IP4221CZ6-S

ESD protection for high-speed interfaces

Rev. 2 — 13 December 2012 Product data sheet

1. Product profile

1.1 General description

The device is designed to protect high-speed interfaces such as USB 2.0, Ethernet and Digital Visual Interface (DVI) against ElectroStatic Discharge (ESD).

The device includes four high-level ESD protection diode structures for high-speed signal lines and is encapsulated in a leadless ultra small DFN1410-6 (SOT886) plastic package.

Special diode configuration protects all signal lines and offers ultra low line capacitance of only 1 pF. The rail-to-rail diodes are connected to the Zener diode which allows ESD protection to be independent of supply voltage.

1.2 Features and benefits

- System ESD protection for high-speed data lines such as USB 2.0, Ethernet and DVI
- All signal lines with integrated rail-to-rail clamping diodes for downstream ESD protection of ±8 kV according to IEC 61000-4-2, level 4
- Line capacitance of only 1 pF for each channel
- Leadless ultra small DFN1410-6 package: 1 × 1.45 × 0.5 mm; pitch 0.5 mm

1.3 Applications

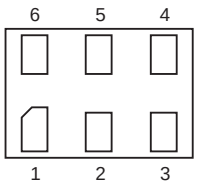
The device is designed for high-speed receiver and transmitter port protection:

- Mobile phones, smartphones and handsets
- TVs and monitors
- DVD recorders and players
- Notebooks, mother boards, graphic cards and ports
- Set-top boxes and game consoles

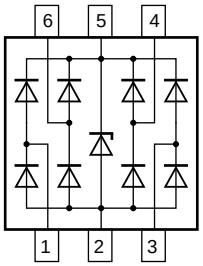
2. Pinning information

Table 1. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	I/O 1	ESD protection		
2	GND	ground		
3	I/O 2	ESD protection		
4	I/O 3	ESD protection		
5	V_{CC}	supply voltage		
6	I/O 4	ESD protection		



Transparent top view



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3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
IP4221CZ6-S	DFN1410-6	plastic extremely thin small outline package; no leads; 6 terminals; body 1 × 1.45 × 0.5 mm	SOT886

4. Marking

Table 3. Marking codes

Type number	Marking code
IP4221CZ6-S	1S

5. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_I	input voltage			−0.5	+5.5	V
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2, level 4; contact discharge	[1]	−8	+8	kV
T_{stg}	storage temperature			−55	+125	°C
T_{amb}	ambient temperature			−40	+85	°C

[1] All pins to ground.

6. Characteristics

Table 5. Characteristics

T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
$C_{(I/O-GND)}$	input/output to ground capacitance	V_I = 0 V; f = 1 MHz; V_{CC} = 3 V	[1][2]	-	1	1.2	pF
I_{RM}	reverse leakage current	V_I = 3 V	[3][2]	-	-	100	nA
V_{BRzd}	Zener diode breakdown voltage	I_I = 1 mA	[4]	6	-	9	V
V_F	forward voltage	I_{test} = 10 mA		-	0.7	-	V

[1] This parameter is guaranteed by design.

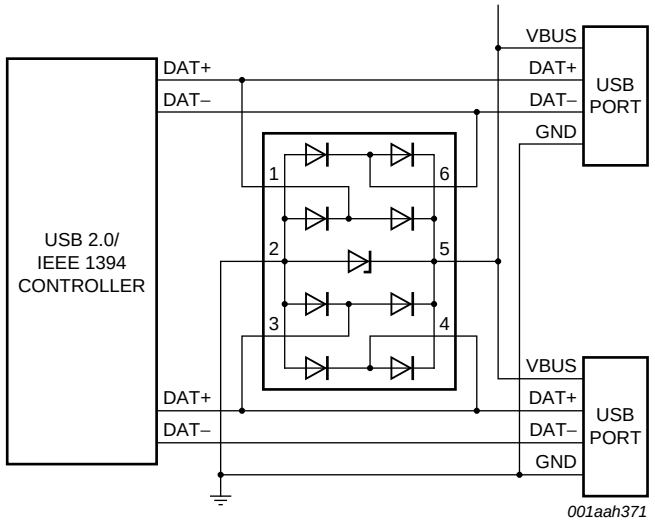
[2] Pins 1, 3, 4 and 6 are measured to ground.

[3] All pins measured to ground (pin 2).

[4] Measured from pin 5 to pin 2.

7. Application information

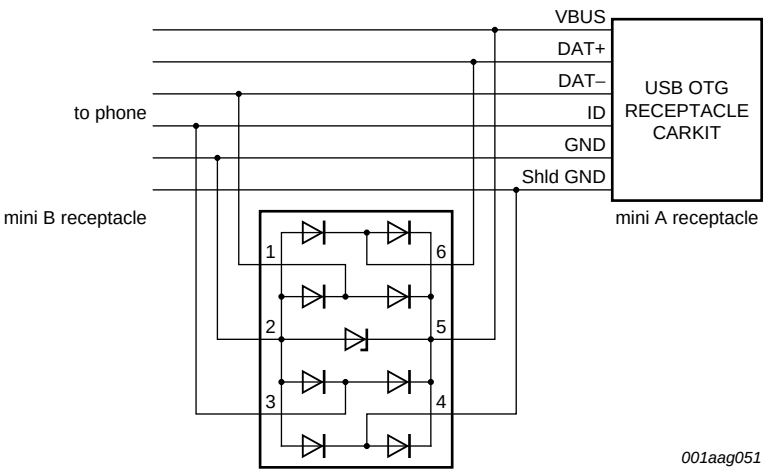
7.1 USB 1.1 and 2.0 protection



Each device is capable to protect USB data lines and V_{BUS} supply.

Fig 1. Typical application for USB ESD protection

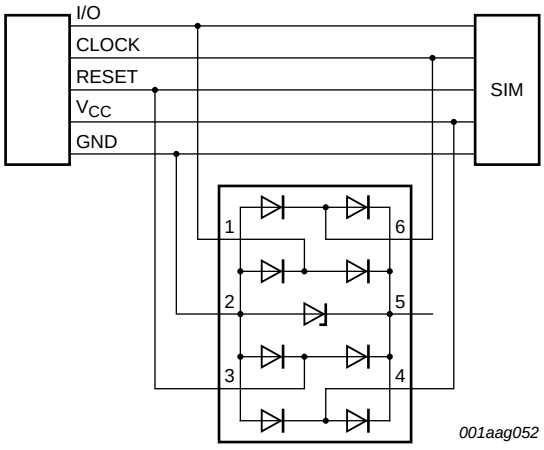
7.2 USB On-The-GO (OTG) protection



The device is capable to protect USB data lines, V_{BUS} supply and ID pin.

Fig 2. Typical application for USB OTG ESD protection

7.3 Universal SIM card protection



The device also protects V_{CC}.

Fig 3. Typical application for universal SIM card ESD protection

7.4 IEEE 1394a/b protection

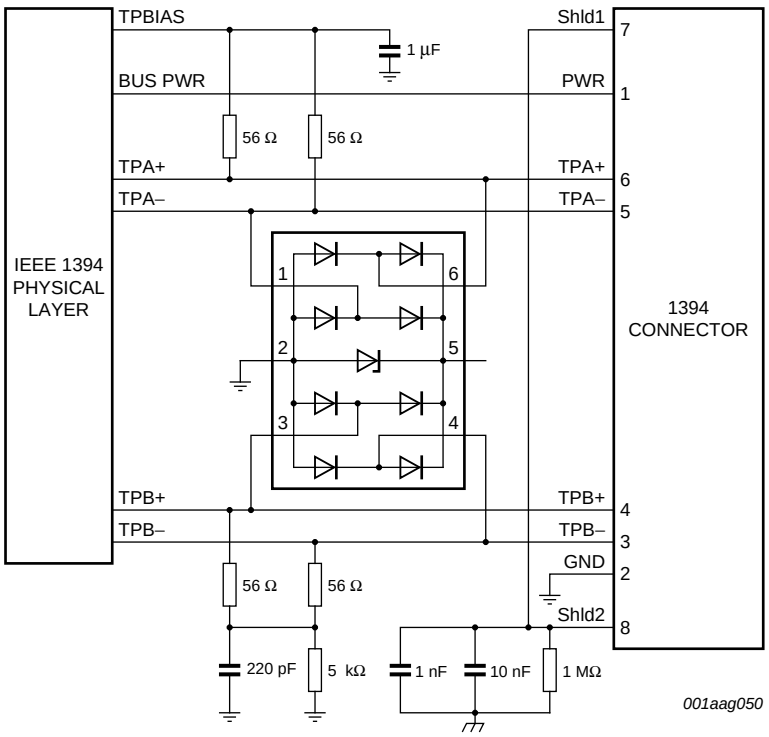


Fig 4. Typical application for IEEE 1394a/b ESD protection

7.5 Gigabit Ethernet transceiver protection

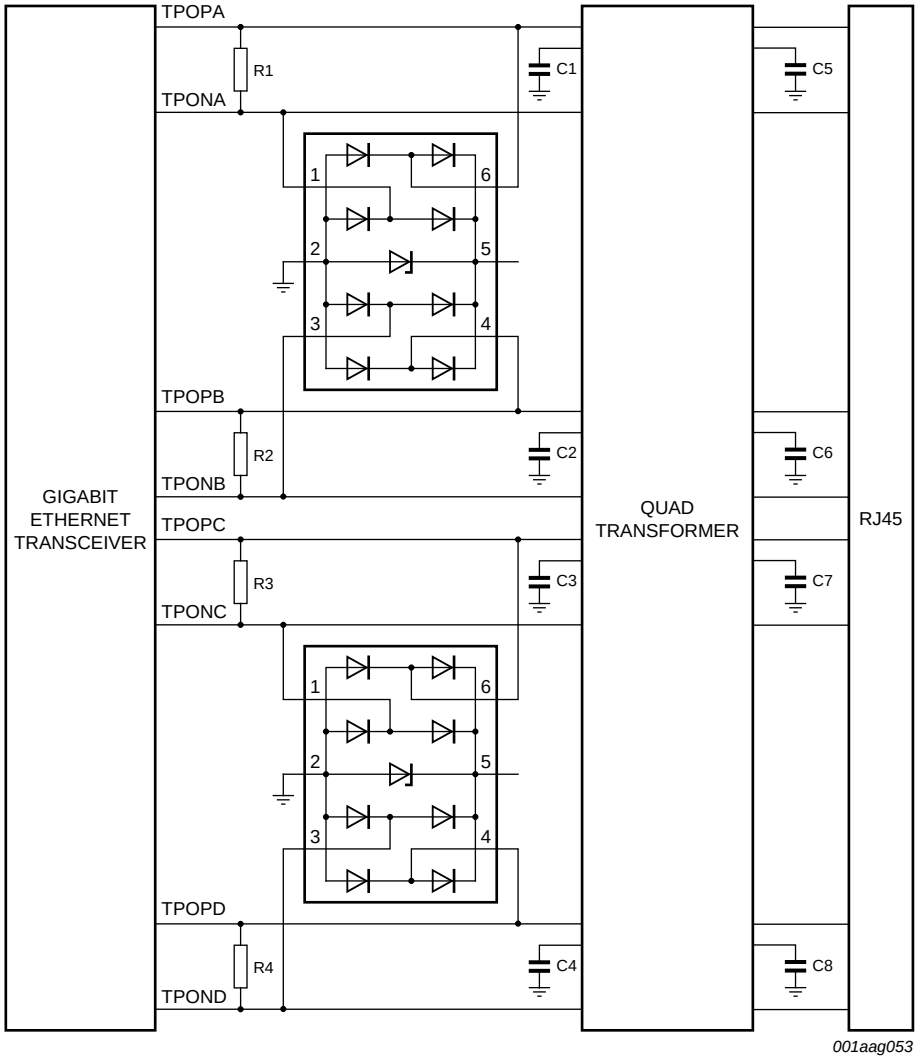


Fig 5. Typical application for gigabit Ethernet transceiver ESD protection

7.6 Universal microSD/TransFlash and SD memory card protection

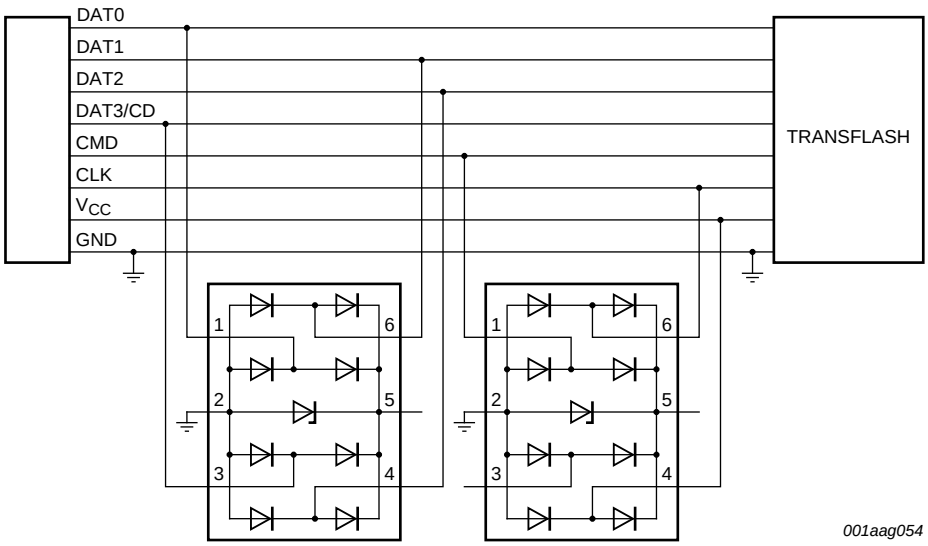


Fig 6. Typical application for universal microSD/TransFlash and SD memory card ESD protection

8. Package outline

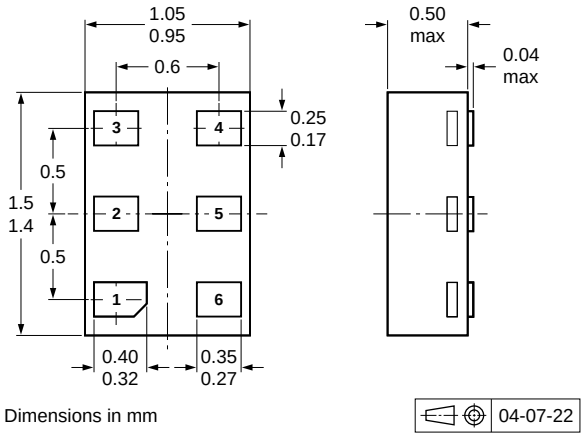


Fig 7. Package outline DFN1410-6 (SOT886)

9. Packing information

Table 6. Packing methods

The indicated -xxx are the last three digits of the 12NC ordering code. [1]

Type number	Package	Description		Packing quantity
				5000
IP4221CZ6-S	DFN1410-6 (SOT886)	4 mm pitch, 8 mm tape and reel; T1	[2]	-115
		4 mm pitch, 8 mm tape and reel; T4	[3]	-132

[1] For further information and the availability of packing methods, see Section 13.

[2] T1: normal taping

[3] T4: reverse taping

10. Soldering

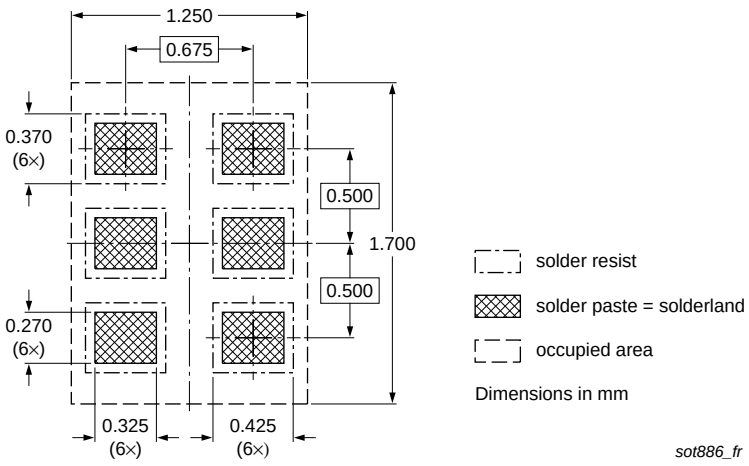


Fig 8. Reflow soldering footprint DFN1410-6 (SOT886)

11. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
IP4221CZ6-S v.2	20121213	Product data sheet	-	IP4221CZ6-S v.1
Modifications:	• Section 1 “Product profile”: updated • Section 4 “Marking”: added • Section 5 “Limiting values”: T_{amb} added • Recommended operating conditions: removed • Table 5 “Characteristics”: updated • Section 7 “Application information”: updated • Section 8 “Package outline”: drawing replaced with minimized package outline drawing • Section 10 “Soldering”: updated • Section 12 “Legal information”: updated			
IP4221CZ6-S v.1	20080429	Product data sheet	-	-

12. Legal information

12.1 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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14. Contents

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