IP4302CX2/A

Low profile bidirectional low capacitance ESD protection diode

Rev. 1 — 28 November 2011 Product data sheet

1. Product profile

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 ±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 ±15 kV contact discharge, far exceeding IEC 61000-4-2 level 4
- Ultra low height of 0.40 mm only
- 0.52 mm × 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_{amb} = 25 °C; unless otherwise specified.

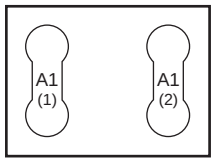
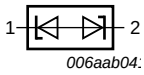
Symbol	Parameter	Conditions		Min	Typ	Max	Unit
V_{BR}	breakdown voltage	I_R = 1 mA		14.0	16.5	-	V
		I_R = −1 mA		-	−16.5	−14.0	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V		-	-	10	pF
V_{ESD}	electrostatic discharge voltage	contact discharge	[1][2]	−15	-	+15	kV

[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]  001aao233	 006aab04
2	cathode (diode 2)		

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

3. Ordering information

Table 3. Ordering information

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

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4. Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{ESD}	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_j	junction temperature			-	150	°C
T_{amb}	ambient temperature			–35	+85	°C
T_{stg}	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_{amb} = 25 °C; unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{LR}	reverse leakage current	V_{RWM} = 5 V	-	-	20	nA
		V_{RWM} = –5 V	–20	-	-	nA
V_{BR}	breakdown voltage	I_R = 1 mA	14.0	16.5	-	V
		I_R = –1 mA	-	–16.5	–14.0	V
C_d	diode capacitance	f = 1 MHz; V_R = 0 V	-	-	10	pF

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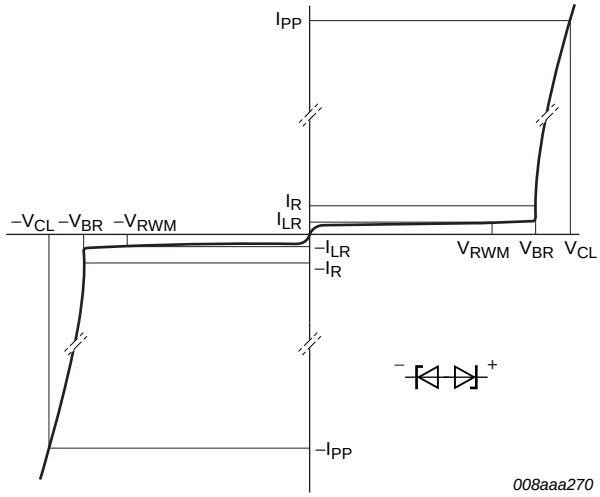


Fig 1. V-I characteristics for a bidirectional ESD protection diode

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.

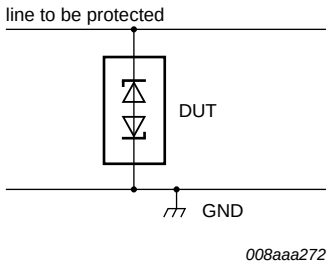


Fig 2. Application diagram of IP4302CX2/A

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

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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)

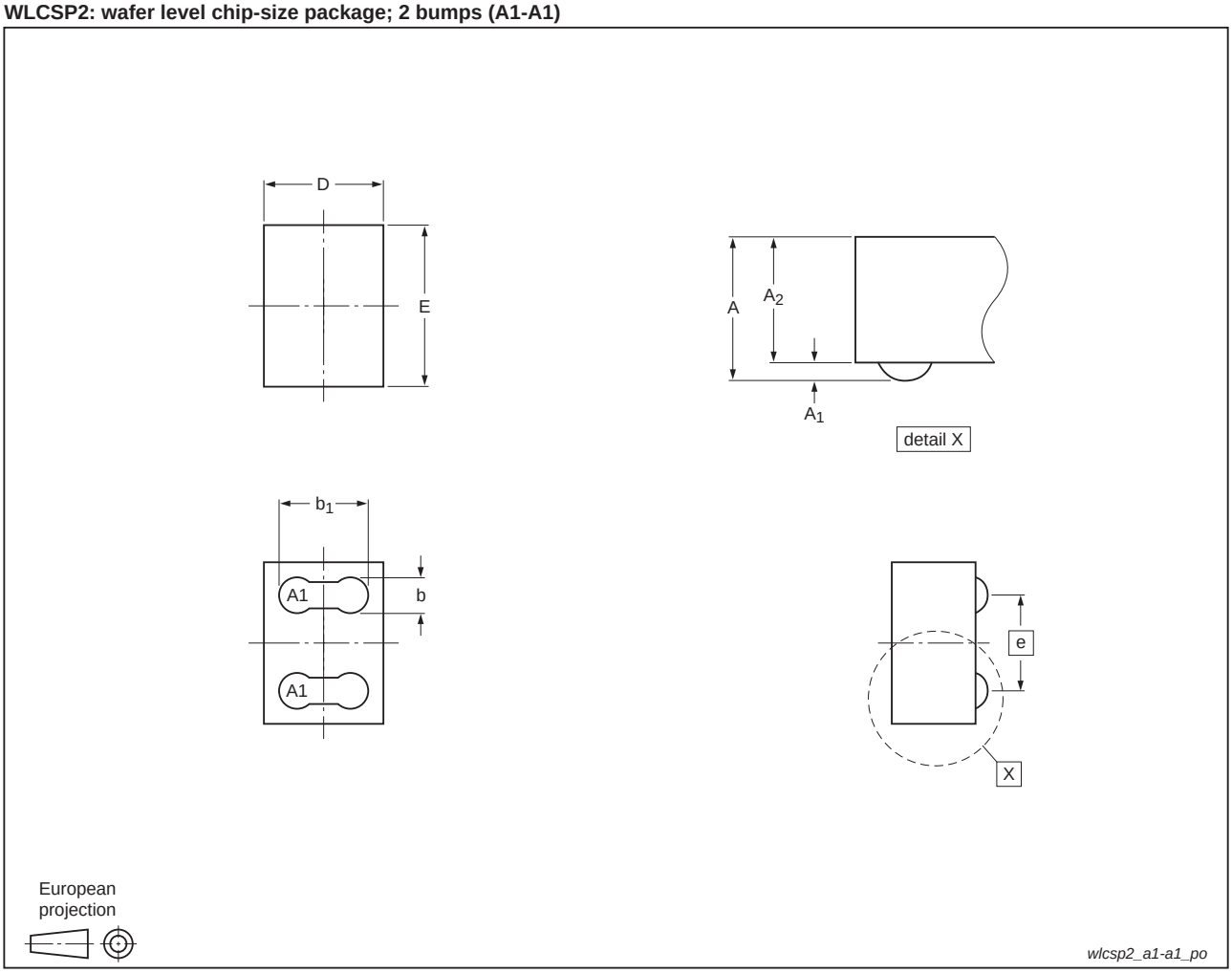


Fig 3. Package outline IP4302CX2/A (WLCSP2)

Table 6. Dimensions for Figure 3

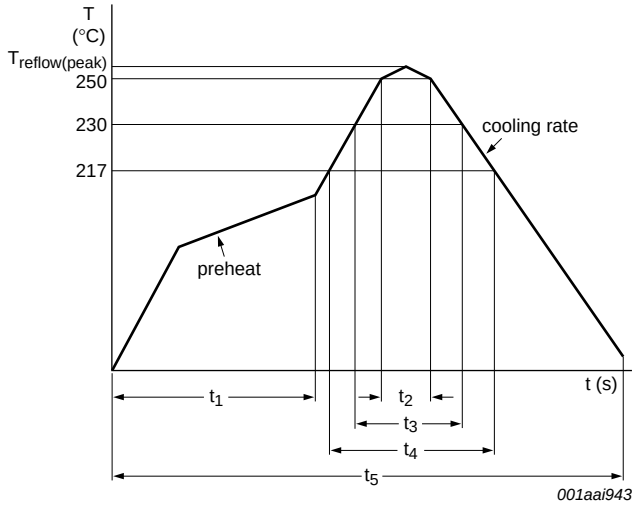
Symbol	Min	Typ	Max	Unit
A	0.37	0.40	0.43	mm
A_1	0.05	0.06	0.07	mm
A_2	0.32	0.34	0.36	mm
b	-	0.14	-	mm
b_1	-	0.35	-	mm
D	0.49	0.52	0.55	mm
E	0.67	0.70	0.73	mm
e	-	0.4	-	mm

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8. Soldering

8.1 Reflow soldering recommendation



The device is capable of withstanding at least three reflows with this profile.

Fig 4. Pb-free solder reflow profile

Table 7. Characteristics

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$T_{reflow(peak)}$	peak reflow temperature		230	-	260	°C
t_1	time 1	soak time	60	-	180	s
t_2	time 2	time during T ≥ 250 °C	-	-	30	s
t_3	time 3	time during T ≥ 230 °C	10	-	50	s
t_4	time 4	time during T > 217 °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

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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	-	-

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Document status[1][2]	Product status[3]	Definition
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