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Kind regards,

Team Nexperia

# PESDxL5UF; PESDxL5UV; PESDxL5UY

Low capacitance unidirectional fivefold ESD protection diode arrays

Rev. 02 — 8 January 2008

Product data sheet

## 1. Product profile

### 1.1 General description

Low capacitance unidirectional fivefold ElectroStatic Discharge (ESD) protection diode arrays in small Surface-Mounted Device (SMD) plastic packages designed to protect up to five unidirectional signal lines from the damage caused by ESD and other transients.

Table 1. Product overview

| Type number | Package |       |        | Package configuration     |
|-------------|---------|-------|--------|---------------------------|
|             | NXP     | JEITA | JEDEC  |                           |
| PESD3V3L5UF | SOT886  | -     | MO-252 | leadless ultra small      |
| PESD5V0L5UF | SOT886  | -     | MO-252 | leadless ultra small      |
| PESD3V3L5UV | SOT666  | -     | -      | ultra small and flat lead |
| PESD5V0L5UV | SOT666  | -     | -      | ultra small and flat lead |
| PESD3V3L5UY | SOT363  | SC-88 | -      | very small                |
| PESD5V0L5UY | SOT363  | SC-88 | -      | very small                |

### 1.2 Features

- ESD protection of up to five lines
- Low diode capacitance
- Max. peak pulse power:  $P_{PP} = 25 \text{ W}$
- Low clamping voltage:  $V_{CL} = 12 \text{ V}$
- Ultra low leakage current:  $I_{RM} = 5 \text{ nA}$
- ESD protection up to 20 kV
- IEC 61000-4-2; level 4 (ESD)
- IEC 61000-4-5 (surge);  $I_{PP} = 2.5 \text{ A}$

### 1.3 Applications

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

1.4 Quick reference data

Table 2. Quick reference data  
*T<sub>amb</sub> = 25 °C unless otherwise specified.*

| Symbol           | Parameter                                 | Conditions                      | Min | Typ | Max | Unit |
|------------------|-------------------------------------------|---------------------------------|-----|-----|-----|------|
| Per diode        |                                           |                                 |     |     |     |      |
| V <sub>RWM</sub> | reverse standoff voltage                  |                                 |     |     |     |      |
|                  | PESD3V3L5UF<br>PESD3V3L5UV<br>PESD3V3L5UY |                                 | -   | -   | 3.3 | V    |
|                  | PESD5V0L5UF<br>PESD5V0L5UV<br>PESD5V0L5UY |                                 | -   | -   | 5.0 | V    |
| C <sub>d</sub>   | diode capacitance                         | f = 1 MHz; V <sub>R</sub> = 0 V |     |     |     |      |
|                  | PESD3V3L5UF<br>PESD3V3L5UV<br>PESD3V3L5UY |                                 | -   | 22  | 28  | pF   |
|                  | PESD5V0L5UF<br>PESD5V0L5UV<br>PESD5V0L5UY |                                 | -   | 16  | 19  | pF   |

2. Pinning information

Table 3. Pinning

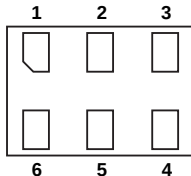
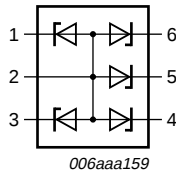
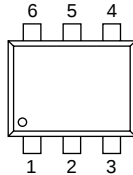
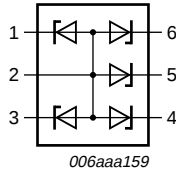
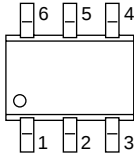
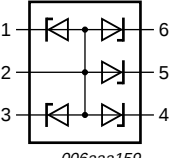
| Pin                      | Description       | Simplified outline                                                                   | Symbol                                                                                |
|--------------------------|-------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| PESD3V3L5UF; PESD5V0L5UF |                   |                                                                                      |                                                                                       |
| 1                        | cathode (diode 1) |  |  |
| 2                        | common anode      |                                                                                      |                                                                                       |
| 3                        | cathode (diode 2) |                                                                                      |                                                                                       |
| 4                        | cathode (diode 3) |                                                                                      |                                                                                       |
| 5                        | cathode (diode 4) |                                                                                      |                                                                                       |
| 6                        | cathode (diode 5) |                                                                                      |                                                                                       |
| bottom view              |                   |                                                                                      |                                                                                       |
| PESD3V3L5UV; PESD5V0L5UV |                   |                                                                                      |                                                                                       |
| 1                        | cathode (diode 1) |  |  |
| 2                        | common anode      |                                                                                      |                                                                                       |
| 3                        | cathode (diode 2) |                                                                                      |                                                                                       |
| 4                        | cathode (diode 3) |                                                                                      |                                                                                       |
| 5                        | cathode (diode 4) |                                                                                      |                                                                                       |
| 6                        | cathode (diode 5) |                                                                                      |                                                                                       |

Table 3. Pinning ...continued

| Pin                             | Description       | Simplified outline                                                                 | Symbol                                                                              |
|---------------------------------|-------------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>PESD3V3L5UY; PESD5V0L5UY</b> |                   |                                                                                    |                                                                                     |
| 1                               | cathode (diode 1) |  |  |
| 2                               | common anode      |                                                                                    |                                                                                     |
| 3                               | cathode (diode 2) |                                                                                    |                                                                                     |
| 4                               | cathode (diode 3) |                                                                                    |                                                                                     |
| 5                               | cathode (diode 4) |                                                                                    |                                                                                     |
| 6                               | cathode (diode 5) |                                                                                    |                                                                                     |

### 3. Ordering information

Table 4. Ordering information

| Type number                | Package |                                                                                                            |         |
|----------------------------|---------|------------------------------------------------------------------------------------------------------------|---------|
|                            | Name    | Description                                                                                                | Version |
| PESD3V3L5UF<br>PESD5V0L5UF | XSON6   | plastic extremely thin small outline package;<br>no leads; 6 terminals; body $1 \times 1.45 \times 0.5$ mm | SOT886  |
| PESD3V3L5UV<br>PESD5V0L5UV | -       | plastic surface-mounted package; 6 leads                                                                   | SOT666  |
| PESD3V3L5UY<br>PESD5V0L5UY | SC-88   | plastic surface-mounted package; 6 leads                                                                   | SOT363  |

### 4. Marking

Table 5. Marking codes

| Type number | Marking code <sup>[1]</sup> |
|-------------|-----------------------------|
| PESD3V3L5UF | A1                          |
| PESD5V0L5UF | A2                          |
| PESD3V3L5UV | E1                          |
| PESD5V0L5UV | E2                          |
| PESD3V3L5UY | K3*                         |
| PESD5V0L5UY | K4*                         |

- [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 |
|-------------------|----------------------|--------------------|----------|------|------|
| <b>Per diode</b>  |                      |                    |          |      |      |
| $P_{PP}$          | peak pulse power     | $t_p = 8/20 \mu s$ | [1][2] - | 25   | W    |
| $I_{PP}$          | peak pulse current   | $t_p = 8/20 \mu s$ | [1][2] - | 2.5  | A    |
| <b>Per device</b> |                      |                    |          |      |      |
| $T_j$             | junction temperature |                    | -        | 150  | °C   |
| $T_{amb}$         | ambient temperature  |                    | -65      | +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.

[2] Measured from pin 1, 3, 4, 5 or 6 to pin 2.

**Table 7. ESD maximum ratings**

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

| Symbol           | Parameter                       | Conditions                        | Min      | Max | Unit |
|------------------|---------------------------------|-----------------------------------|----------|-----|------|
| <b>Per diode</b> |                                 |                                   |          |     |      |
| $V_{ESD}$        | electrostatic discharge voltage | IEC 61000-4-2 (contact discharge) | [1][2] - | 20  | kV   |
|                  |                                 | MIL-STD-883 (human body model)    | -        | 10  | kV   |

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

[2] Measured from pin 1, 3, 4, 5 or 6 to pin 2.

**Table 8. ESD standards compliance**

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

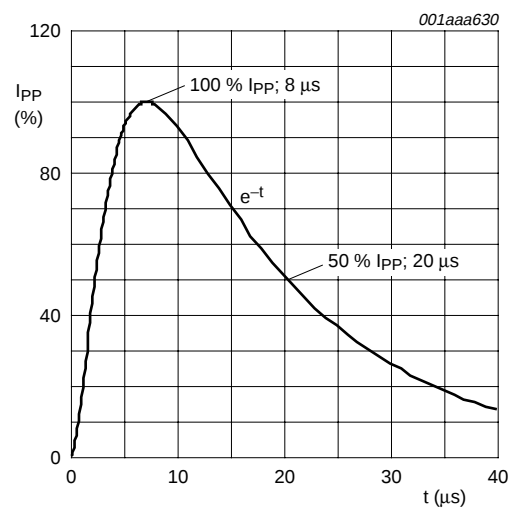


Fig 1. 8/20 μs pulse waveform according to IEC 61000-4-5

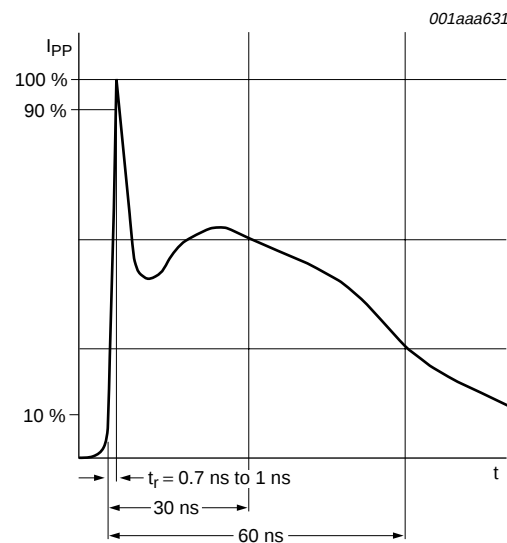


Fig 2. ESD pulse waveform according to IEC 61000-4-2

6. Characteristics

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

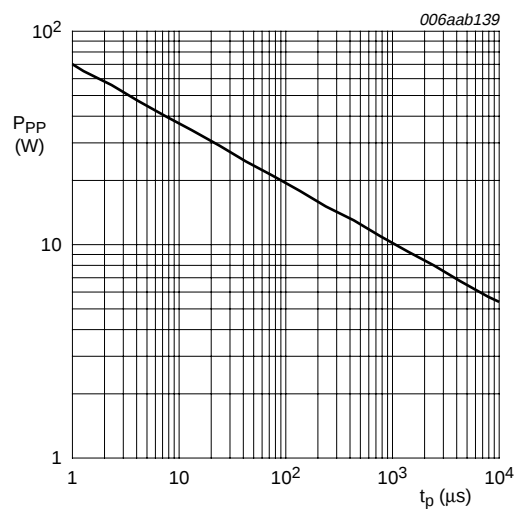
| Symbol           | Parameter                                 | Conditions               | Min | Typ | Max | Unit |
|------------------|-------------------------------------------|--------------------------|-----|-----|-----|------|
| Per diode        |                                           |                          |     |     |     |      |
| V <sub>RWM</sub> | reverse standoff voltage                  |                          |     |     |     |      |
|                  | PESD3V3L5UF<br>PESD3V3L5UV<br>PESD3V3L5UY |                          | -   | -   | 3.3 | V    |
|                  | PESD5V0L5UF<br>PESD5V0L5UV<br>PESD5V0L5UY |                          | -   | -   | 5.0 | V    |
| I <sub>RM</sub>  | reverse leakage current                   |                          |     |     |     |      |
|                  | PESD3V3L5UF<br>PESD3V3L5UV<br>PESD3V3L5UY | V <sub>RWM</sub> = 3.3 V | -   | 75  | 300 | nA   |
|                  | PESD5V0L5UF<br>PESD5V0L5UV<br>PESD5V0L5UY | V <sub>RWM</sub> = 5.0 V | -   | 5   | 25  | nA   |
| V <sub>BR</sub>  | breakdown voltage                         | I <sub>R</sub> = 1 mA    |     |     |     |      |
|                  | PESD3V3L5UF<br>PESD3V3L5UV<br>PESD3V3L5UY |                          | 5.3 | 5.6 | 5.9 | V    |
|                  | PESD5V0L5UF<br>PESD5V0L5UV<br>PESD5V0L5UY |                          | 6.4 | 6.8 | 7.2 | V    |

**Table 9. Characteristics ...continued** $T_{amb} = 25^{\circ}\text{C}$  unless otherwise specified.

| Symbol   | Parameter                                 | Conditions                                | Min                    | Typ | Max | Unit     |
|----------|-------------------------------------------|-------------------------------------------|------------------------|-----|-----|----------|
| $C_d$    | diode capacitance                         | $f = 1\text{ MHz};$<br>$V_R = 0\text{ V}$ |                        |     |     |          |
|          | PESD3V3L5UF<br>PESD3V3L5UV<br>PESD3V3L5UY |                                           | -                      | 22  | 28  | pF       |
|          | PESD5V0L5UF<br>PESD5V0L5UV<br>PESD5V0L5UY |                                           | -                      | 16  | 19  | pF       |
|          | clamping voltage                          |                                           | <a href="#">[1][2]</a> |     |     |          |
|          | PESD3V3L5UF<br>PESD3V3L5UV<br>PESD3V3L5UY | $I_{PP} = 1\text{ A}$                     | -                      | -   | 10  | V        |
|          | PESD3V3L5UF<br>PESD3V3L5UV<br>PESD3V3L5UY | $I_{PP} = 2.5\text{ A}$                   | -                      | -   | 12  | V        |
| $V_{CL}$ | PESD5V0L5UF<br>PESD5V0L5UV<br>PESD5V0L5UY | $I_{PP} = 1\text{ A}$                     | -                      | -   | 10  | V        |
|          | PESD5V0L5UF<br>PESD5V0L5UV<br>PESD5V0L5UY | $I_{PP} = 2.5\text{ A}$                   | -                      | -   | 12  | V        |
|          | differential resistance                   | $I_R = 1\text{ mA}$                       |                        |     |     |          |
|          | PESD3V3L5UF<br>PESD3V3L5UV<br>PESD3V3L5UY |                                           | -                      | -   | 200 | $\Omega$ |
|          | PESD5V0L5UF<br>PESD5V0L5UV<br>PESD5V0L5UY |                                           | -                      | -   | 100 | $\Omega$ |
|          |                                           |                                           |                        |     |     |          |

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

[2] Measured from pin 1, 3, 4, 5 or 6 to pin 2.



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

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

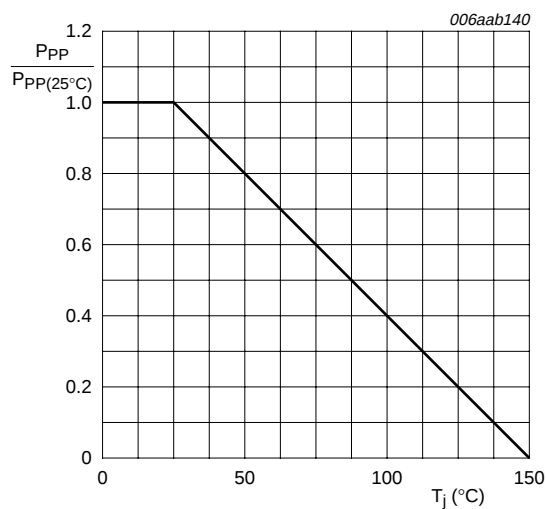
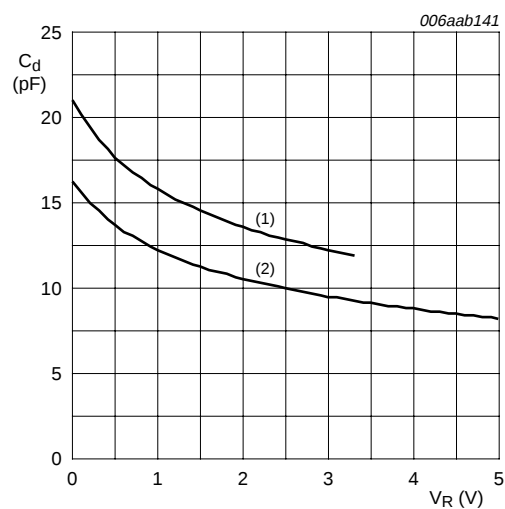


Fig 4. Relative variation of peak pulse power as a function of junction temperature; typical values



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

- (1) PESD3V3L5UF; PESD3V3L5UV; PESD3V3L5UY
- (2) PESD5V0L5UF; PESD5V0L5UV; PESD5V0L5UY

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

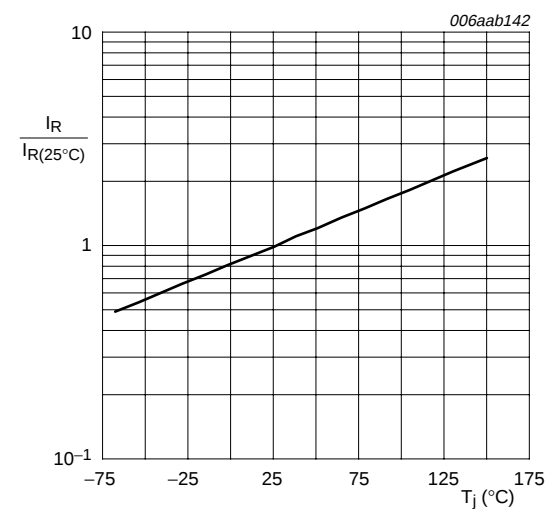
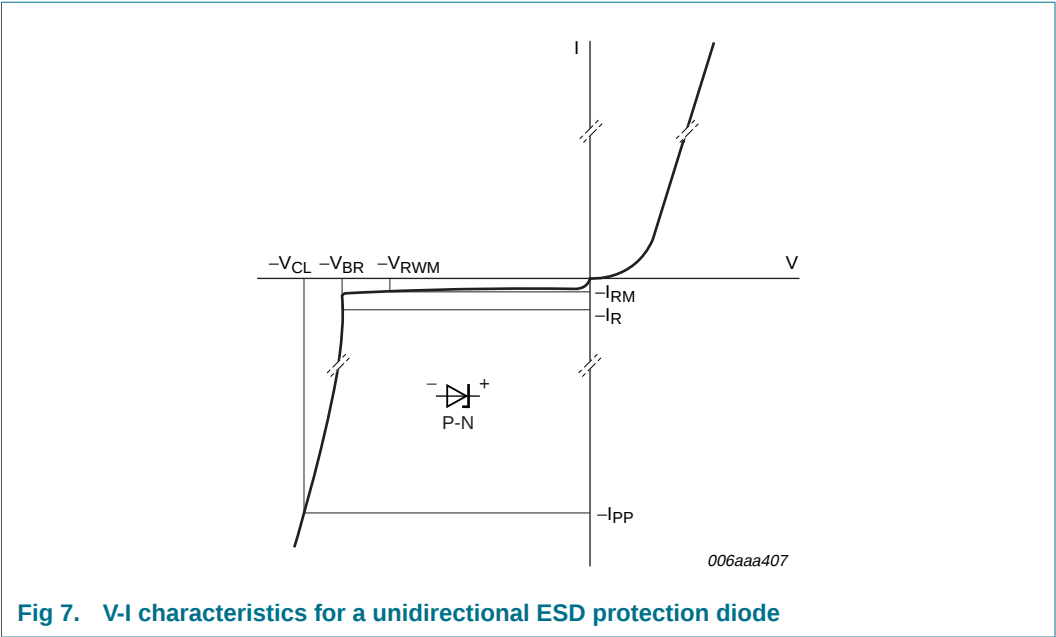


Fig 6. Relative variation of reverse current as a function of junction temperature; typical values



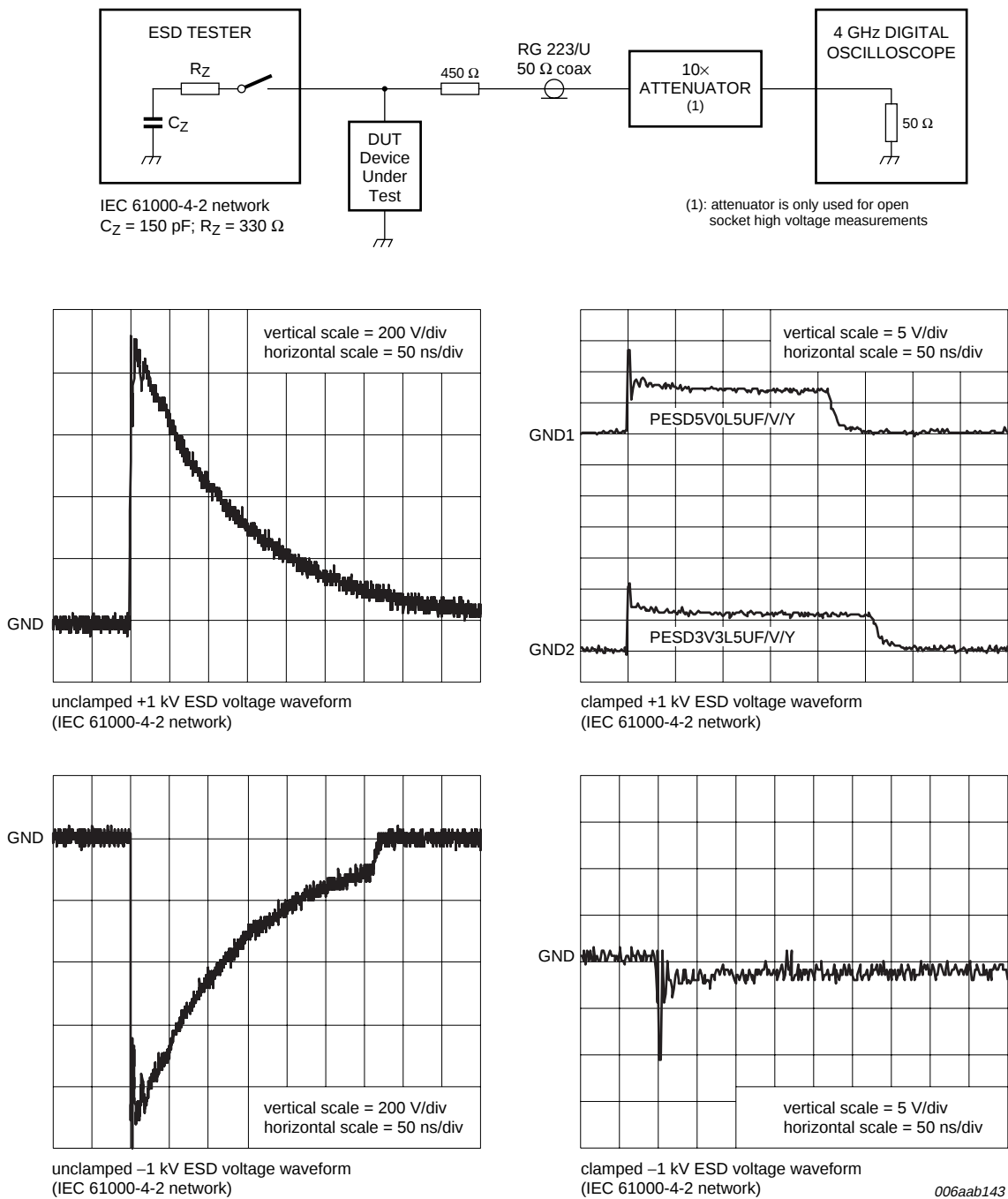
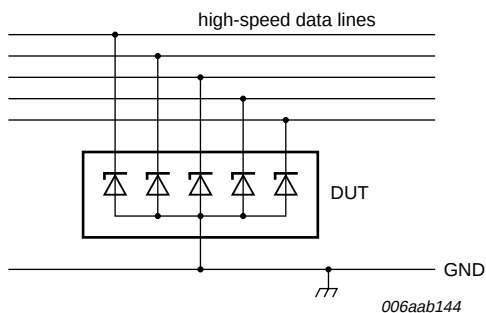


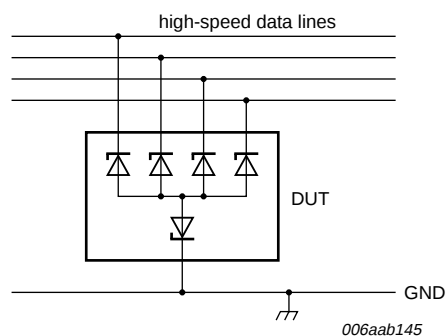
Fig 8. ESD clamping test setup and waveforms

## 7. Application information

The devices are designed for the protection of up to five unidirectional data or signal lines from the damage caused by ESD and surge pulses. The devices may be used on lines where the signal polarities are both, positive and negative with respect to ground. The devices provide a surge capability of 25 W per line for an 8/20  $\mu$ s waveform each.



**Fig 9. Typical application for unidirectional application of five lines**



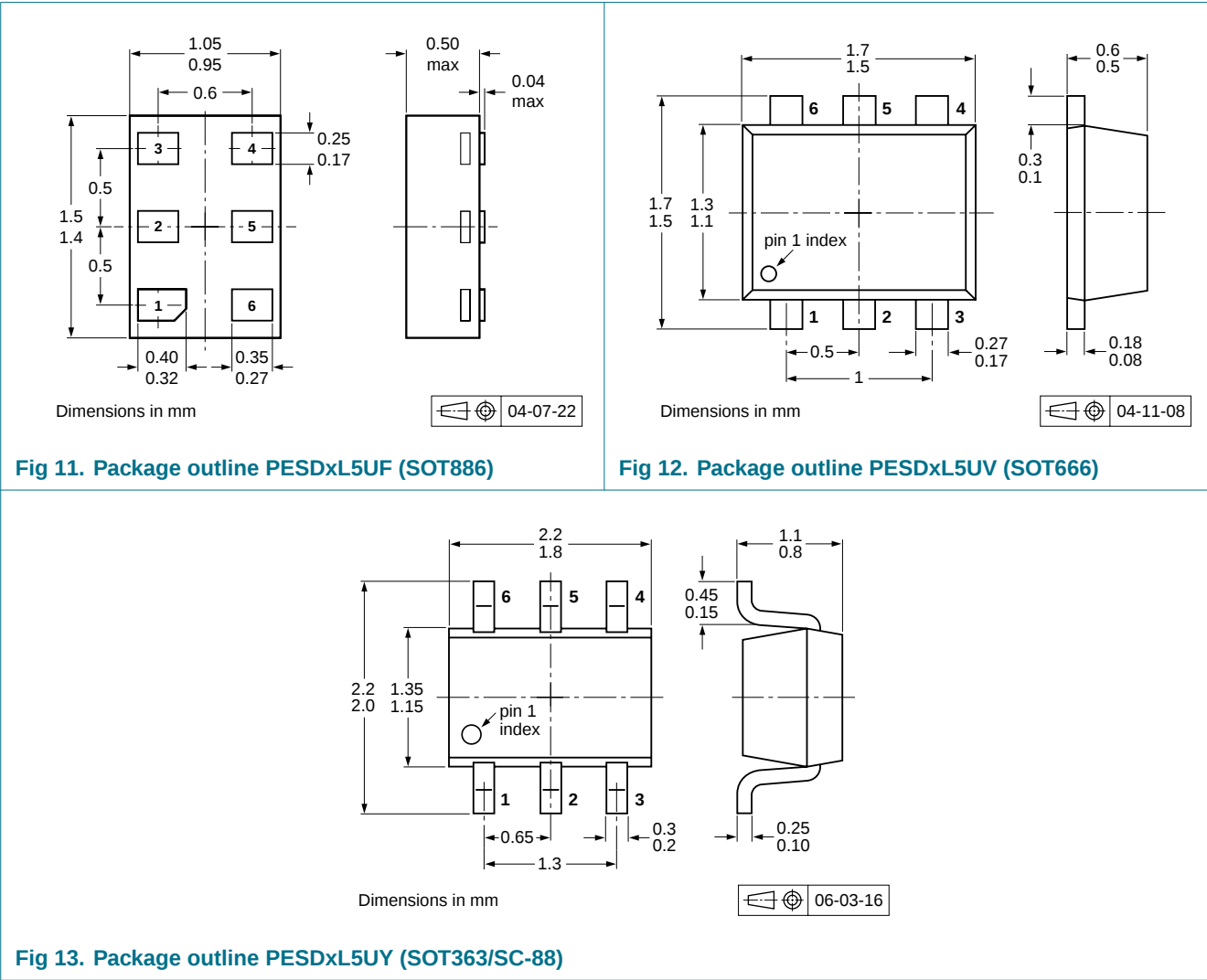
**Fig 10. Typical application for bidirectional application of four lines**

### 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.

8. Package outline



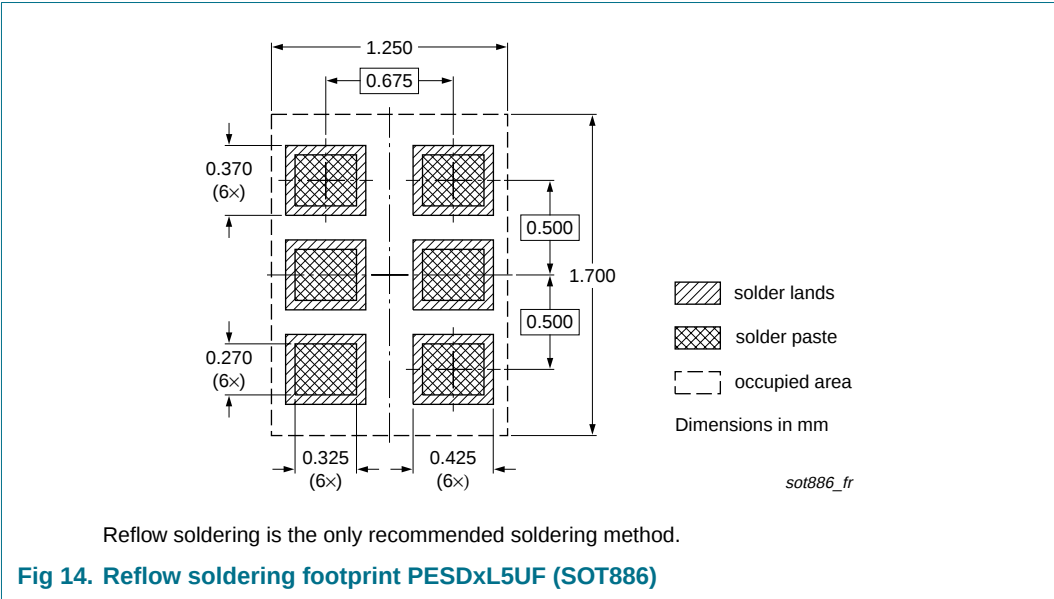
9. Packing information

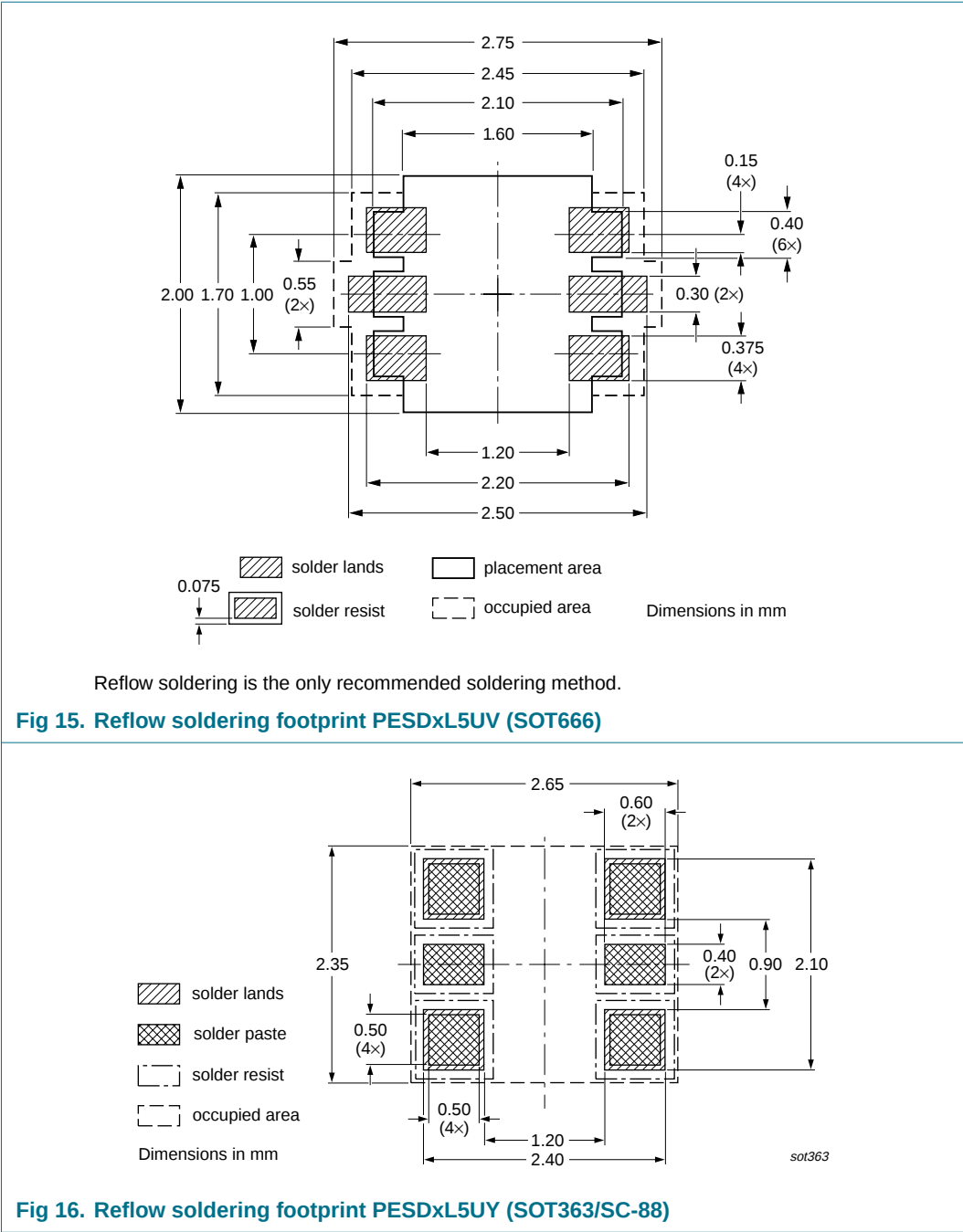
Table 10. Packing methods  
The indicated -xxx are the last three digits of the 12NC ordering code.<sup>[1]</sup>

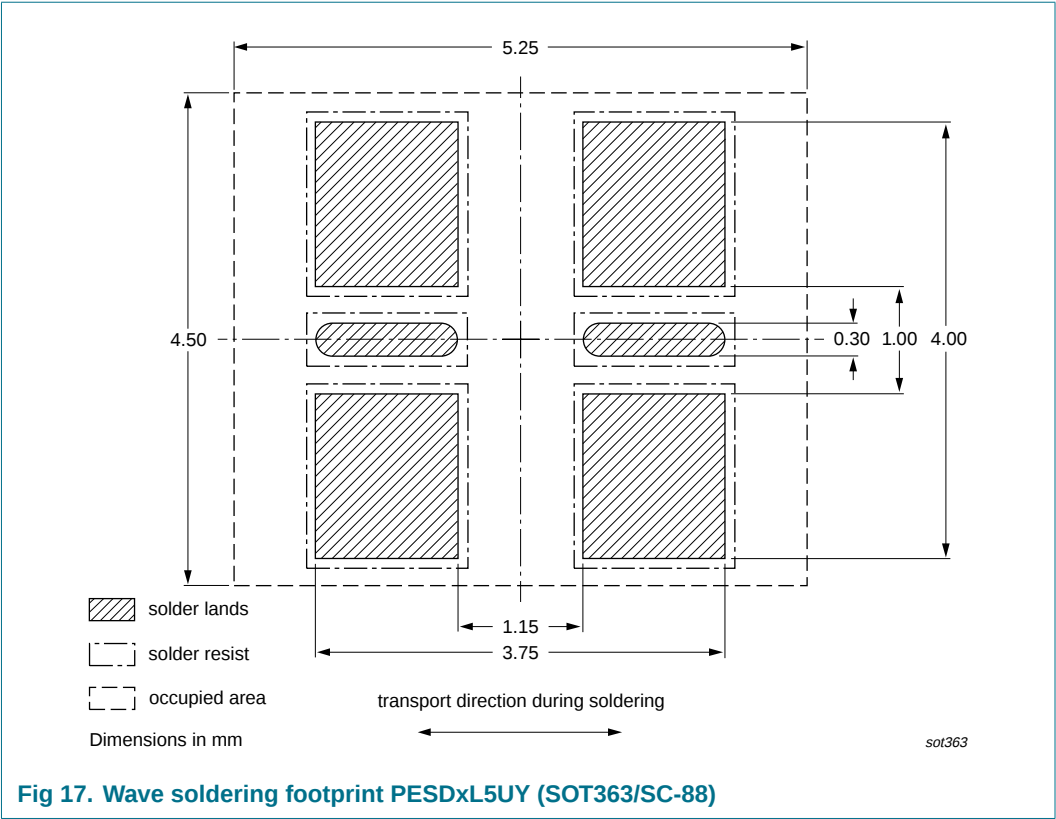
| Type number | Package | Description                        | Packing quantity    |      |      |      |       |
|-------------|---------|------------------------------------|---------------------|------|------|------|-------|
|             |         |                                    | 3000                | 4000 | 5000 | 8000 | 10000 |
| PESD3V3L5UF | SOT886  | 4 mm pitch, 8 mm tape and reel; T1 | <sup>[2]</sup> -    | -    | -115 | -    | -     |
|             |         | 4 mm pitch, 8 mm tape and reel; T4 | <sup>[3]</sup> -    | -    | -132 | -    | -     |
| PESD5V0L5UF | SOT886  | 4 mm pitch, 8 mm tape and reel; T1 | <sup>[2]</sup> -    | -    | -115 | -    | -     |
|             |         | 4 mm pitch, 8 mm tape and reel; T4 | <sup>[3]</sup> -    | -    | -132 | -    | -     |
| PESD3V3L5UV | SOT666  | 2 mm pitch, 8 mm tape and reel     | -                   | -    | -    | -315 | -     |
|             |         | 4 mm pitch, 8 mm tape and reel     | -                   | -115 | -    | -    | -     |
| PESD5V0L5UV | SOT666  | 2 mm pitch, 8 mm tape and reel     | -                   | -    | -    | -315 | -     |
|             |         | 4 mm pitch, 8 mm tape and reel     | -                   | -115 | -    | -    | -     |
| PESD3V3L5UY | SOT363  | 4 mm pitch, 8 mm tape and reel; T1 | <sup>[2]</sup> -115 | -    | -    | -    | -135  |
|             |         | 4 mm pitch, 8 mm tape and reel; T2 | <sup>[4]</sup> -125 | -    | -    | -    | -165  |
| PESD5V0L5UY | SOT363  | 4 mm pitch, 8 mm tape and reel; T1 | <sup>[2]</sup> -115 | -    | -    | -    | -135  |
|             |         | 4 mm pitch, 8 mm tape and reel; T2 | <sup>[4]</sup> -125 | -    | -    | -    | -165  |

- [1] For further information and the availability of packing methods, see [Section 13](#).  
[2] T1: normal taping  
[3] T4: 90° rotated reverse taping  
[4] T2: reverse taping

10. Soldering







## 11. Revision history

Table 11. Revision history

| Document ID                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Release date | Data sheet status     | Change notice | Supersedes                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|-----------------------|---------------|----------------------------------------------------------------|
| PESDXL5UF_V_Y_2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 20080108     | Product data sheet    | -             | PESD3V3L5UV_<br>PESD5V0L5UV_1<br>PESD3V3L5UY_<br>PESD5V0L5UY_1 |
| Modifications:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |              |                       |               |                                                                |
| <ul style="list-style-type: none"><li>• The format of this data sheet has been redesigned to comply with the new identity guidelines of NXP Semiconductors.</li><li>• Legal texts have been adapted to the new company name where appropriate.</li><li>• Type numbers PESD3V3L5UF and PESD5V0L5UF added</li><li>• <a href="#">Table 1 “Product overview”</a>: added</li><li>• <a href="#">Section 4 “Marking”</a>: marking code for PESD3V3L5UV amended</li><li>• <a href="#">Section 4 “Marking”</a>: marking code for PESD5V0L5UV amended</li><li>• <a href="#">Section 4 “Marking”</a>: marking code for PESD3V3L5UY amended</li><li>• <a href="#">Section 4 “Marking”</a>: marking code for PESD5V0L5UY amended</li><li>• <a href="#">Figure 7</a>: added</li><li>• <a href="#">Section 9 “Packing information”</a>: added</li><li>• <a href="#">Section 10 “Soldering”</a>: added</li><li>• <a href="#">Section 12 “Legal information”</a>: updated</li></ul> |              |                       |               |                                                                |
| PESD3V3L5UV_PESD5V0L5UV_1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 20040323     | Product specification | -             | -                                                              |
| PESD3V3L5UY_PESD5V0L5UY_1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 20040323     | Product specification | -             | -                                                              |

## 12. Legal information

### 12.1 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. |
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| 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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