

IP4305CX4/LF (/P)

Integrated dual Schottky diode array with ESD protection to IEC61000-4-2, level 4

20 August 2009

Product data sheet

1. Product profile

1.1 General description

IP4305CX4/LF (/P) is a dual Schottky diode – one back-2-back diode array in a 2 x 2 pin CSP with 0.4 mm pitch. In addition to two Schottky diodes with a common Cathode connection, a integrated bi-directional diode supports the realisation of a high level ESD-protection. IP4305CX4/LF (/P) is fabricated using monolithic silicon technology and integrates Schottky and standard silicon Zener diodes in a single *Wafer-Level* chip-scale package. These features make the IP4305CX4/LF (/P) ideal for use in applications requiring component miniaturization, such as mobile phone handsets. For mechanically demanding applications the option /P as IP4305CX4/LF/P is offering improved mechanical stability by using advanced solder joints.

1.2 Features

- Pb-free, RoHS compliant and free of Halogen and Antimony (dark green compliant)
- 2 Schottky diodes with common Cathode
- One back-to-back diode
- Back to back diodes to provide downstream ESD protection up to ± 15 kV (contact)
- Wafer-Level chip-scale package with 0.4 mm pitch only

1.3 Applications

General purpose ESD-protection and voltage detection in mobile appliances such as:

- Cellular and PCS mobile handsets
- Wireless data (WAN/LAN) systems

2. Pinning Information

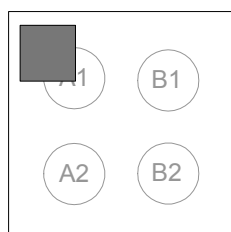


Fig 1. Transparent package view, balls facing down

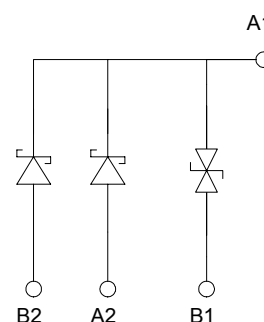


Fig 2. IP4305CX4/LF (/P) schematic diagram

3. Limiting values

Table 1. Limiting values

Symbol	Parameter	Conditions	Min	Max	Unit
$V_{I/O}$	DC input voltage range for A1 to A2, B2		0	+5.5	V
$V_{I/O}$	DC input voltage range for A1 to B1		-5.5	+5.5	V
ESD	Electrostatic Discharge				
	Pins A1 to B1 (B2, A2 connected to an 2kV compliant IC I/O)	IEC 61000-4-2, Level 4			
		Contact	-8 (-15) ¹	+8 (+15) ¹	kV
		Air Discharge	-15	+15	kV
	Pins to B2, A2 to A1 or B1 ⁽²⁾ or A1 to A2 or B2 with B1 unconnected	IEC 61000-4-2, Level 1			
		Contact & Air Discharge	-2	+2	kV
P_{D-ch}	Maximum continuous power dissipation per channel	@ 70°C		5	mW
T_{stg}	storage temperature range		-55	+150	°C
T_{pk}	Peak solder reflow temperature	10 seconds max.		+260	°C
T_{amb}	Ambient operating temperature		-30	+85	°C

4. Electrical Characteristics

Table 2. Characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$C_{jo-Schottky}$	Schottky diode junction capacitance	$V = 0\text{ V}$; $f = 1\text{ MHz}$	-	19	-	pF
C_{jo-Si}	Back-to-back diode junction capacitance	$V = 0\text{ V}$; $f = 1\text{ MHz}$	-	7	-	pF
V_{BR-Si}	Back-to-back diode breakdown voltage	$I_{test} = +1\text{ mA}$	5.5	-	10	V
		$I_{test} = -1\text{ mA}$	-10	-	-5.5	V
$V_{BR-Schottky}$	Schottky diode breakdown voltage	$I_{test} = +1\text{ mA}$	15	-	-	V
$V_{Schottky}$	Schottky diode forward voltage	$I_{test} = +10\text{ }\mu\text{A}$	-	-	0.25	V
		$I_{test} = +100\text{ }\mu\text{A}$	-	-	0.35	V
		$I_{test} = +10\text{ mA}$	-	-	0.45	V
I_{lkg-Si}	Back-to-back diode leakage current	$V = +3\text{ V}$	-	-	+50	nA
		$V = -3\text{ V}$	-50	-	-	nA
$I_{lkg-Schottky}$	Schottky diode leakage current	$V = +5\text{ V}$, $T_{amb} = +25\text{ °C}$	-	-	1	μA
		$V = +5\text{ V}$, $T_{amb} = +50\text{ °C}$	-	-	8	μA
		$V = +5\text{ V}$, $T_{amb} = +85\text{ °C}$	-	-	80	μA

¹ Device is tested with 1000 pulses of $\pm 15\text{ kV}$ contact discharges each, according the IEC61000-4-2 model² The two Schottky diodes are **neither** build for ESD protection **nor** to survive ESD discharges when connected directly to GND.

5. Design/Assembly Recommendations

5.1 PCB Design Guidelines

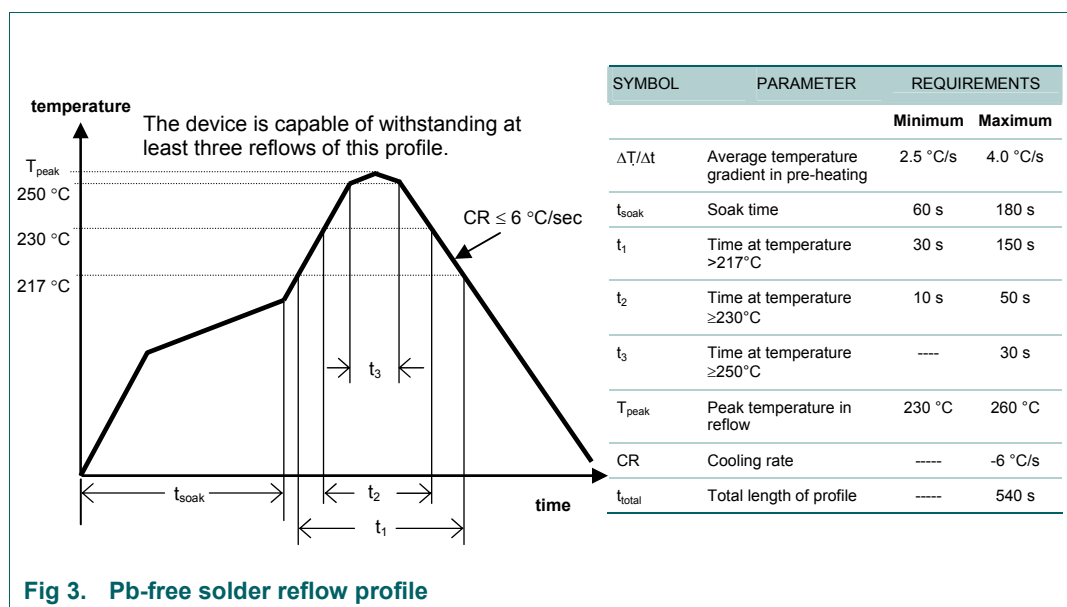
For the optimum performance, a Non-Solder Mask PCB design (NSMD), also known as a copper-defined design, incorporating laser-drilled micro-vias connecting the ground pads to a buried ground-plane layer is recommended. This results in the lowest possible ground inductance and provides the best high frequency and ESD performance. For this case, the following are the recommended PCB design parameters:

- PCB pad size: 0.20 mm diameter
- Micro-Via diameter: 0.1 mm (0.004")
- Solder Mask opening: 0.37 mm diameter
- Copper thickness: 20-40 μm
- Copper finish: AuNi
- PCB material: FR4

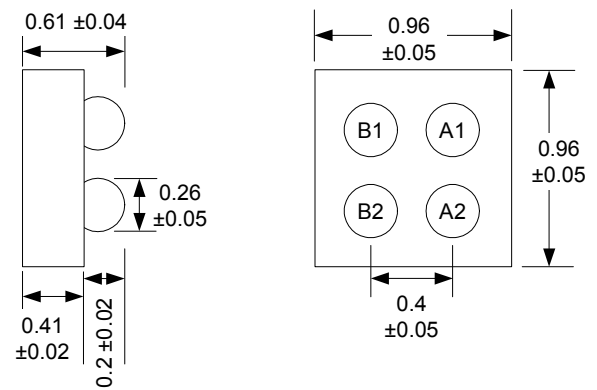
5.2 PCB Assembly Guidelines for Pb-free soldering

The following are recommendations for the assembly of this device:

- Solder Screen Aperture size: 0.33 mm diameter
- Solder Screen thickness: 100 μm (0.004")
- Solder Paste: Pb-free: Sn Ag(3-4) Cu(0.5-0.9)
- Solder/Flux ratio: 50 / 50
- Solder Reflow Profile: see below

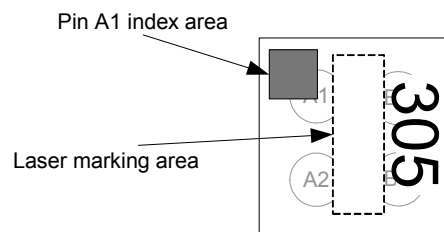


6. Package outline



Side view

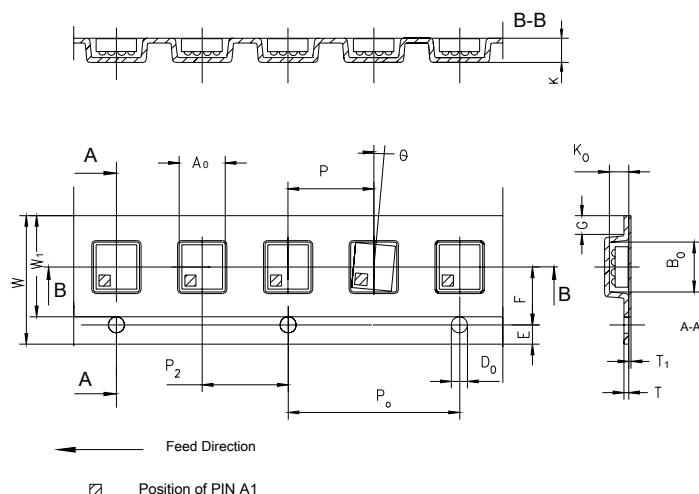
Bottom view, balls facing up



Transparent top view, solder balls facing down

Fig 4. IP4305CX4/LF (/P) outline dimensions

7. Tape & Reel information



ITEM		SYMBOL	SPECIFICATIONS		NOTE
			DIMENSION	TOLERANCE	
OVERALL DIMENSIONS	TAPE WIDTH	W	8.00	± 0.1	
	THICKNESS	K	1.20	MAX	
	DISTANCE	G	0.75	MIN	
SPROCKET HOLES	DIAMETER	D_0	1.50	$+0.1/-0.0$	CUM. PITCH ERROR $\pm 0.2 / 10$ PITCHES
	DISTANCE	E	1.75	± 0.1	
	PITCH	P_0	4.00	± 0.1	
DISTANCE BETWEEN CENTRE LINES	LENGTH DIRECTION	P_2	2.00	± 0.05	
	WIDTH DIRECTION	F	3.50	± 0.05	
COMPARTMENTS	LENGTH	A_0	1.06	± 0.05	
	WIDTH	B_0	1.06	± 0.05	
	DEPTH	K_0	0.70	± 0.05	
	PITCH	P	2.00	± 0.1	
DEVICE	OUTLINE	IP4305CX4/LF (/P)			
	ROTATION	θ	20°	MAX	
CARRIER TAPE ANTISTATIC	FILM THICKNESS	T	0.25	± 0.07	CARBON LOADED POLYSTYRENE 100% RECYCLABLE
	BEND		0.25	± 0.07	
COVER TAPE	WIDTH	W_1	5.75	MAX	
	FILM THICKNESS	T_1	0.1	MAX	
BENDING RAD	IN WINDING DIRECTION	R	30	MIN	

Fig 5. IP4305CX4/LF (/P) Tape & Reel information

8. Legal information

8.1 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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10. Contents

1. Product profile.....1

1.1 General description 1

1.2 Features 1

1.3 Applications..... 1

2. Pinning Information 1

3. Limiting values2

4. Electrical Characteristics2

5. Design/Assembly Recommendations3

5.1 PCB Design Guidelines.....3

5.2 PCB Assembly Guidelines for Pb-free soldering 3

6. Package outline4

7. Tape & Reel information5

8. Legal information6

8.1 Data sheet status6

8.2 Definitions6

8.3 Disclaimers.....6

8.4 Trademarks6

9. Contact information6

10. Contents.....7

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