

# IP4283CZ10 series

ESD protection for ultra high-speed interfaces

Rev. 4 — 8 April 2013

Product data sheet

## 1. Product profile

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### 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  $\pm 8$  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  $\pm 8$  kV according to IEC 61000-4-2, level 4
- Matched 0.5 mm trace spacing
- Signal lines with  $\leq 0.05$  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

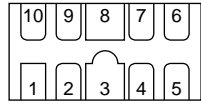
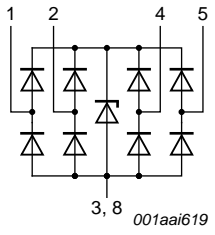
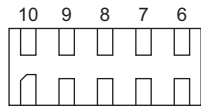
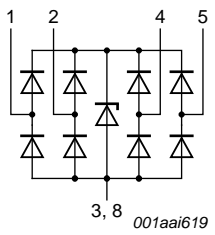
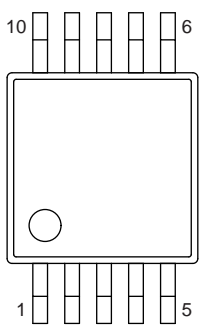
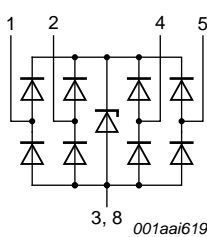
Pin	Symbol	Description	Simplified outline	Graphic symbol
<b>IP4283CZ10-TBA (SOT1165-1)</b>				
1	TMDS_CH1-	negative channel 1 ESD protection	 <p>Transparent top view <b>DFN2510-10</b></p>	 <p>001aai619</p>
2	TMDS_CH1+	positive channel 1 ESD protection		
3	GND	ground		
4	TMDS_CH2-	negative channel 2 ESD 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		
<b>IP4283CZ10-TBR (SOT1176-1)</b>				
1	TMDS_CH1-	negative channel 1 ESD protection	 <p>Transparent top view <b>DFN2510A-10</b></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
<b>IP4283CZ10-TT (SOT552-1)</b>				
1	TMDS_CH1-	negative channel 1 ESD protection	 <p style="text-align: center;"><b>TSSOP10</b></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 <a href="#">[1]</a>			
		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	$\mu\text{A}$
$V_F$	forward voltage	$I_{test} = 1\text{ mA}$	-	0.7	-	V
$C_{line}$	line capacitance	$f = 1\text{ MHz}$ ; $V_{bias} = 2.5\text{ V}$	<a href="#">[1]</a>	-	0.6	pF
$\Delta C_{line}$	line capacitance difference	$f = 1\text{ MHz}$ ; $V_{bias} = 2.5\text{ V}$	<a href="#">[1]</a>	-	0.05	pF
$C_{line(mutual)}$	mutual line capacitance	$f = 1\text{ MHz}$ ; $V_{bias} = 2.5\text{ V}$	<a href="#">[1][2]</a>	-	0.07	pF
$r_{dyn}$	dynamic resistance	surge <a href="#">[3]</a>				
		positive transient	-	0.8	-	$\Omega$
		negative transient	-	0.85	-	$\Omega$
$V_{CL}$	clamping voltage	positive transient; $I_{PP} = 3.8\text{ A}$	<a href="#">[3]</a>	-	9.5	V
		negative transient; $I_{PP} = -2.8\text{ A}$	<a href="#">[3]</a>	-	-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  $\mu\text{s}$ ).

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](#).

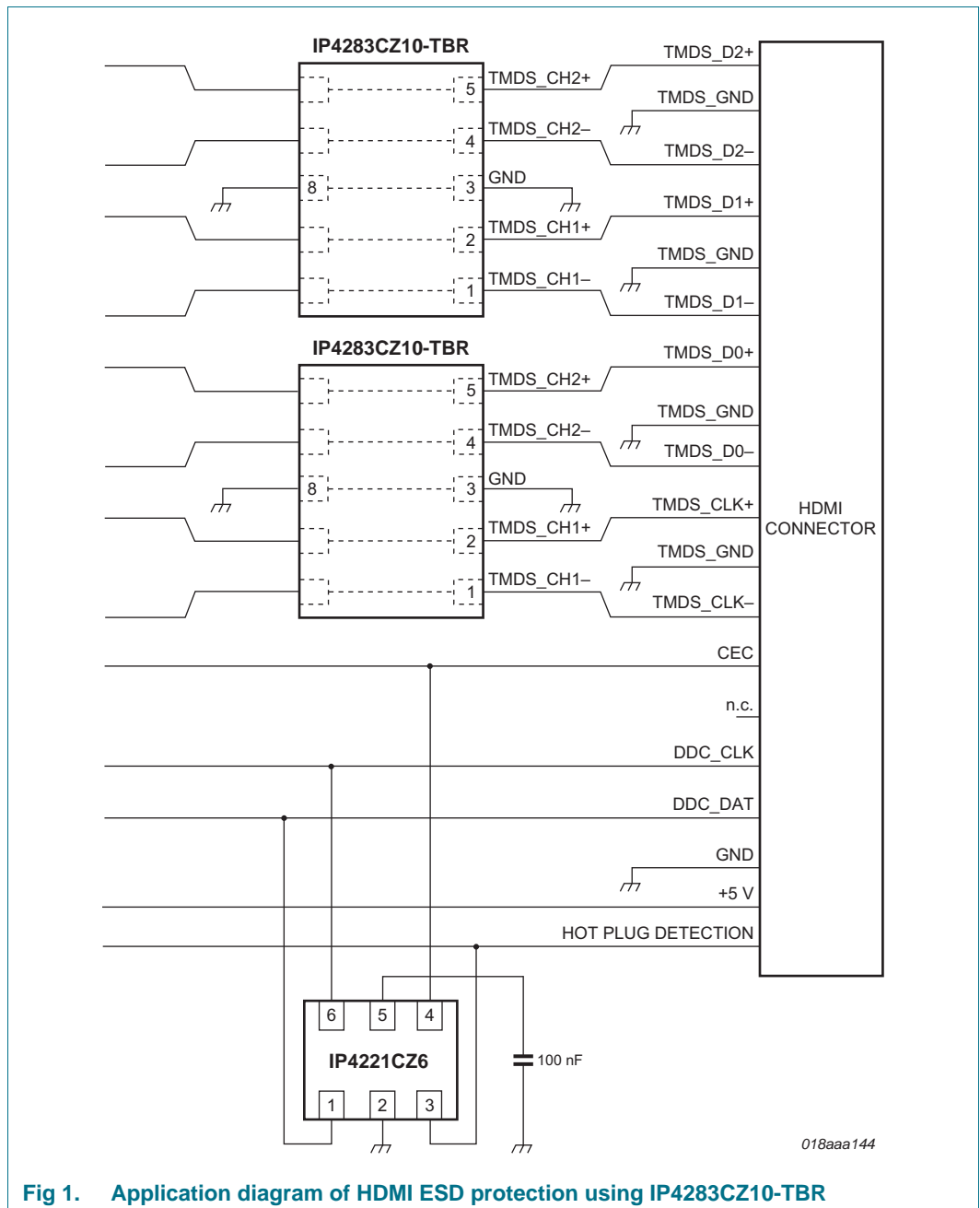


Fig 1. Application diagram of HDMI ESD protection using IP4283CZ10-TBR

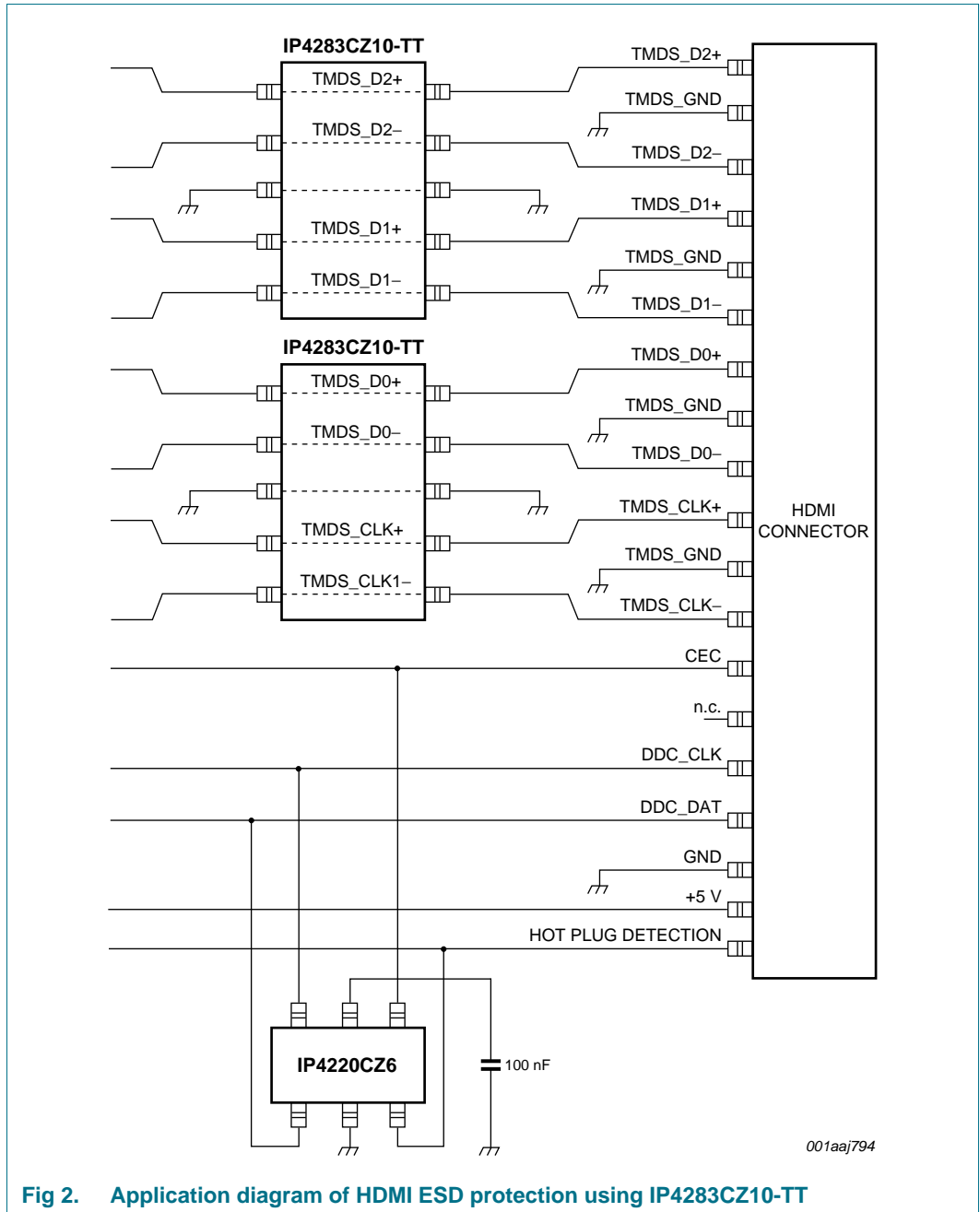


Fig 2. Application diagram of HDMI ESD protection using IP4283CZ10-TT

8. Package outline

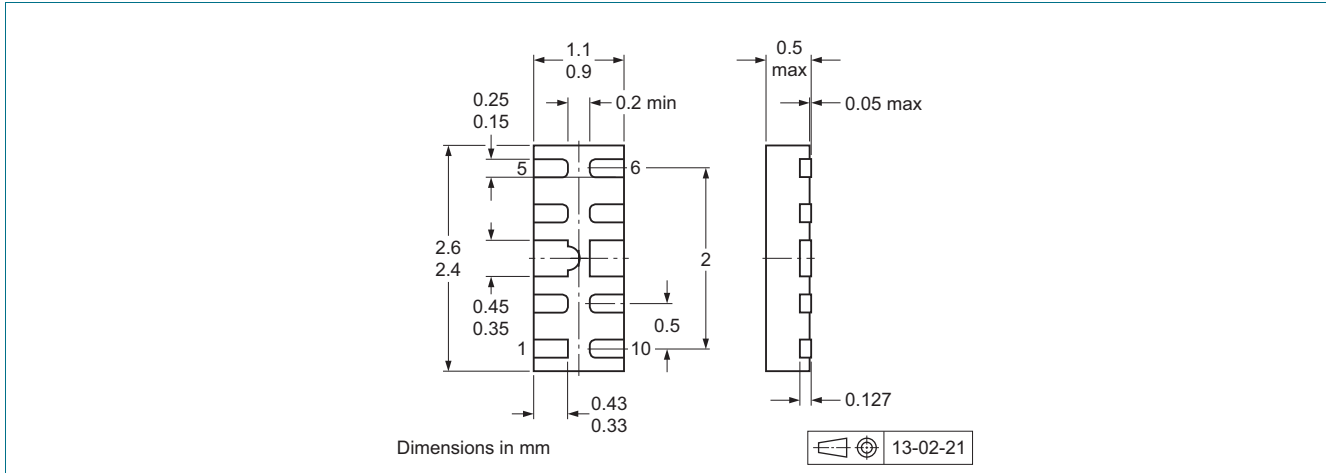


Fig 3. Package outline DFN2510-10 (SOT1165-1)

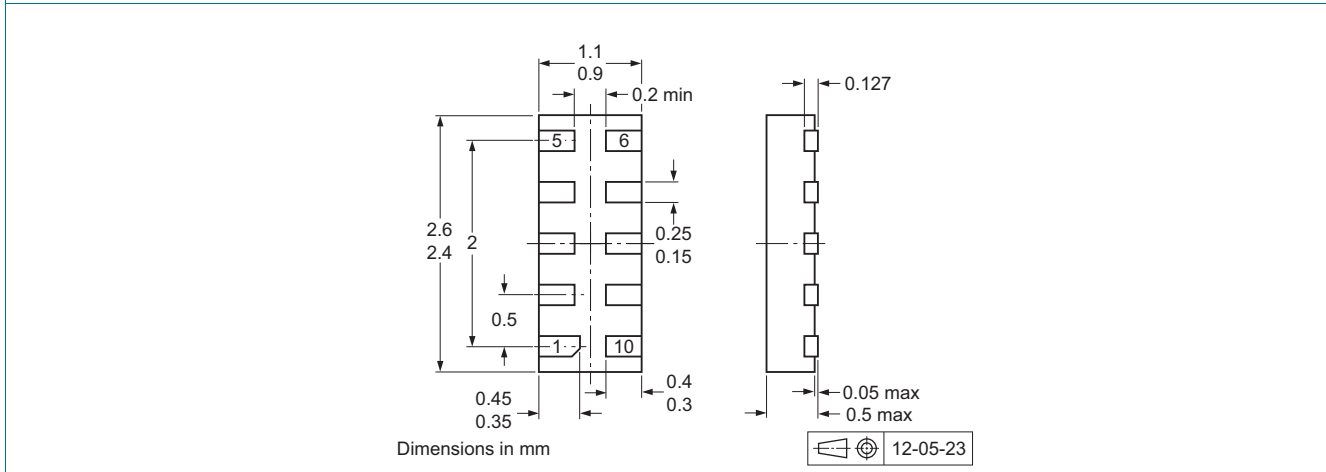


Fig 4. Package outline DFN2510A-10 (SOT1176-1)

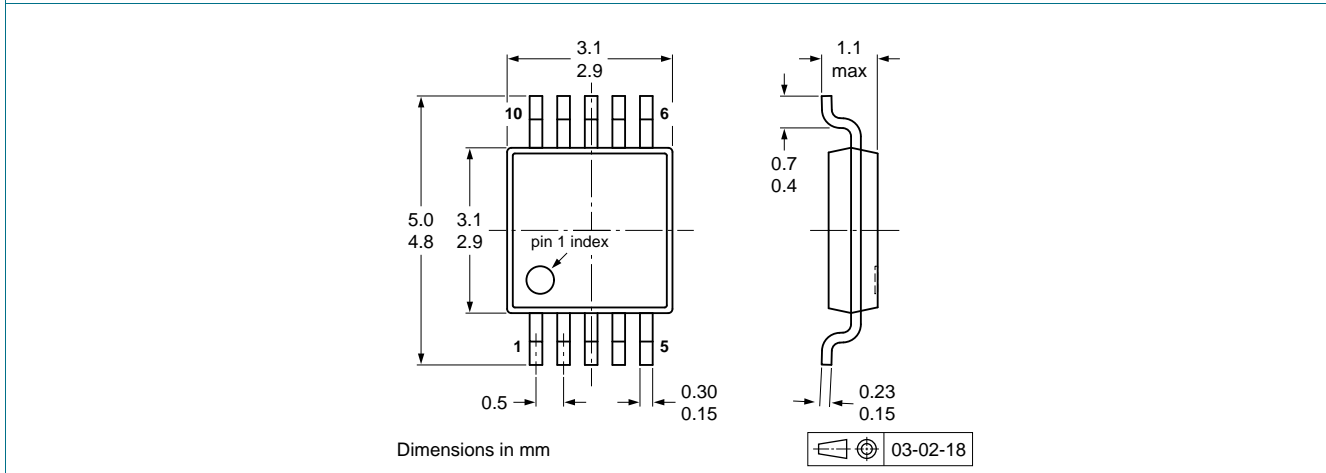


Fig 5. Package outline TSSOP10 (SOT552-1)

9. Soldering

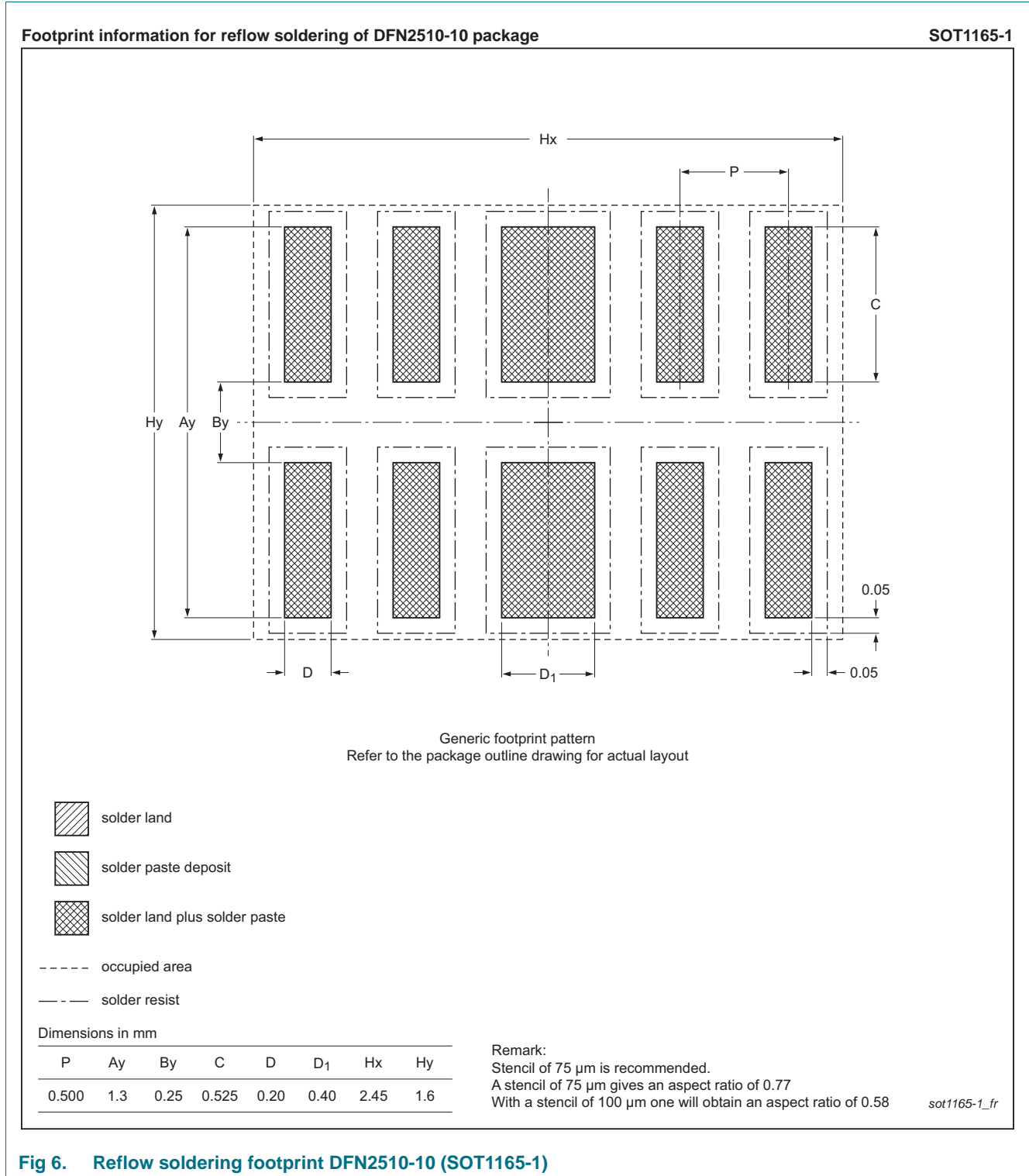


Fig 6. Reflow soldering footprint DFN2510-10 (SOT1165-1)



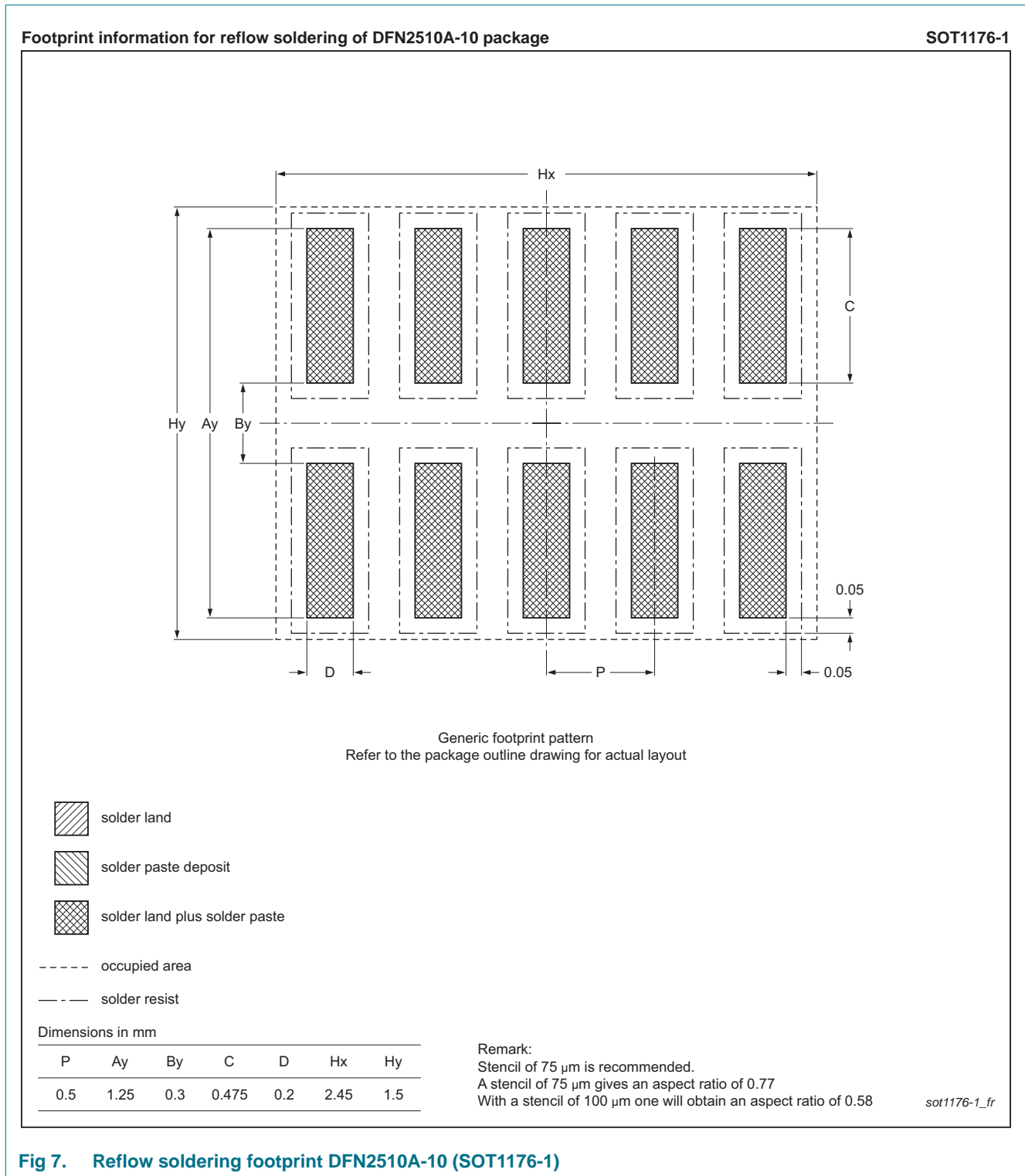


Fig 7. Reflow soldering footprint DFN2510A-10 (SOT1176-1)

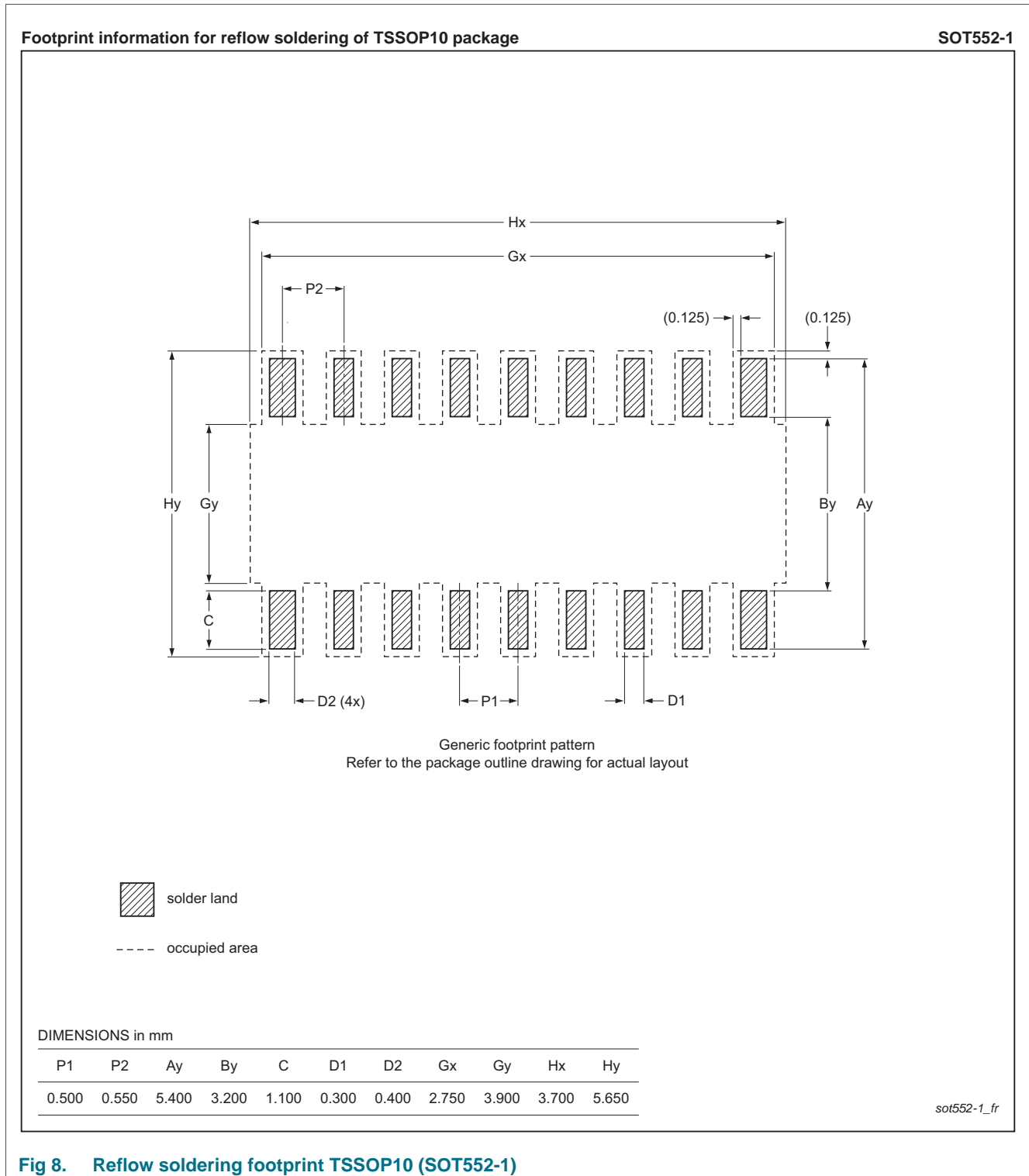


Fig 8. Reflow soldering footprint TSSOP10 (SOT552-1)

## 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"> <li>• <a href="#">Section 1.1 “General description”</a>: updated</li> <li>• <a href="#">Section 1.2 “Features and benefits”</a>: updated</li> <li>• <a href="#">Section 2 “Pinning information”</a>: updated</li> <li>• <a href="#">Section 3 “Ordering information”</a>: updated</li> <li>• <a href="#">Table 5 “Characteristics”</a>: updated; <math>r_{dyn}</math> value corrected</li> <li>• <a href="#">Section 8 “Package outline”</a>: drawings replaced with minimized package outline drawings</li> <li>• <a href="#">Section 9 “Soldering”</a>: updated</li> <li>• <a href="#">Section 11 “Legal information”</a>: updated</li> </ul>			
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 <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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Телефон: 8 (812) 309-75-97 (многоканальный)

Факс: 8 (812) 320-03-32

Электронная почта: [ocean@oceanchips.ru](mailto:ocean@oceanchips.ru)

Web: <http://oceanchips.ru/>

Адрес: 198099, г. Санкт-Петербург, ул. Калинина, д. 2, корп. 4, лит. А