

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

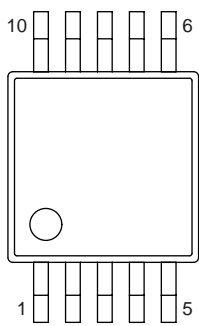
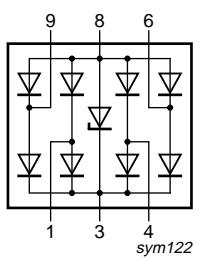
- Pb-free and RoHS compliant, Dark Green
- ESD protection for HDMI
- All TMDS lines with integrated rail-to-rail clamping diodes with downstream ESD protection of ± 8 kV according to IEC 61000-4-2, level 4 standard
- Matched 0.5 mm trace spacing
- TMDS lines with ≤ 0.05 pF matching of capacitance between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

$T_{amb} = 25\text{ }^{\circ}\text{C}$; 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 | $I = 1\text{ A}$, $T_{amb} = 25\text{ }^{\circ}\text{C}$; 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 | $V_{esd} = 8\text{ kV HBM}$; $T_{amb} = 25\text{ }^{\circ}\text{C}$ | [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](#).

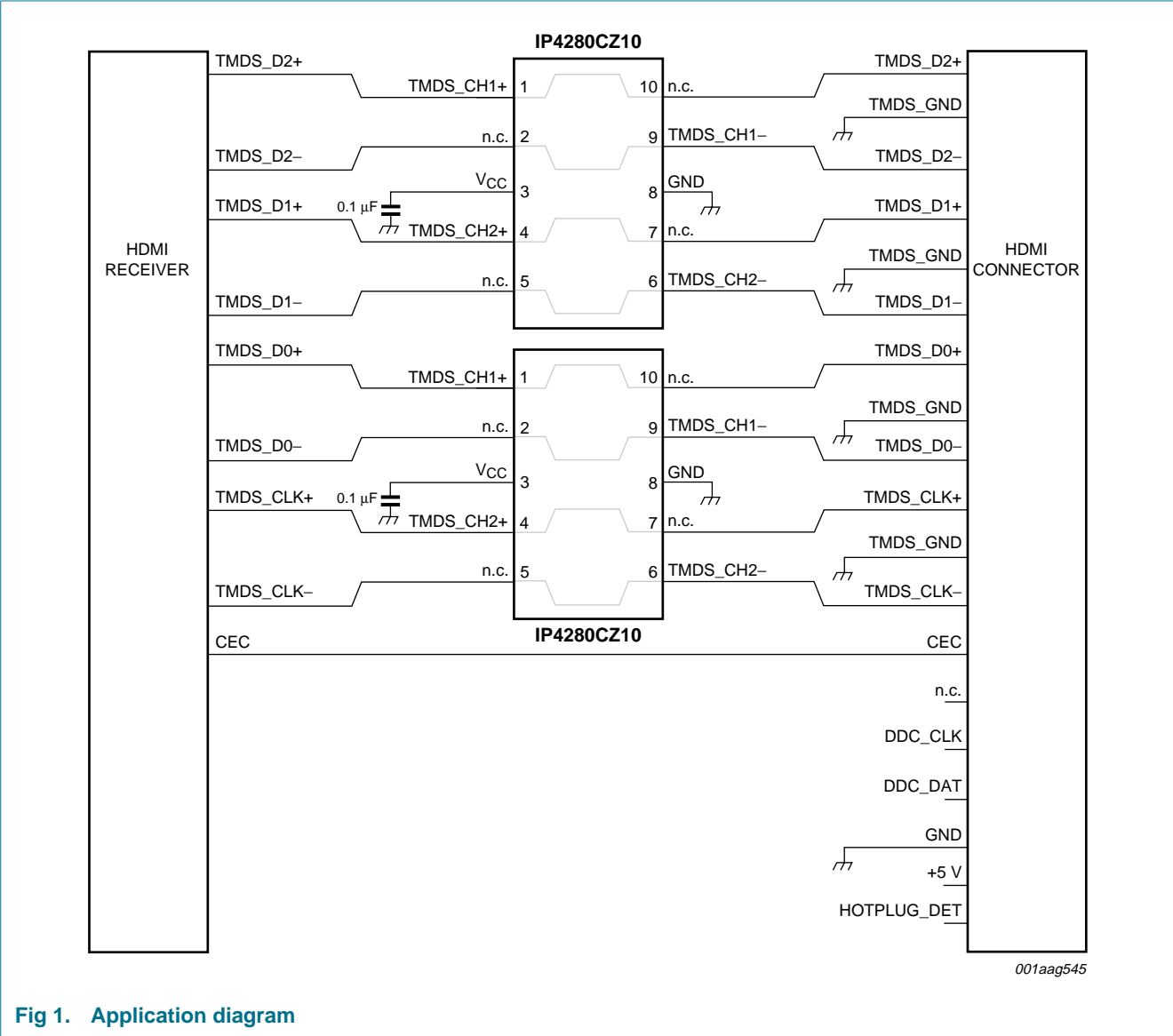


Fig 1. Application diagram

8. Package outline

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

SOT552-1

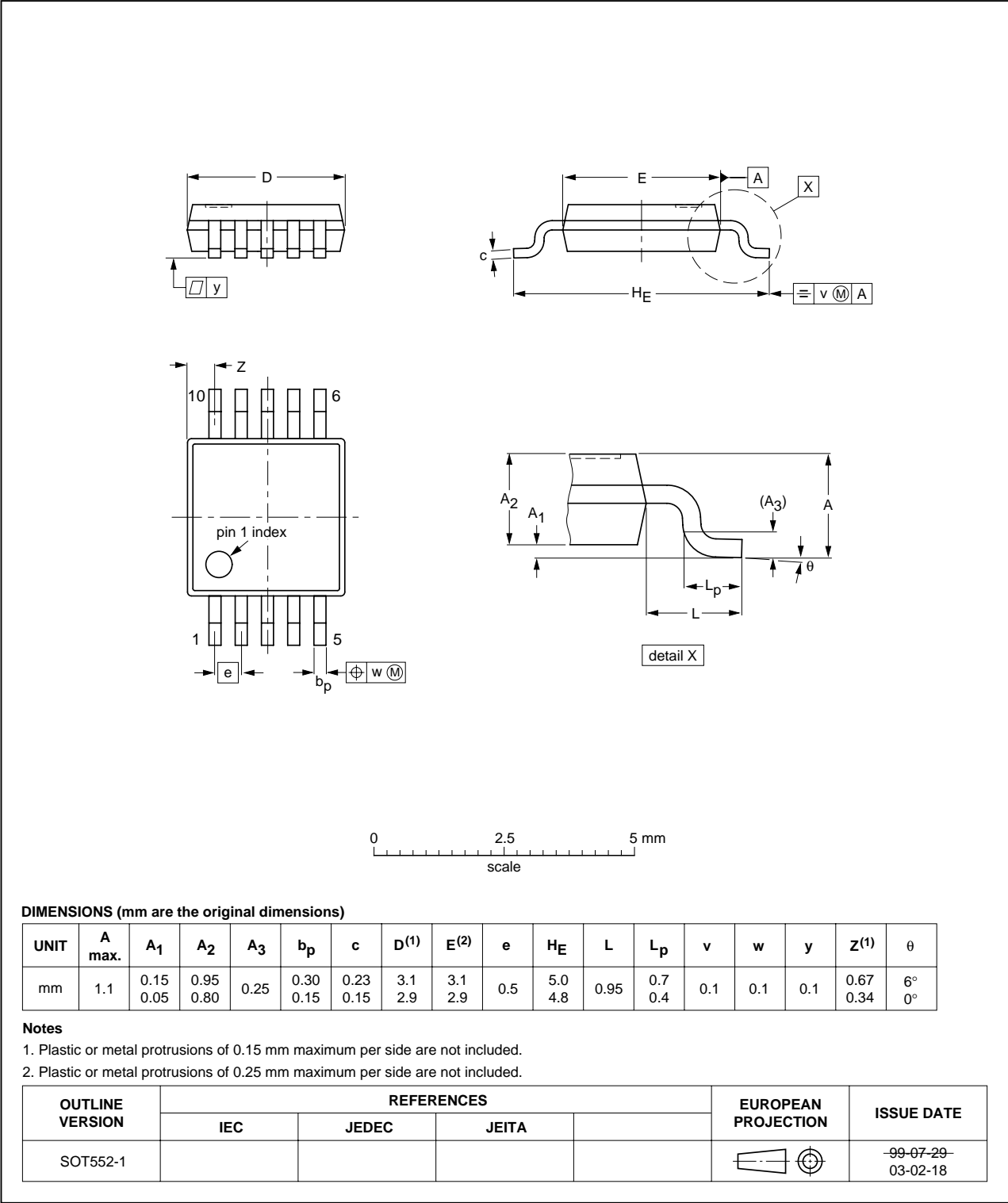


Fig 2. Package outline TSSOP10 (SOT552-1)

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".

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13. Contents

1 Product profile 1

1.1 General description..... 1

1.2 Features 1

1.3 Applications 1

2 Pinning information..... 2

3 Ordering information..... 2

4 Limiting values..... 2

5 Recommended operating conditions..... 2

6 Characteristics..... 3

7 Application information..... 4

8 Package outline 5

9 Abbreviations..... 6

10 Revision history..... 6

11 Legal information..... 7

11.1 Data sheet status 7

11.2 Definitions..... 7

11.3 Disclaimers..... 7

11.4 Trademarks..... 7

12 Contact information..... 7

13 Contents 8



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