



PESD5V0X1BQ

Ultra low capacitance bidirectional ESD protection diodes

28 December 2022

Product data sheet

1. General description

Ultra low capacitance bidirectional ElectroStatic Discharge (ESD) protection diodes in an ultra small and flat lead SOT666 Surface-Mounted Device (SMD) plastic package, 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.

2. Features and benefits

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

3. Applications

- USB interfaces
- Antenna protection
- Computers, peripherals
- Cellular handsets and accessories
- Portable electronics
- Communication systems
- Audio and video equipment
- High-speed data lines

4. Quick reference data

Table 1. Quick reference data

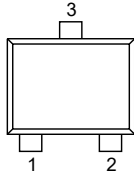
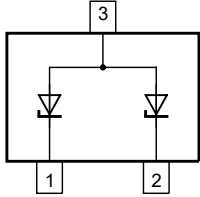
| Symbol | Parameter | Conditions | | Min | Typ | Max | Unit |
|-----------|--------------------------|---|-----|-----|-----|-----|------|
| V_{RWM} | reverse standoff voltage | $T_{amb} = 25$ °C | | - | - | 5 | V |
| C_d | diode capacitance | $f = 1$ MHz; $V_R = 0$ V; $T_{amb} = 25$ °C | [1] | - | 0.9 | 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.

5. Pinning information

Table 2. Pinning information

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----|--------|-------------------|--|--|
| 1 | K1 | cathode (diode 1) |  <p>SOT663</p> |  <p>006aaa154</p> |
| 2 | K2 | cathode (diode 2) | | |
| 3 | CA | common anode | | |

6. Ordering information

Table 3. Ordering information

| Type number | Package | | |
|-------------|---------|---|---------|
| | Name | Description | Version |
| PESD5V0X1BQ | SOT663 | plastic, surface-mounted package; 3 leads; 1 mm pitch; 1.6 mm x 1.2 mm x 0.55 mm body | SOT663 |

7. Marking

Table 4. Marking codes

| Type number | Marking code |
|-------------|--------------|
| PESD5V0X1BQ | E6 |

8. Limiting values

Table 5. Limiting values

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

| Symbol | Parameter | Conditions | | Min | Max | Unit |
|----------------------------|---------------------------------|-------------------------------------|-----|-----|-----|------|
| T_j | junction temperature | | | - | 150 | °C |
| T_{amb} | ambient temperature | | | -55 | 150 | °C |
| T_{stg} | storage temperature | | | -65 | 150 | °C |
| ESD maximum ratings | | | | | | |
| V_{ESD} | electrostatic discharge voltage | IEC 61000-4-2; contact discharge | [1] | - | 9 | kV |
| | | MIL-STD-883; human body model (HBM) | | - | 10 | kV |

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

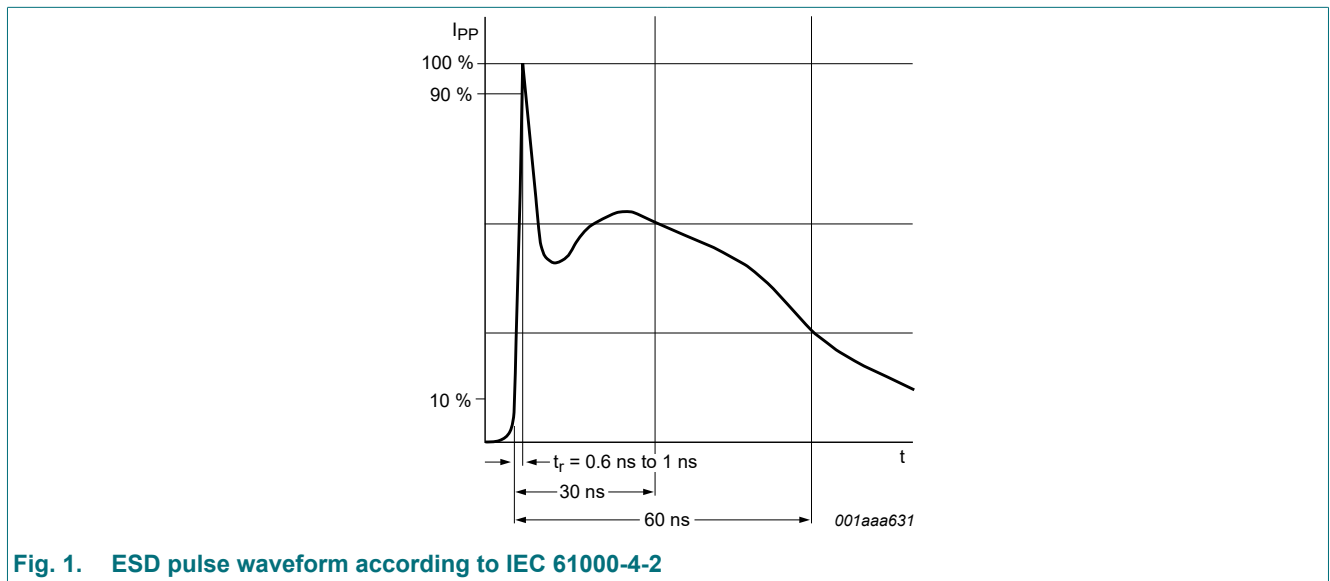


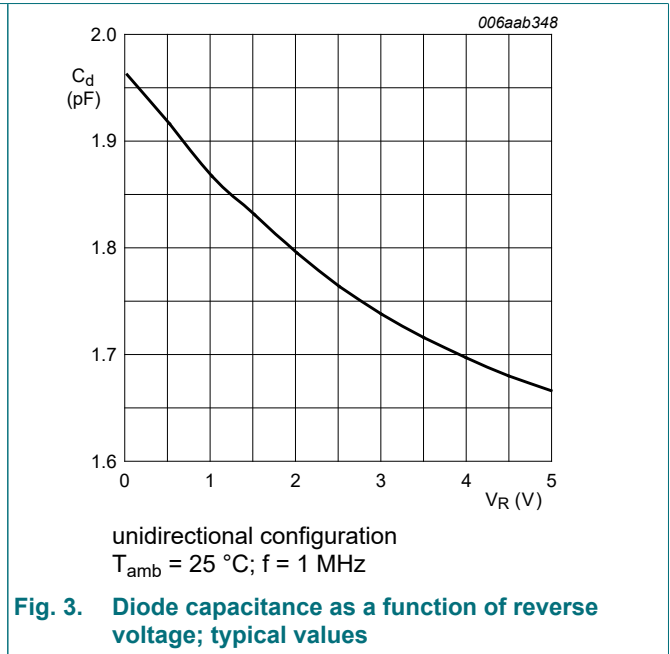
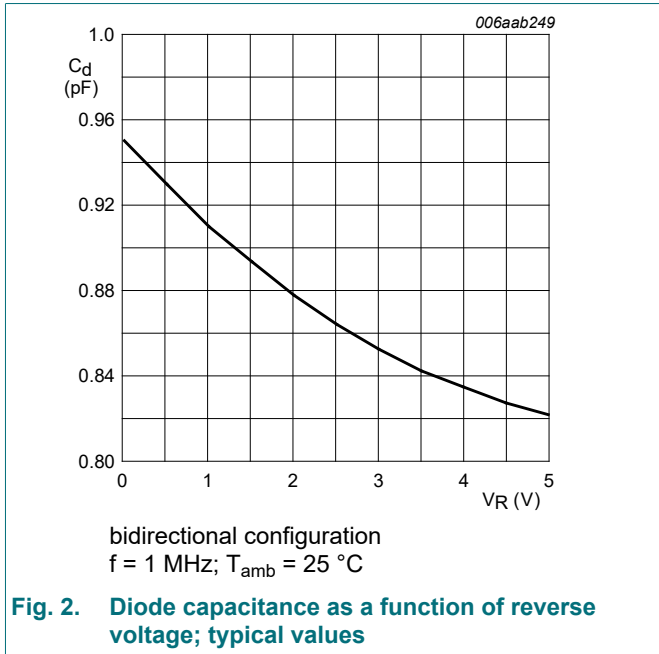
Fig. 1. ESD pulse waveform according to IEC 61000-4-2

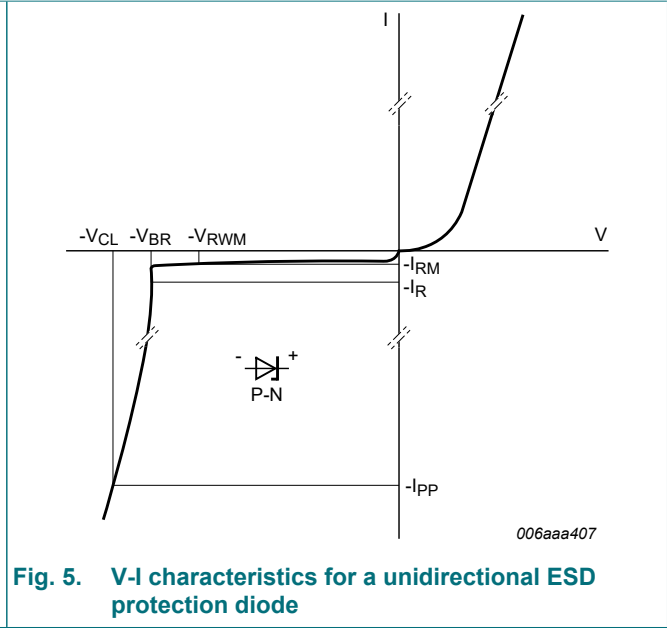
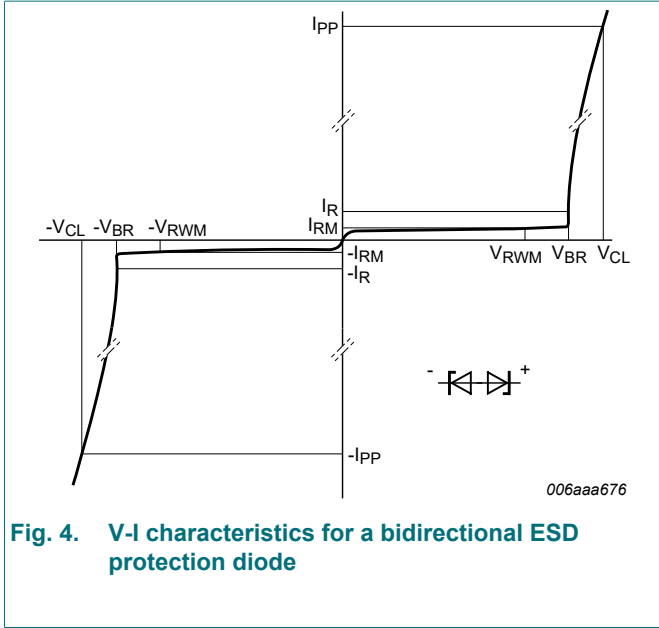
9. Characteristics

Table 6. Characteristics

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit | |
|------------|--------------------------|--|-----|-----|-----|----------|----|
| V_{RWM} | reverse standoff voltage | $T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | - | 5 | V | |
| V_{BR} | breakdown voltage | $I_R = 5\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | 5.8 | 7.5 | 9.5 | V | |
| I_{RM} | reverse leakage current | $V_{RWM} = 5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | 1 | 100 | nA | |
| C_d | diode capacitance | $f = 1\text{ MHz}; V_R = 0\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | [1] | - | 0.9 | 1.3 | pF |
| | | | [2] | - | 2 | 2.6 | pF |
| | | $f = 1\text{ MHz}; V_R = 5\text{ V}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | [1] | - | 0.8 | 1.2 | pF |
| | | | [2] | - | 1.7 | 2.3 | pF |
| R_{diff} | differential resistance | $I_R = 1\text{ mA}; T_{amb} = 25\text{ }^{\circ}\text{C}$ | - | - | 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.





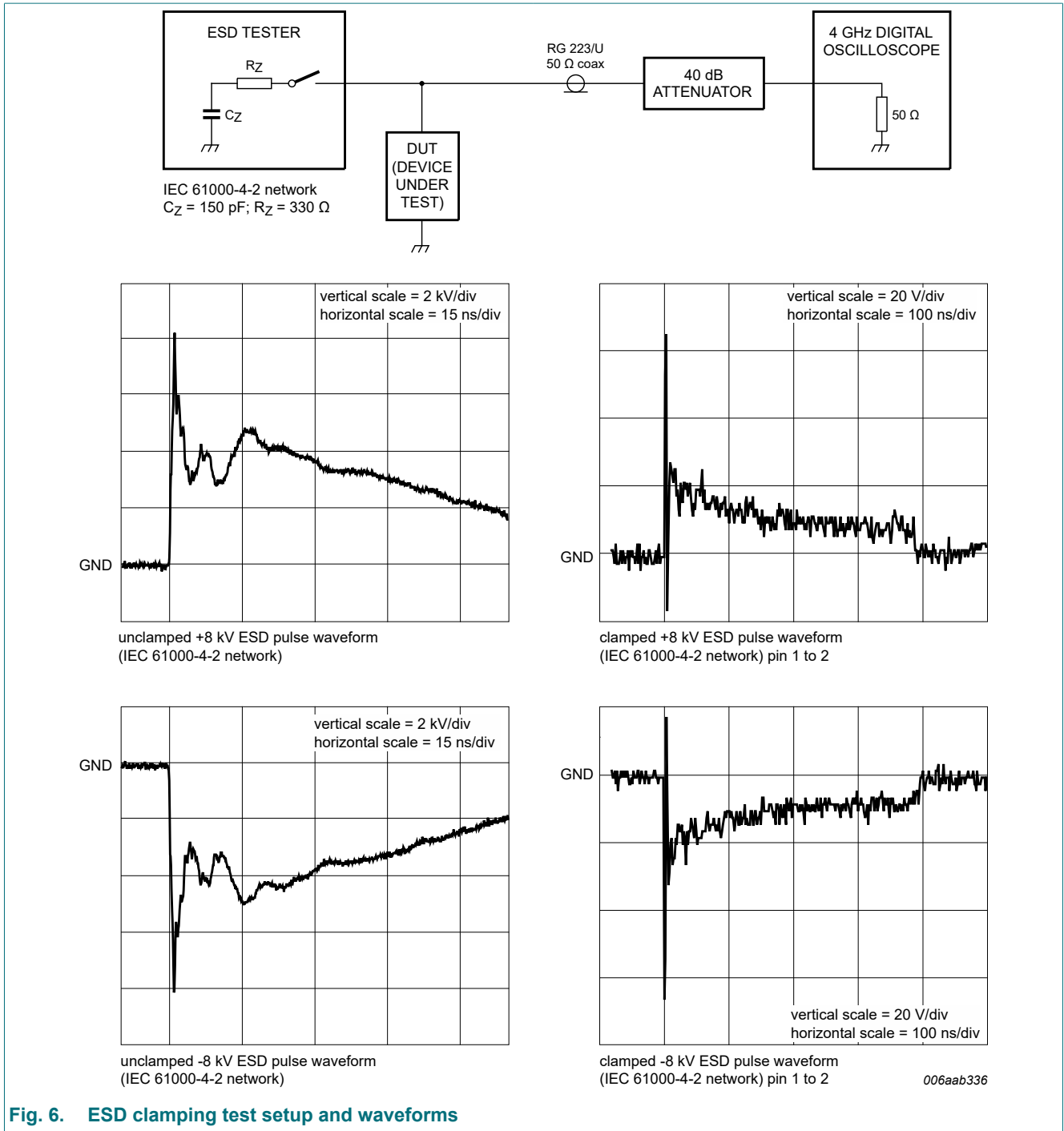


Fig. 6. ESD clamping test setup and waveforms

10. Application information

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

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

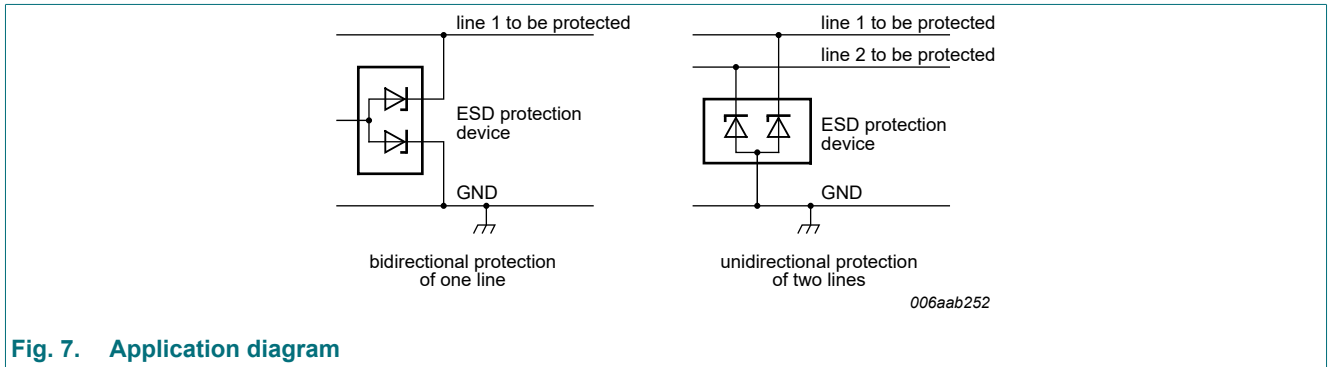


Fig. 7. Application diagram

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. 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.

11. Package outline

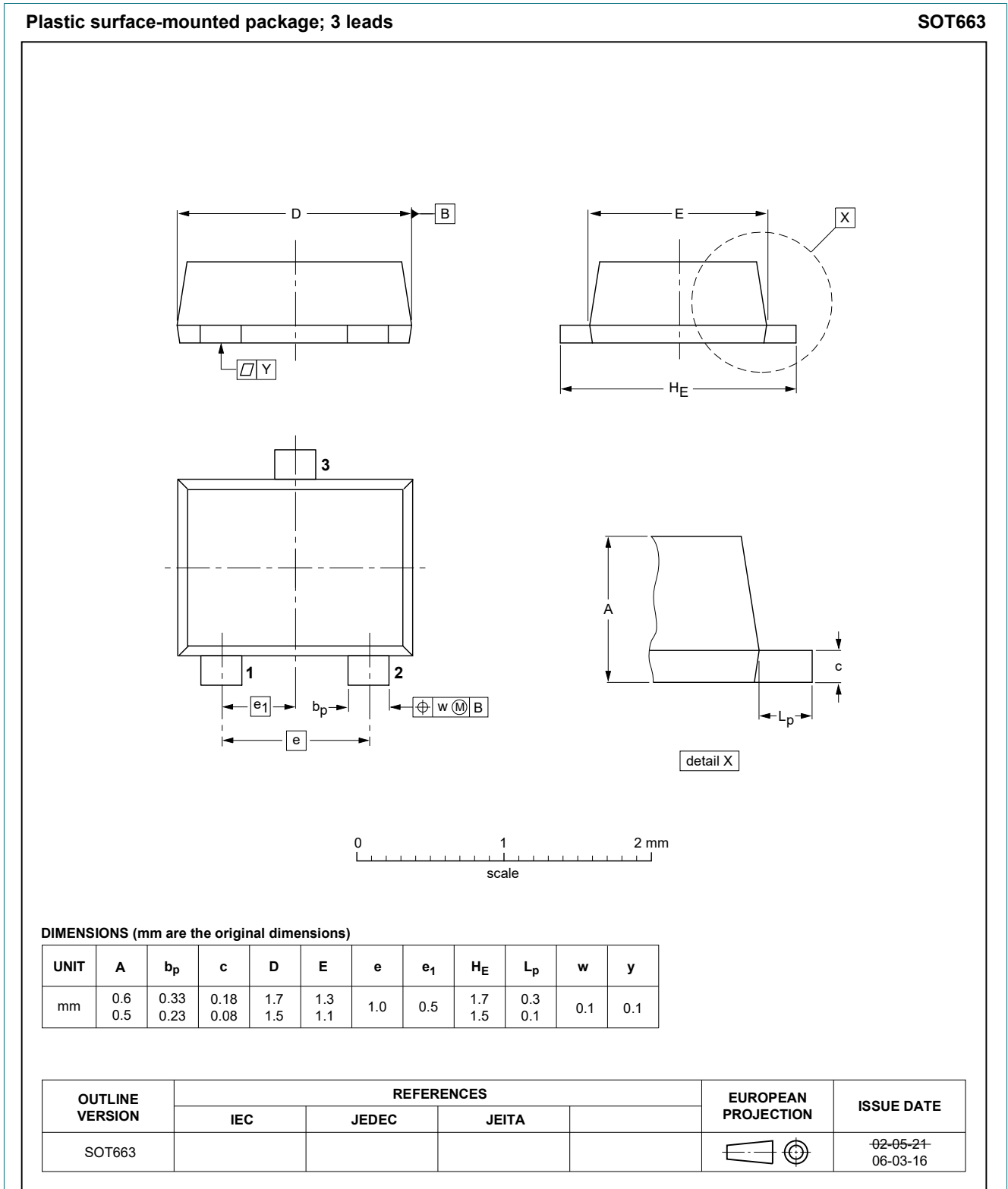


Fig. 8. Package outline SOT663

12. Soldering

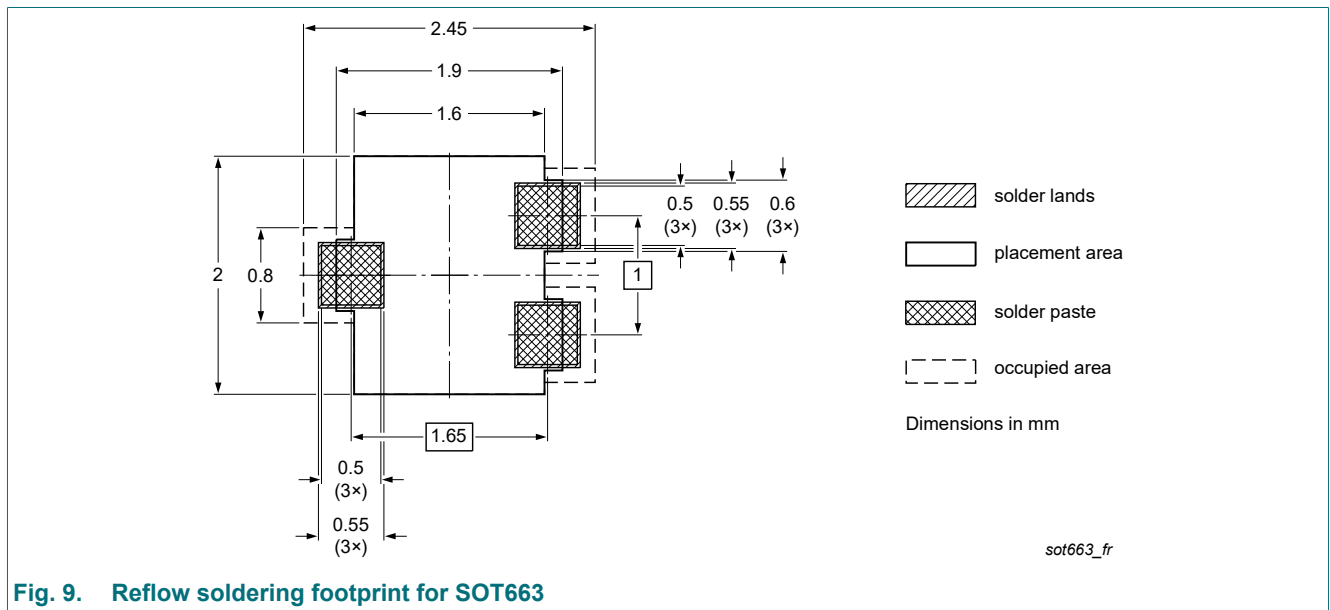


Fig. 9. Reflow soldering footprint for SOT663

13. Revision history

Table 7. Revision history

| Data sheet ID | Release date | Data sheet status | Change notice | Supersedes |
|---------------------------|---|--------------------|---------------|---------------------------|
| PESD5V0X1BQ v.2 | 20221228 | Product data sheet | - | PESD5V0X1BQ_PESD5V0X1BT_1 |
| Modifications: | <ul style="list-style-type: none"> The format of this data sheet has been redesigned to comply with the identity guidelines of Nexperia Legal texts have been adapted to the new company name where appropriate Family data sheet reduced to single type data sheet Product changed to non-automotive qualification | | | |
| PESD5V0X1BQ_PESD5V0X1BT_1 | 20081030 | Product data sheet | - | - |

14. Legal information

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".
- [3] The product status of device(s) described in this document may have changed since this document was published and may differ in case of multiple devices. The latest product status information is available on the internet at <https://www.nexperia.com>.

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