



# Sigfox Monarch Module WSG309S

Compact-sized  
With Ultra-low Power  
Consumption

WSG309S\_IPEX



WSG309S\_RF\_PAD



Sigfox Support (Monarch)



RC1/2/3/4/5/6



AT Commands



Extended Temperature  
Range: -30°C to +85°C



Ultra-Low Power Consumption  
(5uA @ sleep mode)

WSG309S RC 1/2/3/4/5/6 is a Sigfox +BT5.0 modem module for the low power wide area network (LPWAN) market. It is designed with STM's system S2-LP+BLUENRG248 MCU

The module was designed for high performance, high quality, low cost, small form factor and most importantly. The Sigfox application is running on BLUENRG2 MCU at high efficiency executed at high efficiency using its internal 32bit core Cortex-M0 processor.

Every module is preloaded with Sigfox application software, module specific ID/KEY/PAC as referring to Sigfox network system. The preloaded software also includes a bootloader which allows software update or future user application development.

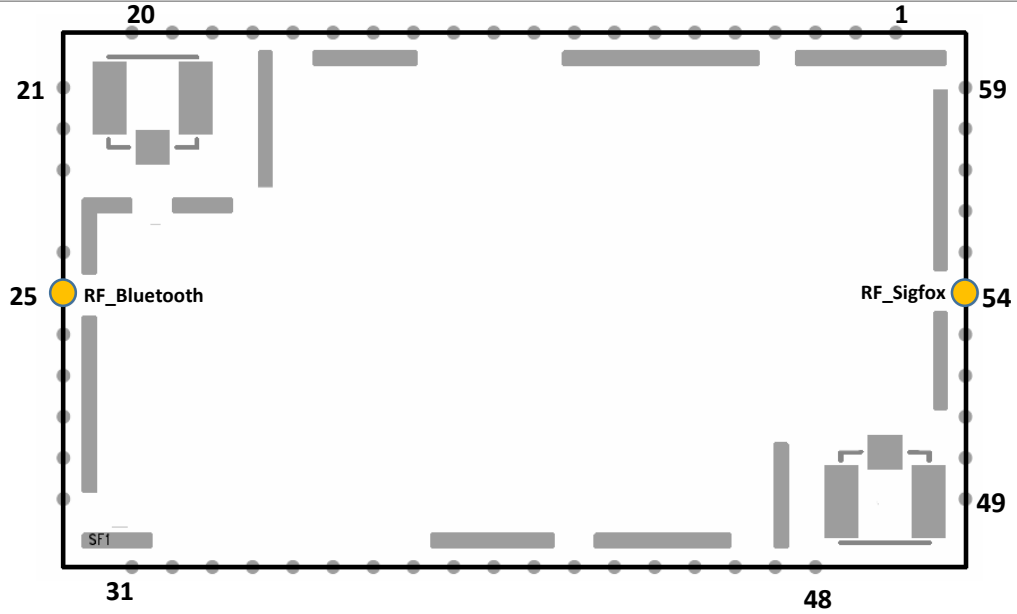
## ◆ General Feature

- General Sigfox module for Smart City, Smart Agriculture , Smart Industry, IOT Application
- Compact Form Factor: 28.5 x 16.5 x 3.0 mm
- 59 Pin Stamp Pad for PCB SMT mounting
- Interface : I2C\*1/UART\*1/GPIO\*12/ADC\*2/SWD\*1
- Temperature range: -30°C to +85°C
- Supply voltage: 2.1 ~ 3.6V
- Preloaded Sigfox application with ID/KEY/PAC

## ◆ Product Specifications

RF Function	
Standard	Sigfox Network System
Interface	I2C/UART/GPIO/ADC/SWD/DIO
Transmit Output Power	22dBm(RC2/4) , 14dBm(RC1/6), 13dBm(RC3/5)
Data Rate	Uplink: 100bps Downlink: 600bps
Modulation Techniques	Uplink DBPSK Modulation Downlink GFSK Modulation
Sigfox Frequency bands	RC 1/2/3/4/5/6
Operating Voltage	2.1 ~ 3.6V
Operating Temperature	-30 ~ 85 degree C
Current consumption	121mA Tx at 22dBm (peak current with Sigfox packet transmission) 33mA Tx at 14dBm (peak current with Sigfox packet transmission) 31mA Tx at 13dBm (peak current with Sigfox packet transmission)  22mA Tx at 4dBm with BT packet transmission 6.17uA at sleep mode

◆ **MODULE PINOUT**



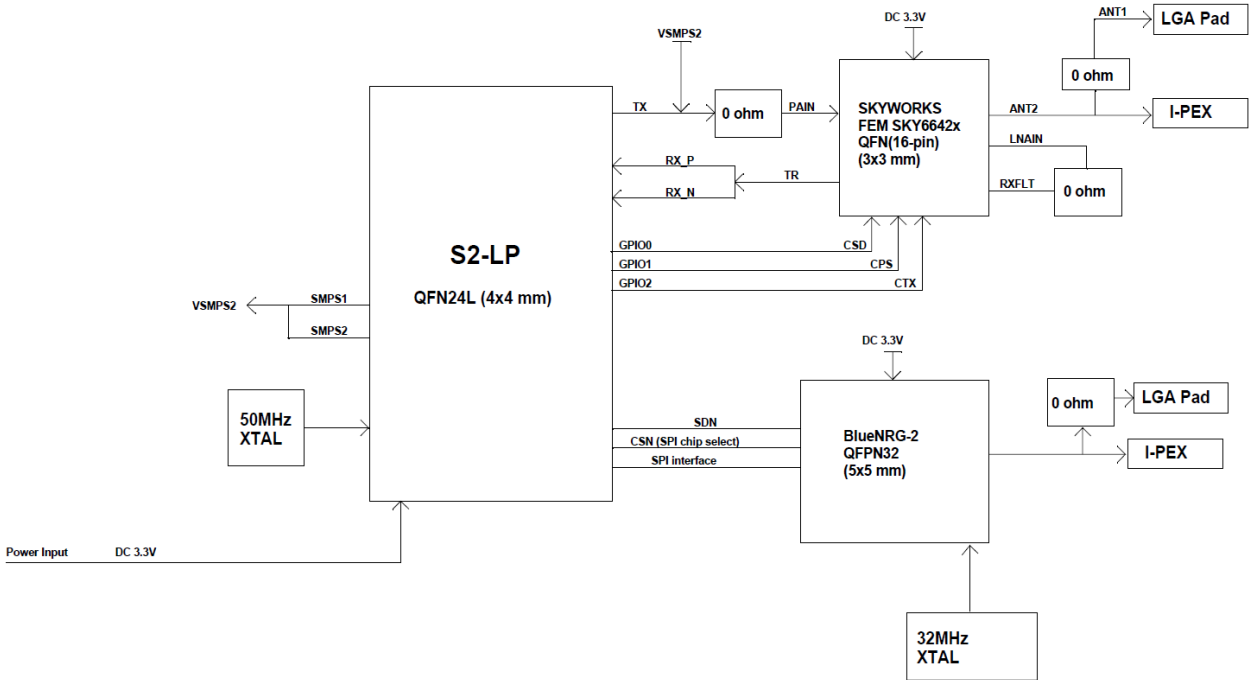
◆ **PIN DEFINITION**

No.	Name	I/O	Function
1	GND	GND	Ground
2	GND	GND	Ground
3	GND	GND	Ground
4	GND	GND	Ground
5	GND	GND	Ground
6	S2-LP SDO	I/O	Connect to BlueNRG-2 _DIO3
7	S2-LP SDI	I/O	Connect to BlueNRG-2 _DIO2
8	S2-LP SCLK	I/O	Connect to BlueNRG-2 _DIO0
9	S2-LP CSN	I/O	Connect to BlueNRG-2 _DIO20
10	DIO1	I/O	BlueNRG-2 _DIO1
11	DIO17	I/O	BlueNRG-2 DIO17
12	S2-LP GPIO2	I/O	Connect to BlueNRG-2 _DIO19
13	S2-LP GPIO3	I/O	Connect to BlueNRG-2 _DIO21
14	S2-LP SDN	I/O	Connect to BlueNRG-2 _DIO25
15	GND	GND	Ground
16	GND	GND	Ground
17	DIO16	I/O	BlueNRG-2 DIO16
18	DIO15	I/O	BlueNRG-2 DIO15
19	ADC1	I	BlueNRG-2 ADC1
20	ADC2	I	BlueNRG-2 ADC2
21	GND	GND	Ground
22	DIO14	I/O	BlueNRG-2 DIO14
23	GND	GND	Ground
24	GND	GND	Ground
25	BT Antenna	RF	Only work on WSG309S_RF_PAD version

## PIN DEFINITION

No.	Name	I/O	Function
26	GND	GND	Ground
27	GND	GND	Ground
28	GND	GND	Ground
29	DIO13	I/O	BlueNRG-2 DIO13
30	GND	GND	Ground
31	DIO11	I/O	BlueNRG-2 DIO11
32	DIO8	I/O	BlueNRG-2 DIO8
33	DIO7	I/O	BlueNRG-2 DIO7
34	JTMS-SWTDIO	I/O	SW DIO (BlueNRG-2 DIO10) SWD data signal
35	JTMS-SWTCK	I/O	SW CLK (BlueNRG-2 DIO9) SWD clock signal
36	DIO12	I/O	BlueNRG-2 DIO12
37	DIO6	I/O	BlueNRG-2 DIO6
38	DIO18	I/O	BlueNRG-2 DIO18
39	NC		No Connection on module
40	I2C2_DAT	I/O	BlueNRG-2 DIO5 (module internal PU 10k)
41	RESETN	I	BlueNRG-2 RESETN (module internal PU 100k) Low Active
42	NC		No Connection on module
43	I2C2_CLK	I/O	BlueNRG-2 DIO4 (module internal PU 10k)
44	XI	I	Reserve for external RTC 32.768k
45	XO	O	Reserve for external RTC 32.768k
46	VDD	P	Power Input
47	GND	GND	Ground
48	GND	GND	Ground
49	GND	GND	Ground
50	GND	GND	Ground
51	GND	GND	Ground
52	GND	GND	Ground
53	GND	GND	Ground
54	Sigfox Antenna	RF	Only work on WSG309S_RF_PAD version
55	GND	GND	Ground
56	GND	GND	Ground
57	GND	GND	Ground
58	GND	GND	Ground
59	GND	GND	Ground

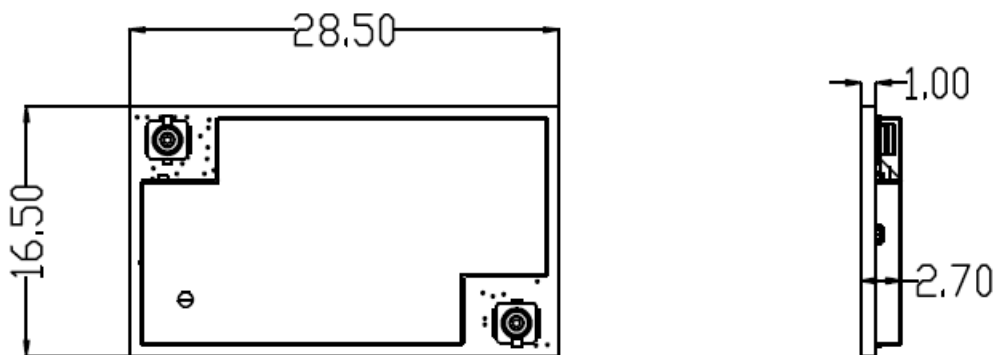
◆ **BLOCK DIAGRAM**



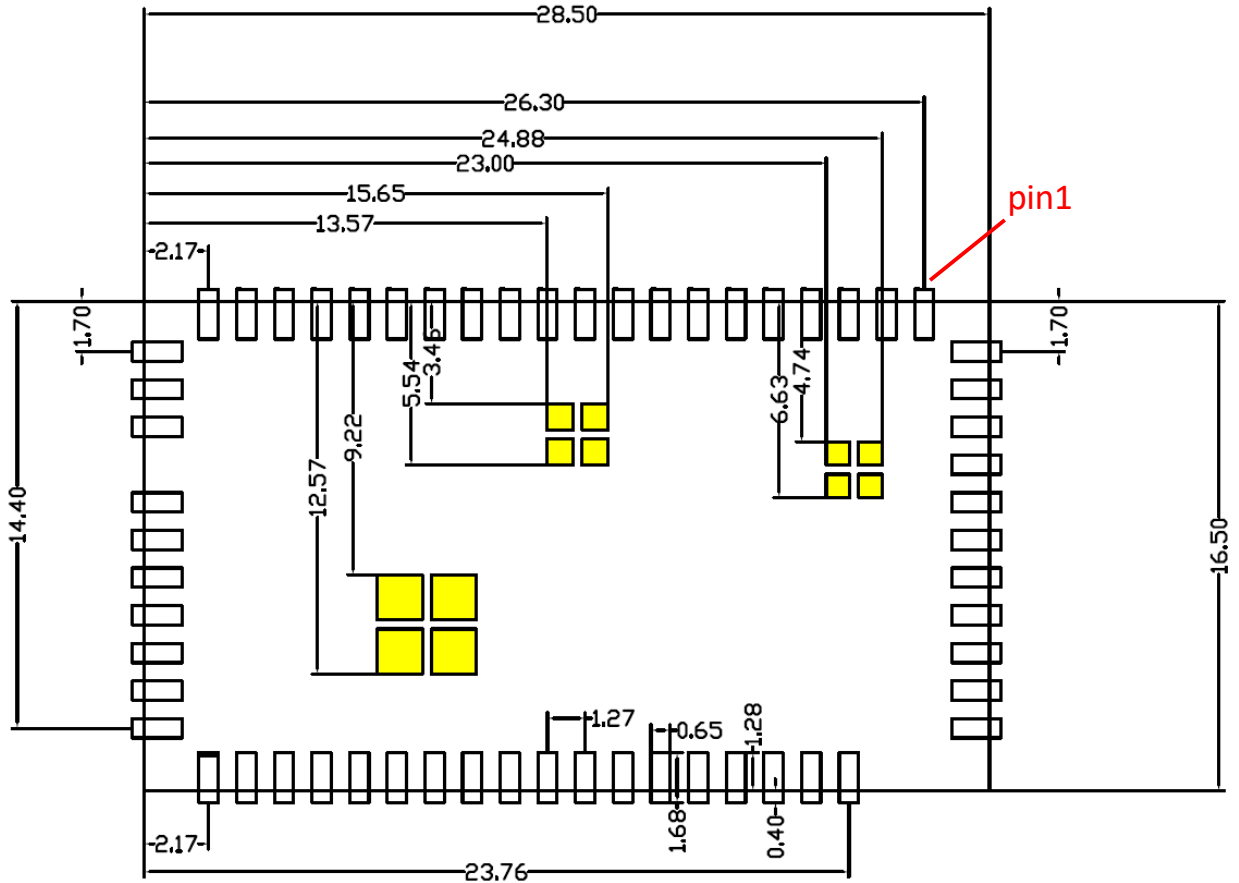
◆ **MODULE DIMENSION**



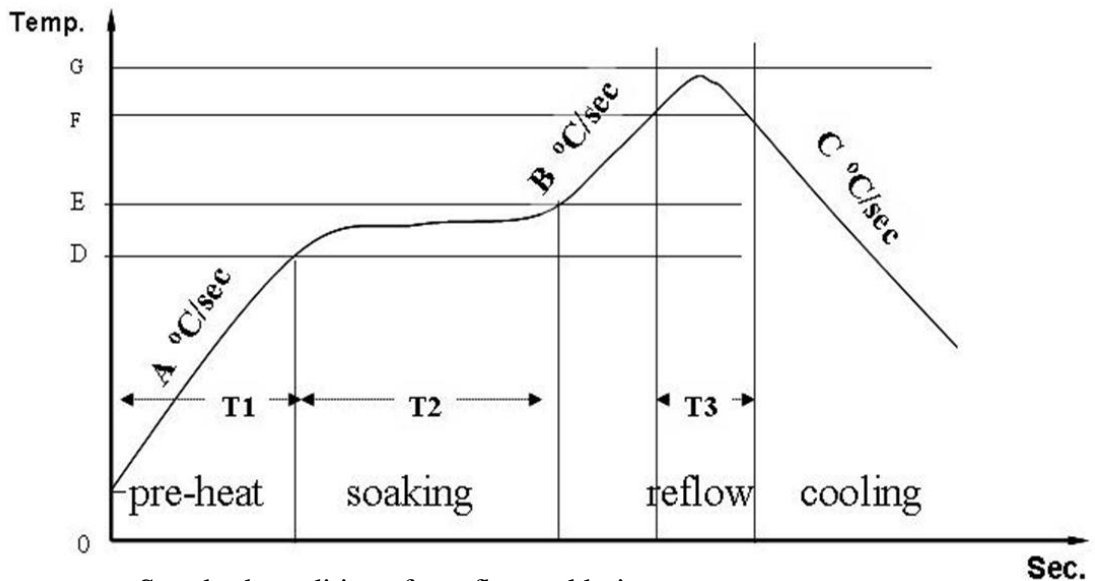
Dimension: mm



◆ RECOMMENDED FOOTPRINT



◆ RECOMMENDED REFLOW PROFILE



Standard conditions for reflow soldering:

- a. Pre-heating Ramp (A) (Initial temperature: 150°C): 1~2.5°C/sec;
- b. Soaking Time (T2) (150°C~180°C): 60sec~100sec;
- c. Peak Temperature (G): 230~250°C;
- d. Reflow Time (T3) (>220°C): 30~60 sec;
- e. Ramp-up Rate (B): 0~2.5°C/ sec;
- f. Ramp-down Rate (C): 1~3°C/ sec.

## ◆ AT COMMAND LIST

Command	Description	Value
Get_FWVer	Get fw version	return firmware version
Get_API_Ver u	Get version of specified module	u= 0 is SigFox library ,1 is MCU_API, 2 is RF_API and 5 is MONARCH_API version
Get_ID	ID of the current device	return ID
Get_PAC	PAC of the current device	return PAC
Switch_Public_Key u	Switch public/private key	u= 0: private , 1: public
Open_RCZ u	Set the Sigfox RCZ	u= [1~6] is RC1/RC2/RC3C/RC4/ RC5/RC6
Get_RCZ	RCZ of the current device	return regional
Send_frame u v z	Send a frame	Frame: data bytes (0,1,2,3...C,D,E,F) to be sent, 12 byte maximum
		u= data to transmit, e.g. u= 1234
		v= Number of repetition[1 to 3], e.g. u= 2
		z= Flag to initiate a downlink response, 1= downlink 0= non downlink if data not 1 byte, fill up with 0 e.g. w= ABC -> AB0C .
Send_MSG u	Send a only Uplink frame	Frame: data bytes (0,1,2,3...C,D,E,F) to be sent, 12 byte maximum
		u= data to transmit, e.g. u= 1234
		if data not 1 byte must be discarded e.g. w= 012 -> 01
Uplink u	Send the number of Uplink frames	u= how many frames to send. The transmitted data is 0x11, 0x22, 0x33, 0x44
Set_CWTx u	Start continuous wave transmission	e.g. u = 5000, u is waiting the number of console line to be sent
		the transmission frequency based on opened regional
Set_CMTx u	Start continuous modulated transmission	e.g. u = 5000, u is waiting the number of console line to be sent
		the transmission frequency based on opened regional
Get_FreqBase	Get current frequency setting	Return frequency in Hz
Get_Rssi u	Direct to measure RSSI level	u= how many RSSI value to get. Please set the frequency first by Set_FreqBase command
SleepMode	Device enter sleep mode	In Sleep Mode, press any key to exit and enable auto in sleep mode after 5s
Reset	Reset device	System soft reset and disable auto in sleep mode
Get_BTAddr	BT Address of device	Return BT Address
BT_Reset	Restart BT	Reset BT
BT_TX u v x	u :BT transmission channel [0x00~0x27]	u :TX_Frequency 0x00 is 2402,0x01 is 2402+1x2=2404,0x27 is 2402+39*2=2480
	Length_Of_Test_Data Length	v: 0x00~0x25
	Packet_Payload Type(Pseudo-Random bit sequence 9)	x: 0x00
BT_RX u	Receive test packets at a fixed interval	u :TX_Frequency 0x00 is 2402,0x01 is 2402+1x2=2404,0x27 is 2402+39*2=2480
BT_Stop	Stop any test in progress and report receive packets	return receive packets
BT_Tone_Start u	Starts a carrier frequency on a specific channel	u :TX_Frequency 0x00 is 2402,0x01 is 2402+1x2=2404,0x27 is 2402+39*2=2480
BT_Tone_Stop	Stop the previously started BT_Tone_Start command	Reset BT carrier
Scan_RCZ u	Scan region(Monarch beacon detected)	u: Bigger than 360 second. Only bigger than 360 seconds Monarch beacon can be detected
help	Show command list	Display the all AT command

**◆ SIGFOX VERIFIED CERTIFICATE****Sigfox Verified™ Certificate****M\_004E\_0C85\_01**

Congratulations Liteon, the following product is now Sigfox Verified™ certified :



**CERTIFICATION TYPE :** MODULAR DESIGN  
**PRODUCT NAME :** WSG309S  
**MODEL NAME :** WSG309S  
**TYPE :** RC1 RC2 RC3c RC4 RC5 RC6 UDL-ENC-MONARCH  
**LAYOUT :** V01  
**SCHEMATIC VERSION :** V01  
**BOM :** V01  
**FIRMWARE :** SW:V2.1.0.1 MCU: V2.4.3 RF: V2.5.0.0 MONARCH: V1.0.1  
**SIGFOX LIB/ADDON :** V2.6.1\_FDL\_MON\_RF\_PROTOCOL\_V0.5.0  
CORP-13447\_RC1\_UDL\_MON CORP-  
13447\_RC2\_UDL\_MON CORP-13447\_RC3c\_UDL\_MON CORP-  
**TEST REPORT :** 13447\_RC4\_UDL\_MON CORP-13447\_RC5\_UDL\_MON CORP-  
13447\_RC6\_UDL\_MON  
**CERTIFICATION DATE :** MAY 9, 2019

This certificate is valid for this product only. Any change to the certified product has to be reported to Sigfox as it may lead to a renewal of the Sigfox RF & Protocol Tests.  
The Sigfox Verified™ logo must be used in respect of Sigfox branding guidelines.





**◆ CHANGE LIST**

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Rev	Date	Author	Change List
V1.0	2019.03.26	Kaysa Lee	Preliminary (official)
V1.1	2019.06.28	Kelly Hsu	Update Sigfox Verified Certificate