

IP4280CZ10

ESD protection for HDMI interface

Rev. 01 — 6 June 2007

Product data sheet

1. Product profile

1.1 General description

The IP4280CZ10 is designed for HDMI interface protection. The device includes high-level ElectroStatic Discharge (ESD) protection diodes for the TMDS signal lines.

Furthermore, all TMDS intra-pairs are protected by a special diode configuration offering a low line capacitance of 0.7 pF only. These diodes provide protection to downstream components from ESD voltages of up to ± 8 kV contact according to IEC 61000-4-2, level 4 standard.

1.2 Features

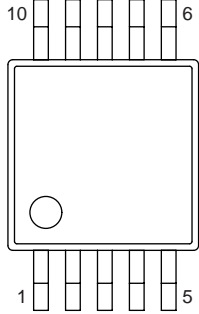
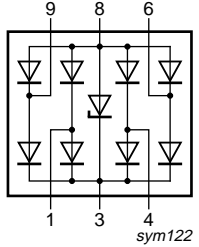
- Pb-free and RoHS compliant, Dark Green
- ESD protection for HDMI
- All TMDS lines with integrated rail-to-rail clamping diodes with downstream ESD protection of ± 8 kV according to IEC 61000-4-2, level 4 standard
- Matched 0.5 mm trace spacing
- TMDS lines with ≤ 0.05 pF matching of capacitance between the TMDS pairs
- Line capacitance of only 0.7 pF per channel
- 4-channel TSSOP10 lead-free package
- HDMI 1.3 compliant

1.3 Applications

- The IP4280CZ10 is designed for HDMI receiver and transmitter port protection e.g.:
 - ◆ TVs, monitors
 - ◆ Notebooks and mainboard graphics cards and ports
 - ◆ Set-top boxes and game consoles
 - ◆ DVD recorders and players

2. Pinning information

Table 1. Pinning

| Pin | Description | Simplified outline | Symbol |
|-----|--------------------------------|--|---|
| 1 | TMDS_CH1+ ESD protection |  |  |
| 2 | n.c. | | |
| 3 | V _{CC} supply voltage | | |
| 4 | TMDS_CH2+ ESD protection | | |
| 5 | n.c. | | |
| 6 | TMDS_CH2- ESD protection | | |
| 7 | n.c. | | |
| 8 | GND ground | | |
| 9 | TMDS_CH1- ESD protection | | |
| 10 | n.c. | | |

3. Ordering information

Table 2. Ordering information

| Type number | Package | | |
|-------------|---------|--|----------|
| | Name | Description | Version |
| IP4280CZ10 | TSSOP10 | plastic thin shrink small outline package; 10 leads; body width 3 mm | SOT552-1 |

4. Limiting values

Table 3. Limiting values

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

| Symbol | Parameter | Conditions | Min | Max | Unit |
|------------------|---------------------------------|--|-----------|-----------------------|------|
| V _{CC} | supply voltage | | GND – 0.5 | +5.5 | V |
| V _I | input voltage | | GND – 0.5 | V _{CC} + 0.5 | V |
| V _{esd} | electrostatic discharge voltage | all pins to ground; IEC 61000-4-2, level 4 | | | |
| | | contact | –8 | +8 | kV |
| | | air discharge | [1] –15 | +15 | kV |
| T _{stg} | storage temperature | | –55 | +125 | °C |

[1] This measurement is made with a 0.1 μF external capacitor connected between pin 3 (supply voltage) and pin 8 (ground).

5. Recommended operating conditions

Table 4. Recommended operating conditions

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|------------------|---------------------|------------|-----|-----|-----|------|
| T _{amb} | ambient temperature | | –40 | - | +85 | °C |

6. Characteristics

Table 5. Characteristics

$T_{amb} = 25\text{ °C}$; unless otherwise specified.

| Symbol | Parameter | Conditions | Min | Typ | Max | Unit |
|-----------------------|---|--|-------|------|-----|---------------|
| V_{BRzd} | Zener diode breakdown voltage | $I = 1\text{ mA}$ | 6 | - | 9 | V |
| $I_{L(r)}$ | reverse leakage current | per TMDS channel; $V = 3.0\text{ V}$ | - | - | 1 | μA |
| V_F | forward voltage | | - | 0.7 | - | V |
| $C_{ch(TMDS)}$ | TMDS channel capacitance | $V_{CC} = 5\text{ V}$; $f = 1\text{ MHz}$; $V_{bias} = 2.5\text{ V}$ | [1] - | 0.7 | - | pF |
| $\Delta C_{ch(TMDS)}$ | TMDS channel capacitance difference | $V_{CC} = 5\text{ V}$; $f = 1\text{ MHz}$; $V_{bias} = 2.5\text{ V}$ | [1] - | 0.05 | - | pF |
| $C_{ch(mutual)}$ | mutual channel capacitance | between signal pin and pin n.c.; $V_{CC} = 0\text{ V}$; $f = 1\text{ MHz}$; $V_{bias} = 2.5\text{ V}$ | [1] - | 0.07 | - | pF |
| R_{dyn} | dynamic resistance | $I = 1\text{ A}$, $T_{amb} = 25\text{ °C}$; 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 | $V_{esd} = 8\text{ kV HBM}$; $T_{amb} = 25\text{ °C}$ | [2] - | 8 | - | V |

[1] This parameter is guaranteed by design.

[2] This measurement is made with a $0.1\text{ }\mu\text{F}$ external capacitor connected between pin 3 (supply voltage) and pin 8 (ground).

7. Application information

The IP4280CZ10 is mainly designed to act as a high-level ESD protection for high-speed serial data buses such as HDMI, USB 2.0 and other LVDS data lines.

Therefore, a 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](#).

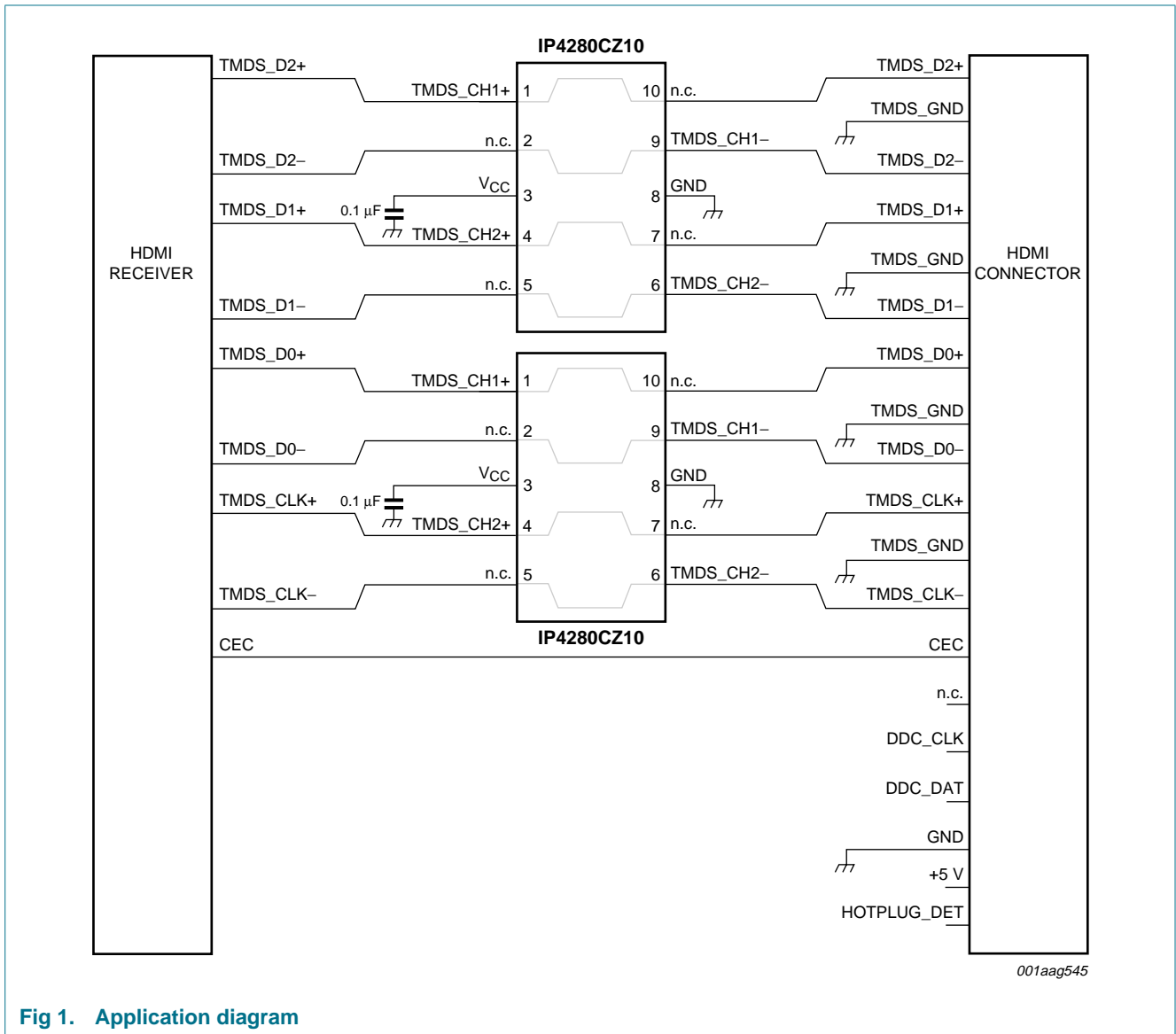


Fig 1. Application diagram

8. Package outline

TSSOP10: plastic thin shrink small outline package; 10 leads; body width 3 mm

SOT552-1

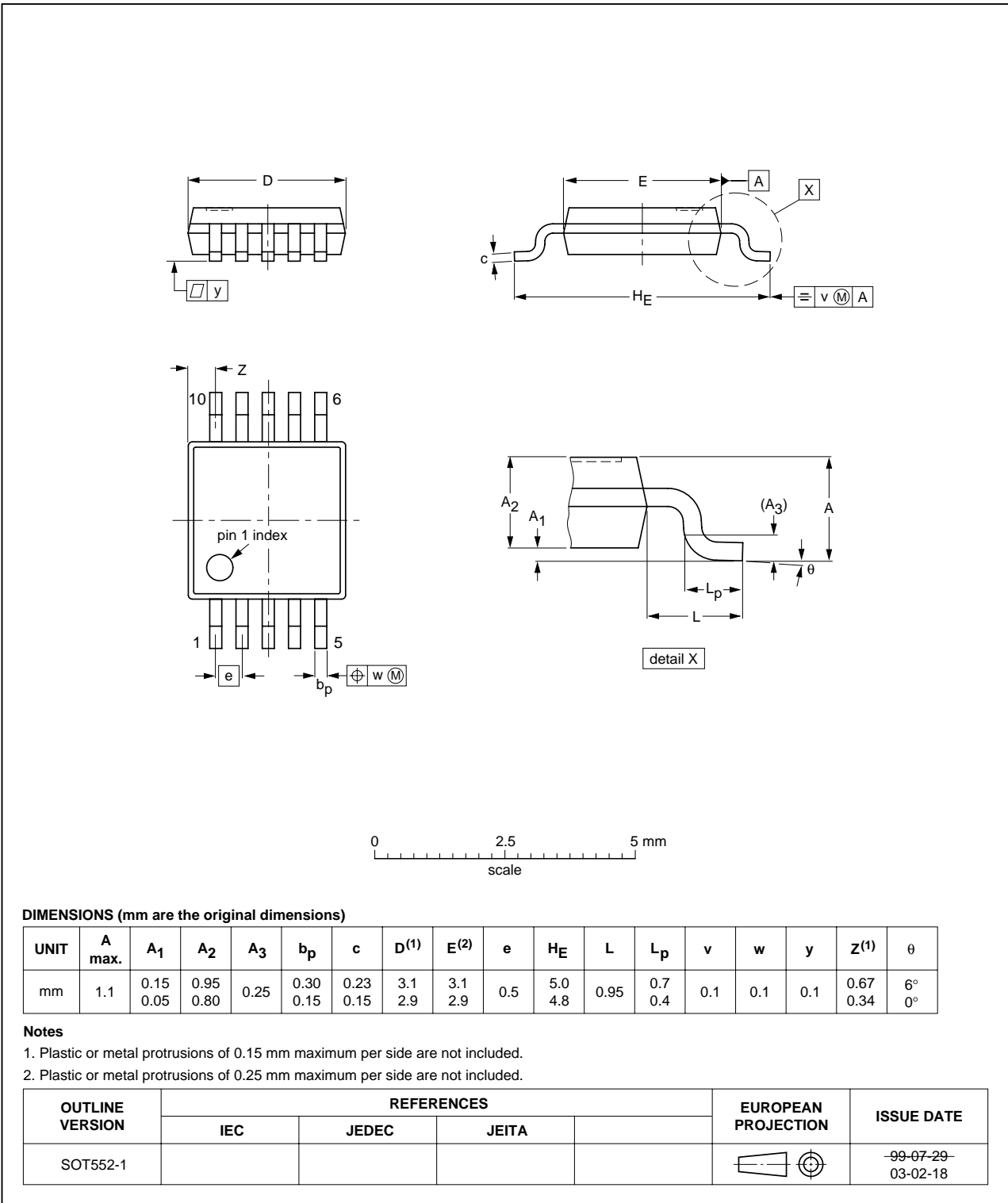


Fig 2. Package outline TSSOP10 (SOT552-1)

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 |
| USB | Universal Serial Bus |

10. Revision history

Table 7. Revision history

| Document ID | Release date | Data sheet status | Change notice | Supersedes |
|--------------|--------------|--------------------|---------------|------------|
| IP4280CZ10_1 | 20070606 | 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.nxp.com>.

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