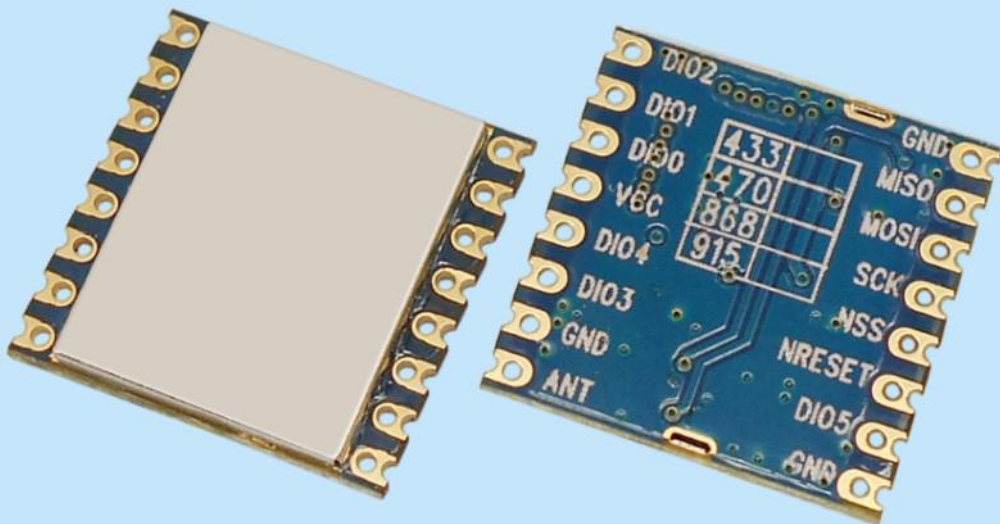


100mW Long Range Spread Spectrum Modulation
Wireless Transceiver Module

Product Specification



Catalogue

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Note: Revision History

Revision	Date	Comment
V1.0	2017-3	First release
V1.1	2017-06	Logo updated

1. Overview

LoRa1278-C1 integrates Semtech RF transceiver chip SX1278, which adopts LoRa TM Spread Spectrum modulation frequency hopping technique. The features of long distance and high sensitivity (-139 dBm) make this module perform better than FSK and GFSK module. Multi-signal won't affect each other even in crowd frequency environment; it comes with strong anti-interference performance. This module is 100mW and ultra small size, widely used in AMR,remote industrial control filed.

2. Features

- Frequency Range: 433/490 MHz (137~525MHz)
- Sensitivity up to -139dBm @Lora
- Maximum output power: 20 dBm
- 13mA@receiver mode
- Sleep current <200 nA
- Data transfer rate: @FSK,1.2-300 Kbps
- @Lora TM, 0.018-37.5 Kbps
- Lora TM, FSK, GFSK & OOK Modulation mode
- Built-in ESD Protection
- 127 dB Dynamic Range RSSI
- Packet engine up to 256 bytes with FIFO and CRC
- Hopping frequency
- Built-in temperature sensor and low battery indicator
- Excellent blocking immunity
- Operating Temperature Range: -40 ~ + 85 °C

3. Applications

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

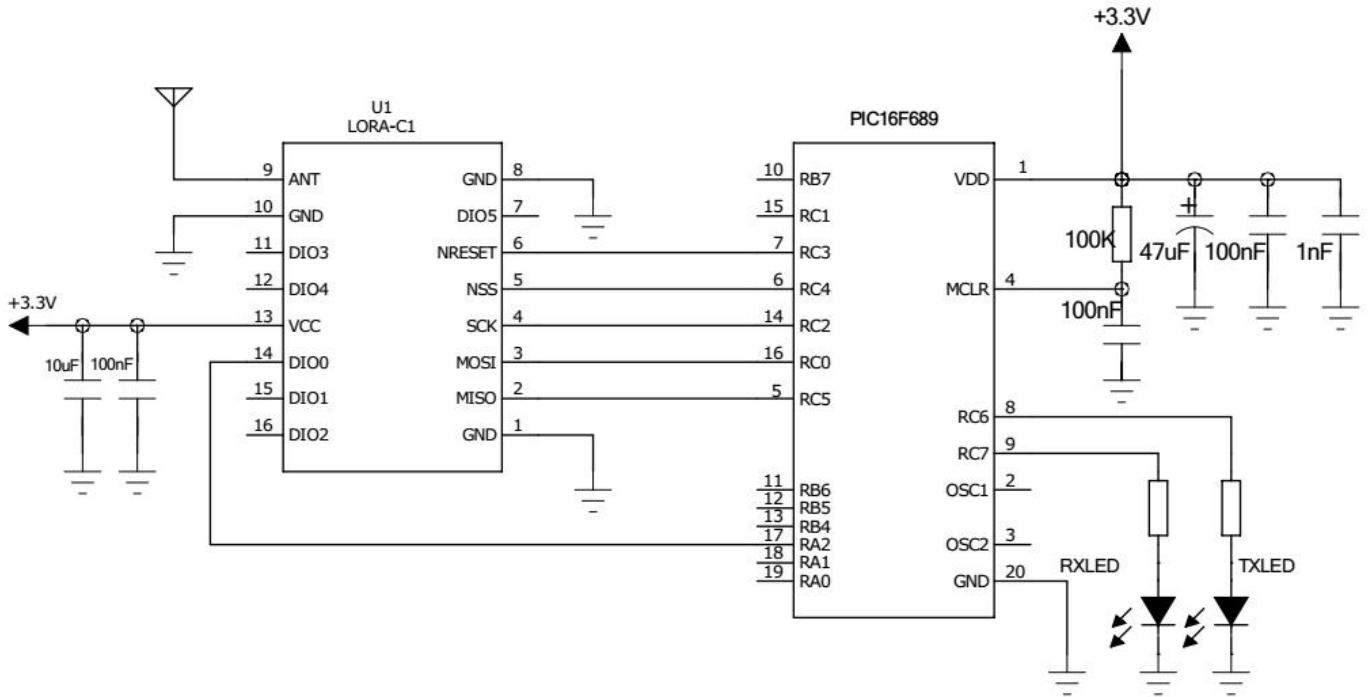
4. Electrical Characteristics

Parameter	Min	Typ.	Max.	Unit	Condition
Operation condition					
Working voltage	1.8	3.3	3.7	V	
Temperature range	-40		85	°C	
Current consumption					
RX current		10.8		mA	
TX current		120		mA	@20dBm
Sleep current		<0.2		uA	
RF parameter					
Frequency range	403	433	463	MHZ	@433MHZ
	470	490	510	MHZ	@490MHZ
Modulation rate	1.2		300	Kbps	FSK
	0.018		37.5	Kbps	LoraTM
Output power range	-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;

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: $P_{max}=10.8+0.6*MaxPower$ [dBm]
	3-0	OutputPower	rw	0x0f	$P_{out}=P_{max}-(15-OutputPower)$ if PaSelect = 0 (RFO pin) $P_{out}=17-(15-OutputPower)$ if PaSelect = 1 (PA_BOOST pin)

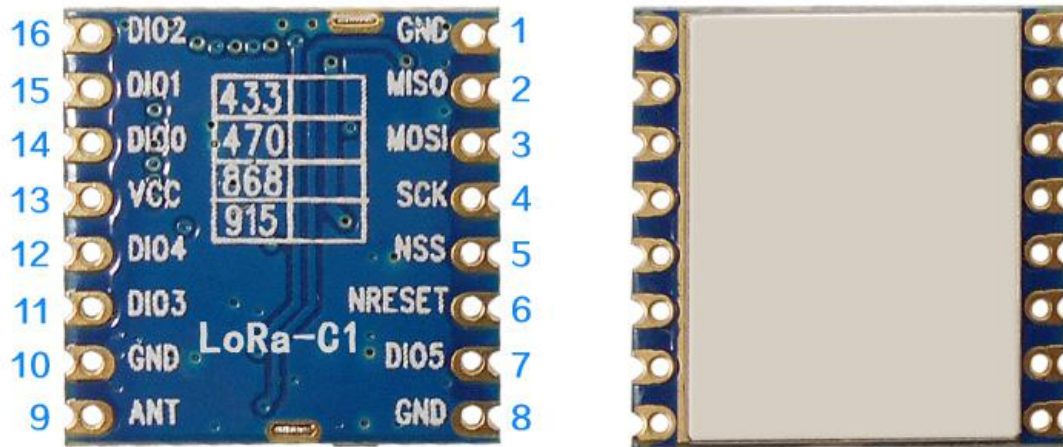
5. Schematic



6. Speed rate correlation table

SingnalBandWidth	SpreadingFactor	Sensitivity(dbm)	ActualBandRate(pbs)
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

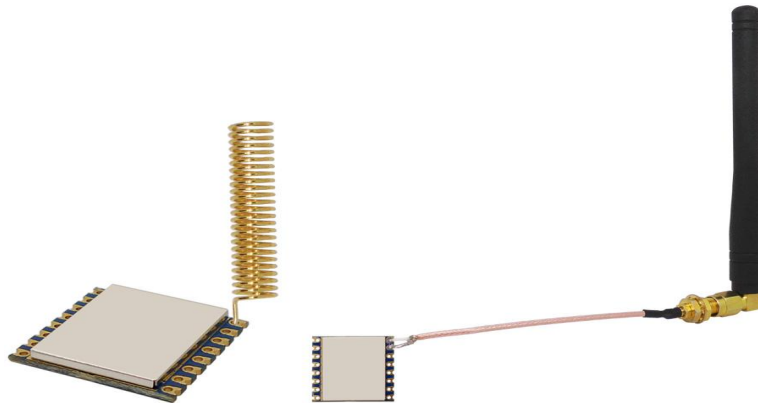


Pin NO.	Pin name	Description
1	GND	Power ground
2	MISO	SPI Output for SPI data
3	MOSI	SPI Input for SPI data
4	SCK	Serial clock for SPI interface
5	NSS	SPI enable
6	NRESET	Reset input
7	DIO5	Digital I/O
8	GND	Power ground
9	ANT	Connect with 50 ohm coaxial antenna
10	GND	Power ground
11	DIO3	Digital I/O
12	DIO4	Digital I/O
13	VCC	Power supply (default 3.3V)
14	DIO0	Digital I/O
15	DIO1	Digital I/O
16	DIO2	Digital I/O

8. Accessories

1)Antenna

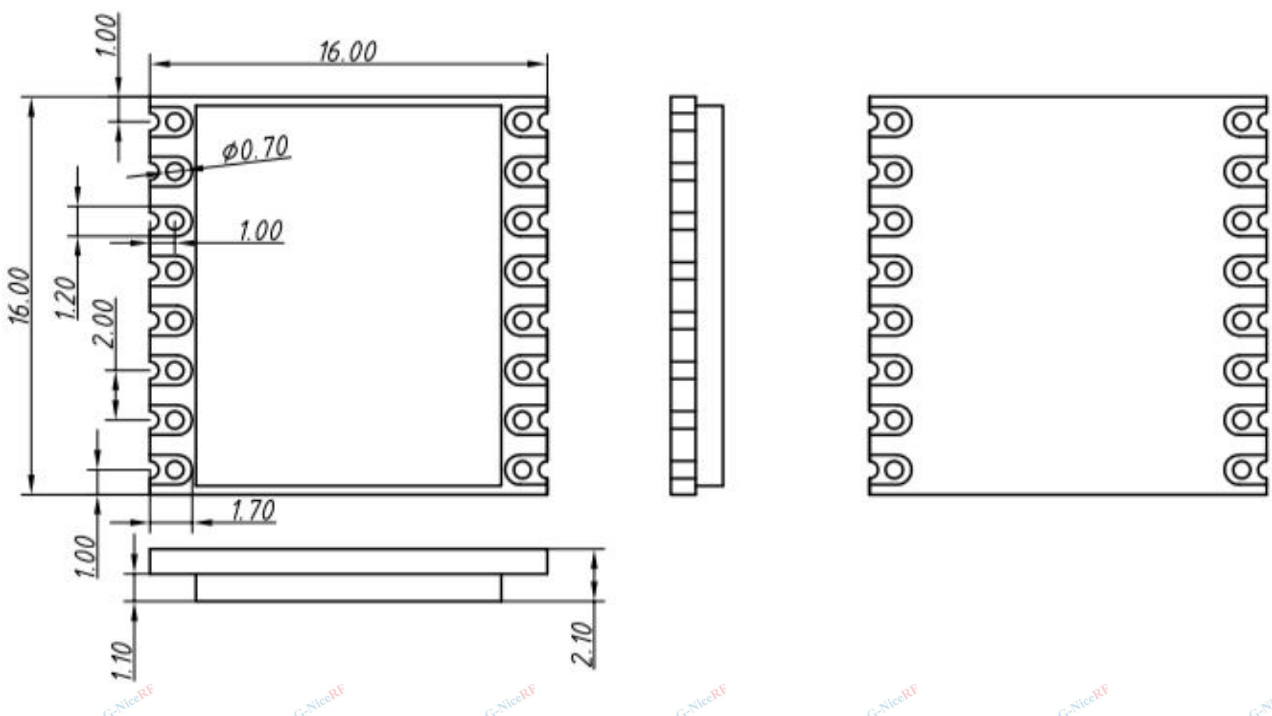
antenna is very important for RF communication, its performance will affect the communication directly. Module needs antenna in 50ohm. Common antenna has rubber straight/ elbow/ foldable rod and sucker antenna and etc. Users can order accordingly. To ensure module in the best performance, we suggest 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. Order information

LoRa1278-C1-433

Product name

Frequency

For example: If the customer needs 433MHz Frequency, the order no. shall be LoRa1278-C1-433.

Here are the product types:

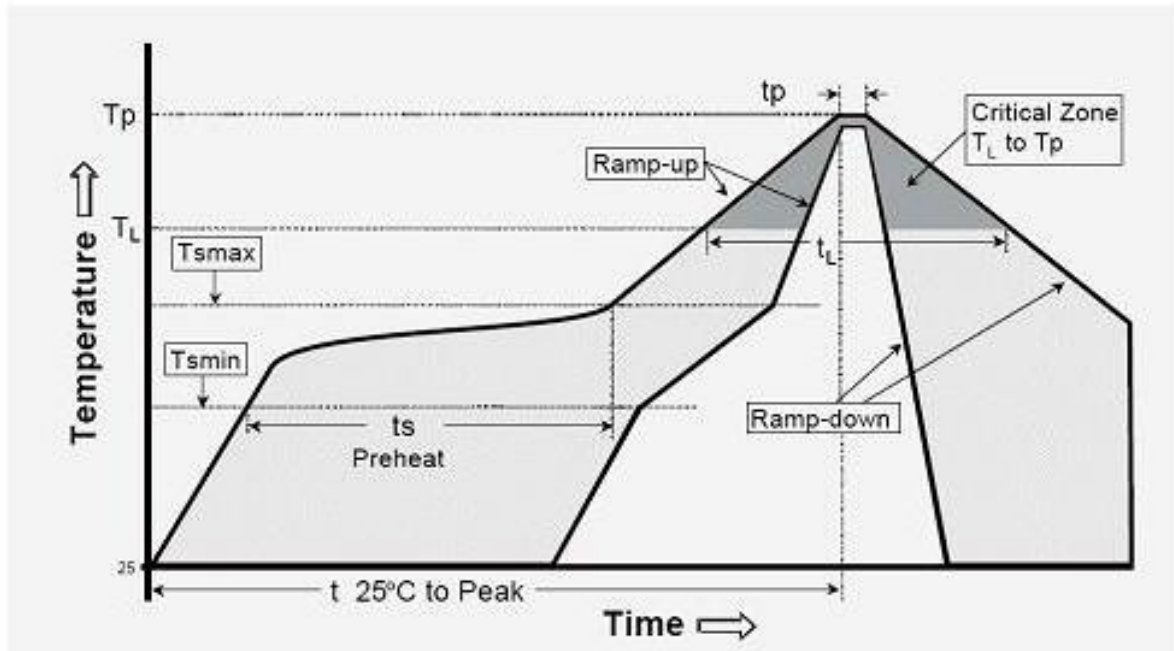
Product Name	Description
LoRa1278-C1-433	SX1278 chip, Working frequency 433MHz
LoRa1278-C1-490	SX1278 chip, Working frequency 490MHz

11. FAQ:

- a) Why module can not communicate properly?
 - 1) Check if the band, channel, rate, NET ID has set to the same;
 - 2) Check if there is power connection error;
 - 3) Check if the module is enabled (CS high);
 - 4) Check if the antenna connection is not correct;
 - 5) Check if the module is damaged.
- b) Why transmission distance is not far as it should be?
 - 1) Power supply ripple is too large;
 - 2) The antenna types do not match, or not properly installed;
 - 3) The surrounding environment is harsh, strong interference sources;
 - 4) Surrounding co-channel interference;

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 $\geq 2.5\text{mm}$)
The ramp-up rate (Tl to Tp)	3°C/s (max.)
preheat temperature	
- Temperature minimum (Tsmmin)	150°C
- Temperature maximum (Tsmmax)	200°C
- preheat time (ts)	60~180s
Average ramp-up rate(Tsmmax to Tp)	3°C/s (Max.)
- Liquidous temperature(Tl)	217°C
- Time at liquidous(tL)	60~150 second
peak temperature(Tp)	245+/-5°C