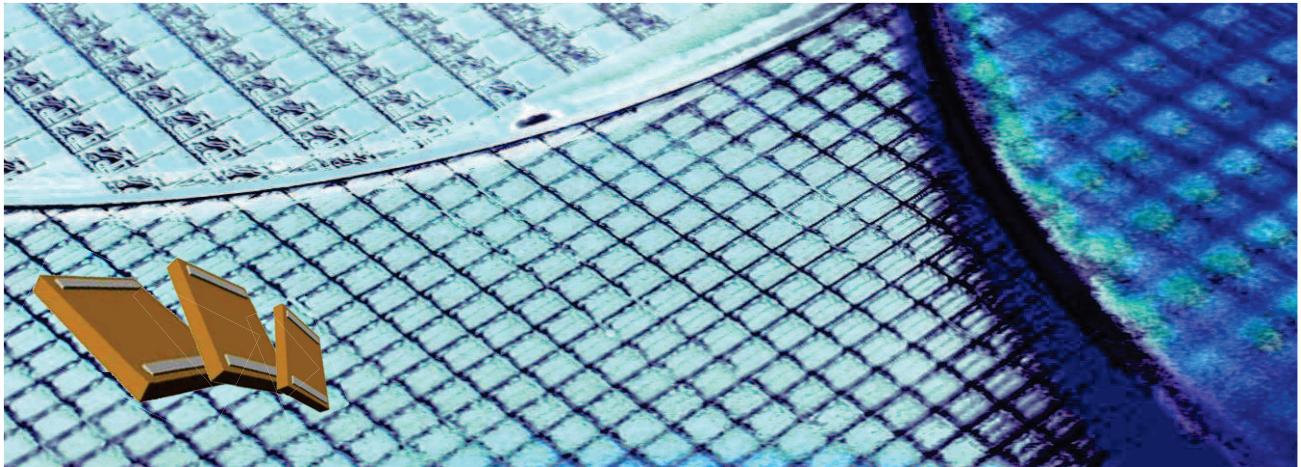


Manual Handling recommendation



These capacitors are designed to be mounted with a standard pick and place machine, with reflow.

In case of manual handling, please follow below recommendations:

- Minimize mechanical pressure on the capacitors (use of a vacuum nozzle is recommended).
- Minimize temperature shocks (pre-heat the substrate).
- No wirebonding on 0402 47nF, 0402 100nF, 1206 1 μ F, 1812 3,3 μ F

Process steps:

- On substrate, form the solder meniscus on each land pattern targeting 100 meniscus height after reflow (screen printing, dispensing solder paste or by wire soldering).
- Pick the capacitor from the tape & reel or the Gel Pack keeping backside visible using a vacuum nozzle.
- Temporary place the capacitor on land pattern assuming remaining flux will stick the capacitor.
- Reflow the assembly with a dedicated profile (see reflow recommendation profile)
- After soldering, no solder paste should touch the side of the capacitor dies.

If you have any questions prior to mounting the capacitors, please contact IPDiA (contact details below) and ask for our assembly specialist.

IPDiA

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ipdia
The 3D Silicon Leader



ASPICS320.604/5 – IPD Companion for ISM Transceiver IC: Synthesis part

Rev 1.1

TD

General description

The ASPICS320.604/605 are integrated passive devices specifically designed for use with the SEMTECH SX1211 868/915 MHz ISM/UHF transceiver. These synthesis parts include VCO coils and PLL loop filter and replace 5 equivalent SMDs.

ASPICS320.604 (for 868 MHz band) and ASPICS320.605 (for 915 MHz band) are used with ASPICS320.606 / RF front-end, forming highly optimized chip-set solutions by reducing the number of components by 50 % for a typical application.

They are flipped directly on the PCB closest to this specific ISM transceiver (Standard reflow soldering technology can be used).

The ASPICS320.604/605 exhibits improved performance (in terms of phase noise and even harmonic rejection) in a small footprint with excellent symmetry for the VCO tank and an optimum loop bandwidth for the loop filter.

Features

- **IPD Companion for Transceiver IC**
- **ISM band:**
 - 863-870MHz
 - 902-928 MHz
- **Passive integration of VCO tank, loop filter on single Silicon die (in replacement of 5 key components)**
- **Cost reduction**
- **Compatible with current packaging**
- **Miniaturization of application:**
Small size 1.75 x 2.5 mm
- **Enhanced performance:**
 - Optimum Loop bandwidth of PLL
 - Better system stability
 - No even harmonic creation
 - Shorter distance with the active die
- **Low aging**
- **High reliability**
- **Very low leakage**
- **Operating temp. range:**
-40 °C to +150 °C

Applications

- **Wireless alarm and security systems**
- **Wireless sensor networks**
- **Automated Meter Reading (AMR)**
- **Home and building automation**
- **Industrial monitoring and control**
- **Remote Wireless Control**

Ordering Information

Type number	Package			
	Product Name	Die Name	Description	Version
935 480 320 604	ASPICS320.604	ASP124.1	WLCSP Companion RF IPD – 9 bumps – 1.75 mm x 2.50 mm x 0.55mm – 868 MHz band	1
935 480 320 605	ASPICS320.605	ASP125.1	WLCSP Companion RF IPD – 9 bumps – 1.75 mm x 2.50 mm x 0.55 mm – 915 MHz band	1

Table 1: die information

Type number	Package			
	Packaging	Termination	Description	Version
935 480 320 604-T3S	Tape & Reel 1000	SAC305 (96.5Sn/3.0Ag/0.5Cu)	7" diameter	1
935 480 320 605-T3S	Tape & Reel 1000	SAC305 (96.5Sn/3.0Ag/0.5Cu)	7" diameter	1

Table 2: ordering information

Specific application for ISM 869 MHz/915 MHz transceiver SX1211

Integration of RF front end, VCO tank, loop filter and decoupling in single IPD die around the transceiver SX1211

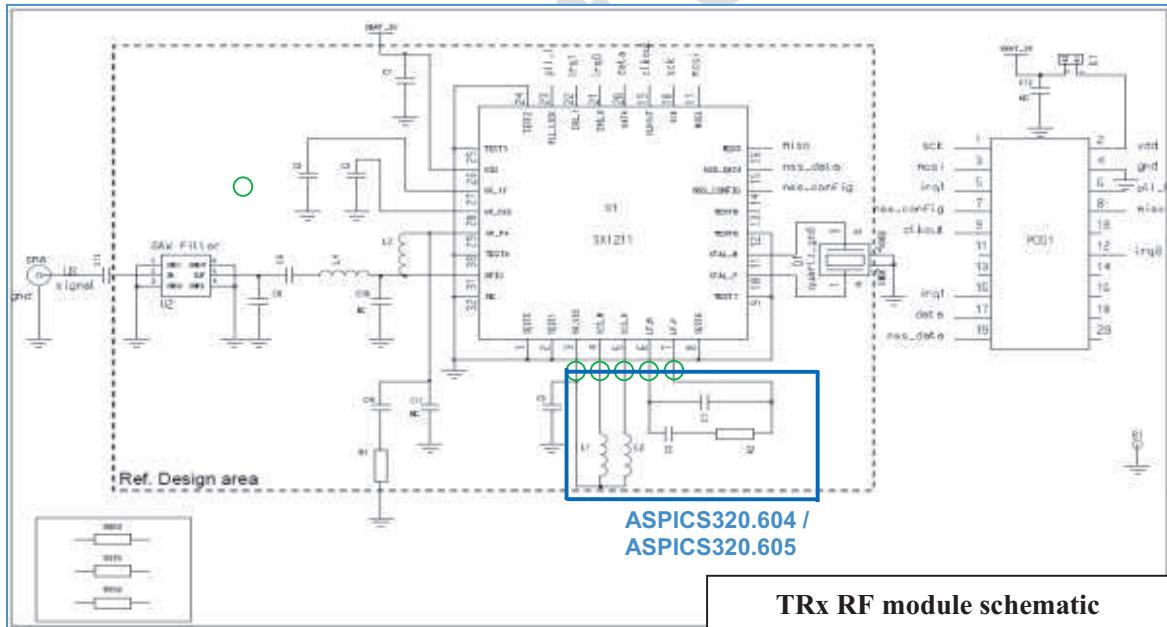


Fig 1: SX1211 Schematic for RF layouts

■ Details of PICS integration

ASPICS320.604 / ASPICS320.605

“VCO tank” part

2 coils (L1,L2=8.2 nH /6.8 nH)

“Loop filter” part:

2 capacitors (C6=10 nF & C7=680 pF) and 1 resistor (R2=6.8 kOhms)

⇒ Number of components integrated from BOM = 5

Block Diagram

ASPICS320.604 / ASPICS320.605 Electrical Schematic

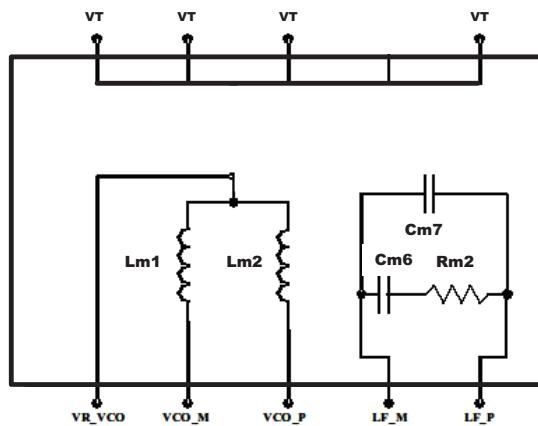


Fig2: ASPICS320.604/ ASPICS320.605 Block Diagram

Electrical specification

Table of Absolute Maximum Ratings

Symbol	Description	Min	Typ	Max	Unit
VDDmr	Supply voltage	-0.3	3.3	3.7	V
Tmr	Storage temperature	-55	25	200	°C
Pmr	input level	-	-	33	dbm

Table of Operating Range

Symbol	Description	Min	Typ	Max	Unit
VDDop	Supply voltage	-	3.3	3.6	V
Trop	Operation temperature	-40	25	150	°C
ML	input level	-	-	33	dBm

Table 2: Absolute maximum ratings

Ref	Value	Tol(+/-)	Description	Function
Cm6	10 nF	15%	-	Loop filter
Cm7	1 nF	15%	-	Loop filter
Lm1,Lm2	8 nH	5%	-	VCO tank inductor for 868 MHz TRx
Lm1,Lm2	6.6 nH	5%	-	VCO tank inductor for 915 MHz TRx
Rm2	6.8 kΩ	10%	-	Loop filter

Table 4: Component description

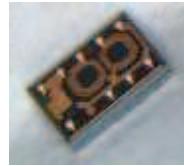
Symbol	Description	Min	Typ	Max	Unit
F_{LO}	LO frequency ($F_{LO}=F_{RF} \times 8 / 9$)	802	-	825	MHz
F_{RF}	RF frequency (915 MHz band)	902	-	928	MHz
F_{LO}	LO frequency ($F_{LO}=F_{RF} \times 8 / 9$)	767	-	773	MHz
F_{RF}	RF frequency (868 MHz band)	863	-	870	MHz

Table 5: specification

Pinning definition

Symbol	Pin	Coordinate of ASPICS320.604/5 bump (0,0) = center of ASPICS320.604/5		
		X (μm)	Y (μm)	side
VT	10	-1000	605.5	top
VT	9	-500	605.5	top
VT	8	0	605.5	top
N-C	7	N-A	N-A	top
VT	6	1000	605.5	top
LP_P	5	1000	-605.5	bottom
LP_M	4	500	-605.5	bottom
VCO_P	3	0	-605.5	bottom
VCO_M	2	-500	-605.5	bottom
VR_VCO	1	-1000	-605.5	bottom

Table 6: ASPICS320.604/5 Pinning



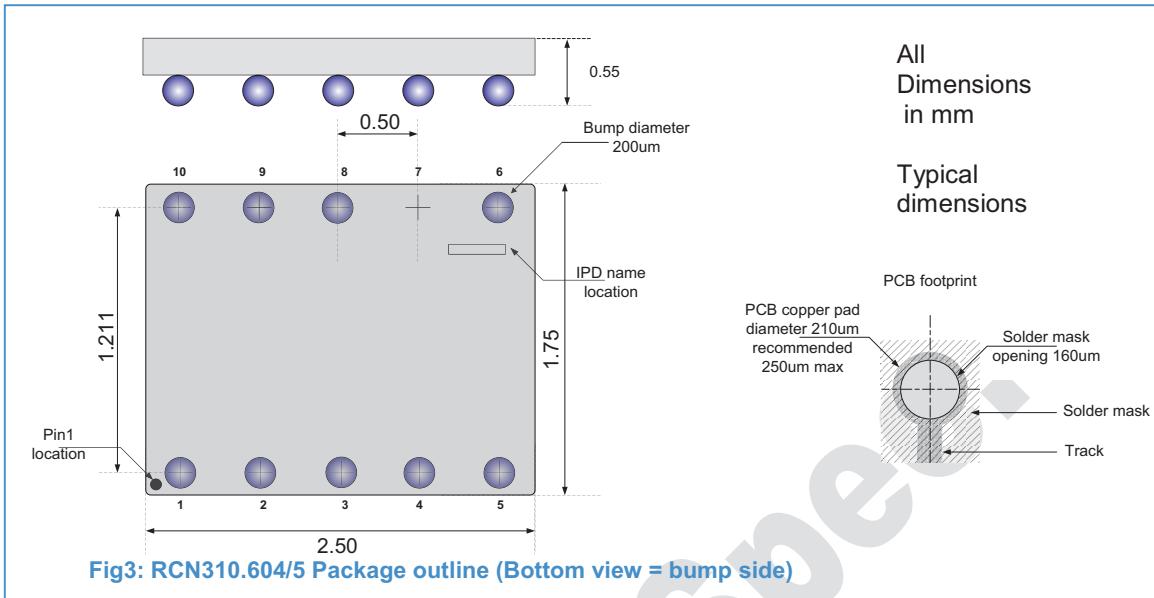
Item	Unit	Size
IPD height	μm	550.0 ± 50
Bump diameter	μm	200.0 ± 20
Minimum bump pitch	μm	500.0 ± 10

Table 7: ASPICS320.604/5 IPD definition

IPD Size	Unit	X	Y
Die size including scribe lane	μm	$2\ 500.0 \pm 50$	1750.0 ± 50

Table 8: ASPICS320.604/5 IPD size

Package outline and PCB footprint recommendation



Termination

Lead-free nickel/solder coating compatible with automatic soldering technologies: reflow and manual

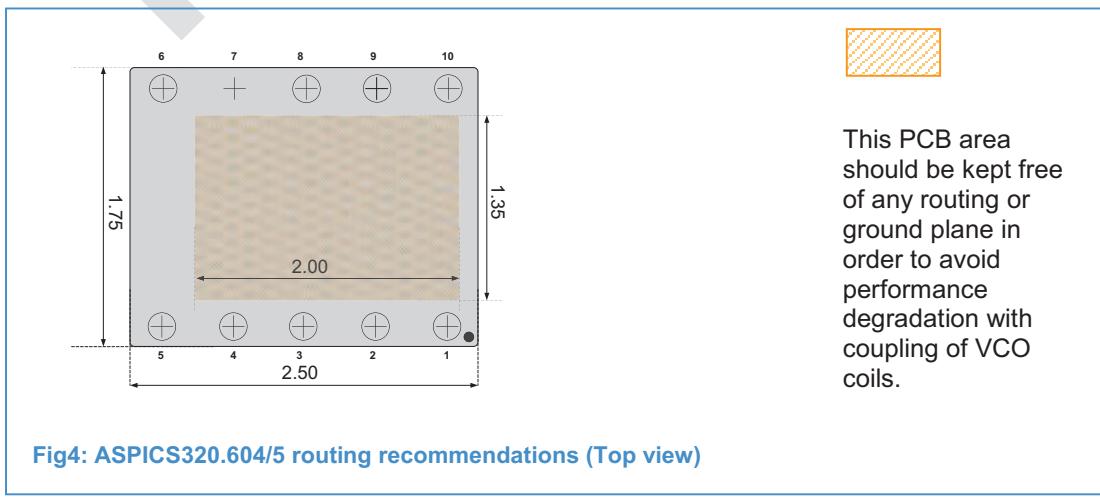
Assembly

Assembly of WL CSP has to be done with standard lead-free profile(for SAC alloys) or according to recommendations of J-STD 020. Regarding the reliability, 550 μm IPD height is preferred. Underfilling is strongly recommended for lower values.

To optimize the natural self-centering effect of WL-CSPs on PCB, PCB pad positioning and size must be properly designed.

Note: Underfilling under IPD and micro via on PCB pad are the customer's responsibility. PCB pad finishing: Cu-Ni (2-6 μm) – Au (0.2 μm max).

Routing recommendations



Platform PCB layout

As illustrated in figures below, the layout has the following characteristics:

- ✓ Small BOM (8 components) → few pick & place
- ✓ Very compact ref design (7.5 x 15.8 mm) → Can be easily inserted even on very small PCBs
- ✓ Standard PCB technology (2 layers, 1.6 mm, standard vias and clearance) → low cost
- ✓ Performance quasi insensitive to dielectric thickness and optimum RF interconnections → quasi zero effort portability to other PCB technologies (thickness, number of layers, etc.)

The layers description is illustrated in figure below:



Fig5: Platform PCM layout with ASPICS320.604/5 & SX1211 (top view)

The layout itself is illustrated in figure below. Please contact contact@ipdia.com for assistance

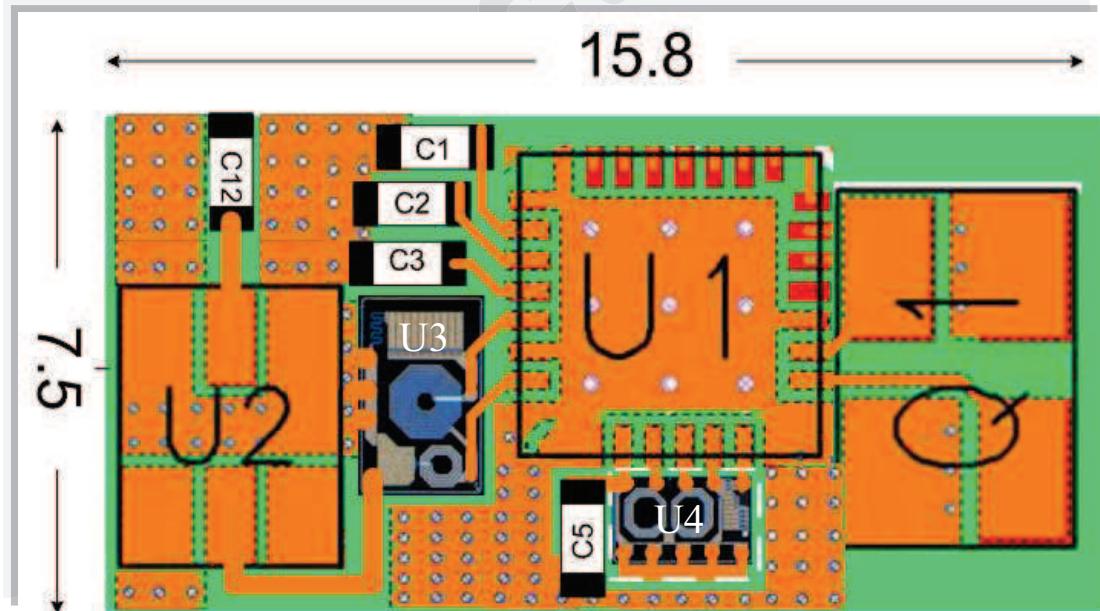


Fig6: Platform PCM layout with ASPICS320.606 & ASPICS320.604/5 & SX1211 (top view)

BOM

Ref	Value	Tol(+/-)	Description	Size / Techno
U1	SX1211	-	Semtech Transceiver IC	TQFN-32
U2	SAW	-	SAW filter	3.8 x 3.8 mm
U3	ASPICS320.606	-	IPDiA IPD RF matching	2.65 x 2.05 mm / PICS
U4	ASPICS320.604/5	-	IPDiA IPD synthesis part	2.5 x 1.75 mm / PICS
Q1	12.8 MHz	15 ppm at 25 °C 20 ppm over -40/+85 °C 2 ppm/year max	Fundamental, Cload=15pF	5.0 x 3.2 mm / AT-cut
C1	1 uF	15%	VDD decoupling	0402 / X5R
C2	1 uF	15%	Top regulator decoupling	0402 / X5R
C3	220 nF	5%	Digital regulator decoupling	0402 / X7R
C5	100 nF	5%	VCO decoupling	0402 / X7R
C12^(*)	47 pF	5%	DC block	0402 / NPO

(*) not part of the ref. design (not required for direct antenna connection)

Table 9: BOM

References

- [1] Semtech SX1211 – Datasheet
- [2] SM1211 RF Module – User’s Guide
- [3] IPDiA_ASPICS_For_SX1211 – Applications Notes
- [4] IPDiA_WLCSP assembly application notes

Definitions

Data sheet status	
Objective specification	This data sheet contains target or goal specifications for product development.
Preliminary specification	This data sheet contains preliminary data; supplementary data may be published later.
Product specification	This data sheet contains final product specifications.
Limiting values	
Limiting values given are in accordance with the Absolute Maximum Rating System (IEC 134). Stress above one or more of the limiting values may cause permanent damage to the device. These are stress ratings only and operation of the device at these or any other conditions above those given in the Characteristics sections of this specification is not implied. Exposure to limiting values for extended periods may affect device reliability.	
Application information	
Where application information is given, it is advisory and does not form part of the specification.	

Revision history

Revision	Date	Description	Author
Release 1.0	August 31, 2011	Creation	OGA
Release 1.1	October 7, 2011	Release	MARCOM

Life Support Applications

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