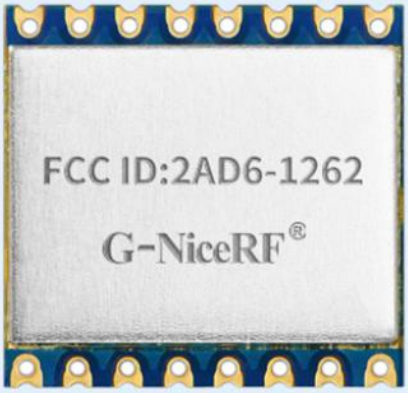
Spread spectrum wireless transceiver module

TCXO Ultra-low power 160mw

Product Specification



LoRa1262-915

LoRa1268

LoRa1262-868

Catalogue

Note: Revision History

Revision	Date	Comment
V1.0	2018-10	First release
V1.1	2019-7	Update picture
V2.0	2020-11	Modify description
V2.1	2020-11	Format updated

1.Overview

The LoRa126X wireless module uses Semtech's SX126X device, which uses a high-precision TCXO crystal oscillator, ultra-low receive current and sleep current, and sensitivity of -148dBm. Built-in 64KHz crystal oscillator can wake up the microcontroller periodically under low power consumption. The module antenna switch is integrated and controlled by the chip, which saves the resources of the external MCU. The compact size and 22dBm (160mW) output power have great advantages in IoT and battery-powered applications.

LoRa126X comply with lead-free craft in production and testing and meets RoHS and Reach standards.

LoRa1262-868 has obtained CE certification, LoRa1262-915 has obtained FCC certification.

Module	Chip	Frequency Band	Crystal	Certification
Lora1268-433	SX1268	Center 433MHz customizable 410-810 MHz	10ppm Industrial grade crystal oscillator	——
Lora1268-490	SX1268	Center 490MHz customizable 410-810 MHz	10ppm Industrial grade crystal oscillator	——
Lora1262-868	SX1262	Center 868 MHz customizable 150-960 MHz	0.5ppm TCXO Temperature compensated crystal	CE
Lora1262-915	SX1262	Center 915 MHz customizable 150-960 MHz	0.5ppm TCXO Temperature compensated crystal	FCC

2.Features

- Frequency Range：433/490/868/915 MHz（customizable150-960 MHz）
- Sensitivity：-148dBm @Lora
- Maximum output power：22 dBm（160mW）
- Industrial grade high precision crystal oscillator
- Lora,(G)FSK
- 256 bytes FiFo
- Data transfer rate：

  0.6-300 Kbps @FSK

  0.018-62.5 Kbps @Lora

3.Applications

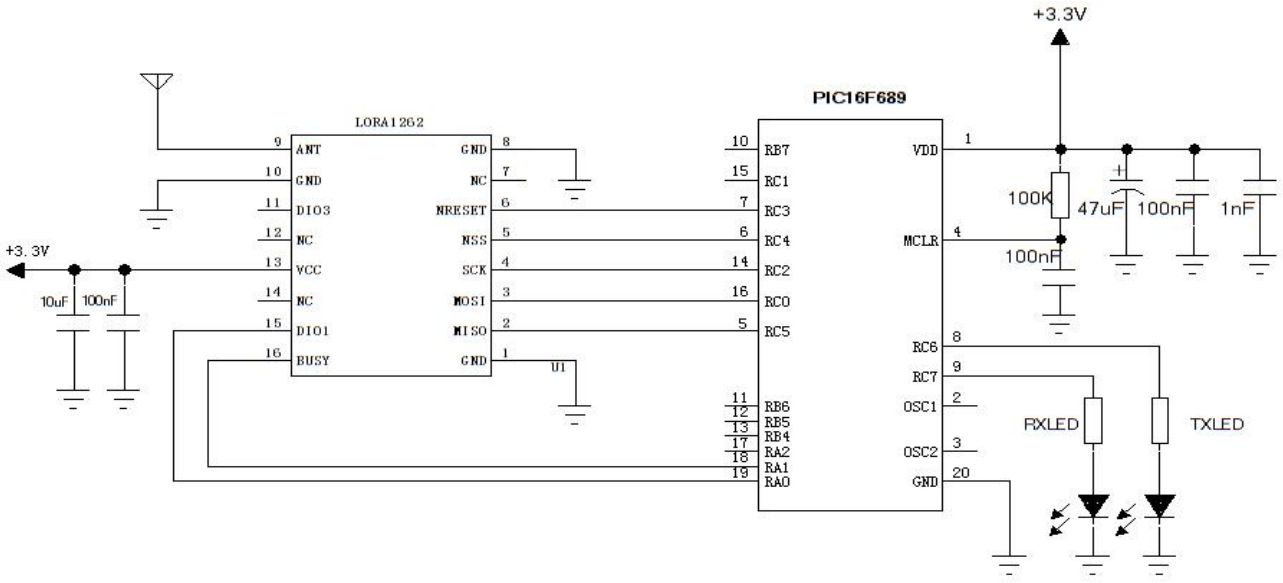
- Industrial meter reading
- Parking lot sensor management
- Industrial automation
- Agricultural sensor
- Smart city
- Remote control
- Street lights
- Logistics management
- Environmental sensor
- Health products
- Security products
- Warehouse management

4.Electrical Characteristics(@Vcc=3.3v ANT connected to 50 ohm load)

★Note: The default shipment is the TCXO crystal oscillator version. If needs, the ordinary crystal oscillator version can also be customized.

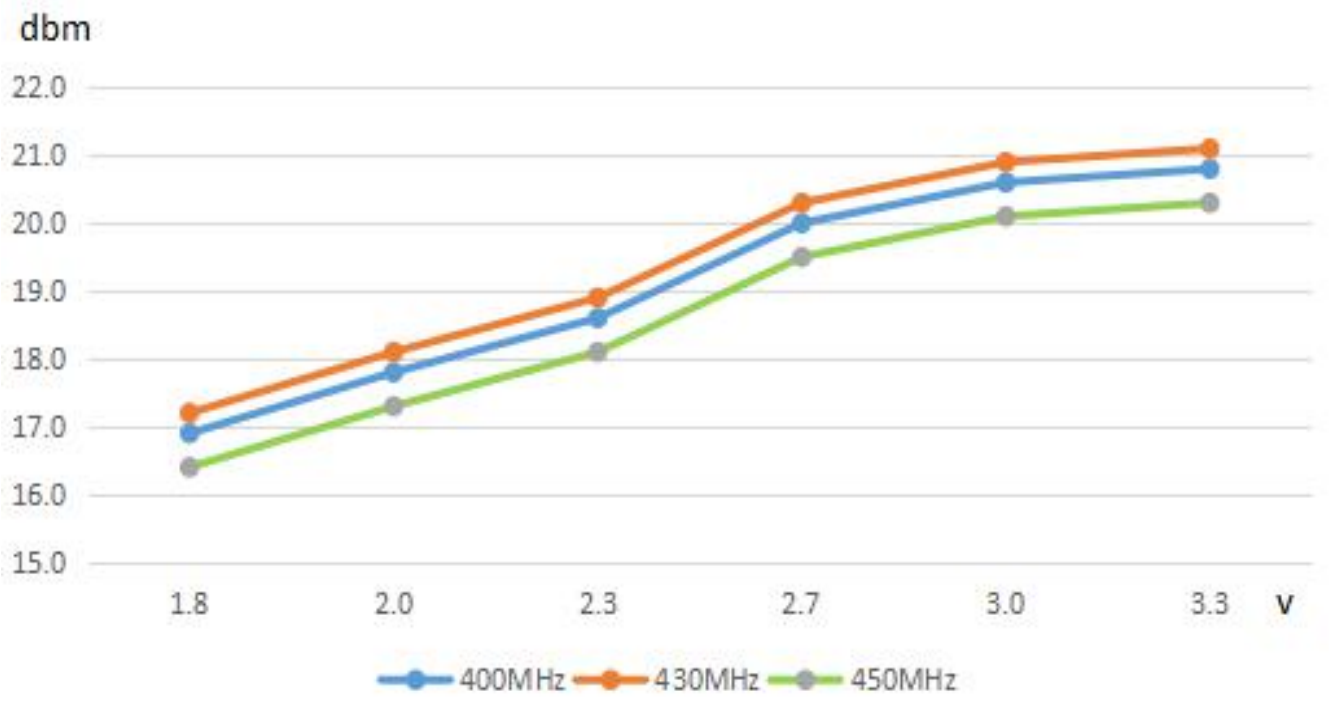
Parameter	Min.	Typ.	Max.	Unit	Condition
Operation Condition					
Working voltage	1.8	3.3	3.7	V	
Temperature range	-40	25	85	℃	
Current Consumption					
RX current		< 6.5		mA	@TCXO Crystal (default 2.8V, 1.8V optional)
		< 5		mA	@ crystal oscillator
TX current		< 130		mA	@868MHz @915MHz
		< 110		mA	@433MHz @490MHz
Sleep current		1.9		uA	OFF mode (SLEEP mode with cold start) All blocks off
		2.3		uA	SLEEP mode (SLEEP mode with warm start) Configuration retained
		2.9		uA	SLEEP mode (SLEEP mode with warm start) Configuration retained + RC64k
		0.56		mA	STDBY_RC mode ， RC13M, XOSC OFF
		2.35		mA	STDBY_XOSC mode ， XOSC ON
RF Parameter					
Frequency range	400	433	450	MHz	@433MHz
	470	490	510	MHz	@490MHz
	848	868	888	MHz	@868MHz
	900	915	940	MHz	@915MHz
Output power	-15	22		dBm	
Receiving sensitivity		-133		dBm	@Lora BW=125KHz_SF = 10_CR=4/5

5.Typical application circuit

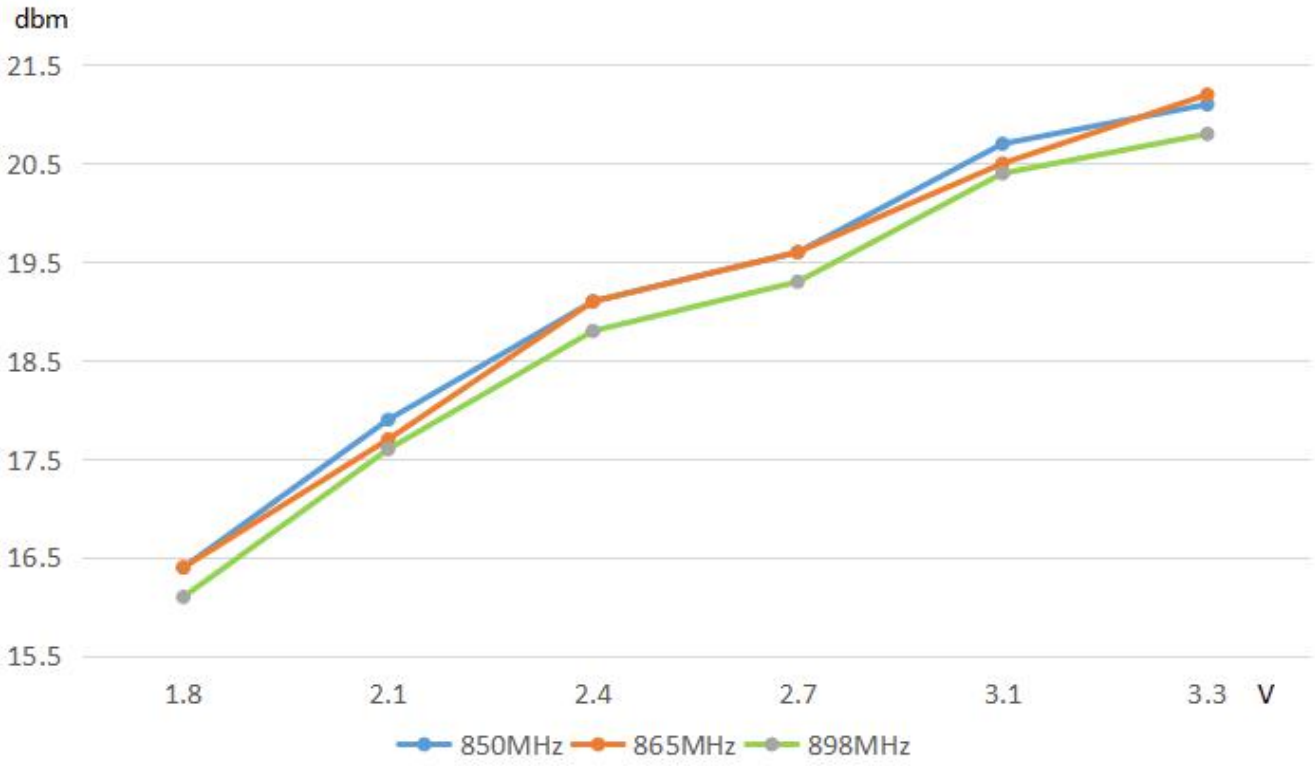


6.Module performance index

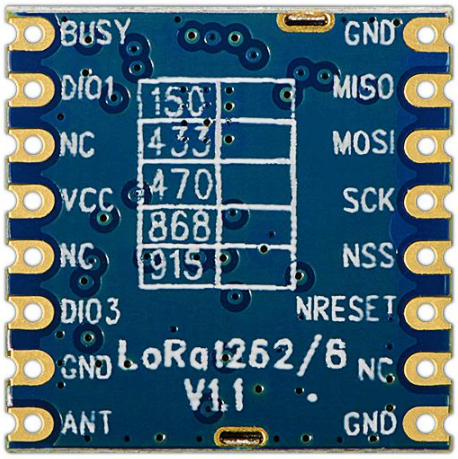
Frequency band	Power level	Current (mA)	Power (dBm)	Register value
LoRa1268 @ 433MHz @ 490MHz	9	98	21.2	22
	8	80	17.8	19
	7	64	14.2	16
	6	54	11.5	13
	5	44	8.7	10
	4	37	6.0	7
	3	32	3.0	4
	2	26	0	1
	1	22	-2.5	-2
	0	20	-5	-5



Frequency band	Power level	Current (mA)	Power (dBm)	Register value
LoRa1262 @ 868MHz @ 915MHz	9	123.5	21.2	22
	8	110.5	18.03	19
	7	102.2	14.67	16
	6	88.7	11.79	13
	5	74.2	9.15	10
	4	62.9	6.6	7
	3	53.6	3.5	4
	2	44.2	0.53	1
	1	36.8	-2.15	-2
	0	31.7	-4.8	-5



7.Pin definition



Pin NO.	Pin name	Description
1	GND	power ground
2	MISO	SPI Output for SPI data
3	MOSI	SPI Input for SPI data
4	SCK	Serial clock for SPI interface

5	NSS	SPI enable
6	NRESET	Reset input
7、12、14	NC	Empty
8	GND	power ground
9	ANT	Connect with 50 ohm coaxial antenna
10	GND	power ground
11	DIO3	Digital I/O
13	VCC	Connected power supply（default3.3V）
15	DIO1	Digital I/O
16	BUSY	Used for status indication, see datasheet for details.

8.Rate comparison table

SingnalBandWidth	SpreadingFactor	Sensitivity(dbm)	ActualBandRate(bps)
62.5kHz	SF=7	-126	2169
62.5kHz	SF=8	-129	1187
62.5kHz	SF=9	-132	656
62.5kHz	SF=10	-135	296
62.5kHz	SF=11	-137	164
62.5kHz	SF=12	-139	91
125kHz	SF=7	-123	4338
125kHz	SF=8	-126	2375
125kHz	SF=9	-129	1312
125kHz	SF=10	-132	733
125kHz	SF=11	-133	328
125kHz	SF=12	-136	183
250kHz	SF=7	-120	8676
250kHz	SF=8	-123	4750
250kHz	SF=9	-125	2624
250kHz	SF=10	-128	1466
250kHz	SF=11	-130	778
250kHz	SF=12	-133	366
500kHz	SF=7	-118	17353
500kHz	SF=8	-121	9501
500kHz	SF=9	-124	5249
500kHz	SF=10	-127	2932
500kHz	SF=11	-129	1557
500kHz	SF=12	-130	830

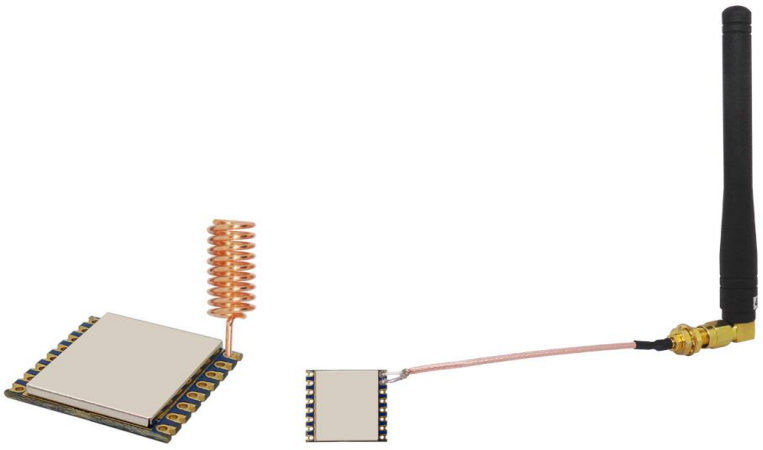
9.Pin comparison table

The package size of the LoRa1262 module and our LoRa1278/1276-C1 module are the same. The pin definitions of the two modules are compared as shown in the table below:

Module Pin	LoRa1278/1276-C1	LoRa1262/1268
1	GND	GND
2	MISO	MISO
3	MOSI	MOSI
4	SCK	SCK
5	NSS	NSS
6	NRESET	NRESET
7	DIO5	NC
8	GND	GND
9	ANT	ANT
10	GND	GND
11	DIO3	DIO3
12	DIO4	NC
13	VCC	VCC
14	DIO0	NC
15	DIO1	DIO1
16	DIO2	BUSY

10. Communication Antenna

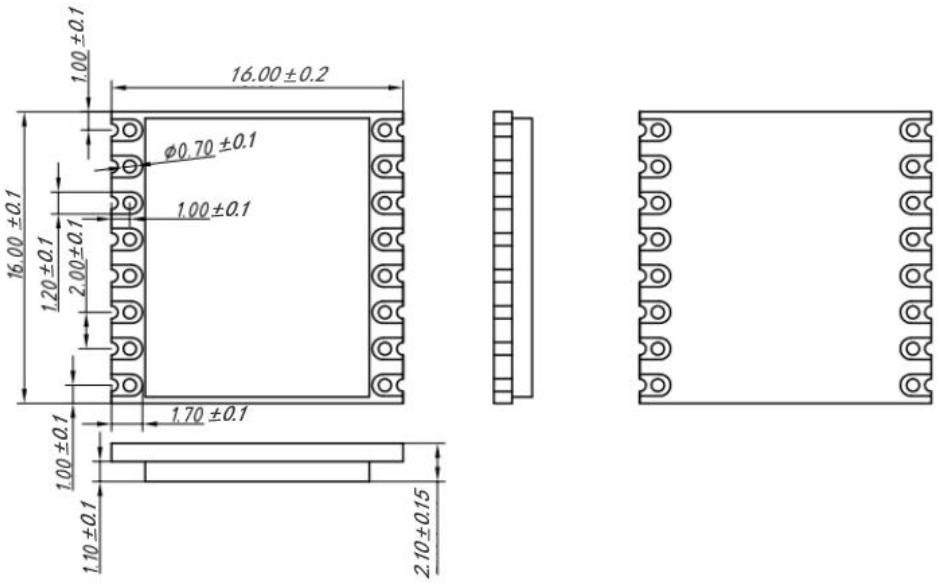
Antenna is very important for RF communication, its performance will affect the communication directly. Module needs antenna in 50ohm.SMA can also be used to transfer straight/elbow/folded rod. Users can order accordingly. To ensure module in the best performance, we suggest to use the our antenna.



★To ensure modules get the best performance, user must obey the following principles when using the antennas：

- Put the antenna away from the ground and obstacles as possible as you could；
- If you choose the sucker antenna, pull straight the lead wire as possible as it can be, the sucker under arches should be attached on the metal object.

11.Mechanical Dimensions(Unit:mm)



12.Product order information

For example: If the customer needs 868MHz Frequency, the order no. shall be LoRa1262-868.

Product Name	Description
LoRa1268-433	sx1268 chip. Working frequency 433MHz
LoRa1268-490	sx1268 chip. Working frequency 490MHz
LoRa1262-868	sx1262 chip. Working frequency 868MHz
LoRa1262-915	sx1262 chip., Working frequency 915MHz

13.Common problem

a) Why can't the normal communication between the modules?

1) The power connection is wrong and the module is not working normally;

2) Check whether the frequency bands of each module and other RF parameters are consistent;

3) Whether the module is damaged.

b) Why is the transmission distance not far?

1) The power supply ripple is too large;

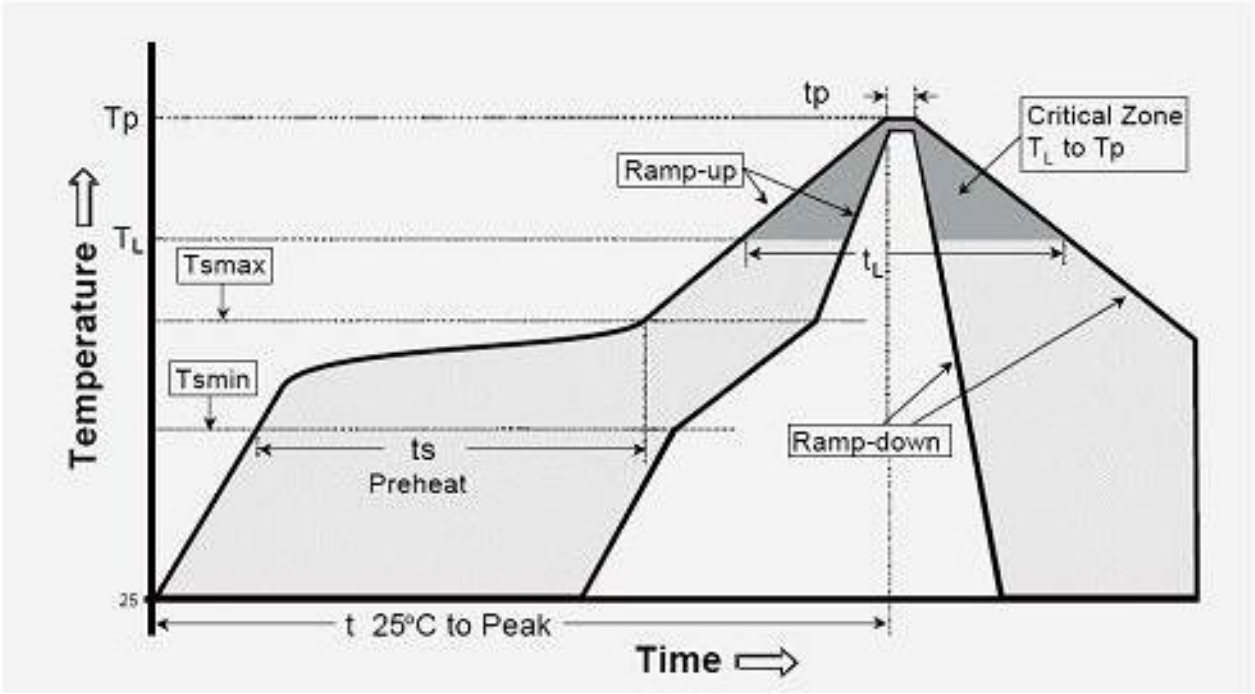
2) The antenna type is not matched or installed incorrectly;

3) Surrounding co-channel interference;

4) The surrounding environment is harsh and there are strong interference sources.

Appendix 1:SMD Reflow Chart

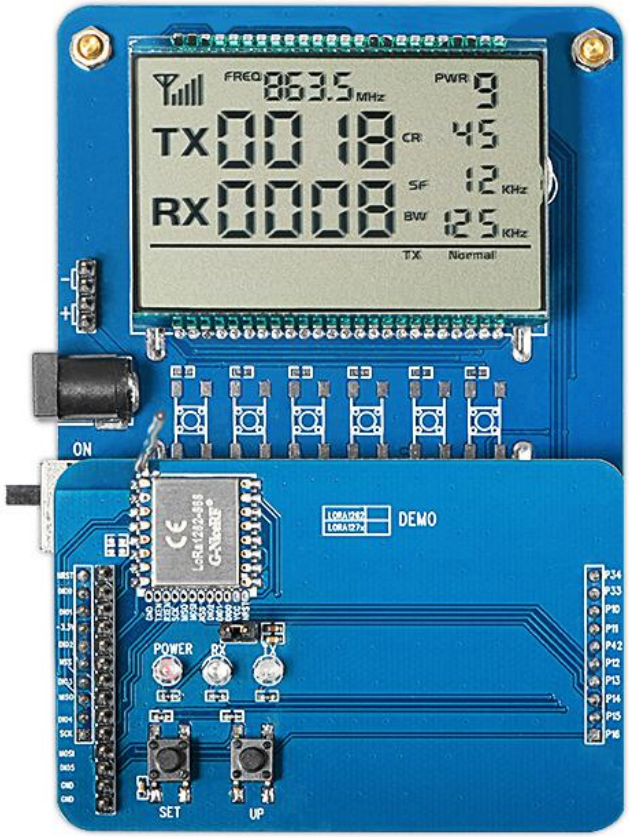
We recommend you should obey the IPC related standards in setting the reflow profile:



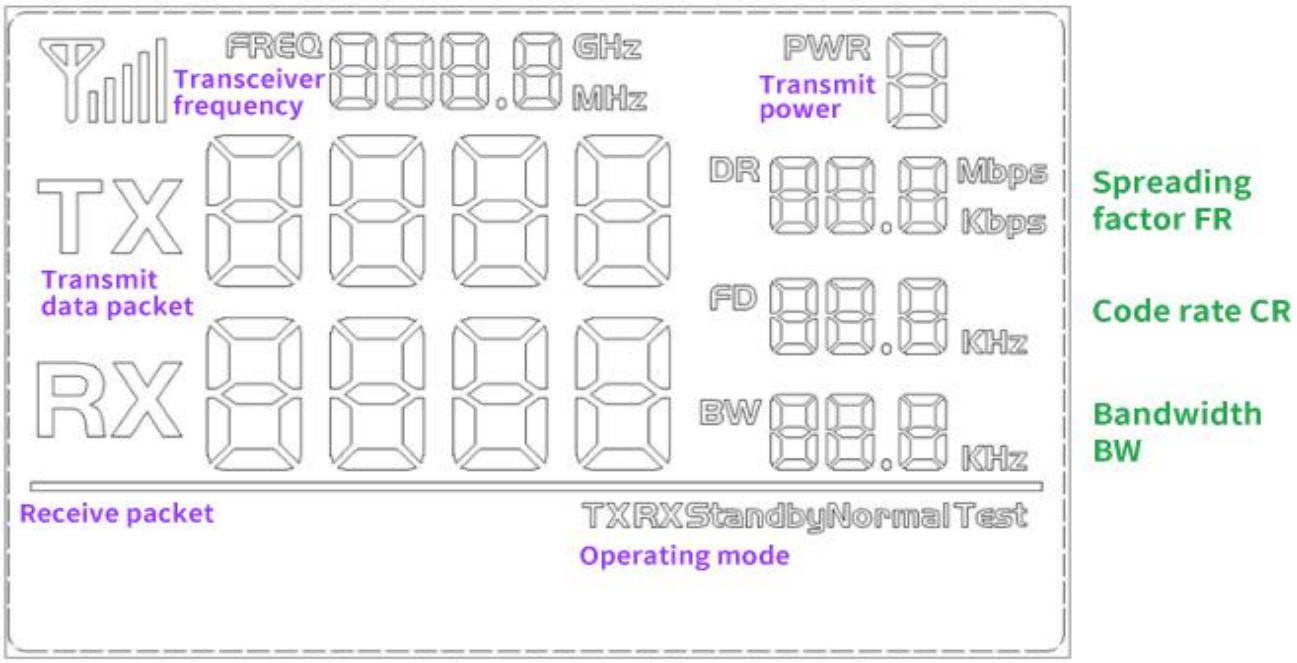
IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering	big size components (thickness >=2.5mm)
The ramp-up rate (Tl to Tp)	3℃/s (max.)
preheat temperature - Temperature minimum (Tsmin) - Temperature maximum (Tsmax) - preheat time (ts)	 150℃ 200℃ 60~180s
Average ramp-up rate(Tsmax to Tp)	3℃/s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

Appendix 2:Demo Board

The module is equipped with a standard DEMO board for customer to debug the program and test distance. The power supply voltage range: 3.3V~6.0V. It shows as below:



The LCD Full Segment is as below:



The users can set the parameters of the RF module such as frequency /transmitter power / transmission data rate through the buttons.

➢ Working Mode

1) Tx normal mode: send data packets regularly (in the setting mode, data packets will not be sent temporarily);

2) Rx normal mode: Power on and enter the receiving state, receive data packets, and then send out the correctly received data packets;

3) Tx Test Mode: RF module continuously transmit signal;

4) Rx Test Mode: RF module is always in Rx mode;

5) Standby Mode: RF module is always in standby state.

➢ Button Operation

1) [SET] Button

Press the key to enter the setting mode. If the last parameter is set, the key will exit the setting mode.

2) UP /Down Button

In setting mode,press to modify the corresponding setting parameters.

Note: The DEMO board has FLASH memory inside, all the setting parameters will behave automatically and keep unchanged even power-off.