LinksField chipSIM

Technical Product Specification

Part Number	**CP-O-C-C-0L-202A-G**
Model	**Linksim M2M Consumer 228**
Description	**ChipSIM_5x6_Consumer**
Version:	**1.8**
Date:	**19. April 2021**
Classification:	**Business Confidential**
State:	**Released**
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Approved by:	**Bruce Wang**

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1 ChipSIM Data sheet

1.1 Product-features – Hardware

LinksField chipSIM comes along with the following hardware features / support:

Product name	Linksim M2M consumer 228
CPU	8bit HC8051
NVM	504kB
IRAM	256Bytes
XRAM	4.25KBytes
Flash	228KBytes Program 500,000 10-year data retention 512Bytes page erase 1~512Bytes write Erase time：2ms Byte Write time：20us
I/O	
ISO/IEC7816	ISO/IEC 7816-3 T=0 Hardware ETU counter Hardware automatic 60H External clock 1～5MHz
GPIO	1（ISO7816 IO）

Security	
Hardware Random Number Generator	V
Power-On voltage sensor, High/Low voltage sensors,	V
DES/3DES, CRC	V
Software FLASH program protect	V
Chip internal oscillator	V
Data encryption	V
Unique chip identification number	V

Electric Features	
Current	Dynamic current： <10mA@5.5V,5MHz
	Standby current： <200uA @5.5V,1MHz
	Stop Clock current：<100uA@5.5V
Voltage	1.62V～5.5V
Temperature	-25°C up to 85°C
ESD	>4000V
IDE	
Keil uVision IDE	V

Table 1: HW features

Note: This table shows general hardware features. Detailed technical information to be found in the following chapters.

1.2 Product-features – Software

For the latest software features supported by LinksField chipSIM please check the corresponding product datasheet incl. all relevant standards.

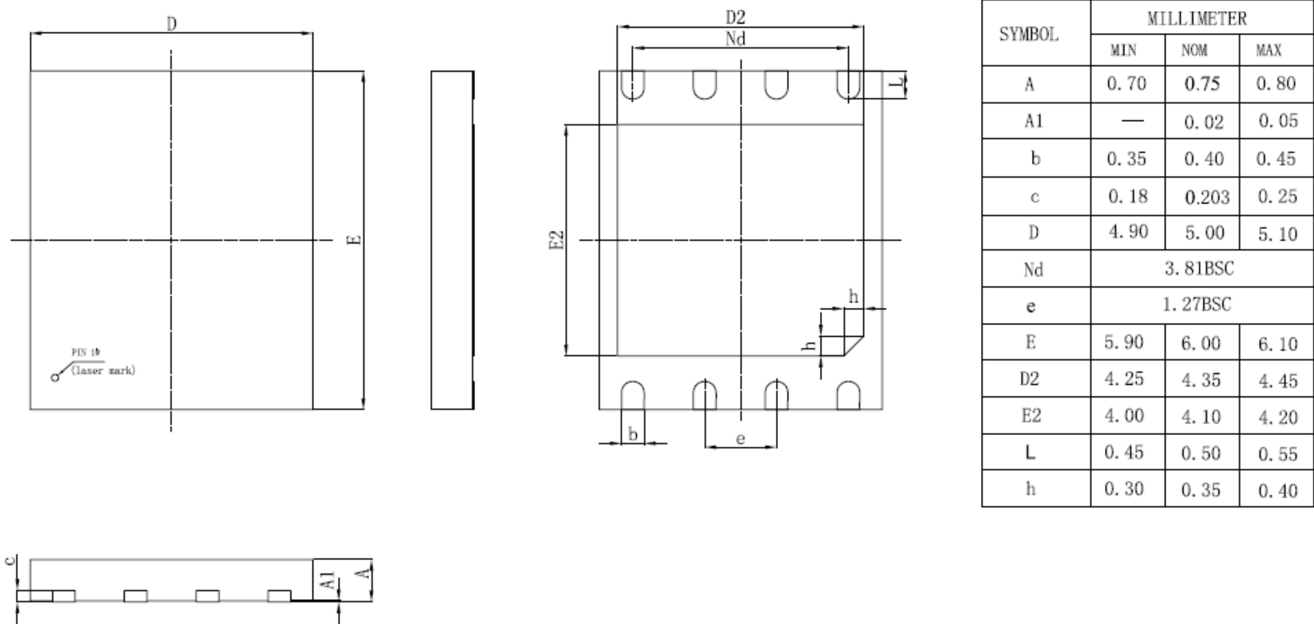
Please refer to Datasheet LinksField chipSIM, generally the newest version.

2 ChipSIM Package Handling Description

LinksField chipSIM product packaging solution is fully compliant with ETSI TS102 671 Release 9 MFF2 (M2M Form Factor) definition.

2.1 Package Outline

LinksField chipSIM Package engineering drawing is according to IFX public information.



SYMBOL	MILLIMETER		
	MIN	NOM	MAX
A	0. 70	0.75	0. 80
A1	—	0. 02	0. 05
b	0. 35	0. 40	0. 45
c	0. 18	0.203	0. 25
D	4. 90	5. 00	5. 10
Nd	3. 81BSC		
e	1. 27BSC		
E	5. 90	6. 00	6. 10
D2	4. 25	4. 35	4. 45
E2	4. 00	4. 10	4. 20
L	0. 45	0. 50	0. 55
h	0. 30	0. 35	0. 40

Figure 1 ETSI MFF2 compliant package dimension (Source: IFX Package Overview)

2.2 Pin-out Assignment

The pin-out is compliant to MFF2 definition in ETSI TS 102 671.

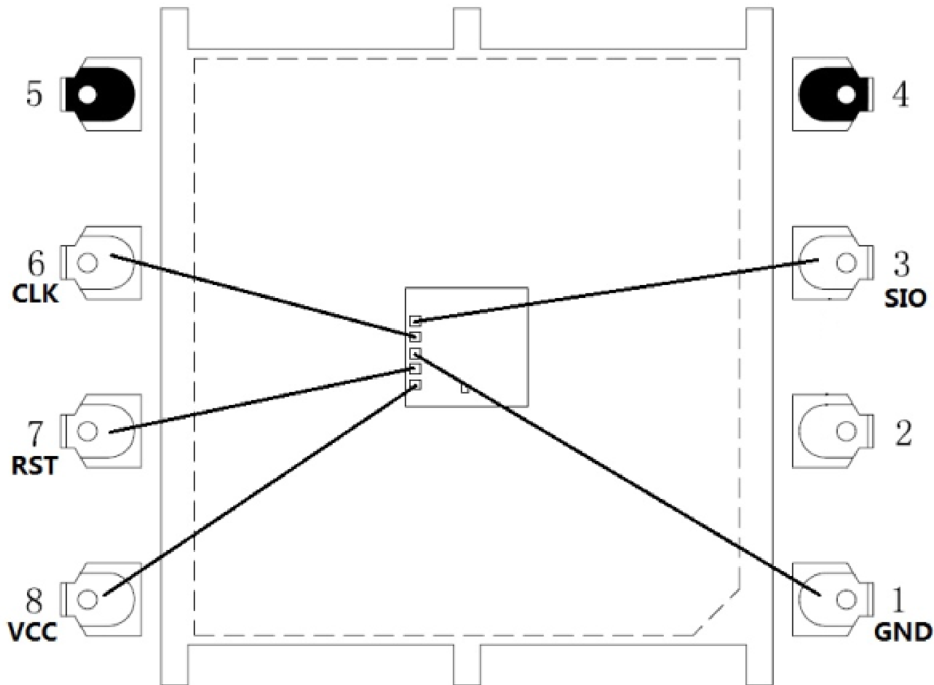


Figure 2 MFF2 pin-out drawing top view

Pin	UICC Contact	Contact Name	Description
1	C5	GND	Ground
2	-	NC	No Connection
3	C7	I/O	Serial data in-/output
4	-	NC	No Connection
5	-	NC	No Connection
6	C3	CLK	External clock input
7	C2	RST	System reset input
8	C1	VCC	Power input

Table 2 Package pin to UICC contact mapping from Figure 2

3 Laser Marking Description

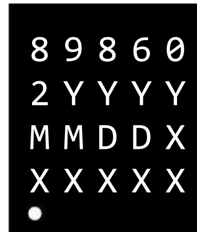


Figure 3 Laser marking pattern of ETSI MFF2 compliant package for LF-ChipSIM-I

Note: The ICCID marked on top is unique for each SIM chip for identification and tracking purpose. The laser marked surface shall be handled carefully during manufacturing process to provide the possibility to identify the SIM chip visually after it is launched in field.

3.1 Soldering Recommendation

Footprint engineering drawing is according to IFX public information. Recommendations for board assembly is referring to Recommendations for Printed Circuit Board Assembly of Infineon QFN Packages DS7, 2012-05

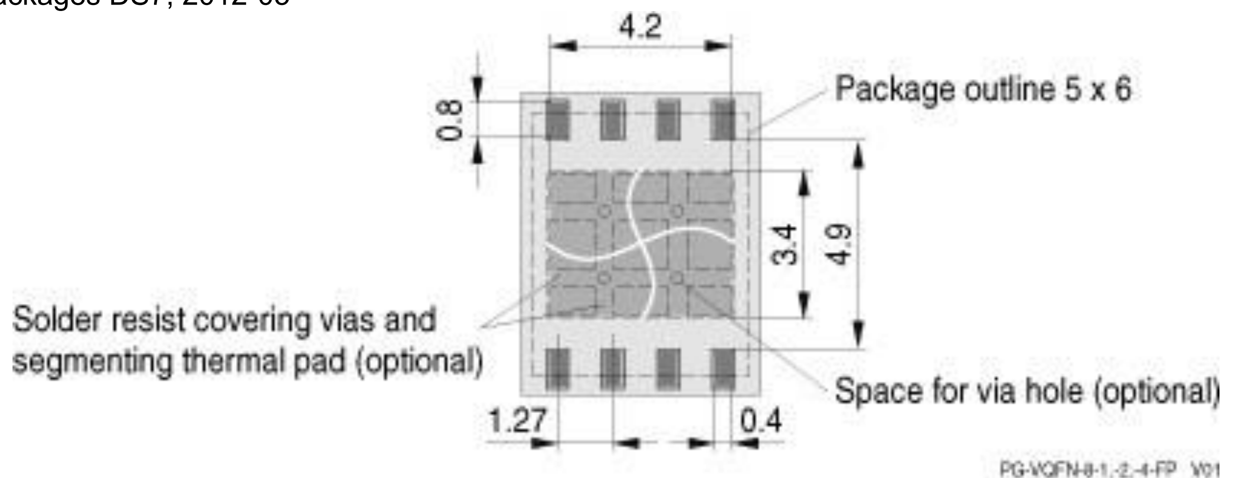


Figure 4 MFF2 package footprint drawing (Source: IFX Package Ove

4 Technical Specification

The LinksField chipSIM features a wide range of operational characteristics. These values are summarized within the following chapter. Additionally, check the “M2M-Module Integration Guide” for general recommendation for integrating the LF-ChipSIM-I platform.

Of ISO/IEC 7816-3, all currents flowing into the UICC / eUICC are considered as positive (+); all currents flowing out of the card are considered as negative (-). All timing shall be measured with respect to the appropriate threshold levels.

The physical characteristics of the electrical connection as well as the signaling scheme and data transmission are described in the ISO/IEC 7816-3 and ETSI TS 102 221 standards.

4.1 Absolute Maximum Ratings

Symbol	Description	Minimum	Maximum	Unit	Comment
V_{CC}	Input supply voltage range	- 0.3	7.0	V	./.
V_{IN}	Input voltage range	- 0.3	V_{CC} + 0.3	V	./.
T_A	Operational temperature	- 25	85	°C	./.
V_{ESD}	ESD protection	6000	./.	V	HBM (Human Body Model) JESD22-A114

Table 4 Absolute maximum ratings

Stresses beyond the values listed in Absolute Maximum Ratings may cause permanent damage to the device. These are stress ratings only and functional operation of the device at these or any other conditions beyond those indicated in Electrical characteristics are not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability, over all lifetime, data retention of the NVM and endurance of write/erase cycles.

4.2 Electrical Characteristics

It is assumed that a pull-up resistor is used on the interface device (recommended value: 20 kΩ). For details check ISO/IEC 7816-3.

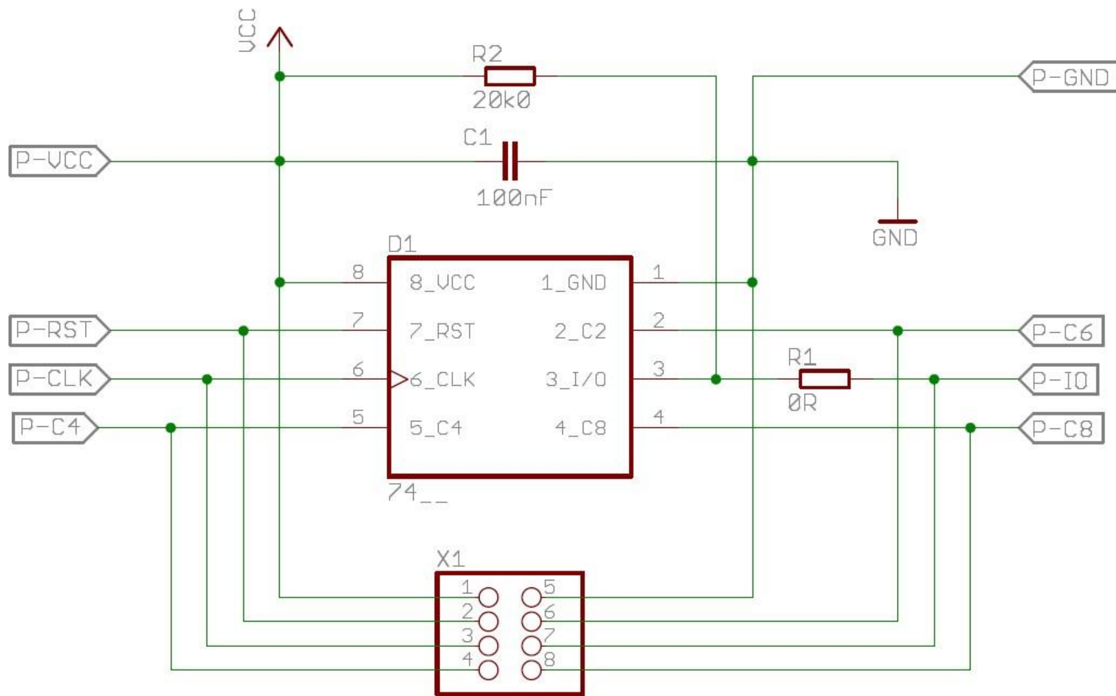


Figure 5 Schematic

4.3 DC Characteristics

Symbol	Description	Minimum	Nominal	Maximum	Unit	Comment
V_{CC}	Input supply voltage range	4.5	5.0	5.5	V	ISO 7816-3 Class A Acc. ETSI 102 671 voltage class A shall not be used
		2.7	3.0	3.3	V	ISO 7816-3 Class B
		1.62	1.8	1.98	V	ISO 7816-3 Class C
I_{CC}	Input supply current	./.	./.	20	mA	25°C
$I_{CCspike}$	Spikes on input supply current	./.	./.	100	mA	ISO 7816-3 Class A Max. charge: 20 nAS
		./.	./.	50	mA	ISO 7816-3 Class B Max. charge: 10 nAS
		./.	./.	30	mA	ISO 7816-3 Class A Max. charge: 6 nAS
I_{CCMax}	Current limitation mode: Supply current	./.	./.	10	mA	V_{CC} < 5.0V
		./.	./.	6	mA	V_{CC} < 3.3V
		./.	./.	4	mA	V_{CC} < 1.98V
I_{CCS1}	Sleep mode: Supply current	./.	./.	200	µA	TA=25°C ; f_{CLK}=1MHz
I_{CCS2}	Sleep mode: Supply current	./.	./.	100	µA	Class B / C ; T_A=25°C ; CLK off

Table 5 DC Characteristics - Power Supply

Note: Not all classes may be activated by customer specific software configuration (profile configuration).
Spikes in power supply could be prevented by placing a capacitor (e.g. 100 nF, ceramic) as close as possible to the contacting elements (see also Figure 5 / capacitor C1).

Symbol	Description	Minimum	Nominal	Maximum	Unit	Comment
I/O; Bidirectional port						
V_{IH}	Input voltage High	0.8 * V_{CC}	./.	V_{CC} + 0.3	V	-20µA ≤ I_{IH} ≤ 20µA
V_{IL}	Input voltage Low	- 0.3	./.	0.2 * V_{CC}	V	-1mA ≤ I_{IL} ≤ 20µA
V_{OH}	Output voltage High	0.7 * V_{CC}	./.	V_{CC} + 0.33	V	-20µA ≤ I_{OH} ≤ 20µA
RST						
V_{IH}	Input voltage High	0.8 * V_{CC}	./.	V_{CC} + 0.3	V	-20µA ≤ I_{IH} ≤ 20µA
V_{IL}	Input voltage Low	- 0.3	./.	0.2 * V_{CC}	V	-50µA ≤ I_{IL} ≤ 20µA
CLK						
V_{IH}	Input voltage High	0.85 * V_{CC}	./.	V_{CC} + 0.3	V	-20µA ≤ I_{IH} ≤ 20µA
V_{IL}	Input voltage Low	- 0.3	./.	0.2 * V_{CC}	V	-30µA ≤ I_{IL} ≤ 20µA

Table 6 DC Characteristics - Communication Pins

For the given values in Table 6 it is assumed that a pull-up resistor to V_{CC} is used (External pull-up resistor: 20 kΩ to V_{CC}).

Contacts	Symbol	Minimum	Nominal	Maximum	Unit	Comment
ISO/IEC 7816-3, 2001						
I/O	V_{OL}	./.	./.	0.15 * V_{CC}	V	Class A: I_{OL} = 1mA
		./.	./.	0.15 * V_{CC}	V	Class B: I_{OL} = 1mA
		./.	./.	0.15 * V_{CC}	V	Class C: I_{OL} = 500µA
GSM 11.11 (2000-08); GSM 11.12 (March 1998); GSM 11.18 (1999-07); ETSI TS 102 221 4.3.0 (2001-07)						
I/O	V_{OL}	./.	./.	0.4	V	Class A & B: I_{OL} = -1mA
		./.	./.	0.3	V	Class C: I_{OL} = -1mA
EMV 2000 (Status: 2001-11-30 - Draft Version 1.0)						
I/O	V_{OL}	./.	./.	0.08 * V_{CC}	V	Class A: I_{OL} = 1mA
		./.	./.	0.15 * V_{CC}	V	Class B: I_{OL} = 500µA
		./.	./.	0.15 * V_{CC}	V	Class C: I_{OL} = 500µA

Table 7 DC Characteristics - I/O Pin V_{OL}

Note: I/O current direction in GSM11.xx is different to these in other standards.

4.4 AC Characteristics

Symbol	Description	Minimum	Nominal	Maximum	Unit	Comment
			V_{CC} – Input supply voltage			
t_{R_VCC}	Rise time VCC	1	./.	10_7	µs	0 to 100% of supply voltage
			I/O			
t_R; t_F	Rise / Fall time	./.	./.	1	µs	30 pF external
			RST			
t_R; t_F	Rise / Fall time	./.	./.	1	µs	30 pF external
			CLK			
f_{CLK}	External frequency	1	./.	10	MHz	
t_R; t_F	Rise / Fall time	./.	./.	0.1 * 1/f_{CLK}	ns	0.1 * V_{CC} to 0.9 * V_{CC}; V_T = 0.5 * V_{CC}
Duty cycle		40	./.	60	%	

Table 8 AC Characteristics

Shorter rise time t_{R_VCC} may result in pre-damage of the internal protection circuitry.

5 ChipSIM Package Information

LinksField chipSIM product is packaged in tape and reel for delivery. Standard quantity is 3000 pieces per 13" reel for commercial volume delivery.

Reel diameter	7" / 12mm
Standard quantity	1000 pieces per reel
Packaging	Tape and Reel
Delivery format	1 reel/box

Table 10 Delivery information

5.1 Tape and Reel packing description

As the MFF2 package supports MSL 3 dry packing is needed.

Detailed packing information available in "SMD devices – Dry packing", generally the newest version applicable.

6 Applicable Documents and Standards

EIA-481
EMV Co V4.2
ETSI TS 102 221
ETSI TS 102 671
LINKSFIELD M2M-Module Integration Guide
GSM 11.11
GSM 11.12
GSM 11.18
ISO/IEC 7816-3
JESD22-A114
Recommendations for Printed Circuit Board Assembly of Infineon QFN Packages DS7, 2012-05
LINKSFIELD SMD devices – Dry Packing, Tape and Reel Packing Description

7 Glossary

AFR	Average Failure Rate
ATR	Answer To Reset
CLK	Clock Signal
DFA	Differential Fault Analysis
DFN8	Dual Flat No-Leads (with 8 contacts)
DPA	Differential Power Analysis
DPM	Defect per Million
EIA	Electronics Industries Alliance
ELFR	Early Lifetime Failure Rate
EMV	Europay, MasterCard and VISA
eSE	embedded Secure Element
eUICC	embedded Universal Integrated Circuit Card
ETSI	European Telecommunications Standards Institute
FIT	Failure In Time
GND	Ground
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
I/O	Input/Output
MFF2	Machine-to-Machine (M2M) Form Factor 2 according ETSI TS 102 671
NVM	Non-Volatile Memory
QFN8	Quad-Flat No-leads (with 8 contacts)
RST	Reset
SFA	Simple Fault Analysis
SIO	Serial Input Output (part of a microcontroller)
SMD	Surface-Mounted Device
SON8	Small-Outline No-leads (with 8 contacts)
SPA	Simple Power Analysis
SPI	Serial Peripheral Interface
UART	Universal Asynchronous Receiver Transmitter
V_{CC}	Positive Power Supply

8 Revision History

Version	Date	Author	Comments
V1.0	25. Jul 2012	H. Chen	Initial version
V1.1	28. Jan 2013	H. Chen	Datasheet update
V1.2	03. Jul 2013	H. Chen	Editorial change
V1.3	23. Sep 2013	H. Chen	Editorial correction Label size
V1.4	30. Jan 2014	H. Chen	Reel drawing update in 3.2
V1.5	31. Jul 2017	Qiu Kun	Update to new document and brand layout; Product renaming
V 1.6	21. Nov 2019	Qiu Kun	Update pin spec
V 1.7	11. Nov 2020	Qiu Kun	Update laser mark
V 1.8	19. April 2021	Qiu Kun	Update laser mark and package outline