IP4060CX16/LF

High-speed MultiMediaCard interface filter with ESD protection to IEC 61000-4-2 level 4

Rev. 01 — 14 May 2009 Product data sheet

1. Product profile

1.1 General description

The IP4060CX16/LF is a diode array with integrated EMI/RF filters and pull-up resistors, which is designed to protect downstream components from ElectroStatic Discharge (ESD) voltages up to ±15 kV, far exceeding IEC 61000-4-2 standard, level 4.

The IP4060CX16/LF is fabricated using monolithic silicon semiconductor technology integrating 6 resistors and 13 pseudo back-to-back diodes in a single Wafer-Level Chip-Scale Package (WLCSP) measuring only 1.96 mm by 1.97 mm.These features make the IP4060CX16/LF ideal for applications using miniaturized components, such as mobile phone handsets, cordless telephones and personal digital devices.

1.2 Features

- Pb-free
- High-speed MMC card specific ESD protection with integrated EMI/RF filters and pull-up resistors for all channels
- All channels with ±15 kV ESD contact protection at input terminals exceeding IEC 61000-4-2 standard level 4
- WLCSP with 0.5 mm pitch

1.3 Applications

- ElectroMagnetic Interference (EMI) and Radio-Frequency Interference (RFI) reduction and downstream ESD protection for high-speed MultiMediaCards (MMC) in:
  - Cellular and Personal Communication System (PCS) mobile handsets
  - PC/notebook card readers
  - Cordless telephones
  - Wireless data (WAN/LAN) systems
  - PDAs

2. Pinning information

2.1 Pinning

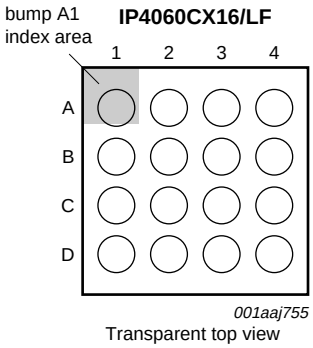


Fig 1. Pin configuration IP4060CX16/LF

Table 1. Pinning

Pin	Description
A2 and A4	filter channel 1
A1 and B4	filter channel 2
B2 and C4	filter channel 3
B1 and C3	filter channel 4
C1 and D4	filter channel 5
D1 and D3	filter channel 6
B3, C2, D2	ground

3. Ordering information

Table 2. Ordering information

Type number	Package		
	Name	Description	Version
IP4060CX16/LF	WLCSP16	wafer level chip-size package; 16 bumps; 1.96 × 1.97 × 0.7 mm	IP4060CX16/LF

4. Functional diagram

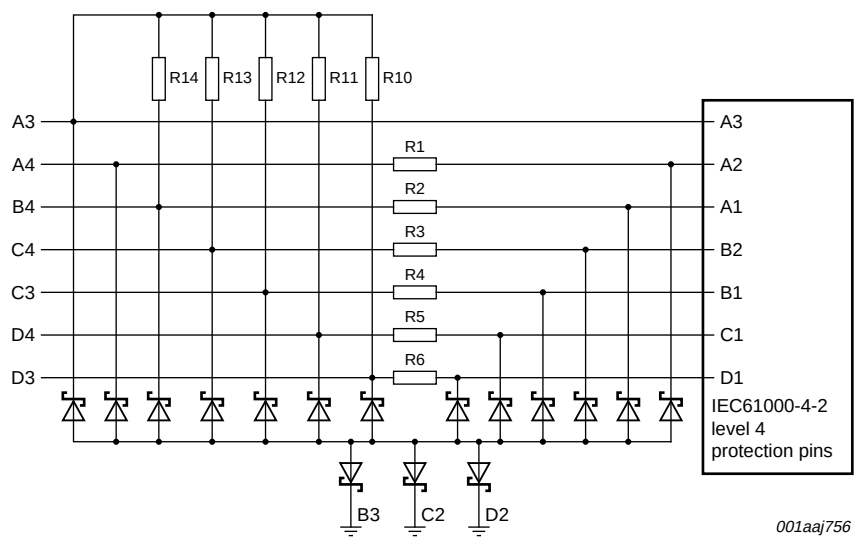


Fig 2. Schematic diagram IP4060CX16/LF

5. Limiting values

Table 3. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_I	input voltage			–	+5.0	V
V_{ESD}	electrostatic discharge voltage	IEC 61000-4-2, level 4; pins A1, A2, A3, B1, B2, C1 and D1 connected to ground				
		contact discharge	[1]	–15	+15	kV
		air discharge		–15	+15	kV
		IEC 61000-4-2, level 1; all other pins connected to ground				
		contact discharge		–2	+2	kV
		air discharge		–2	+2	kV
P_{ch}	channel power dissipation			-	20	mW
P_{tot}	total power dissipation			-	120	mW
T_{stg}	storage temperature			–55	+150	°C
$T_{reflow(peak)}$	peak reflow temperature	10 s maximum		-	260	°C
T_{amb}	ambient temperature			–30	+85	°C

[1] Device withstands at least 1000 pulses of ±8 kV contact discharges without degradation, according to the IEC 61000-4-2 model.

6. Characteristics

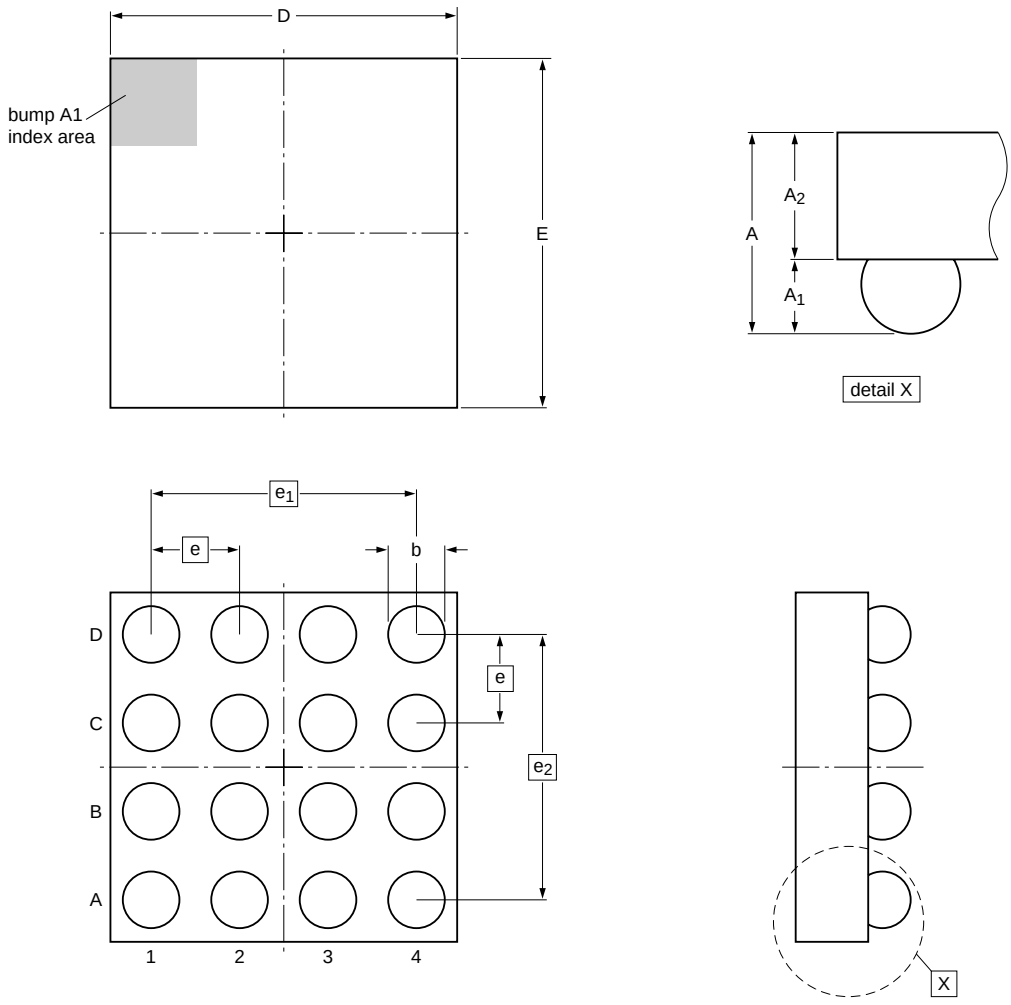
Table 4. Channel characteristics

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

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
$R_{s(ch)}$	channel series resistance	–30 °C < t_c < +85 °C				
		R1 to R6	40	50	60	Ω
		R10 to R13	52.5	75	97.5	kΩ
		R14	4.9	7	9.1	kΩ
C_{ch}	channel capacitance	$V_{bias(DC)}$ = 0 V; f = 1 MHz; pin A3 = +3 V	-	18	20	pF
V_{BR}	breakdown voltage	I_{test} = +1 mA	7	-	10	V
		I_{test} = –1 mA	–10	-	–7	V
I_{LR}	reverse leakage current	per diode pair				
		V_I = +5 V	-	-	100	nA
		V_I = –5 V	–100	-	-	nA

7. Package outline

WLCSP16: wafer level chip-size package; 16 bumps; 1.96 x 1.97 x 0.7 mm **IP4060CX16/LF**



Dimensions

Unit		A	A_1	A_2	b	D	E	e	e_1	e_2
	max	0.70	0.26	0.44	0.37	2.01	2.02			
mm	nom	0.65	0.24	0.41	0.32	1.96	1.97	0.5	1.5	1.5
	min	0.60	0.22	0.38	0.27	1.91	1.92			

ip4060cx16_lf_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
IP4060CX16/LF						~~09-02-25~~ 09-03-12

Fig 3. Package outline IP4060CX16/LF (WLCSP16)

8. Soldering of WLCSP packages

8.1 Introduction to soldering WLCSP packages

This text provides a very brief insight into a complex technology. A more in-depth account of soldering WLCSP (Wafer Level Chip-Size Packages) can be found in application note *AN10439 "Wafer Level Chip Scale Package"* and in application note *AN10365 "Surface mount reflow soldering description"*.

Wave soldering is not suitable for this package.

All NXP WLCSP packages are lead-free.

8.2 Board mounting

Board mounting of a WLCSP requires several steps:

1. Solder paste printing on the PCB
2. Component placement with a pick and place machine
3. The reflow soldering itself

8.3 Reflow soldering

Key characteristics in reflow soldering are:

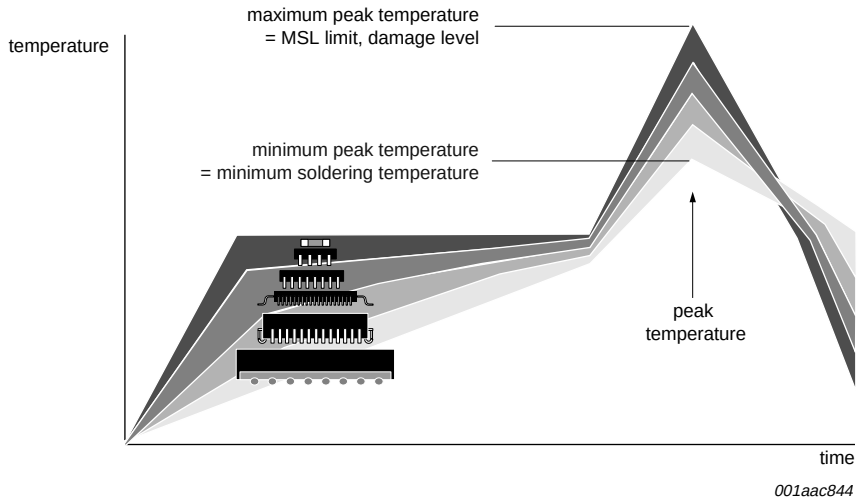
- Lead-free versus SnPb soldering; note that a lead-free reflow process usually leads to higher minimum peak temperatures (see Figure 4) than a PbSn process, thus reducing the process window
- Solder paste printing issues, such as smearing, release, and adjusting the process window for a mix of large 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) while being 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 5.

Table 5. 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 4.



MSL: Moisture Sensitivity Level

Fig 4. Temperature profiles for large and small components

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

8.3.1 Stand off

The stand off between the substrate and the chip is determined by:

- The amount of printed solder on the substrate
- The size of the solder land on the substrate
- The bump height on the chip

The higher the stand off, the better the stresses are released due to TEC (Thermal Expansion Coefficient) differences between substrate and chip.

8.3.2 Quality of solder joint

A flip-chip joint is considered to be a good joint when the entire solder land has been wetted by the solder from the bump. The surface of the joint should be smooth and the shape symmetrical. The soldered joints on a chip should be uniform. Voids in the bumps after reflow can occur during the reflow process in bumps with high ratio of bump diameter to bump height, i.e. low bumps with large diameter. No failures have been found to be related to these voids. Solder joint inspection after reflow can be done with X-ray to monitor defects such as bridging, open circuits and voids.

8.3.3 Rework

In general, rework is not recommended. By rework we mean the process of removing the chip from the substrate and replacing it with a new chip. If a chip is removed from the substrate, most solder balls of the chip will be damaged. In that case it is recommended not to re-use the chip again.

Device removal can be done when the substrate is heated until it is certain that all solder joints are molten. The chip can then be carefully removed from the substrate without damaging the tracks and solder lands on the substrate. Removing the device must be done using plastic tweezers, because metal tweezers can damage the silicon. The surface of the substrate should be carefully cleaned and all solder and flux residues and/or underfill removed. When a new chip is placed on the substrate, use the flux process instead of solder on the solder lands. Apply flux on the bumps at the chip side as well as on the solder pads on the substrate. Place and align the new chip while viewing with a microscope. To reflow the solder, use the solder profile shown in application note *AN10365 "Surface mount reflow soldering description"*.

8.3.4 Cleaning

Cleaning can be done after reflow soldering.

9. Abbreviations

Table 6. Abbreviations

Acronym	Description
EMI	ElectroMagnetic Interference
ESD	ElectroStatic Discharge
LAN	Local Area Network
MMC	MultiMediaCard
PCS	Personal Communication System
PDA	Personal Digital Assistant
RFI	Radio-Frequency Interference
WAN	Wide Area Network
WLCSP	Wafer-Level Chip-Scale Package

10. Revision history

Table 7. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
IP4060CX16LF_1	20090514	Product data sheet	-	-

11. Legal information

11.1 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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