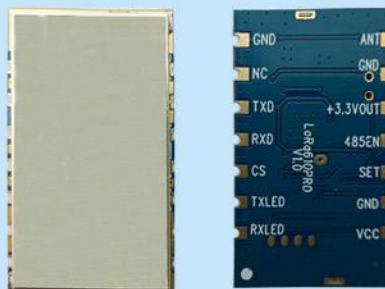


LoRa Long Range Wireless Transceiver
Data transmission module

Product Specification



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Note: Revision History

Revision	Date	Comment
V1.0	2018-2	First release

1. Overview

LoRa610Pro is a small wireless transceiver data transmission module, based on SX1276/1278 chips from Semtech. This module adopts LoRa technology to achieve high effective sensitivity and superior anti-interference. The communication distance and receiver sensitivity are far exceeds the FSK, GFSK modulation. For better security, the module uses AES128 encryption. LoRa610Pro has 100mW output power and TTL interface available. It is widely applied in meter reading, remote industrial control, etc

Note: The LoRaPro series can be work on different modes(according to the PC software settings), and they can communicate with NiceRF old version LoRa modules each other.

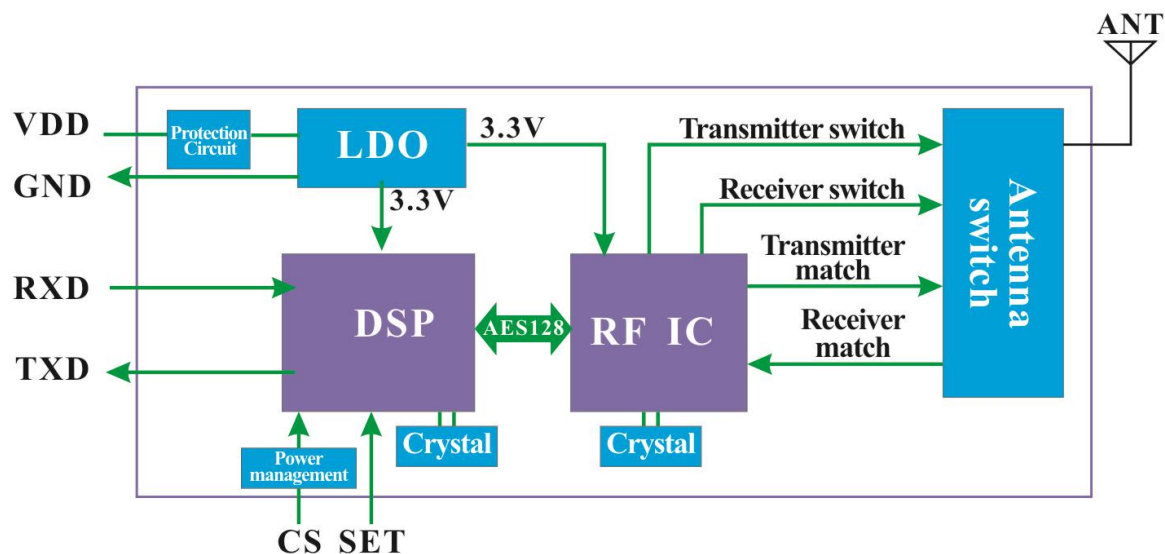
2. Feature

- Transmission distance in open area up to 5000 meters @ 91bps
- 433/470/868/915 MHz(Customizable)
- AES128 Data encryption
- MESH & Node working mode
- 40 channels
- LoRa modulation
- Interface: TTL
- Sensitivity: -139 dBm
- Max output power: 100mW (+20dBm)
- Working voltage: 3.3 ~ 6.5 V
- Working temperature: -40 ~ +85 °C

3. Application

- Remote control telemetry
- Remote meter reading
- Security system
- Industrial data acquisition
- Home automation
- Wireless data communication
- Access system
- Robot control

4. Block Diagram



5. Electrical Characteristics

Note: High quality 3.3V LDO is integrated, and Pin CS / SET are 3.3V interface. TXD/RXD is also 3.3V for TTL modules.

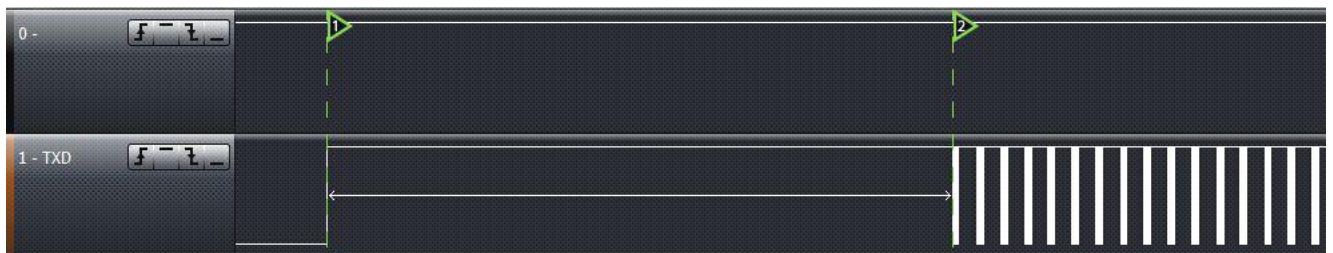
Parameters	Min.	Typ.	Max.	Unit	Condition
Working condition					
Voltage range	3.3	5.0	6.5	V	
Operating Temperature	-40	25	+85	°C	
Current consumption					
Rx current		<15		mA	TTL level
Tx current		< 130		mA	@20dBm
Sleep current		< 200		uA	
RF parameters					
Frequency range	414.92	433.92	453.92	MHZ	@433MHZ
	470.92	490.92	509.92	MHZ	@490MHZ
	849.92	868.92	888.92	MHZ	@868MHZ
	895.92	914.92	934.92	MHZ	@915MHZ
Data rate	91	656	17353	bps	LoRaTM
Output power	4	20	+20	dBm	Configurable
Sensitivity		-139		dBm	91bps

Remark: If you need lower sleep power consumption, please contact us to send the “sleep current = 5uA” version.

6. Operation

1) Power on Reset

Standard supply voltage of 5V (ordinary lithium battery of 4.2V is also applicable), After powered on reset, the TX LED (Red) and RX LED (Blue) will blink 3 times, (If no lights, module may damaged), The total reset time is around 2s, as below:



Note: Contact us to customize if you want to shorten the POR time.

2) Working Mode

The CS and SET Pin is internally pulled up. Pull CS pin high or leave it open will make the module enter into working mode.

In working mode, LoRa610Pro stay in receiving mode and wait for the series signal and RF signal.

Module can connect with any device which is standard TTL/RS232/RS485 interface.

When series signal comes, module will check the input series signal if there is any error, and then transmit the received data out via RF automatically if no errors found.

When RF signal comes, module will check the input RF signals if there is any error, and then transmit the received data out via series port automatically if no errors found.

When one packet is transmitted successfully, the Red LED will blink once.

When one packet is received and verified with no problem, the Blue LED will blink once.

The upgraded LoraPro series can be compatible with all versions of our LORA data before. The user can use PC software to configure the module to work mode according to his application needs. Now the comparison between several versions is as follows:

Item	Model Number	Feature	Maximum payload length (bytes)	Delay time	Encryption	repeater Function	communicate with other module
1	LoRA series	transparent wireless communication, basic function	200	shortest	xor	no	Item 1, 2, 3 can't communicate with each other, Item4 can communicate with 1,2,3 according to the setting.
2	LoRA_AES series	AES encryption /decryption added	62	longest	AES	No	
3	LoRA_Mesh series	Mesh function added	150	middle	xor	yes	
4	LoRA-Pro series	newest version , combine all the above function	231	different according to the setting.	configurable	yes	

- **Normal mode PC settings**——(**Work Mode = Normal + disable Encryption**)
- **AES mode PC settings**——(**Work Mode = Normal + Enable Encryption**)
- **MESH mode PC settings**——(**Work Mode = MESH; Mode = Router or Node**)

When set as ROUTER, in working mode, the module can repeat the RF signal in the same network automatically to extend the distance.

Normally, Router module is connected with external power supply to keep long time in receiving mode and repeat the signal to extend the range.

a) Parameter matching

The series parameter between the device and LoRa610Pro should be same,

RF parameters should be same in Tx and Rx.

The Net ID should be same in Tx and Rx.

Note: Default setting is : 9600, 8, N,1

b) Delay Time

Data delay is exist between series input of the transmitter and series output of the receiver. This

Delay Time is different from the series data rate, RF data rate and payload length. Detailed value is as

below:



✓ @ Normal mode

Speed rate	91	164	296	656	830	1557	2932	4750	9501	17353
1byte time (ms)	2240	1120	560	283	285	146	76	41	23	16
56bytes time (ms)	5840	3089	1712	940	737	392	220	139	73	45

✓ @ AES Mode

Speed rate	91	164	296	656	830	1557	2932	4750	9501	17353
1byte time (ms)	3222	1654	931	490	450	248	158	107	77	64
56bytes time (ms)	6364	3576	2034	1817	937	592	3996	307	237	208

✓ @ MESH Mode

Speed rate	91	164	296	656	830	1557	2932	4750	9501	17353
1byte time (ms)	2240	1120	560	283	285	146	76	41	23	16
56bytes time (ms)	5840	3089	1712	940	737	392	220	139	76	45

c) Data flow

The maximum packet length is 231bytes. If the data transmitted for one packet exceed 231 bytes, it should be splitted into several packets. And the interval time between packets should be longer than the delay time mentioned above.

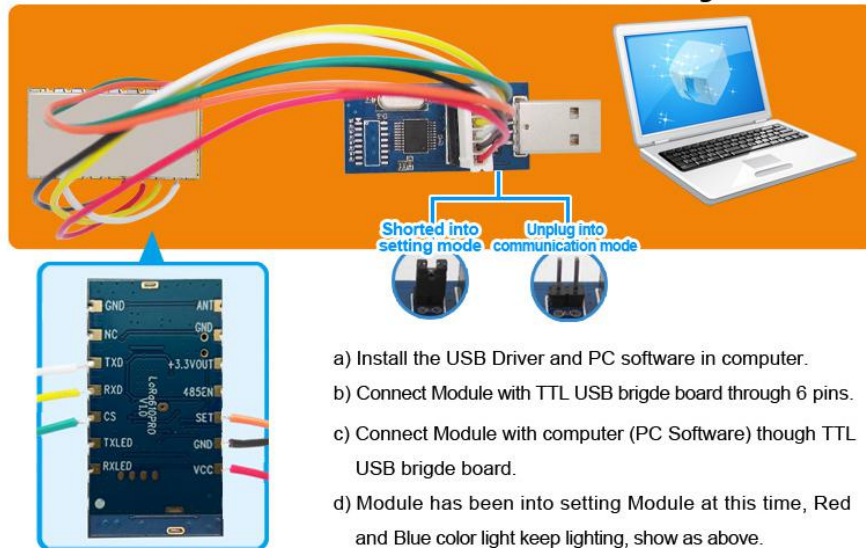
3) Setting mode

In working mode, pull low the SET pin to force the module into setting mode. When using USB

bridge board, simply put on the short cap to enter into setting mode.

In setting mode, both blue and red LED will be light on, shown as below:

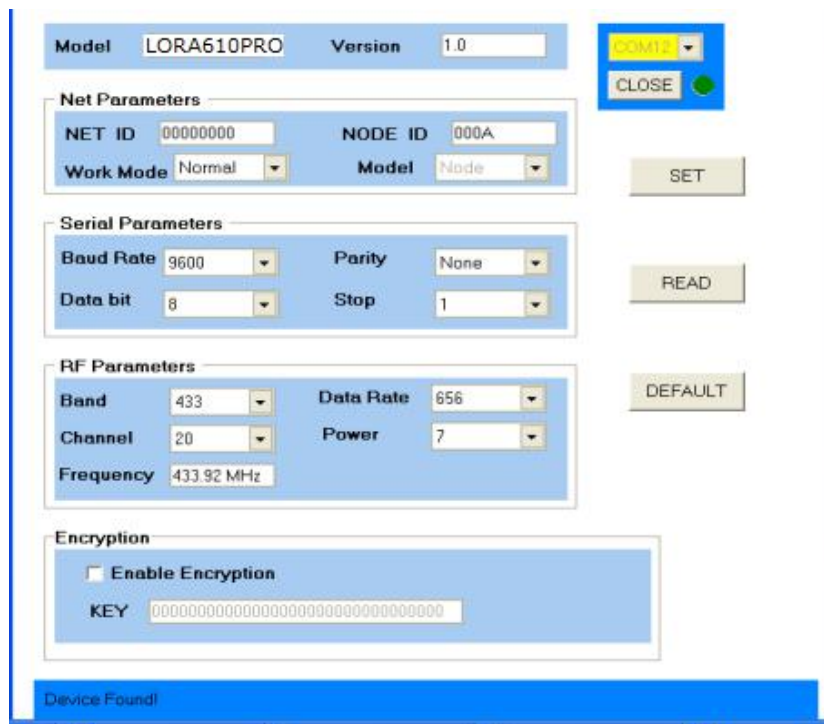
Data Transceiver Module TTL Interface Diagram



In setting mode, users can set the parameters by PC software or customer's own device. The parameters will be stored and keep unchanged even powered off.

User can download the PC software and USB driver from our website: <http://www.nicerf.com>

Select the right COM port and click "OPEN" button, all the parameters stored in the module will be read out and display, the status bar will appear the message "Device Found".



If the module hasn't connected with PC correctly or wrong COM port is chosen, the status bar will show "Device Not Found".

Note: About the Net ID and Node ID

After connected with PC correctly, all the parameters can be set freely including Net ID, Node ID and Key..

The Net ID is the group name for transmitter and receiver, all the transmitter and receiver with the same Net ID can communicate with each other. The only exception is 0000. When the Net ID is set as 0000, it can receive the signal of all the transmitter even the Net ID is not 0000.

The Node ID can be thought as the name of the module. Each module can be set with one Node ID. The Node can set and read out freely. The Node ID can be used in the application which the receiver should identify who is the transmitter. User can read out the Node ID of the module, and add the Node ID into the payload, then in Rx side; it can identify who is the transmitter.

The key is 16bytes(128bit), user can set it with any HEX code.

4) Communication Protocol

Besides PC, user can set all the parameters by their own device. The communication protocol is as below:

Baud rate=9600 bps; Data bit=8 bits Stop bit:1 Parity bit: none

Command format : AA FA + command +[parameters]

Command is 1 byte, parameters are 0 or Hex format.

Return value ended with “\r\n”.

a) Command : Read module name and version:

Instruction format: AA FA AA

Return value is:“LoRa610Pro_VER1.0\r\n”

b) Command: Read out all the parameters:

Instruction format: AA FA 01

The return value in turn is:

RF channel / RF band / RF data rate / RF power / Serial data rate / Series Data bit / Series Stop bit / Series Parity bit / NET ID / NODE ID / MESH / NODE / Key / Key data / \r\n

c) Command : Reset to default setting

Instruction format: AA FA 02

The return value in turn is: "OK \r \n" or "ERROR \r \n"

After this command, the module will reset to default setting, which is

Frequency: Tx = Rx = CH20 = 433.92 MHz (Band = 433MHz)

RF data rate: Tx = Rx=9600 bps RF power= 7 (Max output)

Serial: baud rate = 656 bps Data bit= 8 Bits Stop bit = 1 Bits Parity bit=None

NET ID = 00 00 00 00 NODE ID = 00 00

d) Command: Set the group parameters

Length of the command is 33 bytes, and format as follows:

Instruction format: AA FA 03 RF Channel / RF Band / RF Rate / RF Power / Serial transmission date / data bits / stop bits / parity / NET ID / NODE ID / MESH / NODE / Key /Key value

Setting command: AA FA 03 XX XX XX XX XX XX XX XX

The return is: "OK \r \n" or "ERROR \r \n"

5) Parameters Description:

a) RF Channel = RF Frequency

Each frequency band is divided into 40 channels; user can select one of the 40 channels to use. The corresponding frequency is as below, Also we can customized the specified frequency which is not in the table.

frequency band1	channel	1	2	3	4	5	6	7	8	9	10
	frequency	414.92	415.92	416.92	417.92	418.92	419.92	420.92	421.92	422.92	423.92
	channel	11	12	13	14	15	16	17	18	19	20
	frequency	424.92	425.92	426.92	427.92	428.92	429.92	430.92	431.92	432.92	433.92
	channel	21	22	23	24	25	26	27	28	29	30
	frequency	434.92	435.92	436.92	437.92	438.92	439.92	440.92	441.92	442.92	443.92
433MHz	channel	31	32	33	34	35	36	37	38	39	40
	frequency	444.92	445.92	446.92	447.92	448.92	449.92	450.92	451.92	452.92	453.92
	channel	1	2	3	4	5	6	7	8	9	10
	frequency	470.92	471.92	472.92	473.92	474.92	475.92	476.92	477.92	478.92	479.92
	channel	11	12	13	14	15	16	17	18	19	20
	frequency	480.92	481.92	482.92	483.92	484.92	485.92	486.92	487.92	488.92	489.92
470MHz	channel	21	22	23	24	25	26	27	28	29	30
	frequency	490.92	491.92	492.92	493.92	494.92	495.92	496.92	497.92	498.92	499.92
	channel	31	32	33	34	35	36	37	38	39	40
	frequency	500.92	501.92	502.92	503.92	504.92	505.92	506.92	507.92	508.92	509.92
	channel	1	2	3	4	5	6	7	8	9	10
	frequency	849.92	850.92	851.92	852.92	853.92	854.92	855.92	856.92	857.92	858.92
868MHz	channel	11	12	13	14	15	16	17	18	19	20
	frequency	859.92	860.92	861.92	862.92	863.92	864.92	865.92	866.92	867.92	868.92
	channel	21	22	23	24	25	26	27	28	29	30
	frequency	869.92	870.92	871.92	872.92	873.92	874.92	875.92	876.92	877.92	878.92
	channel	31	32	33	34	35	36	37	38	39	40
	frequency	879.92	880.92	881.92	882.92	883.92	884.92	885.92	886.92	887.92	888.92
frequency band4	channel	1	2	3	4	5	6	7	8	9	10
	frequency	895.92	896.92	897.92	898.92	899.92	900.92	901.92	902.92	903.92	904.92
	channel	11	12	13	14	15	16	17	18	19	20
	frequency	905.92	906.92	907.92	908.92	909.92	910.92	911.92	912.92	913.92	914.92
	channel	21	22	23	24	25	26	27	28	29	30
	frequency	915.92	916.92	917.92	918.92	919.92	920.92	921.92	922.92	923.92	924.92
915MHz	channel	31	32	33	34	35	36	37	38	39	40

b) Working Band

The working band is as below

Parameter	01	02	03	04
Frequency	433 MHz	490 MHz	868 MHz	915 MHz
	414.92 ~ 453.92	470.92 ~ 509.92	849.92 ~ 888.92	895.92 ~ 934.92

Note: Changing working band is not suggested

c) RF data rate

The RF data rate is as below : 91 164 296 656 830 1557 1932 4750 9501 17353 bps

Parameter	0	1	2	3	4	5	6	7	8	9
TX/RX rate(bps)	91	164	296	656	830	1557	1932	4750	9501	17353

d) RF output power

The output power is as below:

Set level	0	1	2	3	4	5	6	7
TX/RX power(dBm)	+1	+2	+5	+8	+11	+14	+17	+20

e) Serial baud rate

Series data rate is as below: .

Parameter	0	1	2	3	4	5	6	7	8	9
Serial rate(bps)	1200	2400	4800	9600	14400	19200	38400	57600	76800	115200

f) Serial data bit

Series data bit is as below:

Parameter	1	2
Data Bits	7 bits	8 bits

Remark: 9 bits is invalid.

g) Serial stop bit

Series stop bit is as below:

Parameter	1	2
Stop bit	1 bits	2 bits

h) Serial parity

Series Parity bit is as below:

Parameter	1	2	3
Parity bit	No	Odd	Even

i) NET ID:

The Net ID is 4 bytes, and range from 00 00 00 00 to FF FF FF FF

Note: if the modules' NET ID setting are different, then they can't communicate with each other except when the Net ID = 0000, it will receive all the message despite the Net ID is difference.

j) NODE ID

The Node ID is 2 bytes, range from 00 00 to FF FF.

k) MESH

This parameter is 1 byte, as below:

Parameter	0	1
Data Bits	Normal mode	Mesh mode

Notes: To ensure communication, Modules in the same network should be configured in the same way.

l) NODE

This parameter is 1 byte, as below:

Parameter	0	1
Data Bits	Node mode	Router mode

m) Key:

Setting the Key of RF signal encryption, "parameter" is 1 bytes

Setting range: 00~01

Parameter	0	1
Key	default	user-defined

n) **Key data:** Setting the Key data of AES128, "parameter" is 16bytes.

o) **Setting range:** 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 ~ FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF

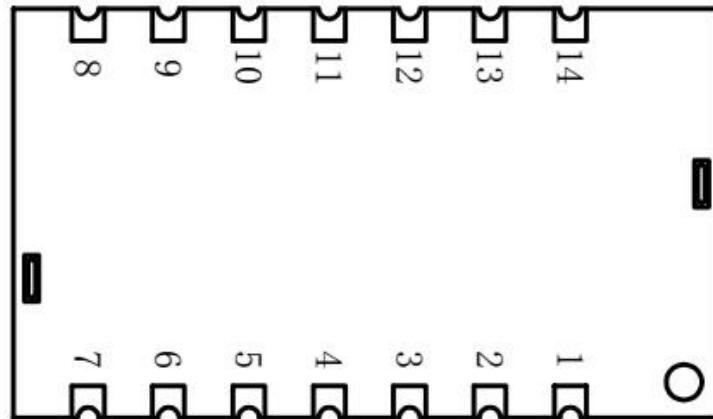
Note: when the key is 00, key data is invalid. No actual key value return when inquiry parameters.

6) Sleep mode

After Power on Reset, the module enters into sleep mode when CS pin is pulled low. In this mode, the current consumption is very small. In Sleep mode, the module can't do any communication and cant' be set even Set Pin is pulled low. All the parameters will be kept unchanged in Sleep mode.

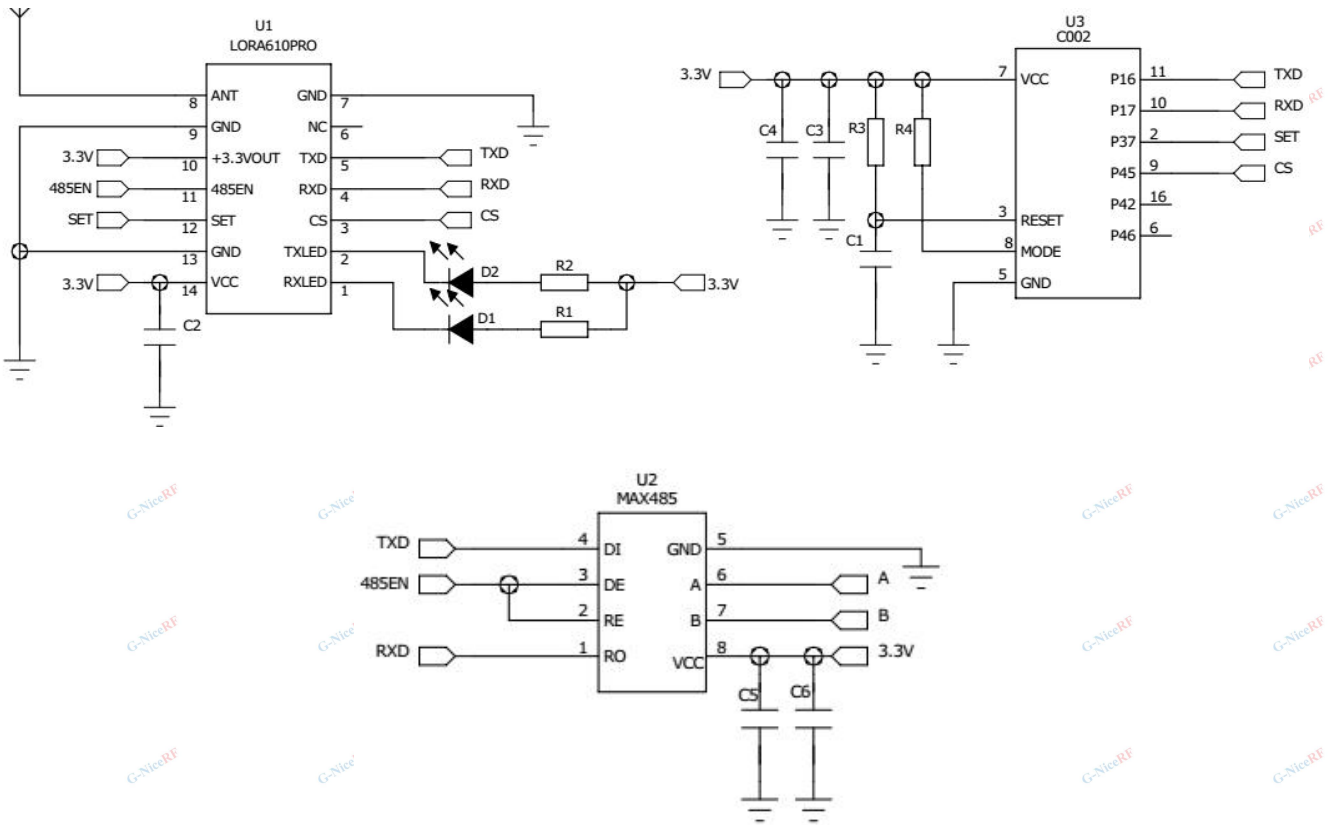
User can wake up the module by pulling high the CS Pin.

7. Pin definition



NO.	PIN	Description
1	RXLED	RX LED
2	TXLED	TX LED
3	CS	Module working Enable (Pull Low to make the module enter into sleep mode, Leave open or connect high level make the module enter into normal working mode)
4	RXD	RXD of the module and connect to external TXD
5	TXD	TXD of the module and connect to external RXD
6	NC	No use
7	GND	Antenna Ground
8	ANT	Antenna output pin
9	GND	Antenna Ground
10	+3.3V OUT	+3.3V output pin
11	485EN	485 interface control pin
12	SET	Configuration mode enable (low to enter into the setting mode, leave open or connect high level to exit setting mode) Valid when CS Pin is high or leave open.
13	GND	Connected to ground
14	VCC	Connected to the positive power supply (typical 5V)

8. Typical Application

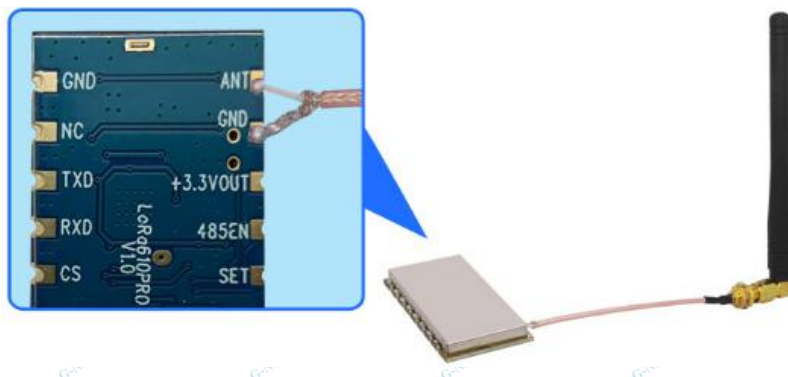


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9. Accessories

1) Antenna

The antenna is very important for RF communication. We have many kinds of antenna for customer to choose, please contact the corresponding sales engineer for help.



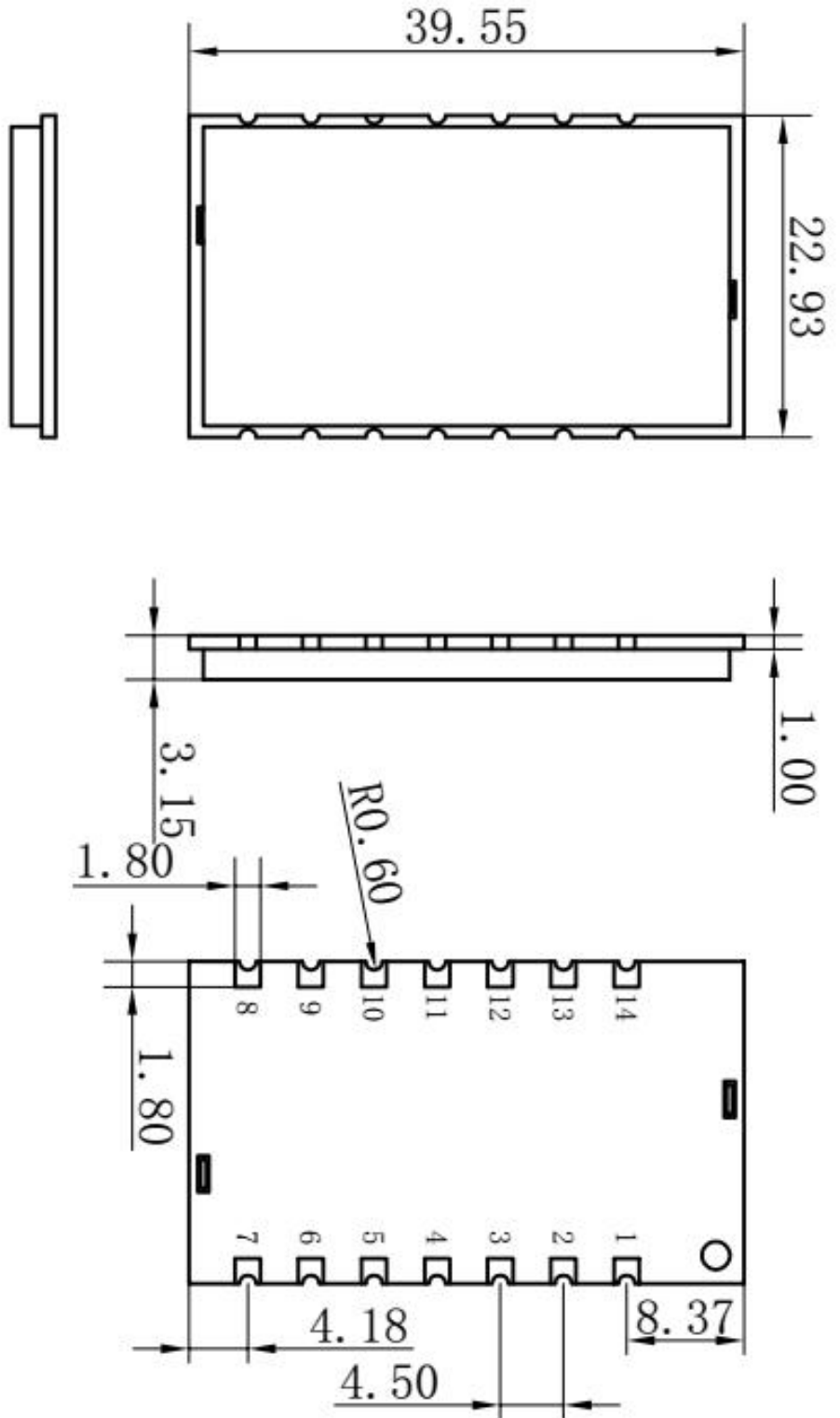
★ Tips for antenna:

- Don't close to the ground, metal, magnet, big current;
- If you are using the sucker antenna, pull the wire as straight as possible, the sucker foundation should stick with metal

2) USB bridge board

There are 3 type of USB bridge, which is SU108-TTL/ SU108-232 / SU108-485. SU108 -TTL is for TTL Interface, SU108-232 is for 232 Interface, SU108 - 485 is for 485 Interface. User should select the right USB Bridge corresponding to the RF module.

10. Mechanical dimension(Unit: mm)



11. Order information

For example:

If the customer needs 433MHZ band, then part number of released order shall be: LoRa610Pro-433.

Product Name	Description
LoRa610Pro-433	433MHZ, TTL interface
LoRa610Pro-490	490MHZ, TTL interface
LoRa610Pro-868	868MHZ, TTL interface
LoRa610Pro-915	915MHZ, TTL interface

12. FAQ

- Why module can not communicate properly?
 - a) Check if the band, channel, rate, NET ID has set to the same;
 - b) Check if there is power connection error;
 - c) Check if the module is enabled (CS high);
 - d) Check if the antenna connection is not correct;
 - e) Check if the module is damaged.
- Why transmission distance is not far as it should be?
 - a) Power supply ripple is too large;
 - b) The antenna types do not match, or not properly installed;
 - c) The surrounding environment is harsh, strong interference sources;
 - d) Surrounding co-channel interference;
- Why receiving data incorrect?
 - a) Improper parameter settings;
 - b) Module data interface is bad.