

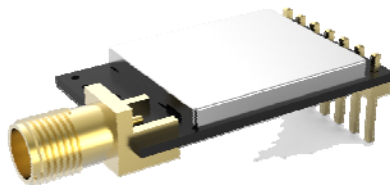


LoRa Wireless Communication Module

Design Guide

LR-101H

VER: 1.0



GlobalSat WorldCom Corporation
16F., No. 186, Jian 1st Rd, Zhonghe Dist.,
New Taipei City 23553, Taiwan
Tel: 886.2.8226.3799/ Fax: 886.2.8226.3899
service@globalsat.com.tw
www.globalsat.com.tw

USGlobalSat Incorporated
14740 Yorba Court Chino, CA 91710
Tel: 888.323.8720 / Fax: 909.597.8532
sales@usglobalsat.com
www.usglobalsat.com



Product Description

LR-101H is a low power-consuming, half-duplex module. It can wirelessly transmit data to long-distance. It is built-in high-speed and low power-consuming MCU and SX1276 modulation chipset. This chipset is applied with the forward error correction technique which greatly improves interference immunity and advances sensitivity. The coding can detect errors and automatically filter out errors and false data

LR-101H provides multi-channels. It supports various settings like baud rate, transmission power, and transmission speed, etc.

LR-101H is suitable for long-distance transmission or harsh environments.

Product feature

- Ultra-high sensitive receiving ability by LoRa spread spectrum modulation technology
- Long-distance transmission (1kM)
- Support setting various parameters like baud rate, transmission power, and transmission speed
- Multi-channel, dual data buffer (each 256 Bytes)
- Instant wake up over the air
- Four operating modes
- Built- in watchdog
- PIN connector for easy development and test

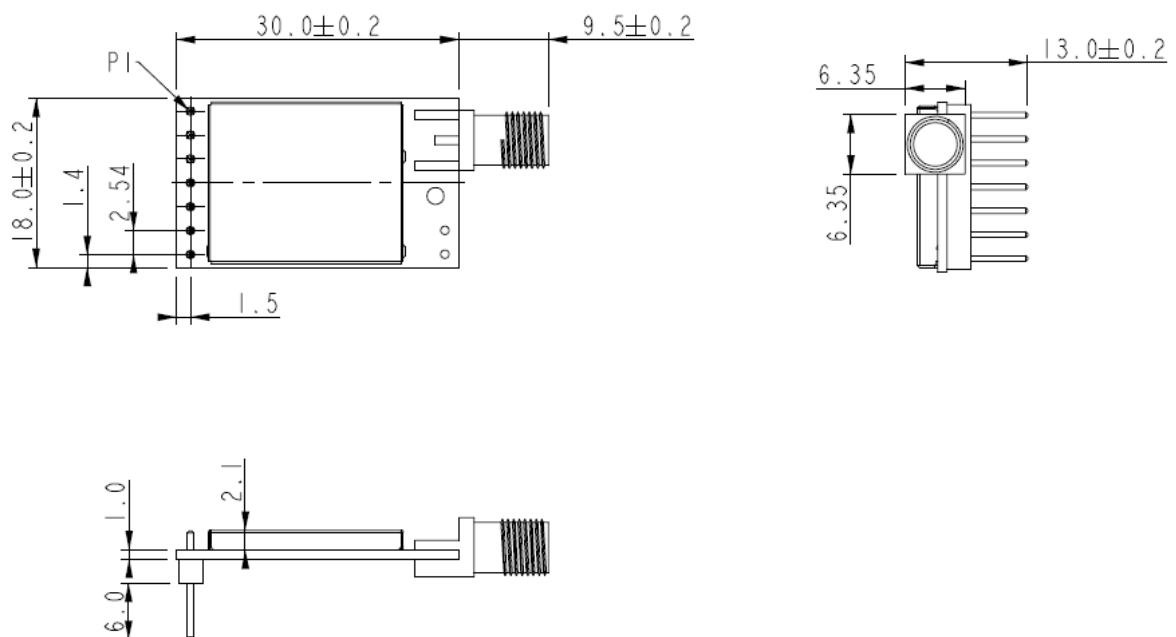
Hardware Specifications

Chipset	SEMTECH LoRa SX1276
Antenna	RPSMA/50Ω
Frequency	903-927 MHz
Transmission power	100mW (MAX.)
Transmission media	UART
UART	Baud Rate: 1200/2400/4800/9600(Default)/19200/38400/57600bps Parity: 8N1/8E1/8O1
Operation Voltage	3.0V~6V
Current consumption	Receiving: 13 mA(typical) , Transmitting: 120 mA(typical) Sleeping: 2.2uA(typical)
Transmission distance	1kM(0.81Kbps)
Receiving sensitivity	-132dBm@0.81Kbps
Operation Temperature	-40°C~ 85°C
Humidity	5%~95%(Non-condensing)
Dimension	30mm x 18mm(PCBA)
Connector	PIN type, pitch 2.54mm

Pin Definition

LR-101H Pin Definition			
Pin	Signal name	I/O	Description
1	GND	-	Ground
2	VCC	-	3.0V~6.0V
3	RXD	Input	UART input
4	TXD	Output	UART output
5	BZ	Output	Module's operation status
6	P2	Input	Pin2 for switching operation mode
7	P1	Input	Pin1 for switching operation mode

Product Size





Operation Mode

There are four operating modes of LR-101H.

1. Normal mode
2. Wake-up mode
3. Power-saving mode
4. Setup mode.

The four operation modes are switched by the signal level of P1 and P2.

Mode 1: Normal mode (P1=0, P2=0)

UART is opened. Wireless channel is opened. Penetrating transmission.

Mode 2: Wake-up mode (P1=0, P2=1)

UART is opened. Wireless channel is opened. The only difference from normal mode is that its preamble is longer than normal mode's, so that it can make sure the receiver could be waked in the power-saving mode.

Note: The receiver could be waked no matter it is in normal mode or wake-up mode or power-saving mode. The receiver would automatically add the RSSI at the end of the received data.

Mode 3: Power-saving mode (P1=1, P2=0)

UART is closed. The wireless channel is in power-saving mode. You can set up an interval from 0.5 to 5 seconds to wake up in power-saving mode to check if there is preamble. If the receiver receives preamble, it will open UART, and wake MCU to process the received data and return data. After that, it will return to the power-saving mode.

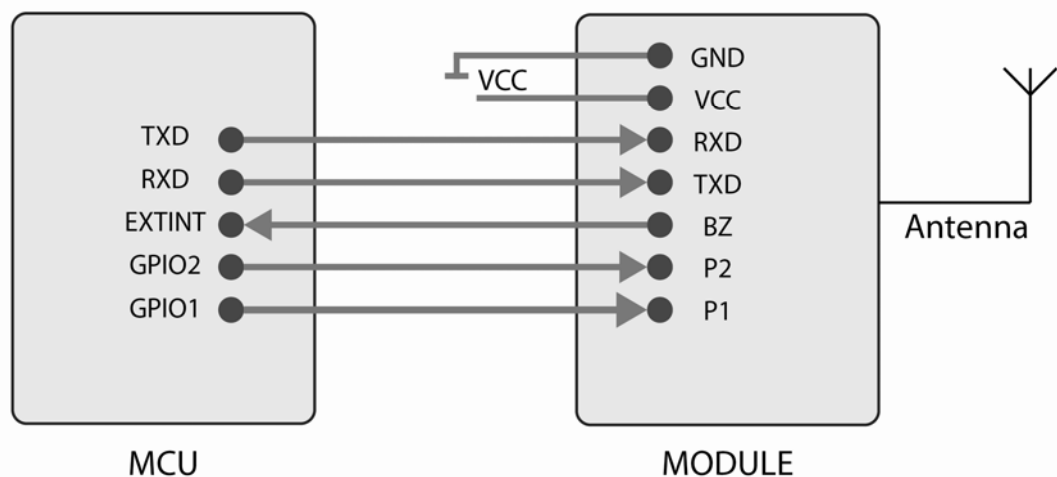
Mode 4: Setup mode (P1=1, P2=1)

UART is closed. Wireless channel is closed. It could only be configured.

Application Note

1. For proper operation of LR-101H, do not leave P1 or P2 floating. Do keep P1 and P2 at fixed level; otherwise it might cause the module instable.
2. Antenna is the important part in the communication system. The quality of antenna would directly influence the communication. Please take the antenna type and antenna's electrical characteristics into consideration while integrating LR-101 into product.

The Connection Diagram of the Module with MCU :





Parameter Setting

The configuration of LR-101H is programmed by hexadecimal notation. The default of baud rate is 9600bps. You can read and write the setting as below:

1) Read the setting: 0xFF 0x4C 0xCF 0x52 0xA1 0x52 0xF0 (7 bytes)

Response:

Preamble	Model Name	FW Version	LoRa MAC Address	Group ID	RF Frequency	RF TRx Rate	RF Power	UART Baud Rate	UART Parity	Wakeup Time	End Word
0x24 (1 byte)	4 bytes	7 bytes	8 bytes	1 byte	3 bytes	1 byte	1 byte	1 byte	1 byte	1 byte	0x21 (1 byte)

2) Write the setting:

Header of writing command	RF Frequency	Group ID	RF TRx Rate	RF Power	UART Baud Rate	UART Parity	Wakeup Time
0xFF 0x4C 0xCF 0x52 0xA1 0x57 0xF1 (7 byte)	3 bytes	1 byte	1 byte	1 byte	1 byte	1 byte	1 byte

Response:

Preamble	Model Name	FW Version	LoRa MAC Address	Group ID	RF Frequency	RF TRx Rate	RF Power	UART Baud Rate	UART Parity	Wakeup Time	End Word
0x24 (1 byte)	4 bytes	7 bytes	8 bytes	1 byte	3 bytes	1 byte	1 byte	1 byte	1 byte	1 byte	0x21 (1 byte)



The parameters are presented as hexadecimal.

Parameter Name	Bytes	Description
Model Name	4	Show the last 4 characters of model number in hexadecimal format. The last 4 characters of LR-101H are 101H. The hexadecimal of 101H is 0x31 0x30 0x31 0x4C. Model Name is written in FLASH memory and could not be modified.
FW Version	7	Show the last 7 characters of firmware version in hexadecimal format. EX: The hexadecimal of 1507291. is 0X31 0x35 0x30 0x37 0x32 0x39 0x31. FW Version is written in FLASH memory and could not be modified.
LoRa MAC Address	8	Show the last 8 characters of MCU ID. If MCU is changed, the LoRa Mac address must also be changed. LoRa Mac Address is written in FLASH memory and could not be modified. EX. 0x2A 0x1D 0x1C 0X1D 0x1E 0x1F 0x2A 0x2B
Group ID	1	The range is from 0 to 255. Please set the same group ID for the same group's devices for proper communication in the same group. (Default: 0, this function is disabled.)
RF Frequency	3	The unit is KHz. (Default: 915000KHz, which is presented as 0x0D 0xF6 0x38.)
RF TRx Rate	1	0.81K, 1.46K, 2.6K, 4.56K, 9.11K, 18.23Kbps are represented as 0x00 to 0x05. (Default: 4.56Kbps, which is presented as 0x03)
RF Power	1	The range is from 0 to 7. It is represented as 0x00 to 0x07. It would increase about 2dBm while increasing 1 to this parameter. (Default: 20dBm, which is presented as 0x07)
UART Baud Rate	1	1200,2400,4800,9600,19200,38400,57600 bps are represented as 0x00 to 0x06. (Default: 9600 bps, which is presented as 0x03)
UART Parity	1	No parity check is presented as 0x00. Odd parity check is presented as 0x01. Even parity check is presented as 0x02. (Default: no parity check, which is presented as 0x00)
Wakeup Time	1	50ms,100ms,200ms,400ms,600ms,1s,1.5s,2s,2.5s,3s,4s,5s are presented as 0x00 to 0x0b. (Default: 1sec, which is presented as 0x05)



For example, Module setting is as below:

Group ID is 0. Air rate is 0.81K bps. RF frequency is 915.000MHz. RF power is 20dBm.
UART Baud Rate is 9600bps. UART parity is none. Wakeup time is 1 sec.

Write the setting:

0xFF 0x4C 0xCF 0x52 0xA1 0x57 0xF1 0x0D 0xF6 0x38 0x00 0x00 0x07 0x03 0x00 0x05

Response:

0x24 0x31 0x30 0x31 0x4C 0x31 0x35 0x30 0x37 0x32 0x39 0x31 0x2A 0x1D 0x1C 0X1D
0x1E 0x1F 0x2A 0x2B 0x00 0x0D 0xF6 0x38 0x00 0x07 0x03 0x00 0x05 0x21



Design Note

The LR-101H LoRa modules are for being integrated into your devices for applying the LoRa technology, you can refer to the page3 of this doc.

1. GND under module should be kept into integrity.
2. Power Filter circuitry and matched resistance should be close to module.
3. The placement of the module should be kept away from the interfering source, such as WiFi Antenna, GSM Antenna, DDR CLK, and LCD line bundle, etc.

Quality Guarantee

LR-101H has been certificated with FCC, FCC ID certification number: RID-LR101H. To ensure the quality, every single device has to pass through testing and must be scrupulously checked for imperfections.

Trademark:  **GlobalSat**®

Product Name: LoRa Wireless Module

Model No.: LR-101H

FCC ID: RID-LR101H

Manual and Product Labeling Information To the End User

The end user manual shall include all required regulate or information/warning as shown in this manual. And when this module is installed in the host product, you must include a “Contains FCC ID:RID-LR101H” in the label of the host product.

FCC warning:

For Customers in the United States:

Any Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

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.

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. This equipment should be installed and operated with minimum distance 20cm between the radiator& your body.

This transmitter must not be co-located or operating in conjunction with any other antenna or transmitter.

Note: 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.