IP4238CZ10

Surge protection for ethernet and telecom

Rev. 1 — 1 October 2012 Product data sheet

1. Product profile

1.1 General description

The device provides ElectroStatic Discharge (ESD) and surge protection on ethernet and telecom ports. It includes low capacitance protection diodes for high-speed signal lines and is encapsulated in a leadless medium power DFN2626-10 (SOT1197-1) Surface-Mounted Device (SMD) plastic package.

1.2 Features and benefits

- Pb-free, Restriction of Hazardous Substances (RoHS) compliant and free of halogen and antimony (Dark Green compliant)
- ±30 kV IEC 61000-4-2 ESD protection of all signal lines
- 25 A surge protection 8/20 μs according to IEC 61000-4-5
- Matched 0.5 mm trace spacing
- Line capacitance of only 3 pF typical for each channel

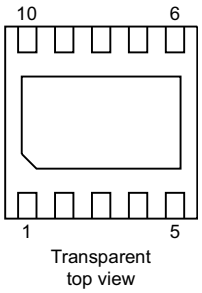
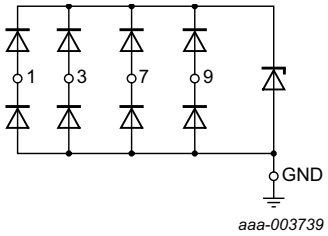
1.3 Applications

High-speed receiver and transmitter port protection for:

- Ethernet routers, hubs, modems
- Notebooks, main board graphic cards and ports
- Set-top boxes and game consoles

2. Pinning information

Table 1. Pinning

Pin	Symbol	Description	Simplified outline	Graphic symbol
1	CH1	surge protection channel 1		
2	n.c.	not connected		
3	CH3	surge protection channel 3		
4	n.c.	not connected		
5	n.c.	not connected		
6	n.c.	not connected		
7	CH4	surge protection channel 4		
8	n.c.	not connected		
9	CH2	surge protection channel 2		
10	n.c.	not connected		
11	GND	ground pad		

3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
IP4238CZ10	DFN2626-10	plastic thermal enhanced extremely thin small outline package; no leads; 10 terminals; body 2.6 × 2.6 × 0.5 mm	SOT1197-1

4. Marking

Table 3. Marking code

Type number	Marking code
IP4238CZ10	4238

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; contact discharge	[1]	–30	+30	kV
T_{stg}	storage temperature			–55	+125	°C
T_{amb}	ambient temperature			–40	+125	°C

[1] All pins to ground.

6. Characteristics

Table 5. Characteristics

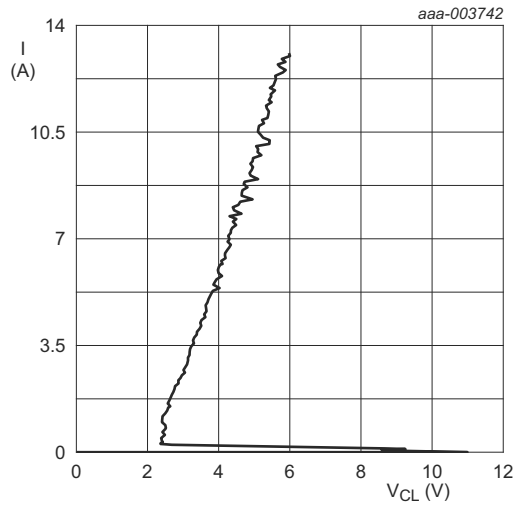
T_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{BR}	breakdown voltage	I_{test} = 1 mA		6	-		V
I_{RM}	reverse leakage current	V_{bias} = 3 V		-	-	100	nA
V_F	forward voltage	I_{test} = 1 mA		-	0.7	-	V
C_{line}	line capacitance	f = 1 MHz; V_{bias} = 2.5 V	[1]	-	3	-	pF
$C_{line(mutual)}$	mutual line capacitance	f = 1 MHz; V_{bias} = 2.5 V	[1][2]	-	0.07	-	pF
r_{dyn}	dynamic resistance	surge	[3]				
		positive transient		-	0.23	-	Ω
		negative transient		-	0.23	-	Ω
$V_{CL(ch)trt(pos)}$	positive transient channel clamping voltage	I_{PP} = 1 A	[3]	-	2.1	-	V
		I_{PP} = 10 A	[3]	-	4.0	-	V
		I_{PP} = 25 A	[3]	-	7.3	-	V

[1] This parameter is guaranteed by design.

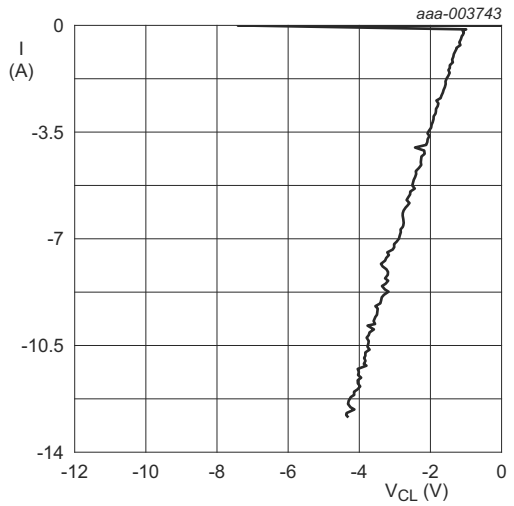
[2] Between signal pin and pin n.c.

[3] According to IEC 61000-4-5 (8/20 μs).



t_p = 100 ns; Transmission Line Pulse (TLP)

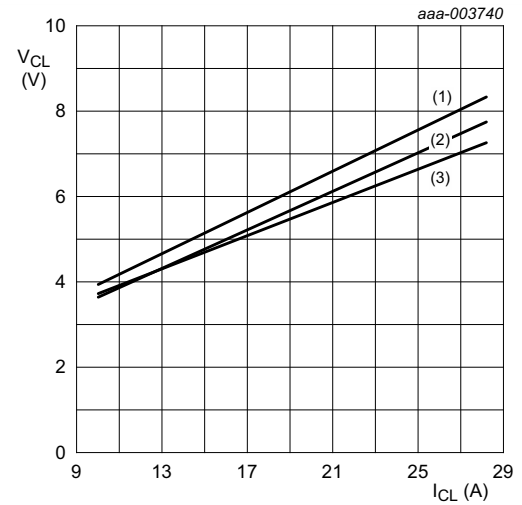
Fig 1. Dynamic resistance with positive clamping



t_p = 100 ns; Transmission Line Pulse (TLP)

Fig 2. Dynamic resistance with negative clamping

The device uses an advanced clamping structure showing a negative dynamic resistance. This snap-back behavior strongly reduces the clamping voltage to the system behind the ESD protection during an ESD event. Do not connect unlimited DC current sources to the data lines to avoid keeping the ESD protection device in snap-back state after exceeding breakdown voltage (due to an ESD pulse for instance).



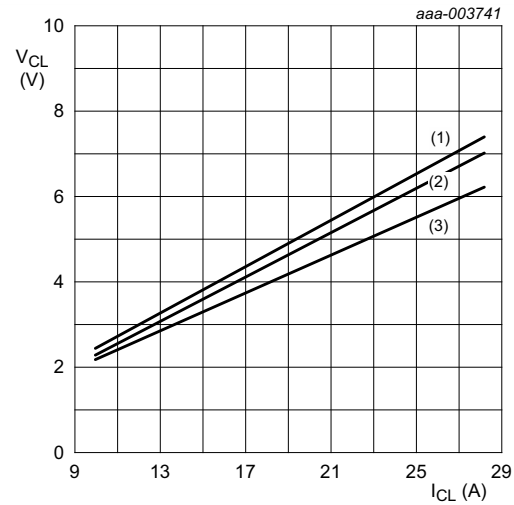
IEC 61000-4-5; t_p = 8/20 μs; positive pulse

(1) T_{amb} = 125 °C

(2) T_{amb} = 75 °C

(3) T_{amb} = 25 °C

Fig 3. Dynamic resistance with positive clamping



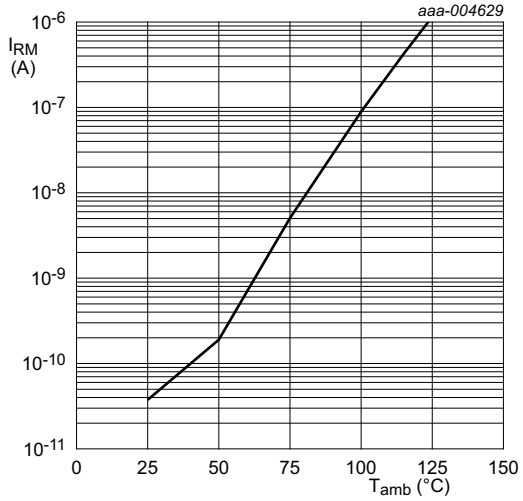
IEC 61000-4-5; t_p = 8/20 μs; negative pulse

(1) T_{amb} = 125 °C

(2) T_{amb} = 75 °C

(3) T_{amb} = 25 °C

Fig 4. Dynamic resistance with negative clamping



V_{bias} = 3 V

Fig 5. Reverse leakage current as a function of ambient temperature; typical values

7. Application information

The device can be configured to protect line-to-line and line-to-ground configurations, as well as parallel configurations to increase the clamping performance.

When designing the Printed-Circuit Board (PCB), consider the parasitic resistance of traces for relatively long surge pulses. For signal integrity, give careful consideration to basic high-speed routing guidelines, impedance matching, and signal coupling. Do not connect the signal lines to unlimited current sources like for example, a battery.

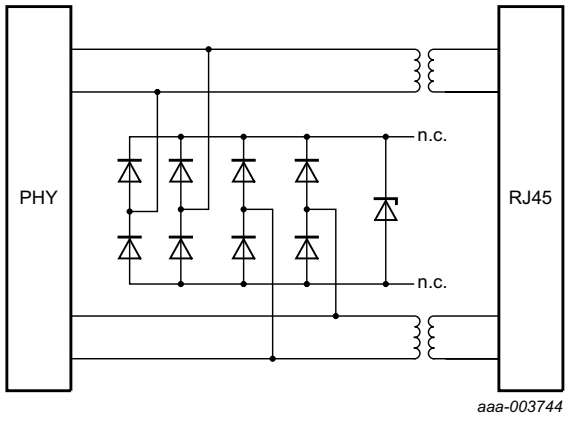


Fig 6. Line-to-line surge protection of an ethernet interface with IP4238CZ10

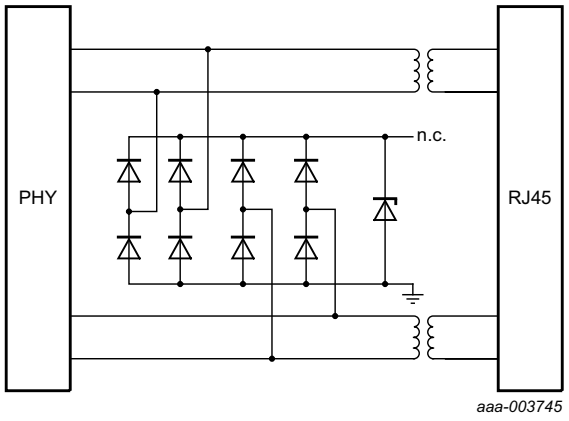


Fig 7. Line-to-ground surge protection of an ethernet interface with IP4238CZ10

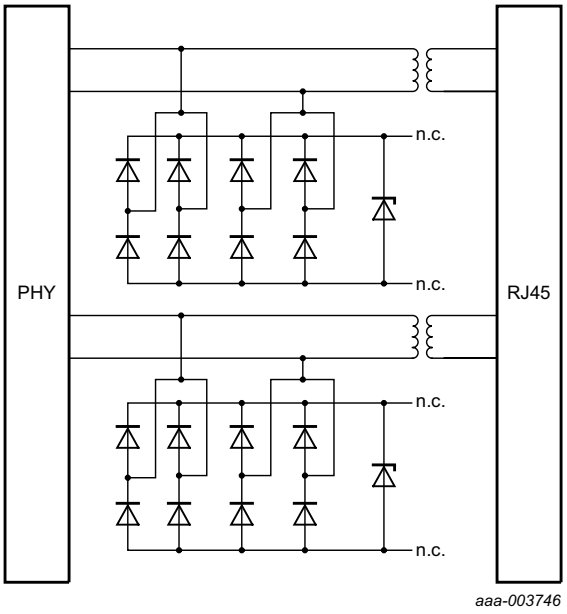


Fig 8. Enhanced surge protection of an ethernet interface with IP4238CZ10 (ground pad floating)

8. Package outline

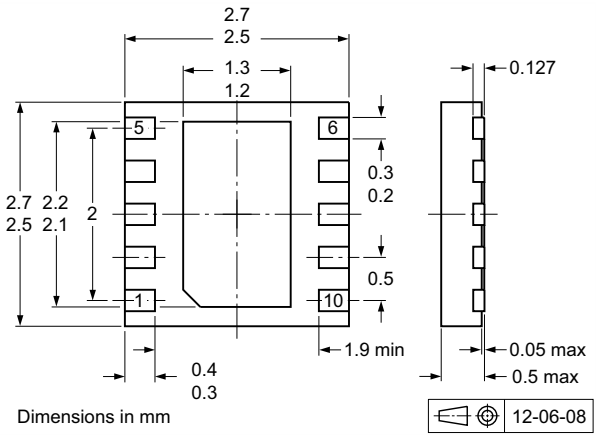


Fig 9. Package outline DFN2626-10 (SOT1197-1)

9. Packing information

Table 6. Packing methods

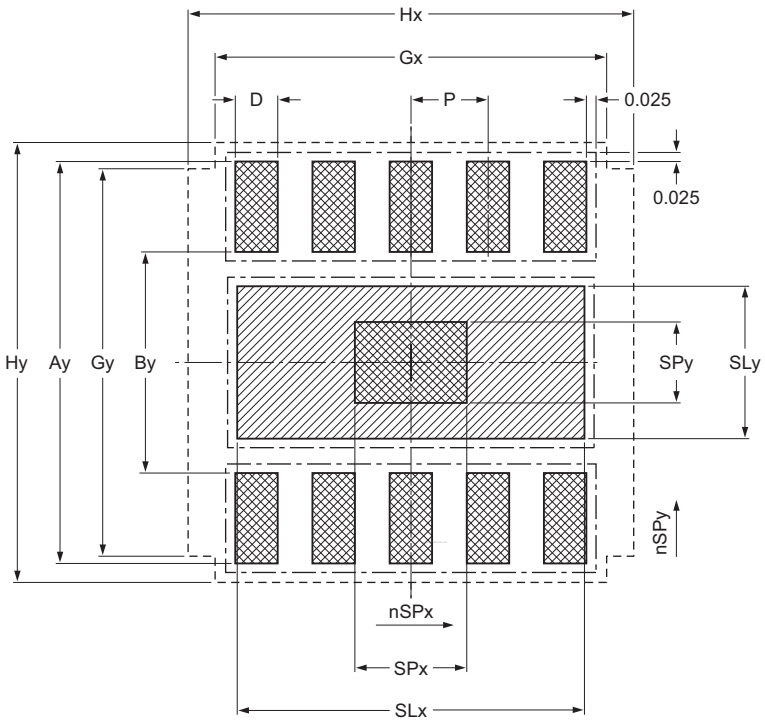
The indicated -xxx are the last three digits of the 12NC ordering code.[1]

Type number	Package	Description	Packing quantity
			4000
IP4238CZ10	DFN2626-10 (SOT1197-1)	4 mm pitch, 8 mm tape and reel	-115

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

10. Soldering

Footprint information for reflow soldering of DFN2626-10 package **SOT1197-1**



Generic footprint pattern
Refer to the package outline drawing for actual layout

solder land

solder paste deposit

solder land plus solder paste

occupied area

solder resist

DIMENSIONS in mm

P	Ay	By	D	SLx	SLy	SPx	SPy	Gx	Gy	Hx	Hy
0.5	3.05	1.9	0.25	2.2	1.3	0.8	0.4	2.5	2.85	2.85	3.3

Issue date ~~11-07-27~~ 12-09-16

sot1197-1_fr

Fig 10. Reflow soldering footprint DFN2626-10 (SOT1197-1)

11. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
IP4238CZ10 v.1	20121001	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".

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14. Contents

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