

User Manual for SL101EU

LoRaWAN Temperature and Humidity Sensor

V1.0



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SL101EU is long range low power temperature and humidity sensor based on Semtech SX1262.

Main features:

Sensirion High Sensitivity Sensor

2.9 -inch Screen Local Display

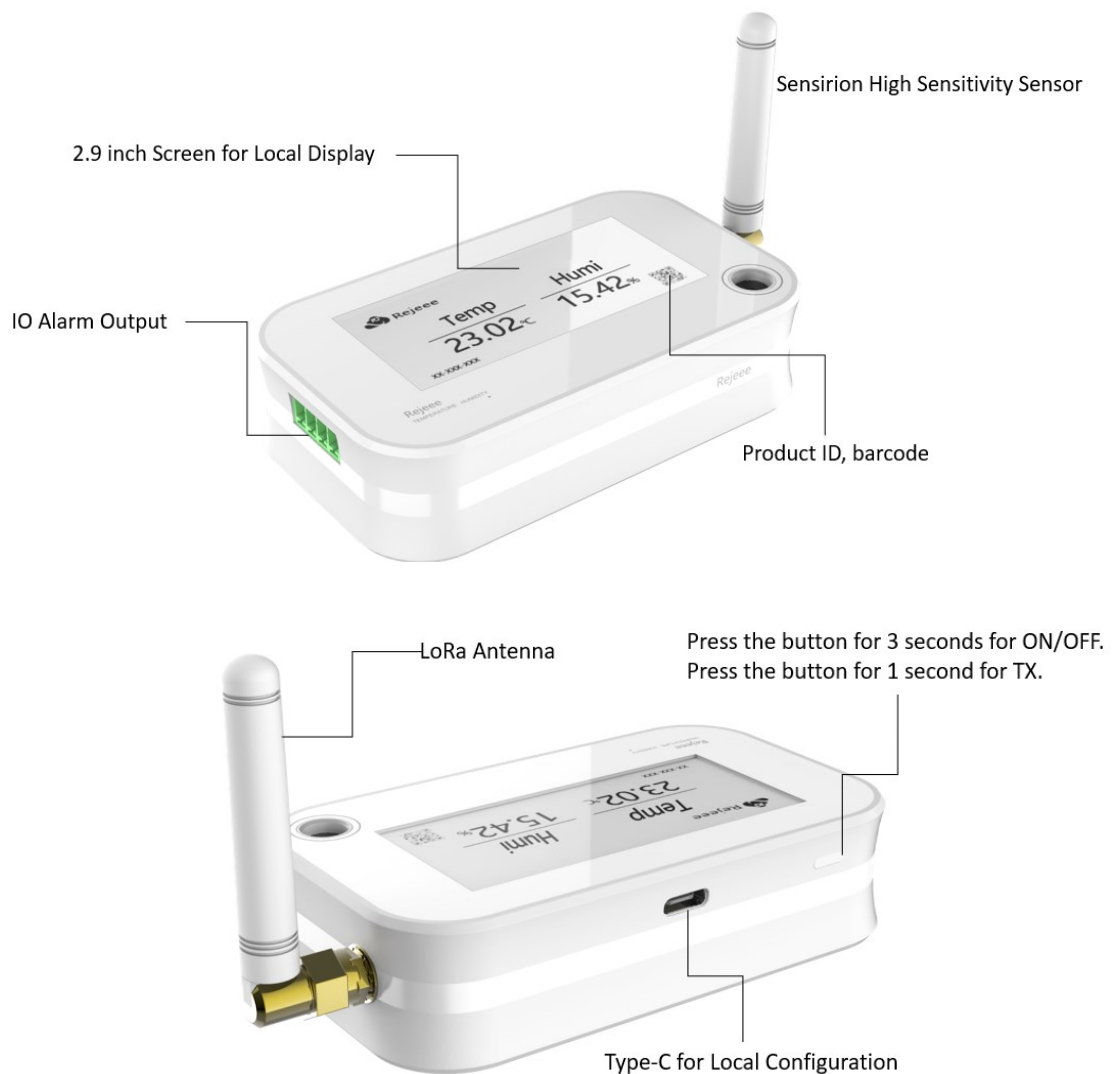
IO Alarm Output

Type-C for Local Configuration

Internal Battery Up to 5 Years

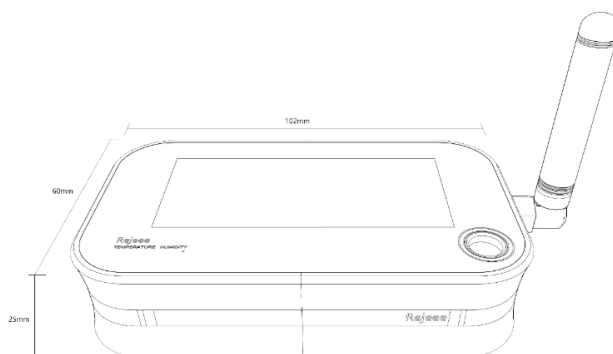
LoRa SX1262, Long Range Low Power

1. Details:



Parameter	Feature
CPU	M0+
Wireless	LoRaWAN(SX1262)
Encryption	AES128 Optional
Power	Built-in Li-battery
Working Temperature	-45 °C~+ 85 °C
Working Humidity	0-100%RH
Communication	Half duplex
Accuracy	Temperature: $\pm 0.3^{\circ}\text{C}$ Humidity: $\pm 3\%RH$
Power Capacity	4800mAh
Lifespan	3 Years(Every times for data uploading)
Data Speed	300bps-62.5k bps
Size	102mm*60mm*25mm
TX Power	22dBm Max
RX Sensitivity	-140 dBm
Frequency	470MHz~510MHz 868MHz 915MHz

2. Size: 102*65*25mm



3. Installation:

Hang on the wall

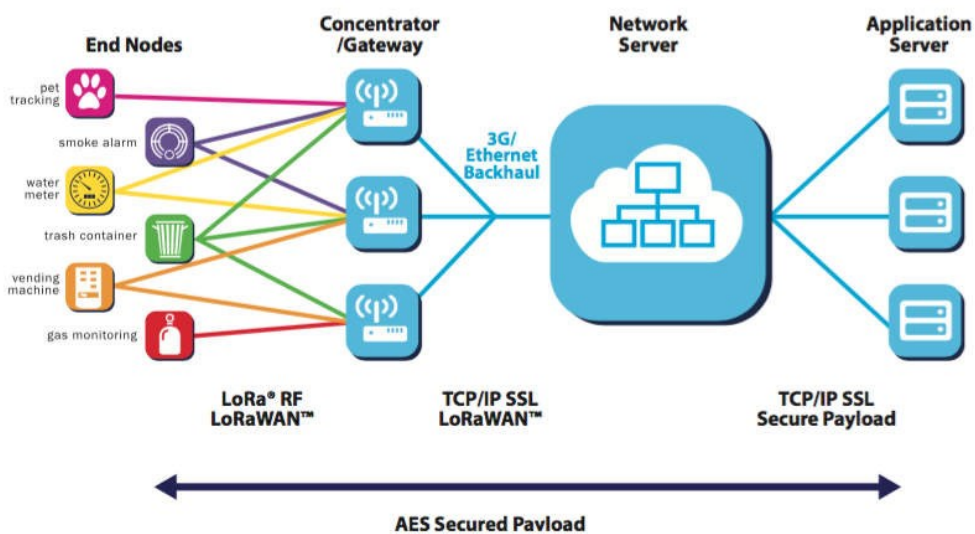


Lay the product flat on the table



4. Connect to LoRaWAN Network

LoRaWAN Network Structure



SL101EU temperature and humidity sensor is based on standard LoRaWAN Class A, so you can connect to any LoRaWAN network as below:

SL101EU sensor data uplink format with LoRaWAN by ABP, ABP parameter as below:

AppKey: 11223344556677889900aabbccddeeff

ADDR: Sensor ID as display on screen

DEVUI: Customer can add 4 bytes based on sensor ID displayed on screen, or customer can read 8 bytes ID through UART with Rejeee AT command.

Connecting to The Things Network, please make sure choose manually connect and ABP as below:

Register end device

From The LoRaWAN Device Repository Manually

LoRaWAN version ⓘ *

MAC V1.0 | v

Regional Parameters version ⓘ *

PHY V1.0 | v

Frequency plan ⓘ *

Europe 863-870 MHz (SF12 for RX2) | v

Show advanced activation, LoRaWAN class and cluster settings ^

Activation mode ⓘ *

Over the air activation (OTAA)

Activation by personalization (ABP)

Define multicast group (ABP & Multicast)

Additional LoRaWAN class capabilities ⓘ

None (class A only) | v

Network defaults ⓘ

Use network's Rx and frequency defaults

Cluster settings ⓘ

Use external LoRaWAN backend servers

Network Server address

eu1.cloud.thethings.network

5. Wireless LoRaWAN Sensor Data Format

Sensor Data		
Data 1	...	Data N
Type+Data N Bytes	Type+Data N Bytes	Type+Data N Bytes

LoRaWAN Format:

In order to connect to LoRaWAN network, the sensor support ABP data uploading.

AT+SIP=02(Start LoRaWAN format)

AT+AK=<32 Hex Chars>, which means AppKey, NwkSKey and AppSKey share the same secret key.

AT+ADDR=<8 Hex Char> or AT+ADDR? That means customers can set his own ADDR or choose sensor ADDR as LoRaWAN DevAddr.

AT+TFREQ=<8 Hex Char> according to different zone to set the starting frequency(By default, there are 8 frequencies), If the area standard frequency point is discontinuous, AT+NET=00 can be used to fix the transmission frequency point.

Picture as below, FRMPayload is sensor data, MIC replaces CRC.



MHDR	FHDR	FPort	FRMPayload=Sensor Data(Message)			MIC
			Data 1	...	Data N	4 Bytes
			Type+Data N Bytes	Type+Data N Bytes	Type+Data N Bytes	

6. Sensor Data Definition

Device(0x00)

Type 1 Byte	Value 2 Byte		
Status	Version 3bit	Level 5bit	Reserve 1 bit
0x00	000 x xxxx yyyyyyy First 3 is version, last 5 is battery level		

Temperature(0x04)

Type 1 Bytes	Value 2 Bytes	Notes
0x04	Temperature	2-byte signed integer with negative value below zero The default unit is 0.1 degrees, that is, 201 means 20.1 degrees

e.g: 0xFF88 is -120 (-12°C), Network byte order mode is {04 FF 88}

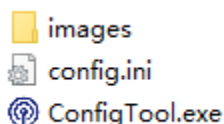
Humidity(0x05)

Type 1 Bytes	Value 1 Bytes	Notes
0x05	Humidity	Unsigned integer of 1 byte The default unit is 1%, that is, 10 means 10%

7. Local Configuration:

Note: Factory reset data uploading is every 10 mins, customers can change data uploading frequency as below:

Connect sensor with a USB-C cable to computer for local configuration, through local configuration, you can change the packet frequency. Download config tool here: <http://www.rejeee.com/#/w>, unpack the document as below:



Double click ConfigTool.exe to the page below, this is the factory reset parameter, and you can change each one to connect to other network, but normally customer only need to change data uploading frequency.

SerialPort : COM18 - USB-SERIAL CH340 (v) Refresh Baudrate : 9600 v Parity : 8N1 v Close

Device Information Settings(Blue is Often)

ReadConfig UpdateConfig

DevAddr: 053501CF ParamMode : 00 - Simple v NetMode : 00 - Fix v

Version(ATI): 2,1008 LFT : 300 LCP : 3 secur

NetMode: Node to Node Frequency(TX) : 868.1 Mhz Frequency(RX) : 868.1 Mhz

LinkCheckPeriod: 3 Protocol(IP) : 02 - ABP v SyncWord : 52

LifeTime: 300

TFREQ: 868100kHz AES Key(Hex) : 00000000000000000000000000000000

RFREQ: 868100kHz Set AES Clear AES Clear LCP Reset

SpreadingFactor: 7,12

SyncWord: 0x34

SEQ/IP: 0 2

AES: ON

IQ Inverted: OFF ON

LowDataRate: 0,0

Preamble: 8,10

Bandwidth: 125kHz

FNB: 0x84

Power: 22dBm

Modulation: LORA

CodeRate: 4/5

CRC: ON

ACK: OFF

TYPE: 0x00

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Following below steps to change packet uploading frequency:

1. Refresh
2. Open the serial port

SenceMode Help

SerialPort : USB-SERIAL CH340 (COM18) Refresh 1 Baudrate : 9600 Parity : 8N1 Open 2

Device Information Settings(Blue is Often)

ReadConfig UpdateConfig

DevAddr: ?? ParamMode : 00 - Simple NetMode : 00 - Fix

Version(ATI): ?? LFT : 0 LCP : 0 sector

NetMode: ?? Frequency(TX) : 433.00 Mhz Frequency(RX) : 433.00 Mhz

LinkCheckPeriod: ?? Protocol(IP) : 00 - None SyncWord : 18

LifeTime: ?? AES Key(Hex) : 00000000000000000000000000000000

TFREQ: ?? Set AES Clear AES Clear LCP Reset

RFREQ: ??

SpreadingFactor: ??

SyncWord: ??

SEQ/IP: ?? ??

AES: ??

IQ Inverted: ?? ??

LowDataRate: ??

Preamble: ??

Bandwidth: ??

FNB: ??

Power: ??

Modulation: ??

CodeRate: ??

CRC: ??

ACK: ??

TYPE: ??

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3. Read config information

4. Update the date uploading frequency for LCP and LFT. LCP is the frequency for sensor data collecting, LTF is the frequency for data uploading.

SerialPort : COM18 - USB-SERIAL CH340 Refresh Baudrate : 9600 Parity : 8N1 Close Config Read Succes

Device Information Settings(Blue is Often) AT Interactive message

ReadConfig UpdateConfig

DevAddr: 053501CF ParamMode : 00 - Simple NetMode : 00 - Fix

Version(ATI): 2,1008 LFT : 300 LCP : 3 sector

NetMode: Node to Node Frequency(TX) : 868.1 Mhz Frequency(RX) : 868.1 Mhz

LinkCheckPeriod: 3 Protocol(IP) : 02 - ABP SyncWord : 52

LifeTime: 300 AES Key(Hex) : 00000000000000000000000000000000

TFREQ: 868100kHz Set AES Clear AES Clear LCP Reset

RFREQ: 868100kHz

SpreadingFactor: 7,12

SyncWord: 0x34

SEQ/IP: 0 2

AES: ON

IQ Inverted: DIFFON

LowDataRate: 0,0

Preamble: 8,10

Bandwidth: 125kHz

FNB: 0x84

Power: 22dBm

Modulation: LORA

CodeRate: 4/5

CRC: ON

```
<: EROO
>: AT+CFG?
<: NET: Node to Node
<: TFRREQ: 868100kHz
<: RFRREQ: 868100kHz
<: POW: 22dBm
<: BW: 125kHz
<: TSF: 7
<: RSP: 12
<: CR: 4/5
<: MODE: LORA
<: SYNC: 0x34
<: PREM: 8, 10
<: FIX: 0, 0
<: CRC: ON
<: TIQ: OFF
<: RIQ: ON
<: SEQ: OFF
<: IP: ON
<: AES: ON
<: ACK: OFF
<: LDR: 0, 0
<: LCP: 3
<: LFT: 300
<: EXW: 0
<: FNB: 0x84
<: TYPE: 0x00
<: MIN: -50
<: MAX: 150
>: AT+ADDR?
<: +ADDR: 053501CF
>: AT+SIP?
<: +SIP: 02
>: ATI
<: +ATI: 2, 1008
```

5. Update config, and when configuration update successfully, close the config tool, and local configuration has been finished.

SerialPort: COM18 - USB-SERIAL CH340 (v) Refresh Baudrate: 9600 Parity: 8N1 Close Config Update Success

Device Information	Settings(Blue is Often)	AT Interactive message
<p>ReadConfig</p> <p>DevAddr: 053501CF Version(ATI): 2.1008 NetMode: Node to Node LinkCheckPeriod: 3 LifeTime: 600</p> <p>TFREQ: 868100kHz RFREQ: 868100kHz SpreadingFactor: 7,12 SyncWord: 0x34 SEQ/IP: 0 2</p> <p>AES: <input checked="" type="checkbox"/> ON IQ Inverted: <input checked="" type="checkbox"/> OFF ON LowDataRate: 0,0 Preamble: 8,10 Bandwidth: 125kHz</p> <p>FNB: 0x84 Power: 22dBm Modulation: LORA CodeRate: 4/5 CRC: <input checked="" type="checkbox"/> ON</p>	<p>UpdateConfig</p> <p>ParamMode: 00 - Simple NetMode: 00 - Fix LFT: 600 LCP: 3 secor Frequency(TX): 868,1 Mhz Frequency(RX): 868,1 Mhz Protocol(IP): 02 - ABP SyncWord: 52</p> <p>AES Key(Hex): <input type="text"/></p>	<pre> <> OK > AT+CFG? << NET: Node to Node << TFRQ: 868100kHz << RFRQ: 868100kHz << POW: 22dBm << BW: 125kHz << TSP: 7 << RSP: 12 << CR: 4/5 << MODE: LORA << SYNC: 0x34 << PREM: 8.10 << FIX: 0.0 << CRC: ON << TIQ: OFF << RIQ: ON << SBQ: OFF << IP: ON << AES: ON << ACK: OFF << LDR: 0.0 << LCP: 3 << LFT: 600 << RXW: 0 << FNB: 0x84 << TYPE: 0x00 << MIN: -50 << MAX: 150 > AT+ADDR? << +ADDR: 053501CF > AT+SIP? << +SIP: 02 > ATI << +ATI: 2.1008 </pre>
<div style="border: 1px solid gray; padding: 5px; width: fit-content; margin: auto;"> <p>System Notice</p> <p> Congratulations, your configuration update successful.</p> <p style="text-align: right;">Reset</p> <p style="text-align: center;"><input type="button" value="OK"/></p> </div>		