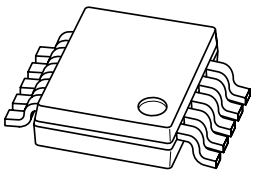


IP4280CZ10

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

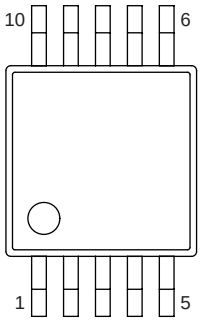
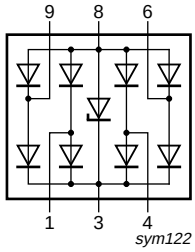
- Pb-free and RoHS compliant, Dark Green
- ESD protection for HDMI
- All TMDS lines with integrated rail-to-rail clamping diodes with downstream ESD protection of ±8 kV according to IEC 61000-4-2, level 4 standard
- Matched 0.5 mm trace spacing
- TMDS lines with ≤ 0.05 pF matching of capacitance between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

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{BRzd}	Zener diode breakdown voltage	I = 1 mA		6	-	9	V
$I_{L(r)}$	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	V_{CC} = 5 V; f = 1 MHz; V_{bias} = 2.5 V	[1]	-	0.7	-	pF
$\Delta C_{ch(TMDS)}$	TMDS channel capacitance difference	V_{CC} = 5 V; 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.; V_{CC} = 0 V; 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	[2]	-	8	-	V

[1] This parameter is guaranteed by design.

[2] This measurement is made with a 0.1 µF 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.

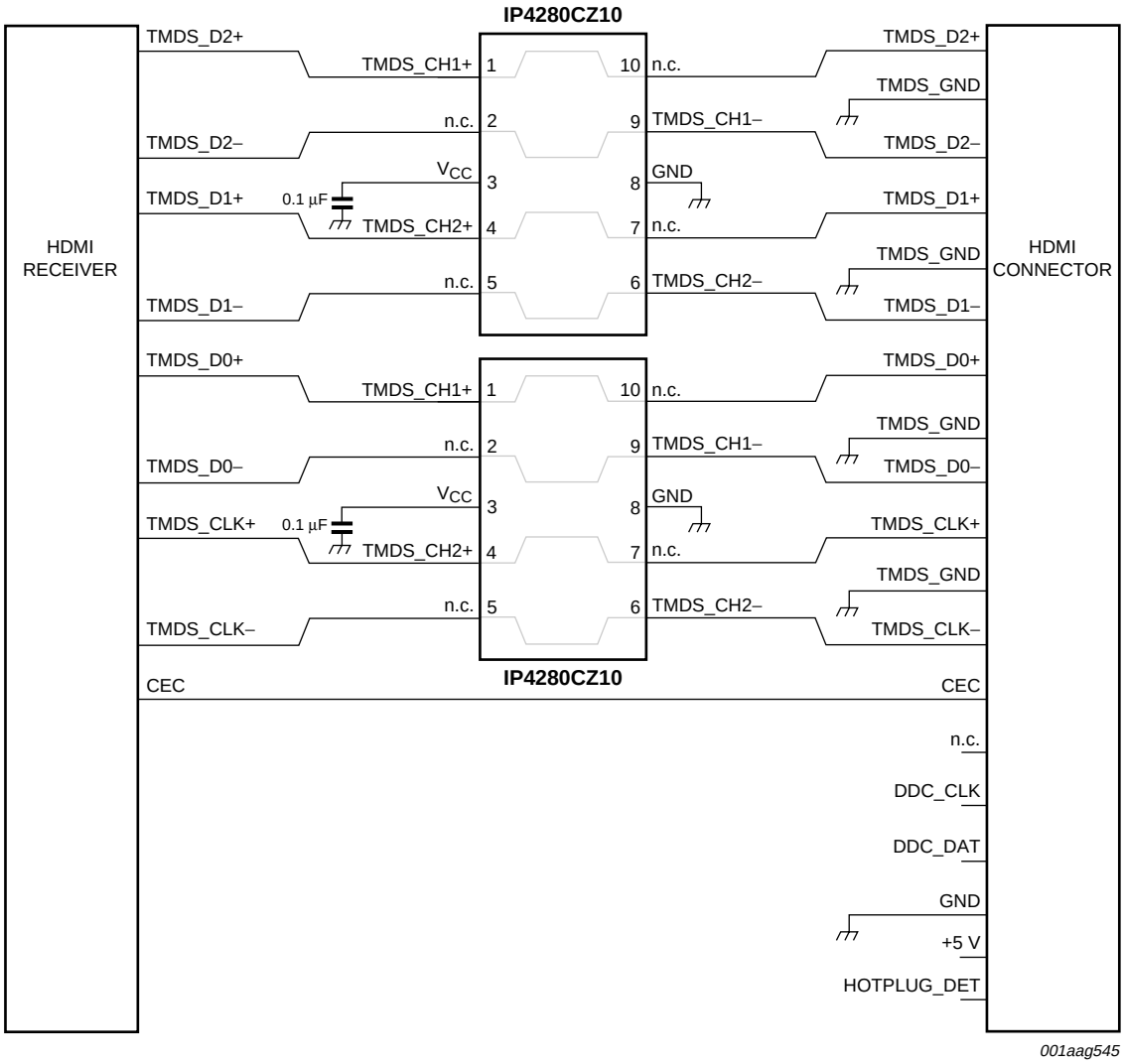
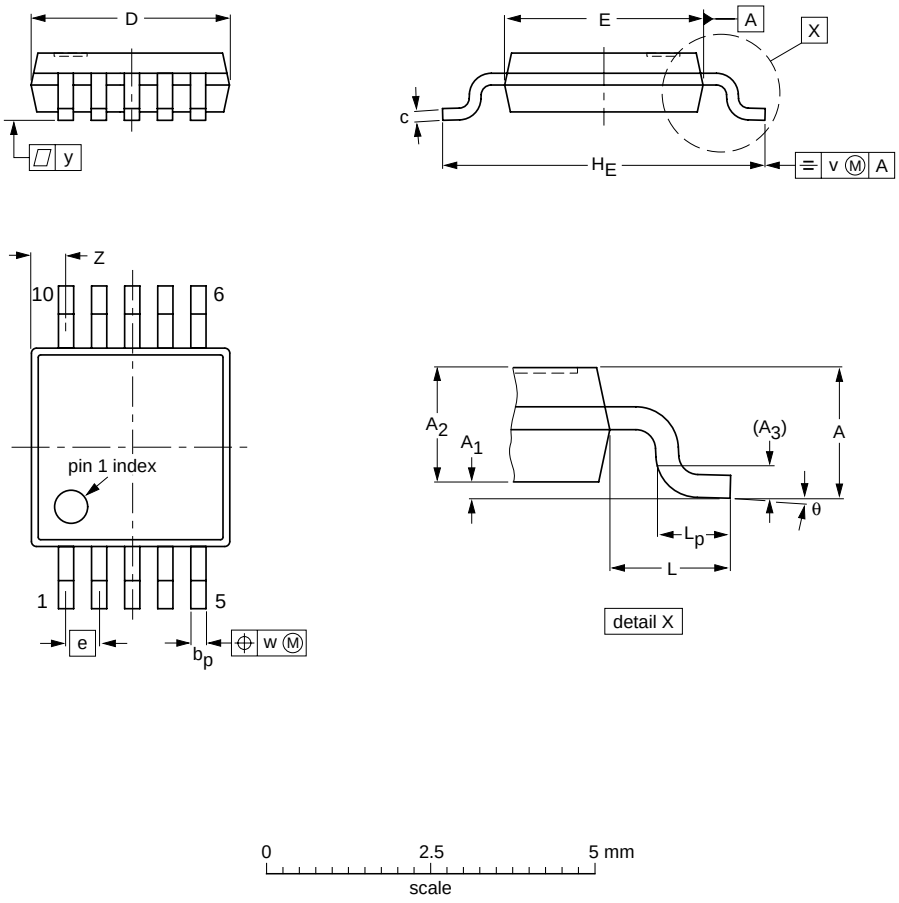


Fig 1. Application diagram

8. Package outline

TSSOP10: plastic thin shrink small outline package; 10 leads; body width 3 mm **SOT552-1**



DIMENSIONS (mm are the original dimensions)

UNIT	A max.	A_1	A_2	A_3	b_p	c	$D^{(1)}$	$E^{(2)}$	e	H_E	L	L_p	v	w	y	$Z^{(1)}$	θ
mm	1.1	0.15 0.05	0.95 0.80	0.25	0.30 0.15	0.23 0.15	3.1 2.9	3.1 2.9	0.5	5.0 4.8	0.95	0.7 0.4	0.1	0.1	0.1	0.67 0.34	6° 0°

Notes

1. Plastic or metal protrusions of 0.15 mm maximum per side are not included.
2. Plastic or metal protrusions of 0.25 mm maximum per side are not included.

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT552-1						~~99-07-29~~ 03-02-18

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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