BGS8324

WLAN LNA + Switch

Rev. 5 — 11 May 2020 Product data sheet

1 General description

The BGS8324 is, also known as the WLAN3001H, a fully integrated Low-Noise Amplifier (LNA), and SP3T switch for Bluetooth path and transmit path. For WLAN applications in the 2.4 GHz to 2.5 GHz ISM band. The BGS8324 is manufactured using NXPs high performance QUBiC eighth generation SiGe:C technology. The BGS8324 couples best-in-class noise figure, linearity, and low insertion loss CMOS switches with the process stability and ruggedness that are the hallmarks of SiGe technology. The BGS8324 has a 2.0 mm × 2.0 mm footprint HX2QFN12 package and a thickness of 300 µm.

2 Features and benefits

- Intended for IEEE 802.11b/g/n WLAN application
- Covers full ISM low band 2400 MHz to 2500 MHz
- Noise figure = 2 dB
- Gain 16 dB
- High input 1 dB compression point $P_{i(1dB)}$ of -6 dBm
- High in band $IP3_i$ of 7 dBm
- Supply voltage 2.7 V to 5.25 V
- Stand-by mode current consumption at 8 µA for 3.3 V supply voltage
- Optimized performance at a low supply current of 8.3 mA
- Integrated concurrent 5 GHz notch filter
- 5 modes of operation (standby, high gain receive, bypass receive, transmit, and Bluetooth modes)
- Integrated matching for input and output
- Requires only one supply decoupling capacitor
- ElectroStatic Discharge (ESD) protection on all pins (HBM > 2 kV)
- Small 12-pin leadless package 2 mm × 2 mm × 0.3 mm; 0.5 mm pitch

3 Applications

- IEEE 802.11b/g/n WiFi, WLAN
- Smartphones, tablets, netbooks, and other portable computing devices
- Access points, routers, gateways
- Wireless video
- General-purpose Industrial, Scientific, and Medical (ISM) applications

4 Quick reference data

Table 1. Quick reference data

V_{CC} = 3.3 V; T_{amb} = 25 °C; 50 Ω load, unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
RF performance at ANT-RX path in high-gain receive mode [1]							
I_{CC}	supply current	high-gain receive mode	[1]	-	8.3	12.0	mA
G_{tr}	transducer power gain			13.7	16	18	dB
NF	noise figure			-	2	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	in-band		-	-6	-	dBm
RL_{in}	input return loss			-	12	-	dB
RL_{out}	output return loss			-	12	-	dB
RF performance at ANT-RX path in bypass receive-mode [1]							
I_{CC}	supply current	bypass receive mode	[1]	-	8	15	µA
G_{tr}	transducer power gain			-9	-6	-4	dB
RF performance at ANT-TX path in transmit mode [1]							
α_{ins}	insertion loss			-	0.8	-	dB
RF performance at ANT-BT path in Bluetooth mode [1]							
α_{ins}	insertion loss			-	0.95	-	dB

[1] See Table 9 for the appropriate control signal settings.

5 Ordering information

Table 2. Ordering information

Type number	Orederable part number	Package		
		Name	Description	Version
BGS8324	BGS8324Z	HX2QFN12	plastic, thermal enhanced super thin quad flat package; no leads; 12 terminals; body 2.0 mm x 2.0 mm x 0.3 mm	SOT1261-1

6 Marking

Type number	Marking code
BGS8324	24
	YWW: Year & Week code

7 Functional diagram

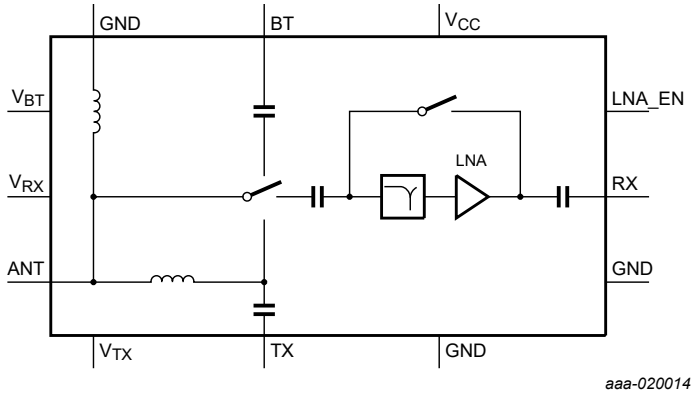


Figure 1. Functional diagram

8 Pinning information

8.1 Pinning

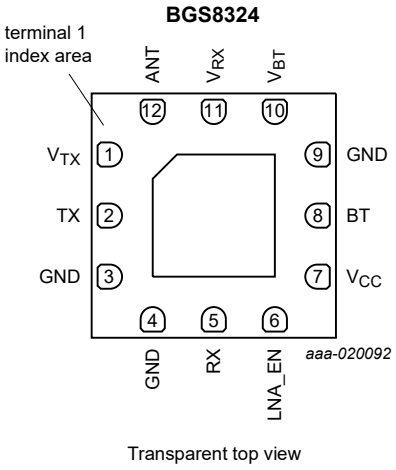


Figure 2. Pin configuration

8.2 Pin description

Table 3. Pin description

Symbol	Pin	Description
V_{TX}	1	transmit mode control
TX	2	transmit input
GND	3, 4, 9, exposed die pad	ground
RX	5	receive output
LNA_EN	6	LNA enable
V_{CC}	7	supply voltage

Symbol	Pin	Description
BT	8	Bluetooth input / output
V_{BT}	10	Bluetooth mode control
V_{RX}	11	receive mode control
ANT	12	antenna input / output

9 Limiting values

Table 4. Limiting values

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

Symbol	Parameter	Conditions		Min	Max	Unit
V_{CC}	supply voltage			-0.3	6	V
I_{CC}	supply current	worst case up to P1dB		-	16	mA
$V_{I(VBT)}$	input voltage on pin VBT	see Figure 1		-0.3	+4	V
$V_{I(VRX)}$	input voltage on pin VRX	see Figure 1		-0.3	+4	V
$V_{I(VTX)}$	input voltage on pin VTX	see Figure 1		-0.3	+4	V
$V_{I(LNA\_EN)}$	input voltage on pin LNA_EN			-0.3	+4	V
$P_{i(ANT)}$	input power-on pin ANT	high-gain receive mode		-	7	dBm
		bypass receive mode		-	19	dBm
$P_{i(TX)}$	input power-on pin TX	CW; transmit mode		-	33	dBm
$P_{i(BT)}$	input power-on pin BT	CW; Bluetooth mode		-	22	dBm
T_{amb}	ambient temperature			-40	+85	°C
T_j	junction temperature			-40	+150	°C
T_{stg}	storage temperature			-40	+140	°C
V_{ESD}	electrostatic discharge voltage	human body model	[1]	-	±2000	V
		charged device model	[2]	-	±500	V

[1] According to ANSI/ESDA/JEDEC standard JS-001.
[2] According to JEDEC standard JESD22-C101.

10 Recommended operating conditions

Table 5. Recommended operating conditions

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
f	frequency			2400	-	2500	MHz
V_{CC}	supply voltage			2.7	3.3	5.25	V
V_{IH}	HIGH-level input voltage		[1]	1.8	-	3.6	V
V_{IL}	LOW-level input voltage			0	-	+0.4	V

[1] V_{IH} is the result of an input voltage on that specific pin between 1.8 V and V_{CC} - 0.2 V and 3.6 V maximum.

11 Thermal characteristics

Table 6. Thermal characteristics

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

12 Characteristics

Table 7. DC Characteristics

V_{CC} = 3.3 V; T_{amb} = 25 °C; 50 Ω load, unless otherwise specified.

Symbol	Parameter	Conditions		Min	Typ	Max	Unit
I_{CC}	supply current	high-gain receive mode	[1]	-	8.3	12	mA
		bypass receive mode	[1]	-	8	15	µA
		transmit mode	[1]	-	200	300	µA
		Bluetooth mode	[1]	-	8	15	µA
		standby mode	[1]	-	8	15	µA
$I_{ctrl(LNA\_EN)}$	control current on pin LNA_EN			-	20	30	µA
t_{on}	turn-on time		[2]	-	-	500	ns
t_{off}	turn-off time		[2]	-	-	500	ns

[1] See Table 9 for the appropriate control signal settings.
[2] From any of three operating modes to another and from 10 % or 90 % of control signal edge to 90 % output level.

1. See Table 9 for the appropriate control signal settings.

Table 8. RF Characteristics

V_{CC} = 3.3 V; T_{amb} = 25 °C; 50 Ω load, unless otherwise specified. All measurements done on application board (decoupling capacitor 100 nF placed near to V_{CC} pin 7) with SMA connectors as reference plane.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
RF performance at ANT-RX path in high-gain receive mode [1]						
G_{tr}	transducer power gain		13.7	16	18	dB
$G_{p(flat)}$	power gain flatness	peak-to-peak over any 40 MHz band	-	-	0.5	dB
NF	noise figure		-	2.0	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	in-band	-	-6	-	dBm
$IP3_i$	input third-order intercept point	20 MHz tone spacing; P_i = -20 dBm	-	7	-	dBm
RL_{in}	input return loss		-	12	-	dB
RL_{out}	output return loss		-	12	-	dB
RF performance at ANT-RX path in bypass receive-mode [1]						
G_{tr}	transducer power gain		-9	-6	-4	dB
$G_{p(flat)}$	power gain flatness	peak-to-peak over any 40 MHz band	-	-	0.5	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	in-band	-	11.5	-	dBm
$IP3_i$	input third-order intercept point	20 MHz tone spacing; P_i = -3 dBm	-	22.5	-	dBm
RL_{in}	input return loss			9		dB

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
RL_{out}	output return loss			14		dB
RF performance at ANT-TX path in transmit mode [1]						
α_{ins}	insertion loss		-	0.8	-	dB
$G_{p(flat)}$	power gain flatness	peak-to-peak over any 40 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			15		dB
RL_{out}	output return loss			15		dB
RF performance at ANT-BT path in Bluetooth mode [1]						
α_{ins}	insertion loss		-	0.95	-	dB
$G_{p(flat)}$	power gain flatness	peak-to-peak over any 40 MHz band	-	-	0.2	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	in-band	-	20	-	dBm
RL_{in}	input return loss			16		dB
RL_{out}	output return loss			15		dB
RF performance at ANT-BT path + ANT-RX path in concurrent mode [1]						
α_{ins}	insertion loss	ANT-BT path	-	5	-	dB
G_{tr}	transducer power gain	ANT-RX path	-	12.5	-	dB

[1] See Table 9 for the appropriate control signal settings.

12.1 Control signal thruth table

Table 9. Control signal truth table

Other modes than the ones given in this table are not allowed.

Control signal setting				Mode of operation				Mode name
V_{BT}	V_{RX}	V_{TX}	LNA_EN	SP3T switch			LNA	
pin 10	pin 11	pin 1	pin 6	ANT-RX	ANT-TX	ANT-BT		
HIGH	HIGH	LOW	HIGH	ON	OFF	ON	ON	concurrent mode
LOW	HIGH	LOW	HIGH	ON	OFF	OFF	ON	high-gain receive mode
LOW	HIGH	LOW	LOW	ON	OFF	OFF	OFF	bypass receive mode
LOW	LOW	HIGH	LOW	OFF	ON	OFF	OFF	transmit mode
HIGH	LOW	LOW	LOW	OFF	OFF	ON	OFF	Bluetooth mode
LOW	LOW	LOW	LOW	OFF	OFF	OFF	OFF	Standby mode

13 Application information

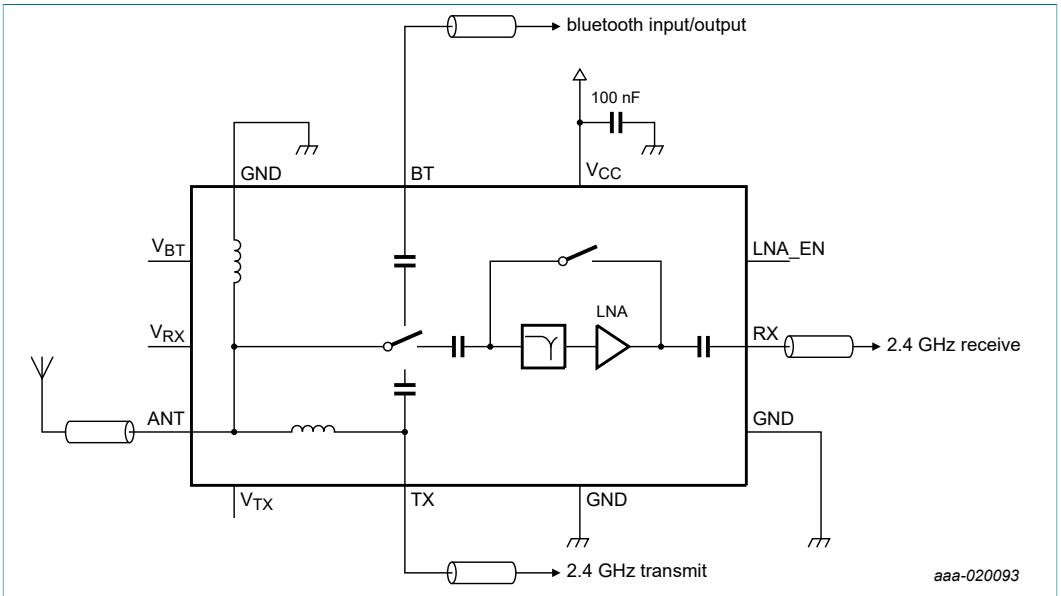
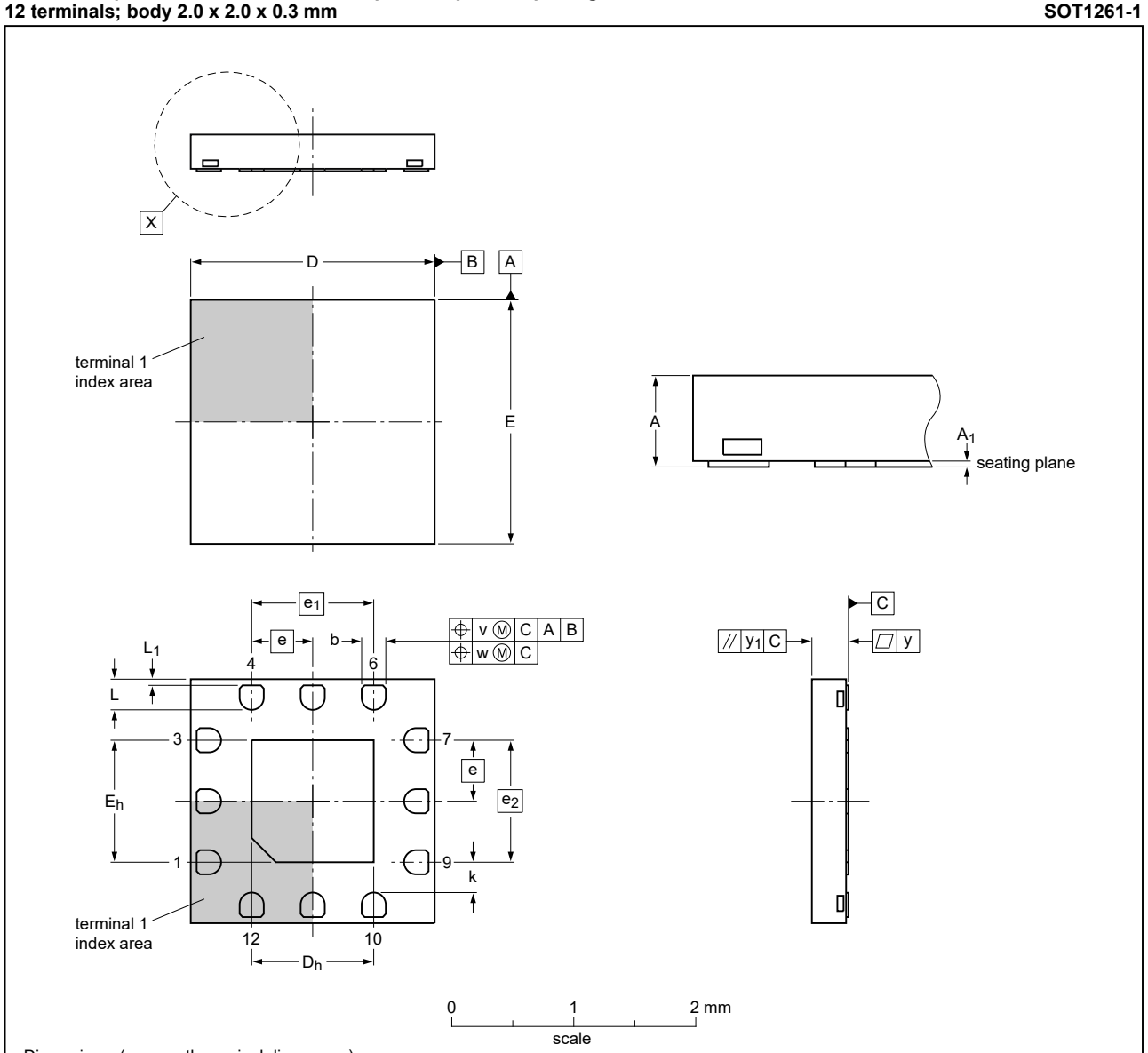


Figure 3. Application diagram

14 Package outline

HX2QFN12: plastic, thermal enhanced super thin quad flat package; no leads; 12 terminals; body 2.0 x 2.0 x 0.3 mm **SOT1261-1**



Dimensions: (mm are the orginal dimensons)

Unit		A	A_1	b	$D^{(1)}$	D_h	$E^{(1)}$	E_h	e	e_1	e_2	k	L	L_1	v	w	y	y_1
	max	0.33	0.05	0.25	2.05	1.10	2.05	1.10					0.35	0.10				
mm	nom	0.30	0.02	0.20	2.00	1.00	2.00	1.00	0.5	1.0	1.0	0.25	0.25	0.05	0.07	0.05	0.05	0.05
	min	0.28	0.00	0.15	1.95	0.85	1.95	0.85				0.20	0.15	0.00				

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

sot1261-1_po

Outline version	References				European projection	Issue date
	IEC	JEDEC	JEITA			
SOT1261-1		MO-255				~~16-01-14~~ 16-01-15

Figure 4. Package outline SOT1261-1 (HX2QFN12)

14.1 Footprint and solder information

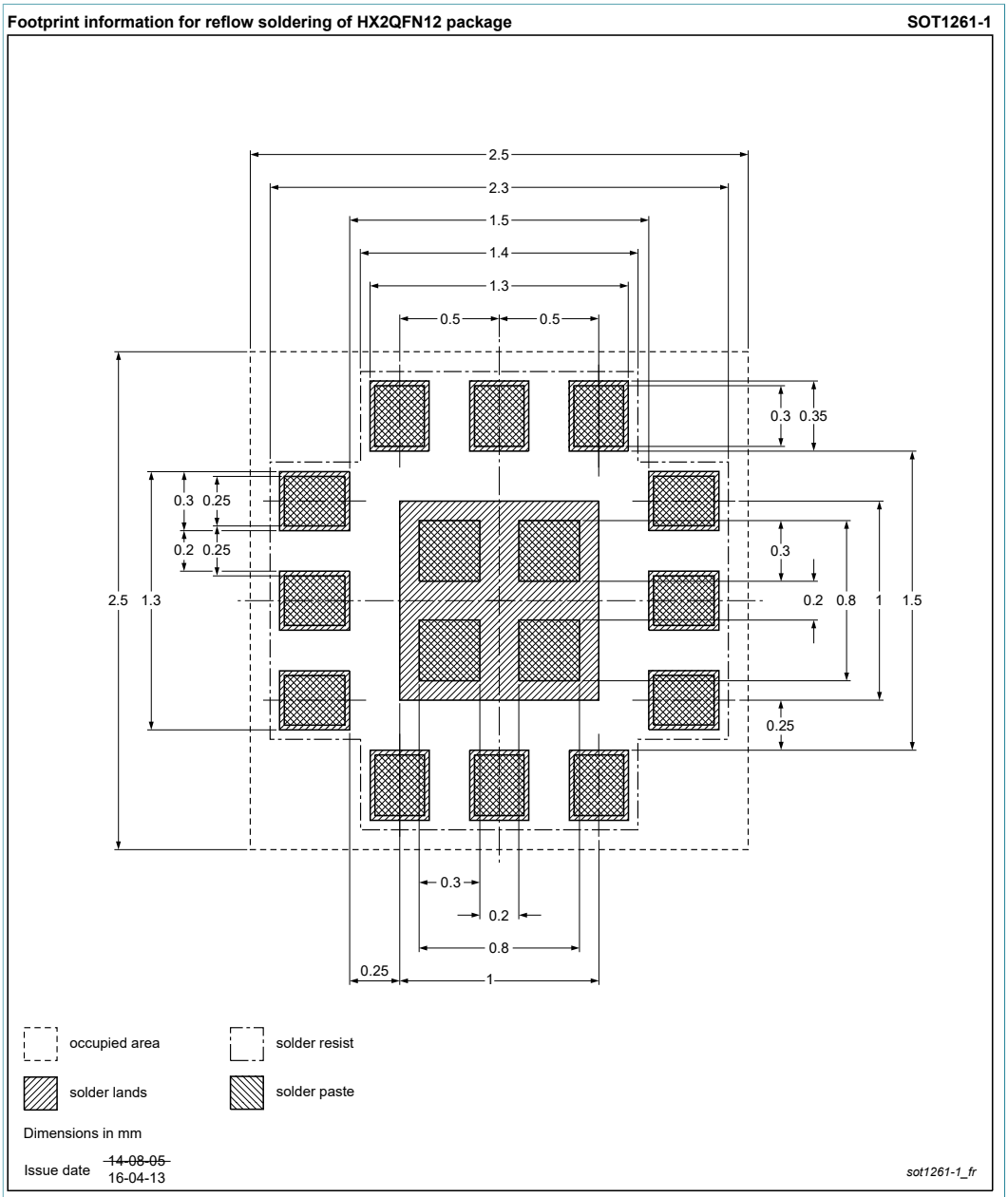


Figure 5. Footprint and solder information

15 Handling information

15.1 Moisture sensitivity

Table 10. Moisture sensitivity level

Test methodology	Class
JESD-22-A113	1

15.2 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 Abbreviations

Table 11. 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	SubMiniature version A
SP3T	Single Pole 3 Throw
WLAN	Wireless Local Area Network

17 Revision history

Table 12. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGS8324 v.5	20200511	Product data sheet	CIN	BGS8324 v.4
Modifications:	• added footprint and solder information • added Orderable part number to the Ordering information table			
BGS8324 v.4	20170118	Product data sheet	-	BGS8324 v.3
Modifications:	• Section 1: added WLAN3001H according to our new naming convention			
BGS8324 v.3	20161215	Product data sheet	-	BGS8324 v.2
Modifications:	• Section 6: extended table information			
BGS8324 v.2	20160621	Product data sheet		BGS8324 v.1
Modifications:	• Data sheet status changed from Preliminary data sheet to Product data sheet			
BGS8324 v.1	20151221	Preliminary data sheet	-	-

18 Legal information

18.1 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.

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