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

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2. Pinning information

Table 1. Pinning

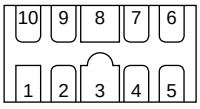
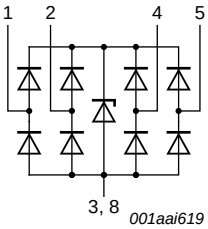
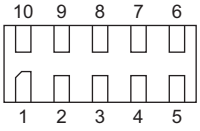
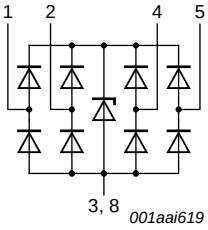
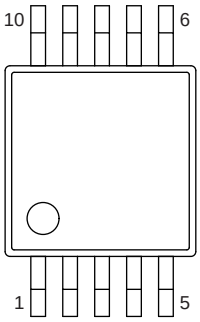
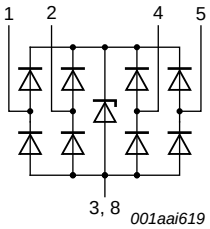
Pin	Symbol	Description	Simplified outline	Graphic symbol
IP4283CZ10-TBA (SOT1165-1)				
1	TMDS_CH1–	negative channel 1 ESD protection	 Transparent top view **DFN2510-10**	
2	TMDS_CH1+	positive channel 1 ESD protection		
3	GND	ground		
4	TMDS_CH2–	negative channel 2 ESD protection		
5	TMDS_CH2+	positive 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	 Transparent top view **DFN2510A-10**	
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	 **TSSOP10**	
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 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{BR}	breakdown voltage	I_{test} = 1 mA		6	-	9	V
I_{LR}	reverse leakage current	per TMDS channel; V = 3 V		-	-	1	μA
V_F	forward voltage	I_{test} = 1 mA		-	0.7	-	V
C_{line}	line capacitance	f = 1 MHz; V_{bias} = 2.5 V	[1]	-	0.6	-	pF
ΔC_{line}	line capacitance difference	f = 1 MHz; V_{bias} = 2.5 V	[1]	-	0.05	-	pF
$C_{line(mutual)}$	mutual line capacitance	f = 1 MHz; V_{bias} = 2.5 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 A	[3]	-	9.5	-	V
		negative transient; I_{PP} = −2.8 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.

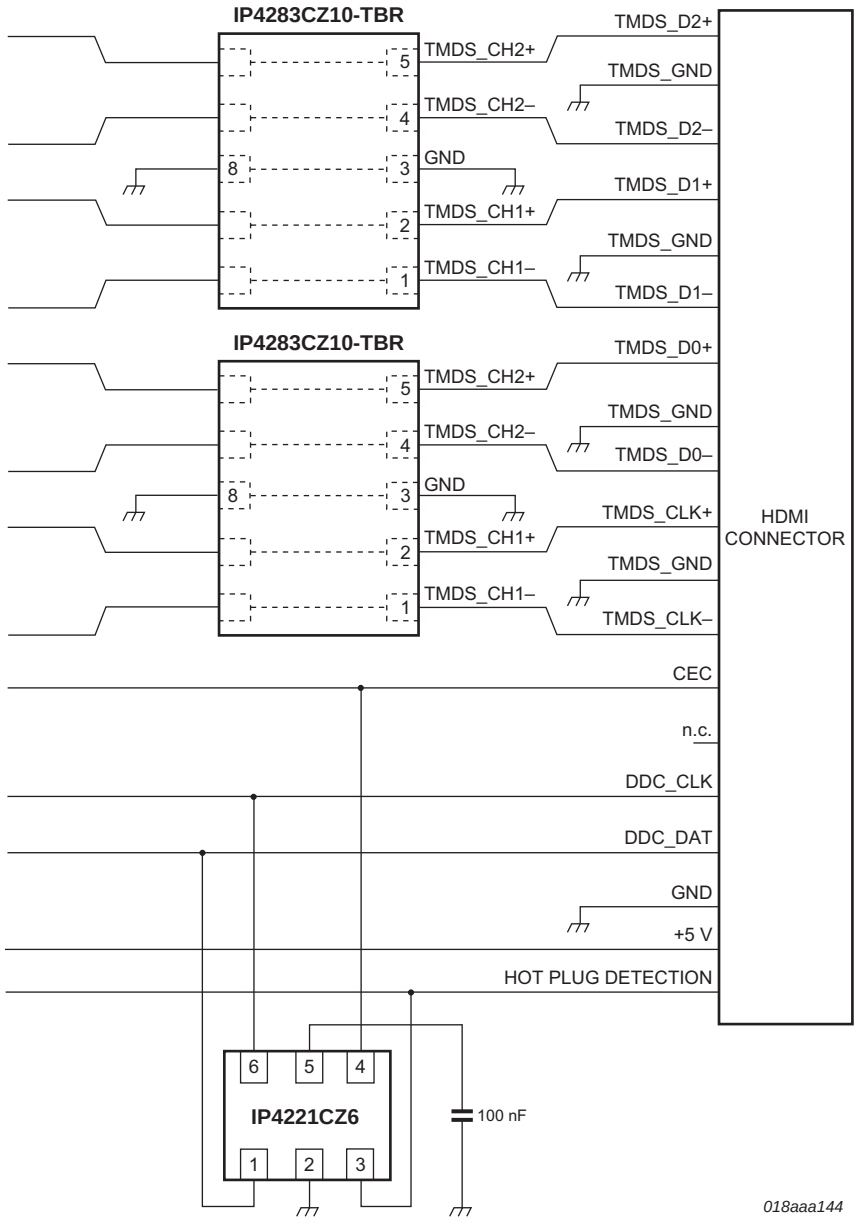


Fig 1. Application diagram of HDMI ESD protection using IP4283CZ10-TBR

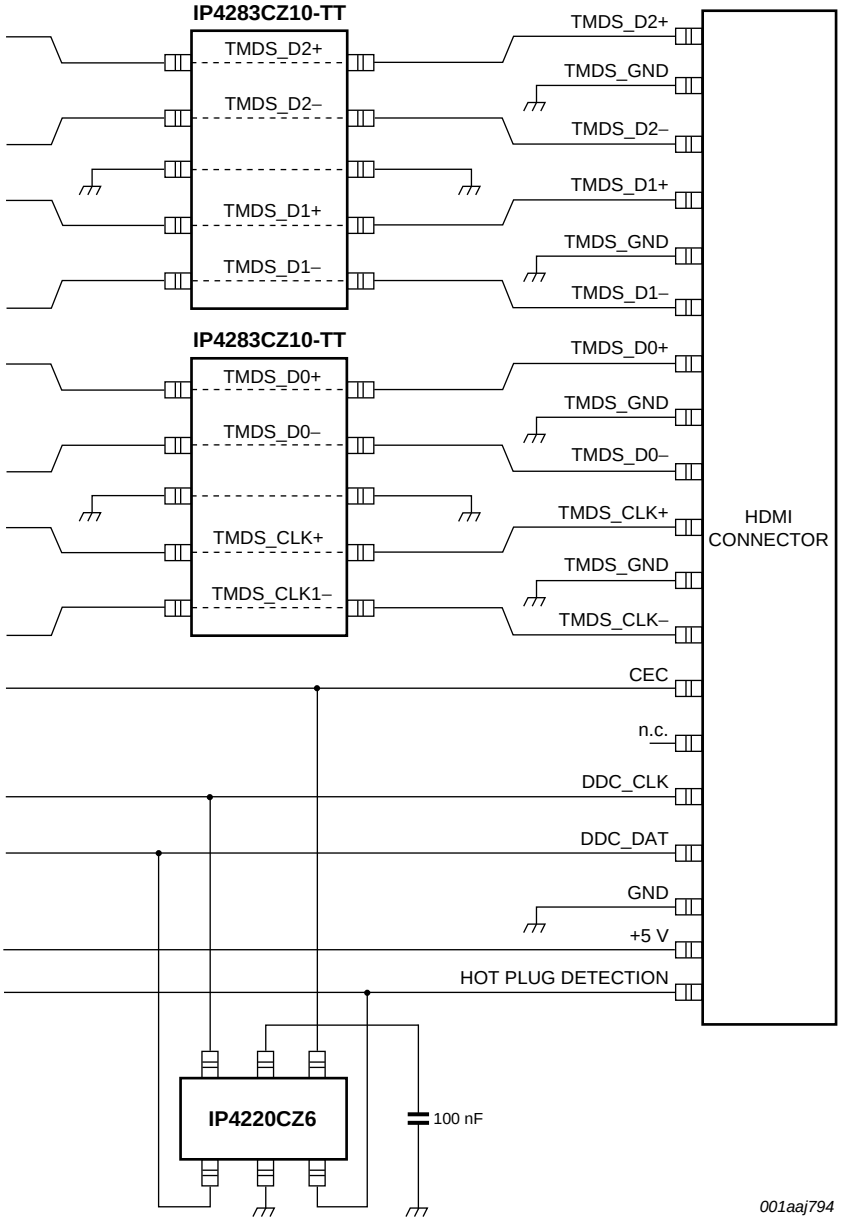


Fig 2. Application diagram of HDMI ESD protection using IP4283CZ10-TT

8. Package outline

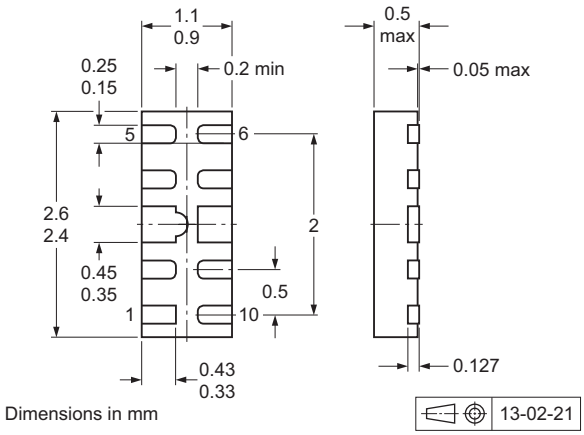


Fig 3. Package outline DFN2510-10 (SOT1165-1)

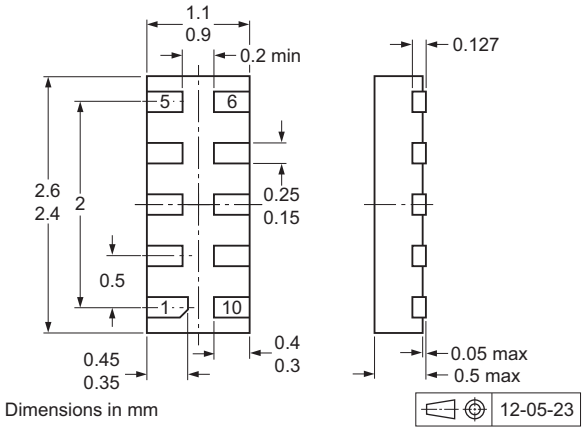


Fig 4. Package outline DFN2510A-10 (SOT1176-1)

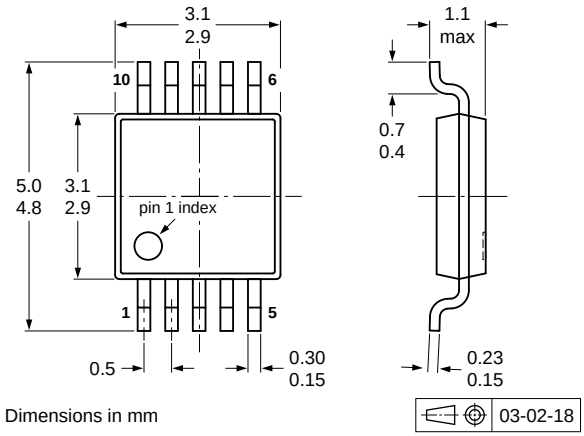
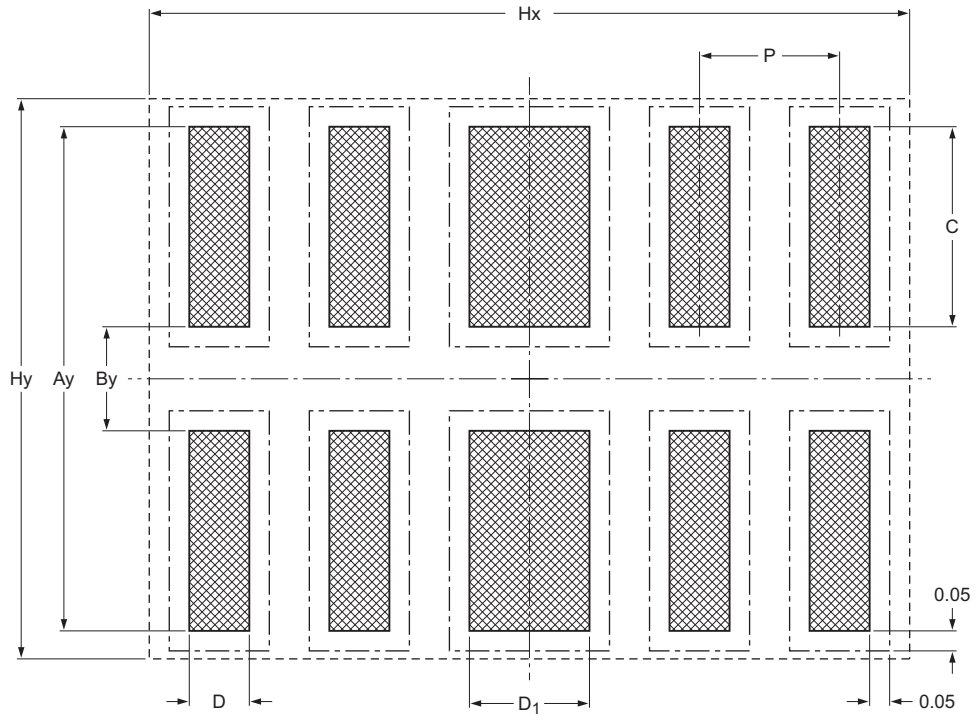


Fig 5. Package outline TSSOP10 (SOT552-1)

9. Soldering

Footprint information for reflow soldering of DFN2510-10 package **SOT1165-1**



Generic footprint pattern
Refer to the package outline drawing for actual layout

solder land

solder paste deposit

solder land plus solder paste

occupied area

solder resist

Dimensions in mm

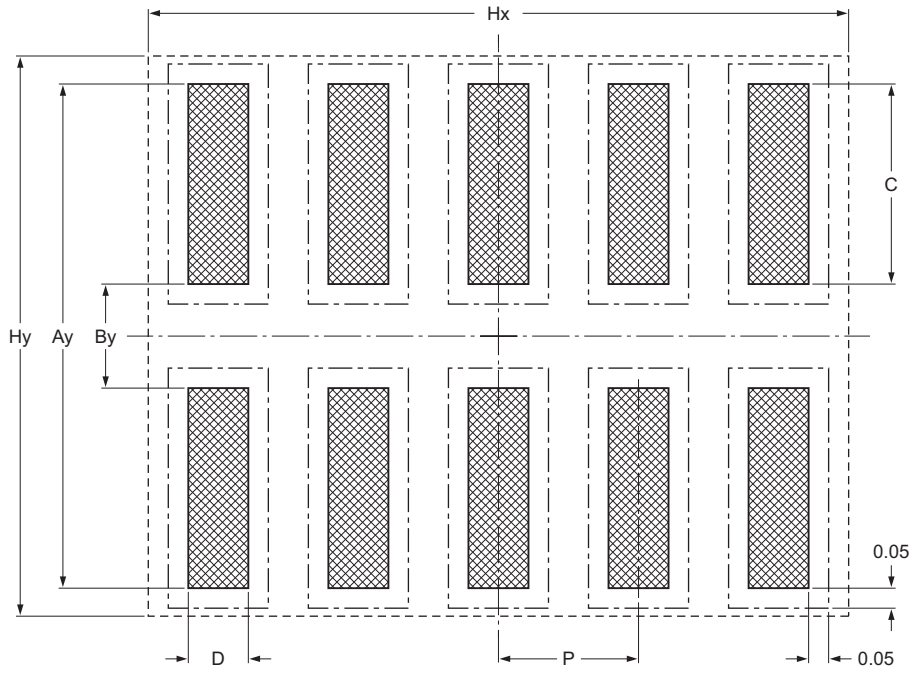
P	Ay	By	C	D	D_1	Hx	Hy
0.500	1.3	0.25	0.525	0.20	0.40	2.45	1.6

Remark:
Stencil of 75 µm is recommended.
A stencil of 75 µm gives an aspect ratio of 0.77
With a stencil of 100 µm one will obtain an aspect ratio of 0.58

sot1165-1_fr

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

Footprint information for reflow soldering of DFN2510A-10 package **SOT1176-1**



Generic footprint pattern
Refer to the package outline drawing for actual layout

solder land

solder paste deposit

solder land plus solder paste

occupied area

solder resist

Dimensions in mm

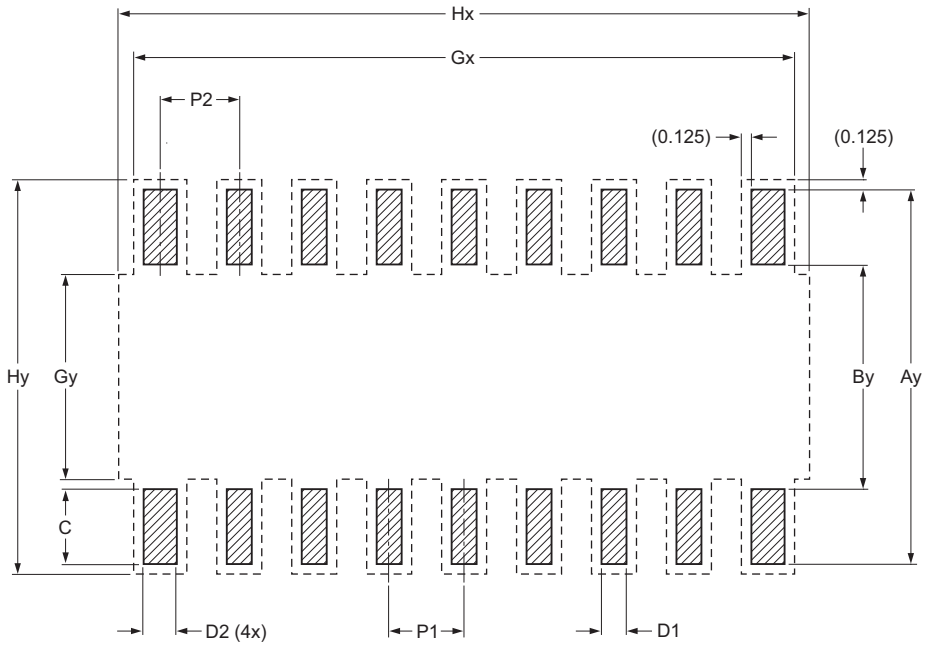
P	Ay	By	C	D	Hx	Hy
0.5	1.25	0.3	0.475	0.2	2.45	1.5

Remark:
Stencil of 75 µm is recommended.
A stencil of 75 µm gives an aspect ratio of 0.77
With a stencil of 100 µm one will obtain an aspect ratio of 0.58

sot1176-1_fr

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

Footprint information for reflow soldering of TSSOP10 package **SOT552-1**



Generic footprint pattern
Refer to the package outline drawing for actual layout

solder land

occupied area

DIMENSIONS in mm

P1	P2	Ay	By	C	D1	D2	Gx	Gy	Hx	Hy
0.500	0.550	5.400	3.200	1.100	0.300	0.400	2.750	3.900	3.700	5.650

sot552-1_fr

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:	• 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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