BGS8424

WLAN LNA + Switch

Rev. 1.3 — 6 May 2019 Product data sheet

1 General description

The BGS8424 is, also known as the WLAN3101H, a fully integrated MMIC low-noise amplifier, and SP3T switch for Bluetooth path and transmit path. For WLAN applications in the 2.4 GHz to 2.5 GHz ISM band. Manufactured using the high performance QUBiC eighth generation SiGe:C technology of NXP.

The BGS8424 couples best-in-class noise figure, linearity, efficiency, low insertion loss. Also the CMOS switches with the process stability and ruggedness are the hallmarks of the SiGe:C technology.

The BGS8424 has a 1.5 mm × 1.5 mm footprint HX2SON8 package and a maximum thickness of 330 µm.

2 Features and benefits

- Covers full ISM low band 2400 MHz to 2500 MHz
- Noise figure = 2 dB
- Gain 15.7 dB
- High input 1 dB compression point $P_{i(1dB)}$ of -4.5 dBm
- High in of band $IP3_i$ of 6 dBm
- Supply voltage 2.7 V to 5.25 V
- Bypass mode current consumption of 4 µA at a supply voltage of 3.6 V
- Optimized performance at low supply current of 8.4 mA
- Integrated concurrent 5 GHz notch filter
- 4 modes of operation (high gain receive, bypass receive, transmit, and Bluetooth modes)
- Integrated matching for input and output
- Requires only one supply decoupling capacitor
- ESD protection on all pins (HBM > 2 kV)
- Small 8-pin leadless package 1.5 mm × 1.5 mm × 0.32 mm; 0.4 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 ISM applications

4 Quick reference data

Table 1. Quick reference data

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 dB; unless otherwise specified. All measurements done on application board (DC-decoupling capacitor 100 pF placed nearby the V_{CC} pin 5) with SMA connectors as reference plane.

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]	-	8.4	11.5	mA
G_{tr}	transducer power gain		14	15.7	18	dB
NF	noise figure		-	2	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	in-band	-	-4.5	-	dBm
RL_{in}	input return loss		-	14	-	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]	-	4	8	µA
G_{tr}	transducer power gain		-8	-6.5	-4	dB
RF performance at ANT-TX path in, transmit mode [1]						
α_{ins}	insertion loss		-	0.7	-	dB
RF performance at ANT-BT path in, Bluetooth mode [1]						
α_{ins}	insertion loss		-	0.95	-	dB

[1] See Table 11 for the appropriate control signal settings.

5 Ordering information

Table 2. Ordering information

Type number	Orderable part number	Package		
		Name	Description	Version
BGS8424	BGS8424Z	HX2SON8	plastic, thermal enhanced super thin small outline package; no leads; 8 terminals; body 1.5 × 1.5 × 0.32 mm	SOT1260C

6 Marking

Table 3. Marking code

Type number	Marking code
BGS8424	24
	YWW: Year & Week code

7 Functional diagram

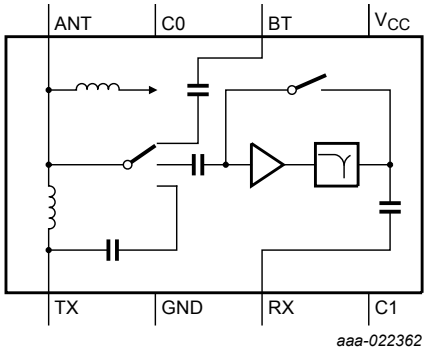


Figure 1. Functional diagram

8 Pinning information

8.1 Pinning

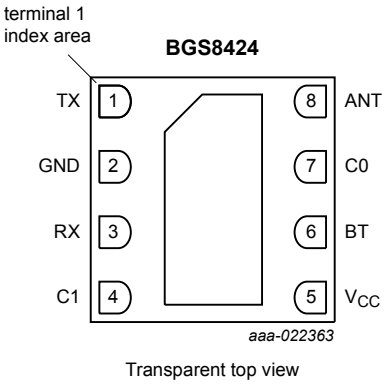


Figure 2. Pin configuration

8.2 Pin description

Table 4. Pin description

Symbol	Pin	Description
TX	1	transmit input
GND	2	ground
RX	3	receive output
C1	4	C1 control pin
V_{CC}	5	supply voltage
BT	6	Bluetooth input / output
C0	7	C0 control pin
ANT	8	antenna input / output
GND	exposed die pad	ground

9 Limiting values

Table 5. Limiting values

In accordance with the Absolute Maximum Rating System (IEC 60134). Do not combine following conditions.

Symbol	Parameter	Conditions	Min	Max	Unit
V_{CC}	supply voltage		-0.3	6	V
I_{CC}	supply current	worst case up to P_{1dB}	-	15	mA
$V_{I(C0)}$	input voltage pin C0		-0.3	4	V
$V_{I(C1)}$	input voltage pin C1		-0.3	4	V
$P_{i(ANT)}$	input power pin ANT	high-gain receive mode	-	7	dBm
		bypass receive mode	-	19	dBm
$P_{i(TX)}$	input power pin TX	CW; transmit mode ZL = 50 Ω	-	32	dBm
$P_{i(BT)}$	input power pin BT	CW; Bluetooth mode ZL = 50 Ω	-	22	dBm
T_{amb}	ambient temperature	air temperature	-40	+85	°C
T_j	junction temperature		-40	+150	°C
T_{stg}	storage temperature		-40	+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 JEDEC standard JESD22-C101	-	±500	V

10 Recommended operating conditions

Table 6. Recommended operating conditions

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
f	frequency		2400	-	2500	MHz
V_{CC}	supply voltage		2.7	3.6	5.25	V
V_{IH}	HIGH-level input voltage	[1]	1.62	-	3.6	V
V_{IL}	LOW-level input voltage		0	-	+0.4	V

[1] Input voltage V_{IH} on that specific pin between 1.62 V and V_{CC1} -0.2 V and 3.6 V maximum.

11 Thermal characteristics

Table 7. Thermal characteristics

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

12 Characteristics

Table 8. 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 (DC-decoupling capacitor 100 pF placed nearby the V_{CC} pin 5) with SMA connectors as reference plane.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
I_{CC}	supply current	high-gain receive mode [1]	-	8.4	11.5	mA
		bypass receive mode [1]	-	4	8	µA
		transmit mode [1]	-	150	300	µA
		Bluetooth mode [1]	-	4	8	µA
$I_{ctrl(C0)}$	control current on pin C0		-	10	15	µA
$I_{ctrl(C1)}$	control current on pin C1		-	3	10	µA

[1] See Table 11 for the appropriate control signal settings.

Table 9. 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 (DC-decoupling capacitor 100 pF placed nearby the V_{CC} pin 5) with SMA connectors as reference plane.

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
t_{on}	turn-on time	From 90 % of control signal to 90 % LNA output level [1]	-	-	500	ns
t_{off}	turn-off time	From 10 % of control signal to 90 % Bypass output level [1]	-	-	500	ns
t_d	delay time	LNA to Bypass mode	-	110	-	ns

[1] From any of four operating modes (except LNA to bypass mode, see t_d) to another and from within 10 % of the initial gain to within 10 % of the final gain.

Table 10. RF 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 (DC-decoupling capacitor 100 pF placed nearby the V_{CC} pin 5) 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		14	15.7	18	dB
$G_{p(flat)}$	power gain flatness	peak-to-peak over any 40 MHz band	-	-	0.5	dB
NF	noise figure		-	2	-	dB
$P_{i(1dB)}$	input power at 1 dB gain compression	in-band	-	-4.5	-	dBm
$IP3_i$	input third-order intercept point	20 MHz tone spacing; P_i = -20 dBm per tone	-	6	-	dBm

Symbol	Parameter	Conditions	Min	Typ	Max	Unit
RL_{in}	input return loss		-	14	-	dB
RL_{out}	output return loss		-	12	-	dB
RF performance at ANT-RX path in, bypass receive mode [1]						
G_{tr}	transducer power gain		-8	-6.5	-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 per tone	-	30	-	dBm
RL_{in}	input return loss		-	9	-	dB
RL_{out}	output return loss		-	13	-	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 40 MHz band	-	-	0.2	dB
ISL	isolation	measured between pin RX and pin TX	35	-	-	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 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
RL_{in}	input return loss		-	16	-	dB
RL_{out}	output return loss		-	16	-	dB

[1] See Table 11 for the appropriate control signal settings.

Table 11. Control signal truth table

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

Control signal setting [1]		Mode of operation				
V_{C0}	V_{C1}	SP2T switch				
(pin 7)	(pin 4)	ANT-RX	ANT-TX	ANT-BT	LNA	Mode name
HIGH	HIGH	ON	OFF	OFF	ON	high-gain receive mode
HIGH	LOW	ON	OFF	OFF	OFF	bypass receive mode
LOW	HIGH	OFF	ON	OFF	OFF	transmit mode
LOW	LOW	OFF	OFF	ON	OFF	Bluetooth mode

[1] A logic LOW is the result of an input voltage on that specific pin between 0 V and 0.4 V.
A logic HIGH is the result of an input voltage on that specific pin between 1.62 V and 3.6 V.

13 Application information

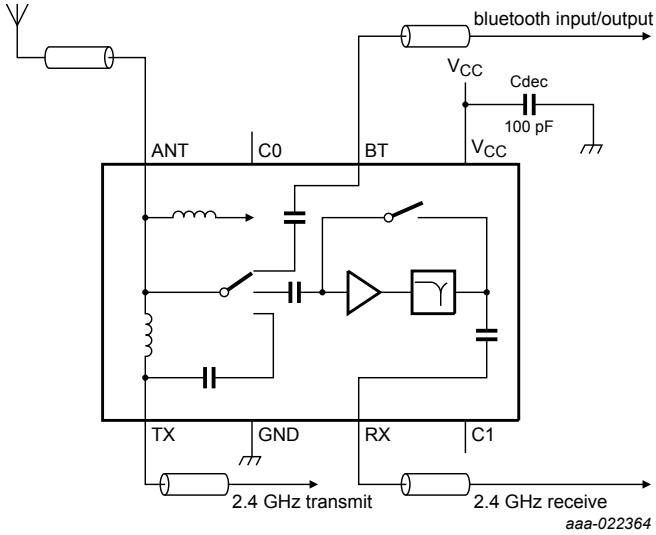
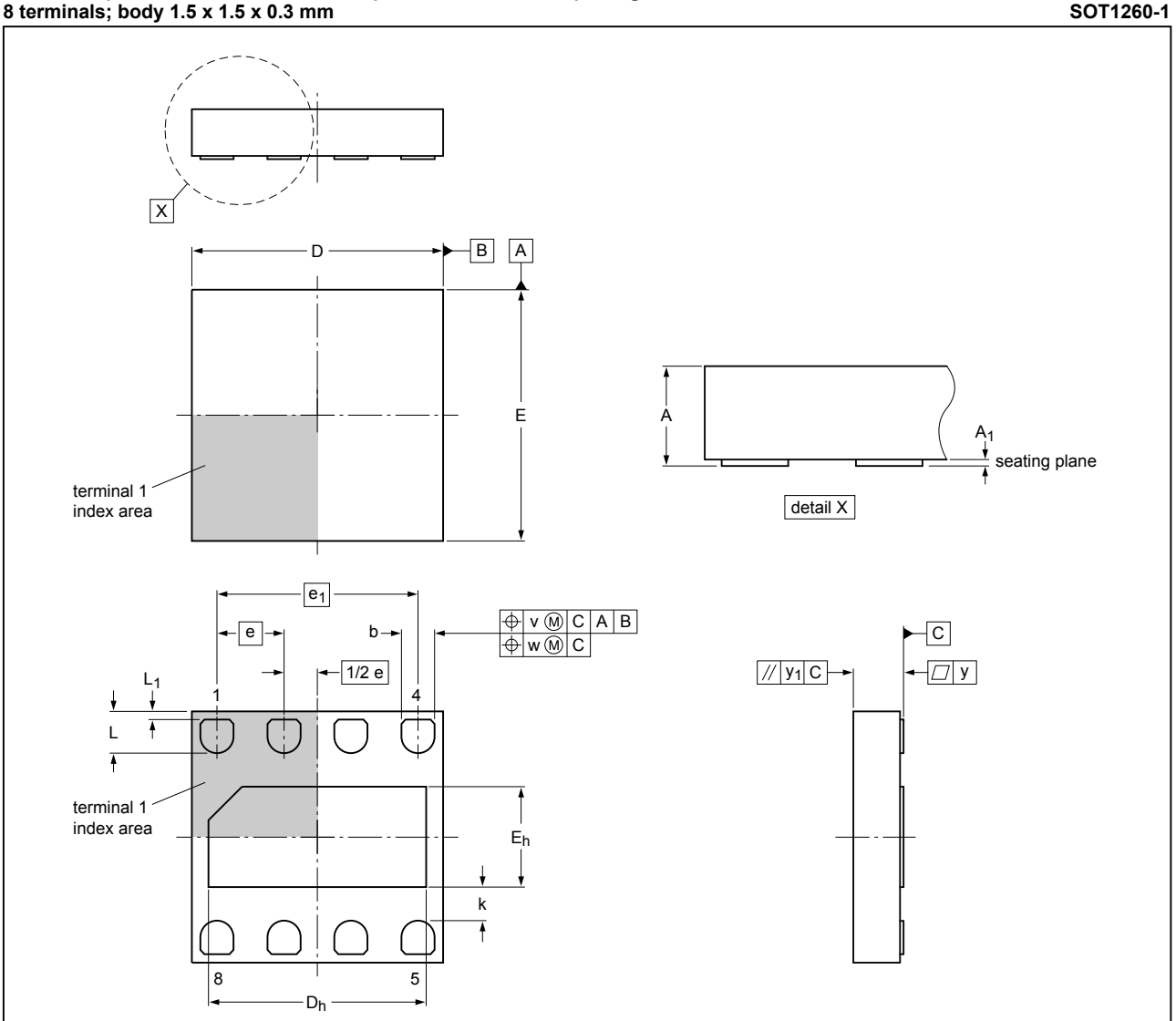


Figure 3. Application information

14 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 orginal dimensons)

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 SOT1260C (HX2SON8)

15 Handling information

15.1 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.

15.2 Moisture sensitivity

Table 12. Moisture sensitivity level

Test methodology	Class
JESD-22-A113	1

16 Abbreviations

Table 13. 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
SP2T	single pole 2 throw
WLAN	wireless local area network

17 Revision history

Table 14. Revision history

Document ID	Release date	Data sheet status	Change notice	Supersedes
BGS8424 v.1.3	20190506	Product data sheet	-	BGS8424 v.1.2
modification	• changed security status into public			
BGS8424 v.1.2	20190503	Product data sheet	-	BGS8424 v.1.1
modification	• added LNA to bypass mode switch delay time to the Transient characteristics table • updated conditions and max values for $P_{i(TX)}$ and $P_{i(BT)}$ in Limiting values table • removed $P_{i(1dB)}$ from Bluetooth mode characteristics			
BGS8424 v.1.1	20181214	Product data sheet	-	BGS8424 v.1
modification	• modified Ordering information with Orderable part number			
BGS8424 v.1	20170505	Product 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.
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