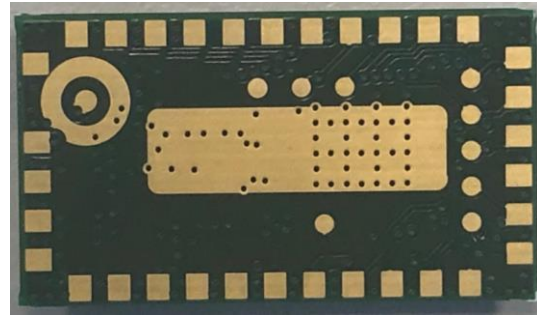




WSG303M Sigfox Module (RC1/2/3/4/5)

Compact-sized With Ultra-Low Power Consumption



Sigfox Support



ISM RC1 (868MHz)
ISM RC2 (902MHz)
ISM RC3/RC5 (923MHz)
ISM RC4 (920MHz)



AT Commands



Extended Temperature
Range: -40°C to +85°C

WSG303M is a Sigfox Verified modem module for the low power wide area network (LPWAN) market. It is designed with M2COMM's system on chip M2C8001 for the US or other FCC-like market (FCC Part 15.247) also for Japan ARIB STD-T108 and the European market (EN 300 220) which is fully compliant to ETSI regulations.

The module was designed for high performance, high quality, low cost, small form factor and most importantly, high RF power of up to 22dBm. The design is fully compliant to FCC regulations. The Sigfox application is running on M2C8001 at high efficiency.

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.

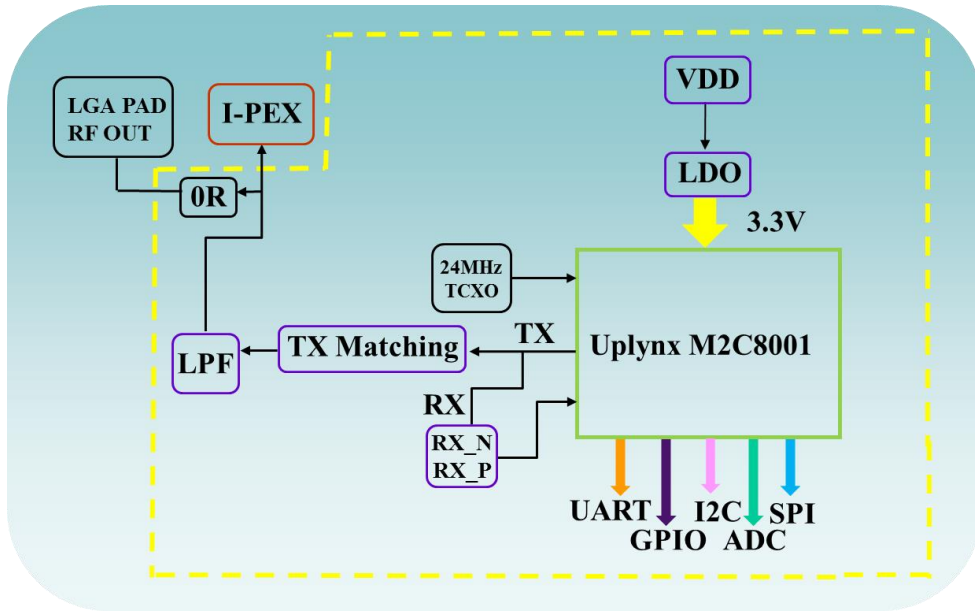
◆ General Feature

- General Sigfox module for Smart City, Smart Agriculture , Smart Industry, IOT Application
- Compact Form Factor: 24 x 13.5 x 3.0 mm
- 33 Pin LGA Pad for PCB SMT mounting
- Interface : I2C*1/UART*2/GPIO*6
- Temperature range: -40°C to +85°C
- Supply voltage: 2.5V ~ 5.5V
- Frequency range: ISM RC1(868MHz), RC2(902MHz), RC3/RC5(923MHz), RC4(920MHz)
- ETSI EN 300 220 compliant
- FCC Part 15.247
- Japan ARIB STD-T108
- KCC Rules 30
- Preloaded Sigfox application with ID/KEY/PAC and bootloader for firmware update

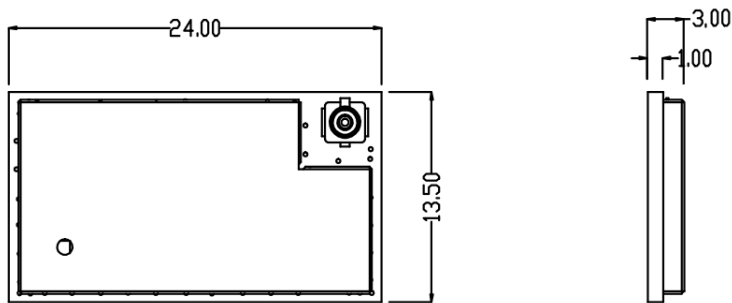
◆ Product Specifications

	RF Function
Standard	Sigfox Network System
Interface	I2C/UART/GPIO
Transmit Output Power	13dBm (JP) 14dBm (EU) 22dBm (US)
Data Rate	RC1: Uplink 100bps RC2/4: Uplink 600bps RC3/5: Uplink 100bps
Modulation Techniques	Uplink DBPSK BPSK Modulation
Frequency bands	RC1(868MHz), RC2(902MHz), RC3/RC5(923MHz), RC4(920MHz)
Operating Voltage	2.5 ~ 5.5V
Operating Temperature	-40 ~ 85 degree C
Current consumption	60mA Tx at 14dBm (average current with Sigfox packet transmission) 130mA Tx at 22dBm (average current with Sigfox packet transmission) 50nA at OFF (via POW_EN control pin)

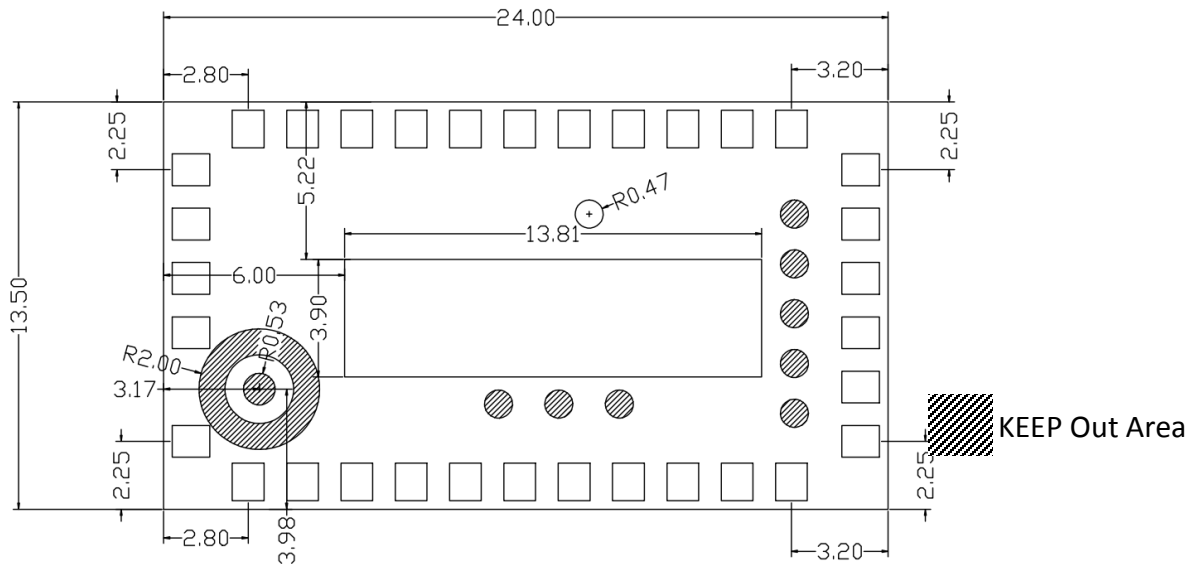
◆ BLOCK DIAGRAM



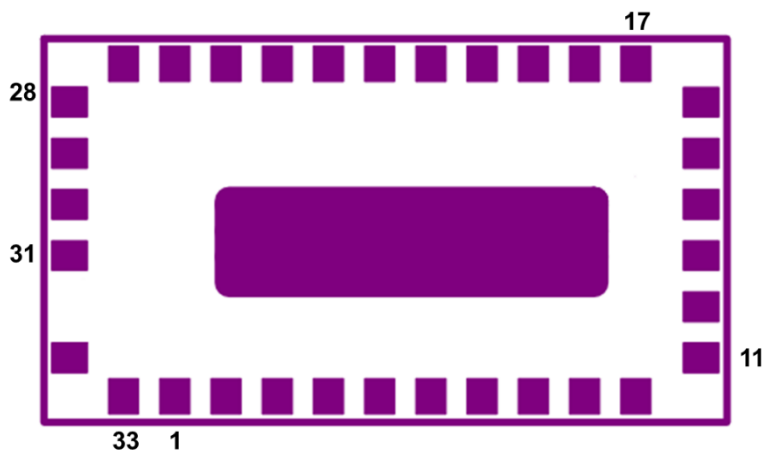
◆ MODULE DIMENSION



◆ RECOMMENDED FOOTPRINT



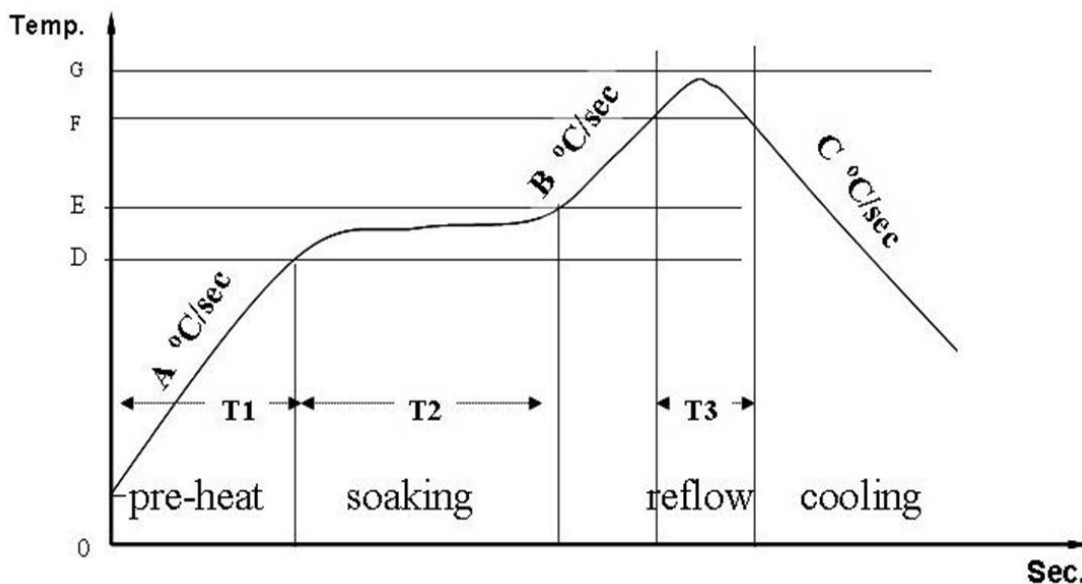
◆ **MODULE PINOUT**



◆ **PIN DEFINITION**

Pin	Function	IO	Description
1	ADC1	IO	ADC1
2	ADC0	IO	ADC0
3	UART1_RX	I	UART1_RXD
4	UART1_TX	O	UART1_TXD
5	Ground	GND	GND
6	STATUS	O	GPIO2
7	UART_TX	O	UART0_TXD (default UART 9600bps)
8	UART_RX	I	UART0_RXD (default UART 9600bps)
9	GPIO[0]	IO	
10	GPIO[1]	IO	
11	JDAT	I	JTAG Interface
12	JCLK	I	JTAG Interface
13	RESET_N	I	RESET ,When asserted LOW sets module to INITIAL state
14	Ground	GND	GND
15	POWER_EN	I	Enable: Logic low for Disable; Logic high for Enable
16	VDD_SYS	Power	Module Power input
17	GPIO[2]	IO	
18	GPIO[3]	IO	
19	GPIO[4]	IO	
20	GPIO[5]	IO	
21	VLDO	Power	Operating voltage monitor point
22	Ground	GND	GND
23	Ground	GND	GND
24	Ground	GND	GND
25	Ground	GND	GND
26	Ground	GND	GND
27	Ground	GND	GND
28	Ground	GND	GND
29	Ground	GND	GND
30	Ground	GND	GND
31	RF_OUT	RF	RF port (reserved , no function) , default RF out by IPEX
32	Ground	GND	GND
33	Ground	GND	GND

◆ **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.

◆ **LABEL DRAWING**

注意事項:

條碼使用二維條碼QR code,5*5MM
 文字顯示為XXXXXXXX(由業務提供)
 條碼掃描的內容為兩行，如下：
 XXXXXXXXX(8碼ID，業務提供)
 XXXXXXXXXXXXXXXXXXXX (16碼PAC,業務提供)



◆ AT COMMAND LIST

Command	Description	Value
AT\$302=pwr	Set Tx power	Pwr = Tx power [10 to 22] RCZ1: Pwr=13 RCZ2: Pwr=22 RCZ3: Pwr=12 RCZ4: Pwr=22 RCZ5: Pwr=11
AT\$302?	Get current TX power	Return Current transmission power setting
AT\$400=v1,v2,v3,v4	Set Sigfox configuration word for RCZ2, RCZ3, RCZ4 and RCZ5 settings	v1 = config_words_0 v2 = config_words_1 v3 = config_words_2 v4 = Macro Channel Listen Before Talk: RCZ3: AT\$400=1,1388,0,0 RCZ5: AT\$400=1,1388,0,0
AT\$400?	Inquire the Sigfox configuration words & macro channel values	Return values: config words v1,v2,v3, macro channel v4
AT\$410=mode	Enable Public Key for emulator mode	Mode: 0-normal mode; 1- Public key enabled (emulator mode)
AT\$SB=bitvalue	Send a bit value of 0 or 1	Bitvalue = 0/1
AT\$SF=frame	Send payload data, 1 to 12 bytes	Frame: data bytes (0,1,2,3...C,D,E,F) to be sent, 12 byte maximum
AT\$ID?	Get device ID	return ID
AT\$PAC?	Get device PAC	return PAC
AT\$IF=freq	Set transmission frequency in Hz	e.g. RCZ1: AT\$IF=868130000 RCZ2: AT\$IF=902200000 RCZ3: AT\$IF=923200000 RCZ4: AT\$IF=902200000 RCZ5: AT\$IF=923250000
AT\$IF?	Inquire current frequency setting	Return frequency in Hz
AT\$CW= freq, mode	Test mode with continuous wave emission	Freq: Check SIGFOX spec for each RCZ for example RCZ1=868130000 mode: 0-disable; 1-enable
AT\$CM= Packet_length	Test mode with random data packet at fixed frequency	Packet_length = number of bytes to be transmitted (1~26)
AT\$V?	Read firmware information	Return values: firmware version
AT\$O=mode, standard	Open Sigfox API library	Mode: 0-open; 1-close Standard: 1-RCZ1; 2-RCZ2; 3-RCZ3; 4-RCZ4; 5-RCZ5
AT\$RCZ=standard	Sigfox library regional setting	Standard: 1-RCZ1; 2-RCZ2; 3-RCZ3; 4-RCZ4; 5-RCZ5
AT\$RCZ?	Inquire Sigfox library regional setting	Return values: 1-RCZ1; 2-RCZ2; 3-RCZ3; 4-RCZ4; 5-RCZ5
AT\$O?	Inquire Sigfox API library open or close	Return values: 0-open; 1-close
AT\$OOB?	Get operation condition	Return values: [Battery voltage before active transmission in mV] [Battery voltage during active transmission in mV] [10x silicon temperature] e.g. 2650 [battery voltage 2.65V before transmission] 2550 [battery voltage 2.55V during transmission] 270 [27C silicon temperature]
AT\$GPIODIR=gpio, val	Set GPIO pin direction	gpio = 1-GPIO0; 2-GPIO1; ... , 6- GPIO5 val: 0-input (weak pull high); 1-output (input float)
AT\$GPI=gpio	Return GPIO value	gpio = 1-GPIO0; 2-GPIO1; ... , 6- GPIO5
AT\$GPO=gpio, val	Set GPIO output high or output low	gpio = 1-GPIO0; 2-GPIO1; ... , 6- GPIO5 val: 0(output low)/1(output high)
AT\$SIO=port	Scan GPIO input values and execute relevant flash page	Port: 6-bit input for GPIO0 to GPIO5. A "1" represents the relevant GPIO input will be scanned. e.g. port = "100000", GPIO0 value is scanned and either GPIO0_Input(High) or GPIO0_input(Low) flash page will be executed
AT\$EOFF=echo	Turn off echo message	echo: 1: off, 0: on
AT\$RST	system soft reset	

◆ Application Information

Recommended connection to essential pins

PIN	Recommendation
STATUS	Can be connected to the host processor to detect module status or the pin can lead to a status LED for displaying purposes
VDD	The voltage supply can come directly from a cell, ac adapter or USB. A decoupling capacitor of size 10 μ F placed close to the 5V input is recommended. The allowable voltage at this power input is below 5.5V and above 2.5V.
POWER_EN	It is connected to a host processor to switch on and off the modem module.
RESET_N	This can be tied to a universal reset pin or the host processor. It is internally pulled high to VLDO. In other words, RST_N only works when POW_EN is set high. A 10 μ F capacitor would be recommended in place close to the module pin in case the supply voltage to the module. The pull high resistance onto pin RESET_N from the system must be smaller than 50k Ω to ensure proper module startup.
VLDO	This is the output of the internal LDO of the module. This voltage supply is used by the module RF system and it is highly recommended to leave this pin unconnected. In case this supply is used by another part of the system, a 1 μ F capacitor is recommended to be put close to the module.

Switch ON and OFF procedure

To ensure proper operation, POW_EN must be asserted high after 5V has settled then wait for 5ms before AT commands can be passed down the UART interface. The settling time is required for the LDO and crystal oscillator to settle to their operating conditions. A software routine can be used to poll the status of STATUS pin before any actual payload is passed to the module.

After switching the module OFF, by pulling POW_EN low, it is highly recommended that the system should wait for at least 10ms before another attempt to power ON.

◆ AT CONFIG FOR EACH ZONE(1~5)

<p>-----RC1----- AT\$O=0 OK</p> <p>AT\$IF=868130000 OK</p> <p>AT\$302=13 OK</p> <p>AT\$RCZ=1 OK</p> <p>AT\$O=1,1 OK</p>	<p>-----RC2----- AT\$O=0 OK</p> <p>AT\$IF=902200000 OK</p> <p>AT\$302=22 OK</p> <p>AT\$400=1,0,0,1 OK</p> <p>AT\$RCZ=2 OK</p> <p>AT\$O=1,2 OK</p>	<p>-----RC3----- AT\$O=0 OK</p> <p>AT\$IF=923200000 OK</p> <p>AT\$302=12 OK</p> <p>AT\$400=1,1388,0,0 OK</p> <p>AT\$RCZ=3 OK</p> <p>AT\$O=1,3 OK</p>
<p>-----RC4----- AT\$O=0 OK</p> <p>AT\$IF=902200000 OK</p> <p>AT\$302=22 OK</p> <p>AT\$400=0,40000000,0,63 OK</p> <p>AT\$RCZ=4 OK</p> <p>AT\$O=1,4 OK</p>	<p>-----RC5----- AT\$O=0 OK</p> <p>AT\$IF=923250000 OK</p> <p>AT\$302=11 OK</p> <p>AT\$400=1,1388,0,0 OK</p> <p>AT\$RCZ=5 OK</p> <p>AT\$O=1,5 OK</p>	

 CHANGE LIST

V	Date	Author	Change List
V1.0	2018.01.22	Kaysa Lee	Preliminary
V1.1	2018.08.09	Kelly Hsu	Add Reflow profile Add Label Drawing
V1.2	2018.09.30	Kelly Hsu	Update Product Picture Update Pin definition
V1.3	2018.10.15	Kaysa Lee	Change Pin definition of Pin1 ~4
V1.4	2018.12.10	Ken Chang	Add AT Config for each Zone, AT Command
V1.5	2019.01.24	Kaysa Lee	Revise typo(remove downlink spec)
V1.6	2019.01.25	Kaysa Lee	Update Label with TELECOM ID & Logo
V1.7	2019.02.13	Kaysa Lee	Add Application information
V1.8	2019.03.07	Kaysa Lee	Revise typo
V1.9	2019.04.19	Kaysa Lee	Add bottom side product picture Update recommended footprint