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Kind regards,

Team Nexperia



# IP4221CZ6-S

## ESD protection for high-speed interfaces

Rev. 2 — 13 December 2012

Product data sheet

## 1. Product profile

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### 1.1 General description

The device is designed to protect high-speed interfaces such as USB 2.0, Ethernet and Digital Visual Interface (DVI) against ElectroStatic Discharge (ESD).

The device includes four high-level ESD protection diode structures for high-speed signal lines and is encapsulated in a leadless ultra small DFN1410-6 (SOT886) plastic package.

Special diode configuration protects all signal lines and offers ultra low line capacitance of only 1 pF. The rail-to-rail diodes are connected to the Zener diode which allows ESD protection to be independent of supply voltage.

### 1.2 Features and benefits

- System ESD protection for high-speed data lines such as USB 2.0, Ethernet and DVI
- All signal lines with integrated rail-to-rail clamping diodes for downstream ESD protection of  $\pm 8$  kV according to IEC 61000-4-2, level 4
- Line capacitance of only 1 pF for each channel
- Leadless ultra small DFN1410-6 package:  $1 \times 1.45 \times 0.5$  mm; pitch 0.5 mm

### 1.3 Applications

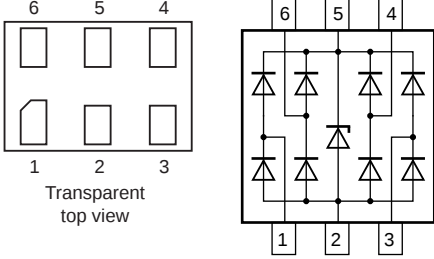
The device is designed for high-speed receiver and transmitter port protection:

- Mobile phones, smartphones and handsets
- TVs and monitors
- DVD recorders and players
- Notebooks, mother boards, graphic cards and ports
- Set-top boxes and game consoles



2. Pinning information

Table 1. Pinning

| Pin | Symbol          | Description    | Simplified outline                                                                  | Graphic symbol |
|-----|-----------------|----------------|-------------------------------------------------------------------------------------|----------------|
| 1   | I/O 1           | ESD protection |  |                |
| 2   | GND             | ground         |                                                                                     |                |
| 3   | I/O 2           | ESD protection |                                                                                     |                |
| 4   | I/O 3           | ESD protection |                                                                                     |                |
| 5   | V <sub>CC</sub> | supply voltage |                                                                                     |                |
| 6   | I/O 4           | ESD protection |                                                                                     |                |

Transparent top view

001aag273

3. Ordering information

Table 2. Ordering information

| Type number | Package   |                                                                                             |         |
|-------------|-----------|---------------------------------------------------------------------------------------------|---------|
|             | Name      | Description                                                                                 | Version |
| IP4221CZ6-S | DFN1410-6 | plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm | SOT886  |

4. Marking

Table 3. Marking codes

| Type number | Marking code |
|-------------|--------------|
| IP4221CZ6-S | 1S           |

5. Limiting values

Table 4. Limiting values

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

| Symbol           | Parameter                       | Conditions                                                    | Min  | Max  | Unit |
|------------------|---------------------------------|---------------------------------------------------------------|------|------|------|
| V <sub>I</sub>   | input voltage                   |                                                               | −0.5 | +5.5 | V    |
| V <sub>ESD</sub> | electrostatic discharge voltage | IEC 61000-4-2, level 4; <a href="#">[1]</a> contact discharge | −8   | +8   | kV   |
| T <sub>stg</sub> | storage temperature             |                                                               | −55  | +125 | °C   |
| T <sub>amb</sub> | ambient temperature             |                                                               | −40  | +85  | °C   |

[1] All pins to ground.

## 6. Characteristics

### Table 5. Characteristics

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

| Symbol          | Parameter                          | Conditions                                                            | Min                                       | Typ | Max | Unit |
|-----------------|------------------------------------|-----------------------------------------------------------------------|-------------------------------------------|-----|-----|------|
| $C_{(I/O-GND)}$ | input/output to ground capacitance | $V_I = 0 \text{ V}$ ; $f = 1 \text{ MHz}$ ;<br>$V_{CC} = 3 \text{ V}$ | <a href="#">[1]</a> <a href="#">[2]</a> - | 1   | 1.2 | pF   |
| $I_{RM}$        | reverse leakage current            | $V_I = 3 \text{ V}$                                                   | <a href="#">[3]</a> <a href="#">[2]</a> - | -   | 100 | nA   |
| $V_{BRzd}$      | Zener diode breakdown voltage      | $I_I = 1 \text{ mA}$                                                  | <a href="#">[4]</a> 6                     | -   | 9   | V    |
| $V_F$           | forward voltage                    | $I_{test} = 10 \text{ mA}$                                            | -                                         | 0.7 | -   | V    |

[1] This parameter is guaranteed by design.

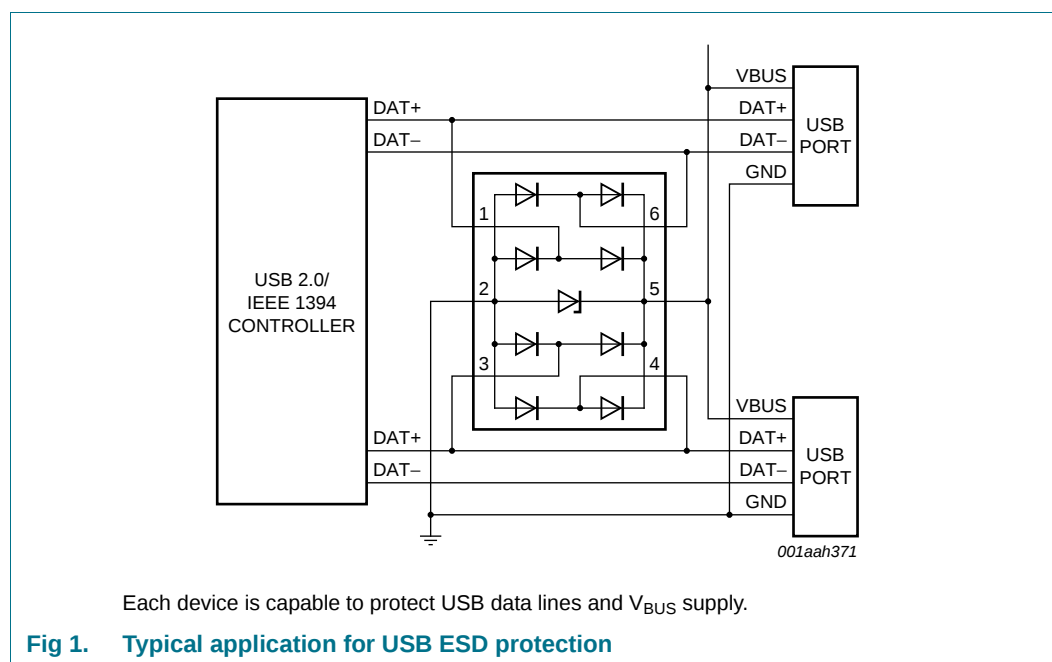
[2] Pins 1, 3, 4 and 6 are measured to ground.

[3] All pins measured to ground (pin 2).

[4] Measured from pin 5 to pin 2.

## 7. Application information

## 7.1 USB 1.1 and 2.0 protection



7.2 USB On-The-GO (OTG) protection

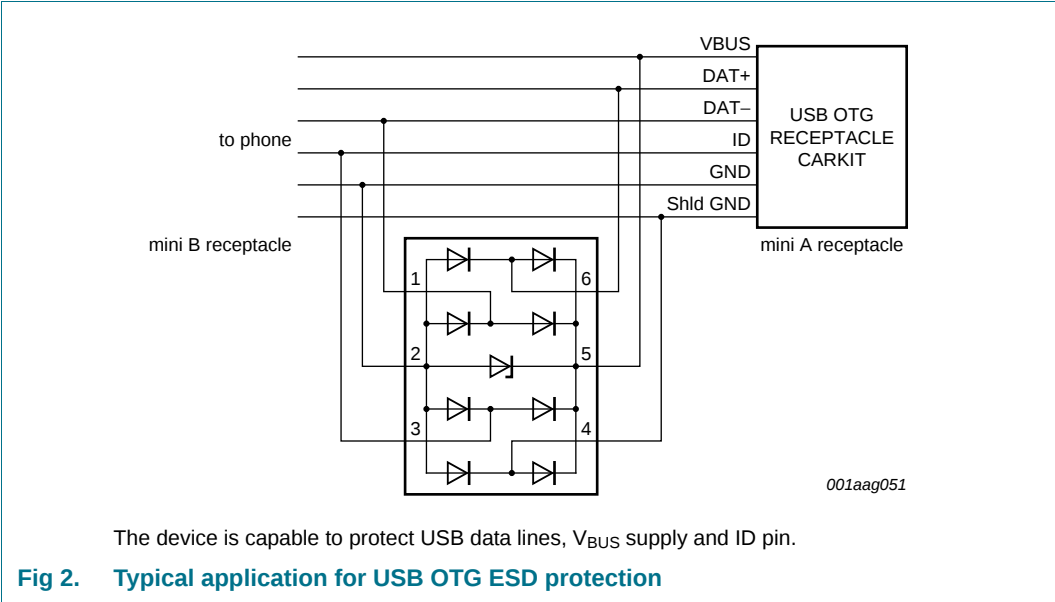


Fig 2. Typical application for USB OTG ESD protection

7.3 Universal SIM card protection

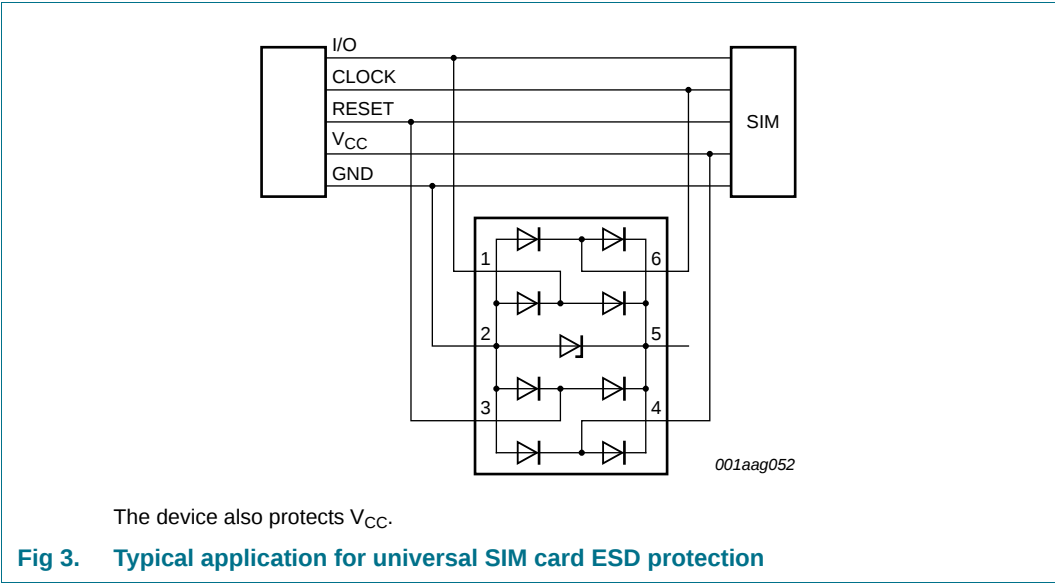


Fig 3. Typical application for universal SIM card ESD protection

7.4 IEEE 1394a/b protection

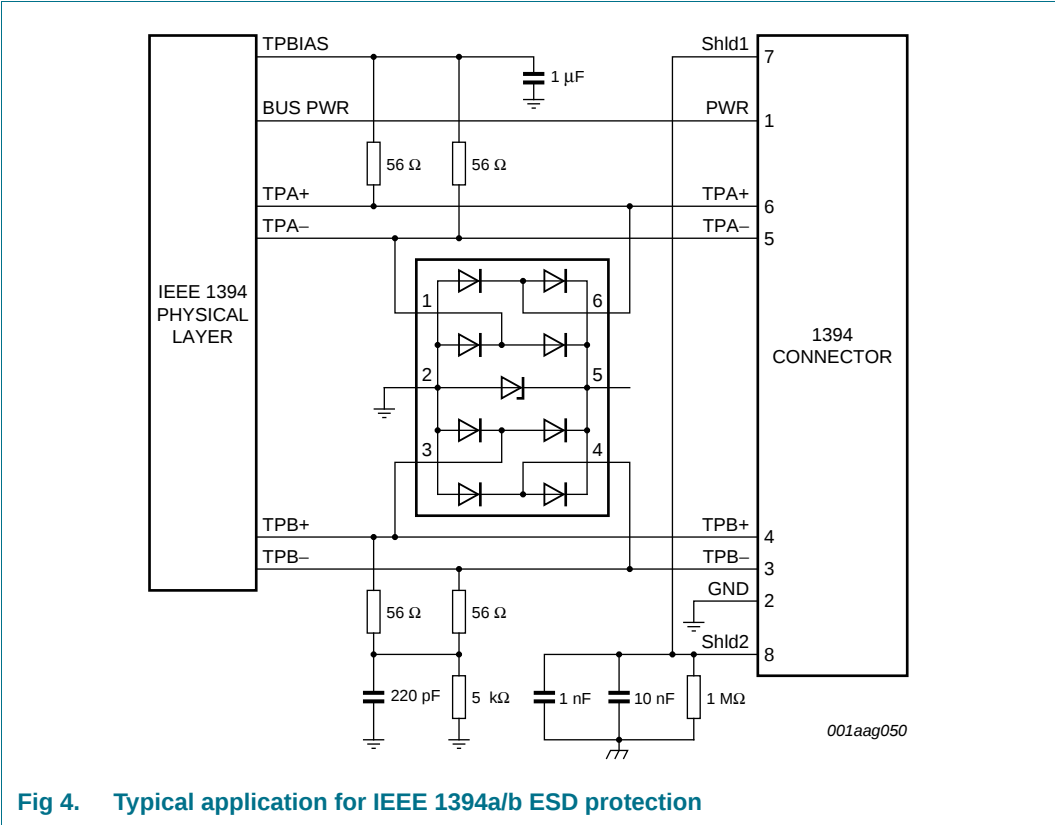


Fig 4. Typical application for IEEE 1394a/b ESD protection

7.5 Gigabit Ethernet transceiver protection

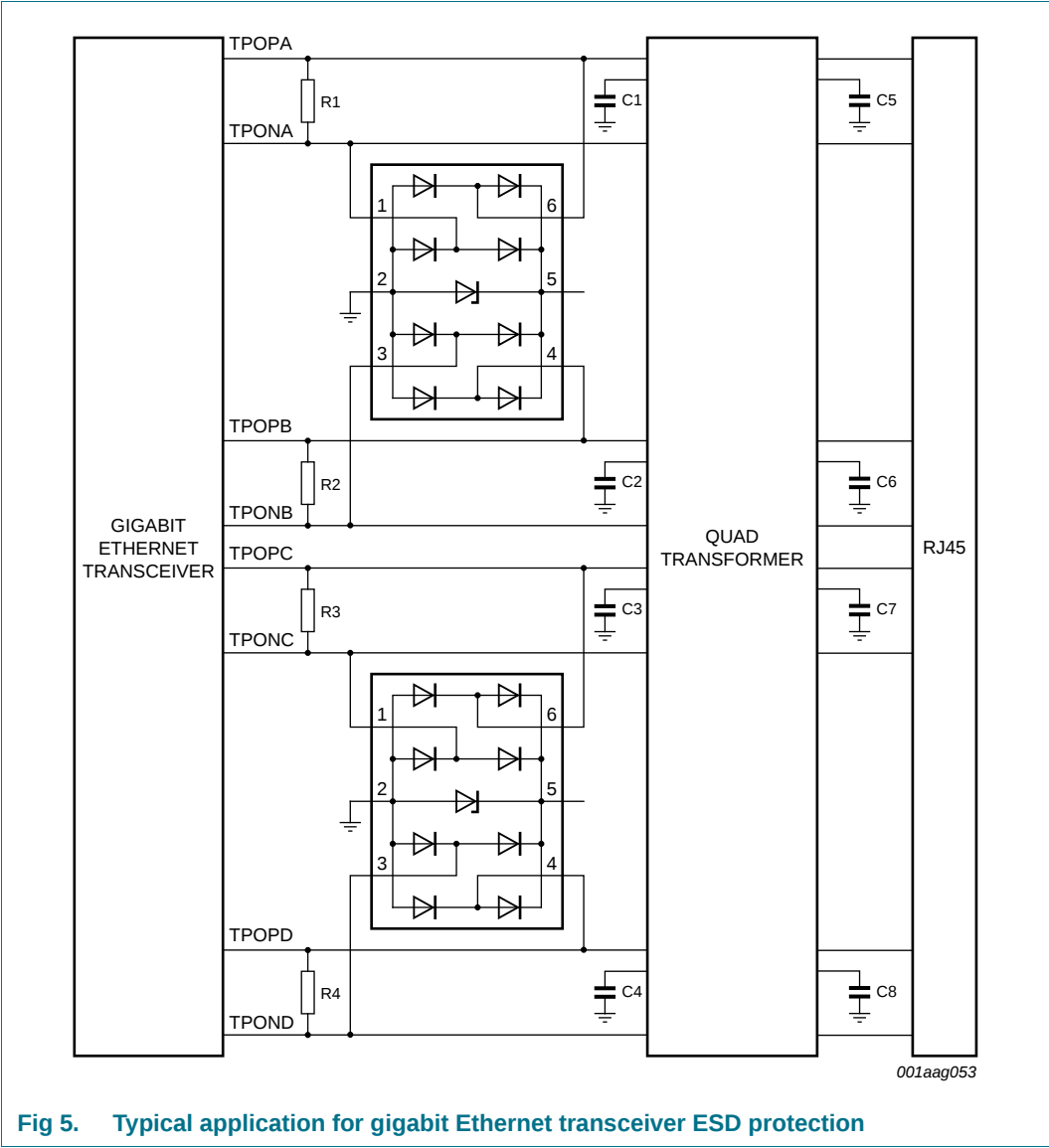
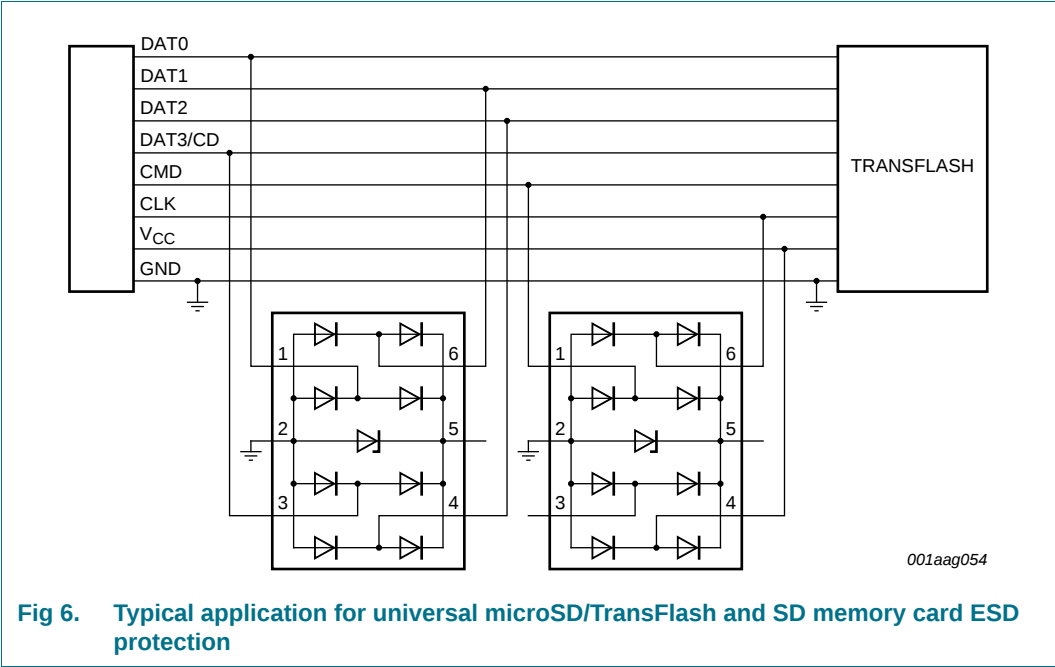
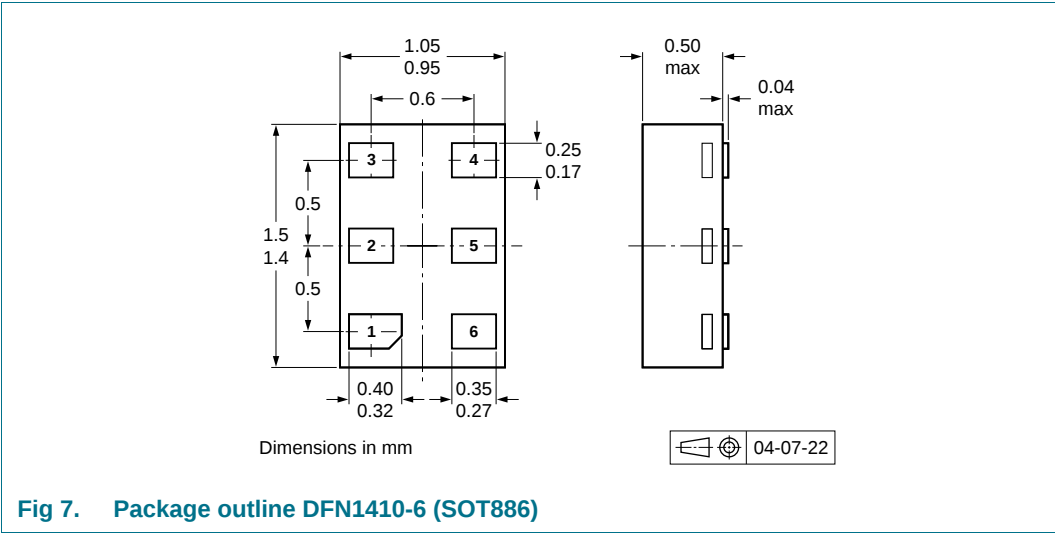


Fig 5. Typical application for gigabit Ethernet transceiver ESD protection

7.6 Universal microSD/TransFlash and SD memory card protection



8. Package outline



9. Packing information

Table 6. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code. [\[1\]](#)

| Type number | Package            | Description                                            | Packing quantity |
|-------------|--------------------|--------------------------------------------------------|------------------|
|             |                    |                                                        | 5000             |
| IP4221CZ6-S | DFN1410-6 (SOT886) | 4 mm pitch, 8 mm tape and reel; T1 <a href="#">[2]</a> | -115             |
|             |                    | 4 mm pitch, 8 mm tape and reel; T4 <a href="#">[3]</a> | -132             |

[1]

For further information and the availability of packing methods, see [Section 13](#).

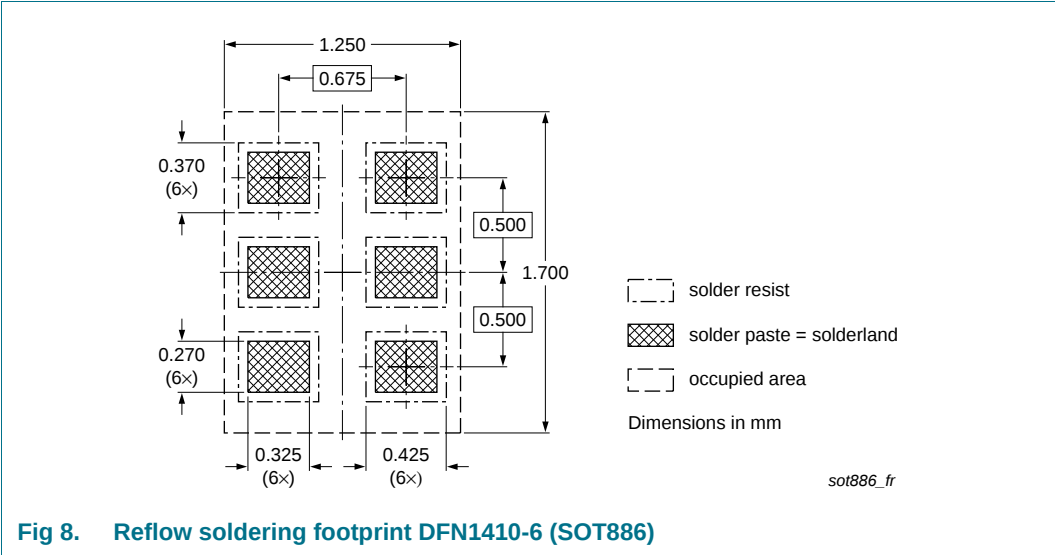
[2]

T1: normal taping

[3]

T4: reverse taping

10. Soldering



## 11. Revision history

Table 7. Revision history

| Document ID     | Release date                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Data sheet status  | Change notice | Supersedes      |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|---------------|-----------------|
| IP4221CZ6-S v.2 | 20121213                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Product data sheet | -             | IP4221CZ6-S v.1 |
| Modifications:  | <ul style="list-style-type: none"><li>• <a href="#">Section 1 "Product profile"</a>: updated</li><li>• <a href="#">Section 4 "Marking"</a>: added</li><li>• <a href="#">Section 5 "Limiting values"</a>: T<sub>amb</sub> added</li><li>• Recommended operating conditions: removed</li><li>• <a href="#">Table 5 "Characteristics"</a>: updated</li><li>• <a href="#">Section 7 "Application information"</a>: updated</li><li>• <a href="#">Section 8 "Package outline"</a>: drawing replaced with minimized package outline drawing</li><li>• <a href="#">Section 10 "Soldering"</a>: updated</li><li>• <a href="#">Section 12 "Legal information"</a>: updated</li></ul> |                    |               |                 |
| IP4221CZ6-S v.1 | 20080429                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Product data sheet | -             | -               |

## 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. |
| 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 URL <http://www.nxp.com>.

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