



## Product Specifications

# LoRa<sup>®</sup> Wireless Communication Module

**LM-110H1**

**VER 1.0**



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## **Product Description**

The GlobalSat LM-110H1 is a RF module that based on LoRa<sup>®</sup> technology which provides long-range, low data rate IoT connectivity to sensors, electronic meter reading, geolocation devices, industrial monitoring and control, home and building automation, long range irrigation systems, and all kinds of IoT/ M2M equipments. It can work as the end-node devices in the LoRaWAN<sup>™</sup> infrastructure or in GlobalSat proprietary M.O.S.T. mode.

## **Product Feature**

- Built-in standard LoRaWAN<sup>™</sup> FW and proprietary M.O.S.T. FW in the same module
- Default as LoRaWAN<sup>™</sup>, switch/ pre-load M.O.S.T. by AT command
- Share same PCB/ device design for both LoRaWAN<sup>™</sup> and private RF data communication
- For LoRaWAN<sup>™</sup> :
  - Standard LoRaWAN<sup>™</sup> protocol for EU868/ US915/ AS923 and profile for local settings
  - Support Class A/ Class C
- For M.O.S.T.:
  - MOST-Link: use AT-command set to send data over MOST-Link protocol
  - M.O.S.T.: set module as different operation mode for data transmission in any format
  - Frequency: 860 - 928 MHz
- Multi-channel, dual data buffer (each 256 Bytes)
- LoRa<sup>®</sup>/ FSK/ GFSK/ OOK modulation, 2-way half –duplex communication, strong anti-interfere
- Easily use, auto exchange on communication & transceiver
- PIN connector for easy development and test
- Accord FCC,ETSI, Telec standard

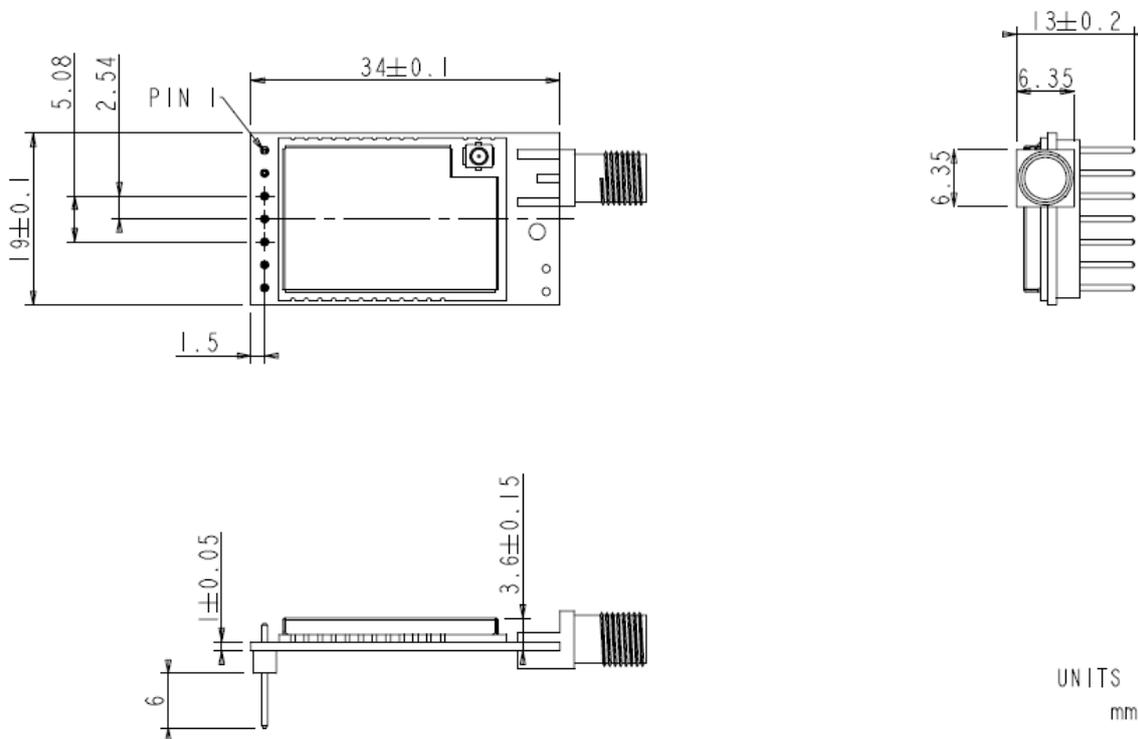
## Hardware Specifications

<b>LoRa<sup>®</sup> Chipset</b>	SX1276
<b>LoRa<sup>®</sup> Module</b>	Globalsat LoRa <sup>®</sup> module LM-130H1
<b>Antenna</b>	IPEX RF Connector RPSMA/ 50Ω
<b>MCU</b>	STM32 (128KB flash)
<b>Frequency</b>	863-870 MHz (EU) 902-928 MHz (US) 920-928 MHz (ROA)
<b>Transmission Power</b>	862-870 MHz (EU) @ 14 dBm 902-928 MHz (US) @ 20 dBm 920-928 MHz (ROA) @ 20 dBm
<b>Transmission Media</b>	UART
<b>UART</b>	Baud Rate : LoRaWAN <sup>™</sup> : 57600 bps, Parity: 8N1 M.O.S.T. : 9600 bps
<b>Operation Voltage</b>	3 ~ 6 V
<b>Current Consumption</b>	Receiving: 21 mA (typical) Transmitting: 125 mA (typical) Sleeping: 5 uA (typical)
<b>Transmission Distance</b>	LoRaWAN <sup>™</sup> : 1KM~10KM @ 980 bps M.O.S.T.: 1KM~10KM @ 0.81 Kbps
<b>Receiving Sensitivity</b>	LoRaWAN <sup>™</sup> : -132 dBm @ 980 bps M.O.S.T.: -132 dBm @ 0.81 Kbps
<b>Operation Temperature</b>	-40 ~ 85°C
<b>Humidity</b>	5 ~ 95% (Non-condensing)
<b>Dimension</b>	34 x 19 ± 0.1 mm (PCBA)
<b>Connector</b>	PIN type, pitch 2.54mm

## Pin Definition

No	Pin	Definition	Description
1	GND	GND	Ground
2	VCC	Input	3.0 ~ 6.0 V
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



## LoRaWAN™ Configuration

Activation of an end-device can be achieved in two ways, either via Over-The-Air Activation (OTAA) when an end-device is deployed or reset, or via Activation By Personalization (ABP) in which the two steps of end-device personalization and activation are done as one step.

### ■ Over-the-Air Activation

For over-the-air activation, end-devices must follow a join procedure prior to participating in data exchanges with the network server. An end-device has to go through a new join procedure every time it has lost the session context information. The join procedure requires the end-device to be personalized with the following information before it starts the join procedure: a globally unique end-device identifier (DevEUI), the application identifier (AppEUI), and an AES-128 key (AppKey).

### ■ Activation by Personalization

Under certain circumstances, end-devices can be activated by personalization. Activation by personalization directly ties an end-device to a specific network by-passing the join request join accept procedure.

Activating an end-device by personalization means that the DevAddr and the two session keys NwkSKey and AppSKey are directly stored into the end-device instead of the DevEUI, AppEUI and AppKey. The end-device is equipped with the required information for participating in a specific LoRa network when started. Each device should have a unique set of NwkSKey and AppSKey. Compromising the keys of one device shouldn't compromise the security of the communications of other devices.

## Operation Mode

- Bi-directional end-devices (Class A): End-devices of Class A allow for bi-directional communications whereby each end-device's uplink transmission is followed by two short downlink receive windows. The transmission slot scheduled by the end-device is based on its own communication needs with a small variation based on a random time basis (ALOHA-type of protocol). This Class A operation is the lowest power end-device system for applications that only require downlink communication from the server shortly after the end-device has sent an uplink transmission. Downlink communications from the server at any other time will have to wait until the next scheduled uplink.

- Bi-directional end-devices with maximal receive slots (Class C): End-devices of Class C have nearly continuously open receive windows, only closed when transmitting.

## **M.O.S.T. Proprietary Mode**

### Operation Mode

There are four operating modes

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.

## **MOST-Link Configuration**

Please refer to LM-130H1 AT Command Reference Guide for the detail setting.