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LoRa1276 CI

LORA RF Transceiver Module

Product Specification

Catalogue

1. Overview

Lora1276 CI integrates Semtech RF transceiver chip SX1276, 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: 902-928MHz
- 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
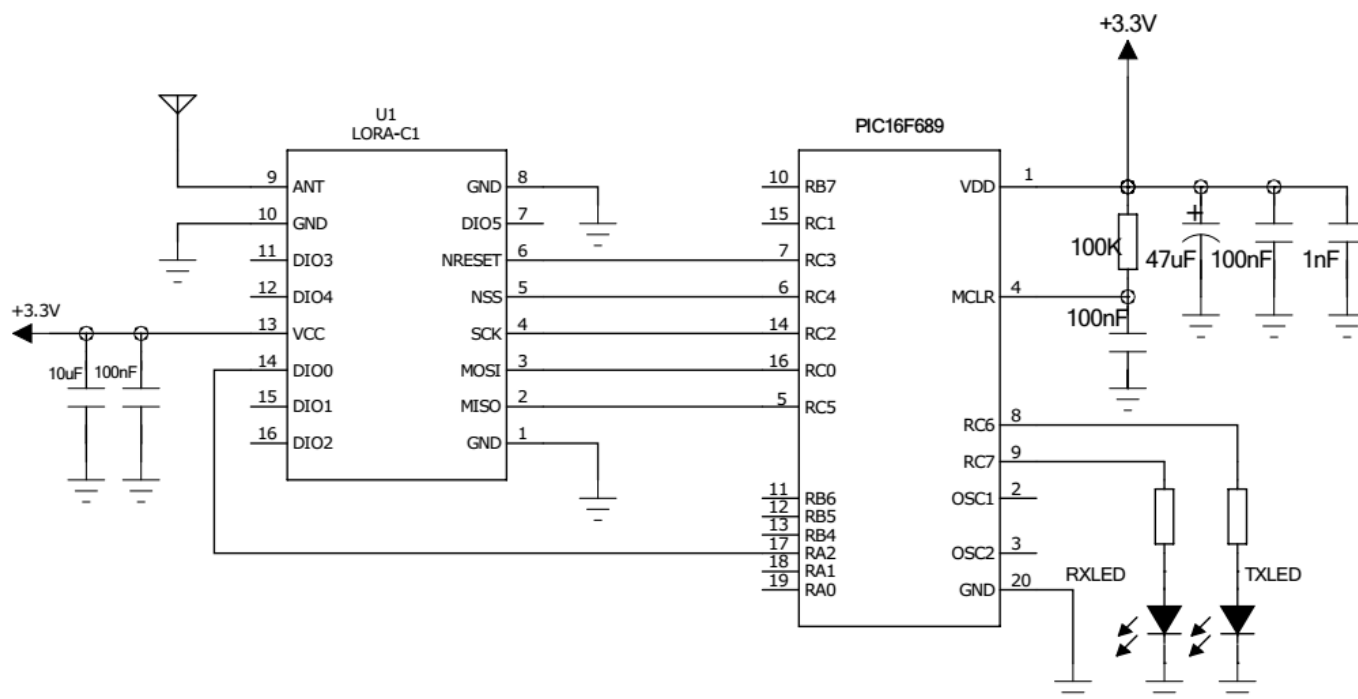- Health monitoring
- Wireless PC peripherals

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	900	915	1000	MHz	@915MHZ
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;

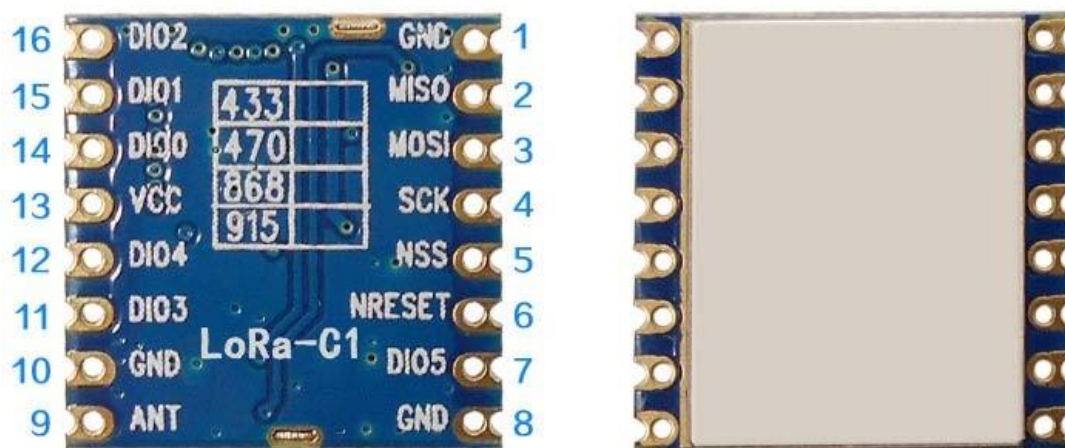| RegPaConfig (0x09)	7	PaSelect	rw	0x00	Selects PA output pin 0 → RFO pin. Output power is limited to +14 dBm. 1 → PA_BOOST pin. Output power is limited to +20 dBm
	6-4	MaxPower	rw	0x04	Select max output power: Pmax=10.8+0.6*MaxPower [dBm]
	3-0	OutputPower	rw	0x0f	Pout=Pmax-(15-OutputPower) if PaSelect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

5. Application circuit

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（default3.3V）
14	DIO0	Digital I/O
15	DIO1	Digital I/O
16	DIO2	Digital I/O

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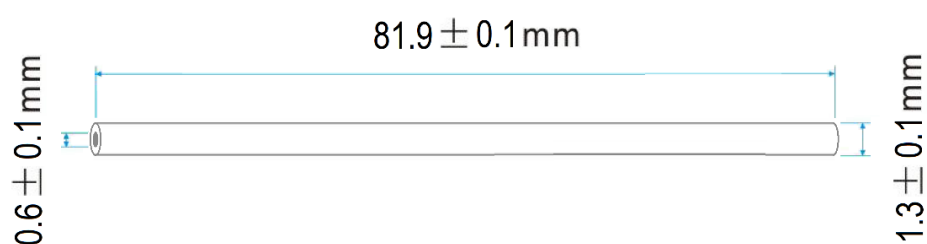
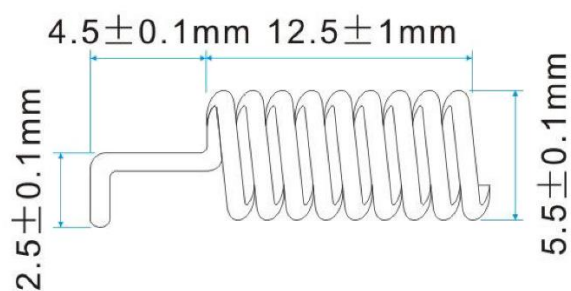To ensure modules get the best performance, user must obey the following principles when using the antennas：

- Put the antenna away from the ground and obstacles as possible as you could；
- If you choose the wire antenna, pull straight the lead wire as possible as it can be.

Ant.	Brand	Model Name	Antenna Type	Gain (dBi)
A	N/A	N/A	Wire Antenna	2.15
B	N/A	N/A	Spring Antenna	2.15

A – Wire Antenna

81.9±0.1mm
0.6±0.1mm
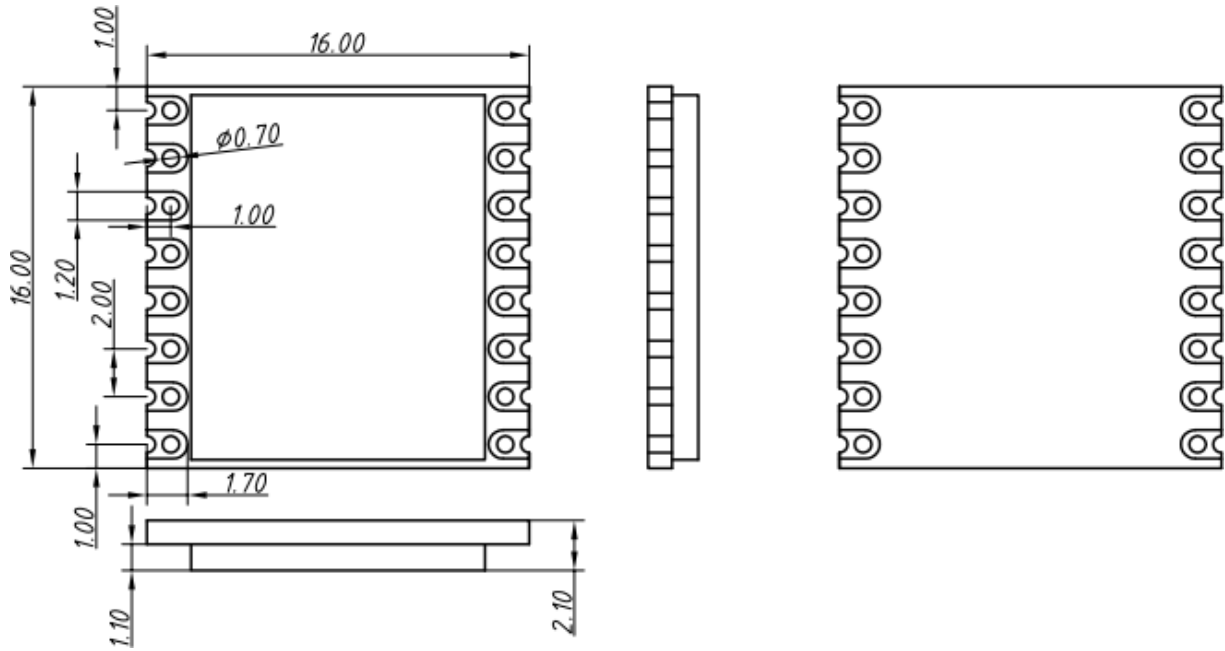1.3±0.1mm

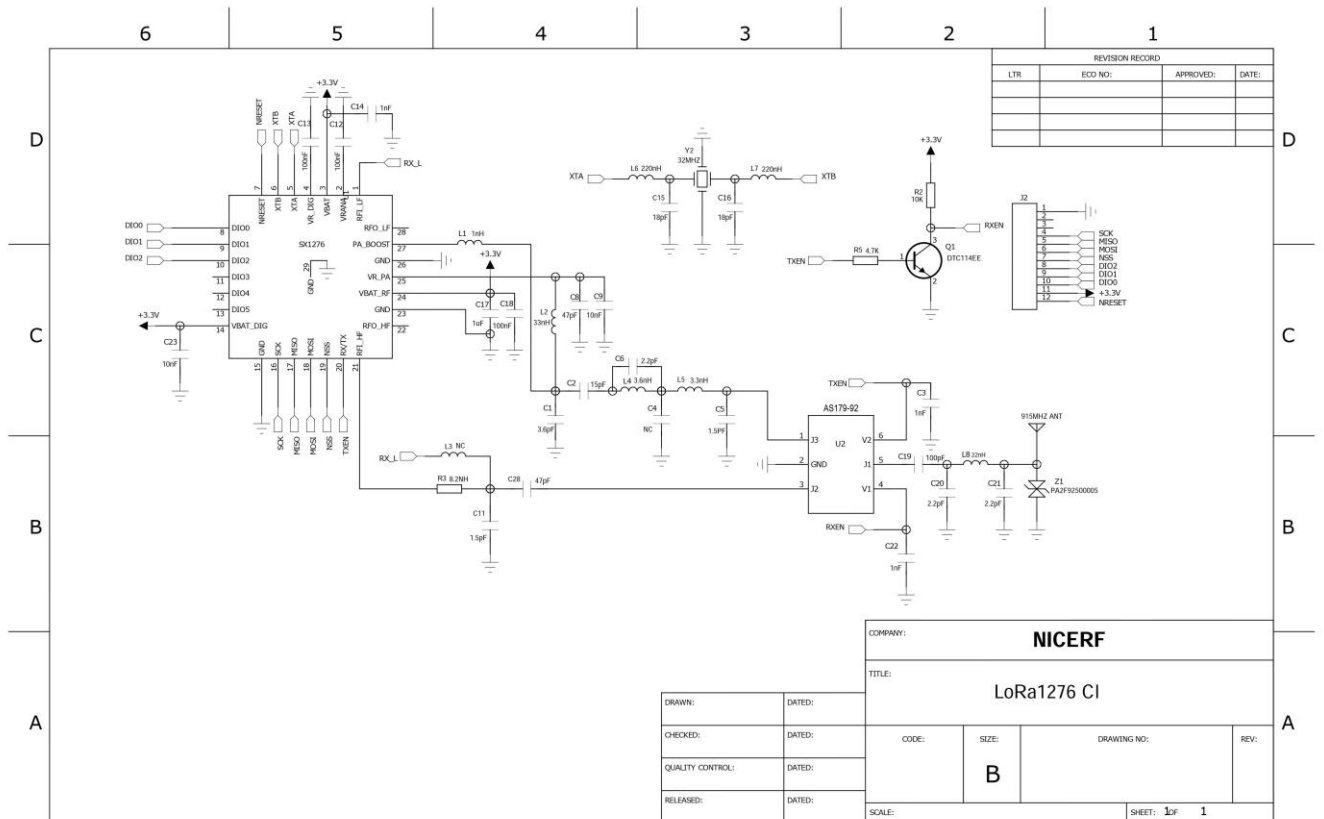## B – Spring Antenna

4.5±0.1mm 12.5±1mm
2.5±0.1mm
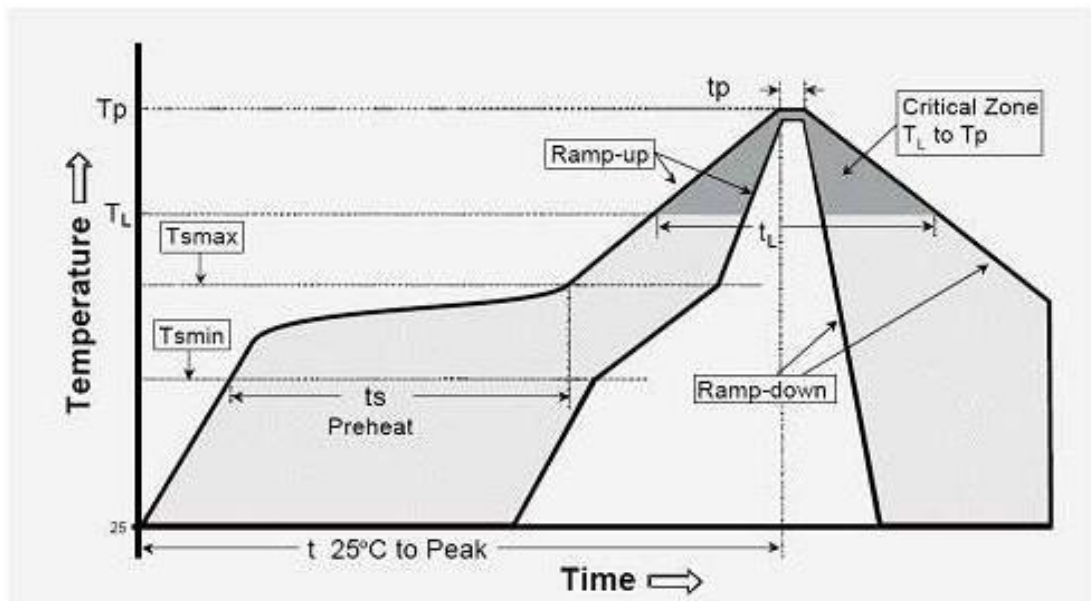5.5±0.1mm

9. Mechanical Dimensions （Unit:mm）

10. Schematic

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℃

FCC Statement

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected
- Consult the dealer or an experienced radio/TV technician for help

FCC RF Exposure Information and Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesirable operation.

Any changes or modifications not expressly approved by B. Thermal Solutions Srl could void the user's authority to operate the equipment.

Make sure that in the final application there is a distance of at least 12mm between the antenna and the skin of the user.

Instructions to the OEM/Integrator

This module has been granted modular approval for mobile and portable applications. OEM integrators for host products may use the module in their final products without additional FCC certification if they meet the following conditions. Otherwise, Additional FCC approvals must be obtained.

- The OEM must comply with the FCC labeling requirements. If the module's label is not visible when installed, then an additional permanent label must be applied on the outside of the finished product which states: "Contains transmitter module FCC ID: 2A2D3-LORA1276". Additionally, the following statement should be included on the label and in the final product's user manual:

    "This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interferences, and (2) this device must accept any interference received, including interference that may cause undesired operation."

- The user's manual for the host product must clearly indicate the operating requirements and conditions that must be observed to ensure compliance with current FCC RF exposure guidelines.
- The final host / module combination may also need to be evaluated against the FCC Part 15B criteria for unintentional radiators in order to be properly authorized for operation as a Part 15 digital device.
- This Module is full modular approval, it is limited to OEM installation ONLY.
- The OEM integrator is responsible for ensuring that the end-user has no manual instruction to remove or install module.
- The Grantee will provide guidance to the Host Manufacturer for compliance with the Part 15B requirements if requested. The transmitter module must not be co-located or operating in conjunction with any other antenna or transmitter except in accordance with FCC multi-transmitter product procedures.

    NOTE: The manufacturer is not responsible for any radio or TV interference caused by unauthorized modifications to this equipment. Such modifications could void the user's authority to operate the equipment.

Important Note:

In the event that the above conditions cannot be met (for certain configurations or co-location with another transmitter), then the FCC authorization is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator will be responsible for re-evaluating the end product (including the transmitter) and obtaining a separate FCC authorization.

End Product Labeling

The LoRa 1276 CI is labeled with her own FCC ID. If the FCC ID is not visible when the module is installed inside another device, then the outside of the device into which the module is installed must also display a label referring to the enclosed module. In that case, the final end product must be labeled in a visible area with the following:

"Contains FCC ID: 2A2D3-LORA1276"