



# PESD5V0X1BCAL

Extremely low capacitance bidirectional ESD protection diode

Rev. 1 — 1 February 2012

Product data sheet

## 1. Product profile

### 1.1 General description

Extremely low capacitance bidirectional ElectroStatic Discharge (ESD) protection diode in a leadless ultra small SOD882 Surface-Mounted Device (SMD) plastic package designed to protect one signal line from the damage caused by ESD and other transients. The combination of extremely low capacitance, high ESD maximum rating and ultra small package makes the device ideal for high-speed data line protection.

### 1.2 Features and benefits

- Bidirectional ESD protection of one line
- ESD protection up to 15 kV
- Extremely low capacitance:  
 $C_d = 0.85$  pF
- IEC 61000-4-2; level 4 (ESD)
- Low clamping voltage:  $V_{CL} = 17$  V
- AEC-Q101 qualified
- Ultra low leakage current:  $I_{RM} = 1$  nA

### 1.3 Applications

- Computers and peripherals
- Communication systems
- Audio and video equipment
- Portable electronics
- Cellular handsets and accessories
- SIM card protection
- 10/100/1000 Mbit/s Ethernet
- USB, High-Definition Multimedia Interface (HDMI), FireWire

### 1.4 Quick reference data


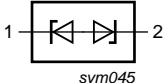
Table 1. Quick reference data

| Symbol            | Parameter                | Conditions               | Min | Typ  | Max  | Unit |
|-------------------|--------------------------|--------------------------|-----|------|------|------|
| <b>Per device</b> |                          |                          |     |      |      |      |
| $V_{RWM}$         | reverse standoff voltage |                          | -   | -    | 5.5  | V    |
| $C_d$             | diode capacitance        | $f = 1$ MHz; $V_R = 0$ V | -   | 0.85 | 0.95 | pF   |



## 2. Pinning information

Table 2. Pinning

| Pin | Description       | Simplified outline   | Graphic symbol  |
|-----|-------------------|--|---|
| 1   | cathode (diode 1) |  <p>Transparent top view</p> |  <p>sym045</p> |
| 2   | cathode (diode 2) |  |   |

## 3. Ordering information

Table 3. Ordering information

| Type number   | Package |  |         |
|---------------|---------|--|---------|
|               | Name    | Description  | Version |
| PESD5V0X1BCAL | -       | leadless ultra small plastic package; 2 terminals; body 1.0 × 0.6 × 0.5 mm | SOD882  |

## 4. Marking

Table 4. Marking codes

| Type number   | Marking code |
|---------------|--------------|
| PESD5V0X1BCAL | NN           |

## 5. Limiting values

Table 5. Limiting values

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

| Symbol            | Parameter                | Conditions         | Min   | Max  | Unit |
|-------------------|--------------------------|--------------------|-------|------|------|
| <b>Per device</b> |                          |                    |       |      |      |
| $I_{PPM}$         | rated peak pulse current | $t_p = 8/20 \mu s$ | [1] - | 1.8  | A    |
| $T_j$             | junction temperature     |                    | -     | 150  | °C   |
| $T_{amb}$         | ambient temperature      |                    | -55   | +150 | °C   |
| $T_{stg}$         | storage temperature      |                    | -65   | +150 | °C   |

[1] Device stressed with ten non-repetitive current pulses (8/20  $\mu s$  exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321).

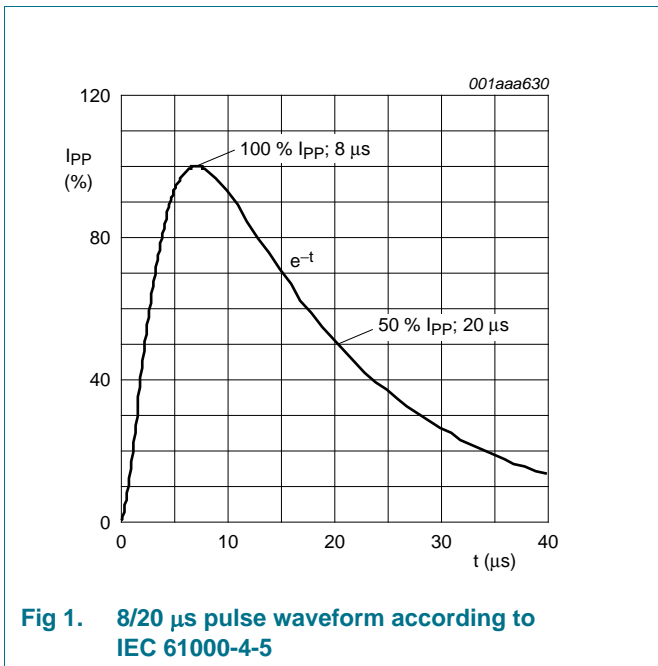
**Table 6. ESD maximum ratings**  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

| Symbol            | Parameter                       | Conditions                        | Min | Max | Unit |    |
|-------------------|---------------------------------|-----------------------------------|-----|-----|------|----|
| <b>Per device</b> |                                 |                                   |     |     |      |    |
| V <sub>ESD</sub>  | electrostatic discharge voltage | IEC 61000-4-2 (air discharge)     | [1] | -   | 15   | kV |
|                   |                                 | IEC 61000-4-2 (contact discharge) | [1] | -   | 15   | kV |
|                   |                                 | machine model                     | -   | -   | 400  | V  |
|                   |                                 | MIL-STD-883 (human body model)    | -   | -   | 10   | kV |

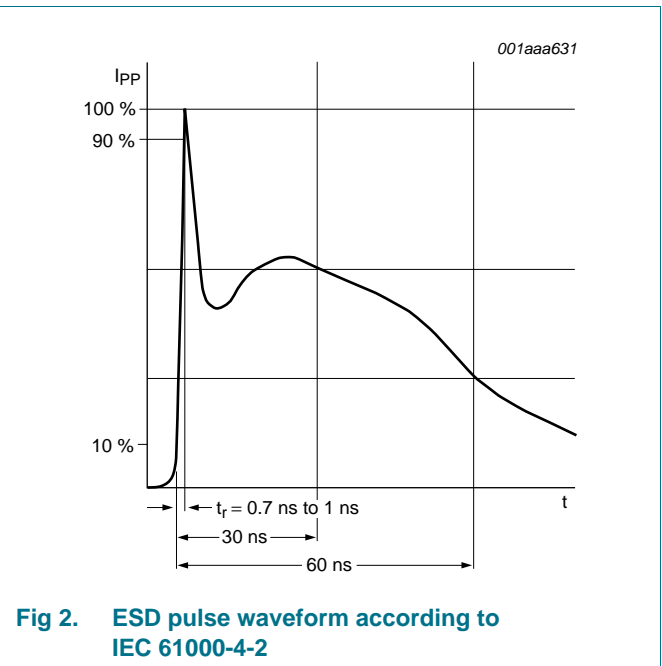
[1] Device stressed with ten non-repetitive ESD pulses.

**Table 7. ESD standards compliance**

| Standard                                 | Conditions                      |
|--|---------------------------------|
| <b>Per device</b>                        |                                 |
| 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 μs pulse waveform according to IEC 61000-4-5**



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

**6. Characteristics**

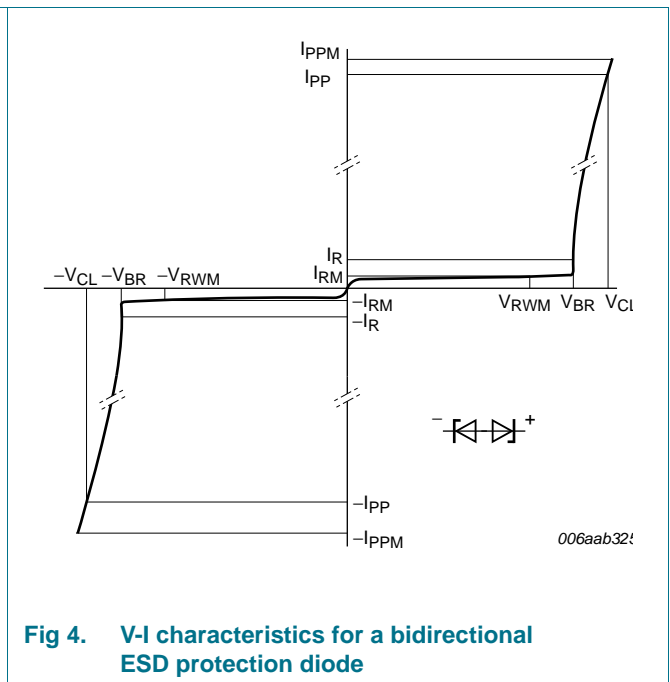
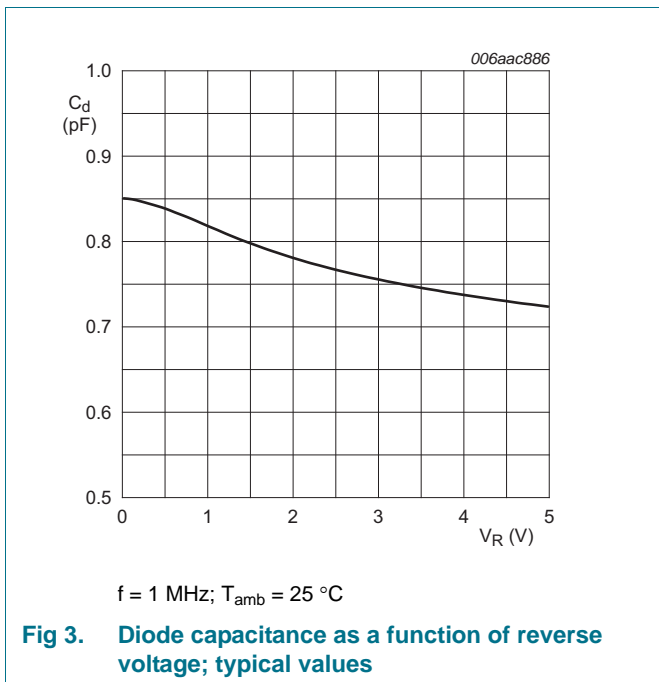
**Table 8. Characteristics**

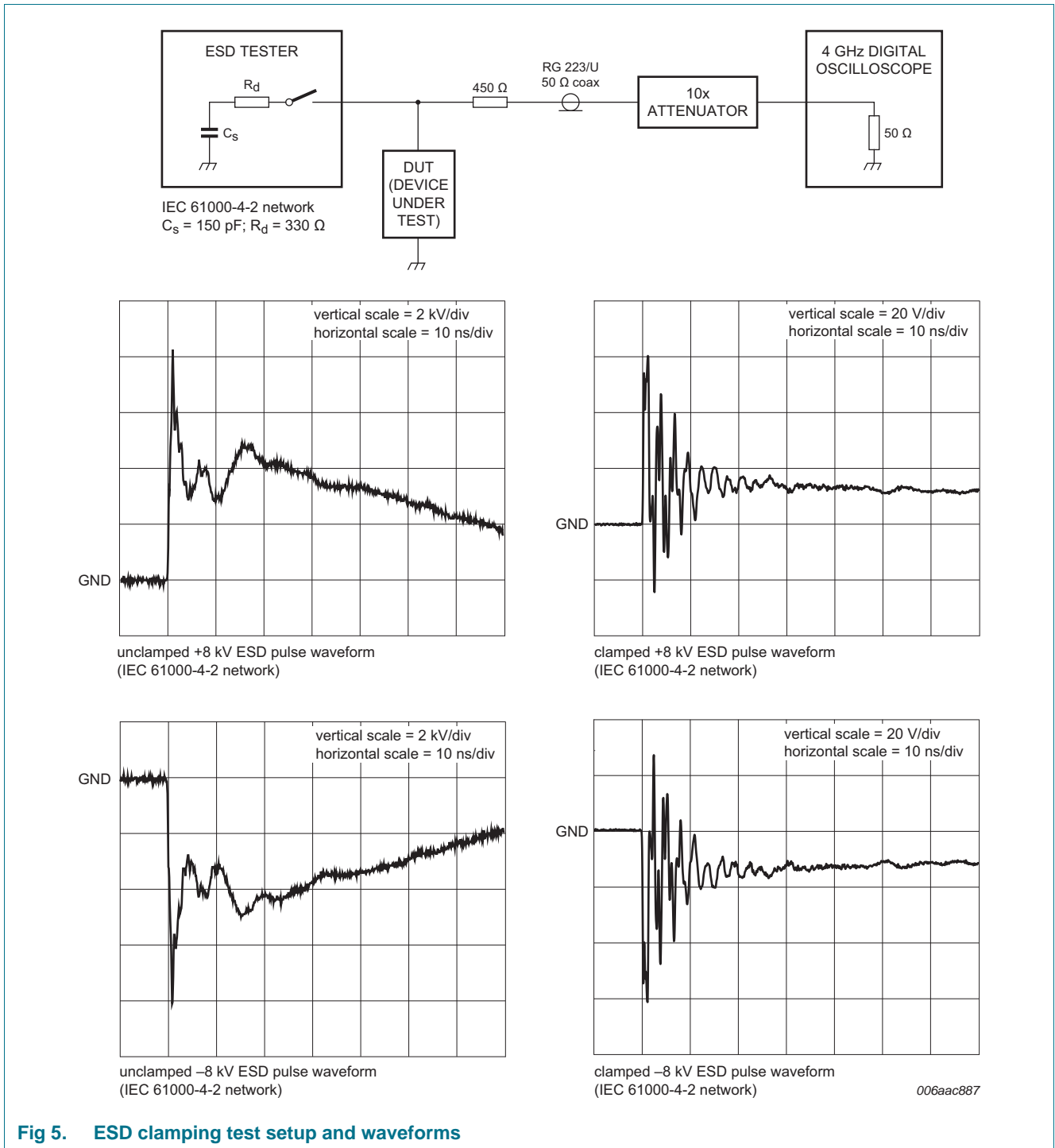
$T_{amb} = 25\text{ }^{\circ}\text{C}$  unless otherwise specified.

| Symbol            | Parameter                | Conditions                           | Min | Typ  | Max  | Unit     |
|-------------------|--------------------------|--------------------------------------|-----|------|------|----------|
| <b>Per device</b> |                          |                                      |     |      |      |          |
| $V_{RWM}$         | reverse standoff voltage |                                      | -   | -    | 5.5  | V        |
| $I_{RM}$          | reverse leakage current  | $V_{RWM} = 5.5\text{ V}$             | -   | <1   | 10   | nA       |
| $V_{BR}$          | breakdown voltage        | $I_R = 10\text{ mA}$                 | 8.1 | 9.8  | 12.3 | V        |
| $C_d$             | diode capacitance        | $f = 1\text{ MHz}; V_R = 0\text{ V}$ | -   | 0.85 | 0.95 | pF       |
| $V_{CL}$          | clamping voltage         | $I_{PPM} = 1.8\text{ A}$             | [1] | -    | 17   | V        |
| $r_{dyn}$         | dynamic resistance       | $I_R = 10\text{ A}$                  | [2] | 0.5  | -    | $\Omega$ |

[1] Device stressed with 8/20  $\mu\text{s}$  exponential decay waveform according to IEC 61000-4-5 and IEC 61643-321.

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





**Fig 5. ESD clamping test setup and waveforms**

## 7. Application information

PESD5V0X1BCAL is designed for the protection of one bidirectional data or signal line from surge pulses and ESD damage. The device is suitable on lines where the signal polarities are both, positive and negative with respect to ground.

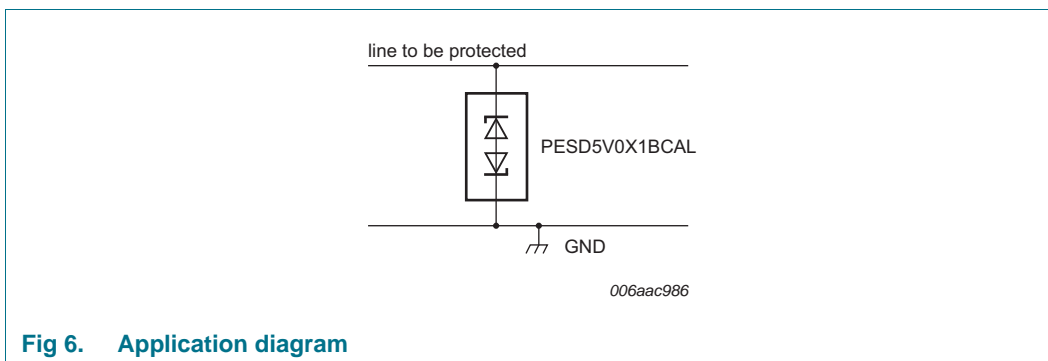


Fig 6. Application diagram

### 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:

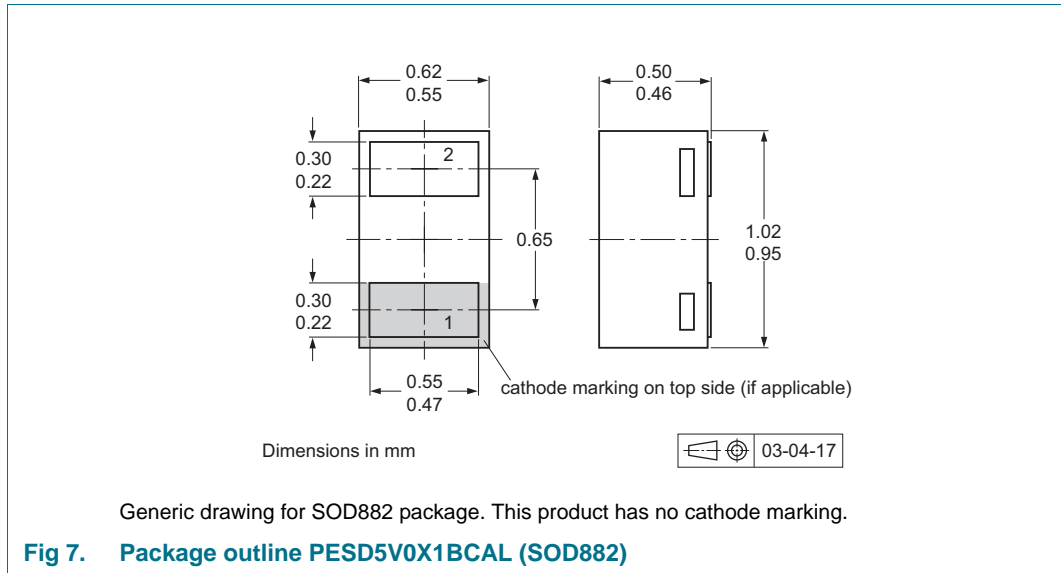
1. Place the device as close to the input terminal or connector as possible.
2. Minimize the path length between the device and the protected line.
3. Keep parallel signal paths to a minimum.
4. Avoid running protected conductors in parallel with unprotected conductors.
5. Minimize all Printed-Circuit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

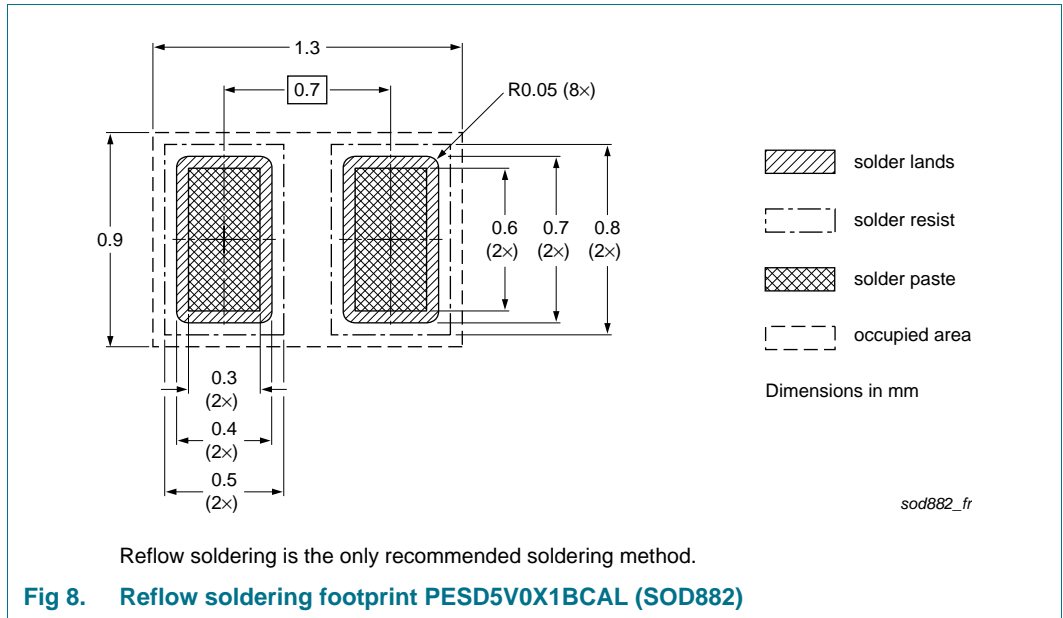
**Table 9. Packing methods**

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

| Type number   | Package | Description                    | Packing quantity |
|---------------|---------|--------------------------------|------------------|
|               |         |                                | 10000            |
| PESD5V0X1BCAL | 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**





## 12. Revision history

Table 10. Revision history

| Document ID       | Release date | Data sheet status  | Change notice | Supersedes |
|-------------------|--------------|--------------------|---------------|------------|
| PESD5V0X1BCAL v.1 | 20120201     | 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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