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Kind regards,

Team Nexperia

# PESD5V0V1BA; PESD5V0V1BB; PESD5V0V1BL

Very low capacitance bidirectional ESD protection diodes

Rev. 2 — 9 November 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Very low capacitance bidirectional ElectroStatic Discharge (ESD) protection diodes in small Surface-Mounted Device (SMD) plastic packages designed to protect one signal line from the damage caused by ESD and other transients.

Table 1. Product overview

| Type number | Package |       | Package configuration     |
|-------------|---------|-------|---------------------------|
|             | NXP     | JEITA |                           |
| PESD5V0V1BA | SOD323  | SC-76 | very small                |
| PESD5V0V1BB | SOD523  | SC-79 | ultra small and flat lead |
| PESD5V0V1BL | SOD882  | -     | leadless ultra small      |

### 1.2 Features and benefits

- Bidirectional ESD protection of one line
- Very low diode capacitance:  $C_d = 11$  pF
- Max. peak pulse power:  $P_{PP} = 45$  W
- Low clamping voltage:  $V_{CL} = 12.5$  V
- Ultra low leakage current:  $I_{RM} < 1$  nA
- ESD protection up to 30 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge);  $I_{PP} = 4.8$  A
- AEC-Q101 qualified

### 1.3 Applications

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- Subscriber Identity Module (SIM) card protection
- Communication systems
- Portable electronics
- 10/100 Mbit/s Ethernet
- FireWire

### 1.4 Quick reference data

Table 2. Quick reference data

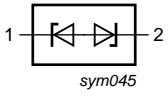
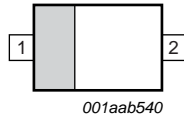
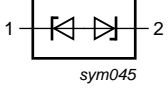
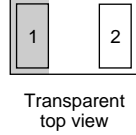
$T_{amb} = 25$  °C unless otherwise specified.

| Symbol    | Parameter                | Conditions               | Min | Typ | Max | Unit |
|-----------|--------------------------|--------------------------|-----|-----|-----|------|
| $V_{RWM}$ | reverse standoff voltage |                          | -   | -   | 5   | V    |
| $C_d$     | diode capacitance        | $f = 1$ MHz; $V_R = 0$ V | -   | 11  | 13  | pF   |



## 2. Pinning information

**Table 3. Pinning**

| Pin                             | Description       | Simplified outline   | Graphic symbol  |
|---------------------------------|-------------------|--|---|
| <b>PESD5V0V1BA; PESD5V0V1BB</b> |                   |  |   |
| 1                               | cathode (diode 1) | [1]  |  |
| 2                               | cathode (diode 2) |  |   |
| <b>PESD5V0V1BL</b>              |                   |  |   |
| 1                               | cathode (diode 1) | [1]  |  |
| 2                               | cathode (diode 2) |  |   |

[1] The marking bar indicates pin 1.

## 3. Ordering information

**Table 4. Ordering information**

| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description  | Version |
| PESD5V0V1BA | SC-76   | plastic surface-mounted package; 2 leads                                   | SOD323  |
| PESD5V0V1BB | SC-79   | plastic surface-mounted package; 2 leads                                   | SOD523  |
| PESD5V0V1BL | -       | leadless ultra small plastic package; 2 terminals; body 1.0 × 0.6 × 0.5 mm | SOD882  |

## 4. Marking

**Table 5. Marking codes**

| Type number | Marking code |
|-------------|--------------|
| PESD5V0V1BA | 1K           |
| PESD5V0V1BB | Z9           |
| PESD5V0V1BL | X1           |

## 5. Limiting values

**Table 6. Limiting values**

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

| Symbol           | Parameter          | Conditions         | Min   | Max | Unit |
|------------------|--------------------|--------------------|-------|-----|------|
| <b>Per diode</b> |                    |                    |       |     |      |
| $P_{PP}$         | peak pulse power   | $t_p = 8/20 \mu s$ | [1] - | 45  | W    |
| $I_{PP}$         | peak pulse current | $t_p = 8/20 \mu s$ | [1] - | 4.8 | A    |

**Table 6. Limiting values ...continued**

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

| Symbol            | Parameter            | Conditions | Min | Max  | Unit |
|-------------------|----------------------|------------|-----|------|------|
| <b>Per device</b> |                      |            |     |      |      |
| $T_j$             | junction temperature |            | -   | 150  | °C   |
| $T_{amb}$         | ambient temperature  |            | -55 | +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 7. ESD maximum ratings**

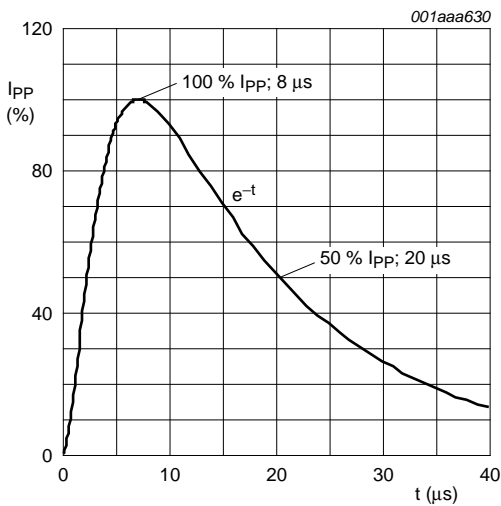
$T_{amb} = 25$  °C unless otherwise specified.

| Symbol    | Parameter                       | Conditions                        | Min | Max | Unit  |
|-----------|---------------------------------|-----------------------------------|-----|-----|-------|
| $V_{ESD}$ | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) | [1] | -   | 30 kV |
|           |                                 | machine model                     | -   | 2   | kV    |
|           |                                 | MIL-STD-883 (human body model)    | -   | 16  | kV    |

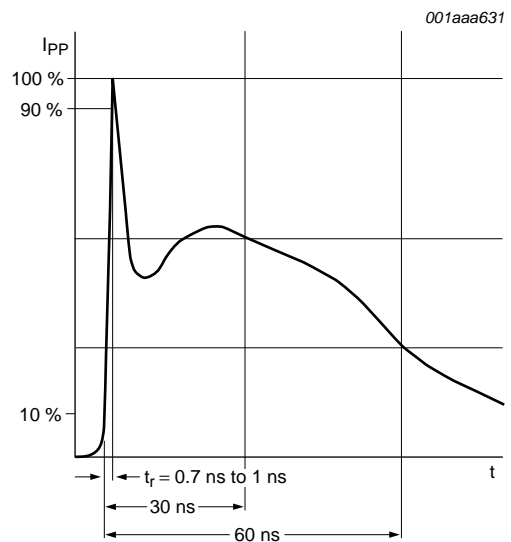
[1] Device stressed with ten non-repetitive ESD pulses.

**Table 8. ESD standards compliance**

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



**Fig 1. 8/20  $\mu$ s pulse waveform according to IEC 61000-4-5**



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

## 6. Characteristics

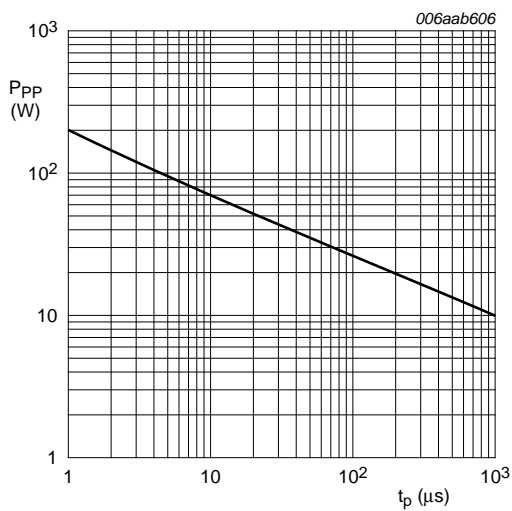
**Table 9. Characteristics**

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

| Symbol    | Parameter                | Conditions                                | Min   | Typ | Max  | Unit     |
|-----------|--------------------------|---|-------|-----|------|----------|
| $V_{RWM}$ | reverse standoff voltage |   | -     | -   | 5    | V        |
| $I_{RM}$  | reverse leakage current  | $V_{RWM} = 5\text{ V}$                    | -     | < 1 | 10   | nA       |
| $V_{BR}$  | breakdown voltage        | $I_R = 5\text{ mA}$                       | 5.8   | 6.8 | 7.8  | V        |
| $C_d$     | diode capacitance        | $f = 1\text{ MHz};$<br>$V_R = 0\text{ V}$ | -     | 11  | 13   | pF       |
| $V_{CL}$  | clamping voltage         | $I_{PP} = 4.8\text{ A}$                   | [1] - | -   | 12.5 | V        |
| $r_{dyn}$ | dynamic resistance       | $I_R = 10\text{ A}$                       | [2] - | 0.2 | -    | $\Omega$ |
| $r_{dif}$ | differential resistance  | $I_R = 5\text{ mA}$                       | -     | -   | 35   | $\Omega$ |

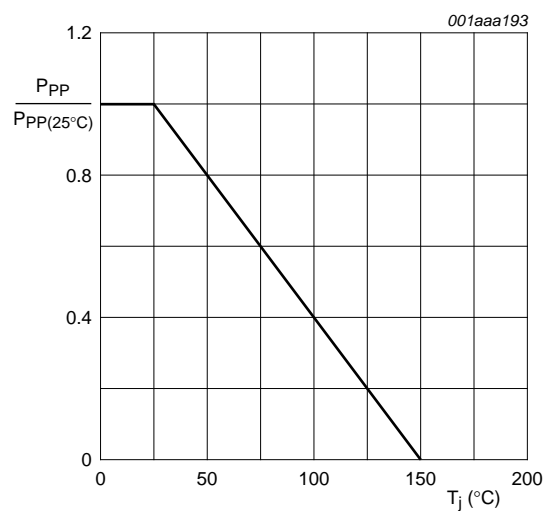
[1] Non-repetitive current pulse 8/20  $\mu\text{s}$  exponential decay waveform according to IEC 61000-4-5.

[2] Non-repetitive current pulse, Transmission Line Pulse (TLP)  $t_p = 100\text{ ns}$ ; square pulse; ANS/IESD STM5.1-2008.

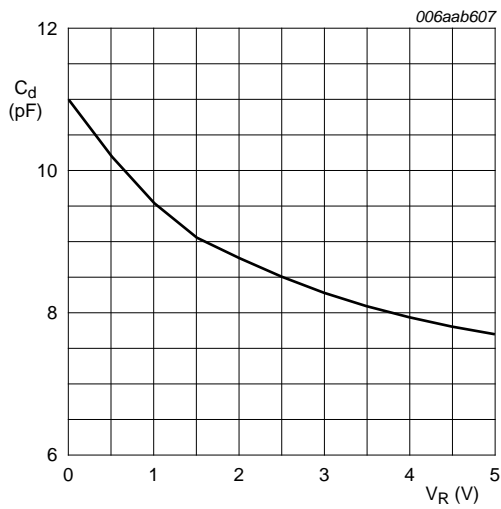


$T_{amb} = 25\text{ }^{\circ}\text{C}$

**Fig 3. Peak pulse power as a function of exponential pulse duration; typical values**

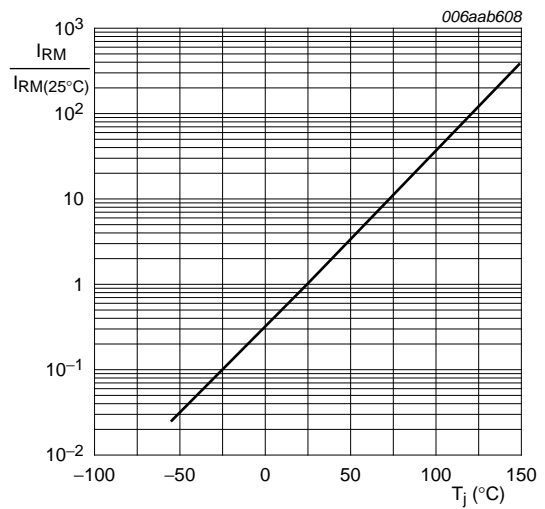


**Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values**

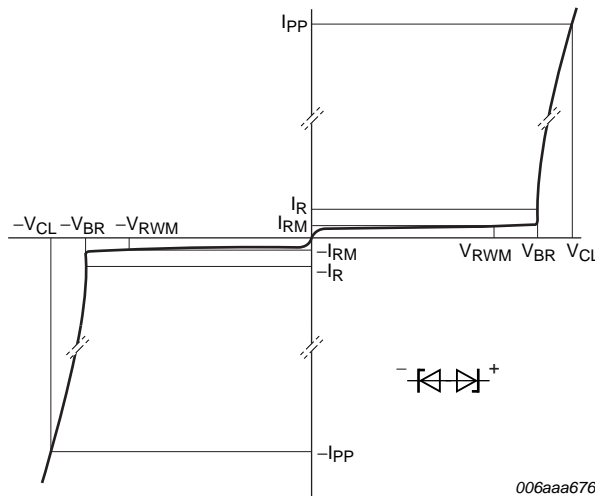


f = 1 MHz; T<sub>amb</sub> = 25 °C

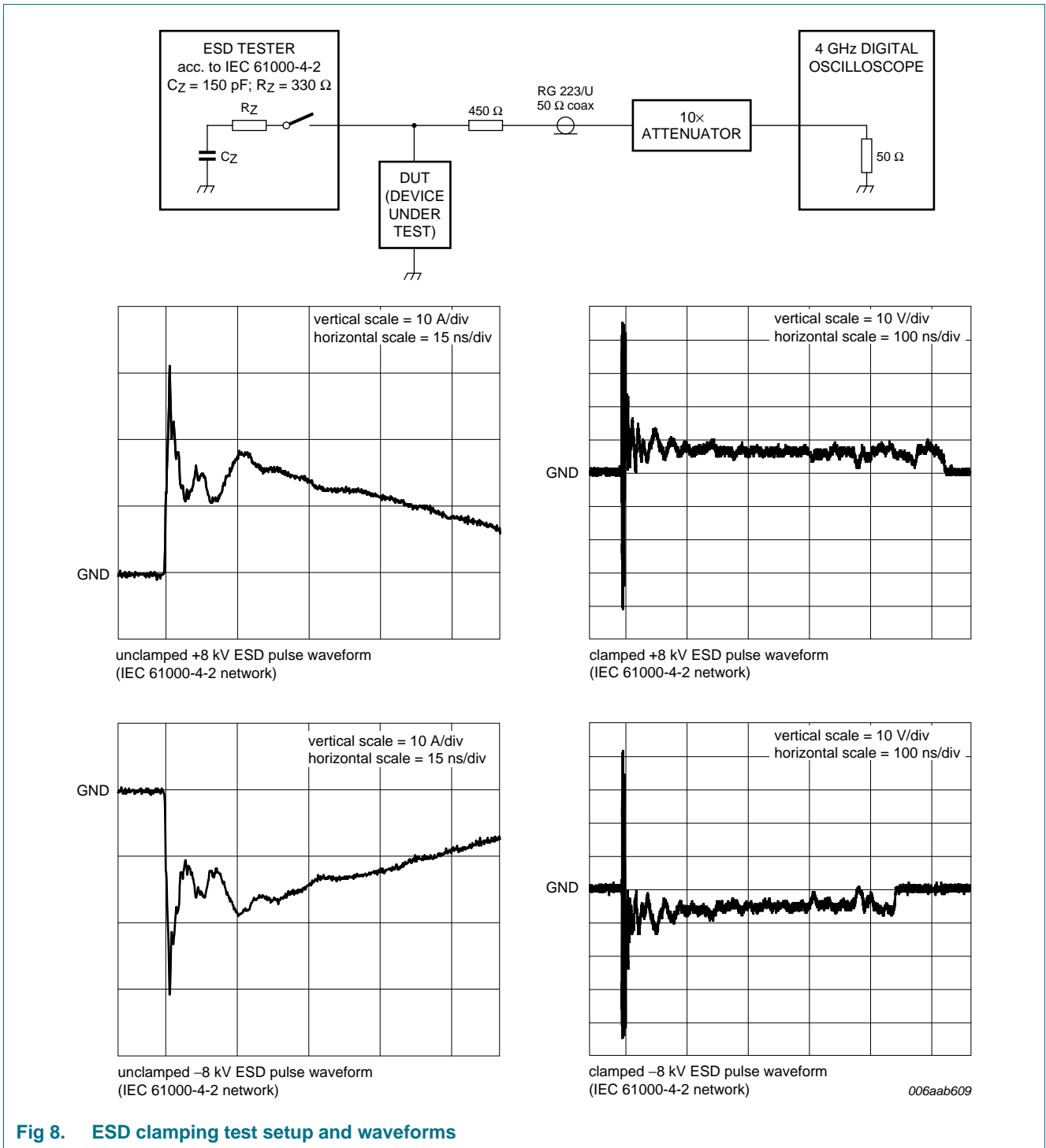
**Fig 5. Diode capacitance as a function of reverse voltage; typical values**



**Fig 6. Relative variation of reverse leakage current as a function of junction temperature; typical values**



**Fig 7. V-I characteristics for a bidirectional ESD protection diode**



006aab609

## 7. Application information

The PESD5V0V1Bx series is designed for the protection of one bidirectional data or signal line from the damage caused by ESD and surge pulses. The devices may be used on lines where the signal polarities are both, positive or negative with respect to ground. The PESD5V0V1Bx series provides a surge capability of 45 W per line for an 8/20  $\mu$ s waveform.

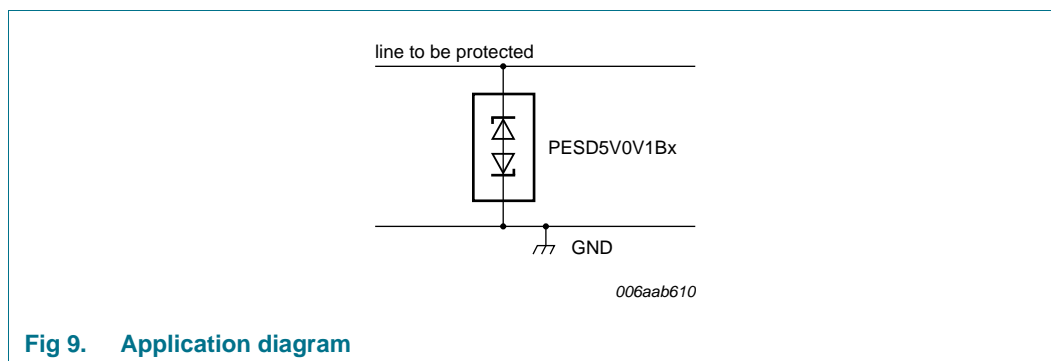


Fig 9. Application diagram

### 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:

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.

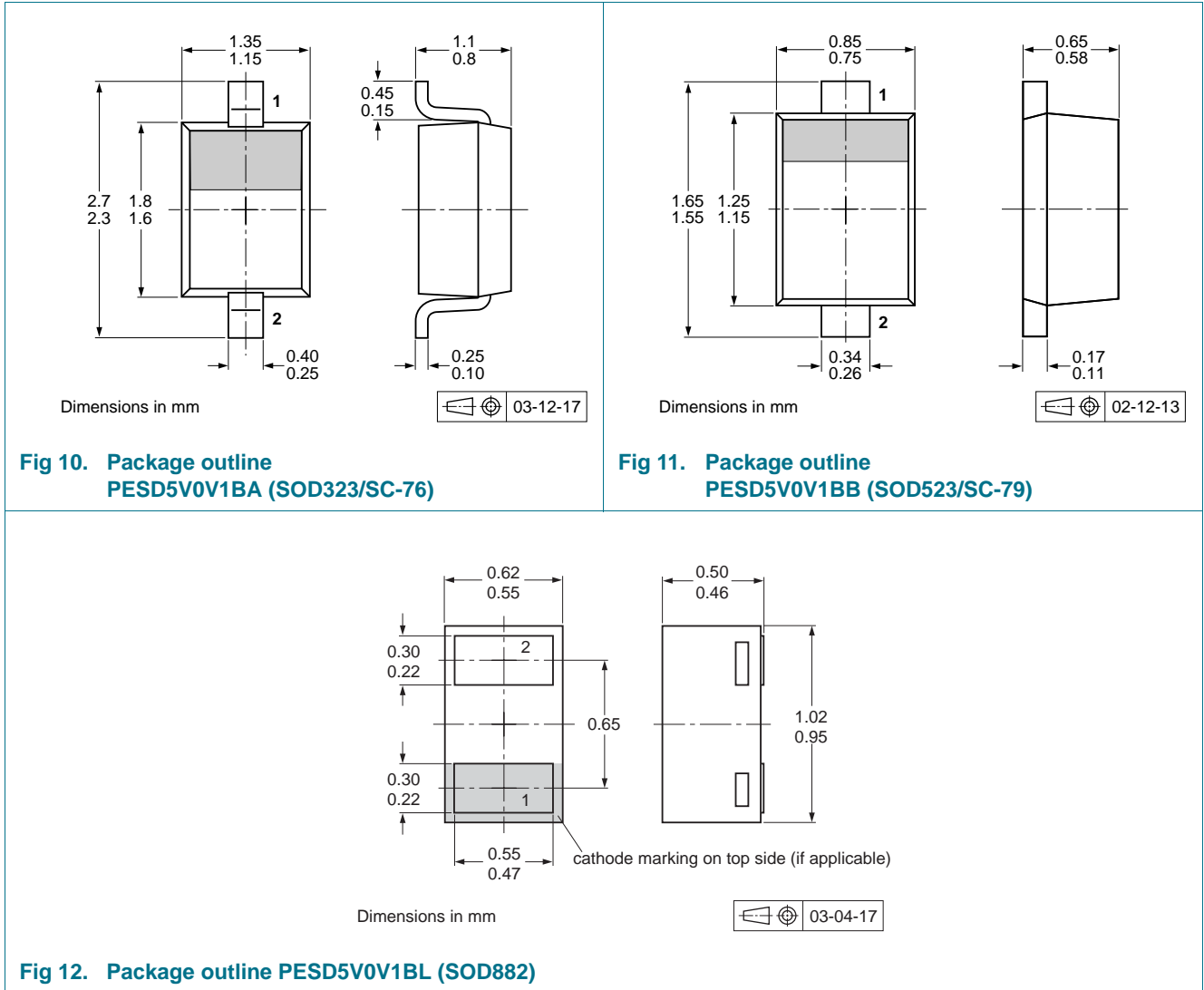
## 8. Test information

### 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**



**10. Packing information**

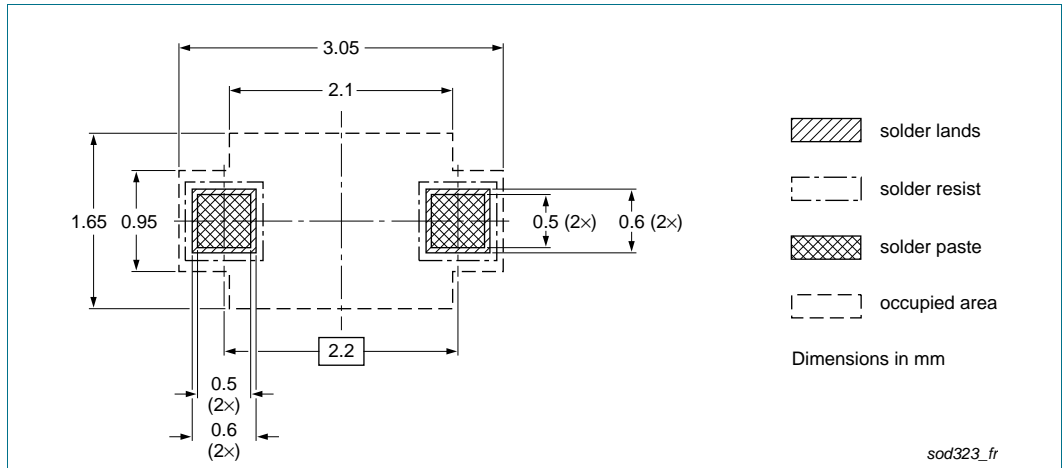
**Table 10. Packing methods**

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

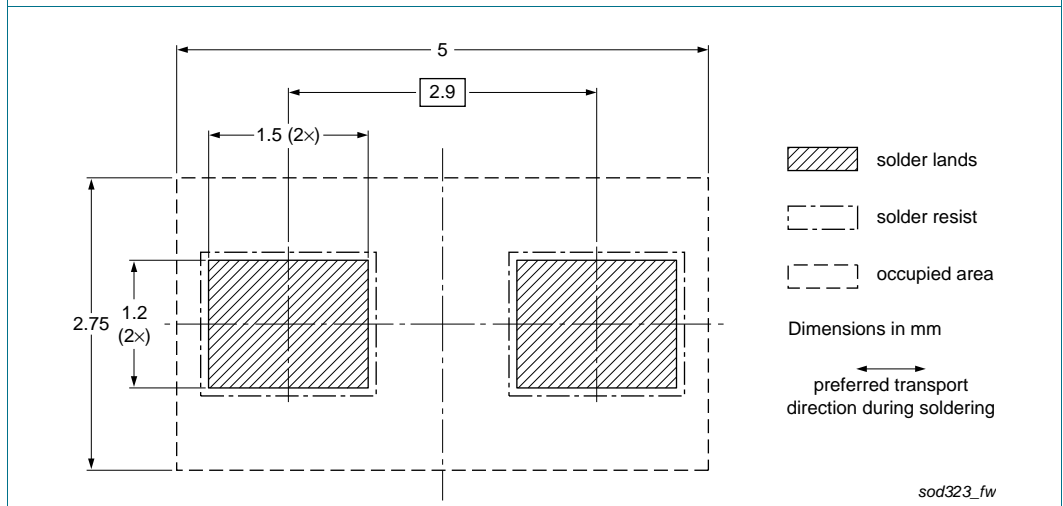
| Type number | Package | Description                    | Packing quantity |      |       |
|-------------|---------|--------------------------------|------------------|------|-------|
|             |         |                                | 3000             | 8000 | 10000 |
| PESD5V0V1BA | SOD323  | 4 mm pitch, 8 mm tape and reel | -115             | -    | -135  |
| PESD5V0V1BB | SOD523  | 2 mm pitch, 8 mm tape and reel | -                | -315 | -     |
|             |         | 4 mm pitch, 8 mm tape and reel | -115             | -    | -135  |
| PESD5V0V1BL | SOD882  | 2 mm pitch, 8 mm tape and reel | -                | -    | -315  |

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

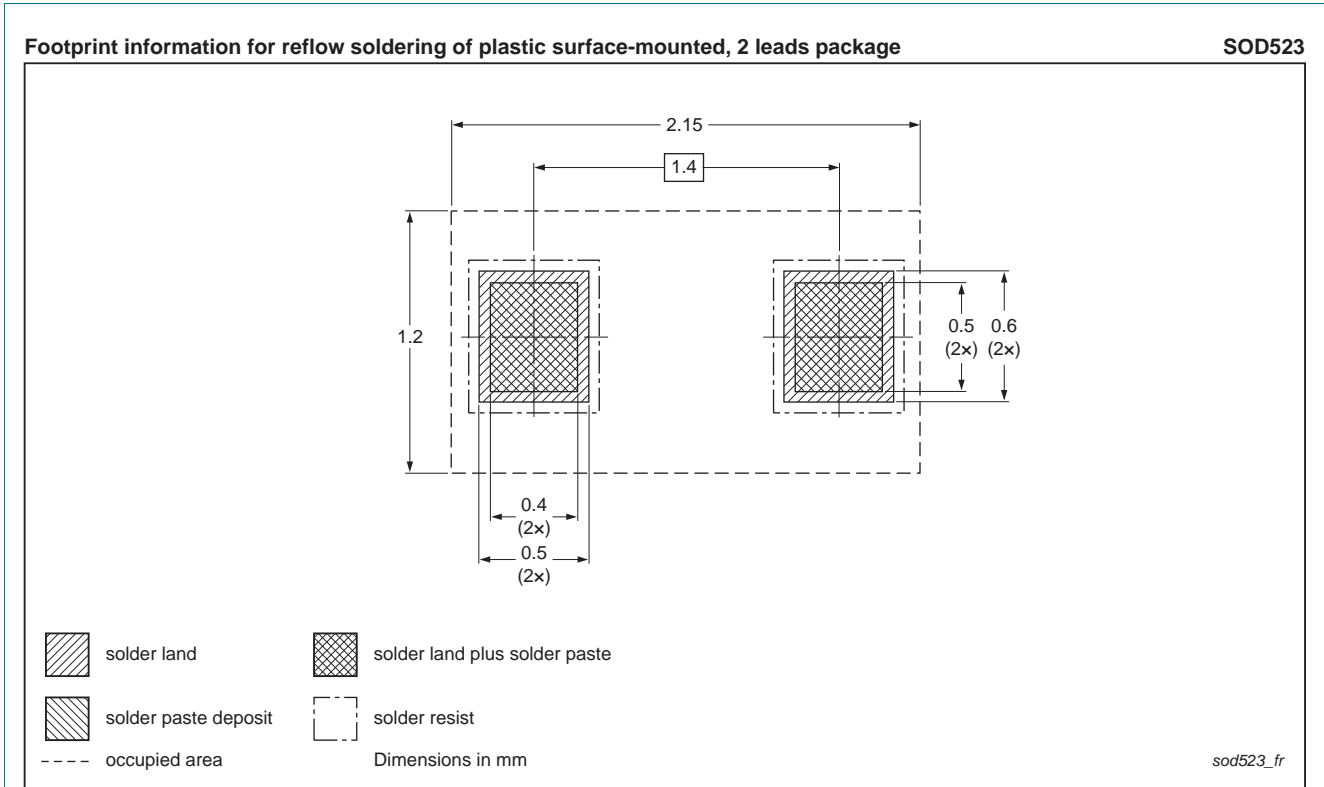
**11. Soldering**



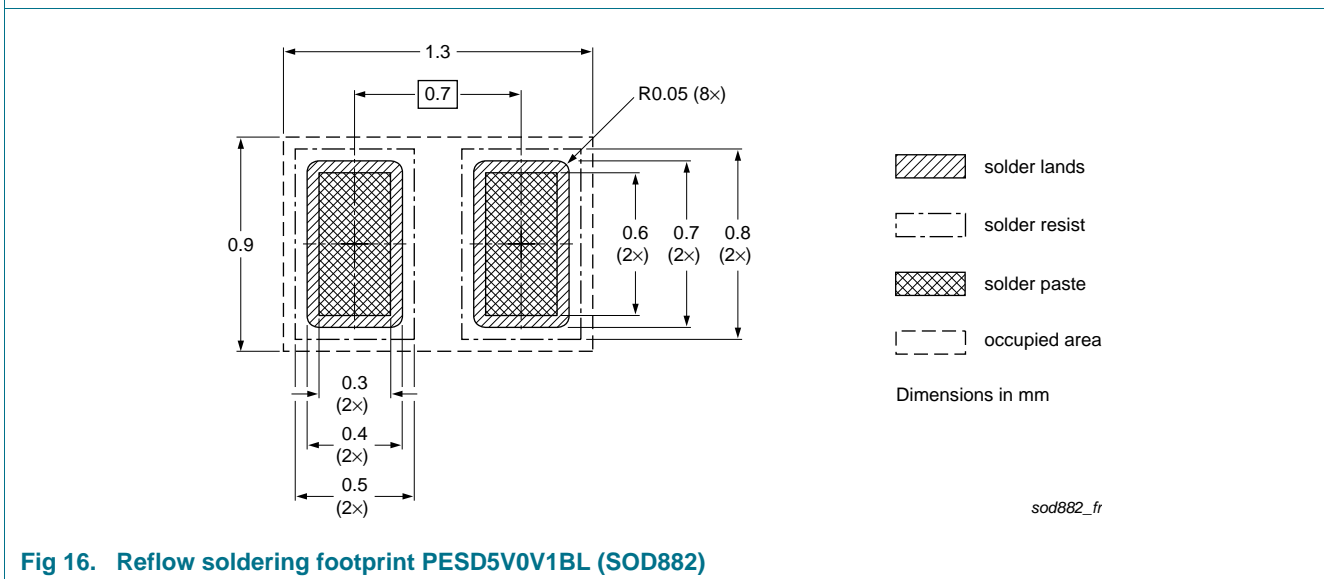
**Fig 13. Reflow soldering footprint PESD5V0V1BA (SOD323/SC-76)**



**Fig 14. Wave soldering footprint PESD5V0V1BA (SOD323/SC-76)**



**Fig 15. Reflow soldering footprint PESD5V0V1BB (SOD523/SC-79)**



**Fig 16. Reflow soldering footprint PESD5V0V1BL (SOD882)**

## 12. Revision history

Table 11. Revision history

| Document ID           | Release date | Data sheet status  | Change notice | Supersedes  |
|-----------------------|--------------|--------------------|---------------|---|
| PESD5V0V1BA_BB_BL v.2 | 20121109     | Product data sheet | -             | PESD5V0V1BA_BB_BL v.1   |
| Modifications:        |              |                    |               |   |
|                       |              |                    |               | <ul style="list-style-type: none"><li>• <a href="#">Table 9 “Characteristics”</a>: added dynamic resistance <math>r_{dyn}</math></li><li>• <a href="#">Figure 15</a>: updated</li><li>• <a href="#">Section 13 “Legal information”</a>: updated</li></ul> |
| PESD5V0V1BA_BB_BL v.1 | 20090728     | Product data sheet | -             | -   |

## 13. Legal information

### 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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