

# IP4302CX2/A

Low profile bidirectional low capacitance ESD protection diode

Rev. 1 — 28 November 2011

Product data sheet

## 1. Product profile

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### 1.1 General description

The IP4302CX2/A is a bidirectional diode which is designed to provide protection to downstream components from ElectroStatic Discharge (ESD) voltages as high as  $\pm 15$  kV contact discharge according to the IEC 61000-4-2 model, far exceeding standard level 4.

The device is fabricated using monolithic silicon technology and integrates one pair of back-to-back diodes in a 0.4 mm pitch Wafer-Level Chip-Scale Package (WLCSP). These features make the IP4302CX2/A ideal for use in applications requiring the utmost in miniaturization such as mobile phone handsets, cordless telephones and other portable electronic devices.

### 1.2 Features and benefits

- Pb-free, RoHS compliant and free of halogen and antimony (Dark Green compliant)
- Bidirectional ESD protection of one line
- Integrated ESD protection withstanding  $\pm 15$  kV contact discharge, far exceeding IEC 61000-4-2 level 4
- Ultra low height of 0.40 mm only
- 0.52 mm  $\times$  0.7 mm size package

### 1.3 Applications

- Cellular handsets and accessories
- Portable electronics
- Subscriber Identity Module (SIM) card protection
- Communication systems
- Computers and peripherals



### 1.4 Quick reference data

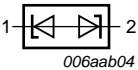
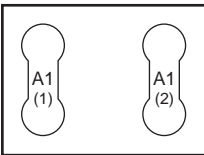
**Table 1. Quick reference data**  
*T<sub>amb</sub> = 25 °C; unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
V <sub>BR</sub>	breakdown voltage	I <sub>R</sub> = 1 mA	14.0	16.5	-	V
		I <sub>R</sub> = -1 mA	-	-16.5	-14.0	V
C <sub>d</sub>	diode capacitance	f = 1 MHz; V <sub>R</sub> = 0 V	-	-	10	pF
V <sub>ESD</sub>	electrostatic discharge voltage	contact discharge	[1][2] -15	-	+15	kV

- [1] Device is qualified with 1000 pulses of ±15 kV contact discharges each, according to the IEC 61000-4-2 model and far exceeds the specified level 4 (8 kV contact discharge).
- [2] A special robust test is performed stressing the devices with ≥ 1000 contact discharges according to the IEC 61000-4-2 model and far exceeds the specified level 4 (8 kV contact discharge).

## 2. Pinning information

**Table 2. Pinning**

Pin	Description	Simplified outline	Graphic symbol
1	cathode (diode 1)	[1]	 006aab04
2	cathode (diode 2)	 001aao233	

- [1] The device is electrically and mechanically symmetrical. Thus no marking is needed.

## 3. Ordering information

**Table 3. Ordering information**

Type number	Package		Version
	Name	Description	
IP4302CX2/A	WLCSP2	wafer level chip-size package; 2 bumps (A1-A1)	IP4302CX2/A

## 4. Limiting values

**Table 4. Limiting values**

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

Symbol	Parameter	Conditions	Min	Max	Unit		
V <sub>ESD</sub>	electrostatic discharge voltage	contact discharge	[1][2]	-15	+15	kV	
		air discharge		-15	+15	kV	
		IEC 61000-4-2 level 4					
		contact discharge		-8	+8	kV	
		air discharge		-15	+15	kV	
		MIL-STD-883D (method 3015) HBM	-4	+4	kV		
T <sub>j</sub>	junction temperature		-	150	°C		
T <sub>amb</sub>	ambient temperature		-35	+85	°C		
T <sub>stg</sub>	storage temperature		-65	+150	°C		

[1] Device is qualified with 1000 pulses of ±15 kV contact discharges each, according to the IEC 61000-4-2 model and far exceeds the specified level 4 (8 kV contact discharge).

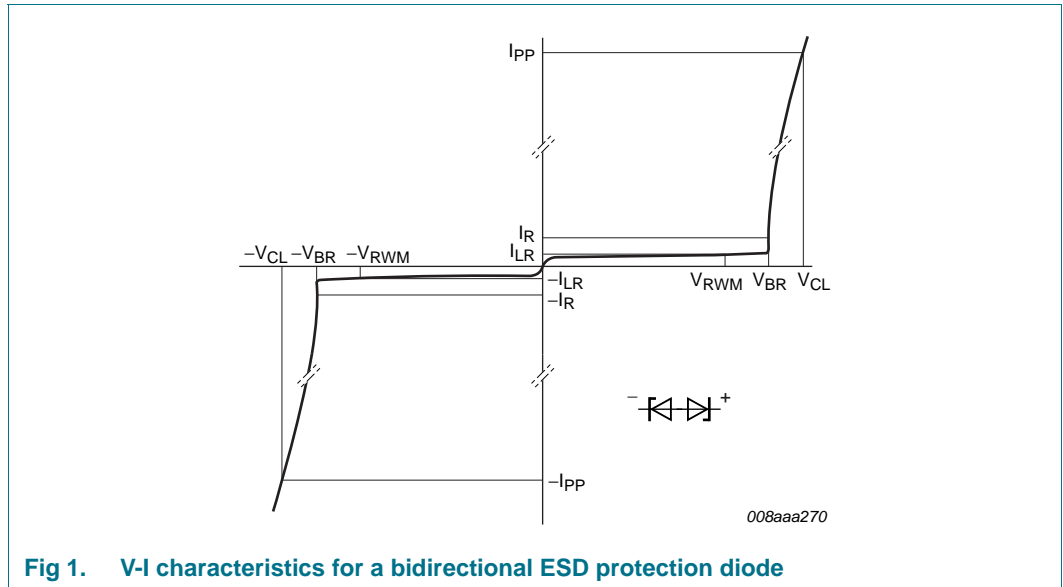
[2] A special robust test is performed stressing the devices with ≥ 1000 contact discharges according to the IEC 61000-4-2 model and far exceeds the specified level 4 (8 kV contact discharge).

## 5. Characteristics

**Table 5. Characteristics**

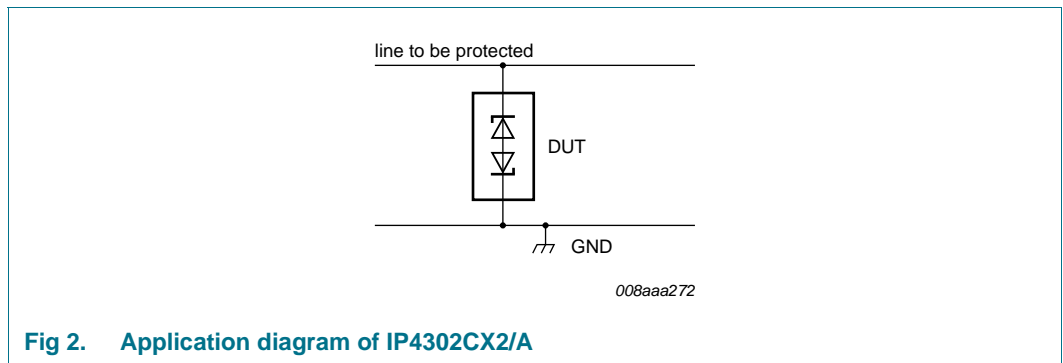
*T<sub>amb</sub> = 25 °C; unless otherwise specified.*

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I <sub>LR</sub>	reverse leakage current	V <sub>RWM</sub> = 5 V	-	-	20	nA
		V <sub>RWM</sub> = -5 V	-20	-	-	nA
V <sub>BR</sub>	breakdown voltage	I <sub>R</sub> = 1 mA	14.0	16.5	-	V
		I <sub>R</sub> = -1 mA	-	-16.5	-14.0	V
C <sub>d</sub>	diode capacitance	f = 1 MHz; V <sub>R</sub> = 0 V	-	-	10	pF



## 6. Application information

The IP4302CX2/A is designed for the protection of one bidirectional data or signal line from the damage caused by ESD. The device may be used on lines where the signal polarities are both, positive and negative with respect to ground.



### 6.1 Printed-Circuit Board (PCB) layout and protection device placement

PCB layout is critical for the suppression of ESD and Electric Fast Transient (EFT). The following guidelines are recommended:

1. Place the device as close as possible to the input terminal or connector
2. The path length between the device and the protected line should be minimized
3. Keep parallel signal paths to a minimum
4. Avoid running protected conductors in parallel with unprotected conductors
5. Minimize all PCB conductive loops including power and ground loops
6. Minimize the length of the transient return path to ground
7. Avoid using shared transient return paths to a common ground point

- 8. Ground planes should be used whenever possible; for multilayer PCBs use ground vias

## 7. Package outline

WLCSP2: wafer level chip-size package; 2 bumps (A1-A1)

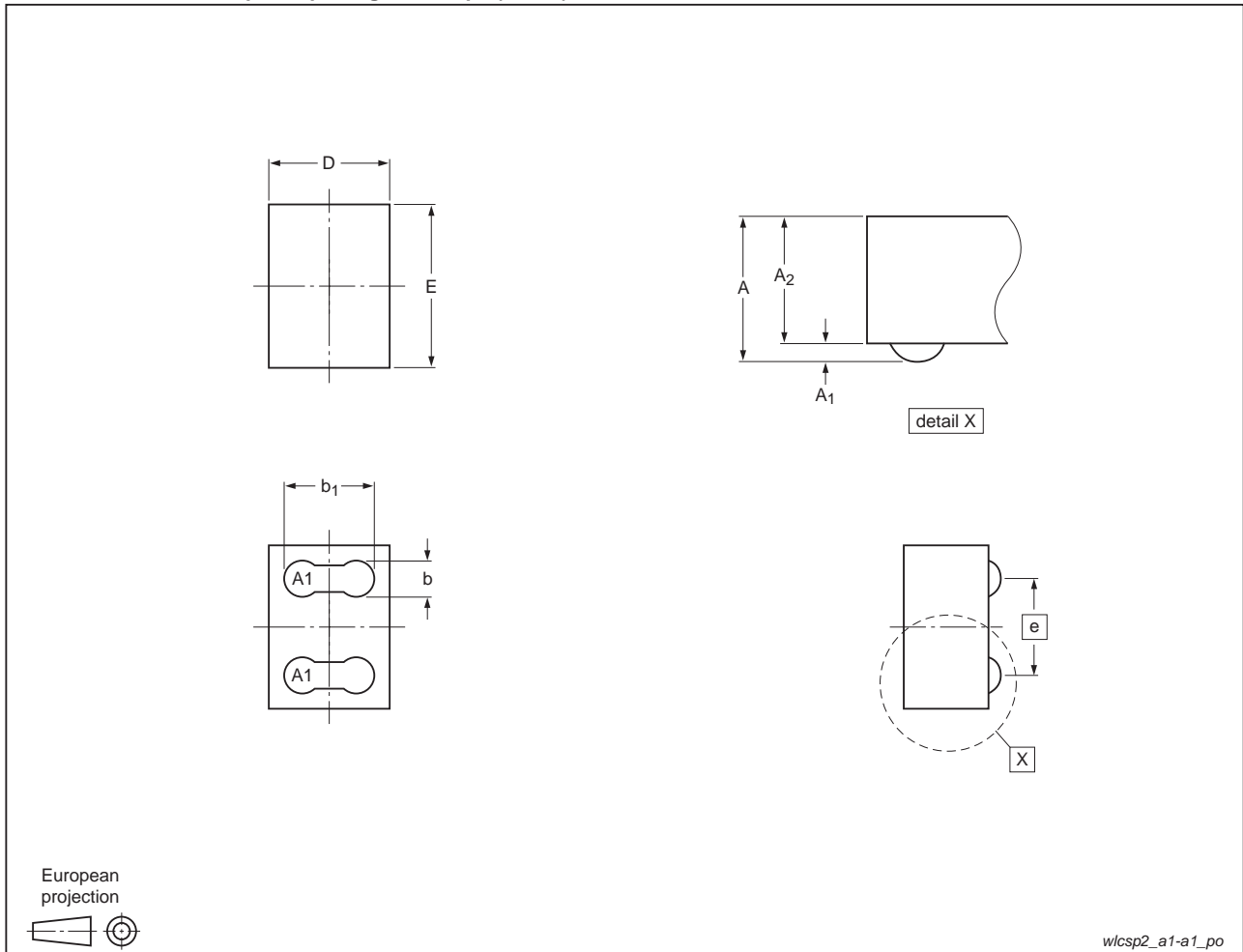


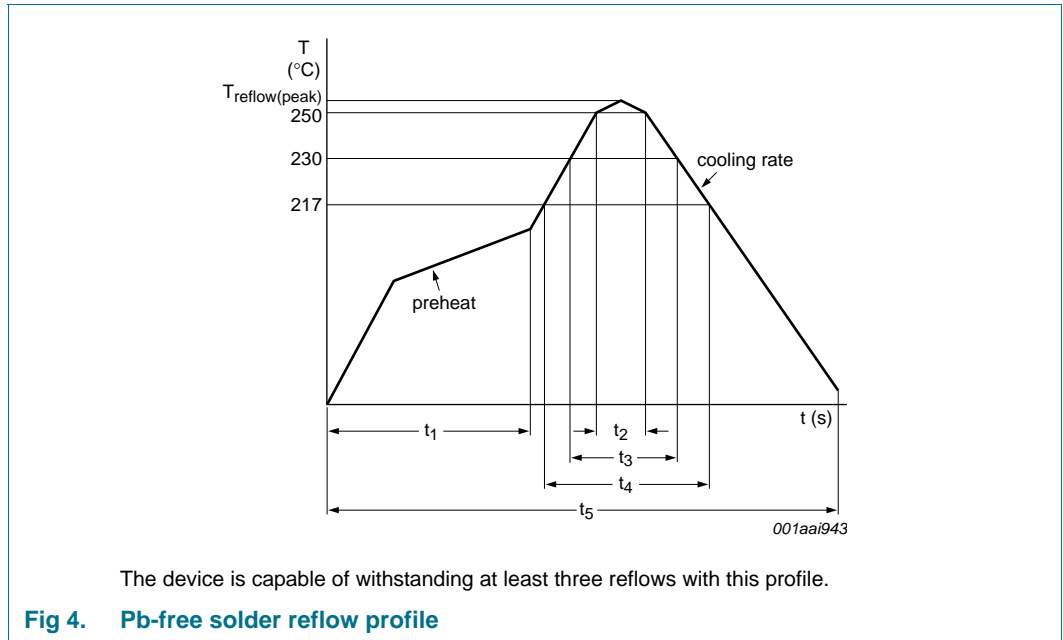
Fig 3. Package outline IP4302CX2/A (WLCSP2)

Table 6. Dimensions for [Figure 3](#)

Symbol	Min	Typ	Max	Unit
A	0.37	0.40	0.43	mm
A <sub>1</sub>	0.05	0.06	0.07	mm
A <sub>2</sub>	0.32	0.34	0.36	mm
b	-	0.14	-	mm
b <sub>1</sub>	-	0.35	-	mm
D	0.49	0.52	0.55	mm
E	0.67	0.70	0.73	mm
e	-	0.4	-	mm

## 8. Soldering

### 8.1 Reflow soldering recommendation



**Table 7. Characteristics**

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{\text{reflow(peak)}}$	peak reflow temperature		230	-	260	°C
$t_1$	time 1	soak time	60	-	180	s
$t_2$	time 2	time during $T \geq 250\text{ °C}$	-	-	30	s
$t_3$	time 3	time during $T \geq 230\text{ °C}$	10	-	50	s
$t_4$	time 4	time during $T > 217\text{ °C}$	30	-	150	s
$t_5$	time 5		-	-	540	s
$dT/dt$	rate of change of temperature	cooling rate	-	-	-6	°C/s
		preheat	2.5	-	4.0	°C/s

## 9. Abbreviations

Table 8. Abbreviations

Acronym	Description
DUT	Device Under Test
EFT	Electric Fast Transient
ESD	ElectroStatic Discharge
HBM	Human Body Model
PCB	Printed-Circuit Board
RoHS	Restriction of Hazardous Substances
SIM	Subscriber Identity Module
WLCSP	Wafer-Level Chip-Scale Package

## 10. Revision history

Table 9. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
IP4302CX2_A v.1	20111128	Product data sheet	-	-

## 11. Legal information

### 11.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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.

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