



**THE DATASHEET OF
IP4340CX15/P**



Important notice

Dear Customer,

On 7 February 2017 the former NXP Standard Product business became a new company with the tradename **Nexperia**. Nexperia is an industry leading supplier of Discrete, Logic and PowerMOS semiconductors with its focus on the automotive, industrial, computing, consumer and wearable application markets

In data sheets and application notes which still contain NXP or Philips Semiconductors references, use the references to Nexperia, as shown below.

Instead of <http://www.nxp.com>, <http://www.philips.com/> or <http://www.semiconductors.philips.com/>, use <http://www.nexperia.com>

Instead of sales.addresses@www.nxp.com or sales.addresses@www.semiconductors.philips.com, use salesaddresses@nexperia.com (email)

Replace the copyright notice at the bottom of each page or elsewhere in the document, depending on the version, as shown below:

- © NXP N.V. (year). All rights reserved or © Koninklijke Philips Electronics N.V. (year). All rights reserved

Should be replaced with:

- © **Nexperia B.V. (year). All rights reserved.**

If you have any questions related to the data sheet, please contact our nearest sales office via e-mail or telephone (details via salesaddresses@nexperia.com). Thank you for your cooperation and understanding,

Kind regards,

Team Nexperia

IP4340CX15

6-channel filter for ESD protection of microSD memory card interfaces

Rev. 2 — 13 August 2012

Product data sheet

1. Product profile

1.1 General description

Array of 13 diodes and 11 resistors designed to protect downstream components against ElectroStatic Discharge (ESD) voltages as high as 15 kV. The device is encapsulated in a 1.56 mm × 1.56 mm Wafer-Level Chip-Scale Package (WLCSP) fabricated using monolithic silicon semiconductor technology.

These features make the device ideal for use in applications requiring a high degree of miniaturization, such as mobile phone handsets, cordless telephones and personal digital devices.

1.2 Features and benefits

- Pb-free, Restriction of Hazardous Substances (RoHS) compliant and free of halogen and antimony (Dark Green compliant)
- Integrated ESD protection, ElectroMagnetic Interference (EMI) and RF filtering for microSD memory card channels
- ESD protection up to 15 kV on 6 channels at output terminals
- Integrated EMI and RF filters with pull-up resistors (on 5 channels)
- Additional power supply protection
- WLCSP with 0.4 mm pitch

1.3 Applications

- microSD memory card interfaces in cellular phone and Personal Communication System (PCS) mobile handsets
- Cordless telephones
- Digital still and video cameras
- Media players
- Card readers



2. Pinning information

2.1 Pinning

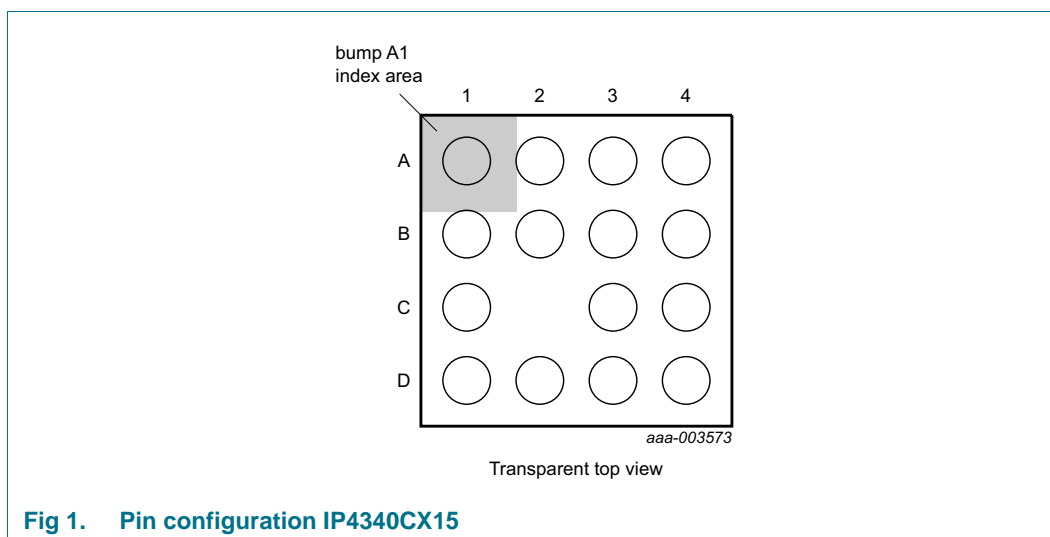


Fig 1. Pin configuration IP4340CX15

2.2 Pin description

Table 1. Pin description

Symbol	Pin	Type ^[1]	Description
DATA0	A1	I/O	data 0 input or output
DATA1	A2	I/O	data 1 input or output
SDDATA1	A3	I/O	data 1 input or output on microSD card side
SDDATA0	A4	I/O	data 0 input or output on microSD card side
CLK	B1	I/O	clock signal input or output
V _{CC}	B2	S	supply voltage
GND	B3	S	ground
SDCLK	B4	I/O	clock signal on microSD card side
CMD	C1	I/O	command signal
n.c.	C2	-	-
GND	C3	S	ground
SDCMD	C4	I/O	command signal on microSD card side
DATA3	D1	I/O	data 3 input or output
DATA2	D2	I/O	data 2 input or output
SDDATA2	D3	I/O	data 2 input or output on microSD card side
SDDATA3	D4	I/O	data 3 input or output on microSD card side

[1] I = input, O = output, I/O = input and output, S = power supply.

3. Ordering information

Table 2. Ordering information

Type number	Package		Version
	Name	Description	
IP4340CX15/P	WLCSP15	wafer-level chip-size package; 15 bumps; 1.56 × 1.56 × 0.47 mm	IP4340CX15/P

4. Functional diagram

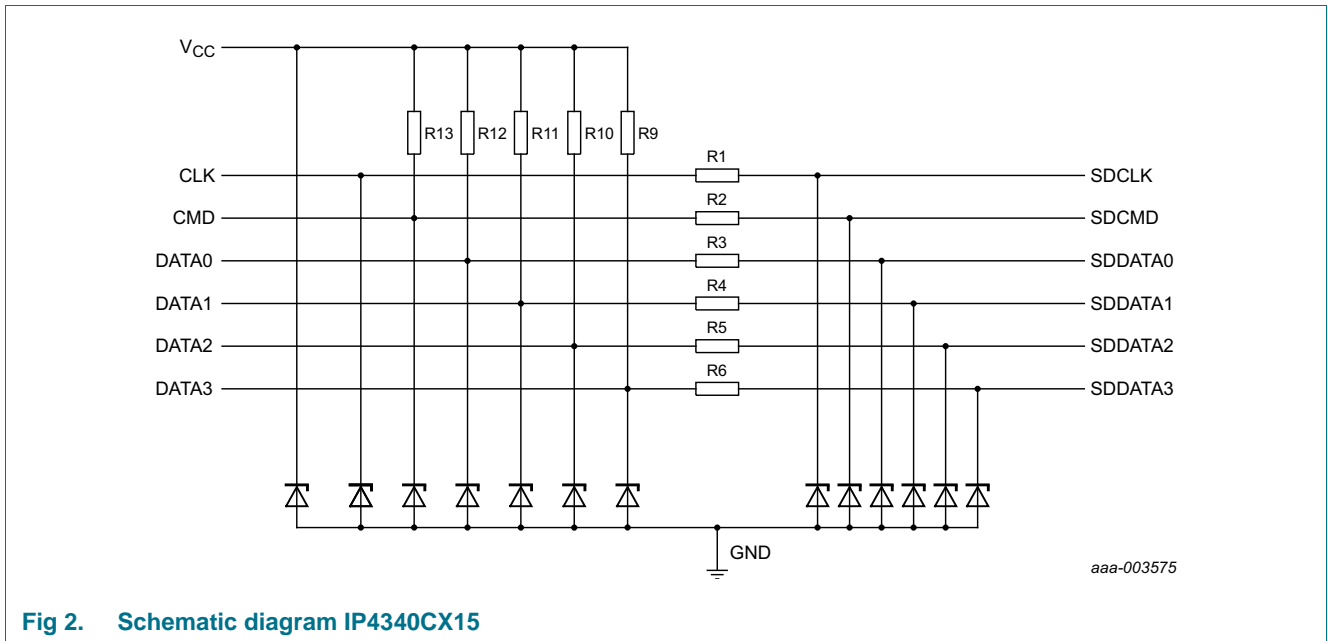


Fig 2. Schematic diagram IP4340CX15

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		-0.5	+5.0	V	
V _{ESD}	electrostatic discharge voltage	IEC 61000-4-2, level 4, pins on microSD card side	[1]			
		contact discharge	[2]	-15	+15	kV
		air discharge		-15	+15	kV
		IEC 61000-4-2, level 1, all other pins				
		contact discharge		-2	+2	kV
		air discharge		-2	+2	kV
P _{ch}	channel power dissipation	continuous power; T _{amb} = 70 °C	-	25	mW	
P _{tot}	total power dissipation	T _{amb} = 70 °C	-	100	mW	

Table 3. Limiting values ...continued

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

Symbol	Parameter	Conditions	Min	Max	Unit
T _{stg}	storage temperature		-55	+150	°C
T _{reflow(peak)}	peak reflow temperature	t _p ≤ 10 s	-	260	°C
T _{amb}	ambient temperature		-30	+85	°C

[1] Pins microSD card side: A3, A4, B4, C4, D3, D4 and B2

[2] 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).

6. Characteristics

Table 4. CharacteristicsT_{amb} = 25 °C unless otherwise specified.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
R _{S(ch)}	channel series resistance	R1 to R6	36	40	44	Ω
R _{pu}	pull-up resistance	R9 to R12	40	50	60	kΩ
		R13	12	15	18	kΩ
C _{line}	line capacitance	including diode capacitance; V _I = 0 V; f = 1 MHz; B2 = GND	[1] 8	11	14	pF
V _{BR}	breakdown voltage	I _I = 1 mA	6	-	-	V
I _{RM}	reverse leakage current	V _I = 3 V	-	-	100	nA

[1] Guaranteed by design.

7. Frequency response

Table 5. Frequency response

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
α _{il}	insertion loss	all channels; R _{source} = 50 Ω; R _L = 50 Ω				
		f < 400 MHz	-	-	7	dB
		400 MHz < f < 800 MHz	4	-	-	dB
		800 MHz < f < 2.5 GHz	8	-	-	dB
		2.5 GHz < f < 6.0 GHz	19	-	-	dB

8. Application information

8.1 Insertion loss

The insertion loss measurement configuration of a typical NetWork Analyzer (NWA) system is shown in [Figure 3](#). The insertion loss is measured with a test Printed-Circuit Board (PCB) utilizing laser-drilled micro-via holes that connect the PCB ground plane to the IP4340CX15 ground pins.

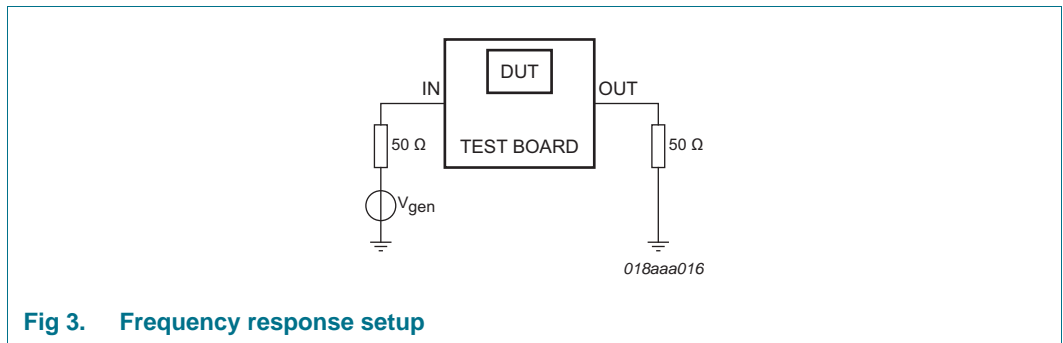


Fig 3. Frequency response setup

The frequency response curves for all channels at frequencies up to 6 GHz are shown in [Figure 4](#).

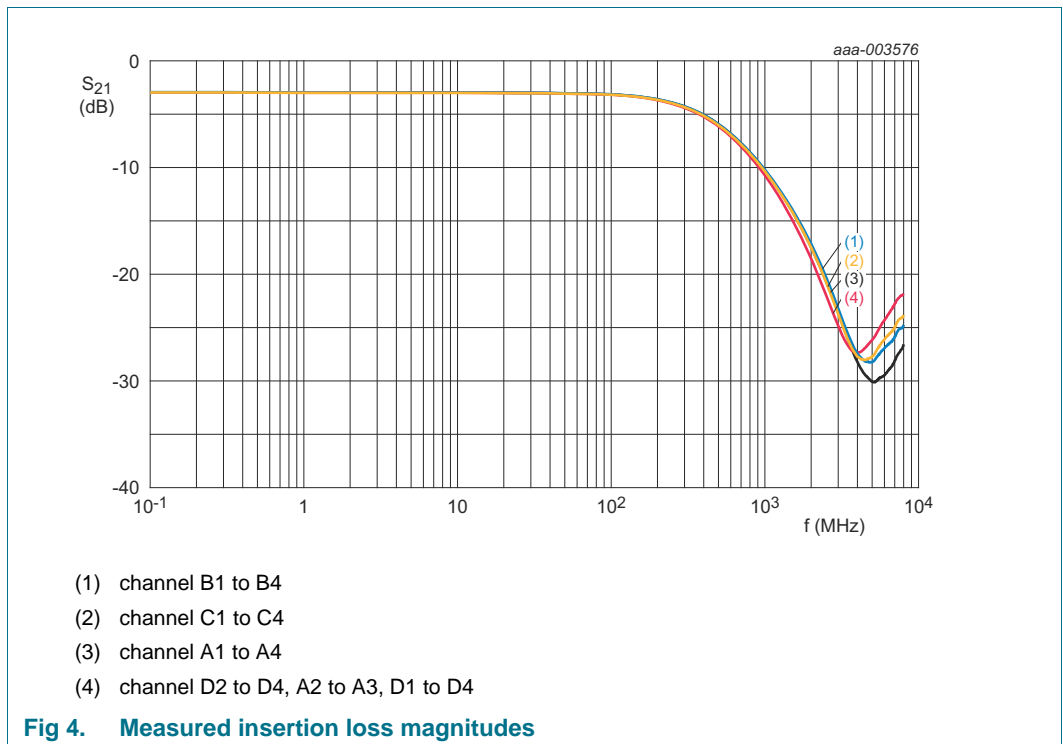


Fig 4. Measured insertion loss magnitudes

8.2 Crosstalk

The setup for crosstalk measurements in a 50 Ω NWA system from one channel to another is shown in Figure 5. For the measurements, calibrated RF-probes are contacted to DUT bumps. Typical examples of crosstalk measurement results are depicted in Figure 6 and 7.

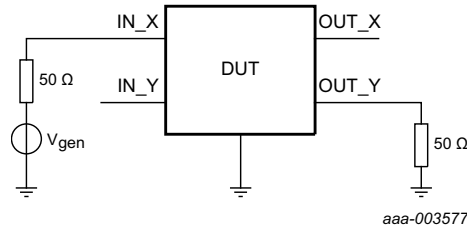
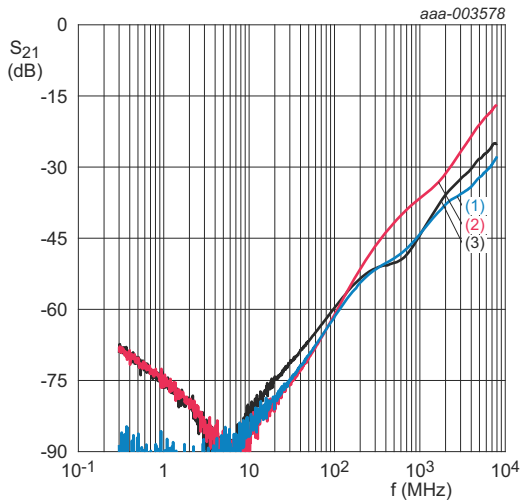
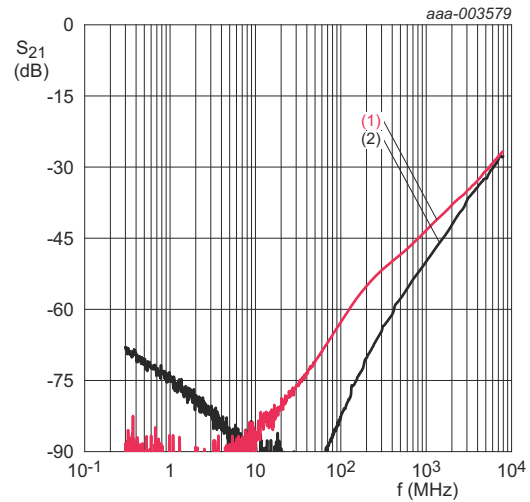


Fig 5. Crosstalk measurement configuration



- (1) Pin A1 to B4
- (2) Pin A1 to A2, D1 to D2
- (3) Pin A1 to A3, D1 to D3

Fig 6. Crosstalk behavior between adjacent channels



- (1) Pin A2 to B4
- (2) Pin A1 to C1

Fig 7. Crosstalk behavior between adjacent channels

9. Package outline

WLCSP15: wafer-level chip-size package; 15 bumps; (4 x 4 - C2)

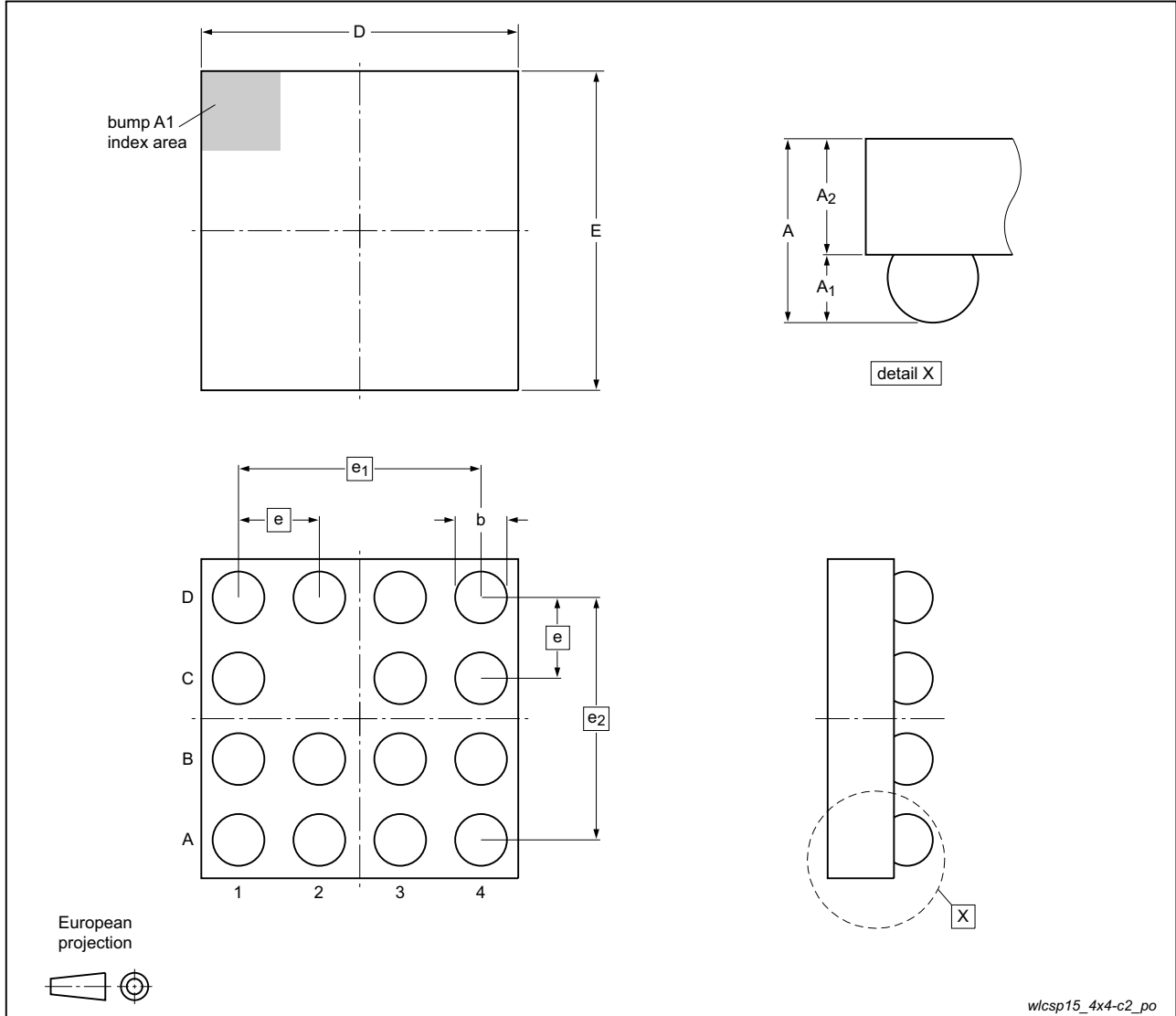


Fig 8. Package outline IP4340CX15 (WLCSP15)

Table 6. Package outline dimensions

Symbol	Min	Typ	Max	Unit
A	0.44	0.47	0.50	mm
A ₁	0.18	0.20	0.22	mm
A ₂	0.26	0.27	0.28	mm
b	0.21	0.26	0.31	mm
D	1.51	1.56	1.61	mm
E	1.51	1.56	1.61	mm

Table 6. Package outline dimensions ...continued

Symbol	Min	Typ	Max	Unit
e	-	0.40	-	mm
e ₁	-	1.2	-	mm
e ₂	-	1.2	-	mm

10. Soldering of WLCSP packages

10.1 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.

10.2 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

10.3 Reflow soldering

Key characteristics in reflow soldering are:

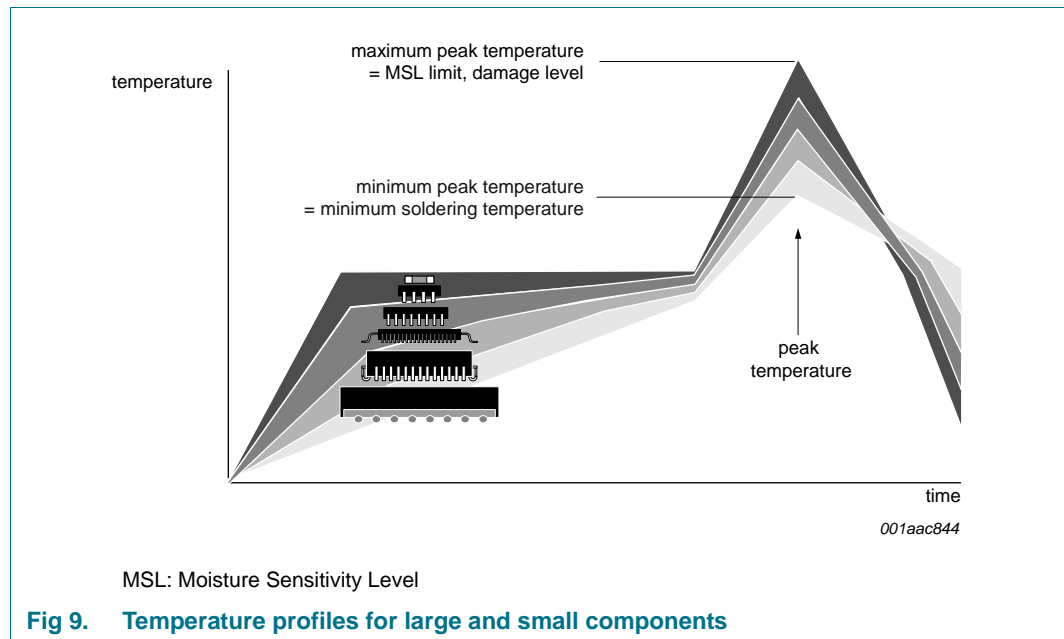
- Lead-free versus SnPb soldering; note that a lead-free reflow process usually leads to higher minimum peak temperatures (see [Figure 9](#)) than a PbSn process, thus reducing the process window
- Solder paste printing issues, such as smearing, release, and adjusting the process window for a mix of 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 7](#).

Table 7. 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 9](#).



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

10.3.1 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.

10.3.2 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.

10.3.3 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".

10.3.4 Cleaning

Cleaning can be done after reflow soldering.

11. Revision history

Table 8. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
IP4340CX15 v.2	20120813	Product data sheet	-	IP4340CX15 v.1
Modifications:	• Corrected package dimensions in Table 2 (height) and Table 6 (maximum values D and E)			
IP4340CX15 v.1	20120615	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".

[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>.

12.2 Definitions

Draft — The document is a draft version only. The content is still under internal review and subject to formal approval, which may result in modifications or additions. NXP Semiconductors does not give any representations or warranties as to the accuracy or completeness of information included herein and shall have no liability for the consequences of use of such information.

Short data sheet — A short data sheet is an extract from a full data sheet with the same product type number(s) and title. A short data sheet is intended for quick reference only and should not be relied upon to contain detailed and full information. For detailed and full information see the relevant full data sheet, which is available on request via the local NXP Semiconductors sales office. In case of any inconsistency or conflict with the short data sheet, the full data sheet shall prevail.

Product specification — The information and data provided in a Product data sheet shall define the specification of the product as agreed between NXP Semiconductors and its customer, unless NXP Semiconductors and customer have explicitly agreed otherwise in writing. In no event however, shall an agreement be valid in which the NXP Semiconductors product is deemed to offer functions and qualities beyond those described in the Product data sheet.

12.3 Disclaimers

Limited warranty and liability — Information in this document is believed to be accurate and reliable. However, NXP Semiconductors does not give any representations or warranties, expressed or implied, as to the accuracy or completeness of such information and shall have no liability for the consequences of use of such information. NXP Semiconductors takes no responsibility for the content in this document if provided by an information source outside of NXP Semiconductors.

In no event shall NXP Semiconductors be liable for any indirect, incidental, punitive, special or consequential damages (including - without limitation - lost profits, lost savings, business interruption, costs related to the removal or replacement of any products or rework charges) whether or not such damages are based on tort (including negligence), warranty, breach of contract or any other legal theory.

Notwithstanding any damages that customer might incur for any reason whatsoever, NXP Semiconductors' aggregate and cumulative liability towards customer for the products described herein shall be limited in accordance with the *Terms and conditions of commercial sale* of NXP Semiconductors.

Right to make changes — NXP Semiconductors reserves the right to make changes to information published in this document, including without limitation specifications and product descriptions, at any time and without notice. This document supersedes and replaces all information supplied prior to the publication hereof.

Suitability for use — NXP Semiconductors products are not designed, authorized or warranted to be suitable for use in life support, life-critical or safety-critical systems or equipment, nor in applications where failure or malfunction of an NXP Semiconductors product can reasonably be expected to result in personal injury, death or severe property or environmental damage. NXP Semiconductors and its suppliers accept no liability for inclusion and/or use of NXP Semiconductors products in such equipment or applications and therefore such inclusion and/or use is at the customer's own risk.

Applications — Applications that are described herein for any of these products are for illustrative purposes only. NXP Semiconductors makes no representation or warranty that such applications will be suitable for the specified use without further testing or modification.

Customers are responsible for the design and operation of their applications and products using NXP Semiconductors products, and NXP Semiconductors accepts no liability for any assistance with applications or customer product design. It is customer's sole responsibility to determine whether the NXP Semiconductors product is suitable and fit for the customer's applications and products planned, as well as for the planned application and use of customer's third party customer(s). Customers should provide appropriate design and operating safeguards to minimize the risks associated with their applications and products.

NXP Semiconductors does not accept any liability related to any default, damage, costs or problem which is based on any weakness or default in the customer's applications or products, or the application or use by customer's third party customer(s). Customer is responsible for doing all necessary testing for the customer's applications and products using NXP Semiconductors products in order to avoid a default of the applications and the products or of the application or use by customer's third party customer(s). NXP does not accept any liability in this respect.

Limiting values — Stress above one or more limiting values (as defined in the Absolute Maximum Ratings System of IEC 60134) will cause permanent damage to the device. Limiting values are stress ratings only and (proper) operation of the device at these or any other conditions above those given in the Recommended operating conditions section (if present) or the Characteristics sections of this document is not warranted. Constant or repeated exposure to limiting values will permanently and irreversibly affect the quality and reliability of the device.

Terms and conditions of commercial sale — NXP Semiconductors products are sold subject to the general terms and conditions of commercial sale, as published at <http://www.nxp.com/profile/terms>, unless otherwise agreed in a valid written individual agreement. In case an individual agreement is concluded only the terms and conditions of the respective agreement shall apply. NXP Semiconductors hereby expressly objects to applying the customer's general terms and conditions with regard to the purchase of NXP Semiconductors products by customer.

No offer to sell or license — Nothing in this document may be interpreted or construed as an offer to sell products that is open for acceptance or the grant, conveyance or implication of any license under any copyrights, patents or other industrial or intellectual property rights.

Export control — This document as well as the item(s) described herein may be subject to export control regulations. Export might require a prior authorization from competent authorities.

Quick reference data — The Quick reference data is an extract of the product data given in the Limiting values and Characteristics sections of this document, and as such is not complete, exhaustive or legally binding.

Non-automotive qualified products — Unless this data sheet expressly states that this specific NXP Semiconductors product is automotive qualified, the product is not suitable for automotive use. It is neither qualified nor tested in accordance with automotive testing or application requirements. NXP Semiconductors accepts no liability for inclusion and/or use of non-automotive qualified products in automotive equipment or applications.

In the event that customer uses the product for design-in and use in automotive applications to automotive specifications and standards, customer (a) shall use the product without NXP Semiconductors' warranty of the product for such automotive applications, use and specifications, and (b) whenever customer uses the product for automotive applications beyond NXP Semiconductors' specifications such use shall be solely at customer's own risk, and (c) customer fully indemnifies NXP Semiconductors for any liability, damages or failed product claims resulting from customer design and use of the product for automotive applications beyond NXP Semiconductors' standard warranty and NXP Semiconductors' product specifications.

12.4 Trademarks

Notice: All referenced brands, product names, service names and trademarks are the property of their respective owners.

13. Contact information

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: salesaddresses@nxp.com

14. Contents

1	Product profile	1
1.1	General description	1
1.2	Features and benefits	1
1.3	Applications	1
2	Pinning information	2
2.1	Pinning	2
2.2	Pin description	2
3	Ordering information	3
4	Functional diagram	3
5	Limiting values	3
6	Characteristics	4
7	Frequency response	4
8	Application information	5
8.1	Insertion loss	5
8.2	Crosstalk	6
9	Package outline	7
10	Soldering of WLCSP packages	8
10.1	Introduction to soldering WLCSP packages	8
10.2	Board mounting	8
10.3	Reflow soldering	8
10.3.1	Stand off	9
10.3.2	Quality of solder joint	9
10.3.3	Rework	10
10.3.4	Cleaning	10
11	Revision history	11
12	Legal information	12
12.1	Data sheet status	12
12.2	Definitions	12
12.3	Disclaimers	12
12.4	Trademarks	13
13	Contact information	13
14	Contents	14

Please be aware that important notices concerning this document and the product(s) described herein, have been included in section 'Legal information'.

© NXP B.V. 2012.

All rights reserved.

For more information, please visit: <http://www.nxp.com>

For sales office addresses, please send an email to: salesaddresses@nxp.com

Date of release: 13 August 2012

Document identifier: IP4340CX15

Looking for pricing, stock, or lifecycle information?

Click below to explore more details on WIN SOURCE:

- [View IP4340CX15/P on WIN SOURCE](#)
- [NXP / Nexperia Information](#)

Optimize Your Supply Chain with WIN SOURCE Solutions

- ✓ Global Sourcing Solution
- ✓ Obsolete Management
- ✓ Cost Control Management
- ✓ Shortage Management
- ✓ Alternative Solution
- ✓ Excess Inventory Management