G-NiceRF LoRa1276-c1-915 Integrates Semtech RF Transceiver Chip User Guide

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Note: Revision History

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

Contents

Overview

LoRa1276-c1-915 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.

Features

- **frequency Range:** 868 / 915 MHz (Customisation :137~1020MHz)
- 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

Applications

- Remote meter reading

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

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	800	868	900	MHz	@868MHZ
	900	915	1000	MHz	@915MHZ
Modulation rate	1.2		300	Kbps	FSK
	0.018		37.5	Kbps	Lora TM
Output power range	-1		20	dBm	
Receiving sensitivity		-123		dBm	@FSK data=1.2kbps, Fdev=10k HZ
		-139		dBm	@Lora BW=125KHz_SF = 12_CR=4/5

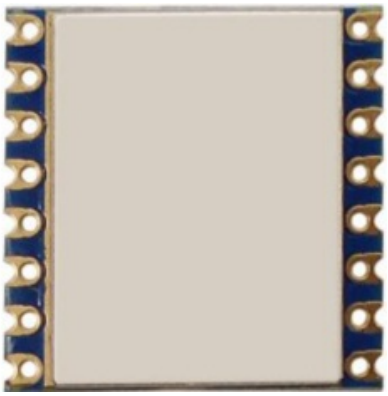
Note: According to the design of the module, the maximum bit of register 0x09 must be set as
1. Pa Select must be set 1;

Rag Pa Comfit (0x09)	7	Pa Select	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	Max Power	rw	0x04	Select max output power: Pmax=10.8+0.6*Max Power [dBm]
	3-0	Output Power	rw	0x0f	Pout=Pmax-(15-Output Power) if PaSelect = 0 (RFO pin) Pout=17-(15-Output Power) if PaSelect = 1 (PA_BOOST pin)

Speed rate correlation table

SinpalBandWidth	SpreadingFactor	Seasitivity(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

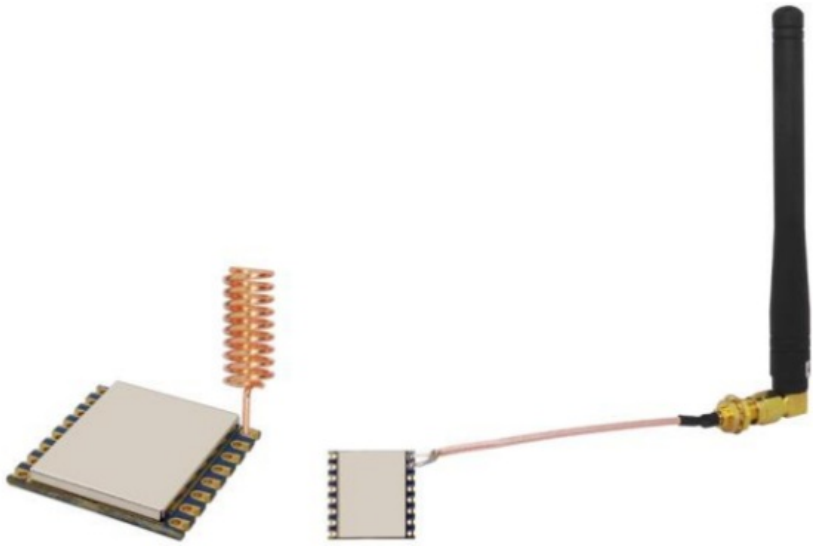
Pin definition



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

Accessories

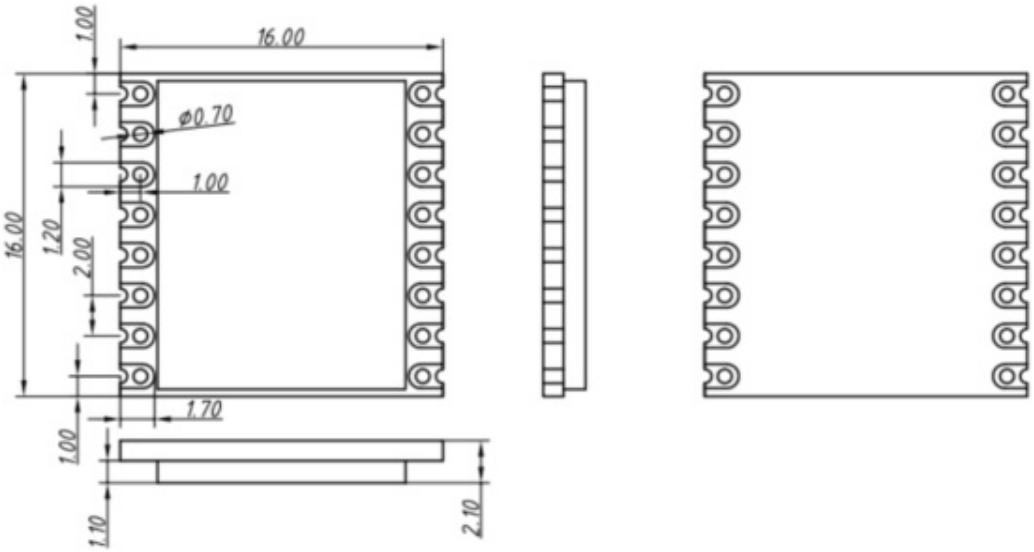
Antenna
antenna is very important for RF communication, its performance will affect the communication directly. Module needs antenna in 50ohm. Common antenna has rubber straight/ elbow/ fordable rod and sucker antenna and etc. Users can order accordingly. To ensure module in the best performance, we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

Mechanical Dimensions Unit:mm)



Order information

LoRa1276-c1-915-868
Product name Frequency

For example: If the customer needs 868MHz Frequency, the order no. shall be LoRa1276-c1-915-868.

Here are the product types:

Product Name	Description
LoRa1276-c1-915-868	SX1276 chip, Working frequency 868MHz
LoRa1276-c1-915-915	SX1276 chip, Working frequency 915MHz

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.

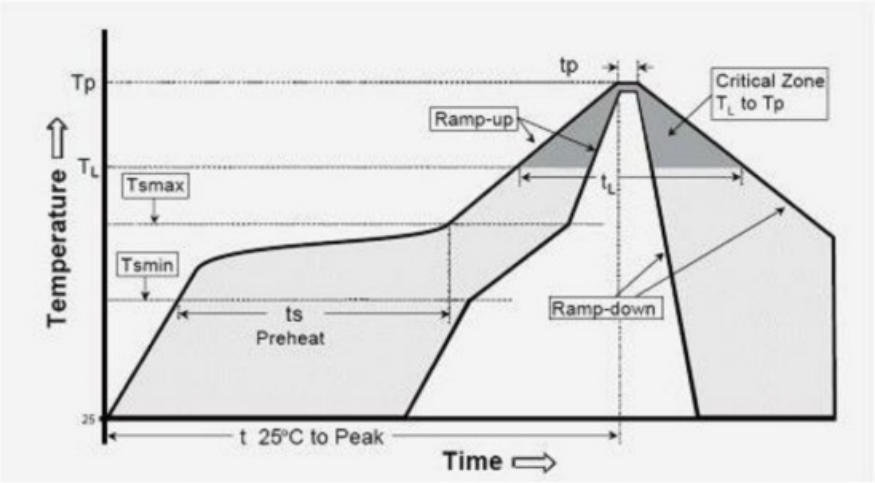
—

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 >=2.5mm)
The ramp-up rate (T1 to Tp)	3ID/s (max.)
preheat temperature • Temperature minimum (Tsmin) • Temperature maximum (Tsmax) • preheat time (ts)	 150°C 200°C 60″180s
Average ramp-up rate(Tsmax to Tp)	3ID/s (Max.)
• Liquidous temperature(TL)	2170
• Time at liquidous (tL)	60150 second
peak temperature(Tp)	245+1-5°C

FCC:

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 undesired operation.

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

RF exposure information: To maintain compliance with FCC RF exposure requirements, use the product that

maintain a 20cm separation distance between the user's body and the host.

This device is intended only for OEM integrator under the following conditions:
The antenna must be installed such that 20 cm is maintained between the antenna and users.
The transmitter module may not be co-located with any other transmitter or antenna. As long as the two conditions above are met, additional transmitter testing will not be required. However, the OEM integrator is still responsible for testing their end-product for any additional compliance requirements required for the installed module.

Important Note:
In the event that these conditions cannot be met (for example certain laptop configurations or co-location with another transmitter), then the Federal Communications Commission of the U.S.
Government (FCC) is no longer considered valid and the FCC ID cannot be used on the final product. In these circumstances, the OEM integrator shall be responsible for re-evaluating the end-product (including the transmitter) and obtaining a separate FCC and IC authorization in the U.S.. OEM

Integrator -End Product Labeling Considerations:
This transmitter module is authorized only for use in device where the antenna may be installed such that 20 cm may be maintained between the antenna and users. The final end product must be labeled in a visible area with the following: "Contains, FCC ID: 2AD66-LORA1276-915. The grantee's FCC ID can be used only when all FCC compliance requirements are met.

OEM Integrators -End Product Manual Provided to the End User:
The OEM integrator shall not provide information to the end user regarding how to install or remove this RF module in end product user manual. The end user manual must include all required regulatory information and warnings as outlined in this document.

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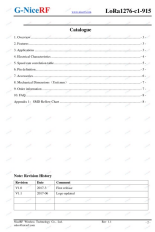
Documents / Resources

	G-NiceRF LoRa1276-c1-915 Integrates Semtech RF Transceiver Chip [pdf] User Guide LoRa1276-c1-915, LoRa1276-c1-915 Integrates Semtech RF Transceiver Chip, Integrates Semtech RF Transceiver Chip, Semtech RF Transceiver Chip, Transceiver Chip, Chip

References

- RF module-LoRa/Audio/2.4G/Bluetooth/ Wireless Transceiver Module-Antenna-NiceRF
- RF module-LoRa/Audio/2.4G/Bluetooth/ Wireless Transceiver Module-Antenna-NiceRF
- User Manual