

IP4233CZ6

Ultra low capacitance ESD protection for Ethernet ports

Rev. 3 — 17 June 2010 Product data sheet

1. Product profile

1.1 General description

The IP4233CZ6 is designed to protect Input/Output (I/O) ports that are sensitive to capacitive loads, such as Ethernet, from destruction by ElectroStatic Discharge (ESD).

The IP4233CZ6 incorporates two pairs of ultra low capacitance back-to-back diodes which protect components from ESD voltages as high as ±8 kV contact discharge according to IEC 61000-4-2, level 4.

The back-to-back diodes prevent negative clipping of AC signals and voltages below zero.

The IP4233CZ6 is fabricated using monolithic silicon technology integrating two ultra low capacitance back-to-back ESD protection diodes in a very small 6-lead SOT363 package.

1.2 Features and benefits

- Pb-free and Restriction of Hazardous Substances (RoHS) compliant
- ESD protection compliant to IEC 61000-4-2 level 4, ±8 kV contact discharge
- Two low input capacitance (0.9 pF typical) back-to-back ESD protection diodes
- Very small 6-lead SOT363 package

1.3 Applications

- ESD protection high-frequency AC-coupled Ethernet ports

1.4 Quick reference data

Table 1. Quick reference data

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

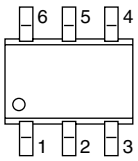
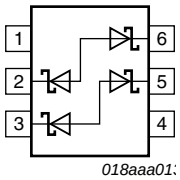
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{ESD}	electrostatic discharge voltage	all pins; IEC 61000-4-2, level 4; contact discharge		-	-	±8	kV
$C_{(I/O-GND)}$	input/output to ground capacitance	V_I = 0 V; f = 1 MHz	[1][2]	-	0.9	1.3	pF

[1] Guaranteed by design.

[2] Pins 2 to 6 and pins 3 to 5.

2. Pinning information

Table 2. Pinning

Pin	Description	Simplified outline	Graphic symbol
1	not connected		
2	ESD protection I/O channel 1		
3	ESD protection I/O channel 2		
4	not connected		
5	ESD protection I/O channel 2		
6	ESD protection I/O channel 1		

3. Ordering information

Table 3. Ordering information

Type number	Package		
	Name	Description	Version
IP4233CZ6	SC-88	plastic surface-mounted package; 6 leads	SOT363

4. 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		-	±5.5	V
V_{ESD}	electrostatic discharge voltage	all pins; IEC 61000-4-2, level 4; contact discharge	-	±8	kV
T_{stg}	storage temperature		–55	+125	°C
T_{amb}	ambient temperature		–40	+85	°C

5. 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	[1][2]	-	0.9	1.3	pF
I_{RM}	reverse leakage current	V_I = 3.0 V	[2]	-	-	100	nA
V_{BR}	breakdown voltage	back-to-back diode; I = 5 mA		6	-	9.5	V

[1] Guaranteed by design.

[2] Pins 2 to 6 and pins 3 to 5.

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6. Application information

A typical application for protecting a 10/100 Mbit/s Ethernet transceiver against ESD is shown in Figure 1.

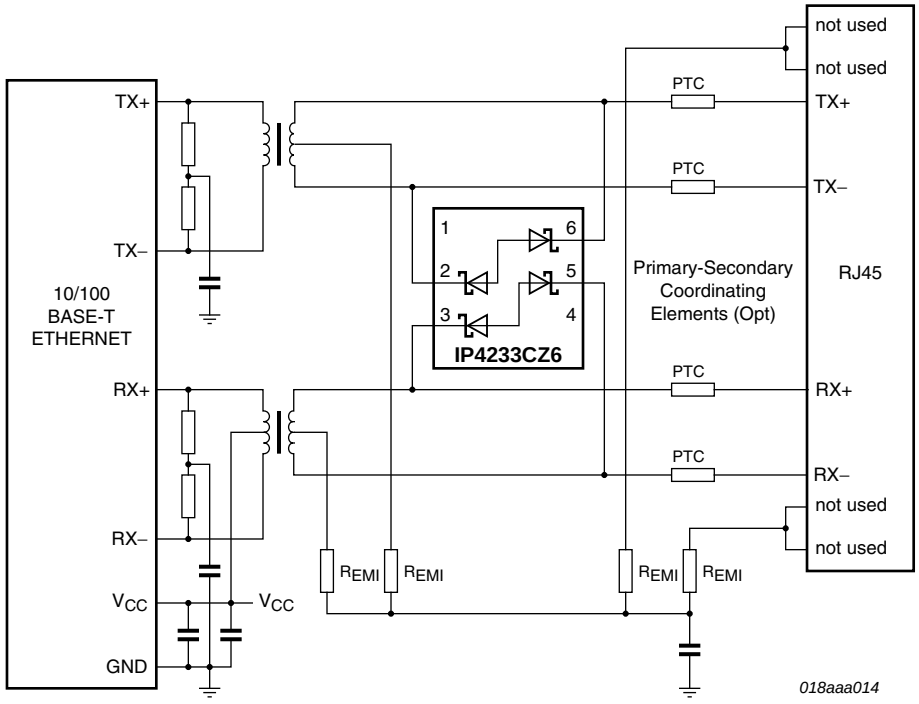


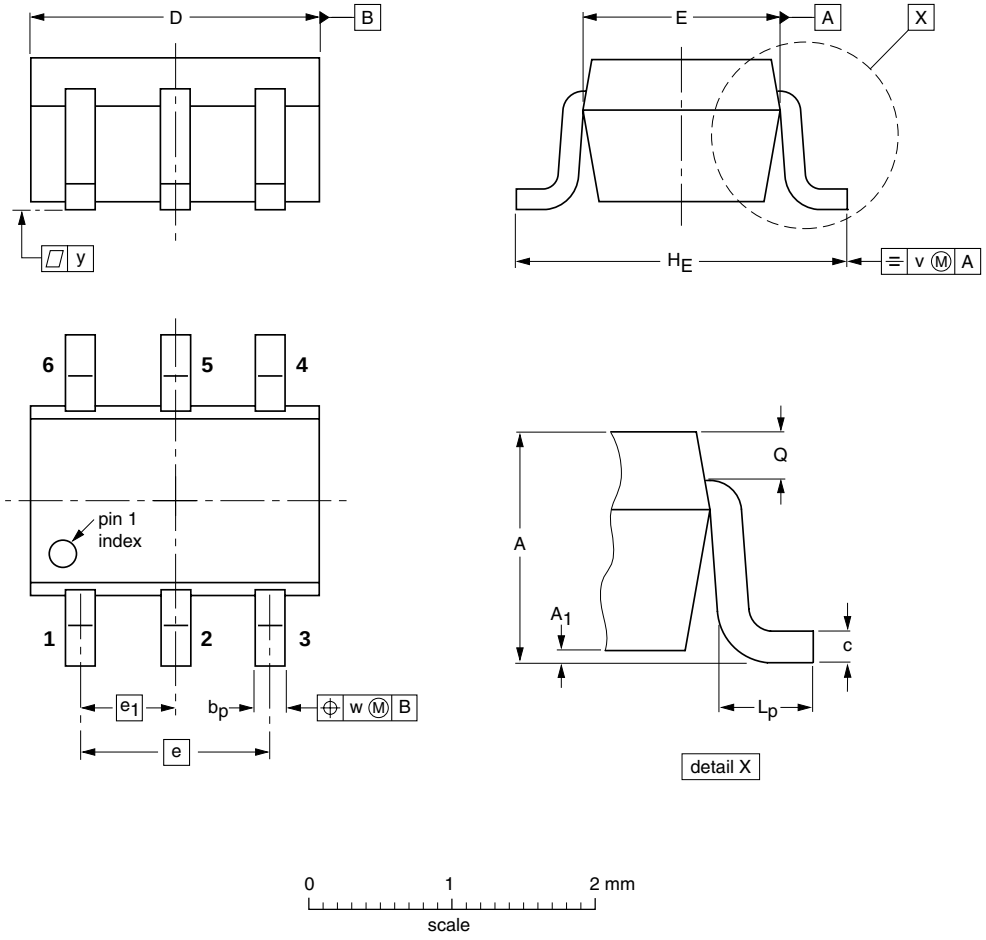
Fig 1. Typical application for ESD protection of a 10/100 Mbit/s Ethernet transceiver

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7. Package outline

Plastic surface-mounted package; 6 leads **SOT363**



DIMENSIONS (mm are the original dimensions)

UNIT	A	A_1 max	b_p	c	D	E	e	e_1	H_E	L_p	Q	v	w	y
mm	1.1 0.8	0.1	0.30 0.20	0.25 0.10	2.2 1.8	1.35 1.15	1.3	0.65	2.2 2.0	0.45 0.15	0.25 0.15	0.2	0.2	0.1

OUTLINE VERSION	REFERENCES				EUROPEAN PROJECTION	ISSUE DATE
	IEC	JEDEC	JEITA			
SOT363			SC-88			~~04-11-08~~ 06-03-16

Fig 2. Package outline SOT363 (SC-88)

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8. Soldering of SMD packages

This text provides a very brief insight into a complex technology. A more in-depth account of soldering ICs can be found in Application Note *AN10365 "Surface mount reflow soldering description"*.

8.1 Introduction to soldering

Soldering is one of the most common methods through which packages are attached to Printed Circuit Boards (PCBs), to form electrical circuits. The soldered joint provides both the mechanical and the electrical connection. There is no single soldering method that is ideal for all IC packages. Wave soldering is often preferred when through-hole and Surface Mount Devices (SMDs) are mixed on one printed wiring board; however, it is not suitable for fine pitch SMDs. Reflow soldering is ideal for the small pitches and high densities that come with increased miniaturization.

8.2 Wave and reflow soldering

Wave soldering is a joining technology in which the joints are made by solder coming from a standing wave of liquid solder. The wave soldering process is suitable for the following:

- Through-hole components
- Leaded or leadless SMDs, which are glued to the surface of the printed circuit board

Not all SMDs can be wave soldered. Packages with solder balls, and some leadless packages which have solder lands underneath the body, cannot be wave soldered. Also, leaded SMDs with leads having a pitch smaller than ~0.6 mm cannot be wave soldered, due to an increased probability of bridging.

The reflow soldering process involves applying solder paste to a board, followed by component placement and exposure to a temperature profile. Leaded packages, packages with solder balls, and leadless packages are all reflow solderable.

Key characteristics in both wave and reflow soldering are:

- Board specifications, including the board finish, solder masks and vias
- Package footprints, including solder thieves and orientation
- The moisture sensitivity level of the packages
- Package placement
- Inspection and repair
- Lead-free soldering versus SnPb soldering

8.3 Wave soldering

Key characteristics in wave soldering are:

- Process issues, such as application of adhesive and flux, clinching of leads, board transport, the solder wave parameters, and the time during which components are exposed to the wave
- Solder bath specifications, including temperature and impurities

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8.4 Reflow soldering

Key characteristics in reflow soldering are:

- Lead-free versus SnPb soldering; note that a lead-free reflow process usually leads to higher minimum peak temperatures (see Figure 3) than a SnPb process, thus reducing the process window
- Solder paste printing issues including smearing, release, and adjusting the process window for a mix of large and small components on one board
- Reflow temperature profile; this profile includes preheat, reflow (in which the board is heated to the peak temperature) and cooling down. It is imperative that the peak temperature is high enough for the solder to make reliable solder joints (a solder paste characteristic). In addition, the peak temperature must be low enough that the packages and/or boards are not damaged. The peak temperature of the package depends on package thickness and volume and is classified in accordance with Table 6 and 7

Table 6. SnPb eutectic process (from J-STD-020C)

Package thickness (mm)	Package reflow temperature (°C)	
	Volume (mm^3)	
	< 350	≥ 350
< 2.5	235	220
≥ 2.5	220	220

Table 7. Lead-free process (from J-STD-020C)

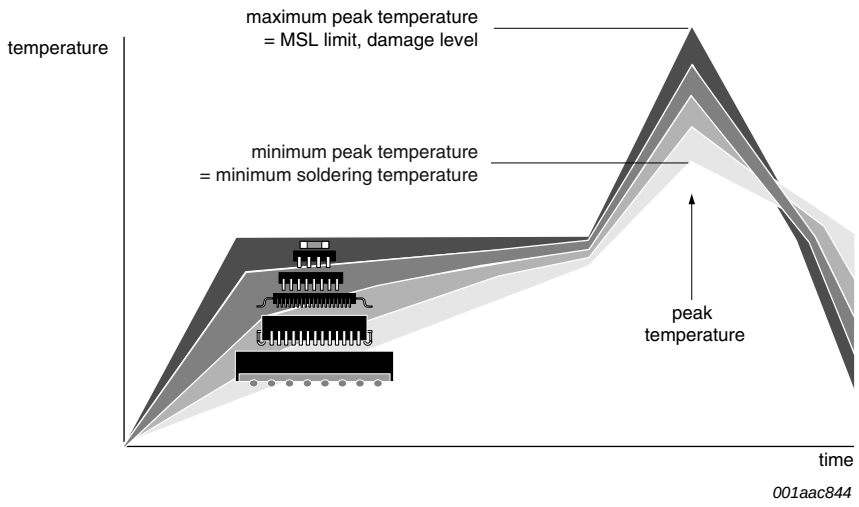
Package thickness (mm)	Package reflow temperature (°C)		
	Volume (mm^3)		
	< 350	350 to 2000	> 2000
< 1.6	260	260	260
1.6 to 2.5	260	250	245
> 2.5	250	245	245

Moisture sensitivity precautions, as indicated on the packing, must be respected at all times.

Studies have shown that small packages reach higher temperatures during reflow soldering, see Figure 3.

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MSL: Moisture Sensitivity Level

Fig 3. Temperature profiles for large and small components

For further information on temperature profiles, refer to Application Note *AN10365 "Surface mount reflow soldering description"*.

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9. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
IP4233CZ6 v.3	20100617	Product data sheet	-	IP4233CZ6 v.2
Modifications:	• Figure 1: corrected • Section 10 “Legal information”: updated			
IP4233CZ6 v.2	20100506	Preliminary data sheet	-	IP4233CZ6_1
IP4233CZ6_1	20090330	Objective data sheet	-	-

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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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