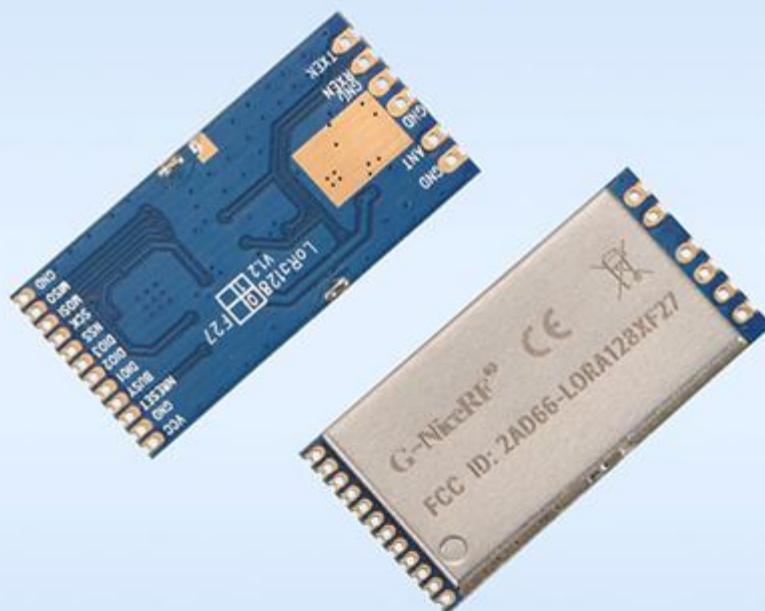


500mW Long distance

2.4GHz LoRa spread spectrum

TCXO Industrial grade

## Product Specification



## Catalogue

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### Note: Revision History

Revision	Date	Comment
V1.0	2018-11-14	First release
V1.1	2019-11	Update picture
V2.0	2020-11	Update description and Format

## 1.Overview

There are three types of modules in LoRa128XF27 series: LoRa1280F27-TCXO, LoRa1280F27 and LoRa1281F27. Users can choose one of them according to their practical application, the specific differences are as follows:

Module type	Built-in chip	Crystal	Certification
Lora1280F27-TCXO	SX1280	0.5ppm industrial grade TCXO temperature	—
Lora1280F27	SX1280	10ppm industrial grade crystal oscillator	CE & FCC
Lora1281F27	SX1281	10ppm industrial grade crystal oscillator	CE & FCC

LoRa128XF27 strictly uses lead-free process for production and testing, and meets RoHS and Reach standards. And Lora1280F27 and Lora1281F27 have obtained CE and FCC certification.

This series of modules are designed based on the original sx1280/sx1281 RF chip from Semtech, and the matching of the PA circuit makes the output power of the module up to 500mW(+27dBm). In addition, the LoRa1280F27-TCXO module is also equipped with an industrial-grade high-precision TCXO temperature-compensated crystal oscillator, which guarantees stable frequency output under harsh environments such as high and low temperature. The high penetration performance of the 2.4GHz frequency band combined with the LoRa modulation enables the module to have high receiving sensitivity and environmental anti-interference ability. The whole series of modules are widely used in applications requiring long-distance 2.4GHz transmission.

## 2.Features

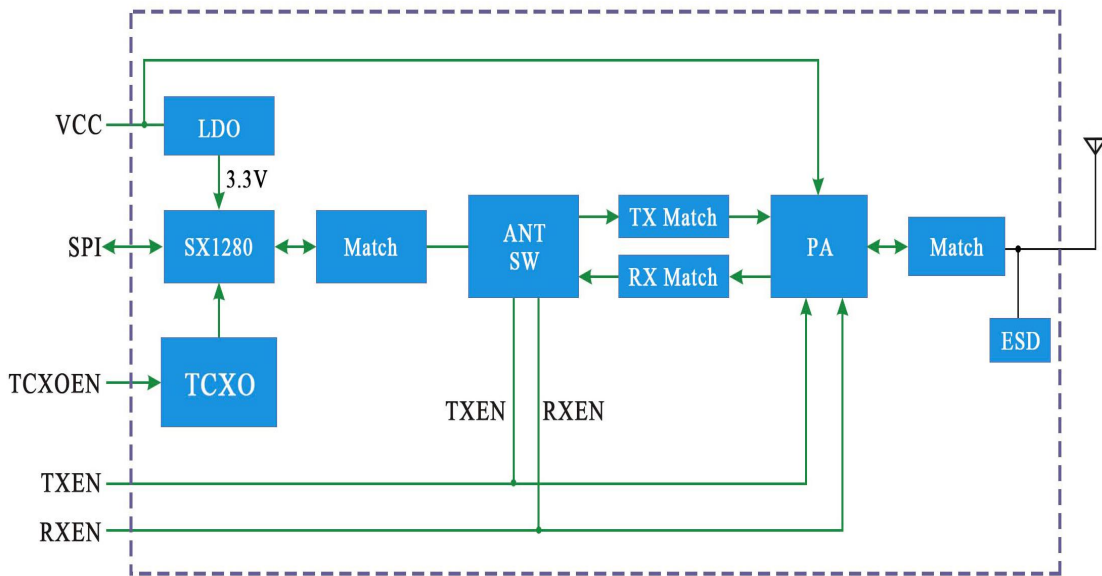
- Operating frequency range: 2400-2500MHz
- Maximum output power: 500mW (27.0dBm)
- Sensitivity : 132dBm@LoRa
- Data transfer rate: 0.476-202Kbps@LoRa
- LoRa modulation
- Built-in LNA
- High precision crystal oscillator (0.5ppm TCXO/10ppm)
- Packet communication mode (receiving FiFo 256 bytes)
- Operating voltage range: 2.0-5.5V
- Operating temperature range: -40~+85 °C

### 3.Applications

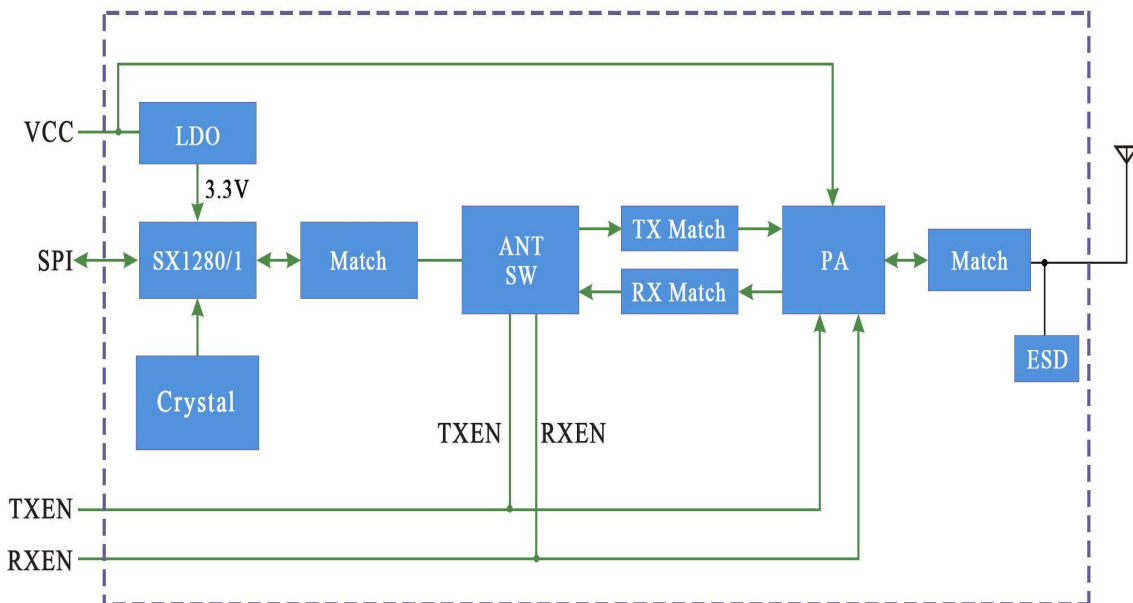
- Wireless remote
- Smart home
- Tag reader
- Toy control
- Tire pressure monitoring
- Health monitoring

### 4.Internal block diagram

➤ The internal block diagram of LoRa1280F27-TCXO is as follows:



➤ The internal block diagram of LoRa1280F27 and LoRa1281F27 is as follows:



## 5. Electrical Characteristics

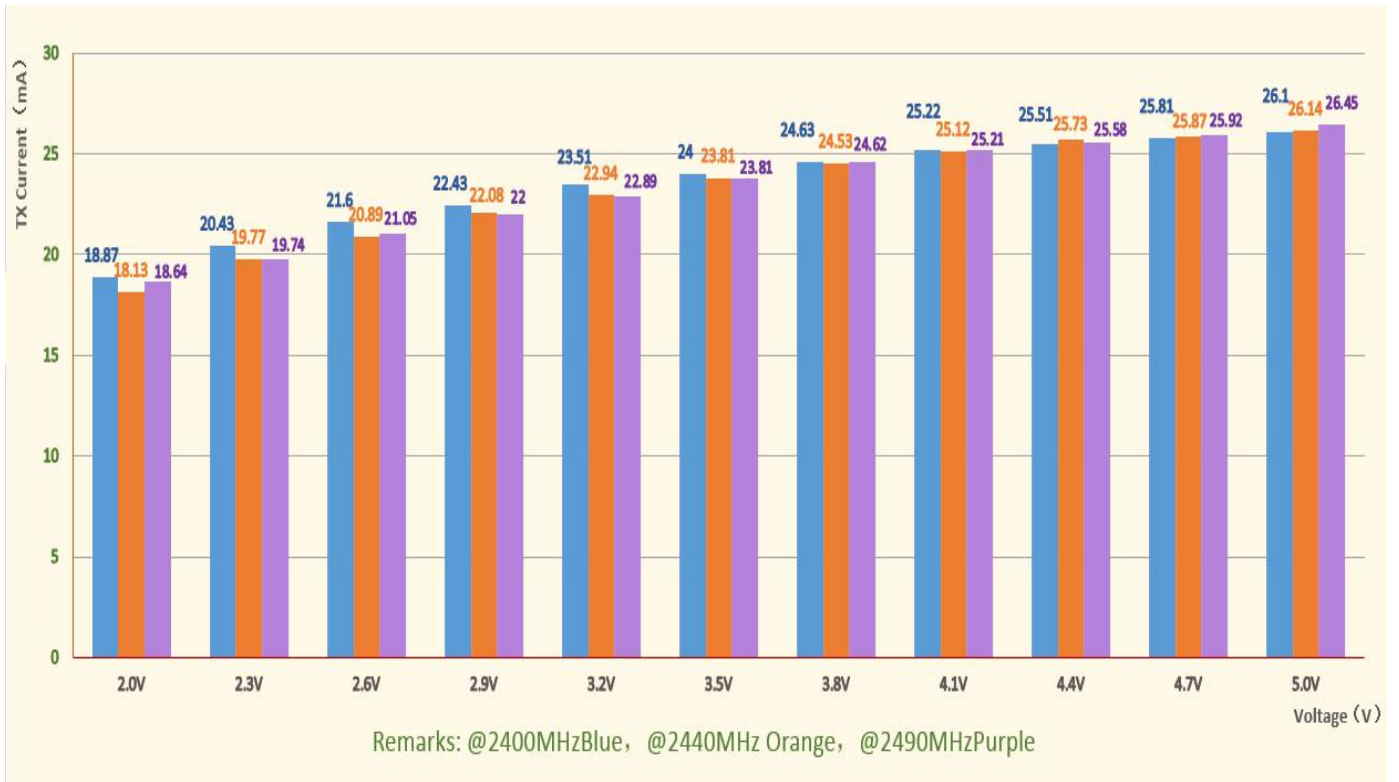
★ The following parameters are obtained by connecting the instrument with a 50 ohm copper axis: @VCC=5 V.

Parameter	Min.	Typ.	Max.	Unit	Condition
Operation Condition					
Working voltage	2	5	5.5	V	
Temperature range	-40		85	°C	
Current Consumption					
TX current		< 600		mA	@Vcc=5V, 27dBm
RX current		< 17		mA	@Ordinary crystal
		< 19		mA	@TCXO
Sleep current		<7		uA	
RF Parameter					
Frequency range	2400		2500	MHz	
Data rate	0.476		202	Kbps	@LoRa
	260		1300	Kbps	@FLRC
	125		2000	Kbps	@FSK
Output power	1		27	dBm	
Maximum Output power	26	26.5	27	dBm	@VCC=5V
Receiving sensitivity		-132		dBm	LoRa@0.476Kbps

★ The following data is tested with DEMO board which under 2440MHz working frequency

Power level	Output power(dBm)	Current (mA)	Register value
9	26.4	520	13
8	25.5	426	10
7	23.4	343	7
6	20.85	268	4
5	18.26	229	1
4	15.2	182	-2
3	12.3	155	-5
2	9.3	138	-8
1	6.0	130	-12
0	3.0	125	-15

➤ The power data with different frequencies and voltages are shown in the figure below:



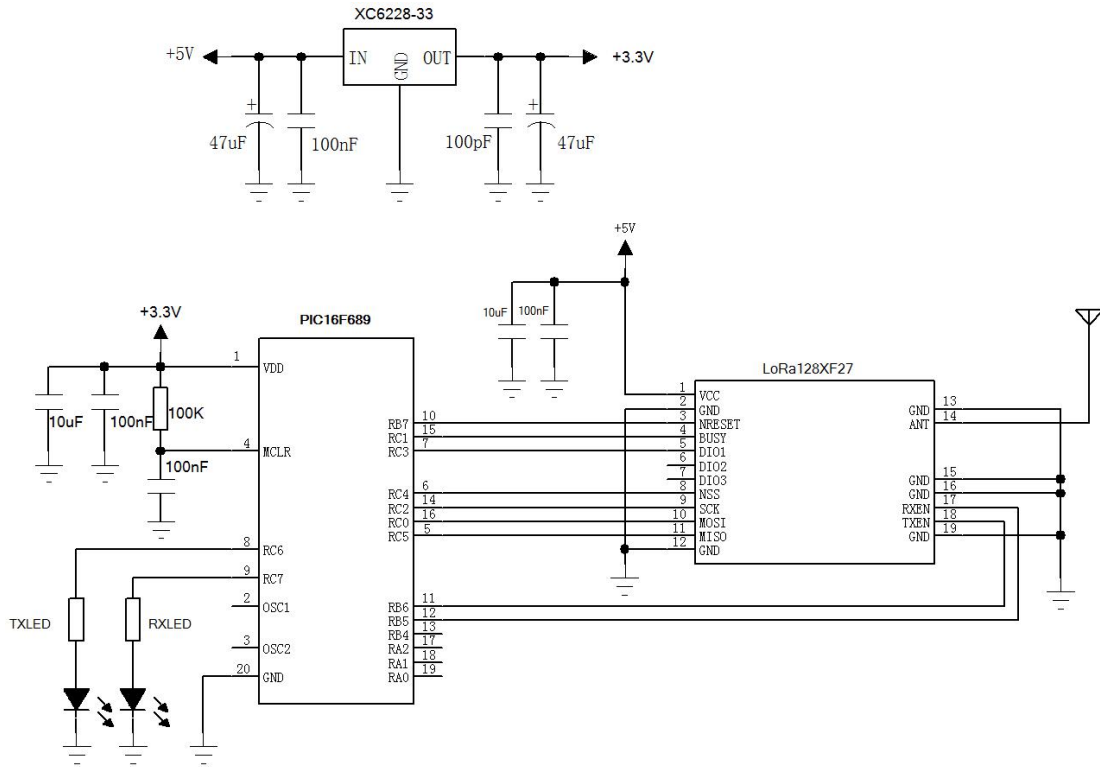
➤ The corresponding crystal frequency deviation data at different temperatures and frequencies are shown in the figure below:

@ Ordinary crystal

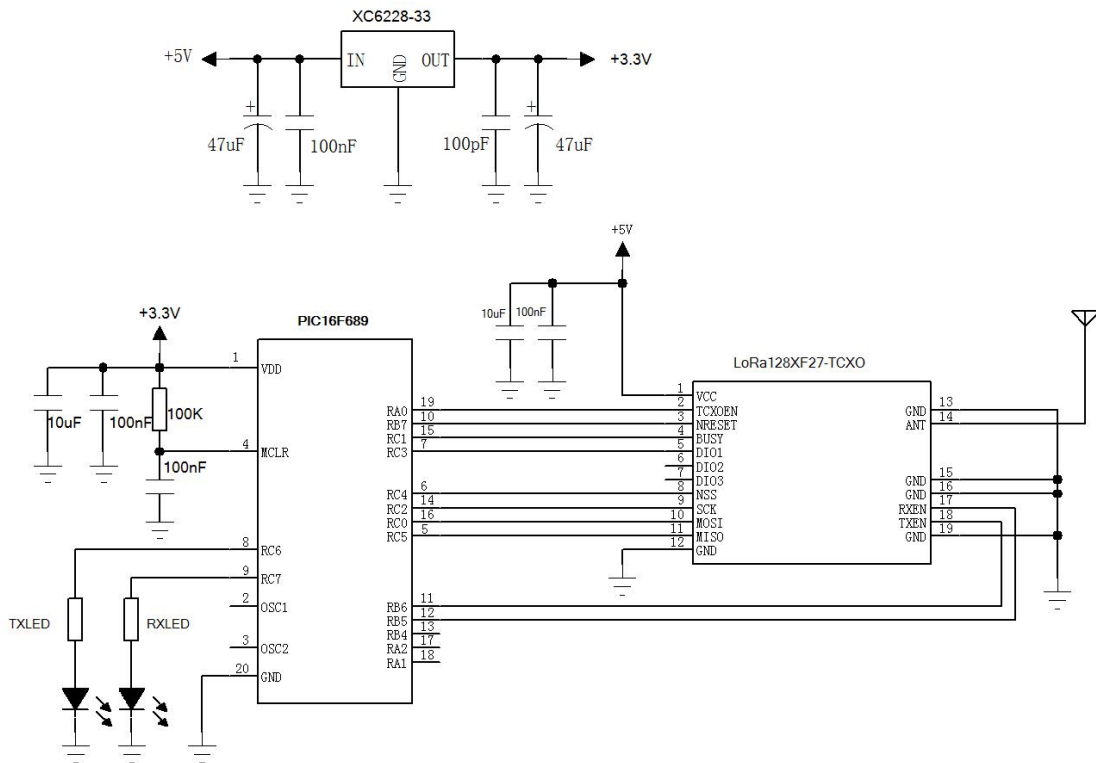


6. Typical application circuit

Lora128XF27



Lora128XF27-TCXO



## 7.Pin definition



**Note: When the power supply is 5V, the high level of all IO is 3.3V**

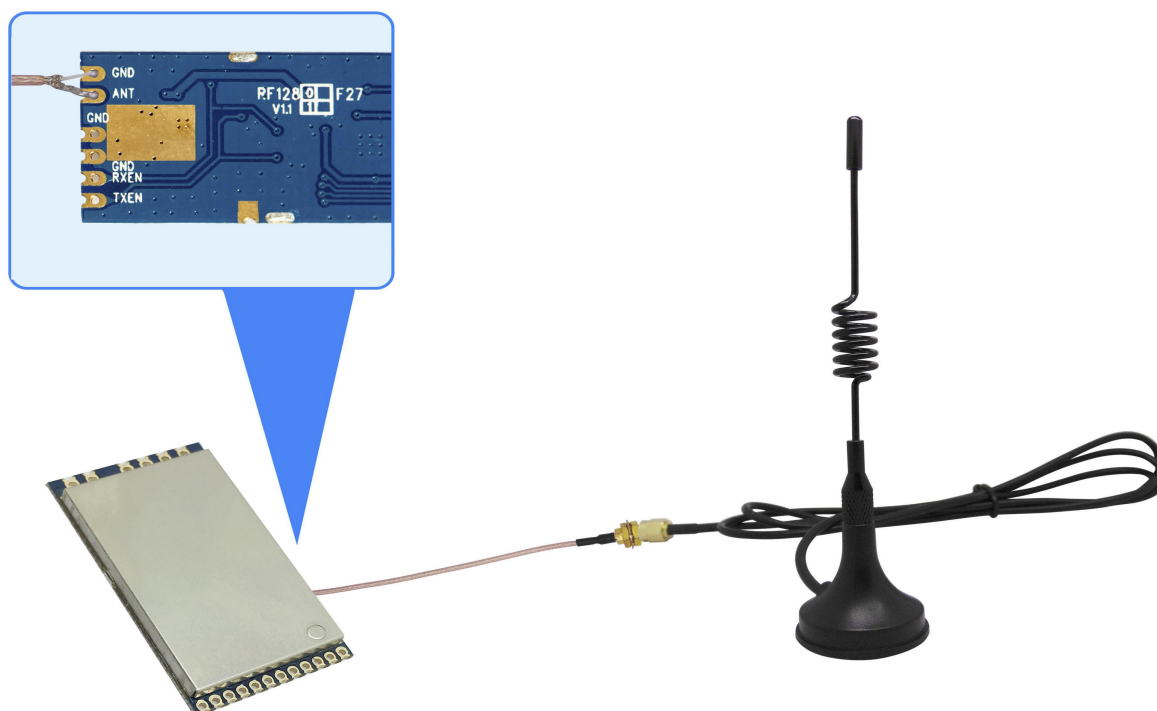
Pin NO	Pin name	I/O	Level standard	Description
1	VCC	-	2.0-5.5v	Connected to the positive pole of the power supply
Note: In Lora1280F27-TCXO module, PIN 2 is TCXOEN				
2	GND	-		Power ground
Note: In Lora1280F27-TCXO module, PIN 2 is TCXOEN				
2	TCXOEN	I	2.0-3.3V	Turn on TCXO: Pull up TCXOEN before controlling SX1280 to reset; Delay at least 3ms to wait for the TCXO startup to complete; 3. During the use of the 1280 module, TCXOEN must always maintain a high level; Turn off TCXO (if the module needs to enter sleep mode): Call the SetSleep() function to make the module enter the sleep mode; Delay at least 1ms to wait for the completion of module sleep; Pull down TCXOEN to turn off TCXO;
3	NRESET	I	0-3.3V	Chip reset trigger pin, active low
4	BUSY	O	0-3.3V	Status indicator pin (see SX1280/1281 specification for details)
5	DIO1	O	0-3.3V	Directly connected to the chip pin, configurable general-purpose IO (see the chip SX1280/1281 specification for details)
6	DIO2	O	0-3.3V	Directly connected to the chip pin, configurable general-purpose IO (see the chip SX1280/1281 specification for details)
7	DIO3	O	0-3.3V	Directly connected to the chip pin, configurable general-purpose IO (see the chip SX1280/1281 specification for details)
8	NSS	I	0-3.3V	Module chip select pin
9	SCK	I	0-3.3V	SPI clock input pin
10	MOSI	I	0-3.3V	SPI data input pin
11	MISO	O	0-3.3V	SPI data output pin
12,15,16	GND	-	-	Connected to the negative pole
13	TXEN	I	0-3.3V	Transmission control pin (high level when transmitting, low level when receiving)
14	RXEN	I	0-3.3V	Receive control pin (high level when receiving, low level when transmitting)
17	ANT	-	-	Connect with 50 ohm coaxial antenna
18	GND	-	-	Connected to the negative pole



## 8.Communication Antenna

The antenna is an important part of the communication system. Its performance directly affects the parameters of the communication system. The antenna impedance required by the module is 50 ohms.

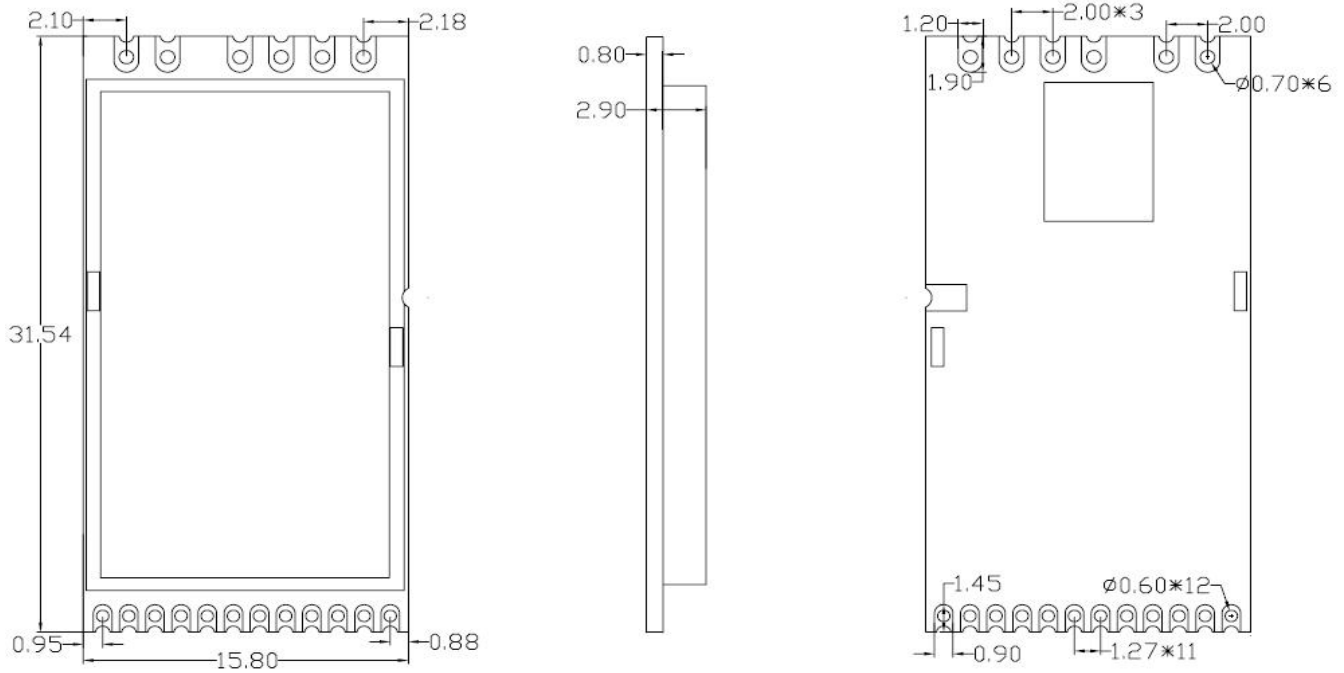
The universal antenna has wires and spring antenna, and can also be used for SMA adapter straight/elbow/folding rods, small suction cups, etc. Users can purchase antennas according to their own application environment. In order to make the module work optimally, it is recommended to use the antenna from our company.



★ The following principles should be followed during antenna use to ensure the best communication distance of the module:

- The antenna should not be close to the ground surface, and the surrounding area should be kept away from obstacles;
- If the suck antenna is purchased, the lead wire should be straightened as much as possible, and the base should be attached to the metal object;

**9. Mechanical Dimensions (Unit: mm)**

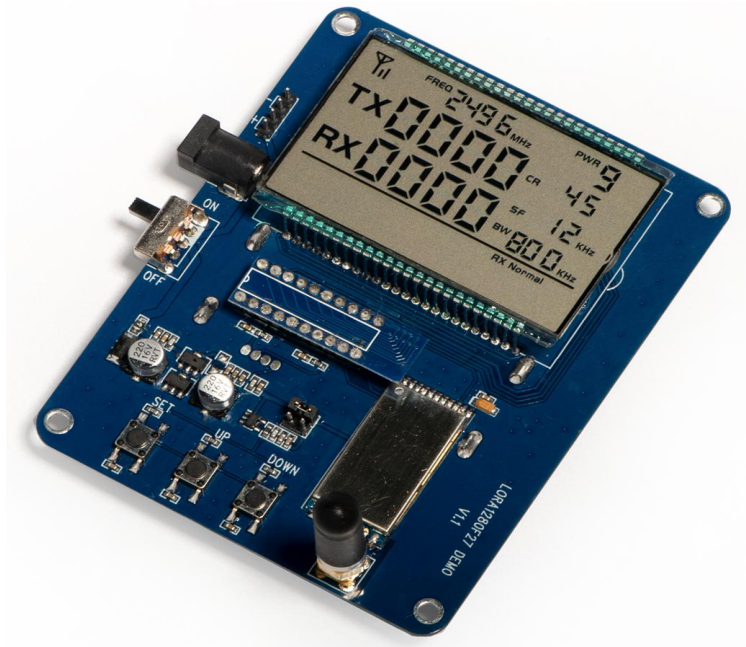


**10. Product order information**

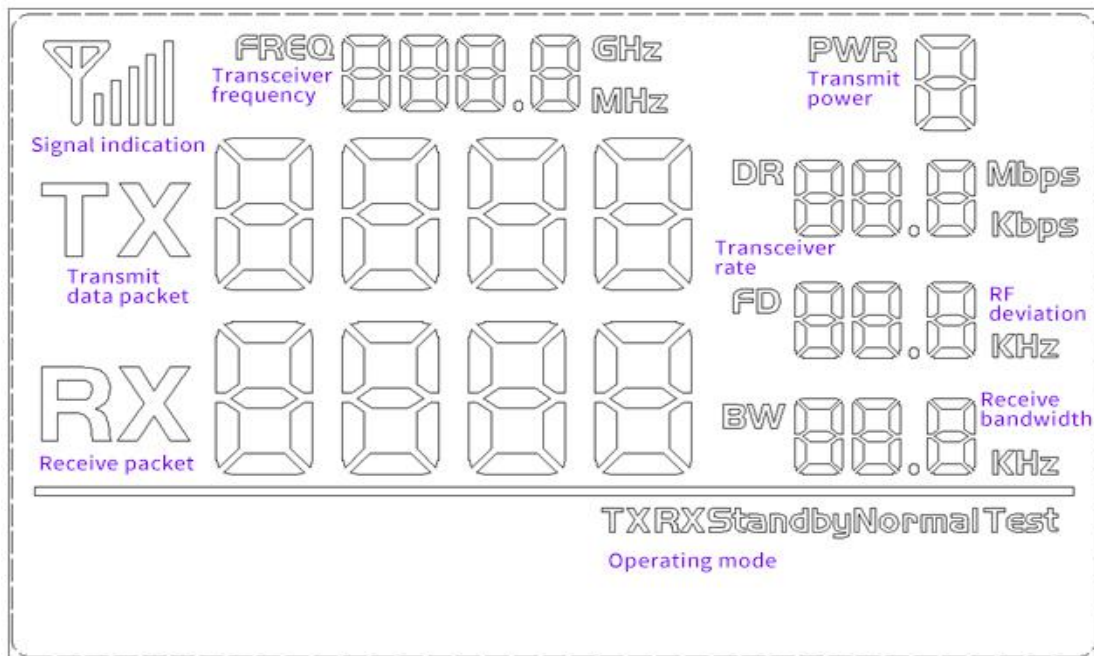
Order type	product type
Lora1280F27-TCXO	sx1280chip, 0.5ppm TCXO Temperature compensated crystal
Lora1280F27	sx1280chip, 10ppm Industrial grade crystal oscillator
Lora1281F27	sx1281chip, 10ppm Industrial grade crystal oscillator

### Appendix 1: Demo Board

The module is equipped with a standard DEMO board for customer to debug the program and test distance. It shows as below:



The LCD Full Segment is as below:



Users can set the parameters of the RF module such as working mode /frequency / transmitter power / transmission data rate through the buttons, and measure the wireless communication distance.

**➤ Working Mode:**

- 1) Normal transmission mode: Send data packets at regular intervals (in the setup mode, no data packets are sent temporarily);
- 2) Normal receiving mode: power-on enters the receiving state, receives the data packet, and re-issues the correctly received data packet;
- 3) Normal transmission mode: the module is in the normal state;
- 4) Constant acceptance mode: the module is in the normal receiving state (no data is forwarded);
- 5) Sleep mode: The RF module is in the standby state.

**➤ Button Operation:**

## 1) [SET] Button

Press the [SET] button to enter into setting mode; Or press the [SET] button to be out of the setting mode upon the last parameter is done.

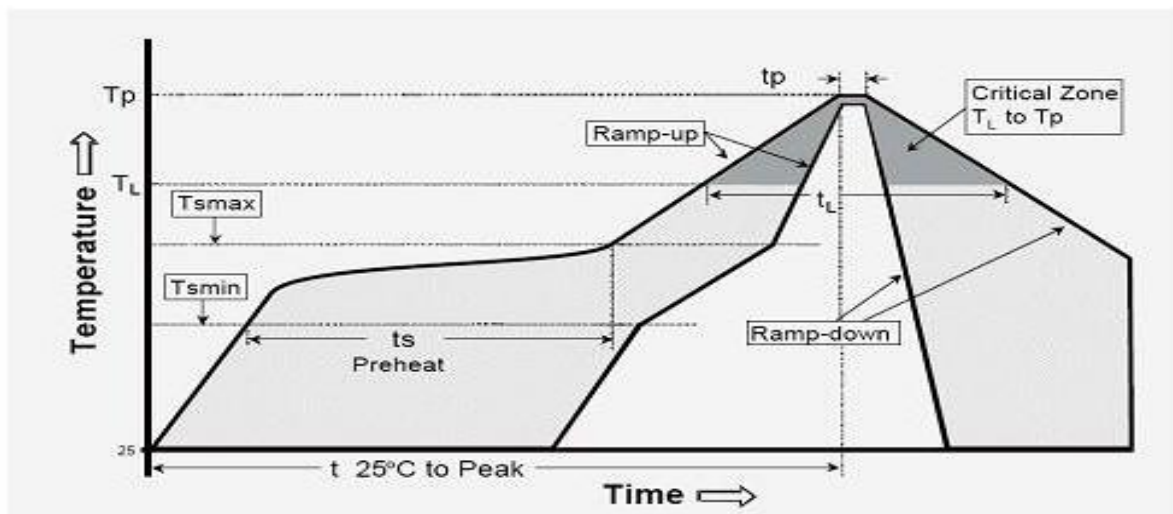
## 2) [UP/Down] Button

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

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

**Appendix 2: 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 $\geq 2.5\text{mm}$ )
The ramp-up rate (Tl to Tp)	3°C/s (max.)
preheat temperature	
- Temperature minimum (T <sub>smin</sub> )	150°C
- Temperature maximum (T <sub>smax</sub> )	200°C
- preheat time (t <sub>s</sub> )	60~180s
Average ramp-up rate(T <sub>smax</sub> to T <sub>p</sub> )	3°C/s (Max.)
- Liquidous temperature(T <sub>L</sub> )	217°C
- Time at liquidous(t <sub>L</sub> )	60~150 second
peak temperature(T <sub>p</sub> )	245+/-5°C