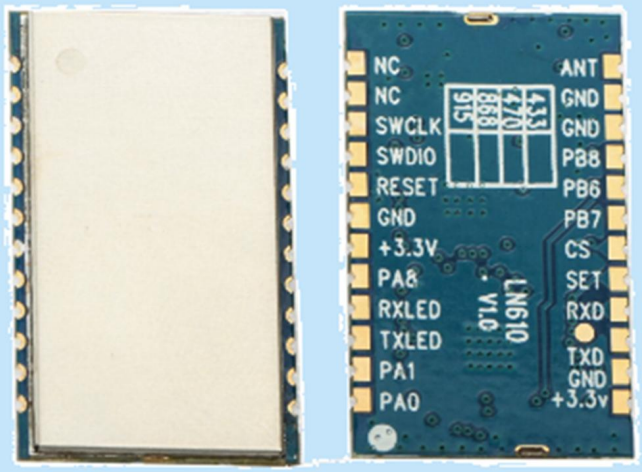
G-NiceRF®

LN610

UART Wireless Data transmission module

LoRaWAN Node module

Product Specification



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Note: Revision History

Revision	Date	Comment
V1.0	2018-5	First release
V2.0	2018-7	Content modification
V2.1	2019-9	Function description modification
V2.2	2021-1	Update format

1. Overview

LN610 is the LoRaWAN node module. LG1301-PF/ LG1301-SE are LoRaWAN gateways. LN610 work with LG1301 to build a LoRaWAN system. This LoRaWAN system integrated the protocol of LoRAWAN V1.0 , and support class C .

When data input to LN610, LN610 will transmit to LG1301. When received the data from LG1301, LN610 will output the received data to the series interface. All the wireless communication comply the LoRaWAN protocol.

Either LG1301-PF or LG1301-SE can be worked with LN610.The detail of these two gateways refer to the datasheet of gateway.

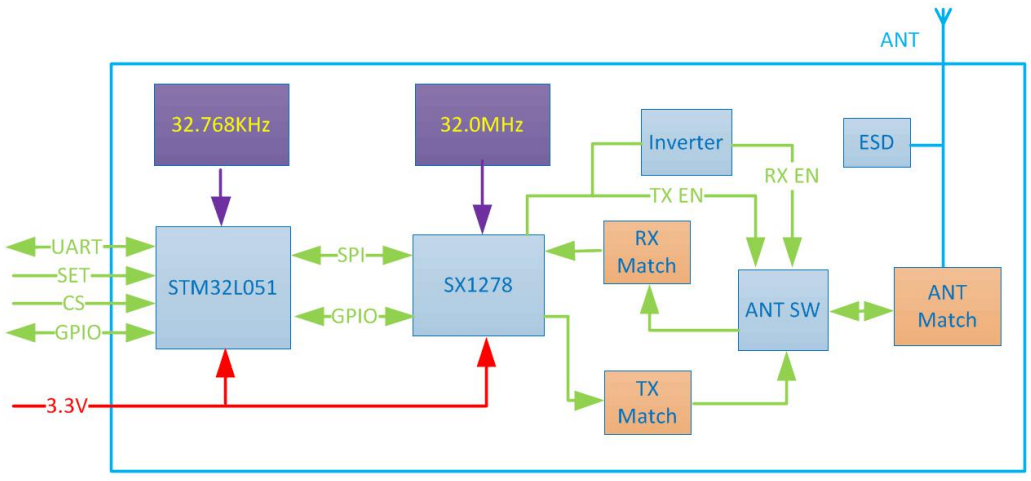
2. Feature

- LoRaWAN protocol supported
- Uart interface
- AES128 encryption
- 8 channel communication simultaneously
- Configurable parameters
- OTAA & ABP
- Long range & Small size
- ADR
- EU433M / EU868M / KR920M / AS923M CN780M/ CN470M / US915M / AS915M

3. Application

- Smart city
- Smart Metering (Water, Electric, Gas meter)
- Agricultural Monitoring
- Irrigation control
- Internet of Things (IoT)
- M2M
- Wireless Sensors
- Wireless Alarm and Security Systems

4. Block Diagram



5. Electrical Characteristics

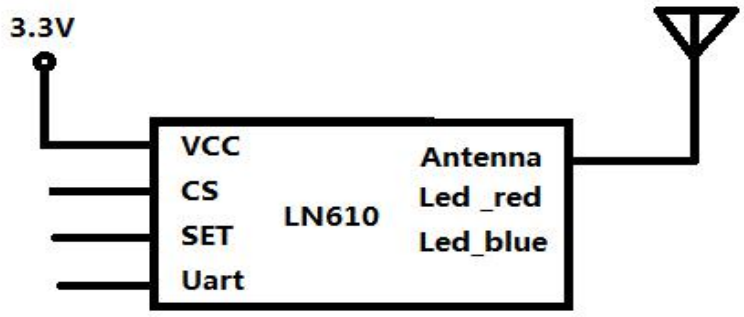
★ Note: the following parameters is VCC = 3.3, with 50 ohm copper axis test instrumentation.

Parameter	Min	Typ	Max	Unite	Condition
Working Condition					
Working voltage range	1.8	3.3	3.6	V	
Temperature voltage	-40		85	℃	
Current Consumption					
Receiving current		18		mA	@Vcc=3.3v
Transmitting current	100	110	120	mA	Vcc=3.3v,Tx=20dBm
Sleep current		<2	3	uA	CS Active H
RF Parameter					
TX Power	4	18	20	dBm	
Receiving sensitivity	-131	-132	-133	dBm	@BW=125KHz,SF=10
2nd Harmonic radations		-45		dBm	
3rd Harmonic radiations		-50		dBm	

6. Function Description

1) Power on Reset

After powered up, both the Red and Blue led will blink 1 times then off.



Control CS and SET pin to enter different mode.

CS	SET	Mode
1	X	Sleeping mode
0	0	Setting mode
0	1	Normal working mode

2) Sleep mode

In this mode,LN610 works with minimal current consumption. It will not respond to the inputted wireless and UART data. Pull high CS pin, LN610 will leave this mode.

3) Normal Working Mode

In this mode, LN610 can communicate with LG1301. The TXLED(Red) will blink once when one packet is transmitted out. And RXLED(Blue) will blink once when one packet is received and verified no problem.

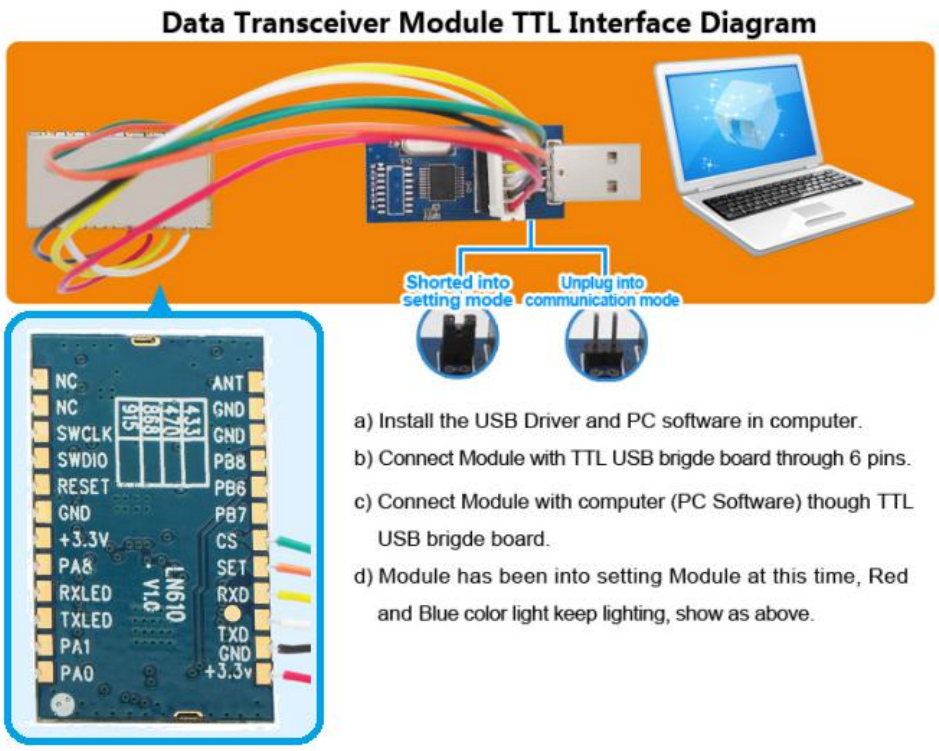
4) Setting mode

In normal working mode, pull low the SET pin to make LN610 to enter into setting mode. Both of the TXLED and RXLED will turn on to indicate.

In setting mode,the parameters of uart will fix to:

baud_rate = 9600, data_bit = 8, parity_bit = None, stop_bit = 1;

Parameters setting :



User can use our specified PC software to configure LN610. LN610 can be connected to PC with SU109_TTL.

Data rate, RF power, Baud rate can be set according to user application. The maximum output power is 100mW.

Note:

Device Addr, NwkSKey, AppSKey should be same as gateway.

The detail method to join the network refer to datasheet of gateway.

User can also set parameter of LN610 by their own device. The detail UART command refer to "UART Protocol of LN610 v1.0"

5) Parameters Description

- Tx Data Rate:

DataRate	SF	Actural Bit rate(bps)	Region
0	SF12 / 125 kHz	250	EU868M/EU433M KR920M/AS923M CN780M/ CN470M
1	SF11 / 125 kHz	440	
2	SF10 / 125 kHz	980	
3	SF9 / 125 kHz	1760	
4	SF8 / 125 kHz	3125	
5	SF7 / 125 kHz	5470	

DataRate	SF	Actural Bit rate(bps)	Region
0	SF10 / 125 kHz	980	US915M AS915M
1	SF9 / 125 kHz	1760	
2	SF8 / 125 kHz	3125	
3	SF7 / 125 kHz	5470	
4	SF8 / 500 kHz	12500	
8	SF12 / 500 kHz	980	
9	SF11 / 500 kHz	1760	
10	SF10 / 500 kHz	3900	
11	SF9 / 500 kHz	7000	
12	SF8 / 500 kHz	12500	
13	SF7 / 500 kHz	21900	

- Tx Power:

parameters	0	1	2	3	4	5
Output power(dBm)	2	5	8	10	14	20

- LoraWAN Tx Frequency channels

channels	Frequency(MHz)				
	EU433M	EU868M	KR920M	AS923M	CN780M
0	433.175	868.10	921.90	923.20	779.50
1	433.375	868.30	922.10	923.40	779.70
2	433.575	868.50	922.30	923.60	779.90
3	433.775	868.70	922.50	923.80	780.50
4	433.975	868.90	922.70	924.00	780.70
5	434.175	869.10	922.90	924.20	780.90
6	434.375	869.30	923.10	924.40	781.10
7	434.575	869.50	923.30	924.60	781.30

channels	Frequency(MHz) CN470M	Step(MHz)
0~95(Upstream)	470.3 ~ 489.3	0.2
0~47(Downstream)	500.3 ~ 509.7	0.2

channels	Frequency(MHz) US915M	Step(MHz)	Data rate
0~63(Upstream)	902.3 ~ 914.9	0.2	BW125 kHz, DR0~DR3
64~71(Upstream)	903.0~914.2	1.6	BW500 kHz, DR4
0~7(Downstream)	923.3 ~ 927.5	0.6	BW 500 kHz,DR8~DR13

channels	Frequency(MHz) AS915M	Step(MHz)	Data rate
0~63(Upstream)	915.2 ~ 927.8	0.2	BW125 kHz, DR0~DR3
64~71(Upstream)	915.9 ~ 927.1	1.6	BW500 kHz, DR4
0~7(Downstream)	923.3 ~ 927.5	0.6	BW 500 kHz,DR8~DR13

- Rx Frequency channel and data rate

Region	Frequency(MHz)	Data rate
EU433M	434.665	DR0 (SF12,125 kHz)
EU868M	869.525	DR0 (SF12,125 kHz)
KR920M	921.90	DR0 (SF12,125 kHz)
AS923M	923.2	DR2 (SF10/125KHz)
CN780M	786	DR0 (SF12,125 kHz)
CN470M	505.3	DR0 (SF12,125 kHz)
US915M	923.3	DR8(SF12,500 kHz)
AS915M	923.3	DR8(SF12,500 kHz)

Note:

The Tx rate of LG1301-SE is fixed as the Rx rate of LN610, the Rx data rate of LG1301-SE is not fixed which match to the LN610's Tx rate automatically.

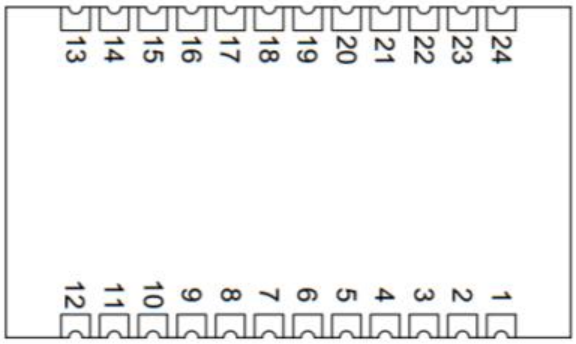
The Tx frequency of LG1301-SE is fixed, but it can receive the data from all the 8 channel simultaneously.

The maximum MAC Payload size length (M) is given by the following table. It is derived from limitation of the PHY layer depending on the effective modulation rate.

And the minimal time interval between packets is in blow table.

DataRate	SF	M(bytes)	Time (s)
0	SF12 / 125 kHz	51	4
1	SF11 / 125 kHz	51	3
2	SF10 / 125 kHz	51	1
3	SF9 / 125 kHz	115	1
4	SF8 / 125 kHz	242	1
5	SF7 / 125 kHz	242	1

7. Pin definition



Pin	Pin Name	Type	Description
1	PA0	I/O	Reserved
2	PA1	I/O	Reserved
3	PA2/TXLED	Output	LED blinks when tx,Active low
4	PA3/RXLED	Output	LED blinks when data received,Active low
5	PA8	I/O	Reserved
6	+3.3V	Power (VCC)	Power Supply(Typical voltage)
7	GND	Power (GND)	Ground
8	RESET	Input	Reset the module
9	PA13/SWDIO	I/O	Reserved for factory firmware upgrade
10	PA14/SWCLK	I/O	Reserved for factory firmware upgrade
11	NC		
12	NC		
13	ANT	Antenna	Connect with 50 ohm coaxial antenna
14	GND	Power (GND)	Ground
15	GND	Power (GND)	Ground
16	PB8	I/O	Reserved
17	PB6	I/O	Reserved
18	PB7	I/O	Reserved
19	PB1/CS	Input	0: working mode，1: sleeping
20	PB2/SET	Input	0: setting mode, 1: normal working
21	PA10/RXD	Input	RXD of this module,
22	PA9/TXD	Output	TXD of this module
23	GND	Power (GND)	Ground
24	+3.3V	Power (VCC)	Power Supply(Typical voltage)

Note: No LDO onboard, the power supply should be : 1.8 –3.6V . 3.3V is suggested .

8. Mechanical dimension(Unit:mm)