

IP4283CZ10 series

ESD protection for ultra high-speed interfaces

Rev. 4 — 8 April 2013

Product data sheet

1. Product profile

1.1 General description

The devices are designed to protect high-speed interfaces such as High-Definition Multimedia Interface (HDMI), DisplayPort, external Serial Advanced Technology Attachment (eSATA) and Low-Voltage Differential Signaling (LVDS) interfaces against ElectroStatic Discharge (ESD).

The devices include four high-level ESD protection diode structures for ultra high-speed signal lines. They are available in three package variants: DFN2510-10 (SOT1165-1), DFN2510A-10 (SOT1176-1) and TSSOP10 (SOT552-1).

All signal lines are protected by a special diode configuration offering ultra low line capacitance of only 0.6 pF. These diodes provide protection to downstream components from ESD voltages up to ± 8 kV contact according to IEC 61000-4-2, level 4.

1.2 Features and benefits

- System ESD protection for HDMI, DisplayPort, eSATA and LVDS
- All signal lines with integrated rail-to-rail clamping diodes for downstream ESD protection of ± 8 kV according to IEC 61000-4-2, level 4
- Matched 0.5 mm trace spacing
- Signal lines with ≤ 0.05 pF matching capacitance between signal pairs
- Line capacitance of only 0.6 pF for each channel
- Design-friendly 'pass-thru' signal routing

1.3 Applications

The devices are designed for high-speed receiver and transmitter port protection:

- TVs, monitors
- DVD recorders and players
- Notebooks, main board graphics cards and ports
- Set-top boxes and game consoles

2. Pinning information

Table 1. Pinning

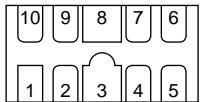
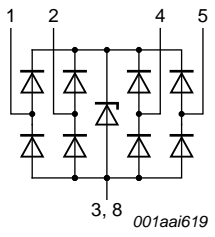
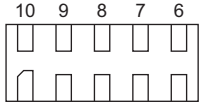
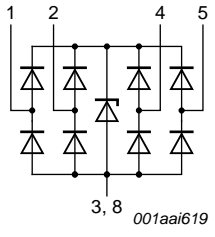
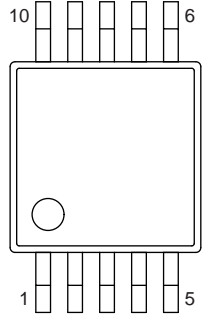
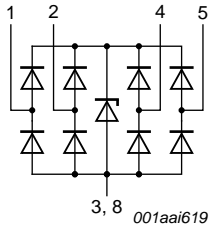
| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|-----------------------------------|-----------|-----------------------------------|---|--|
| IP4283CZ10-TBA (SOT1165-1) | | | | |
| 1 | TMDS_CH1- | negative channel 1 ESD protection |  <p>Transparent top view DFN2510-10</p> |  <p>001aai619</p> |
| 2 | TMDS_CH1+ | positive channel 1 ESD protection | | |
| 3 | GND | ground | | |
| 4 | TMDS_CH2- | negative channel 2 ESD protection | | |
| 5 | TMDS_CH2+ | positive channel 2 ESD protection | | |
| 6 | n.c. | not connected | | |
| 7 | n.c. | not connected | | |
| 8 | GND | ground | | |
| 9 | n.c. | not connected | | |
| 10 | n.c. | not connected | | |
| IP4283CZ10-TBR (SOT1176-1) | | | | |
| 1 | TMDS_CH1- | negative channel 1 ESD protection |  <p>Transparent top view DFN2510A-10</p> |  <p>001aai619</p> |
| 2 | TMDS_CH1+ | positive channel 1 ESD protection | | |
| 3 | GND | ground | | |
| 4 | TMDS_CH2- | negative channel 2 ESD protection | | |
| 5 | TMDS_CH2+ | positive channel 2 ESD protection | | |
| 6 | n.c. | not connected | | |
| 7 | n.c. | not connected | | |
| 8 | GND | ground | | |
| 9 | n.c. | not connected | | |
| 10 | n.c. | not connected | | |

Table 1. Pinning ...continued

| Pin | Symbol | Description | Simplified outline | Graphic symbol |
|---------------------------------|-----------|-----------------------------------|--|--|
| IP4283CZ10-TT (SOT552-1) | | | | |
| 1 | TMDS_CH1- | negative channel 1 ESD protection |  <p style="text-align: center;">TSSOP10</p> |  <p style="text-align: center;">001aai619</p> |
| 2 | TMDS_CH1+ | positive channel 1 ESD protection | | |
| 3 | GND | ground | | |
| 4 | TMDS_CH2- | negative channel 2 ESD protection | | |
| 5 | TMDS_CH2+ | positive channel 2 ESD protection | | |
| 6 | n.c. | not connected | | |
| 7 | n.c. | not connected | | |
| 8 | GND | ground | | |
| 9 | n.c. | not connected | | |
| 10 | n.c. | not connected | | |

3. Ordering information

Table 2. Ordering information

| Type number | Package | | |
|----------------|-------------|---|-----------|
| | Name | Description | Version |
| IP4283CZ10-TBA | DFN2510-10 | plastic extremely thin small outline package; no leads; 10 terminals; body 1 × 2.5 × 0.5 mm | SOT1165-1 |
| IP4283CZ10-TBR | DFN2510A-10 | plastic extremely thin small outline package; no leads; 10 terminals; body 1 × 2.5 × 0.5 mm | SOT1176-1 |
| IP4283CZ10-TT | TSSOP10 | plastic thin shrink small outline package; 10 leads; body width 3 mm | SOT552-1 |

4. Marking

Table 3. Marking codes

| Type number | Marking code |
|----------------|--------------|
| IP4283CZ10-TBA | 83 |
| IP4283CZ10-TBR | 83 |
| IP4283CZ10-TT | 4283 |

5. Limiting values

Table 4. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|-----------|---------------------------------|--|------|------|------|
| V_I | input voltage | | -0.5 | +5.5 | V |
| V_{ESD} | electrostatic discharge voltage | IEC 61000-4-2, level 4 [1] | | | |
| | | contact discharge | -8 | +8 | kV |
| | | air discharge | -15 | +15 | kV |
| T_{stg} | storage temperature | | -55 | +125 | °C |
| T_{amb} | ambient temperature | | -40 | +85 | °C |

[1] All pins to ground.

6. Characteristics

Table 5. Characteristics

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

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|--------------------|-----------------------------|---|------------------------|------|------|---------------|
| V_{BR} | breakdown voltage | $I_{test} = 1\text{ mA}$ | 6 | - | 9 | V |
| I_{LR} | reverse leakage current | per TMDS channel; $V = 3\text{ V}$ | - | - | 1 | μA |
| V_F | forward voltage | $I_{test} = 1\text{ mA}$ | - | 0.7 | - | V |
| C_{line} | line capacitance | $f = 1\text{ MHz}$; $V_{bias} = 2.5\text{ V}$ | [1] | - | 0.6 | pF |
| ΔC_{line} | line capacitance difference | $f = 1\text{ MHz}$; $V_{bias} = 2.5\text{ V}$ | [1] | - | 0.05 | pF |
| $C_{line(mutual)}$ | mutual line capacitance | $f = 1\text{ MHz}$; $V_{bias} = 2.5\text{ V}$ | [1][2] | - | 0.07 | pF |
| r_{dyn} | dynamic resistance | surge [3] | | | | |
| | | positive transient | - | 0.8 | - | Ω |
| | | negative transient | - | 0.85 | - | Ω |
| V_{CL} | clamping voltage | positive transient; $I_{PP} = 3.8\text{ A}$ | [3] | - | 9.5 | V |
| | | negative transient; $I_{PP} = -2.8\text{ A}$ | [3] | - | -3.2 | V |

[1] This parameter is guaranteed by design.

[2] Between signal pin and pin n.c.

[3] According to IEC 61000-4-5 (8/20 μs).

7. Application information

The devices are designed to provide high-level ESD protection for high-speed serial data buses such as HDMI, DisplayPort, eSATA and LVDS data lines.

When designing the Printed-Circuit Board (PCB), give careful consideration to impedance matching, and signal coupling.

Basic application diagrams for the ESD protection of an HDMI interface are shown in [Figure 1](#) and [2](#).

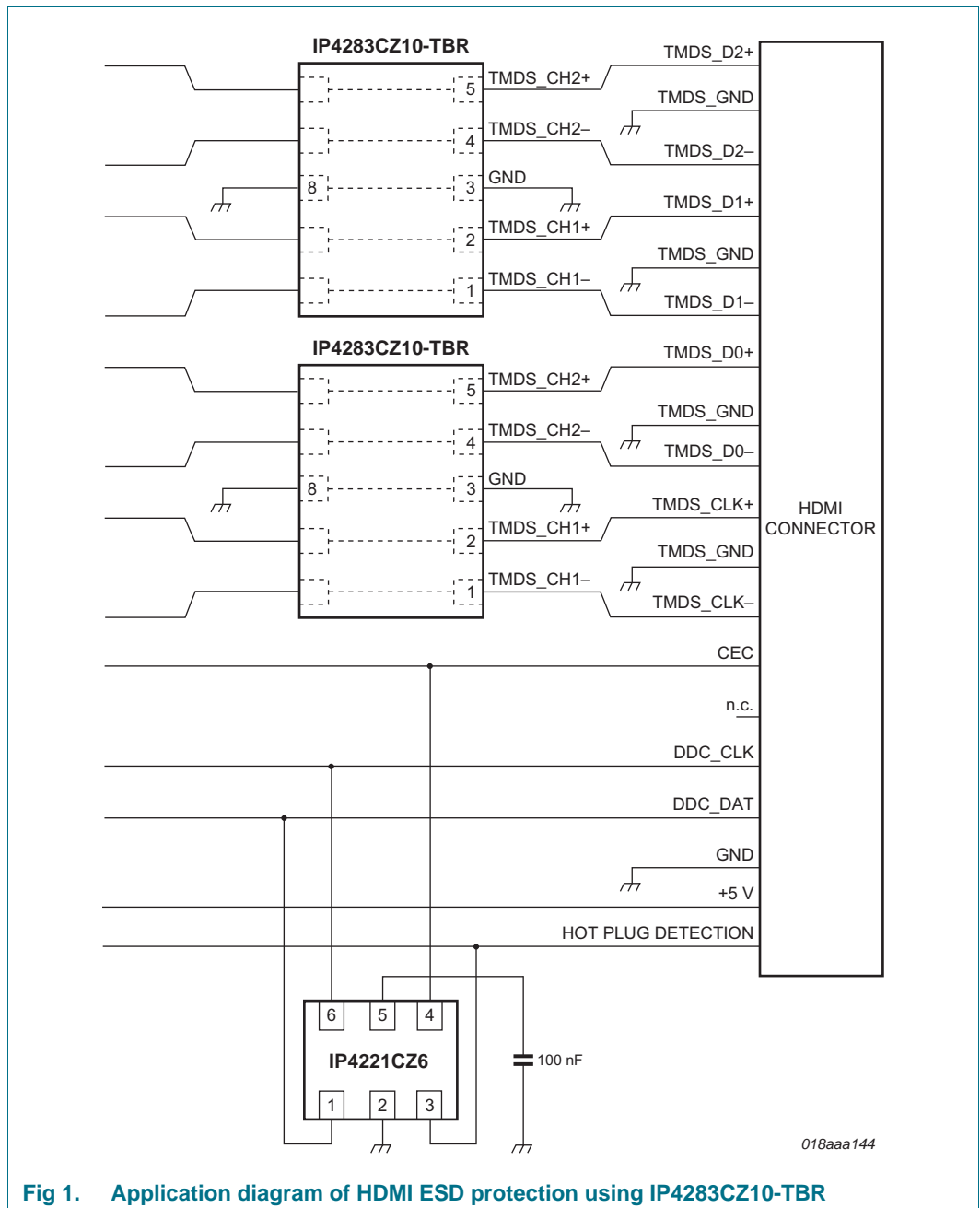


Fig 1. Application diagram of HDMI ESD protection using IP4283CZ10-TBR

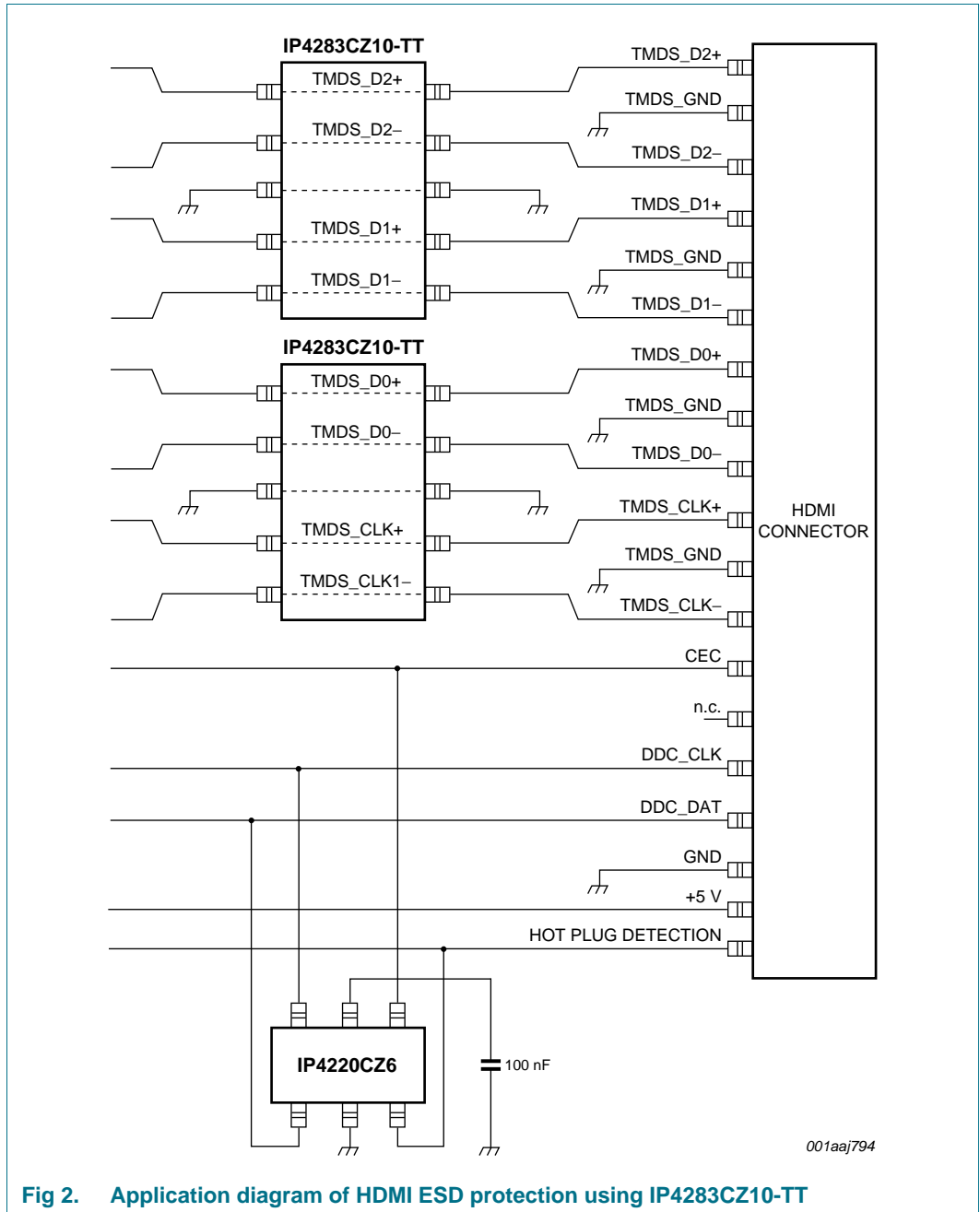


Fig 2. Application diagram of HDMI ESD protection using IP4283CZ10-TT

8. Package outline

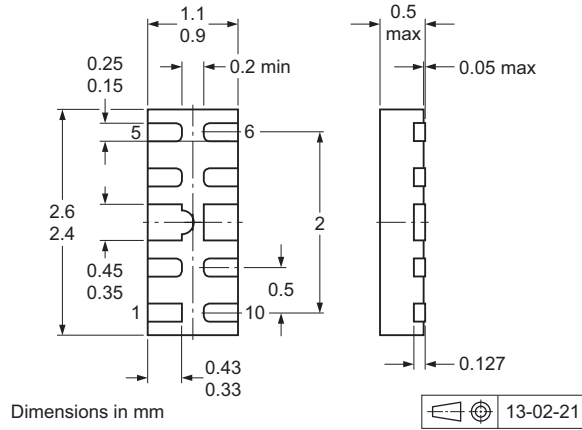


Fig 3. Package outline DFN2510-10 (SOT1165-1)

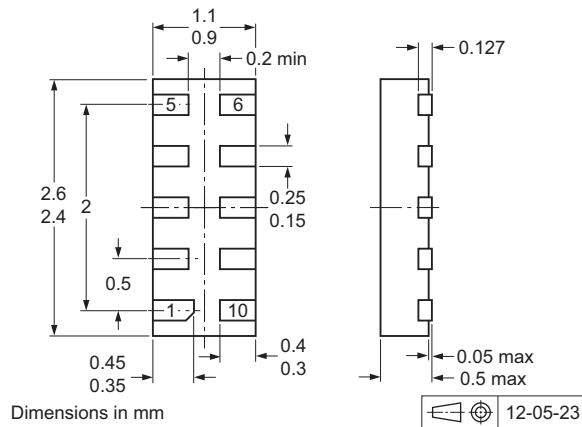


Fig 4. Package outline DFN2510A-10 (SOT1176-1)

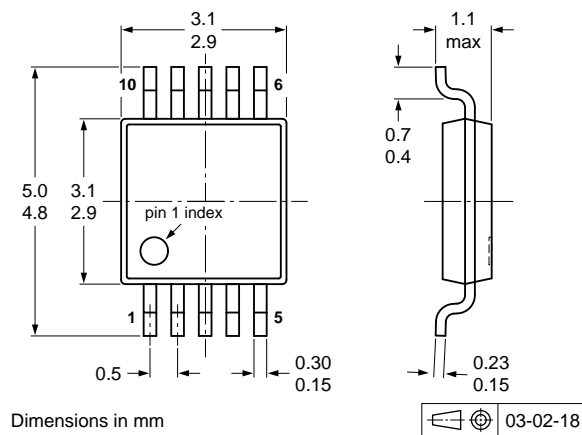


Fig 5. Package outline TSSOP10 (SOT552-1)

9. Soldering

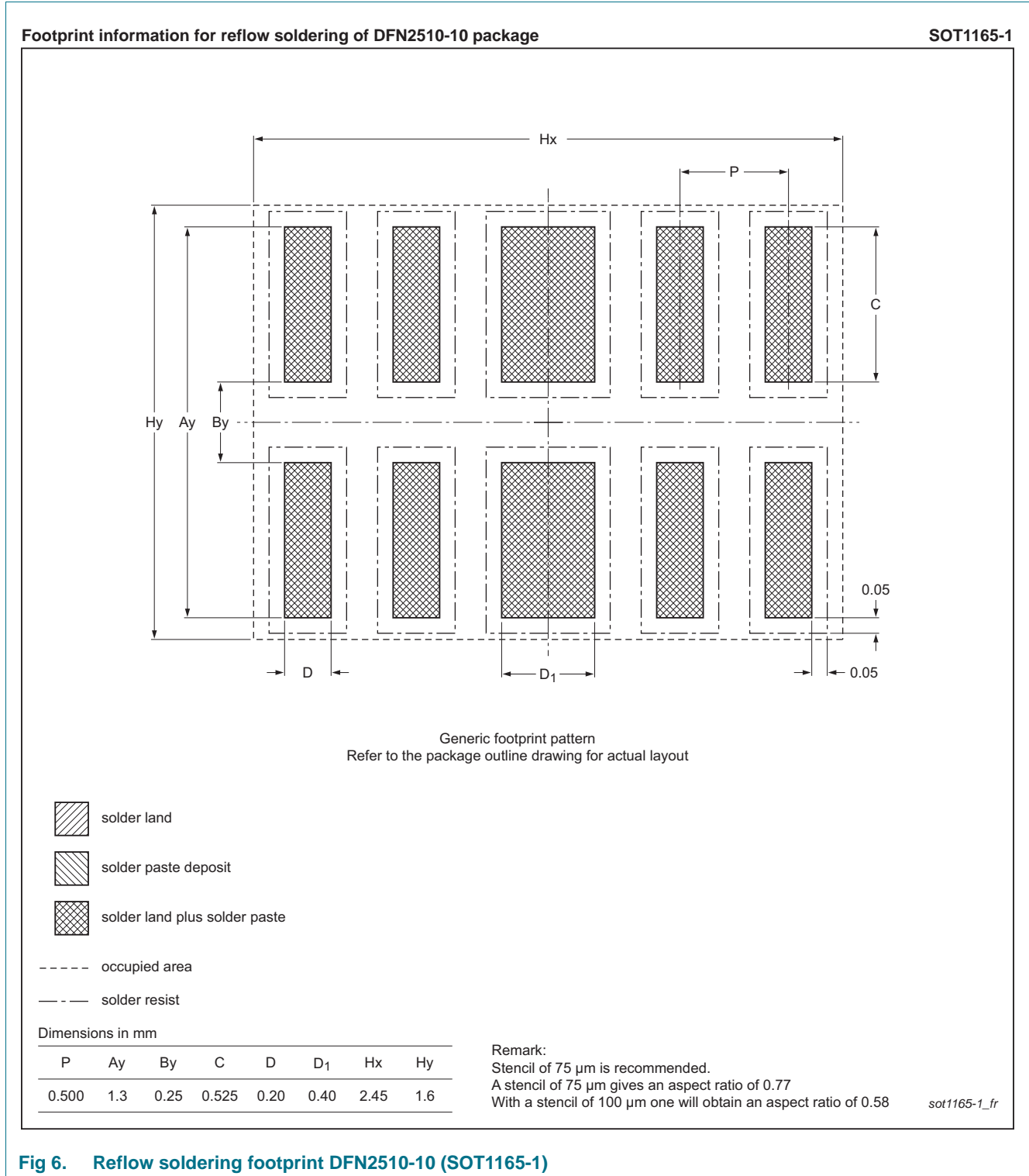


Fig 6. Reflow soldering footprint DFN2510-10 (SOT1165-1)

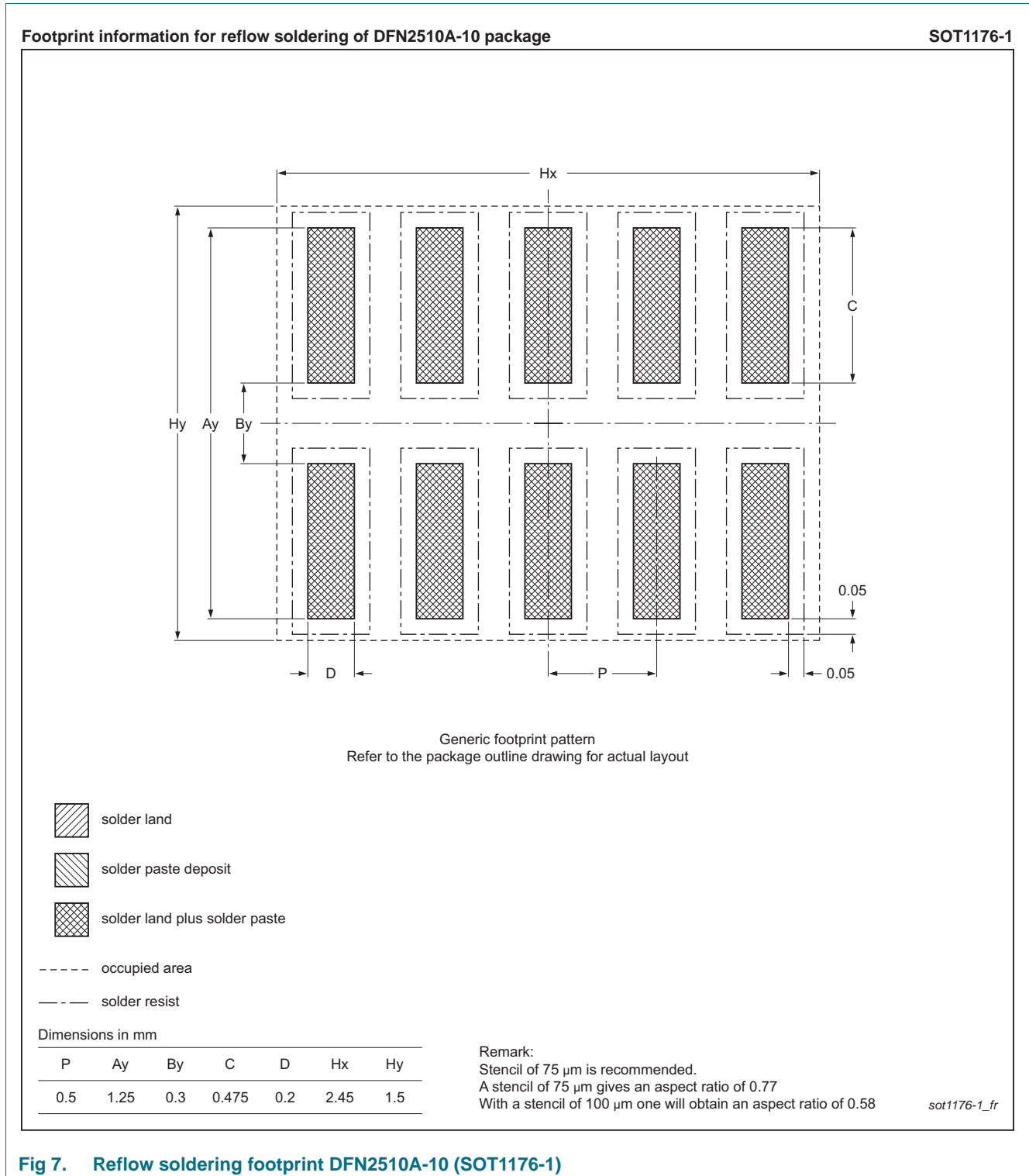


Fig 7. Reflow soldering footprint DFN2510A-10 (SOT1176-1)

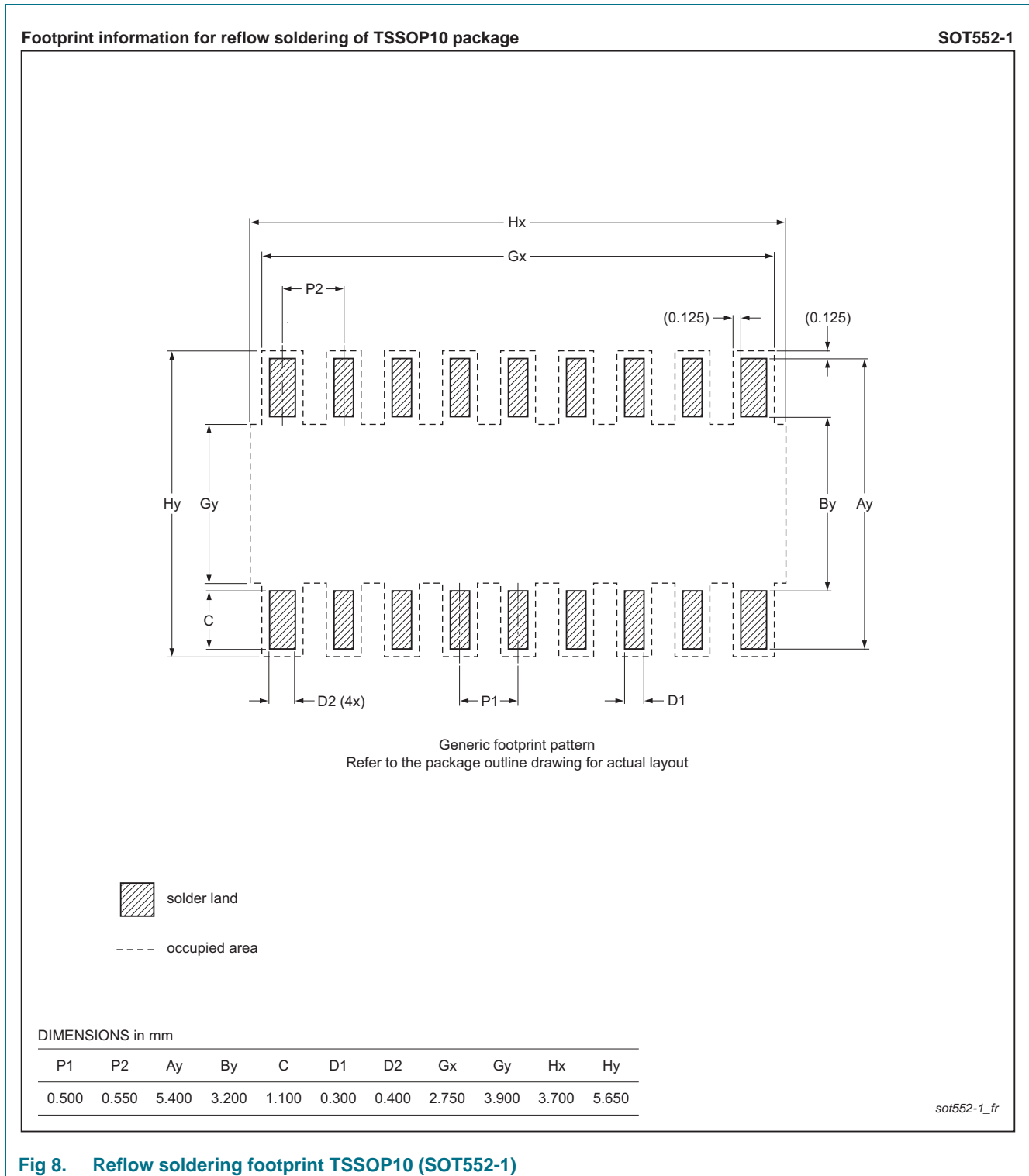


Fig 8. Reflow soldering footprint TSSOP10 (SOT552-1)

10. Revision history

Table 6. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------------|--|--------------------|---------------|--------------------|
| IP4283CZ10_SER v.4 | 20130408 | Product data sheet | - | IP4283CZ10_SER v.3 |
| Modifications: | <ul style="list-style-type: none"> • Section 1.1 “General description”: updated • Section 1.2 “Features and benefits”: updated • Section 2 “Pinning information”: updated • Section 3 “Ordering information”: updated • Table 5 “Characteristics”: updated; r_{dyn} value corrected • Section 8 “Package outline”: drawings replaced with minimized package outline drawings • Section 9 “Soldering”: updated • Section 11 “Legal information”: updated | | | |
| IP4283CZ10_SER v.3 | 20110624 | Product data sheet | - | IP4283CZ10_SER v.2 |
| IP4283CZ10_SER v.2 | 20100827 | Product data sheet | - | IP4283CZ10 v.1 |
| IP4283CZ10 v.1 | 20090507 | Product data sheet | - | - |

11. Legal information

11.1 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".

[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.nexperia.com>.

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