G-NiceRF®

LG1301-PF

Comply Standard LoRaWAN protocol V1.0

LoRaWAN Gateway

Product Specification

Catalog

Note: Revision History

Revision	Date	Comment
V1.0	2018-7	First release
V1.1	2021-1	Update format

1. Overview

LG1301-PF is the LoRaWAN gateway. It can work with any LoRaWAN node which comply Standard LoRaWAN protocol V1.0.

The gateway use linux platform as host.It mainly consists of concentrator ,GPS module ,WIFI and Ethernet. The GPS module send NMEA frames containing time and geographical coordinates data to the host. The GPS module also output one pulse to the sx1301 per second.

The gateway receives the RF data from nodes and sends to the server. It also receive data from the server and transmit to the nodes. The gateway connects to the server via Ethernet or WiFi.

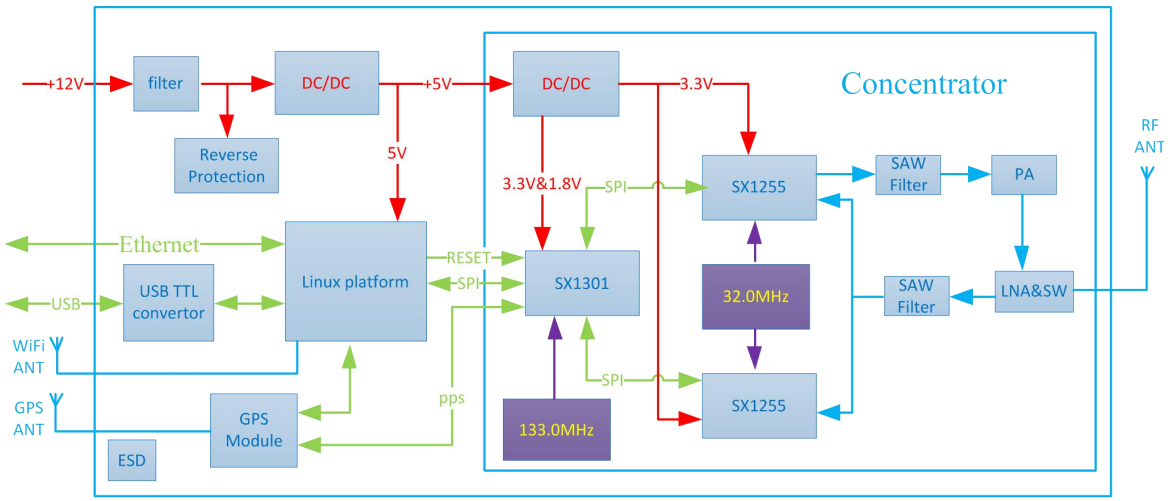
2. Feature

- LoRaWAN protocol supported
- Uart interface
- AES128 encryption
- 8 channel communication simultaneously
- Configurable parameters
- GPS support
- Long range
- 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

Parameter	Min	Typ.	Max	Unite	Condition
Working Condition					
Working voltage range	5	12	30	V	
Temperature voltage	-40		85	℃	
Current Consumption					
Receiving current		<280		mA	@12v,9 channels all open
Transmitting current		<450		mA	@12v,TX=24dBm
Parameter					
Frequency range	429	433	440	MHz	@433MHz
	470	480	490	MHz	@470MHz
	860.75	868.3	874.5	MHz	@868MHz
	902	915	928	MHz	@915MHz
Output power	0		24	dBm	
Receiving sensitivity		-133		dBm	@SF=10,,BW=125kHz

6. Function Description

1) Power on

Connect all the antennas to the corresponding SMA port. Connect the DC power supply and power up.

After powered on, the POWER LED will light on to indicate, the gateway start the initialization . After 15s, the Linux system is ready, and then the Status LED will blink once per second to indicate the whole system is ready.

When the GPS works normaly and connect to the satellites, the GPS LED will blink once per second to indicate.

2) Communication

- Node and gateway

The Node must be added to the network before communicate with this gateway. The node will transmit the data to gateway, and received data from the gateway.

- Gateway and server

After connected to the server, the gateway will communicate with the server using the JSON Data Interchange Format. The detail of the communication protocol between gateway and server please refer to file **LoRaWAN Network Server Demonstration: Gateway to Server Interface Definition.**

3) Connect to server

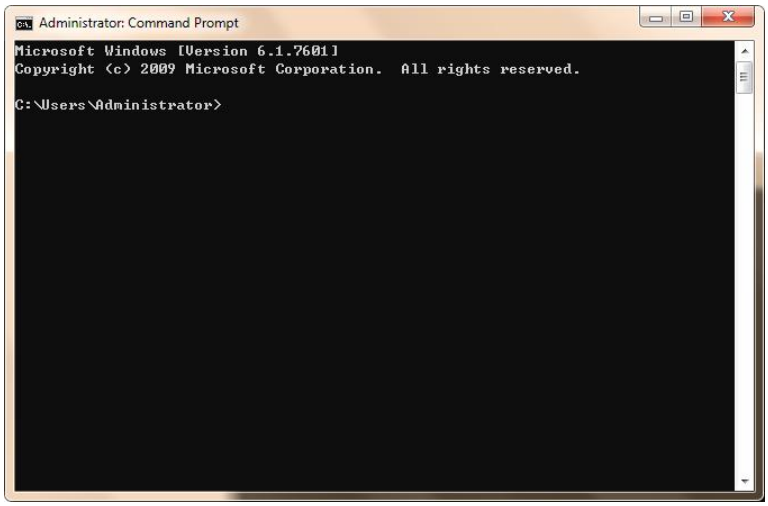
Before communication, the gateway should connect to the internet via Ethernet or WIFI. It use the RJ45 for Ethernet.Use a network cable to connect the gateway to a router.

After power up, you should modify the server address and ports. And you need to open a UDP socket in your server to received the data send from the gateway. The gateway don't deal with the data received, it only forward it to the server. And you may need to build your server and implement the LoRaWAN protocol in the server side.

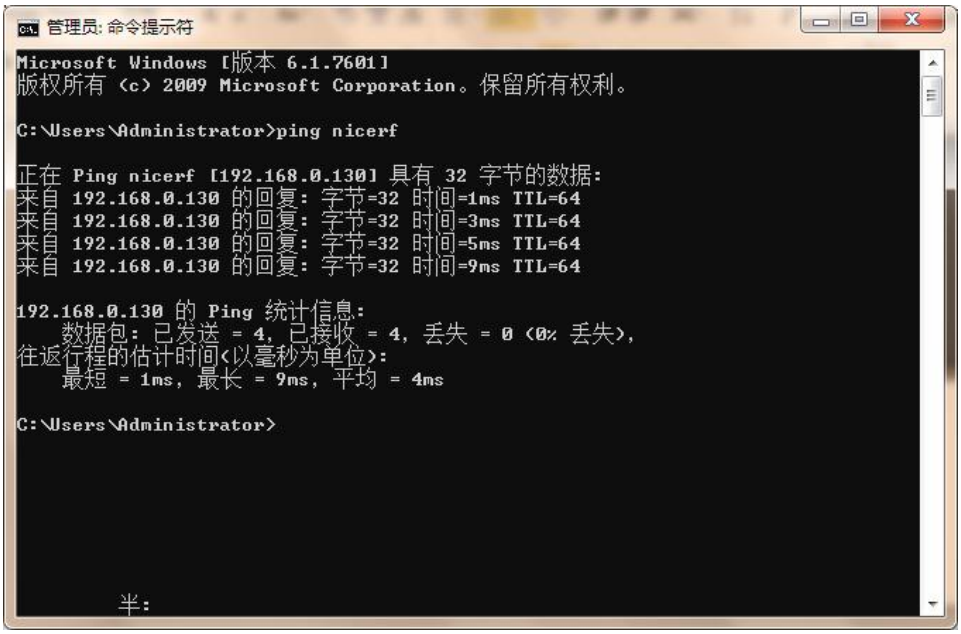
We don't develop server, so we use a public share server platform—TTN(The Things Network) to demonstrate the communication. The procedure please refer to file **Demonstration of communication between LoRaWAN gateway and server**.

4) Connect to WIFI

- Connect the gateway to a router use a network cable connect to the RJ45 port.
- Open the command prompt tool as below, path: Start > ALL Programs > Accessories > Command Prompt.



- Input ping nicerf and finish with ENTER, we can get the IP address of the gateway. As example, it is 192.168.0.130.



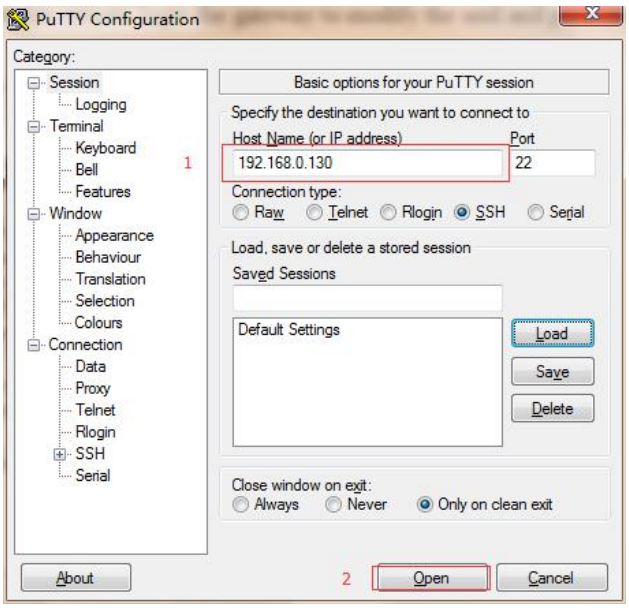
- After getting the IP address, we can remote login the gateway to modify the ssid and password of the wifi.

a. Double click the icon 

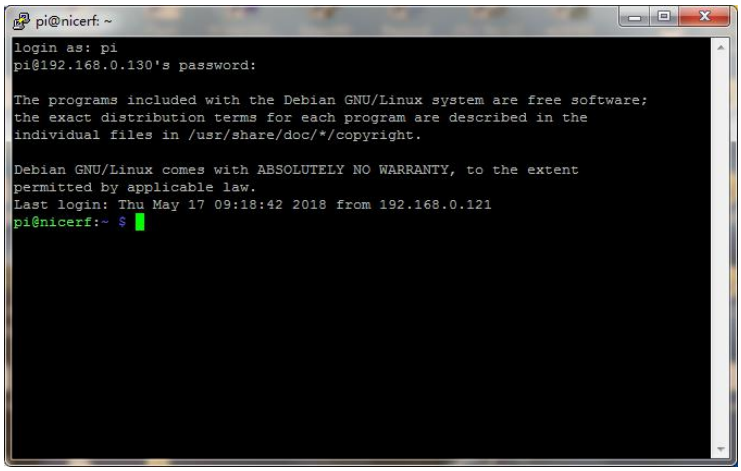
to open the remote login tool **putty**.

b. Input the IP we got in the last step. And click open.

c. If a alert appear, ignore it and click Yes

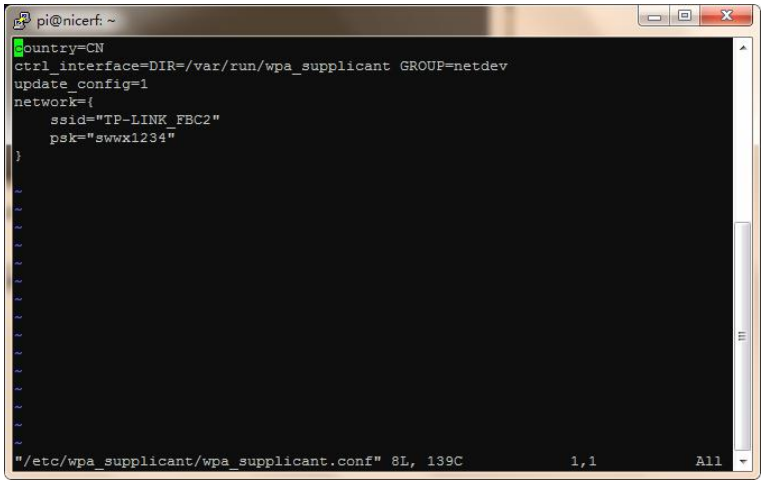


d. Prompt will appear, in the login as: input pi and ENTER, then input the password nicerf and ENTER. Then we login the gateway.



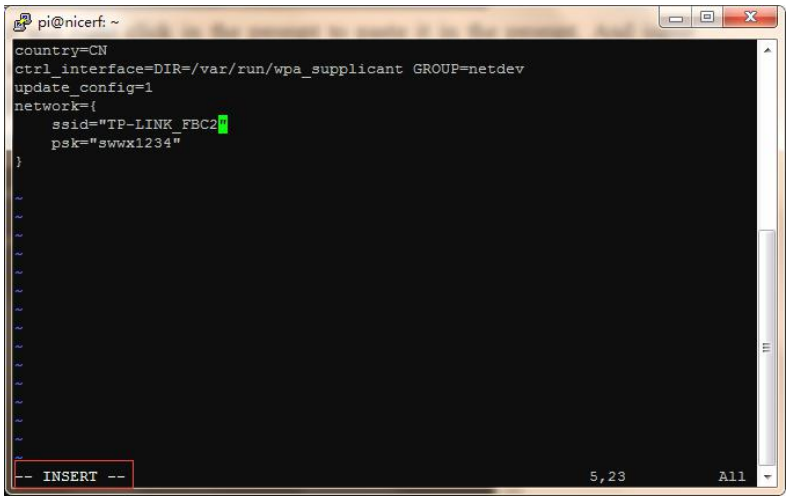
e. Copy this command and right click in the prompt to paste it . And input ENTER, the below screen will appear.

sudo vim /etc/wpa_supplicant/wpa_supplicant.conf



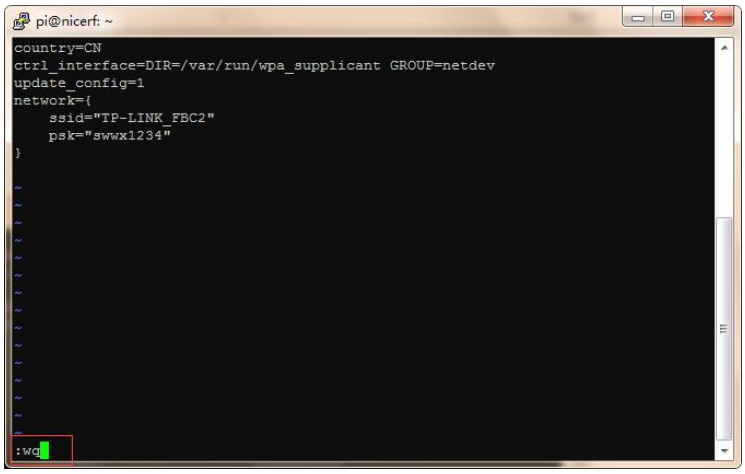
f. Use the DOWN button and RIGHT button to make the cursor to the ssid=" ", input I button then we can change the ssid and psk. As example, the SSID is TP-LINK_FBC2, the PSK is swwx1234, you change these content corresponding to your own wifi.

Note: only after we input the I button, we can change the content, it will prompt the INSERT in the left bottom corner.



g. After modification, press ESC to exit the insert state, and then input :wq and

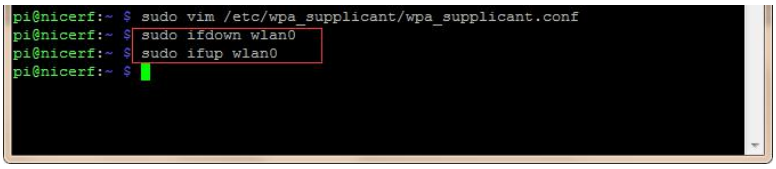
end with ENTER, we save the modification and exit.



- Input the below two command and end with ENTER to restart the wifi.

sudo ifdown wlan0

sudo ifup wlan0



Note: Only need to modify the SSID and PSK once, it will save and auto connect when next power up.

5) Setting mode

After powered up, press SET key to enter setting mode. The Status LED will be turned on to indicate. Press SET key again to exit setting mode, the Status LED will blink once a second in normal mode.

In setting mode , we can use the Serial Port Tool to send HEX commands to set the radio parameters, and send the AT commands to set the server patameters. The protocol please refer to **UART Protocol of NiceRF LoRaWAN Gateway (Packet Forwarder) v1.x**.

6) Default parameters of gateway

- Uart parameter :

Baud rate	Data bit	Parity bit	Stop bit
115200	8	N	1

- SX1301 configuration:

Regional	**EU433M**	**EU868M**	**KR920M**	AS923M	CN780M
Min TX frequence	430	865	920	920	778
Max TX frequence	440	875	930	930	788
Radio_0 RX center freq	433.575	868.50	922.30	923.60	779.90
Radio_1 RX center freq	434.175	869.10	922.90	924.20	780.90

CN470M	US915M	AS915M
500	920	920

510	930	930
470.70	902.7	915.6
471.30	903.3	916.2

Multiple SF Channel configuration							
channel	Enable (true/false)	rf_chain (0 / 1)	IF (hz)	CH_Freq (Mhz)			
				EU433M	EU868M	KR920M	AS923M
CH0:	true	0	-400 000	433.175	868.10	921.90	923.20
CH1:	true	0	-200 000	433.375	868.30	922.10	923.40
CH2:	true	0	0	433.575	868.50	922.30	923.60
CH3:	true	1	-400 000	433.775	868.70	922.50	923.80
CH4:	true	1	-200 000	433.975	868.90	922.70	924.00
CH5:	true	1	0	434.175	869.10	922.90	924.20
CH6:	true	1	200 000	434.375	869.30	923.10	924.40
CH7:	true	1	400 000	434.575	869.50	923.30	924.60

Multiple SF Channel configuration			
CH_Freq (Mhz)			
CN780M	CN470M	US915M	AS915M
779.50	470.30	902.3	915.2
779.70	470.50	902.5	915.4
779.90	470.70	902.7	915.6
780.50	470.90	902.9	915.8
780.70	471.10	903.1	916.0
780.90	471.30	903.3	916.2
781.10	471.50	903.5	916.4
781.30	471.70	903.7	916.6

Standard LoRa Channel configuration							
channel	Enable (true/false)	rf_chain (0 / 1)	IF (hz)	bandwidth	SF	Freq (Mhz)	
						EU433M	EU868M
CH8:	false	0	0	500k	7	433.575	868.50

Standard LoRa Channel configuration					
Freq (Mhz)					
KR920M	AS923M	CN780M	CN470M	US915M	AS915M
922.30	923.60	779.90	470.70	902.7	915.6

FSK Channel configuration

channel	Enable (true/false)	rf_chain (0 / 1)	IF (hz)	bandwidth	datarate	Freq (Mhz)	
						EU433M	EU868M
CH9:	false	1	300000	125k	50000	434.475	869.40

FSK Channel configuration					
Freq (Mhz)					
KR920M	AS923M	CN780M	CN470M	US915M	AS915M
921.20	924.50	781.20	471.60	903.6	916.5

Note: CH_Freq = Radio_x_RX_center_freq + IF.
Example, **CH0** map to rf_chain 0 (radio 0), so it's **Radio_x_RX_center_freq** is **922.3** MHz, it's **IF** is **-400 000** Hz. So the **CH_Freq = 922.3 – 0.4 = 921.9 MHz.**

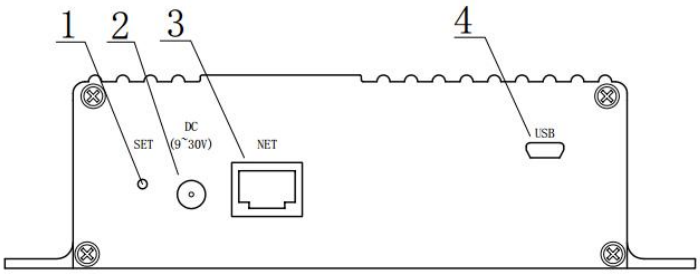
- Tx power table:

TXLUT INDEX	TX POWER(dBm)	DIG	DAC	PA	MIX
0	1	0	3	1	12
1	3	0	3	1	14
2	5	0	3	2	10
3	7	0	3	2	11
4	9	0	3	2	12
5	10	0	3	2	13
6	12	0	3	2	14
7	14	0	3	3	10
8	16	0	3	3	11
9	18	0	3	3	12
10	20	0	3	3	13
11	23	0	3	3	15

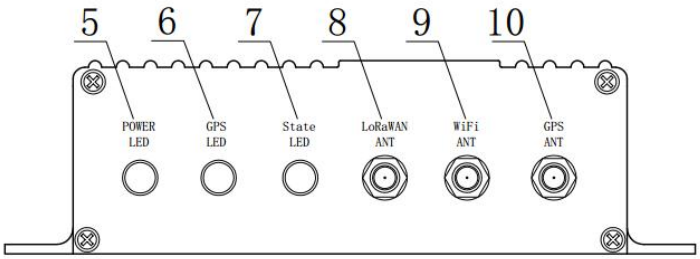
- Gateway configuration:

server_address:	router.as1.thethings.network
server_port_up:	1700
server_port_down:	1700

7. Pin definition



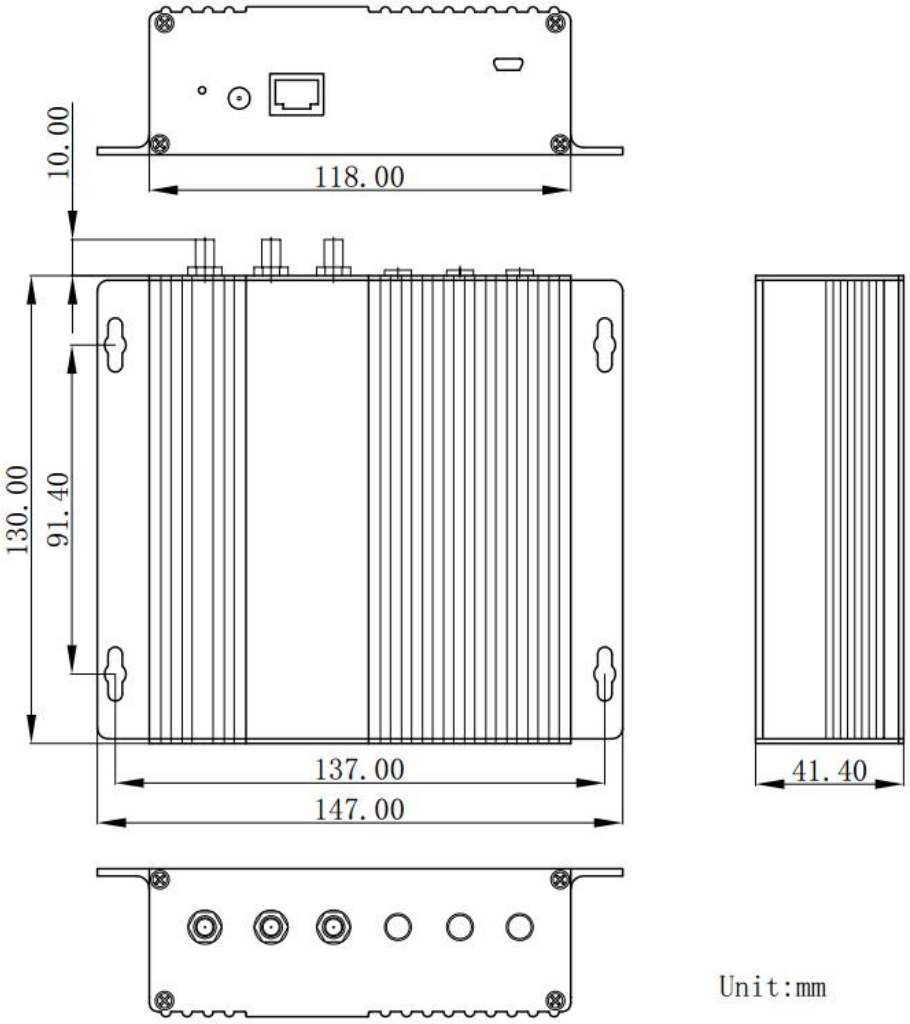
Front



Back

No.	Definition	Description
1	SET	Press to enter/exit setting mode
2	Power input	9~30V
3	RJ45	Connect to the internet
4	Micro USB	Connect to PC for configuration
5	Power LED	Green LED, indication of powered on.
6	GPS LED	Green LED, indication of the GPS module is running.
7	Status LED	Light on in setting mode, and blinks once per second in normal mode
8	LoRaWAN ANT	Connected with Antenna for lora RF radio.
9	WiFi ANT	Connected with Antenna for WiFi.
10	GPS ANT	Connected with Antenna for GPS module.

8. Mechanical dimension(Unit:mm)



9. Appendix

1. LoRaWAN Network Server Demonstration: Gateway to Server Interface Definition
2. Demonstration of communication between LoRaWAN gateway and server
3. UART Protocol of NiceRF LoRaWAN Gateway (Packet Forwarder) v1.x