Product Specification

LoRa1276

LoRa1278

Catalogue

Note: Revision History

Revision	Date	Comment
V1.0	2015-4-2	First release
V1.1	2016-4-26	Add some content
V2.0	2016-8-6	PCB update v2.0, add electrostatic protection, delete antenna switch control
V2.1	2017-1-20	Footprint update
V2.2	2018-12-14	Update PIN definition
V3.0	2020-11	Modify part of the description

1.Overview

LoRa127X integrates Semtech RF transceiver chip SX1276/SX1278, which adopts LoRa Spread Spectrum modulation frequency hopping technique. Its communication distance and receiving sensitivity are much better than the current FSK and GFSK modulation. Multi-signal won't affect each other even in crowd frequency environment; it comes with strong anti-interference performance. This module antenna switch is integrated and controlled by the chip. Its compact size is matched with an output power of 100mw. It can be widely used in wireless meter reading, remote industrial control and other industries.

Module	Chip	Frequency Band	Support customized frequency range	Certification
Lora1278	sx1278	433/490 MHz	Customizable137-525 MHz	—
Lora1276-868	sx1276	868 MHz	Customizable137-1020MHz	—
Lora1276-915	sx1276	915 MHz	Customizable137-1020MHz	FCC

LoRa127X comply with lead-free craft in production and testing and meets RoHS and Reach standards. LoRa1276-915 has obtained FCC certification

Note: There are two versions of this module, V1.1 and V2.0, please select the version you need when ordering.

PCB version	Antenna switch control method	ESD protection	Hardware parts	Software part
V1.1	Module TXEN, RXEN pin control	no	Pin size All compatible	Except for the antenna switch control part, All other programs are compatible
V2.0	Integrated control inside the chip	Have		

2.Features

- Frequency Range：433/490/868/915 MHz（Customizable137-1020 MHz）
- Sensitivity：-139dBm @Lora
- Maximum output power：20 dBm
- Low receiving current：10.8 mA
- Sleep current: 1uA
- Data transfer rate：1.2-300 Kbps @FSK 0.018-37.5 Kbps @Lora

- Lora、FSK、GFSK Modulation mode
- Built-in ESD Protection
- 127dB Dynamic Range RSSI
- 256 bytes FiFo&CRC
- Frequency hopping function
- Built-in temperature sensor and low battery indicator
- Operating Temperature Range：-40 ~ +85 °C

3.Applications

- Remote meter reading
- Toys control
- Health monitoring
- Industrial control
- Sensor network
- Wireless PC peripherals
- Home automation remote sens
- Tire pressure monitoring

4.Electrical Characteristics

Parameter	Min.	Typ.	Max.	Unit	Condition
Operation Condition					
Working voltage	1.8	3.3	3.7	V	
Temperature range	-40		85	℃	
Current Consumption					
RX current		10.8		mA	
TX current		120		mA	@20dBm
Sleep current		1		uA	
RF Parameter					
Frequency range	403	433	463	MHz	@433MHz
	470	490	510	MHz	@490MHz
	848	868	888	MHz	@868MHz
	900	915	940	MHz	@915MHz
Data rate	1.2		300	Kbps	FSK
	0.018		37.5	Kbps	Lora
Output power	-1		20	dBm	
Receiving sensitivity		-123		dBm	@FSK data=1.2kbps, Fdev=10kHz
		-139		dBm	@Lora BW=125KHz_SF = 12_CR=4/5

Note: According to the design of the module, the maximum bit of register 0x09 must be set as 1. PaSelect must be set 1; PaSelect must be set 1 to ensure that the PA of the module is in the open state and work at the maximum power.

| RegPaConfig (0x09)	7	PaSelect	rw	0x00	Selects PA output pin 0 → RFO pin. Output power is limited to +14 dBm. 1 → PA_BOOST pin. Output power is limited to +20 dBm
	6-4	MaxPower	rw	0x04	Select max output power: Pmax=10.8+0.6*MaxPower [dBm]
	3-0	OutputPower	rw	0x0f	Pout=Pmax-(15-OutputPower) if PaSelect = 0 (RFO pin) Pout=17-(15-OutputPower) if PaSelect = 1 (PA_BOOST pin)

5.Typical application circuit
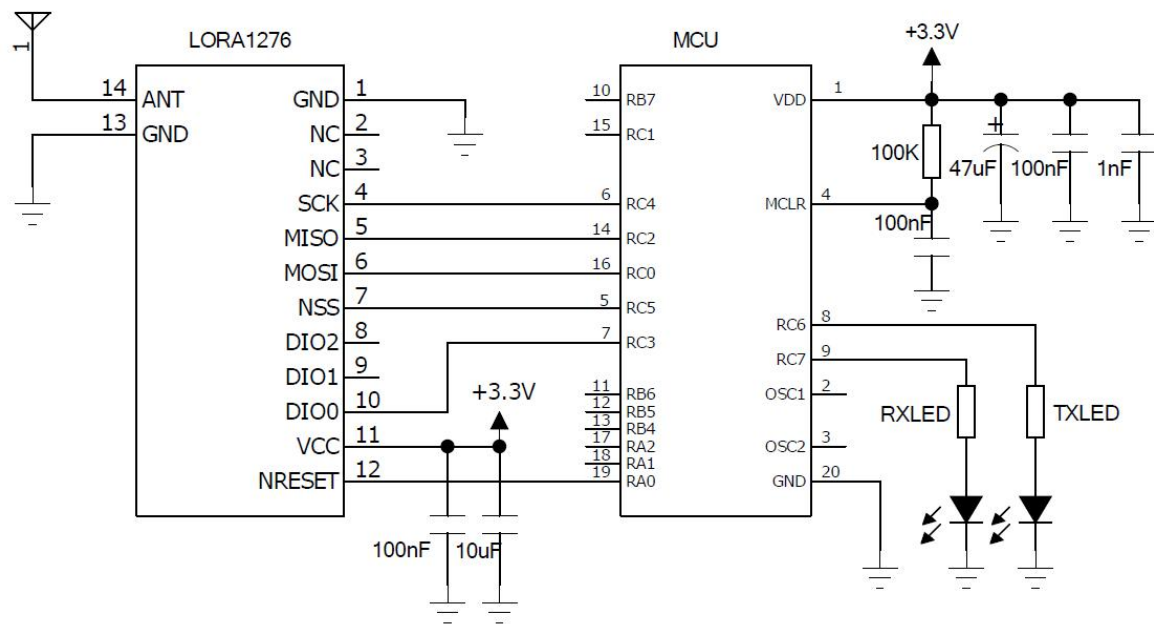
Note: If you purchase a 2.0 version module, there is no TXEN, RXEN and other antenna control pins.

6.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

7.Pin definition
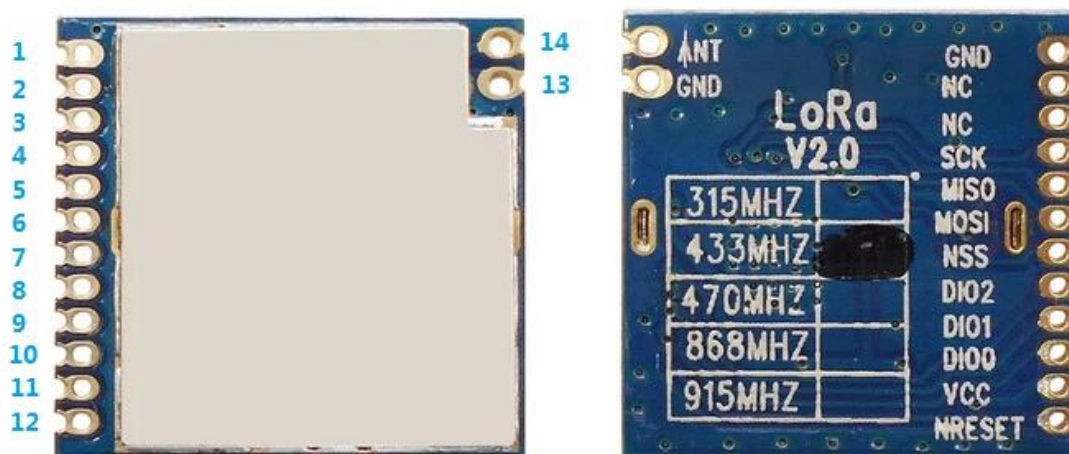
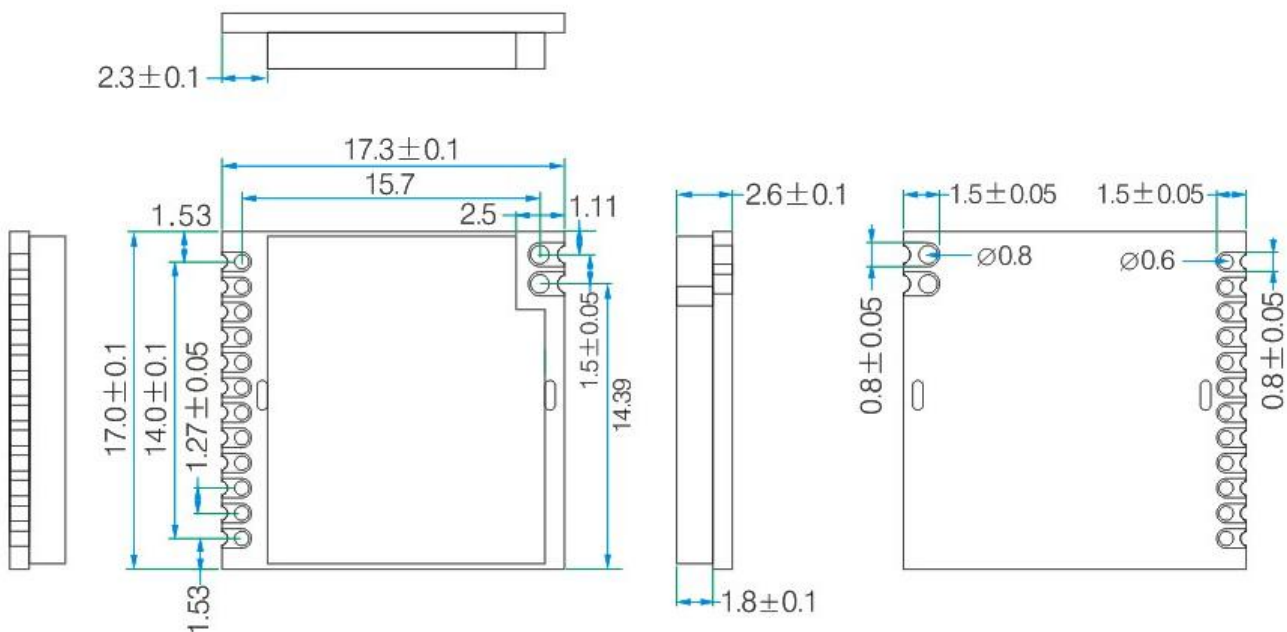| Pin NO.	Pin name	Description
1	GND	power ground
2	NC	Empty
3	NC	Empty
4	SCK	Serial clock for SPI interface
5	MISO	SPI Output for SPI data
6	MOSI	SPI Input for SPI data
7	NSS	SPI enable
8	DIO2	Digital I/O, customizable
9	DIO1	Digital I/O, customizable
10	DIO0	Digital I/O, customizable
11	VCC	Connected power supply（default 3.3V）
12	NRESET	Reset input
13	GND	power ground
14	ANT	Connect with 50 ohm coaxial antenna

8.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.
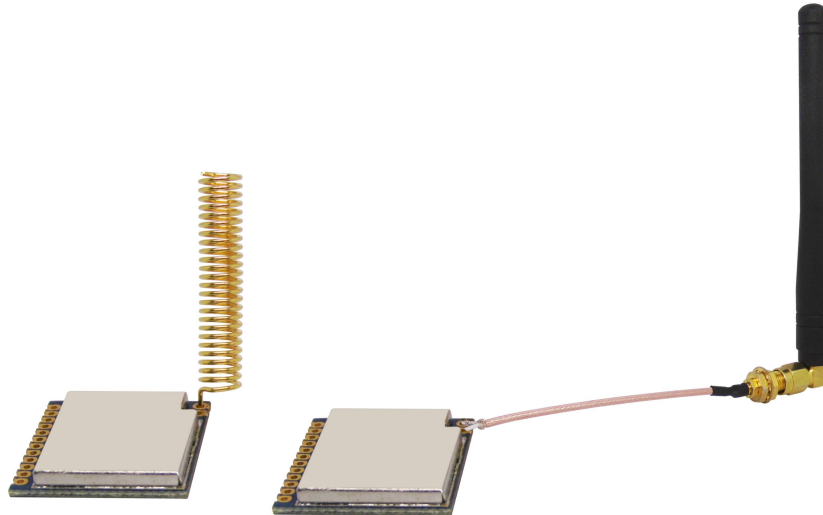
★To ensure modules get the best performance, user must obey the following principles when using the antennas：

➢   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.

9.Mechanical Dimensions（Unit:mm）

10.Product order information

<u>LoRa1278-433</u>

Module model   Frequency

For example: If the customer needs 490MHz Frequency, the order no. shall be LoRa1278-490.

Currently LORA products have the following models:

Product Name	Description
LoRa1278-433	The working center frequency band of the module is 433MHz
LoRa1278-490	The working center frequency band of the module is 490MHz
LoRa1276-868	The working center frequency band of the module is 868MHz
LoRa1276-915	The working center frequency band of the module is 915MHz

11.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:
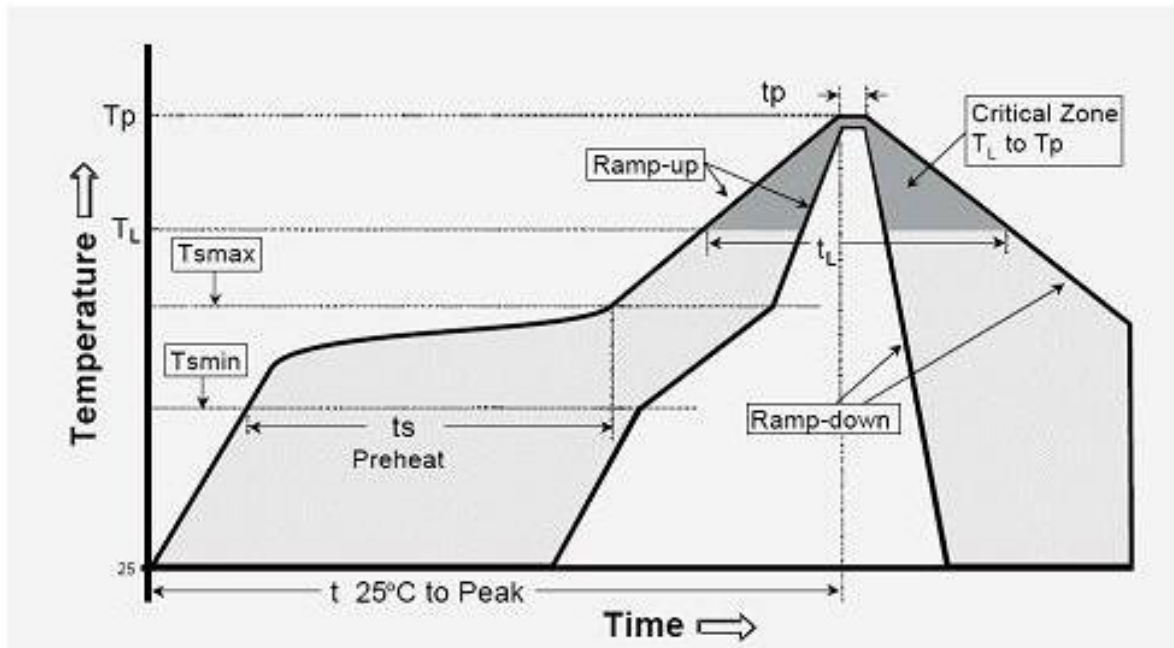

IPC/JEDEC J-STD-020B the condition for lead-free reflow soldering	big size components (thickness >=2.5mm)
The ramp-up rate (Tl to Tp)	3℃/s (max.)
preheat temperature	
– Temperature minimum (Tsmin)	150℃
– Temperature maximum (Tsmax)	200℃
– preheat time (ts)	60~180s
Average ramp-up rate(Tsmax to Tp)	3℃/s (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:
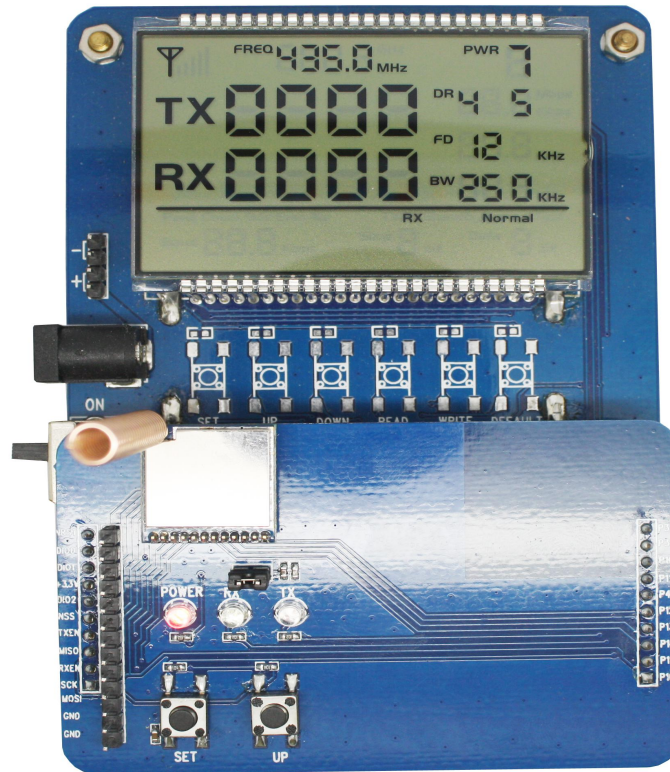
The LCD Full Segment is as below:
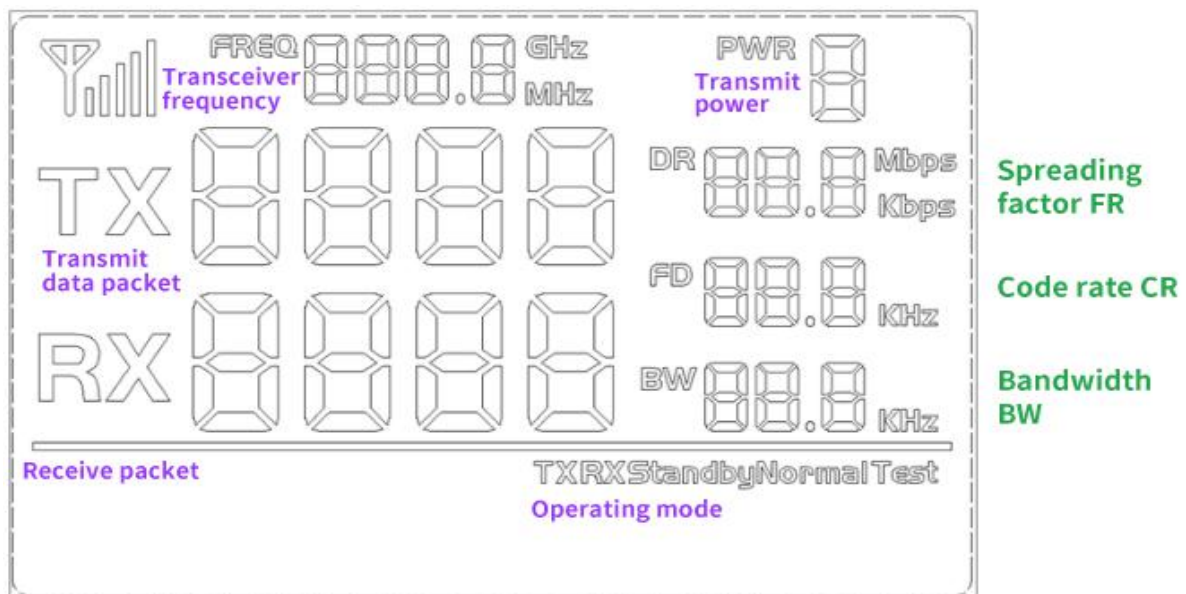
The users can set the parameters of the RF module such as frequency /transmitter power / transmission data rate through the buttons.

➢ **Working Mode:**

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

2) Rx normal mode: Power on and enter the receive 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.