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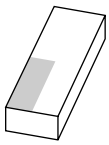


IP4281CZ10

ESD protection for high-speed interfaces

Rev. 01 — 25 September 2008 Product data sheet

1. Product profile

1.1 General description

The IP4281CZ10 is designed for HDMI interface protection. The device includes high-level ElectroStatic Discharge (ESD) protection diodes for the TMDS signal lines.

All TMDS intra-pairs are protected by a special diode configuration offering a low line capacitance of only 0.7 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

- Pb-free, RoHS compliant and free of Halogen and Antimony (dark green compliant)
- ESD protection for HDMI and other LVDS data lines
- All TMDS lines with integrated rail-to-rail clamping diodes for downstream ESD protection of ±8 kV according to IEC61000-4-2, level 4
- Matched 0.5 mm trace spacing
- TMDS lines with ≤ 0.05 pF matching capacitance between TMDS pairs
- Line capacitance of only 0.7 pF for each channel
- 4-channel, 10-terminal Ultra-Thin Leadless Package (UTLP)
- HDMI 1.3a compliant

1.3 Applications

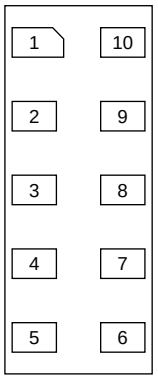
The IP4281CZ10 is designed for HDMI receiver and transmitter port protection:

- TV, monitor
- Notebook, main board graphics card and ports
- Set-top box and game consoles
- DVD recorder and player

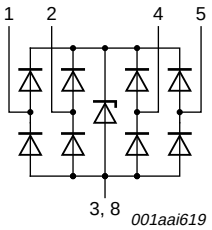
2. Pinning information

Table 1. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	TMDS_CH1–	negative channel 1 ESD protection		
2	TMDS_CH1+	positive channel 1 ESD protection		
3	GND	GND		
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	GND		
9	n.c.	not connected		
10	n.c.	not connected		



Transparent top view



3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
IP4281CZ10	XSON10U	plastic extremely thin small outline package; no leads; 10 terminals; UTLP based; body 1 × 2.5 × 0.5 mm	SOT1059-1

4. Limiting values

Table 3. Limiting values

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

Symbol	Parameter	Conditions	Min	Max	Unit
V_I	input voltage		GND – 0.5	+3.63	V
V_{esd}	electrostatic discharge voltage	all pins to ground; IEC 61000-4-2, level 4			
		contact	–8	+8	kV
		air discharge	–15	+15	kV
T_{stg}	storage temperature		–55	+125	°C

5. Recommended operating conditions

Table 4. Operating conditions

Symbol	Parameter	Conditions	Min	Max	Unit
T_{amb}	ambient temperature		–40	+85	°C

6. Characteristics

Table 5. Characteristics

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{BRzd}	Zener diode breakdown voltage	I = 1 mA		6	-	9	V
I_{LRzd}	Zener diode reverse leakage current	per TMDS channel; V = 3.0 V		-	-	1	μA
V_F	forward voltage			-	0.7	-	V
$C_{ch(TMDS)}$	TMDS channel capacitance	f = 1 MHz; V_{bias} = 2.5 V	[1]	-	0.7	-	pF
$\Delta C_{ch(TMDS)}$	TMDS channel capacitance difference	f = 1 MHz; V_{bias} = 2.5 V	[1]	-	0.05	-	pF
$C_{ch(mutual)}$	mutual channel capacitance	between signal pin and pin n.c.; f = 1 MHz; V_{bias} = 2.5 V	[1]	-	0.07	-	pF
R_{dyn}	dynamic resistance	I = 1 A, T_{amb} = 25 °C; IEC 61000-4-5/9					
		positive transient		-	2.4	-	Ω
		negative transient		-	1.3	-	Ω
$V_{CL(ch)trt(pos)}$	positive transient channel clamping voltage	V_{esd} = 8 kV HBM; T_{amb} = 25 °C		-	8	-	V

[1] This parameter is guaranteed by design.

7. Application information

The IP4281CZ10 is mainly designed to provide high-level ESD protection for high-speed serial data buses such as HDMI and other LVDS data lines.

Therefore, careful printed-circuit board design with respect to impedance matching, coupling to other signals etc. is recommended. An example showing a basic abstract view of a layout for an HDMI interface is shown in Figure 1.

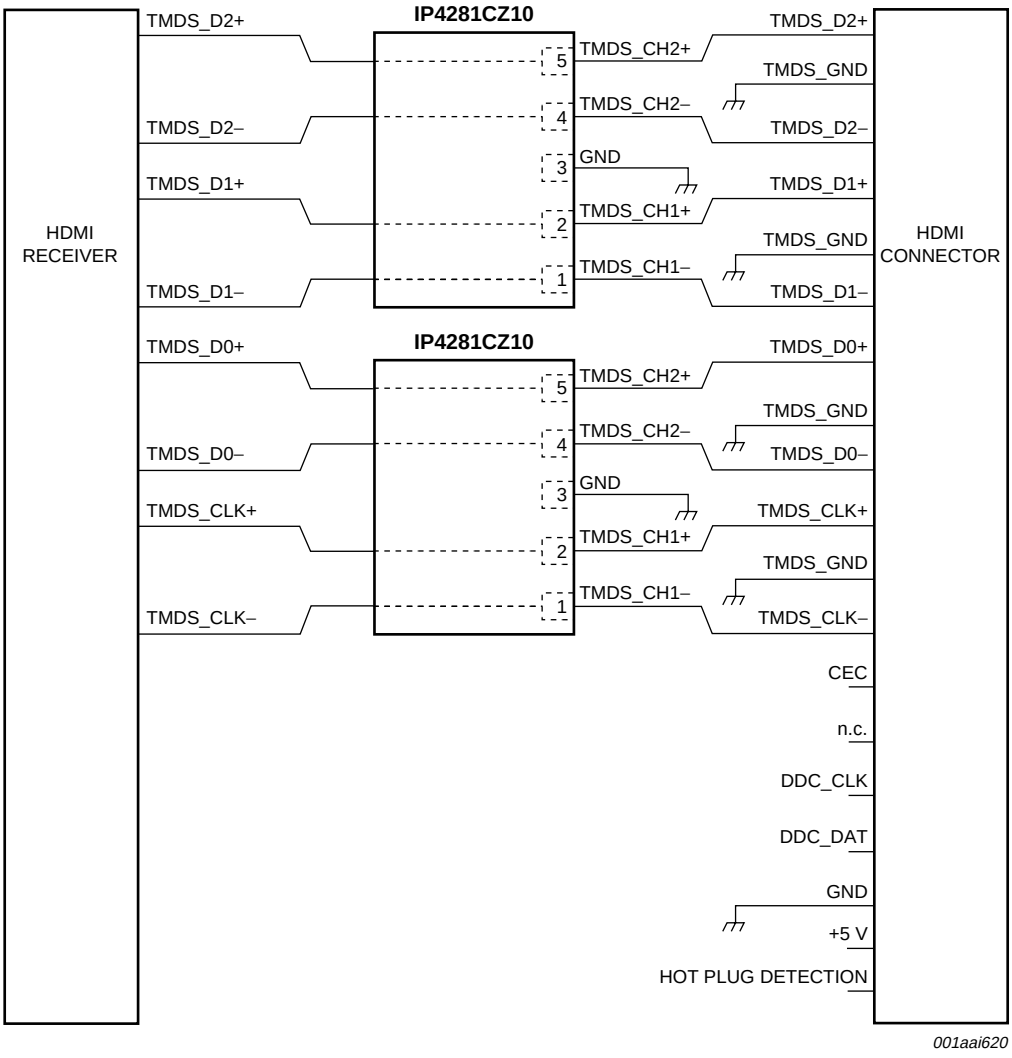
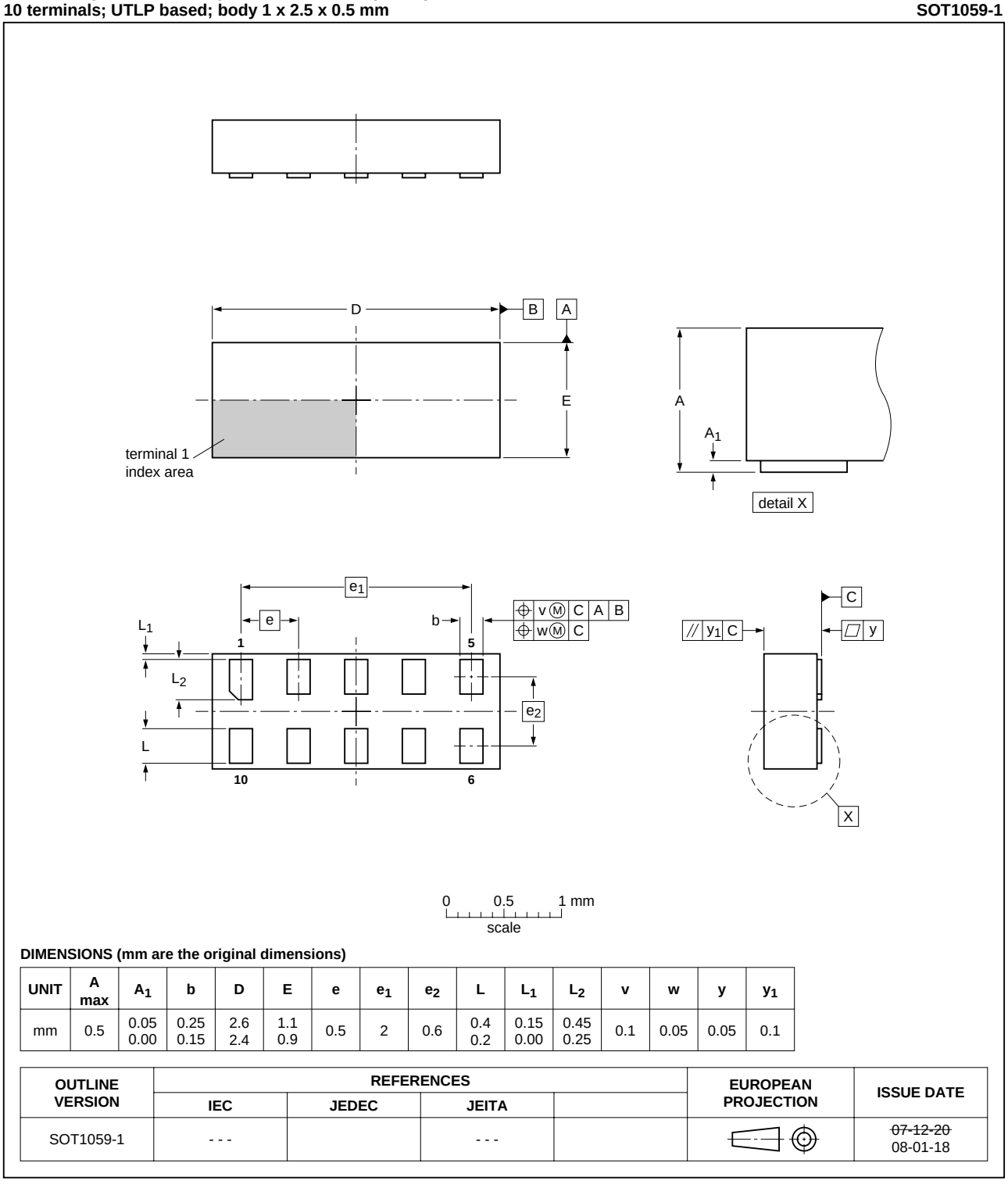


Fig 1. Application diagram

8. Package outline

XSON10U: plastic extremely thin small outline package; no leads; 10 terminals; UTLP based; body 1 x 2.5 x 0.5 mm **SOT1059-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max	A_1	b	D	E	e	e_1	e_2	L	L_1	L_2	v	w	y	y_1
mm	0.5	0.05 0.00	0.25 0.15	2.6 2.4	1.1 0.9	0.5	2	0.6	0.4 0.2	0.15 0.00	0.45 0.25	0.1	0.05	0.05	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT1059-1	- - -		- - -			~~07-12-20~~ 08-01-18

Fig 2. Package outline SOT1059-1 (XSON10U)

9. Abbreviations

Table 6. Abbreviations

Acronym	Description
DVD	Digital Video Disk
ESD	ElectroStatic Discharge
HBM	Human Body Model
HDMI	High-Definition Multimedia Interface
LVDS	Low-Voltage Differential Signaling
RoHS	Restriction of Hazardous Substances
TMDS	Transition Minimized Differential Signaling

10. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
IP4281CZ10_1	20080925	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".

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13. Contents

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