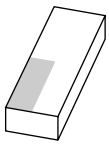


# IP4281CZ10

## 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

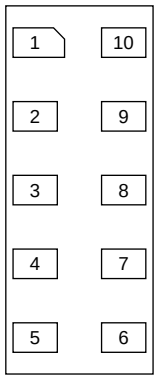
The IP4281CZ10 is designed for HDMI receiver and transmitter port protection:

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

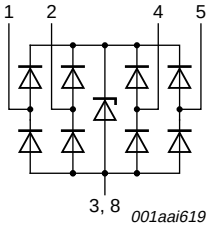
## 2. Pinning information

**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.

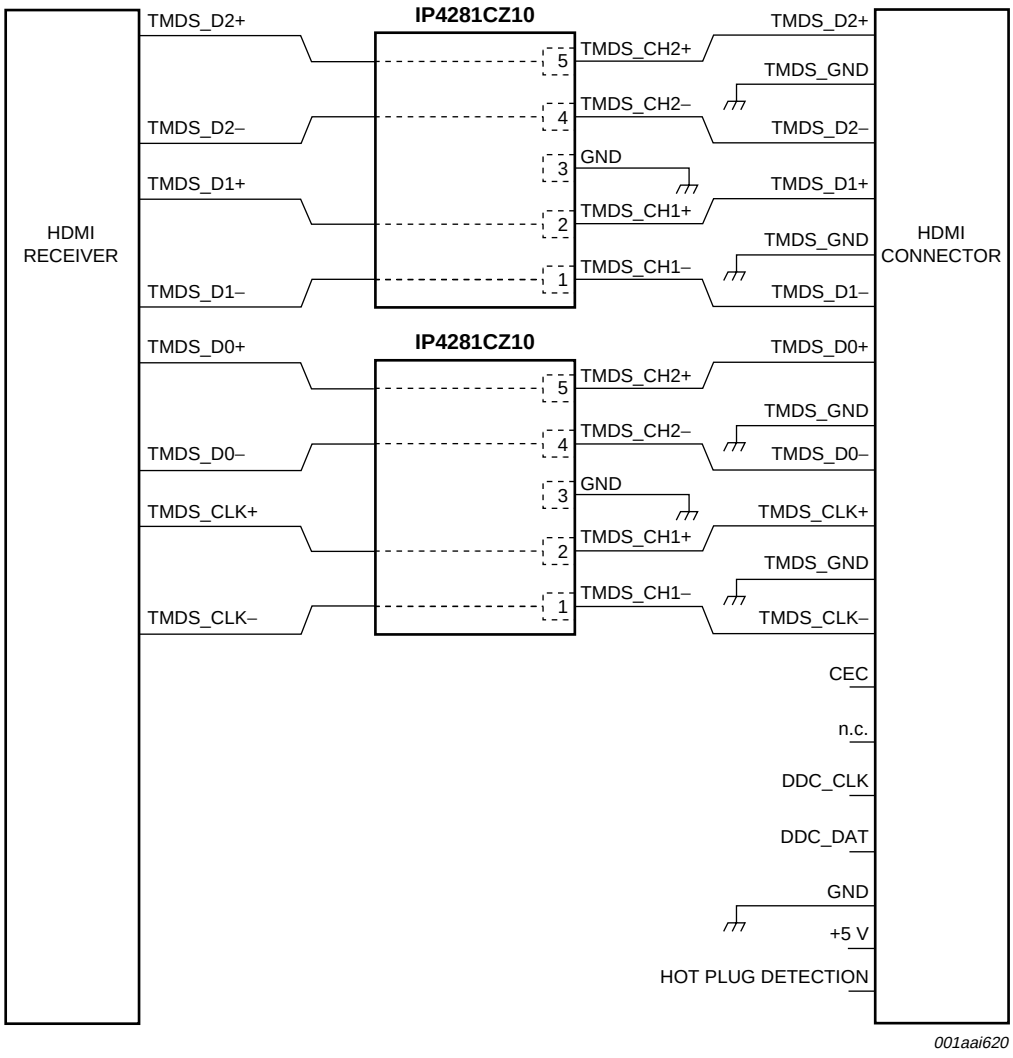
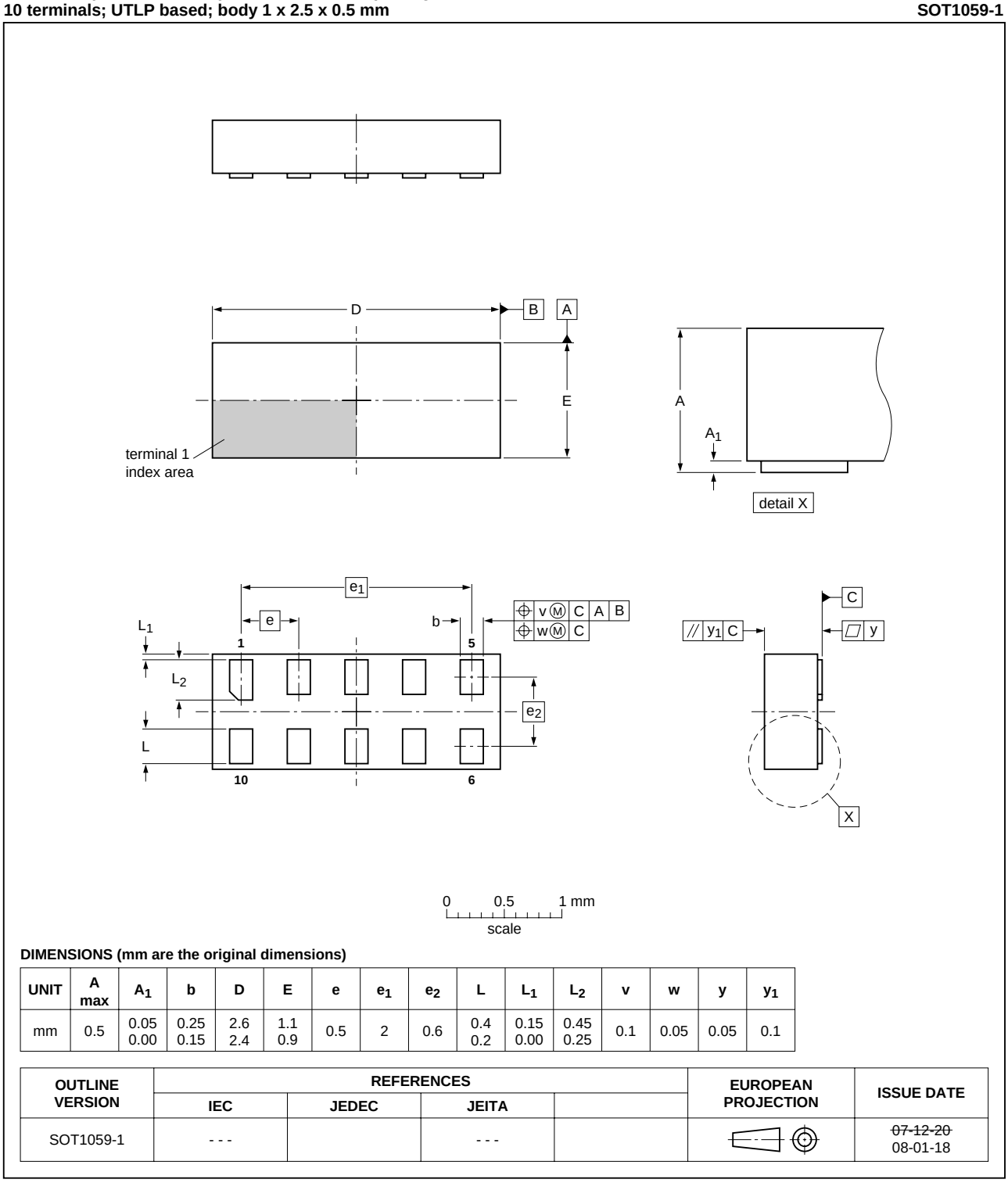



**Fig 1. Application diagram**

# 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<br>0.00 | 0.25<br>0.15 | 2.6<br>2.4 | 1.1<br>0.9 | 0.5 | 2 | 0.6 | 0.4<br>0.2 | 0.15<br>0.00 | 0.45<br>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~~<br>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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