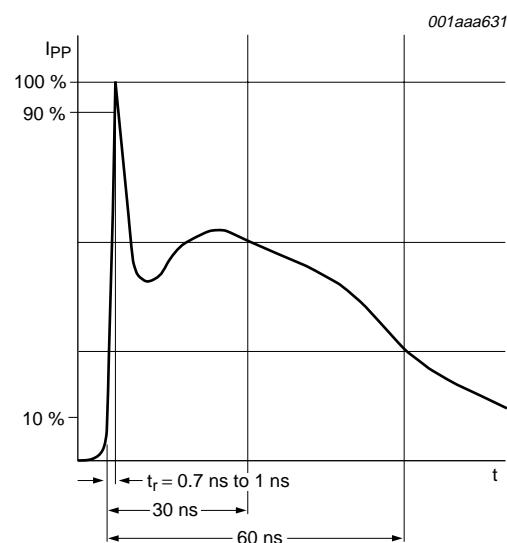


Fig 2. ESD pulse waveform according to IEC 61000-4-2

6. Characteristics

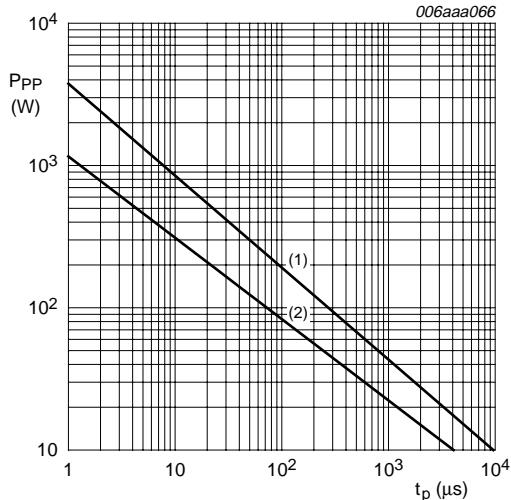
Table 8. Characteristics $T_{amb} = 25^\circ\text{C}$ unless otherwise specified

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-------------|---------------------------|---|------|------|------|---------------|
| V_{RWM} | reverse stand-off voltage | | | | | |
| | PESD3V3L1BA | | - | - | 3.3 | V |
| | PESD5V0L1BA | | - | - | 5.0 | V |
| | PESD12VL1BA | | - | - | 12 | V |
| | PESD15VL1BA | | - | - | 15 | V |
| | PESD24VL1BA | | - | - | 24 | V |
| I_{RM} | reverse leakage current | see Figure 7 | | | | |
| | PESD3V3L1BA | $V_{RWM} = 3.3\text{ V}$ | - | 0.09 | 2 | μA |
| | PESD5V0L1BA | $V_{RWM} = 5.0\text{ V}$ | - | 0.01 | 1 | μA |
| | PESD12VL1BA | $V_{RWM} = 12\text{ V}$ | - | < 1 | 50 | nA |
| | PESD15VL1BA | $V_{RWM} = 15\text{ V}$ | - | < 1 | 50 | nA |
| | PESD24VL1BA | $V_{RWM} = 24\text{ V}$ | - | < 1 | 50 | nA |
| $V_{(BR)}$ | breakdown voltage | $I_R = 5\text{ mA}$ | | | | |
| | PESD3V3L1BA | | 5.8 | 6.4 | 6.9 | V |
| | PESD5V0L1BA | | 7.0 | 7.6 | 8.2 | V |
| | PESD12VL1BA | | 14.2 | 15.9 | 16.7 | V |
| | PESD15VL1BA | | 17.1 | 18.9 | 20.3 | V |
| | PESD24VL1BA | | 25.4 | 27.8 | 30.3 | V |
| C_d | diode capacitance | $V_R = 0\text{ V}; f = 1\text{ MHz};$ see Figure 5 and 6 | | | | |
| | PESD3V3L1BA | | - | 101 | - | pF |
| | PESD5V0L1BA | | - | 75 | - | pF |
| | PESD12VL1BA | | - | 19 | - | pF |
| | PESD15VL1BA | | - | 16 | - | pF |
| | PESD24VL1BA | | - | 11 | - | pF |
| $V_{(CL)R}$ | clamping voltage | | [1] | | | |
| | PESD3V3L1BA | $I_{pp} = 1\text{ A}$ | - | - | 8 | V |
| | | $I_{pp} = 18\text{ A}$ | - | - | 26 | V |
| | PESD5V0L1BA | $I_{pp} = 1\text{ A}$ | - | - | 10 | V |
| | | $I_{pp} = 15\text{ A}$ | - | - | 33 | V |
| | PESD12VL1BA | $I_{pp} = 1\text{ A}$ | - | - | 20 | V |
| | | $I_{pp} = 5\text{ A}$ | - | - | 37 | V |
| | PESD15VL1BA | $I_{pp} = 1\text{ A}$ | - | - | 25 | V |
| | | $I_{pp} = 5\text{ A}$ | - | - | 44 | V |
| | PESD24VL1BA | $I_{pp} = 1\text{ A}$ | - | - | 40 | V |
| | | $I_{pp} = 3\text{ A}$ | - | - | 70 | V |

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------|-------------------------|----------------------|-----|-----|-----|----------|
| r_{dif} | differential resistance | $I_R = 1 \text{ mA}$ | | | | |
| | PESD3V3L1BA | | - | - | 400 | Ω |
| | PESD5V0L1BA | | - | - | 80 | Ω |
| | PESD12VL1BA | | - | - | 200 | Ω |
| | PESD15VL1BA | | - | - | 225 | Ω |
| | PESD24VL1BA | | - | - | 300 | Ω |

[1] Non-repetitive current pulse 8/20 μs exponential decay waveform; see [Figure 1](#).



$T_{amb} = 25^{\circ}\text{C}$
 $t_p = 8/20 \mu\text{s}$ exponential decay waveform; see [Figure 1](#)
(1) PESD3V3L1BA and PESD5V0L1BA
(2) PESD12VL1BA; PESD15VL1BA; PESD24VL1BA

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

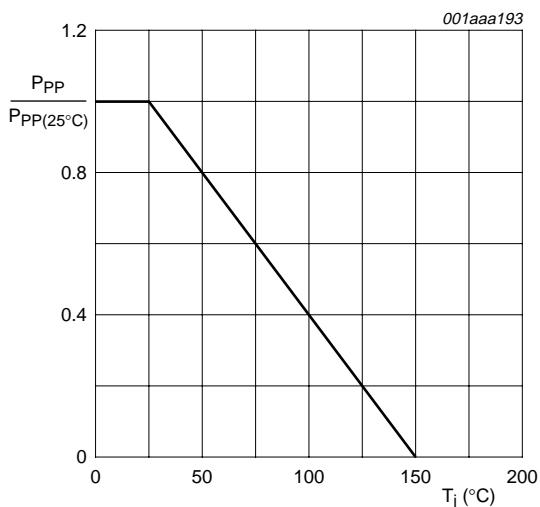
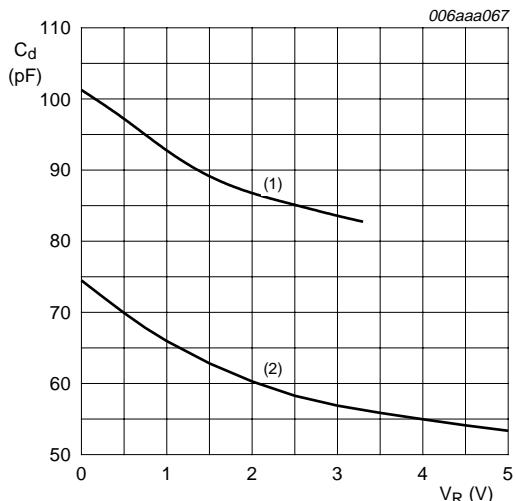
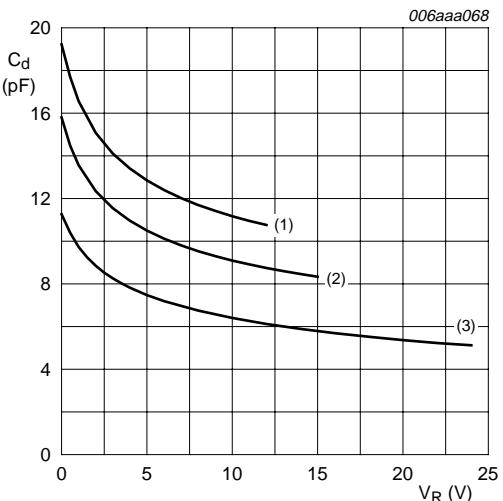


Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values



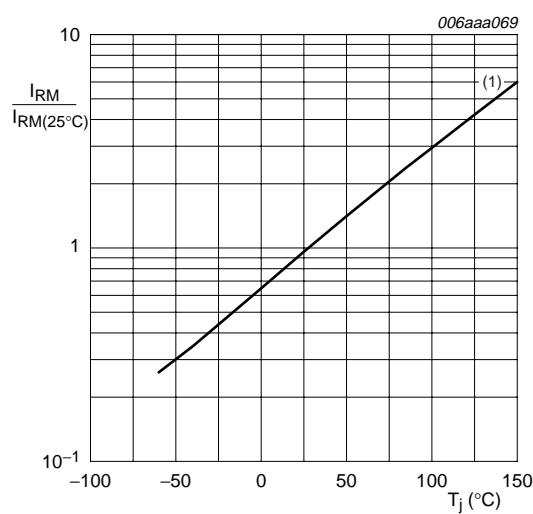
$T_{amb} = 25^{\circ}\text{C}; f = 1 \text{ MHz}$
(1) PESD3V3L1BA
(2) PESD5V0L1BA

Fig 5. Diode capacitance as a function of reverse voltage; typical values



$T_{amb} = 25^{\circ}\text{C}; f = 1 \text{ MHz}$
(1) PESD12VL1BA
(2) PESD15VL1BA
(3) PESD24VL1BA

Fig 6. Diode capacitance as a function of reverse voltage; typical values



(1) PESD3V3L1BA; PESD5V0L1BA

For PESD12VL1BA, PESD15VL1BA and PESD24VL1BA, $I_{RM} < 20$ nA at 150 °C

Fig 7. Relative variation of reverse leakage current as a function of junction temperature; typical values

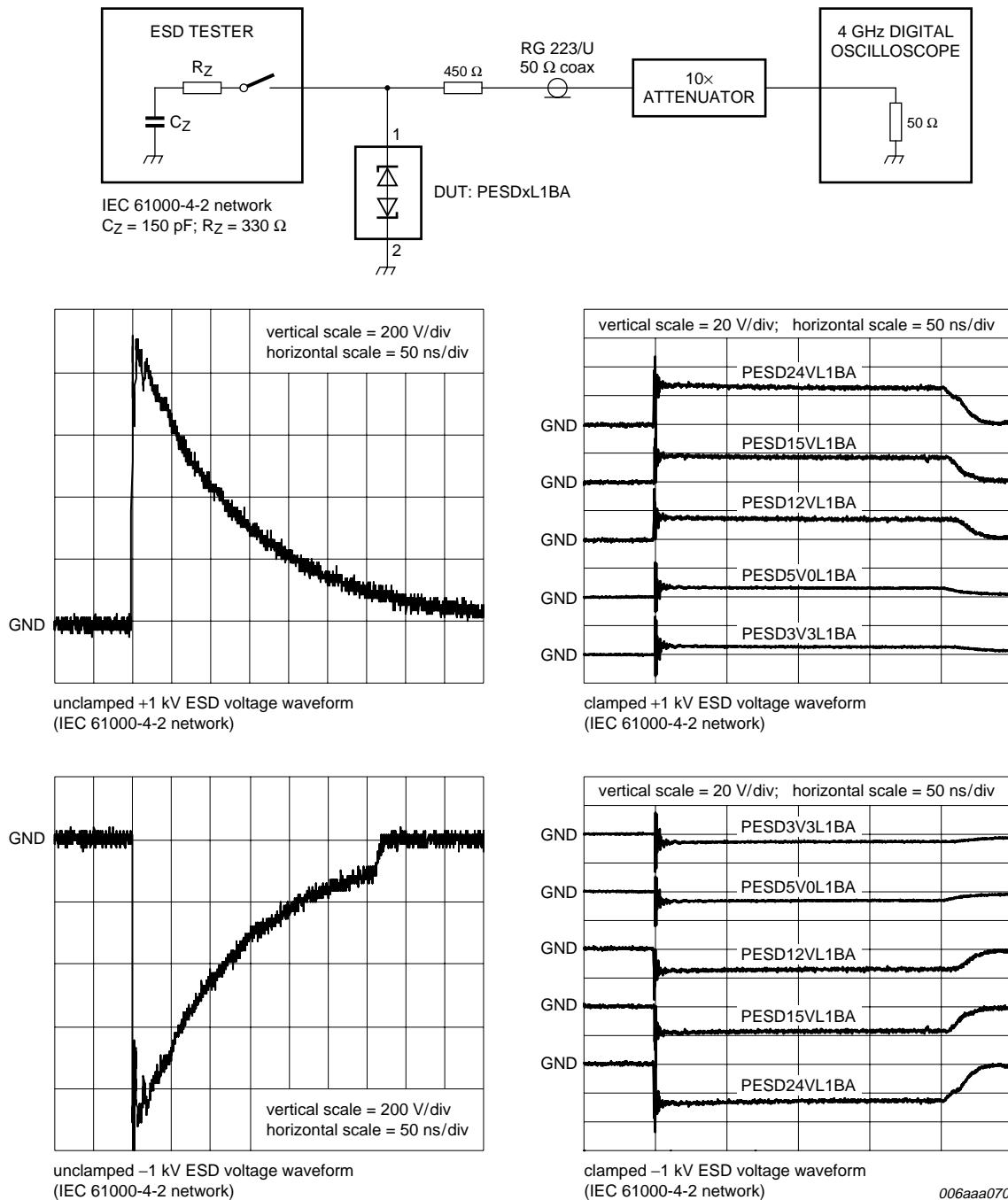


Fig 8. ESD clamping test setup and waveforms

7. Application information

The PESDxL1BA series is designed for bidirectional protection of one signal line from the damage caused by ElectroStatic Discharge (ESD) and surge pulses. The PESDxL1BA series may be used on lines where the signal polarity is above and below ground. The PESDxL1BA series provides a surge capability of up to 500 W per line for a 8/20 μ s waveform.

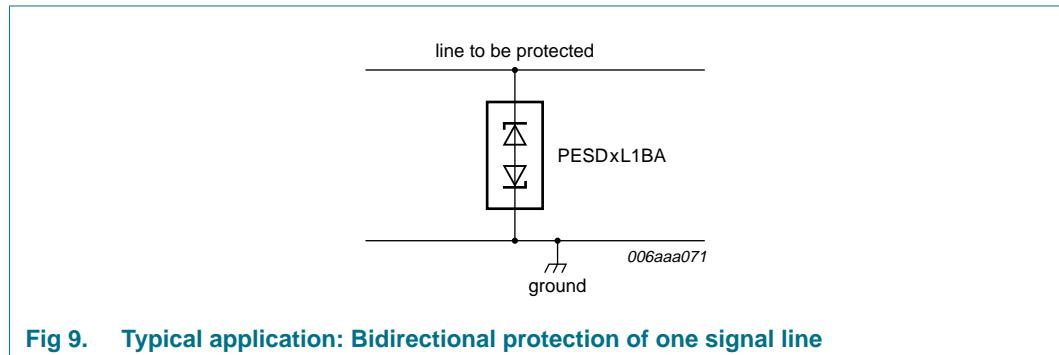


Fig 9. Typical application: Bidirectional protection of one signal line

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 protected 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

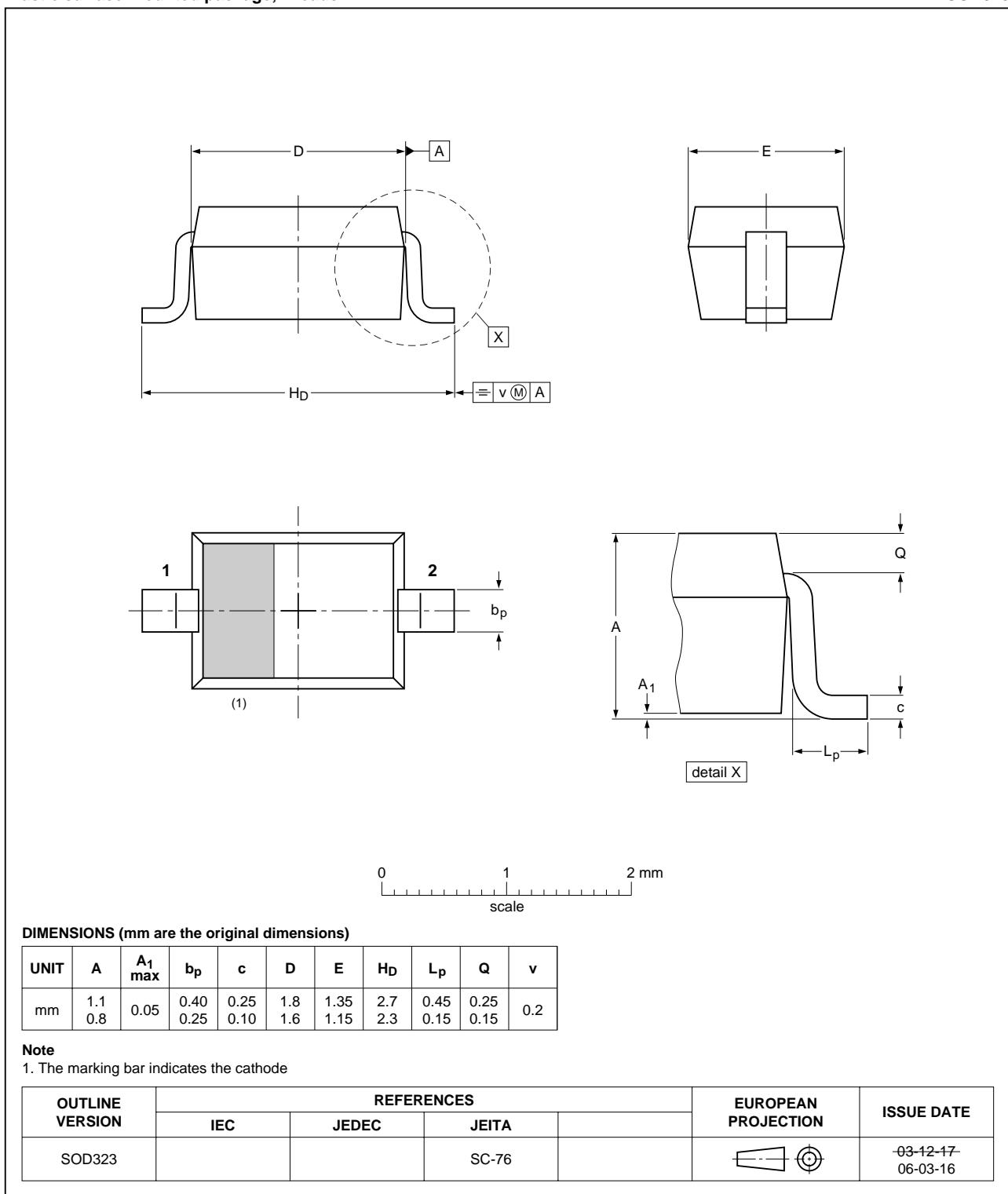


Fig 10. Package outline SOD323 (SC-76)

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 |
| PESDxL1BA series | SOD323 | 4 mm pitch, 8 mm tape and reel | -115 | -135 |

[1] For further information and the availability of packing methods, see [Section 12](#).

10. Revision history

Table 10. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|-----------------|--------------|---|---------------|-----------------|
| PESDXL1BA_SER_2 | 20090820 | Product data sheet | - | PESDXL1BA_SER_1 |
| Modifications: | | <ul style="list-style-type: none">• This data sheet was changed to reflect the new company name NXP Semiconductors, including new legal definitions and disclaimers. No changes were made to the technical content.• Figure 10 "Package outline SOD323 (SC-76)": updated | | |
| PESDXL1BA_SER_1 | 20041004 | Product data sheet | - | - |

11. Legal information

11.1 Data sheet status

| Document status ^{[1][2]} | Product status ^[3] | 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. |
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[2] The term 'short data sheet' is explained in section "Definitions".

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