

# IP4281CZ10

ESD protection for high-speed interfaces

Rev. 01 — 25 September 2008

Product data sheet

## HDMI

## 1. Product profile

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### 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  $\pm 8$  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  $\pm 8$  kV according to IEC61000-4-2, level 4
- Matched 0.5 mm trace spacing
- TMDS lines with  $\leq 0.05$  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		Version
	Name	Description	
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	$I = 1 \text{ mA}$	6	-	9	V
$I_{LRzd}$	Zener diode reverse leakage current	per TMDS channel; $V = 3.0 \text{ V}$	-	-	1	$\mu\text{A}$
$V_F$	forward voltage		-	0.7	-	V
$C_{ch(TMDS)}$	TMDS channel capacitance	$f = 1 \text{ MHz}$ ; $V_{bias} = 2.5 \text{ V}$	[1]	-	0.7	pF
$\Delta C_{ch(TMDS)}$	TMDS channel capacitance difference	$f = 1 \text{ MHz}$ ; $V_{bias} = 2.5 \text{ V}$	[1]	-	0.05	pF
$C_{ch(mutual)}$	mutual channel capacitance	between signal pin and pin n.c.; $f = 1 \text{ MHz}$ ; $V_{bias} = 2.5 \text{ V}$	[1]	-	0.07	pF
$R_{dyn}$	dynamic resistance	$I = 1 \text{ A}$ , $T_{amb} = 25 \text{ }^\circ\text{C}$ ; IEC 61000-4-5/9				
		positive transient	-	2.4	-	$\Omega$
		negative transient	-	1.3	-	$\Omega$
$V_{CL(ch)trt(pos)}$	positive transient channel clamping voltage	$V_{esd} = 8 \text{ kV HBM}$ ; $T_{amb} = 25 \text{ }^\circ\text{C}$	-	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](#).

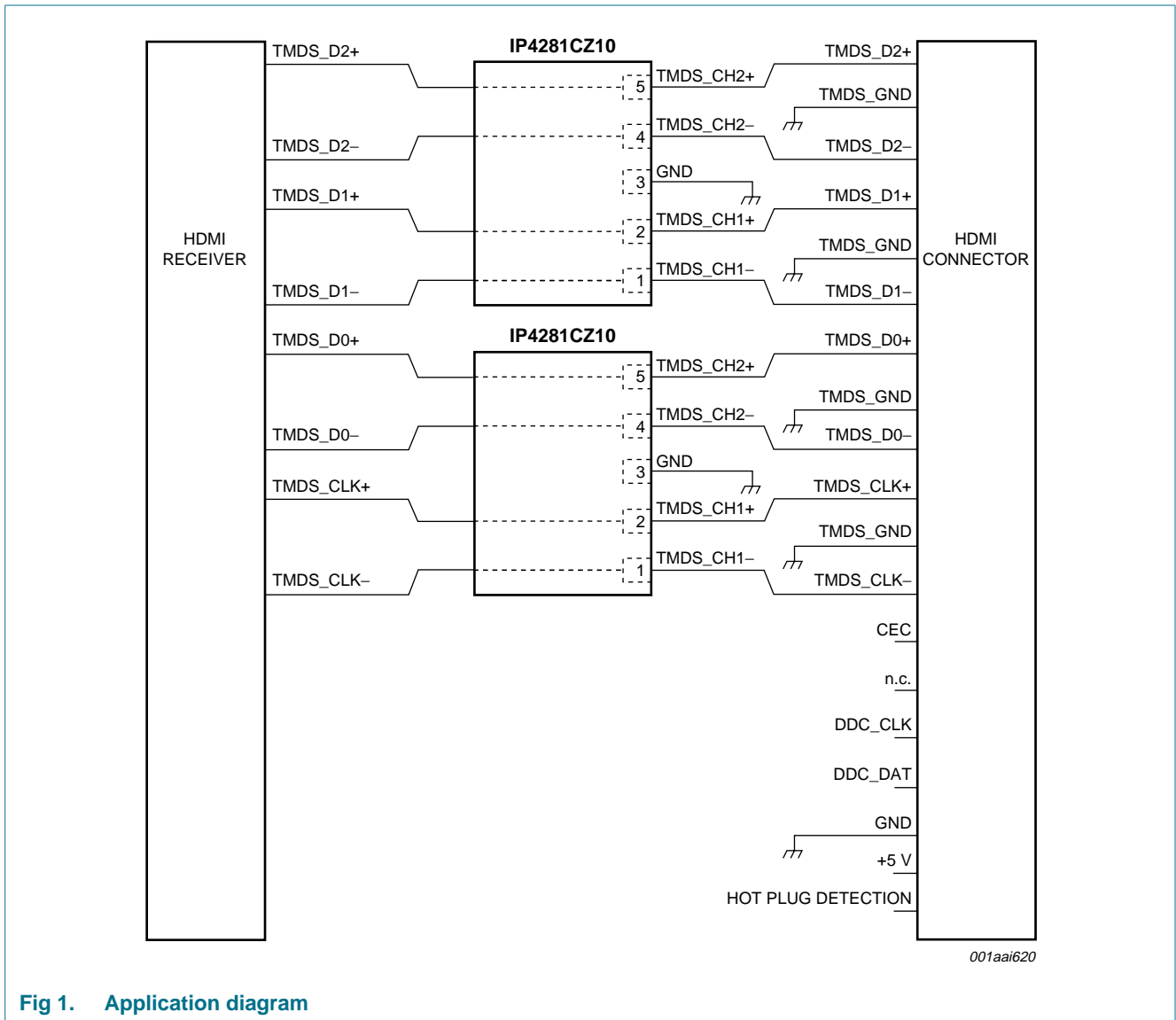


Fig 1. Application diagram

### 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

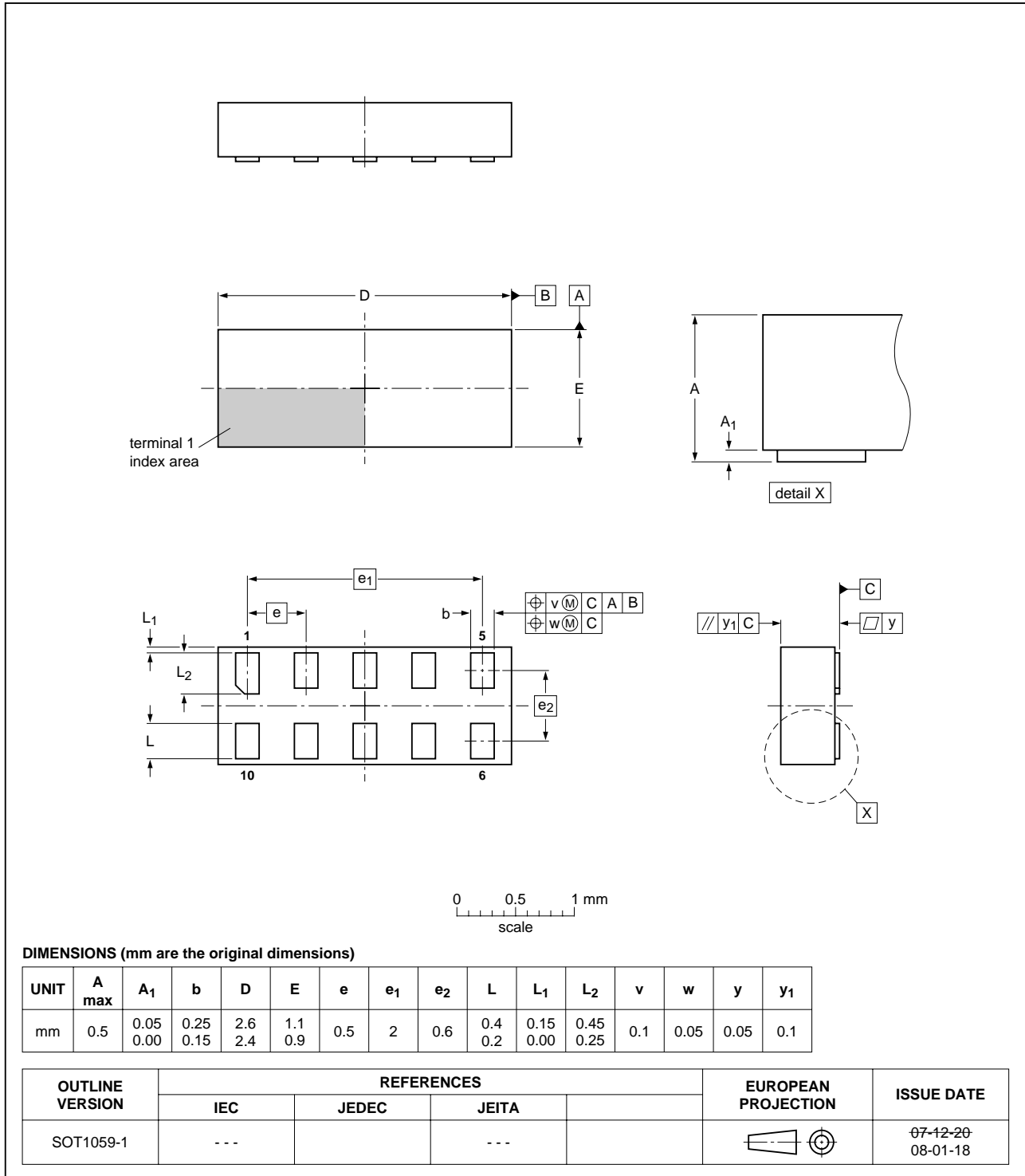


Fig 2. Package outline SOT1059-1 (XSON10U)

## 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 <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.
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[2] The term 'short data sheet' is explained in section "Definitions".

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