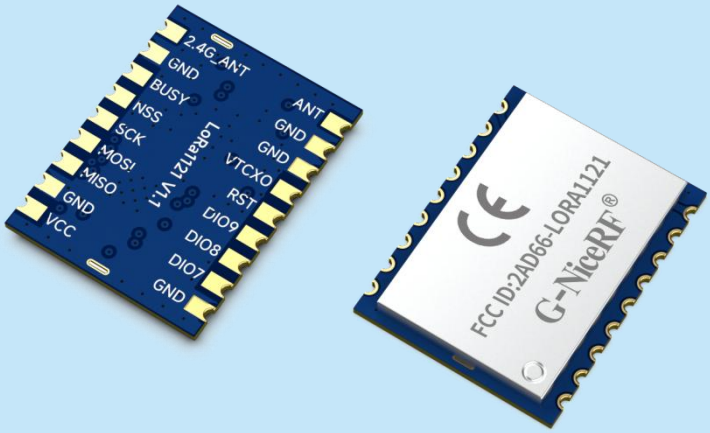
- Multi-Band: Sub-GHz, 2.4GHz, and S band (satellite communication)
- Supports LoRaWAN protocol and Sigfox protocol
- Supports AES-128 encryption and decryption algorithms
- Superior anti-interference: LR-FHSS technology

Product Specification



Catalogue

Note: Revision History

Revision	Date	Comment
V1.0	2024-8	First release
V1.1	2024-8	Add some content
V1.2	2025-4	Update cover, pinout, and dimensions， Add FCC and CE Certified
V1.3	2025-5	Update Appendix 1
V1.4	2025-7	Increase Power and Current Comparison Table

1. Descriptions

The LoRa1121 module utilizes SEMTECH's LR1121 chip, an ultra-low-power, long-range transceiver that supports both global ISM band and 2.4GHz communication. The LoRa1121 supports LoRa and (G)FSK modulation in the Sub-GHz and 2.4GHz bands, as well as Sigfox® modulation in the Sub-GHz band, and long-range frequency hopping spread spectrum (LR-FHSS) in the Sub-GHz, 1.9-2.1GHz, and 2.4GHz ISM bands. The LR1121 complies with the physical layer requirements of the LoRaWAN® specifications released by the LoRa Alliance®, while remaining highly configurable to meet the needs of various applications and proprietary protocols.

LoRa1121 is produced and tested strictly using lead-free processes, and comply with RoHS and REACH standards,LoRa1121 has obtained FCC and CE Certified.

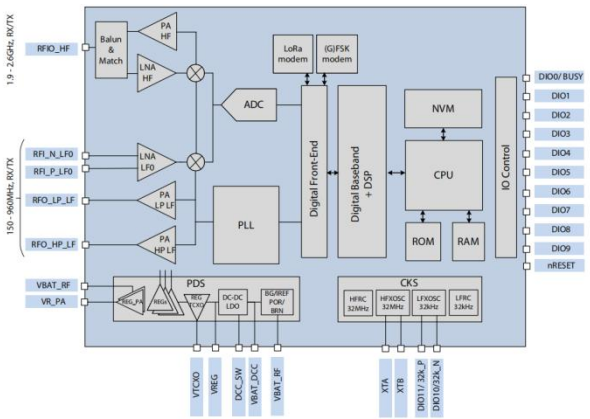
2. Features

- Sub-GHz Bands: 433/470/868/915MHz
  Customizable frequency range: 150~960 MHz
  2.4G band: 2400-2500MHz
  S band: 1900-2200MHz
- Transmission distance ： >5000 meters
  at sub-GHz in open area
- S band sensitivity : up to -132 dBm
  @ BW=125 KHz, SF=12
- 2.4GHz reception sensitivity: up to-129dBm
  @ BW=406 KHz, SF=7
- Sub-GHz reception sensitivity: up to -144dBm
  @ BW=62.5 KHz, SF=12
- Built-in electrostatic protection circuit
- Supports LR-FHSS
- Supports LoRaWAN and Sigfox protocol
- Supports AES-128 encryption and decryption
- Transmitter power is adjustable,up to 22dBm
- Sleep current ≤ 1μA
- Receive current < 7mA
- Small size, stamp hole design

3. Applications

- Drones
- Smart home/Smart agriculture
- Remote irrigation
- Industrial manufacturing

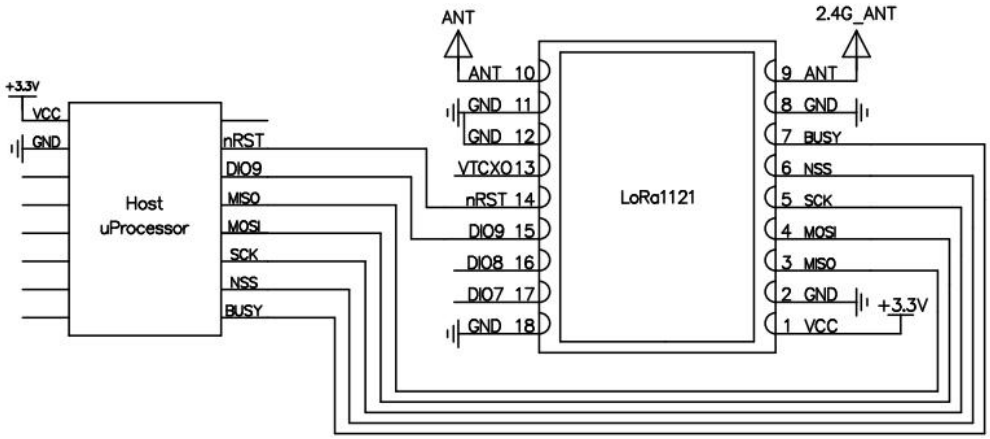
4. Block Diagram



5. Electrical Characteristics

Parameters	Test condition	Min.	Typ.	Max	Unit
Voltage range		1.8	3.3	3.6	V
Operating Temperature		-40	25	85	℃
Maximum Input Signal			10		dBm
Current Consumption					
Transmit Current	@433MHz		< 110		mA
	@2.4GHz		< 36		mA
Receive Current	@3.3V,2.4GHz		< 7		mA
	@3.3V,433MHz		< 6		mA
Sleep Current	@3.3V		⩽ 1		uA
RF Parameters					
Frequency Range	@433MHz	400		460	MHz
	@470MHz	470		510	MHz
	@868MHz	850		890	MHz
	@915MHz	900		940	MHz
Transmit Power	@Sub-GHz	19	21		dBm
	2.4GHz	10	11		dBm
Receive Sensitivity	BW=62.5KHz,SF=12 @Sub-GHz		-142		dBm
	BW=125KHz,SF=12 @S frequency band		-132		dBm
	BW=406KHz,SF=7 @2.4GHz		-129		dBm
Frequency Error			10		ppm
Modulation Rate (@sub-GHz)	@LoRa	0.091		62.5	Kbps
	@FSK	0.6		300	Kbps
Modulation Rate (@S Frequency bands)	@LoRa	0.292		87.5	Kbps
Modulation Rate (@2.4GHz)	@LoRa	0.476		87.5	Kbps

6. Typical Schematic Circuit:



7. Pin definition

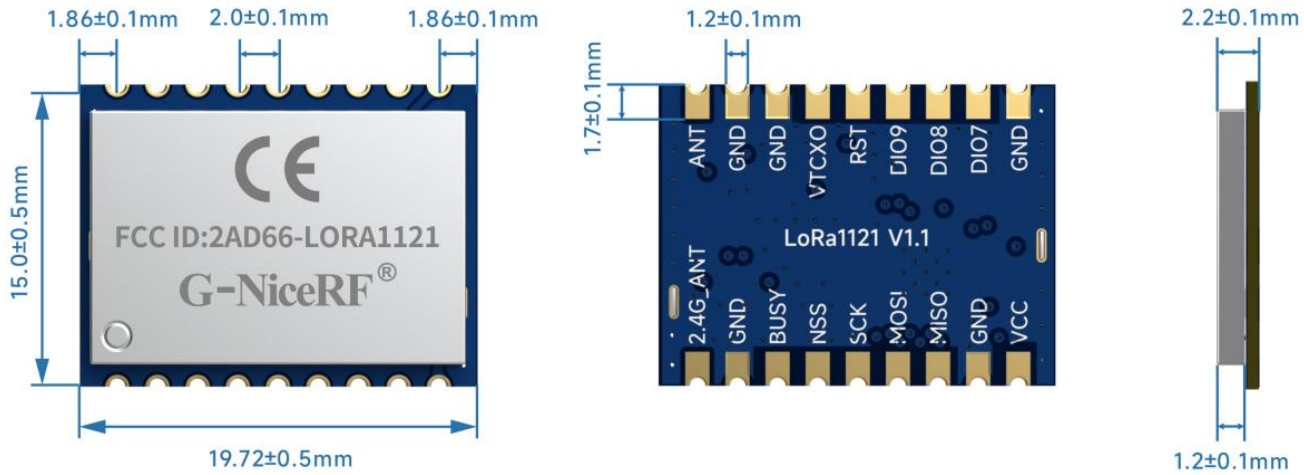
Pin NO.	Pin name	I/0	Description
1	VCC		Connect to the positive power supply.
2,8,11,12	GND		Connect to the negative power supply.
3	MISO	O	SPI data output
4	MOSI	I	SPI data input
5	SCK	I	SPI clock input
6	NSS	I	SPI chip select input
7	BUSY	O	Used for status indication, refer to the chip datasheet for details.
9	2.4/S_ANT		2.4G and S band antenna interface,external 50-ohm antenna.
10	ANTA ANT		@sub-GHz band antenna interface, external 50-ohm antenna.
13	VTCXO	O	Can provide power for an external TCXO.
14	RST	I	Reset trigger input, refer to the chip datasheet for details.
15	DIO9	IO	Multipurpose digital interface, refer to the chip datasheet for details.
16	DIO8	IO	Multipurpose digital interface, refer to the chip datasheet for details.
17	DIO7	IO	Multipurpose digital interface, refer to the chip datasheet for details.

8. Power and Current Comparison Table

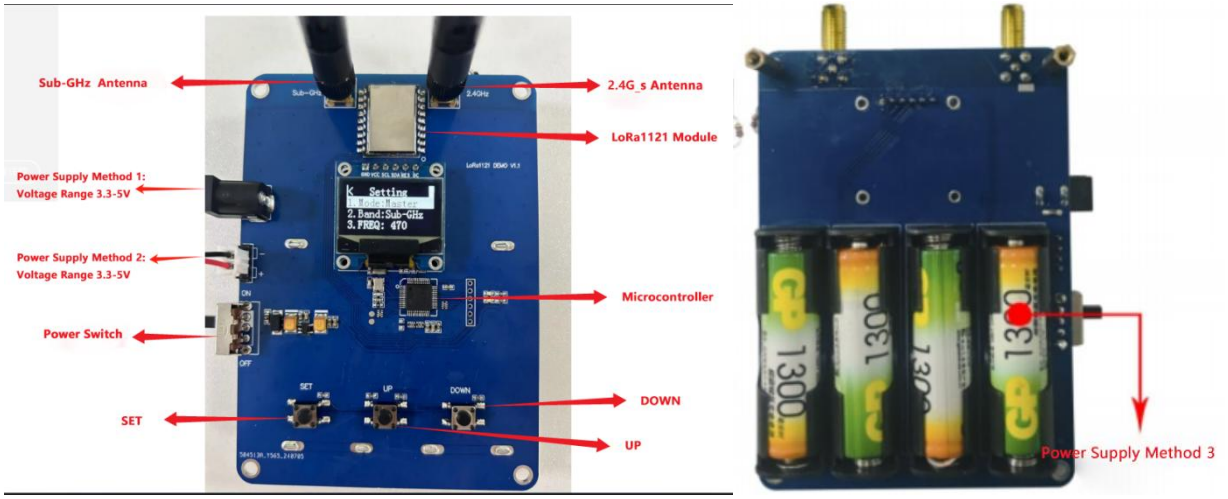
Power Levels of the DEMO Board		0	1	2	3	4	5	6	7	8	9
Sub GHz Register Values		-5	-2	1	4	7	10	13	16	19	22
@433MHz @3.3V	Power (dBm)	-1.7	0.4	3	5.8	8.5	11.2	13.8	16.4	18.9	21.0
	Current (mA)	23	27	33	40	49	59	73	90	110	122
@868MHz @3.3V	Power (dBm)	-6.2	-3.8	-1	2	5	8	10.2	13	16.6	20.6
	Current (mA)	30	37	45	53	62	73	88	104	111	123
1.9GHz/2.4GHz Register Values		-8	-5	-2	1	3	5	7	9	11	13
@1.9GHz @3.3V	Power (dBm)	-6	-3.3	-1	1.8	3.7	5.4	7.3	9	10.7	12.0
	Current (mA)	12	14	15	18	21	23	26	30	34	37
@2.4GHz @3.3V	Power (dBm)	-7.7	-5.1	-3	-0.4	1.2	2.8	4.4	5.9	7.5	10
	Current (mA)	13	14	15	18	19	22	24	27	29	32

Register Value 1: TxPower in the SetTxParams(0x0211) Command

9. Mechanism Dimension(Unit:mm)



Appendix 1: Function Demonstration Board



Note: Only one power supply method can be selected

1. Function Description

The LoRa1121 wireless module demo board primarily implements bidirectional communication (Master and Slave) in LoRa mode, along with sleep (Sleep), transmit power (TxTest), and receiver sensitivity (RxTest) testing functions.

Note: Transmit power and receiver sensitivity must be tested with instruments.

2. Key Functions

The demo board has three buttons: SET, UP, and DOWN. Their functions are as follows:

Buttons	Functions
SET Key Short Press	Confirm or enter the next level of the interface
SET Key Long Press	Return to the previous interface
UP Key Short Press	Move cursor up or increase parameter by 1
UP Key Long Press	Increase parameter
DOWN Key Short Press	Move cursor down or decrease parameter by 1
DOWN Key Long Press	Decrease parameter

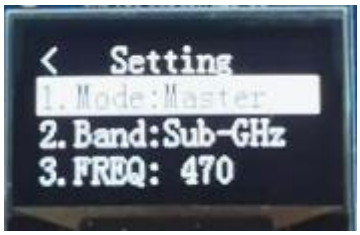
Operation Method:

With normal power supply, toggle the power switch to turn on the device. The LCD screen on the demo board will display the "Setting" interface. Briefly press the UP or DOWN key to move the cursor. When the cursor is on the parameter you wish to modify, press the SET key briefly to

make the cursor flash. Then, use the UP or DOWN key to adjust the parameter. Press the SET key again to confirm the modification.

To enter the test function corresponding to the "Mode" parameter, long-press the SET key. Briefly press the SET key to return to the "Setting" interface.

3. Setting Interface Description



- Mode: Function
- Band: Frequency Band
- FREQ: Frequency
- SF: Spreading Factor
- BW: Bandwidth
- POWER: Power
- CR: Coding Rate

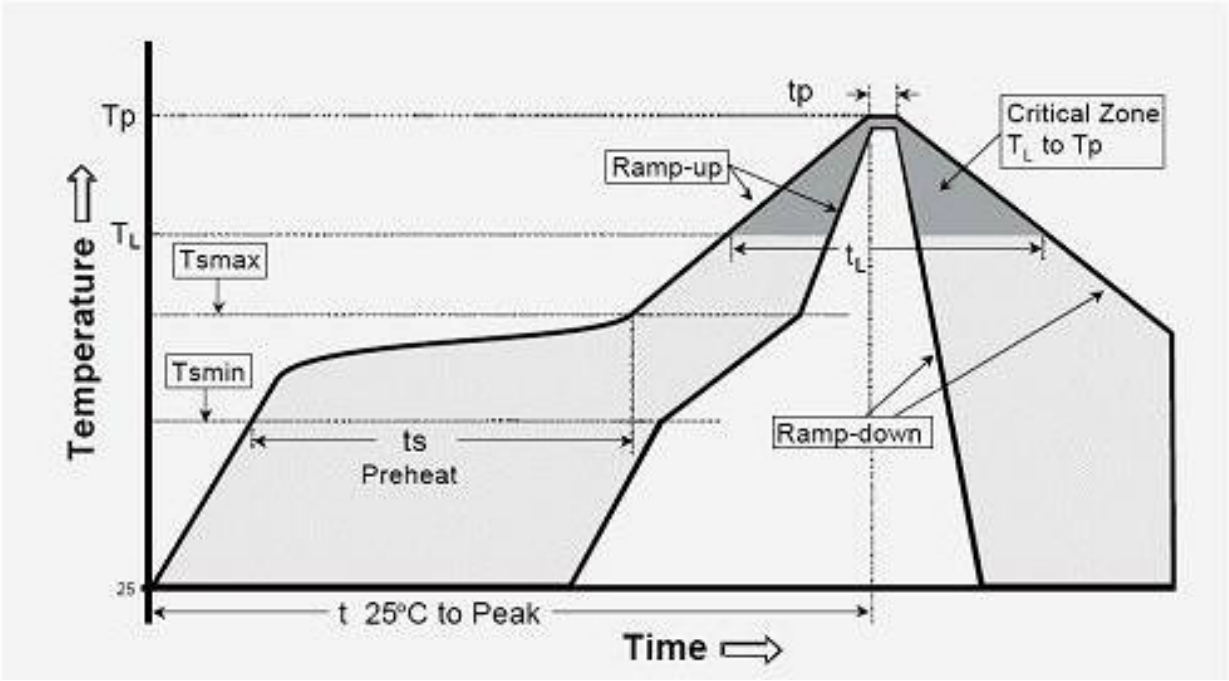
4. Communication Test

Prepare two LoRa1121 demo boards. Set one to Master mode as the communication host, and the other to Slave mode as the communication slave. (Set the LoRa communication parameters: FREQ, SF, BW, and CR to be the same; otherwise, communication will fail.)

On the LoRa communication interface screen, the Tx_cnt and Rx_cnt values will keep increasing. (The red indicator light represents a successful transmission, and the blue indicator light represents a successful reception.)

Appendix 2: SMD Reflow Chart

Below reflow profile is recommended for SMT technology:



IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering	big size components (thickness >=2.5mm)
The ramp-up rate (Tl to Tp)	3℃/s (max.)
preheat temperature - Temperature minimum (Tsmin) - Temperature maximum (Tsmax) - preheat time (ts)	 150℃ 200℃ 60~180s
Average ramp-up rate(Tsmax to Tp)	3℃/s (Max.)
- Liquidous temperature(TL)	217℃
- Time at liquidous(tL)	60~150 second
peak temperature(Tp)	245+/-5℃