

# IP4280CZ10

ESD protection for HDMI interface

Rev. 01 — 6 June 2007

Product data sheet

## 1. Product profile

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### 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  $\pm 8$  kV contact according to IEC 61000-4-2, level 4 standard.

### 1.2 Features

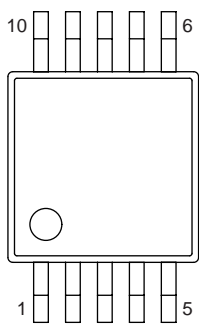
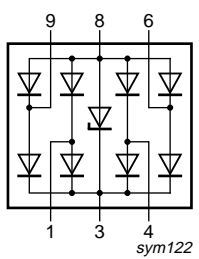
- Pb-free and RoHS compliant, Dark Green
- ESD protection for HDMI
- All TMDS lines with integrated rail-to-rail clamping diodes with downstream ESD protection of  $\pm 8$  kV according to IEC 61000-4-2, level 4 standard
- Matched 0.5 mm trace spacing
- TMDS lines with  $\leq 0.05$  pF matching of capacitance 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 <sub>CC</sub> 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 <sub>CC</sub>	supply voltage		GND – 0.5	+5.5	V
V <sub>I</sub>	input voltage		GND – 0.5	V <sub>CC</sub> + 0.5	V
V <sub>esd</sub>	electrostatic discharge voltage	all pins to ground; IEC 61000-4-2, level 4			
		contact	–8	+8	kV
		air discharge	[1] –15	+15	kV
T <sub>stg</sub>	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 <sub>amb</sub>	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	$\mu\text{A}$
$V_F$	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	-	$\Omega$
		negative transient	-	1.3	-	$\Omega$
$V_{CL(ch)trt(pos)}$	positive transient channel clamping voltage	$V_{esd} = 8\text{ kV HBM}$ ; $T_{amb} = 25\text{ °C}$	[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](#).

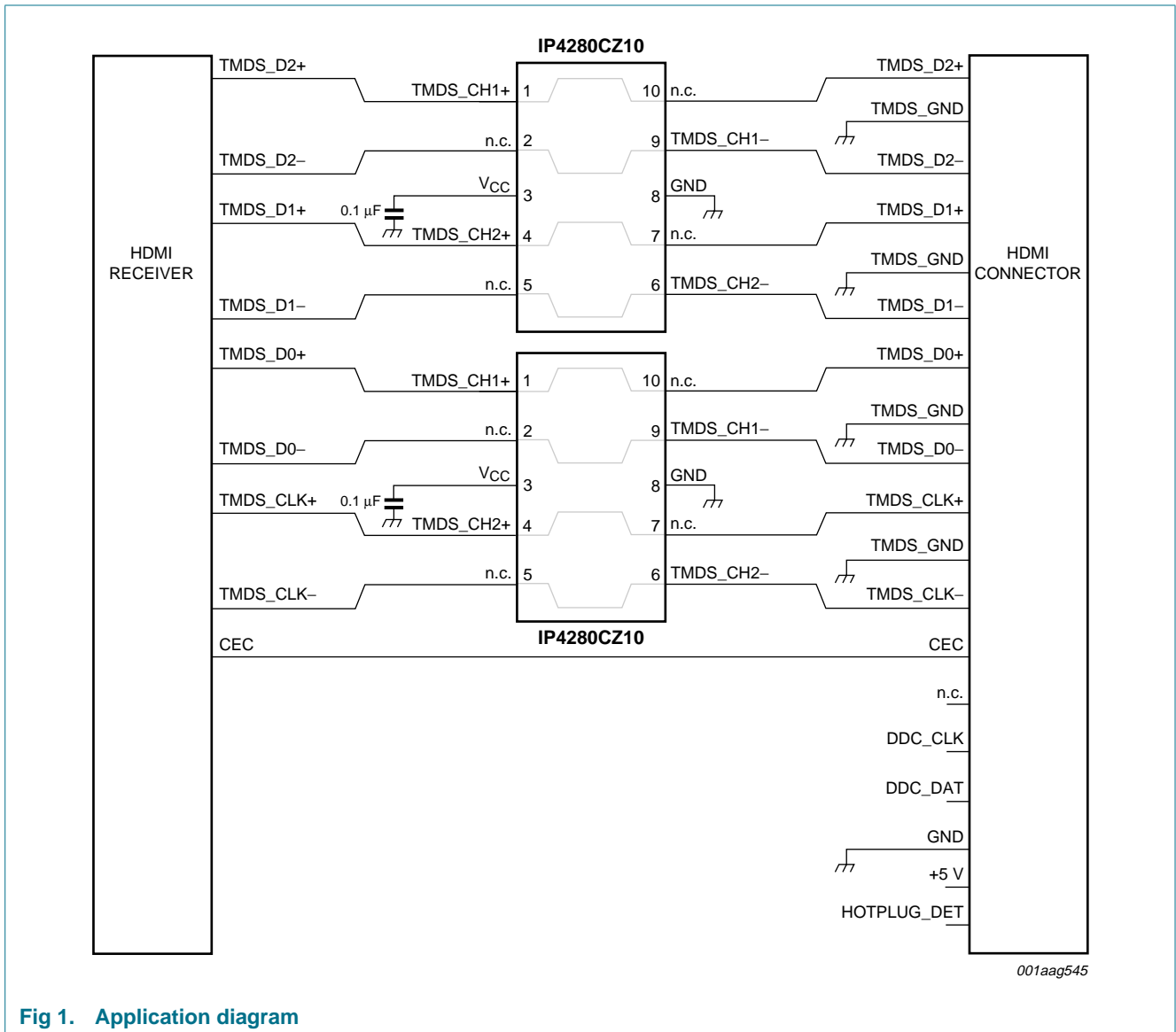


Fig 1. Application diagram

8. Package outline

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

SOT552-1

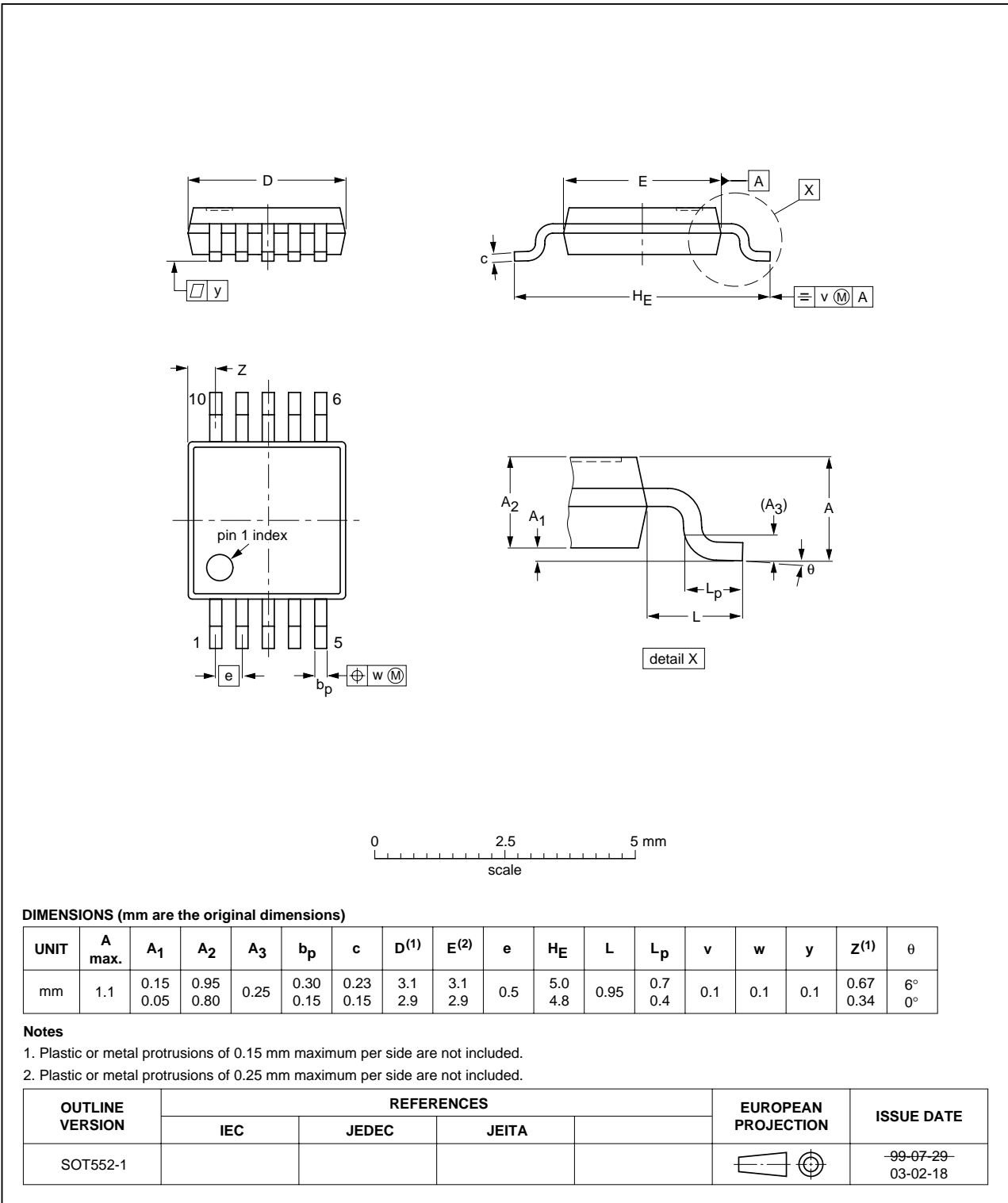


Fig 2. Package outline TSSOP10 (SOT552-1)

## 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 <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.
Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
Product [short] data sheet	Production	This document contains the product specification.

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[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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Date of release: 6 June 2007

Document identifier: IP4280CZ10\_1