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Kind regards,

Team Nexperia

PESD5V0X1BQ; PESD5V0X1BT

Ultra low capacitance bidirectional ESD protection diodes

Rev. 01 — 30 October 2008

Product data sheet

1. Product profile

1.1 General description

Ultra 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.

The devices may also be used for unidirectional ESD protection of up to two signal lines.

Table 1. Product overview

| Type number | Package | | Package configuration |
|-------------|---------|----------|---------------------------|
| | NXP | JEDEC | |
| PESD5V0X1BQ | SOT663 | - | ultra small and flat lead |
| PESD5V0X1BT | SOT23 | TO-236AB | very small |

1.2 Features

- Bidirectional ESD protection of one line
- Unidirectional ESD protection of up to two lines
- Ultra low diode capacitance: $C_d = 0.9 \text{ pF}$
- Very low leakage current: $I_{RM} = 1 \text{ nA}$
- ESD protection up to 9 kV
- IEC 61000-4-2; level 4 (ESD)
- AEC-Q101 qualified

1.3 Applications

- USB interfaces
- Antenna protection
- Radio Frequency (RF) protection
- 10/100/1000 Mbit/s Ethernet
- FireWire
- Asymmetric Digital Subscriber Line (ADSL)
- High-speed data lines
- Subscriber Identity Module (SIM) card protection
- Computers, peripherals and printers
- Cellular handsets and accessories
- Portable electronics
- Communication systems
- Audio and video equipment



1.4 Quick reference data

Table 2. Quick reference data

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

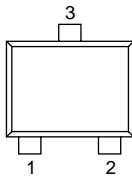
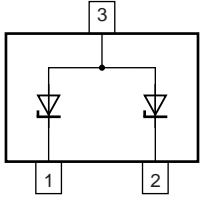
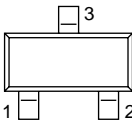
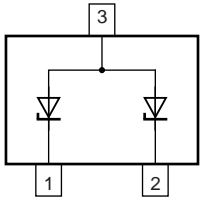
| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|------------------|--------------------------|--------------------------------------|-----|-----|-----|------|----|
| Per diode | | | | | | | |
| V_{RWM} | reverse standoff voltage | | - | - | 5 | V | |
| C_d | diode capacitance | $f = 1\text{ MHz}; V_R = 0\text{ V}$ | [1] | - | 0.9 | 1.3 | pF |
| | | | [2] | - | 2 | 2.6 | pF |

[1] Bidirectional configuration: measured from pin 1 to 2 or pin 2 to 1.

[2] Unidirectional configuration: measured from pin 1 to 3 or pin 2 to 3.

2. Pinning information

Table 3. Pinning

| Pin | Description | Simplified outline | Graphic symbol |
|--------------------|-------------------|--|--|
| PESD5V0X1BQ | | | |
| 1 | cathode (diode 1) |  |  006aaa154 |
| 2 | cathode (diode 2) | | |
| 3 | common anode | | |
| PESD5V0X1BT | | | |
| 1 | cathode (diode 1) |  |  006aaa154 |
| 2 | cathode (diode 2) | | |
| 3 | common anode | | |

3. Ordering information

Table 4. Ordering information

| Type number | Package | | |
|-------------|---------|--|---------|
| | Name | Description | Version |
| PESD5V0X1BQ | - | plastic surface-mounted package; 3 leads | SOT663 |
| PESD5V0X1BT | - | plastic surface-mounted package; 3 leads | SOT23 |

4. Marking

Table 5. Marking codes

| Type number | Marking code ^[1] |
|-------------|-----------------------------|
| PESD5V0X1BQ | E6 |
| PESD5V0X1BT | U3* |

- [1] * = -: made in Hong Kong
 * = p: made in Hong Kong
 * = t: made in Malaysia
 * = W: made in China

5. Limiting values

Table 6. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-------------------|----------------------|------------|-----|------|------|
| Per device | | | | | |
| T_j | junction temperature | | - | 150 | °C |
| T_{amb} | ambient temperature | | -55 | +150 | °C |
| T_{stg} | storage temperature | | -65 | +150 | °C |

Table 7. ESD maximum ratings

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|------------------|---------------------------------|--------------------------------------|------------------|-----|------|
| Per diode | | | | | |
| V_{ESD} | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) | ^[1] - | 9 | kV |
| | | MIL-STD-883 (human body model) | - | 10 | kV |

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

Table 8. ESD standards compliance

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

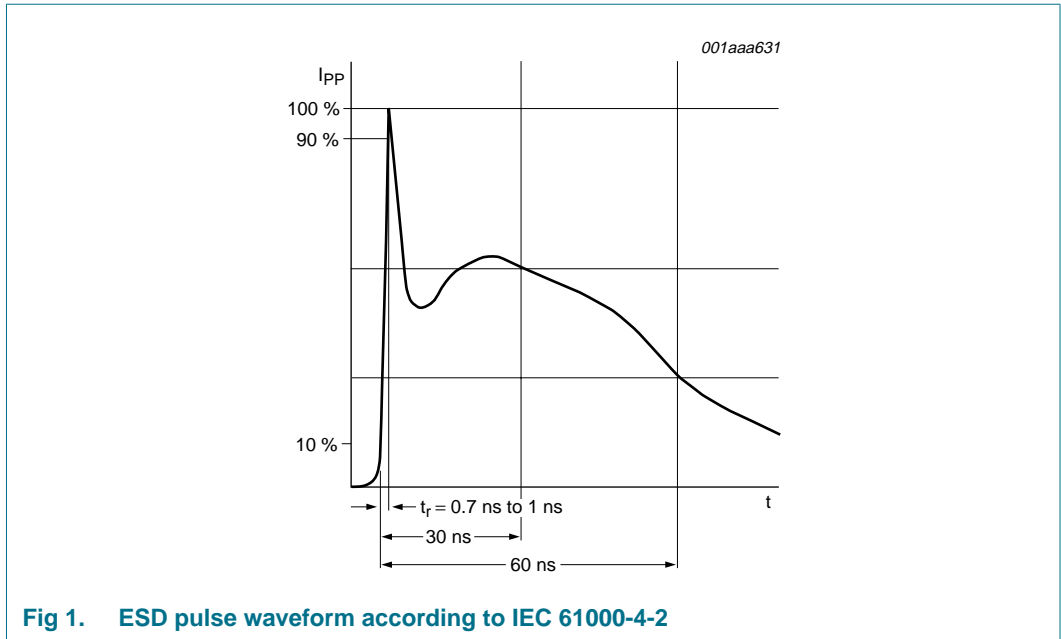


Fig 1. ESD pulse waveform according to IEC 61000-4-2

6. Characteristics

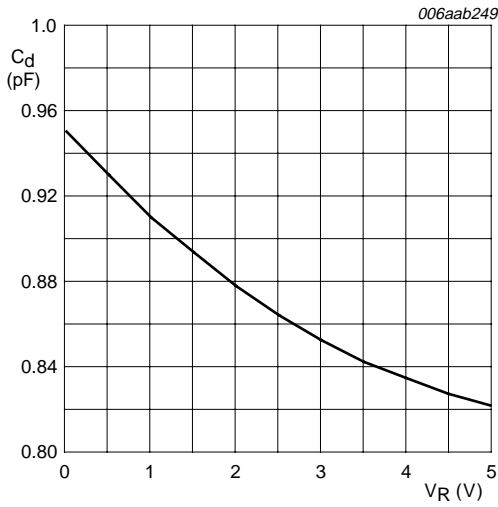
Table 9. Characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | | |
|------------------|--------------------------|------------------------|-----|----------------------|-----|------|-----|----|
| Per diode | | | | | | | | |
| V _{RWM} | reverse standoff voltage | | - | - | 5 | V | | |
| I _{RM} | reverse leakage current | V _{RWM} = 5 V | - | 1 | 100 | nA | | |
| V _{BR} | breakdown voltage | I _R = 5 mA | 5.8 | 7.5 | 9.5 | V | | |
| C _d | diode capacitance | f = 1 MHz | | V _R = 0 V | | | | |
| | | | | [1] | - | 0.9 | 1.3 | pF |
| | | | | [2] | - | 2 | 2.6 | pF |
| | | | | V _R = 5 V | | | | |
| [1] | - | 0.8 | 1.2 | pF | | | | |
| [2] | - | 1.7 | 2.3 | pF | | | | |
| r _{dif} | differential resistance | I _R = 1 mA | - | - | 100 | Ω | | |

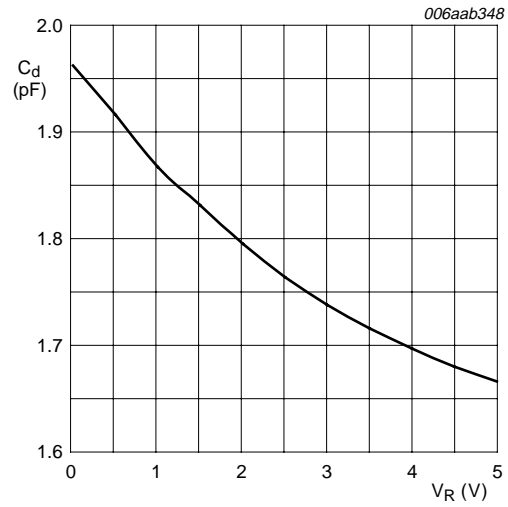
[1] Bidirectional configuration: measured from pin 1 to 2 or pin 2 to 1.

[2] Unidirectional configuration: measured from pin 1 to 3 or pin 2 to 3.



bidirectional configuration
 $f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$

Fig 2. Diode capacitance as a function of reverse voltage; typical values



unidirectional configuration
 $f = 1 \text{ MHz}; T_{\text{amb}} = 25 \text{ }^\circ\text{C}$

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

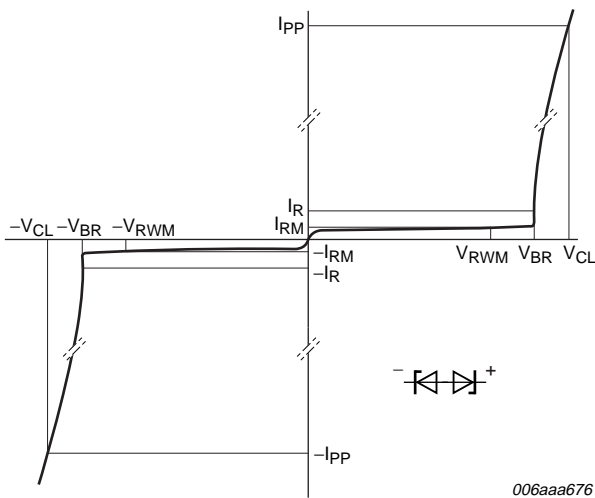


Fig 4. V-I characteristics for a bidirectional ESD protection diode

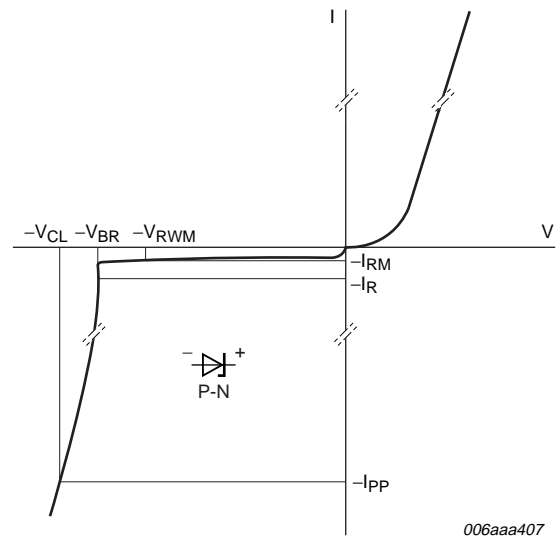
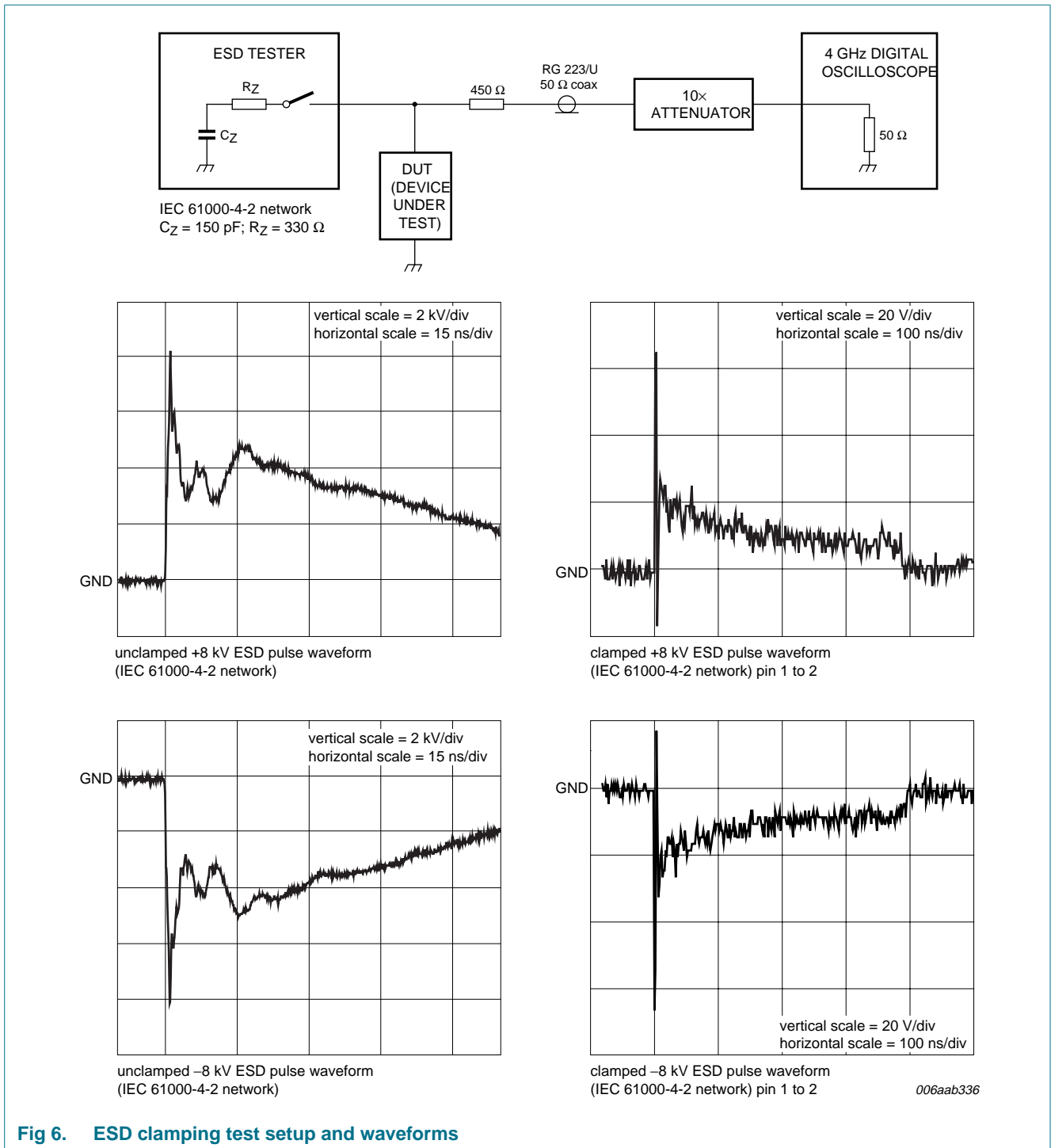


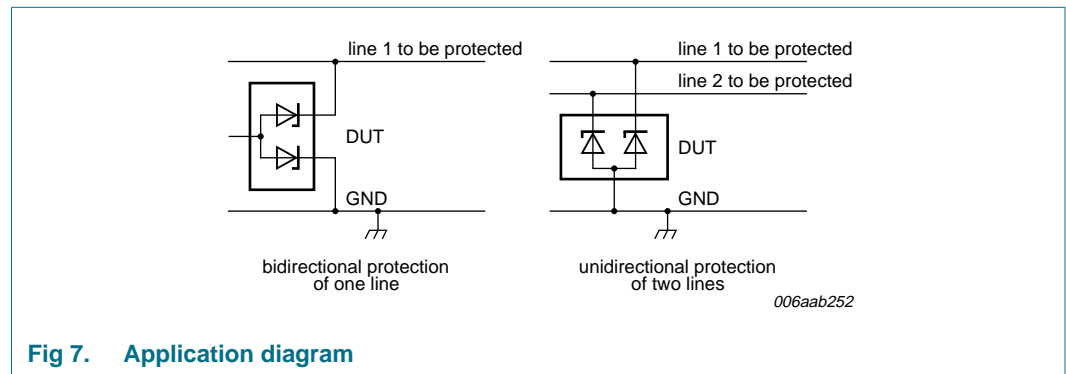
Fig 5. V-I characteristics for a unidirectional ESD protection diode



7. Application information

PESD5V0X1BQ and PESD5V0X1BT are designed for the protection of one bidirectional data or signal line from the damage caused by ESD. The devices may be used on lines where the signal polarities are both, positive and negative with respect to ground.

PESD5V0X1BQ and PESD5V0X1BT may also be used for the protection of two unidirectional data or signal lines, which have positive signal polarities with respect to ground.



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:

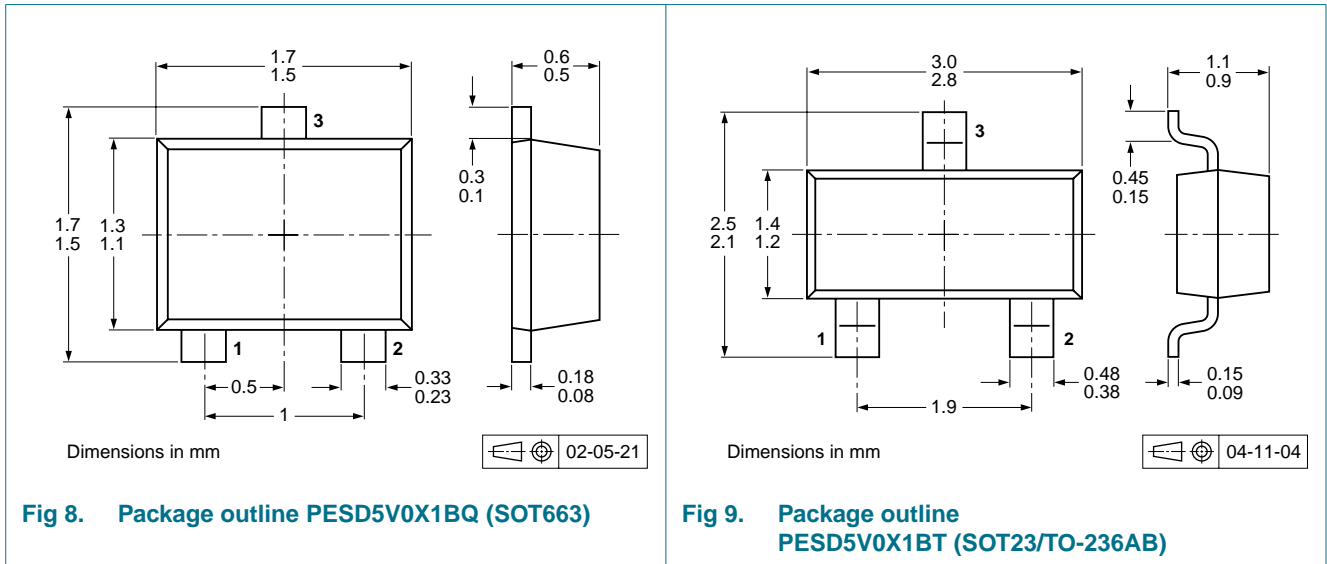
1. Place the device as close to the input terminal or connector as possible.
2. The path length between the device and the protected line should be minimized.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit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

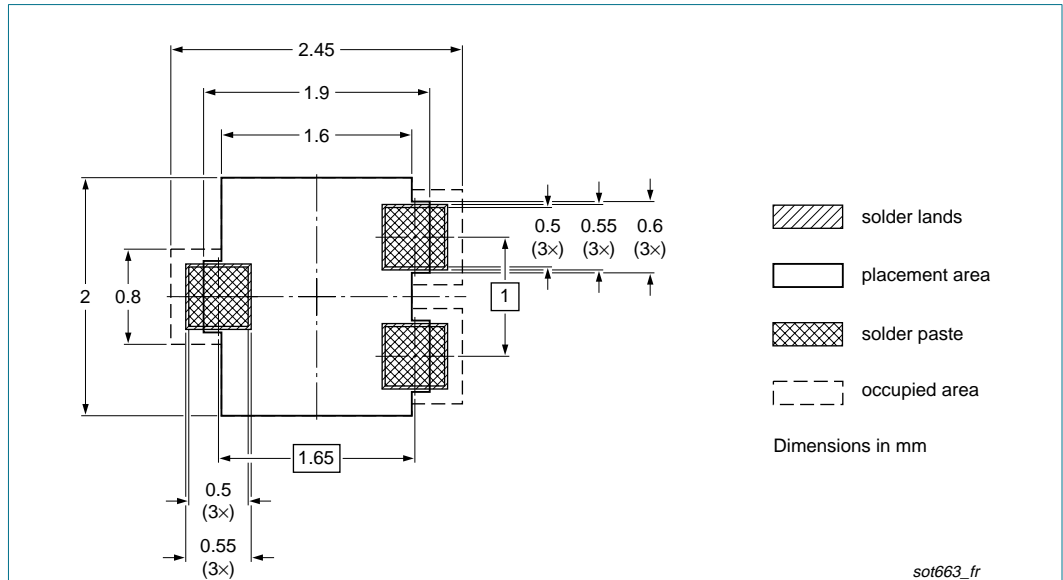
Table 10. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code.^[1]

| Type number | Package | Description | Packing quantity | | | |
|-------------|---------|--------------------------------|------------------|------|------|-------|
| | | | 3000 | 4000 | 8000 | 10000 |
| PESD5V0X1BQ | SOT663 | 2 mm pitch, 8 mm tape and reel | - | - | -315 | - |
| | | 4 mm pitch, 8 mm tape and reel | - | -115 | - | - |
| PESD5V0X1BT | SOT23 | 4 mm pitch, 8 mm tape and reel | -215 | - | - | -235 |

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

11. Soldering



Reflow soldering is the only recommended soldering method.

Fig 10. Reflow soldering footprint PESD5V0X1BQ (SOT663)

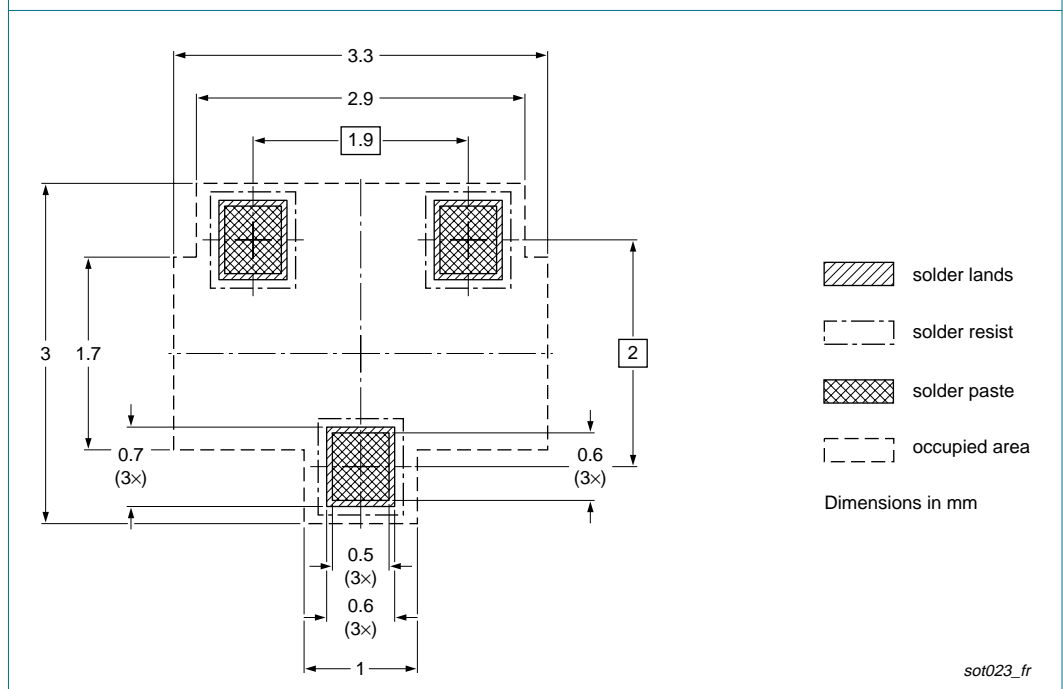
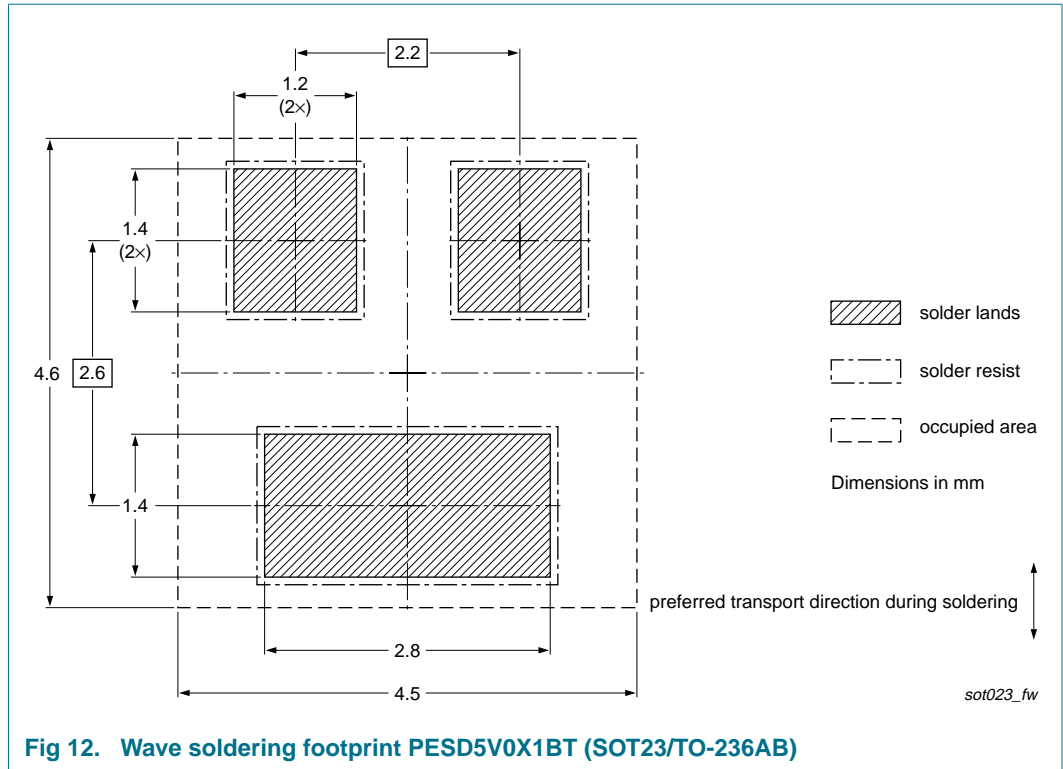


Fig 11. Reflow soldering footprint PESD5V0X1BT (SOT23/TO-236AB)



12. Revision history

Table 11. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------------------|--------------|--------------------|---------------|------------|
| PESD5V0X1BQ_PESD5V0X1BT_1 | 20081030 | Product data sheet | - | - |

13. Legal information

13.1 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. |
| 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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