WLAN3002C

WLAN LNA + switch

Rev. 6 — 19 July 2019 Product data sheet

1 General description

The WLAN3002C is a fully integrated MMIC Low-Noise Amplifier with RX-TX SP2T switch for WLAN applications in the 4.9 GHz to 5.925 GHz ISM band. Manufactured using high performance QUBiC eighth generation SiGe:C technology of NXP.

The WLAN3002C combines best-in-class noise figure, linearity, efficiency, low insertion loss CMOS switches with the process stability and ruggedness that are the hallmarks of SiGe:C technology.

The WLAN3002C has a 1.5 mm x 1.5 mm footprint HX2SON8 package and a thickness of 300 µm.

2 Features and benefits

- Covers full ISM high band 4900 MHz to 5925 MHz
- Noise figure = 2.4 dB
- Gain 13.5 dB
- High input 1 dB compression point $P_{i(1dB)}$ of 0 dBm
- High in band $IP3_i$ of 6 dBm
- Supply voltage 2.7 V to 5.25 V
- Bypass mode current consumption of 3.5 µA
- Optimized performance at low supply current of 10.0 mA
- Integrated concurrent 2.4 GHz notch filter
- 4 modes of operation (high gain receive, bypass receive, transmit, and isolation modes)
- Integrated matching for input and output
- Requires only supply decoupling capacitors
- ESD protection on all pins (HBM > 2 kV)
- Small 8-pin leadless package 1.5 mm x 1.5 mm x 0.30 mm; 0.4 mm pitch

3 Applications

- IEEE 802.11a/n/ac WiFi, WLAN
- Smartphones, tablets, netbooks, and other portable computing devices
- Access points, routers, gateways
- Wireless video
- General-purpose ISM applications

4 Quick reference data

Table 1. Quick reference data

f = 5400 MHz; V_{CC} = 3.6 V; T_{amb} = 25 °C; V_{IH} = 3.3 V; V_{IL} = 0 V; Z_S = Z_L = 50 Ω; P_i = -30 dBm unless otherwise specified. All measurements done on application board, see Figure 3 with tracks and SMA connectors de-embedded.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
RF performances at ANT-RX path in high gain receive mode.[1]						
I_{CC}	supply current	high-gain receive mode [1]	-	10.0	13.0	mA
G_{tr}	transducer power gain		11.5	13.5	16	dB
NF	noise figure		-	2.4	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	in-band	-	0	-	dBm
RL_{in}	input return loss		-	11	-	dB
RL_{out}	output return loss		-	15	-	dB
RF performance at ANT-RX path in bypass receive-mode [1]						
I_{CC}	supply current	bypass receive mode [1]	-	3.5	12	µA
G_{tr}	transducer power gain		-9	-7	-5	dB
RF performance at ANT-TX path in transmit mode [1]						
α_{ins}	insertion loss		-	0.7	-	dB
RF performance at TX-ANT path in isolation mode [1]						
ISL	isolation	4.8 GHz to 5.0 GHz	-	11	-	dB

[1] See Table 5

5 Ordering information

Table 2. Ordering information

Type number	Orderable part number	Package		
		Name	Description	Version
WLAN3002C	WLAN3002CZ	HX2SON8	plastic, thermal enhanced super thin small outline package; no leads; 8 terminals; body 1.5 x 1.5 x 0.30 mm	SOT1260-1

6 Marking

Table 3. Marking code

Type number	Marking code
WLAN3002C	2C
	YWW: Year & Week code

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7 Functional diagram

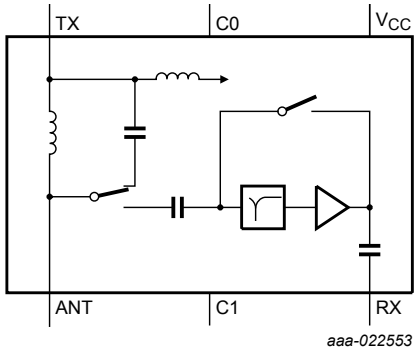

Figure 1. Functional diagram

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8 Pinning information

8.1 Pinning

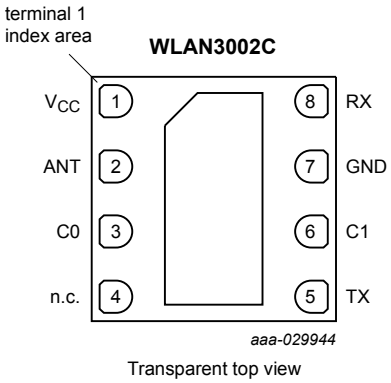

Figure 2. Pin configuration

8.2 Pin description

Table 4. Pin description

Symbol	Pin	Description
V_{CC}	1	supply voltage
ANT	2	antenna input / output
C0	3	C0 control pin, internal pull-down
NC	4	not connected to internal circuit; connect to PCB ground
TX	5	transmit input
C1	6	C1 control pin, internal pull-down
GND	7	ground
RX	8	receive output
GND	exposed die pad	ground

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9 Functional description

Table 5. Control signal truth table

Control signal setting		Mode of operation			Mode name
V_{C0}	V_{C1}	SP2T switch		LNA	
(pin 3)	(pin 6)	ANT-RX	ANT-TX		
HIGH	HIGH	ON	OFF	OFF	bypass receive mode
HIGH	LOW	ON	OFF	ON	high-gain receive mode
LOW	HIGH	OFF	ON	OFF	transmit mode
LOW	LOW	OFF	OFF	OFF	isolation mode

10 Limiting values

Table 6. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). See section18.3 "Disclaimers", paragraph "limiting values".

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.3	6	V
$V_{I(C0)}$	input voltage on pin C0	$V_{i(C0)} < V_{CC} + 0.5$ V	-0.3	4	V
$V_{I(C1)}$	input voltage on pin C1		-0.3	4	V
$V_{i(ANT)}$	input voltage on pin ANT	DC	-0.3	+0.3	V
$V_{i(TX)}$	input voltage on pin TX	DC	-0.2	+0.2	V
$V_{i(RX)}$	input voltage on pin RX	DC; $V_{i(RX)} < V_{CC} + 1.5$ V	-0.3	+3.6	V
$P_{i(ANT)}$	input power-on pin ANT	continuous wave; high-gain receive mode	-	7	dBm
		continuous wave; bypass receive mode	-	19	dBm
		continuous wave; isolation mode	-	19	dBm
$P_{i(TX)}$	input power-on pin TX	continuous wave; transmit mode	-	33	dBm
T_{stg}	storage temperature		-65	+150	°C
V_{ESD}	electrostatic discharge voltage	Human Body Model (HBM) according to ANSI/ESDA/JEDEC standard JS-001	-	±2000	V
		Charged Device Model (CDM) according to ANSI/ESDA/JEDEC standard JS-002	-	±500	V

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11 Recommended operating conditions

Table 7. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
f	frequency		4900	-	5925	MHz
V_{CC}	supply voltage		2.7	3.6	5.25	V
V_{IH}	HIGH-level input voltage	[1]	1.62	-	V_{CC} -0.2 V	V
V_{IL}	LOW-level input voltage		0	-	+0.4	V
T_{amb}	ambient temperature	air temperature	-40	-	+85	°C

[1] Input voltage V_{IH} pins C0, C1. Input voltage must not exceed 3.6 V.

12 Thermal characteristics

Table 8. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
$R_{th(j-a)}$	thermal resistance from junction to ambient		250	K/W

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13 Characteristics

Table 9. DC characteristics

V_{CC} = 3.6 V; T_{amb} = 25 °C; V_{IH} = 3.3 V; V_{IL} = 0 V; Z_S = Z_L = 50 Ω; P_i = -30 dBm unless otherwise specified. All measurements done on application board, see Figure 3 with tracks and SMA connectors de-embedded.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CC}	supply current	high-gain receive mode [1]	-	10.0	13.0	mA
		bypass receive mode [1]	-	3.5	12	µA
		transmit mode [1]	-	150	300	µA
		isolation mode [1]	-	3.5	12	µA
$I_{ctrl(C0)}$	control current on pin C0		-	10	15	µA
$I_{ctrl(C1)}$	control current on pin C1		-	4	10	µA

[1] See Table 5

Table 10. Transient characteristics

V_{CC} = 3.6 V; T_{amb} = 25 °C; V_{IH} = 3.3 V; V_{IL} = 0 V; Z_S = Z_L = 50 Ω; P_i = -30 dBm unless otherwise specified. All measurements done on application board, see Figure 3with tracks and SMA connectors de-embedded.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t_{on}	turn-on time	[1]	-	-	500	ns
t_{off}	turn-off time	[1]	-	-	400	ns

[1] From within 10 % of the initial gain to within 10 % of the final gain.

Table 11. RF characteristics

f = 5400 MHz; V_{CC} = 3.6 V; T_{amb} = 25 °C; V_{IH} = 3.3 V; V_{IL} = 0 V; Z_S = Z_L = 50 Ω; P_i = -30 dBm unless otherwise specified. All measurements done on application board, see Figure 3 with tracks and SMA connectors de-embedded.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
RF performance at ANT-RX path in high-gain receive mode [1]						
G_{tr}	transducer power gain		11.5	13.5	16	dB
$G_{p(flat)}$	power gain flatness	peak-to-peak over any 80 MHz band	-	-	0.5	dB
NF	noise figure		-	2.4	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	in-band	-	0	-	dBm
$IP3_i$	input third-order intercept point	20 MHz tone spacing; P_i = -20 dBm per tone	-	6	-	dBm
RL_{in}	input return loss		-	11	-	dB
RL_{out}	output return loss		-	15	-	dB

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Symbol	Parameter	Conditions	Min	Typ	Max	Unit
RF performance at ANT-RX path in bypass receive-mode.[1]						
G_{tr}	transducer power gain		-9	-7	-5	dB
$G_{p(flat)}$	power gain flatness	peak-to-peak over any 80 MHz band	-	-	0.5	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	in-band	-	17	-	dBm
$IP3_i$	input third-order intercept point	20 MHz tone spacing; P_i = -3 dBm per tone	-	29	-	dBm
RL_{in}	input return loss		-	12	-	dB
RL_{out}	output return loss		-	20	-	dB
RF performance at ANT-TX path in transmit mode.[1]						
α_{ins}	insertion loss		-	0.7	-	dB
$G_{p(flat)}$	power gain flatness	peak-to-peak over any 80 MHz band	-	-	0.2	dB
ISL	isolation	measured between pin RX and pin TX	-	30	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	in-band	-	32	-	dBm
RL_{in}	input return loss		-	17	-	dB
RL_{out}	output return loss		-	17	-	dB
RF performance at TX-ANT path in isolation mode. [1]						
ISL	isolation	4.8 GHz to 5.0 GHz	-	11	-	dB

[1] See Table 5

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14 Application information

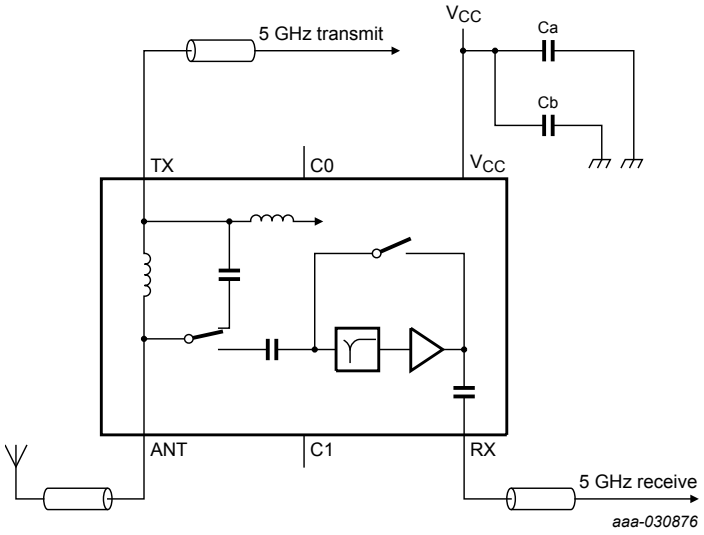

Figure 3. Application information

Table 12. List of components

Component	Name	Value	Quantity
capacitor	Ca	100 nF	1
capacitor	Cb	6.8 pF	1

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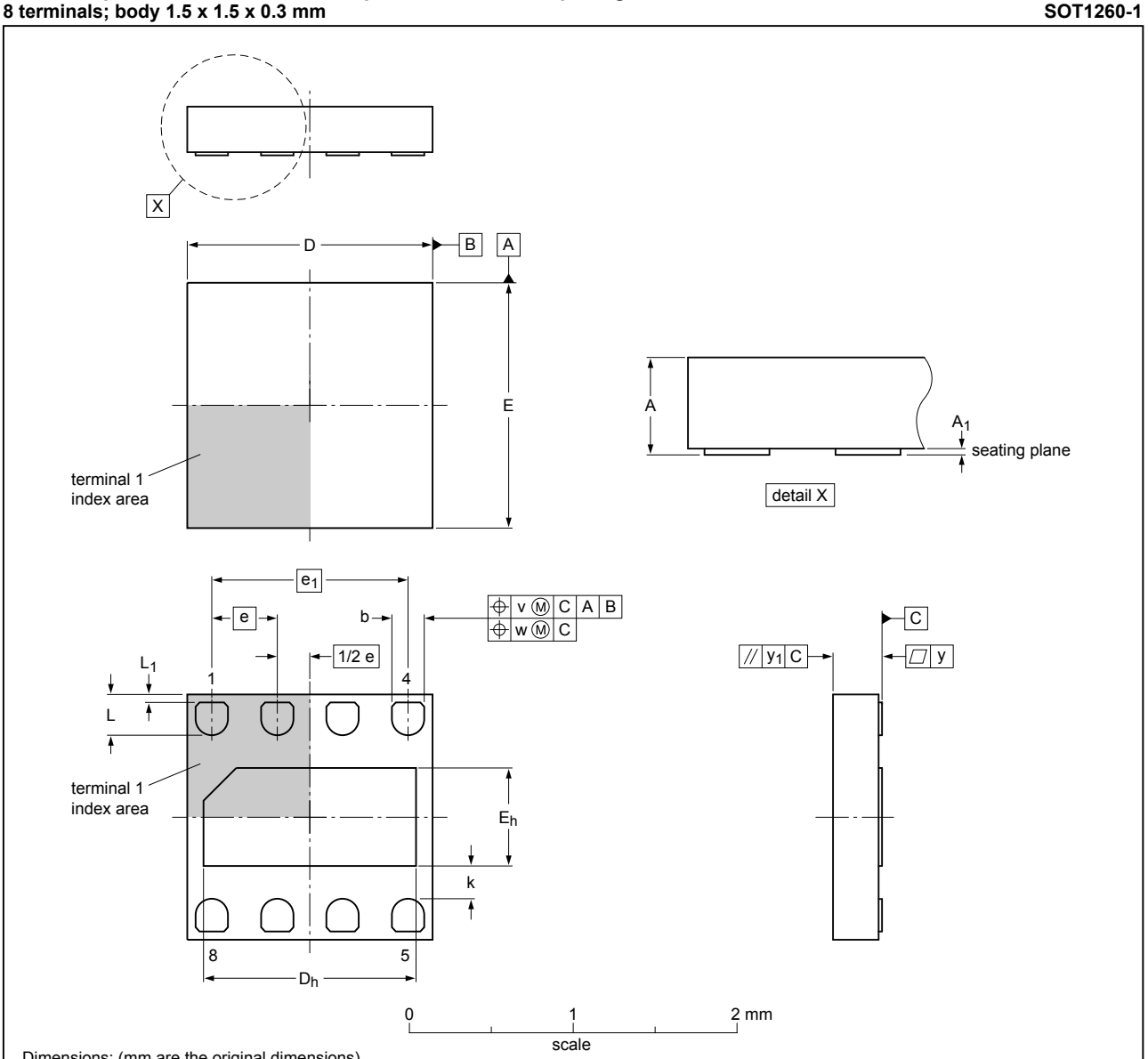
15 Package outline

HX2SON8: plastic, thermal enhanced super thin small outline package; no leads; 8 terminals; body 1.5 x 1.5 x 0.3 mm **SOT1260-1**



Dimensions: (mm are the original dimensions)

Unit		A	A_1	b	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	k	L	L_1	v	w	y	y_1
	max	0.33	0.05	0.25	1.55	1.40	1.55	0.70				0.35	0.10				
mm	nom	0.30	0.02	0.20	1.50	1.30	1.50	0.60	0.4	1.2	0.20	0.25	0.05	0.07	0.05	0.05	0.05
	min	0.28	0.00	0.15	1.45	1.15	1.45	0.45			0.15	0.15	0.00				

Note
1. Plastic or metal protrusions of 0.075 mm maximum per side are not included.

sot1260-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1260-1		MO-255				~~14-06-11~~ 16-01-13

Figure 4. Package outline SOT1260-1(HX2SON8)

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16 Handling information

16.1 Electrostatic discharge (ESD)

CAUTION	
	This device is sensitive to ElectroStatic Discharge (ESD). Observe precautions for handling electrostatic sensitive devices. Such precautions are described in the *ANSI/ESD S20.20, IEC/ST 61340-5, JESD625-A* or equivalent standards.

16.2 Moisture sensitivity

Table 13. Moisture sensitivity level

Test methodology	Class
JESD-22-A113	1

17 Abbreviations

Table 14. Abbreviations

Acronym	Description
CMOS	complementary metal-oxide semiconductor
CW	continuous wave
ESD	electrostatic discharge
HBM	human body model
ISM	industrial, scientific, and medical
LAN	local area network
LNA	low-noise amplifier
MMIC	monolithic microwave-integrated circuit
SiGe:C	silicon germanium carbon
SMA	Sub-Miniature version A
SP2T	single pole 2 throw
WLAN	wireless local area network

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18 Revision history

Table 15. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
WLAN3002C v.6	190719	Product data sheet	-	WLAN3002C v.5
modification	status changed from Company confidential to Public			
WLAN3002C v.5	20190115	Product data sheet	-	WLAN3002C v.4
modification	• Changed data sheet status from Preliminary to Product			
WLAN3002C v.4	20181210	Preliminary data sheet	-	WLAN3002C v.3
modification	• Changed data sheet from Objective to Preliminary • Added Orderable part number to Ordering information			
WLAN3002C v.3	20180725	Objective data sheet	-	WLAN3002C v.2.1
modification	update on I_{CC} RX bypass, and isolation mode			
WLAN3002C v.2.1	20180704	Objective data sheet	-	WLAN3002C v.2
modification	Minor updates			
WLAN3002C v.2	20180626	Objective data sheet	-	WLAN3002C v.1
modification	decoupling capacitor update few parameters updates			
WLAN3002C v.1	03232018	Objective data sheet	-	-

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19 Legal information

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Preliminary [short] data sheet	Qualification	This document contains data from the preliminary specification.
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Contents

1 General description 1
2 Features and benefits 1
3 Applications 1
4 Quick reference data 2
5 Ordering information 2
6 Marking 2
7 Functional diagram 3
8 Pinning information 4
8.1 Pinning 4
8.2 Pin description 4
9 Functional description 5
10 Limiting values 5
11 Recommended operating conditions 6
12 Thermal characteristics 6
13 Characteristics 7
14 Application information 9
15 Package outline 10
16 Handling information 11
16.1 Electrostatic discharge (ESD) 11
16.2 Moisture sensitivity 11
17 Abbreviations 11
18 Revision history 12
19 Legal information 13

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