

# PESD5V0L1UA; PESD5V0L1UB; PESD5V0L1UL

Low capacitance unidirectional ESD protection diodes

Rev. 01 — 17 June 2009

Product data sheet

## 1. Product profile

### 1.1 General description

Low capacitance unidirectional 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 |                           |
| PESD5V0L1UA | SOD323  | SC-76 | very small                |
| PESD5V0L1UB | SOD523  | SC-79 | ultra small and flat lead |
| PESD5V0L1UL | SOD882  | -     | leadless ultra small      |

### 1.2 Features

- Unidirectional ESD protection of one line
- Low diode capacitance:  $C_d = 25$  pF
- Low clamping voltage:  $V_{CL} = 12$  V
- Very low leakage current:  $I_{RM} = 10$  nA
- ESD protection up to 26 kV
- IEC 61000-4-2; level 4 (ESD)
- AEC-Q101 qualified

### 1.3 Applications

- Computers and peripherals
- Audio and video equipment
- Cellular handsets and accessories
- Communication systems
- Subscriber Identity Module (SIM) card protection
- Portable electronics
- FireWire
- High-speed data lines

### 1.4 Quick reference data

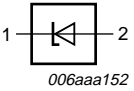
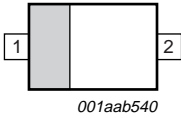
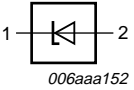
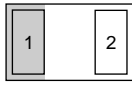
Table 2. Quick reference data

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

| Symbol    | Parameter                | Conditions               | Min | Typ | Max | Unit |
|-----------|--------------------------|--------------------------|-----|-----|-----|------|
| $V_{RWM}$ | reverse standoff voltage |                          | -   | -   | 5.0 | V    |
| $C_d$     | diode capacitance        | $f = 1$ MHz; $V_R = 0$ V | -   | 25  | 30  | pF   |

## 2. Pinning information

**Table 3. Pinning**

| Pin                             | Description | Simplified outline   | Graphic symbol   |
|---------------------------------|-------------|--|--|
| <b>PESD5V0L1UA; PESD5V0L1UB</b> |             |  |  |
| 1                               | cathode     | [1]  | <br>006aaa152 |
| 2                               | anode       | <br>001aab540            |  |
| <b>PESD5V0L1UL</b>              |             |  |  |
| 1                               | cathode     | [1]  | <br>006aaa152 |
| 2                               | anode       | <br>Transparent top view |  |

[1] The marking bar indicates the cathode.

## 3. Ordering information

**Table 4. Ordering information**

| Type number | Package |  |         |
|-------------|---------|--|---------|
|             | Name    | Description  | Version |
| PESD5V0L1UA | SC-76   | plastic surface-mounted package; 2 leads                                   | SOD323  |
| PESD5V0L1UB | SC-79   | plastic surface-mounted package; 2 leads                                   | SOD523  |
| PESD5V0L1UL | -       | 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 |
|-------------|--------------|
| PESD5V0L1UA | 1J           |
| PESD5V0L1UB | Z8           |
| PESD5V0L1UL | XY           |

## 5. Limiting values

**Table 6. Limiting values**

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

| Symbol           | Parameter            | Conditions               | Min      | Max  | Unit |
|------------------|----------------------|--------------------------|----------|------|------|
| P <sub>PP</sub>  | peak pulse power     | t <sub>p</sub> = 8/20 μs | [1][2] - | 42   | W    |
| I <sub>PP</sub>  | peak pulse current   | t <sub>p</sub> = 8/20 μs | [1][2] - | 3.5  | A    |
| T <sub>j</sub>   | junction temperature |                          | -        | 150  | °C   |
| T <sub>amb</sub> | ambient temperature  |                          | -55      | +150 | °C   |
| T <sub>stg</sub> | storage temperature  |                          | -65      | +150 | °C   |

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

[2] Measured from pin 1 to pin 2.

**Table 7. ESD maximum ratings**

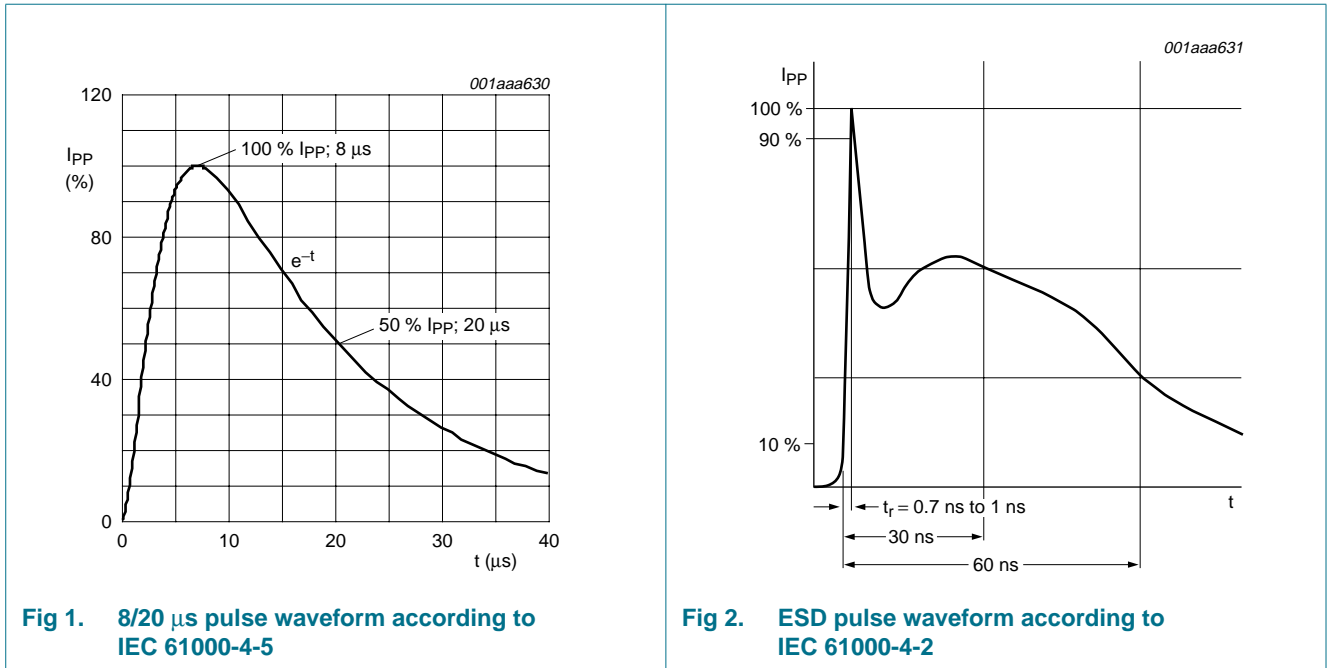
T<sub>amb</sub> = 25 °C unless otherwise specified.

| Symbol           | Parameter                       | Conditions                           | Min   | Max | Unit |
|------------------|---------------------------------|--------------------------------------|-------|-----|------|
| V <sub>ESD</sub> | electrostatic discharge voltage | IEC 61000-4-2<br>(contact discharge) | [1] - | 26  | kV   |
|                  |                                 | machine model                        | -     | 400 | V    |
|                  |                                 | MIL-STD-883 (human<br>body model)    | -     | 10  | 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 3 (human body model) | > 4 kV                          |



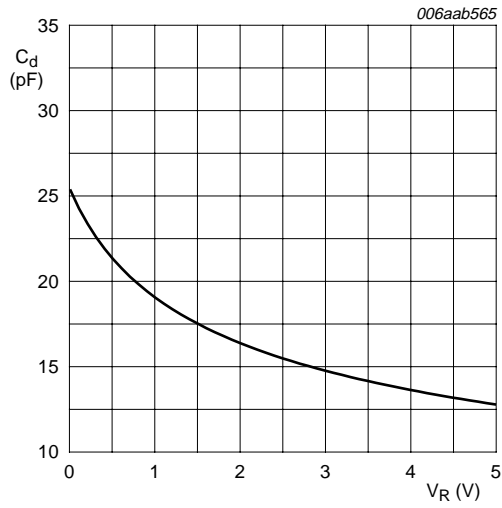
## 6. Characteristics

**Table 9. Characteristics**  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

| Symbol           | Parameter                | Conditions                         | Min                                     | Typ | Max | Unit |
|------------------|--------------------------|------------------------------------|---|-----|-----|------|
| V <sub>RWM</sub> | reverse standoff voltage |                                    | -                                       | -   | 5.0 | V    |
| I <sub>RM</sub>  | reverse leakage current  | V <sub>RWM</sub> = 5.0 V           | -                                       | 10  | 100 | nA   |
| V <sub>BR</sub>  | breakdown voltage        | I <sub>R</sub> = 5 mA              | 6.4                                     | 6.8 | 7.2 | V    |
| C <sub>d</sub>   | diode capacitance        | f = 1 MHz;<br>V <sub>R</sub> = 0 V | -                                       | 25  | 30  | pF   |
| V <sub>CL</sub>  | clamping voltage         |                                    | <a href="#">[1]</a> <a href="#">[2]</a> |     |     |      |
|                  |                          | I <sub>PP</sub> = 1 A              | -                                       | -   | 9   | V    |
|                  |                          | I <sub>PP</sub> = 3.5 A            | -                                       | -   | 12  | V    |
| r <sub>dif</sub> | differential resistance  | I <sub>R</sub> = 5 mA              | -                                       | -   | 30  | Ω    |
| V <sub>F</sub>   | forward voltage          | I <sub>F</sub> = 200 mA            | -                                       | -   | 1.2 | V    |

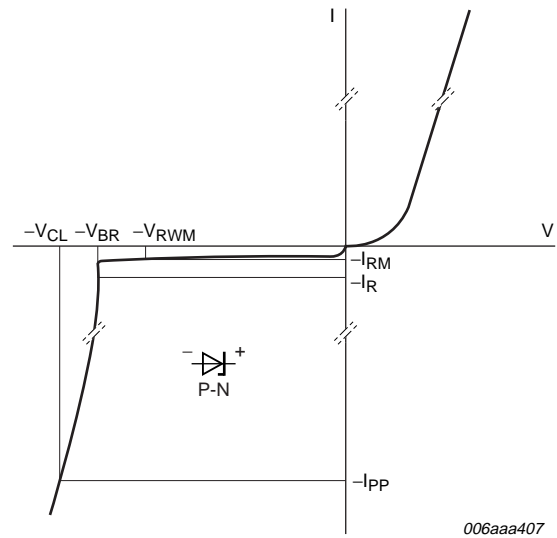
[1] Non-repetitive current pulse 8/20 μs exponential decay waveform according to IEC 61000-4-5.

[2] Measured from pin 1 to pin 2.



f = 1 MHz; T<sub>amb</sub> = 25 °C

**Fig 3. Diode capacitance as a function of reverse voltage; typical values**



**Fig 4. V-I characteristics for a unidirectional ESD protection diode**

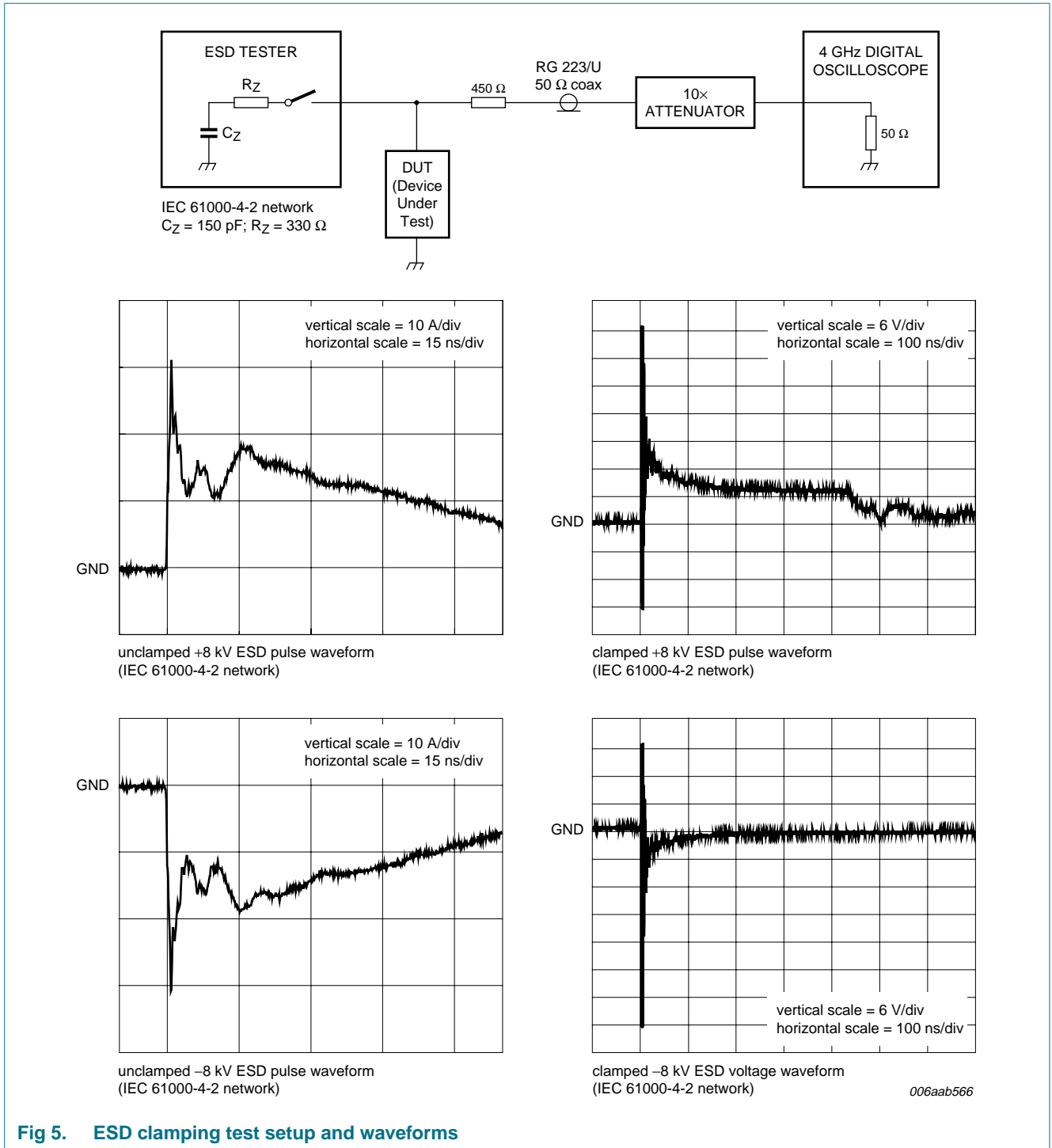
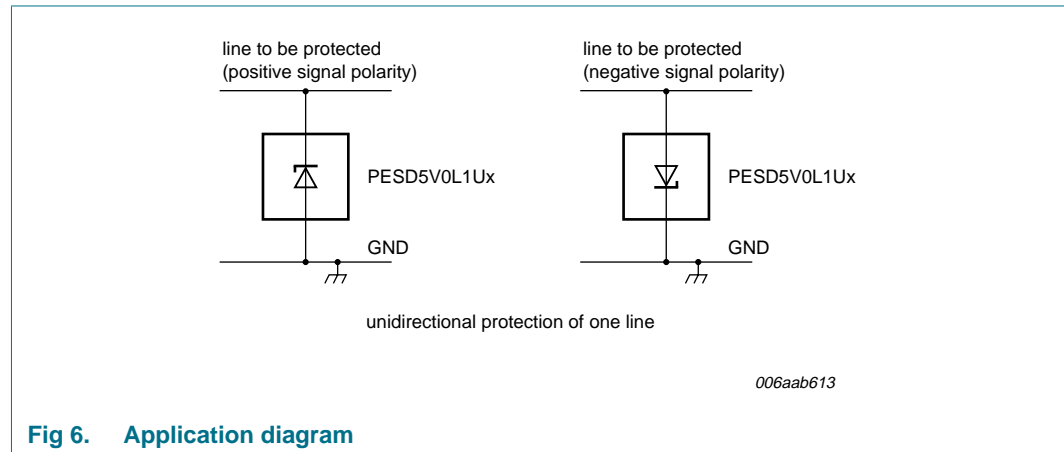


Fig 5. ESD clamping test setup and waveforms

## 7. Application information

The PESD5V0L1Ux series is designed for the protection of one unidirectional 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 either positive or negative with respect to ground. The PESD5V0L1Ux series provides a surge capability up to 42 W per line for an 8/20  $\mu$ s waveform.



### Circuit board layout and protection device placement

Circuit board layout is critical for the suppression of ESD and Electrical Fast Transient (EFT). The following guidelines are recommended:

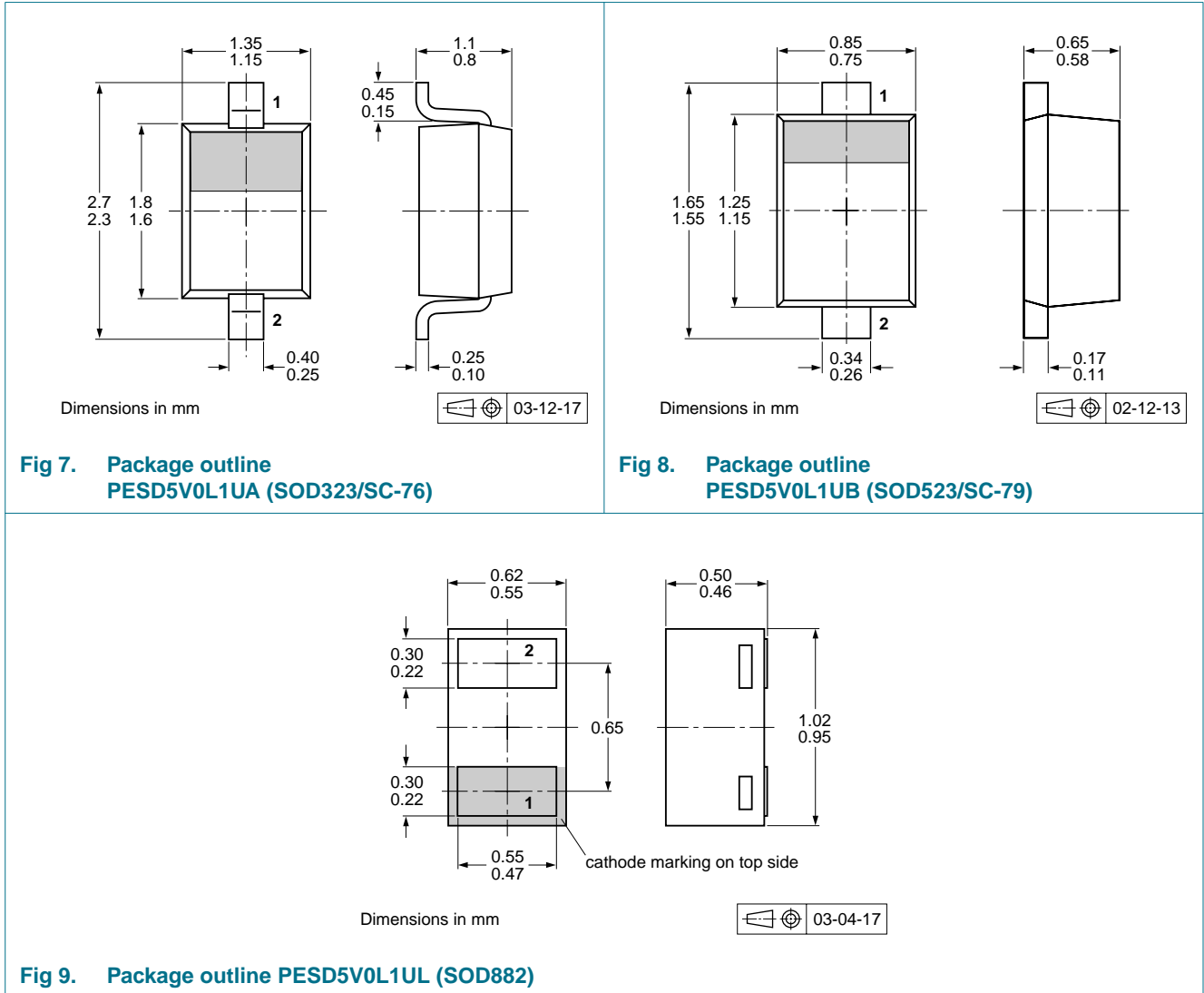
1. Place the device as close to the input terminal or connector as possible.
2. The path length between the device and the protected line should be minimized.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit 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. 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**



**10. Packing information**

**Table 10. Packing methods**

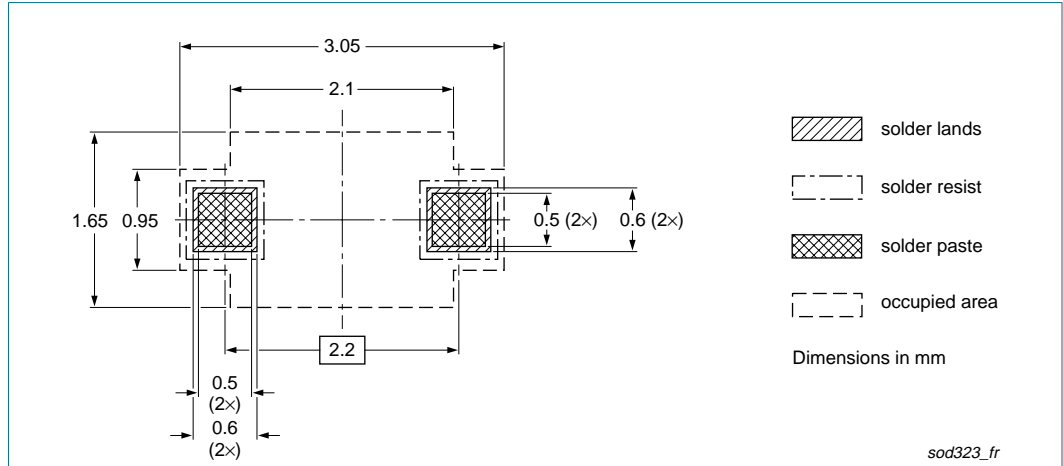
The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

| Type number | Package | Description                    | Packing quantity |      |       |
|-------------|---------|--------------------------------|------------------|------|-------|
|             |         |                                | 3000             | 8000 | 10000 |
| PESD5V0L1UA | SOD323  | 4 mm pitch, 8 mm tape and reel | -115             | -    | -135  |
| PESD5V0L1UB | SOD523  | 2 mm pitch, 8 mm tape and reel | -                | -315 | -     |
|             |         | 4 mm pitch, 8 mm tape and reel | -115             | -    | -135  |
| PESD5V0L1UL | SOD882  | 2 mm pitch, 8 mm tape and reel | -                | -    | -315  |

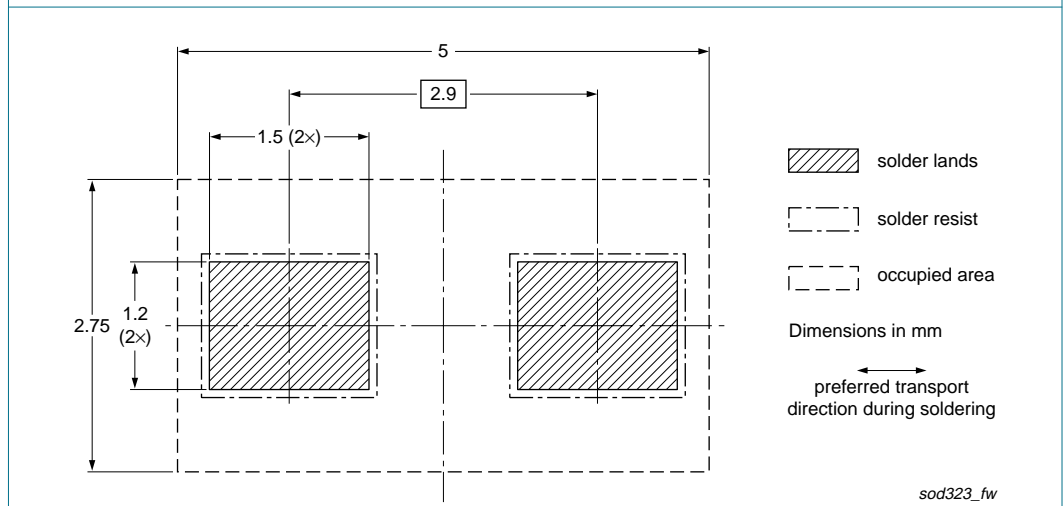
[1] For further information and the availability of packing methods, see [Section 14](#).



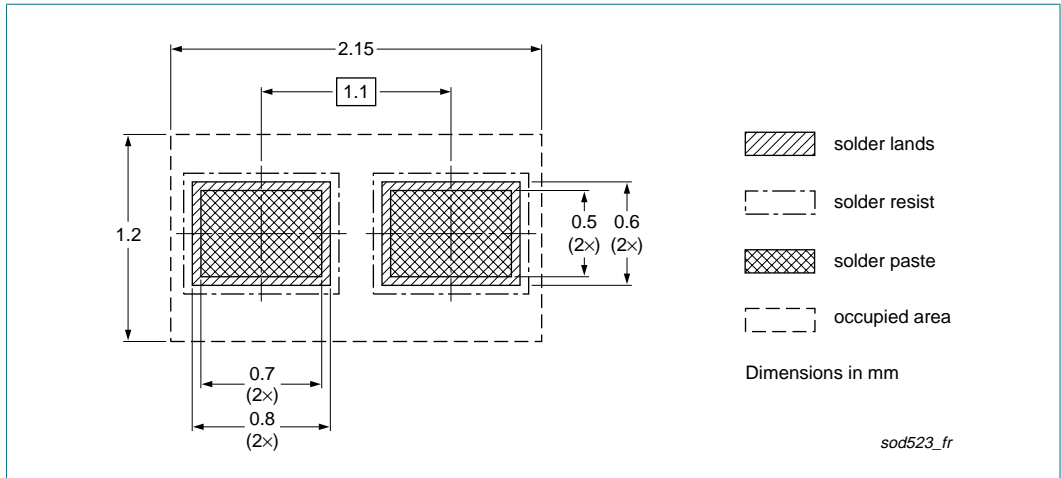
**11. Soldering**



**Fig 10. Reflow soldering footprint PESD5V0L1UA (SOD323/SC-76)**

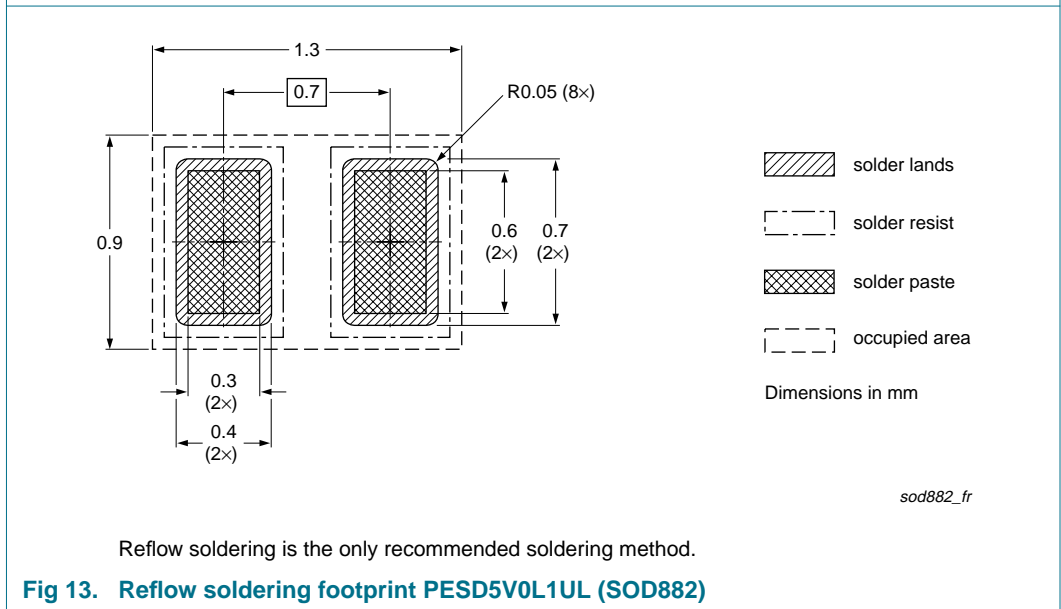


**Fig 11. Wave soldering footprint PESD5V0L1UA (SOD323/SC-76)**



Reflow soldering is the only recommended soldering method.

**Fig 12. Reflow soldering footprint PESD5V0L1UB (SOD523/SC-79)**



Reflow soldering is the only recommended soldering method.

**Fig 13. Reflow soldering footprint PESD5V0L1UL (SOD882)**

## 12. Revision history

Table 11. Revision history

| Document ID         | Release date | Data sheet status  | Change notice | Supersedes |
|---------------------|--------------|--------------------|---------------|------------|
| PESD5V0L1UA_UB_UL_1 | 20090617     | 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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