

# 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  $\pm 8$  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 ±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:

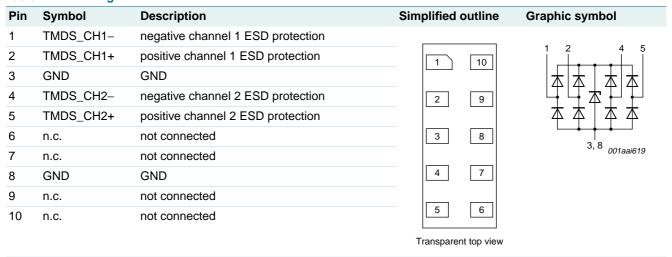
- TV, monitor
- Notebook, main board graphics card and ports
- Set-top box and game consoles
- DVD recorder and player



### **ESD** protection for high-speed interfaces

# 2. Pinning information

Table 1. Pinning



# 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 $1 \times 2.5 \times 0.5$ 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 <sub>esd</sub> electrostatic discharge voltage		all pins to ground; IEC 61000-4-2, level 4			
	contact	-8	+8	kV	
		air discharge	<b>–15</b>	+15	kV
T <sub>stg</sub>	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

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### ESD protection for high-speed interfaces

# 6. Characteristics

Table 5. Characteristics

Symbol	Parameter	Conditions		Min	Тур	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	μΑ
$V_{F}$	forward voltage			-	0.7	-	V
C <sub>ch(TMDS)</sub>	TMDS channel capacitance	$f = 1 \text{ MHz}; V_{\text{bias}} = 2.5 \text{ V}$	[1]	-	0.7	-	pF
$\Delta C_{ch(TMDS)}$	TMDS channel capacitance difference	$f = 1 \text{ MHz}; V_{\text{bias}} = 2.5 \text{ V}$	[1]	-	0.05	-	pF
C <sub>ch(mutual)</sub>	mutual channel capacitance	between signal pin and pin n.c.; f = 1 MHz; V <sub>bias</sub> = 2.5 V	<u>[1]</u>	-	0.07	-	pF
R <sub>dyn</sub>	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 <sub>CL(ch)trt(pos)</sub>	positive transient channel clamping voltage	$V_{esd}$ = 8 kV HBM; $T_{amb}$ = 25 °C		-	8	-	V

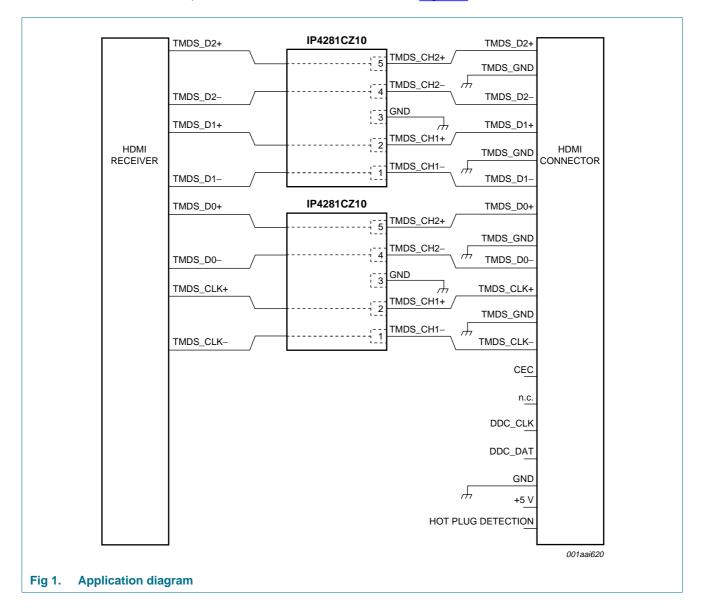
<sup>[1]</sup> This parameter is guaranteed by design.

#### **ESD** protection for high-speed interfaces

# 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.



# 8. Package outline

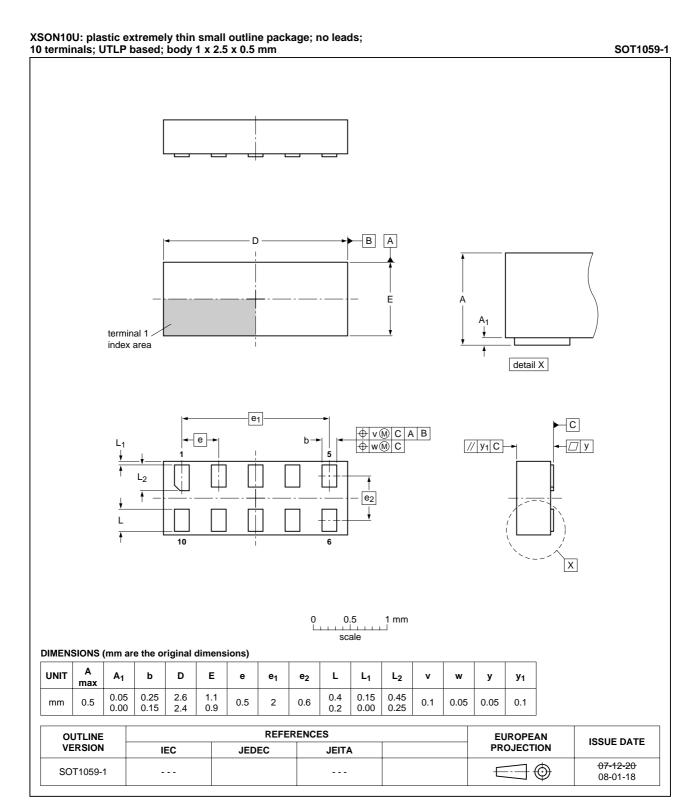


Fig 2. Package outline SOT1059-1 (XSON10U)

### **ESD** protection for high-speed interfaces

# 9. Abbreviations

Table 6. Abbreviations

Acronym	Description
DVD	Digital Video Disk
ESD	ElectroStatic Discharge
НВМ	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	-	-

#### **ESD** protection for high-speed interfaces

### 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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### **ESD** protection for high-speed interfaces

### 13. Contents

1	Product profile
1.1	General description
1.2	Features
1.3	Applications
2	Pinning information
3	Ordering information 2
4	Limiting values
5	Recommended operating conditions 2
6	Characteristics
7	Application information 4
8	Package outline 5
9	Abbreviations 6
10	Revision history 6
11	Legal information 7
11.1	Data sheet status
11.2	Definitions
11.3	Disclaimers
11.4	Trademarks 7
12	Contact information 7
13	Contents

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