



# 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  $\mu\text{m}$ .

## 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  $P_{i(1\text{dB})}$  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  $\mu\text{A}$
- 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. <sup>[1]</sup>						
$I_{CC}$	supply current	high-gain receive mode <sup>[1]</sup>	-	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 <sup>[1]</sup>						
$I_{CC}$	supply current	bypass receive mode <sup>[1]</sup>	-	3.5	12	μA
$G_{tr}$	transducer power gain		-9	-7	-5	dB
RF performance at ANT-TX path in transmit mode <sup>[1]</sup>						
$\alpha_{ins}$	insertion loss		-	0.7	-	dB
RF performance at TX-ANT path in isolation mode <sup>[1]</sup>						
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

## 7 Functional diagram

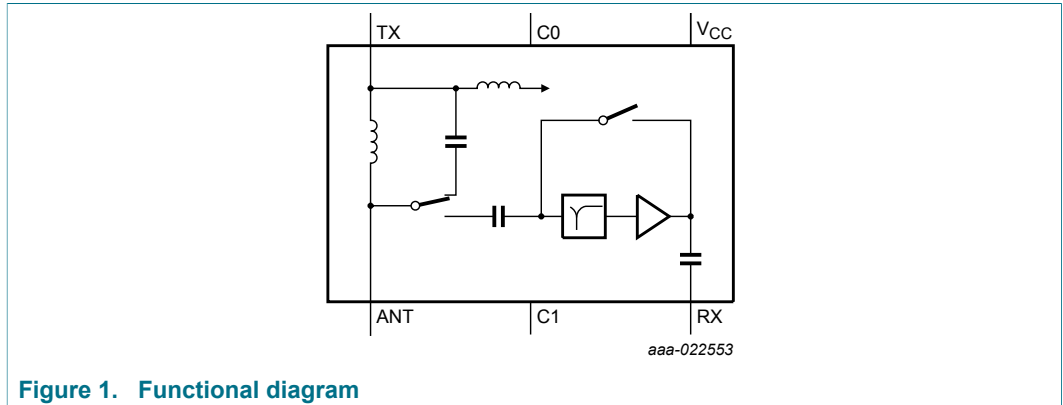


Figure 1. Functional diagram

## 8 Pinning information

### 8.1 Pinning

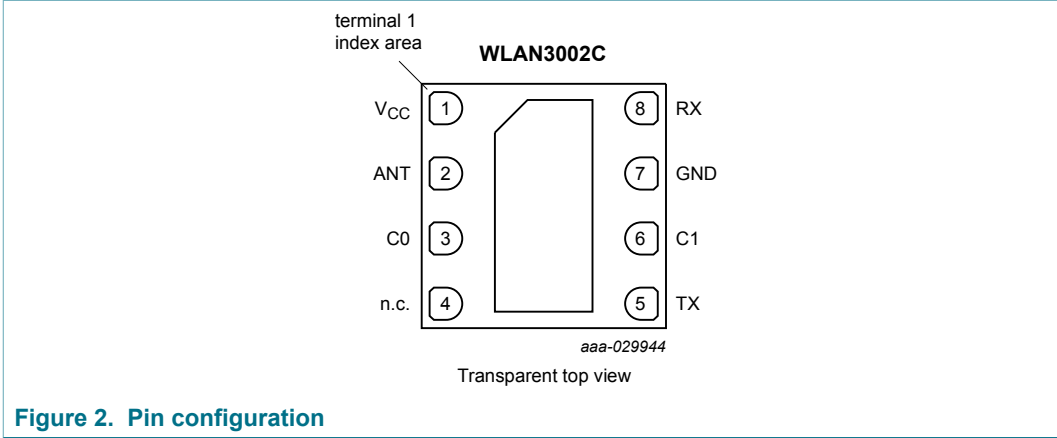


Figure 2. Pin configuration

### 8.2 Pin description

Table 4. Pin description

Symbol	Pin	Description
V <sub>CC</sub>	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

## 9 Functional description

Table 5. Control signal truth table

Control signal setting		Mode of operation			Mode name
V <sub>C0</sub>	V <sub>C1</sub>	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 section 18.3 "Disclaimers", paragraph "limiting values".

Symbol	Parameter	Conditions	Min	Max	Unit
V <sub>CC</sub>	supply voltage		-0.3	6	V
V <sub>I(C0)</sub>	input voltage on pin C0	V <sub>I(C0)</sub> < V <sub>CC</sub> + 0.5 V	-0.3	4	V
V <sub>I(C1)</sub>	input voltage on pin C1		-0.3	4	V
V <sub>I(ANT)</sub>	input voltage on pin ANT	DC	-0.3	+0.3	V
V <sub>I(TX)</sub>	input voltage on pin TX	DC	-0.2	+0.2	V
V <sub>I(RX)</sub>	input voltage on pin RX	DC; V <sub>I(RX)</sub> < V <sub>CC</sub> + 1.5 V	-0.3	+3.6	V
P <sub>I(ANT)</sub>	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 <sub>I(TX)</sub>	input power-on pin TX	continuous wave; transmit mode	-	33	dBm
T <sub>stg</sub>	storage temperature		-65	+150	°C
V <sub>ESD</sub>	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

## 11 Recommended operating conditions

Table 7. Recommended operating conditions

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

[1] Input voltage V<sub>IH</sub> pins C0, C1. Input voltage must not exceed 3.6 V.

## 12 Thermal characteristics

Table 8. Thermal characteristics

Symbol	Parameter	Conditions	Typ	Unit
R <sub>th(j-a)</sub>	thermal resistance from junction to ambient		250	K/W

## 13 Characteristics

**Table 9. DC characteristics**

$V_{CC} = 3.6\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ;  $V_{IH} = 3.3\text{ V}$ ;  $V_{IL} = 0\text{ V}$ ;  $Z_S = Z_L = 50\text{ }\Omega$ ;  $P_i = -30\text{ dBm}$  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 <sup>[1]</sup>	-	10.0	13.0	mA
		bypass receive mode <sup>[1]</sup>	-	3.5	12	$\mu\text{A}$
		transmit mode <sup>[1]</sup>	-	150	300	$\mu\text{A}$
		isolation mode <sup>[1]</sup>	-	3.5	12	$\mu\text{A}$
$I_{ctrl(C0)}$	control current on pin C0		-	10	15	$\mu\text{A}$
$I_{ctrl(C1)}$	control current on pin C1		-	4	10	$\mu\text{A}$

[1] See [Table 5](#)

**Table 10. Transient characteristics**

$V_{CC} = 3.6\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ;  $V_{IH} = 3.3\text{ V}$ ;  $V_{IL} = 0\text{ V}$ ;  $Z_S = Z_L = 50\text{ }\Omega$ ;  $P_i = -30\text{ dBm}$  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
$t_{on}$	turn-on time	<sup>[1]</sup>	-	-	500	ns
$t_{off}$	turn-off time	<sup>[1]</sup>	-	-	400	ns

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

**Table 11. RF characteristics**

$f = 5400\text{ MHz}$ ;  $V_{CC} = 3.6\text{ V}$ ;  $T_{amb} = 25\text{ °C}$ ;  $V_{IH} = 3.3\text{ V}$ ;  $V_{IL} = 0\text{ V}$ ;  $Z_S = Z_L = 50\text{ }\Omega$ ;  $P_i = -30\text{ dBm}$  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 <sup>[1]</sup>						
$G_{tr}$	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 <sub>i</sub>	input third-order intercept point	20 MHz tone spacing; $P_i = -20\text{ dBm}$ per tone	-	6	-	dBm
RL <sub>in</sub>	input return loss		-	11	-	dB
RL <sub>out</sub>	output return loss		-	15	-	dB

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
RF performance at ANT-RX path in bypass receive-mode. <sup>[1]</sup>						
$G_{tr}$	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. <sup>[1]</sup>						
$\alpha_{ins}$	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. <sup>[1]</sup>						
ISL	isolation	4.8 GHz to 5.0 GHz	-	11	-	dB

[1] See [Table 5](#)



### 14 Application information

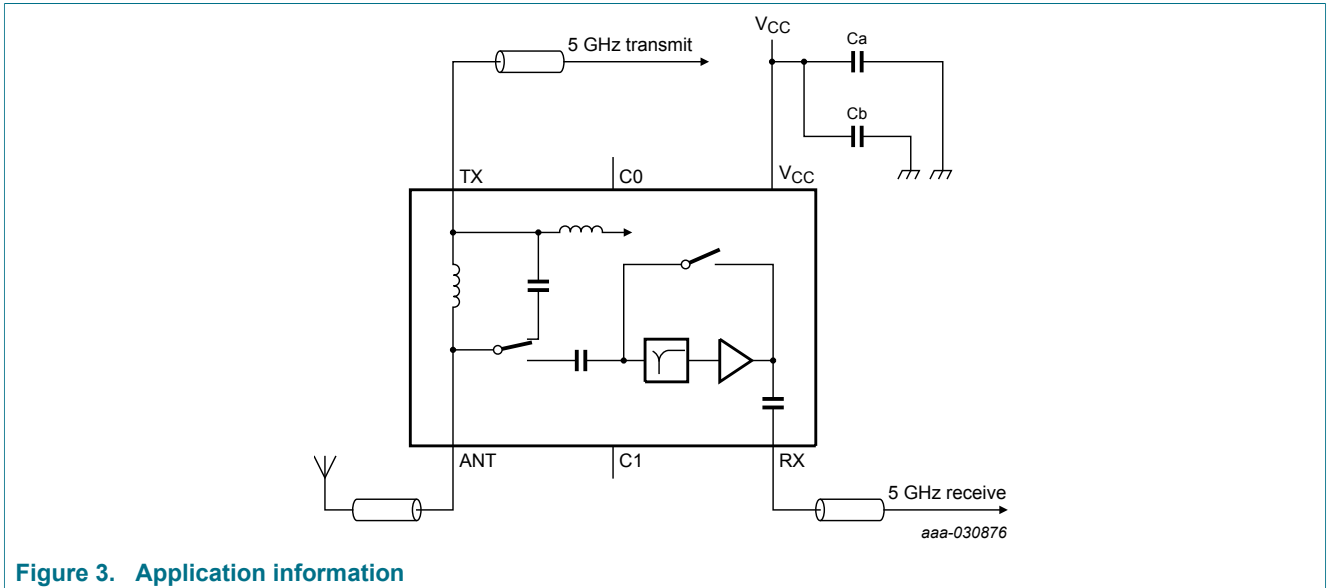


Figure 3. Application information

Table 12. List of components

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

15 Package outline

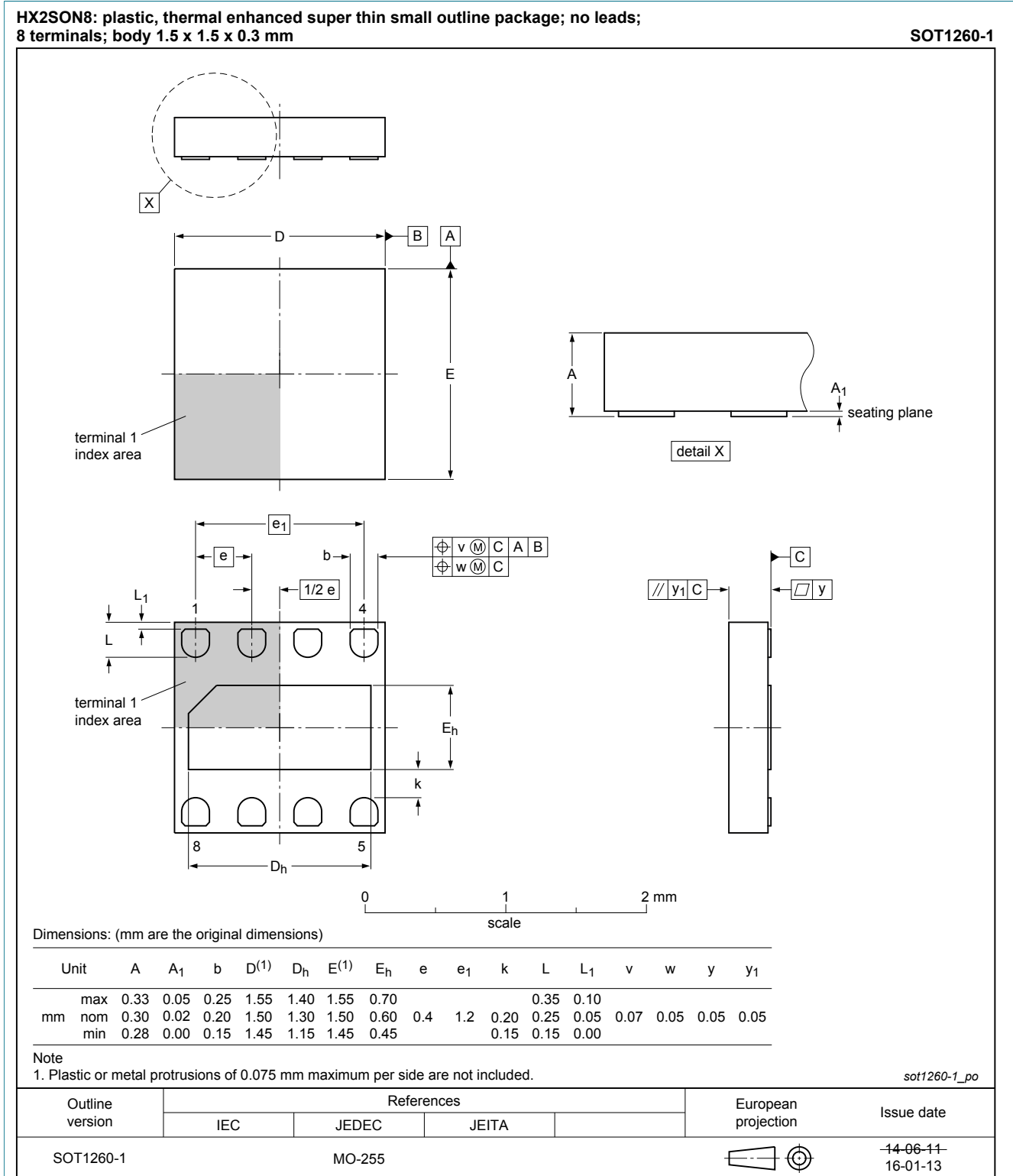


Figure 4. Package outline SOT1260-1(HX2SON8)

## 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

## 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 <sub>CC</sub> 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	-	-

## 19 Legal information

### 19.1 Data sheet status

Document status <sup>[1][2]</sup>	Product status <sup>[3]</sup>	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.
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[2] The term 'short data sheet' is explained in section "Definitions".

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