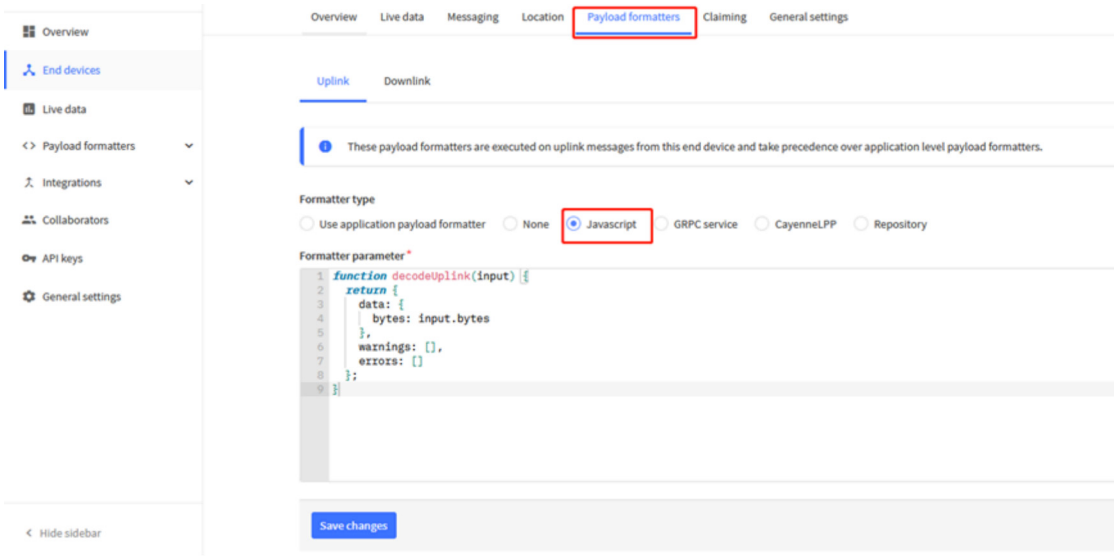


The payload decoder function for TTN V3 are here:

SN50v3-LB TTN V3 Payload Decoder: https://github.com/dragino/dragino-end-node-decoder

2.3.3.1 Battery Info

Check the battery voltage for SN50v3-LB.

Ex1: 0x0B45 = 2885mV

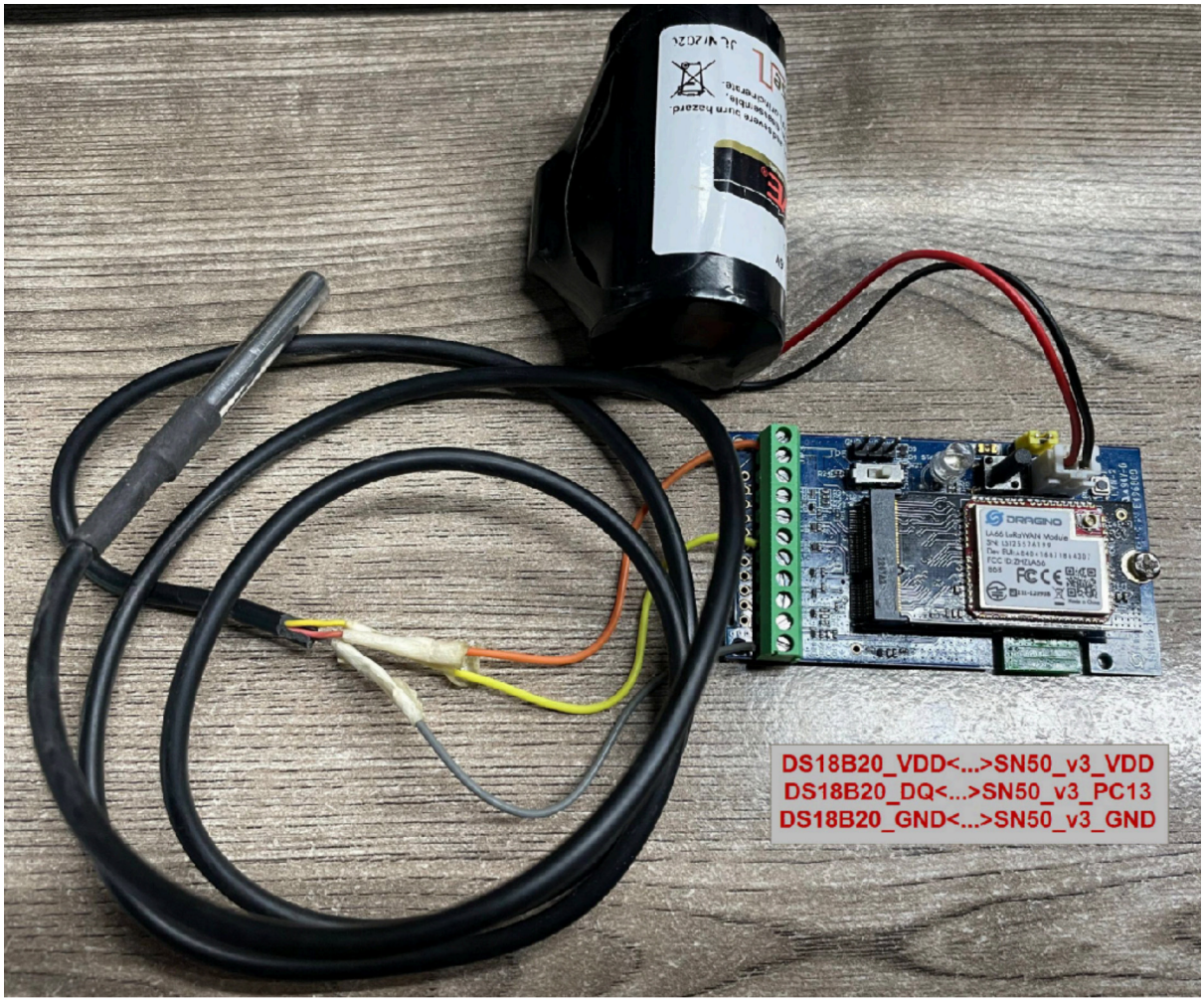
Ex2: 0x0B49 = 2889mV

2.3.3.2 Temperature (DS18B20)

If there is a DS18B20 connected to PC13 pin. The temperature will be uploaded in the payload.

More DS18B20 can check the 3 DS18B20 mode

Connection:



Example:

If payload is: 0105H: (0105 & 8000 == 0), temp = 0105H /10 = 26.1 degree

If payload is: FF3FH : (FF3F & 8000 == 1) , temp = (FF3FH - 65536)/10 = -19.3 degrees.

(FF3F & 8000: Judge whether the highest bit is 1, when the highest bit is 1, it is negative)

2.3.3.3 Digital Input

The digital input for pin PB15,

- When PB15 is high, the bit 1 of payload byte 6 is 1.
- When PB15 is low, the bit 1 of payload byte 6 is 0.

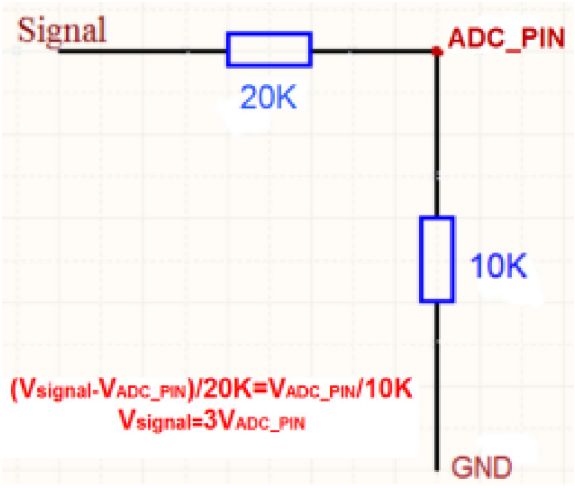
When the digital interrupt pin is set to AT+INTMODx=0, this pin is used as a digital input pin.

Note: The maximum voltage input supports 3.6V.

2.3.3.4 Analogue Digital Converter (ADC)

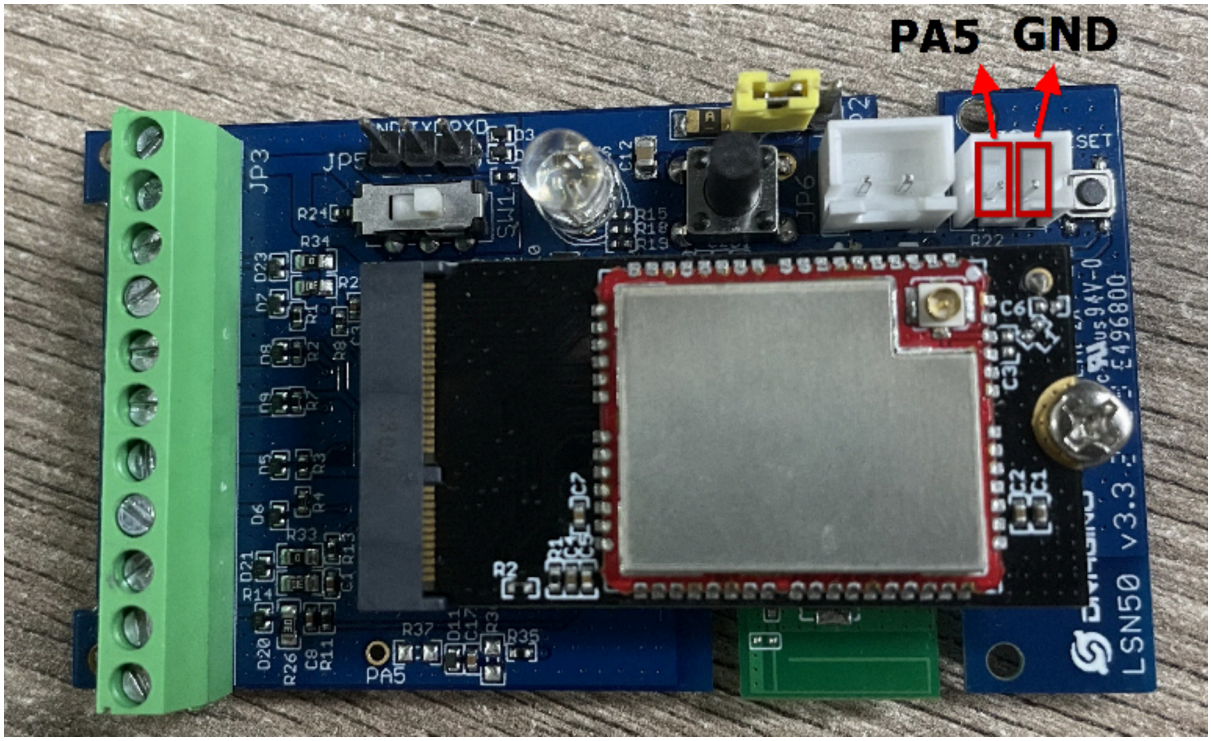
The measuring range of the ADC is only about 0.1V to 1.1V The voltage resolution is about 0.24mv.

When the measured output voltage of the sensor is not within the range of 0.1V and 1.1V, the output voltage terminal of the sensor shall be divided The example in the following figure is to reduce the output voltage of the sensor by three times If it is necessary to reduce more times, calculate according to the formula in the figure and connect the corresponding resistance in series.



Note: If the ADC type sensor needs to be powered by SN50_v3, it is recommended to use +5V to control its switch.Only sensors with low power consumption can be powered with VDD.

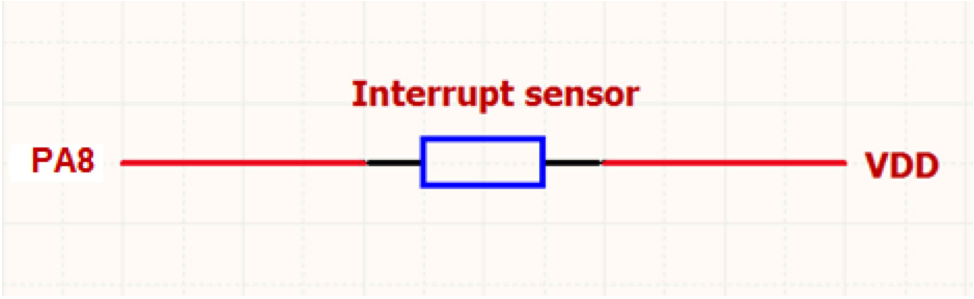
The position of PA5 on the hardware after **LSN50 v3.3** is changed to the position shown in the figure below, and the collected voltage becomes one-sixth of the original.



2.3.3.5 Digital Interrupt

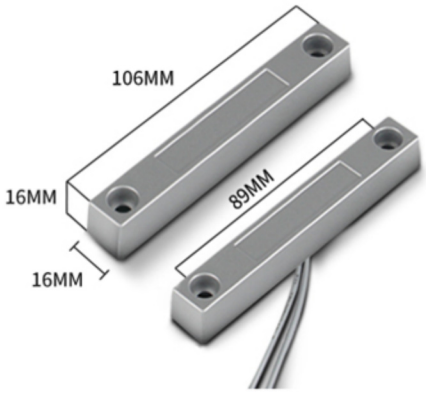
Digital Interrupt refers to pin PA8, and there are different trigger methods. When there is a trigger, the SN50v3-LB will send a packet to the server.

Interrupt connection method:



Example to use with door sensor :

The door sensor is shown at right. It is a two wire magnetic contact switch used for detecting the open/close status of doors or windows.



When the two pieces are close to each other, the 2 wire output will be short or open (depending on the type), while if the two pieces are away from each other, the 2 wire output will be the opposite status. So we can use SN50v3-LB interrupt interface to detect the status for the door or window.

Below is the installation example:

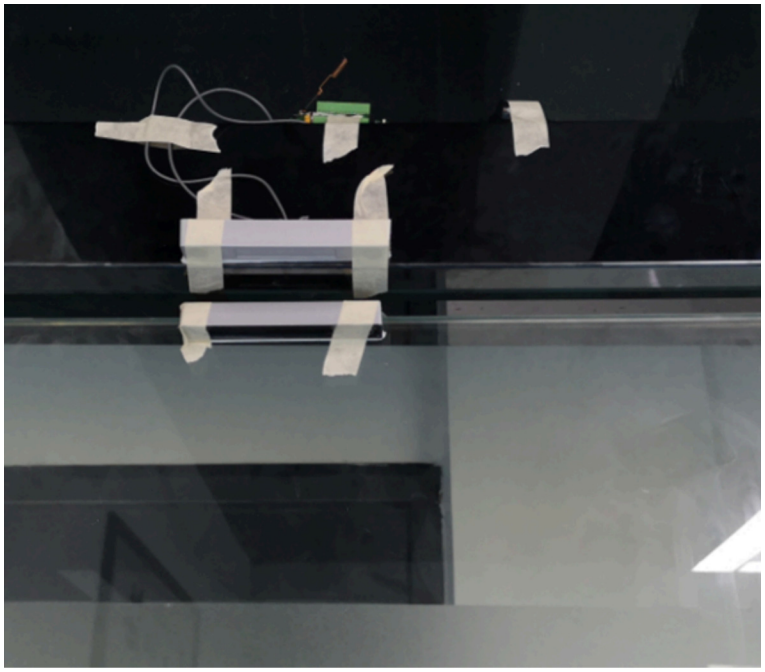
Fix one piece of the magnetic sensor to the door and connect the two pins to SN50v3-LB as follows:

- One pin to SN50v3-LB's PA8 pin
- The other pin to SN50v3-LB's VDD pin

Install the other piece to the door. Find a place where the two pieces will be close to each other when the door is closed. For this particular magnetic sensor, when the door is closed, the output will be short, and PA8 will be at the VCC voltage.

Door sensors have two types: **NC (Normal close)** and **NO (normal open)**. The connection for both type sensors are the same. But the decoding for payload are reverse, user need to modify this in the IoT Server decoder.

When door sensor is shorted, there will extra power consumption in the circuit, the extra current is 3v3/R14 = 3v3/1Mohm = 3uA which can be ignored.



The above photos shows the two parts of the magnetic switch fitted to a door.

The software by default uses the falling edge on the signal line as an interrupt. We need to modify it to accept both the rising edge (0v --> VCC , door close) and the falling edge (VCC --> 0v , door open) as the interrupt.

The command is:

AT+INTMOD1=1 // (more info about INMOD please refer **AT Command Manual.**)

Below shows some screen captures in TTN V3:

In **MOD=1**, user can use byte 6 to see the status for door open or close. TTN V3 decoder is as below:

door= (bytes[6] & 0x80)? "CLOSE":"OPEN";

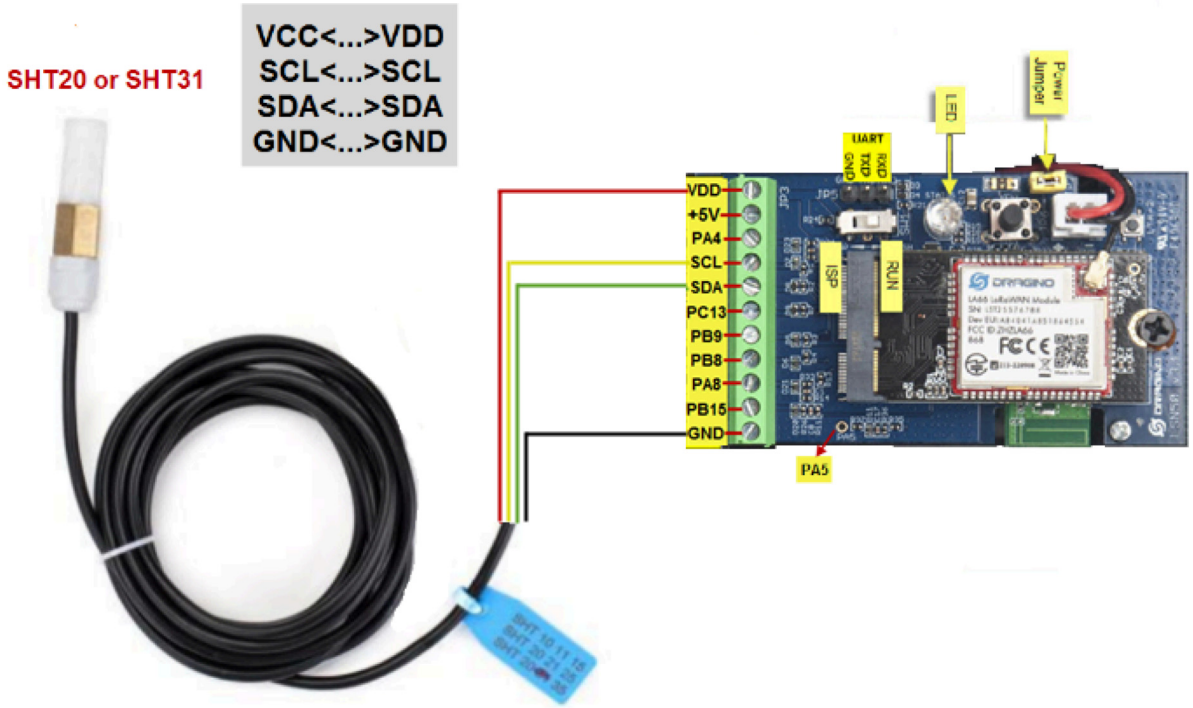
2.3.3.6 I2C Interface (SHT20 & SHT31)

The SDA and SCK are I2C interface lines. You can use these to connect to an I2C device and get the sensor data.

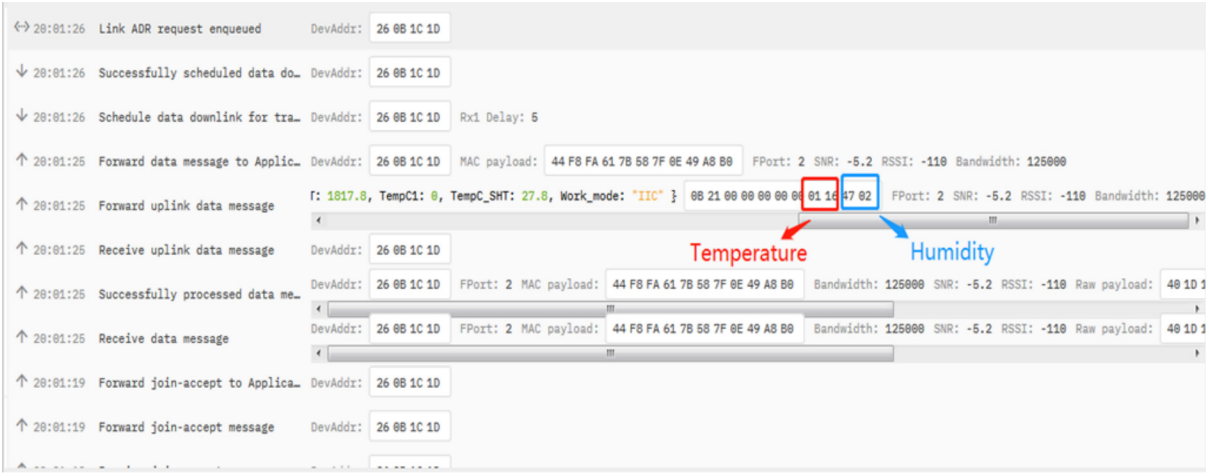
We have made an example to show how to use the I2C interface to connect to the SHT20/ SHT31 Temperature and Humidity Sensor.

Notice: Different I2C sensors have different I2C commands set and initiate process, if user want to use other I2C sensors, User need to re-write the source code to support those sensors. SHT20/ SHT31 code in SN50v3-LB will be a good reference.

Below is the connection to SHT20/ SHT31. The connection is as below:



The device will be able to get the I2C sensor data now and upload to IoT Server.



Convert the read byte to decimal and divide it by ten.

Example:

Temperature: Read:0116(H) = 278(D) Value: 278 /10=27.8℃;

Humidity: Read:0248(H)=584(D) Value: 584 / 10=58.4, So 58.4%

If you want to use other I2C device, please refer the SHT20 part source code as reference.

2.3.3.7 Distance Reading

Refer Ultrasonic Sensor section.

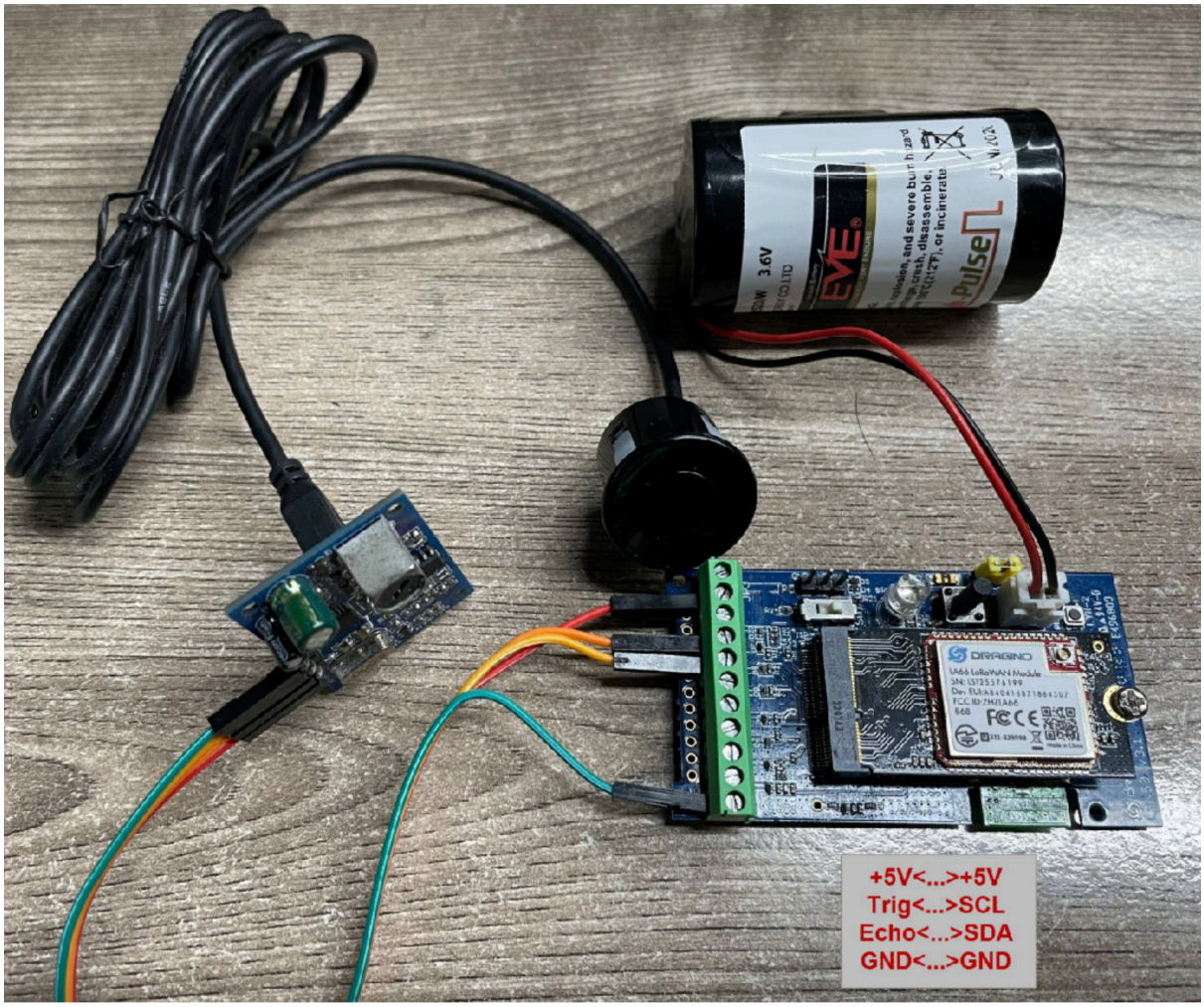
2.3.3.8 Ultrasonic Sensor

This Fundamental Principles of this sensor can be found at this link: https://wiki.dfrobot.com/Weather_-_proof_Ultrasonic_Sensor_with_Separate_Probe_SKU___SEN0208

The SN50v3-LB detects the pulse width of the sensor and converts it to mm output. The accuracy will be within 1 centimeter. The usable range (the distance between the ultrasonic probe and the measured object) is between 24cm and 600cm.

The working principle of this sensor is similar to the **HC-SR04** ultrasonic sensor.

The picture below shows the connection:



Connect to the SN50v3-LB and run **AT+MOD=2** to switch to ultrasonic mode (ULT).

The ultrasonic sensor uses the 8th and 9th byte for the measurement value.

Example:

Distance: Read: 0C2D(Hex) = 3117(D) Value: 3117 mm=311.7 cm

2.3.3.9 Battery Output - BAT pin

The BAT pin of SN50v3-LB is connected to the Battery directly. If users want to use BAT pin to power an external sensor. User need to make sure the external sensor is of low power consumption. Because the BAT pin is always open. If the external sensor is of high power consumption. the battery of SN50v3-LB will run out very soon.

2.3.3.10 +5V Output

SN50v3-LB will enable +5V output before all sampling and disable the +5v after all sampling.

The 5V output time can be controlled by AT Command.

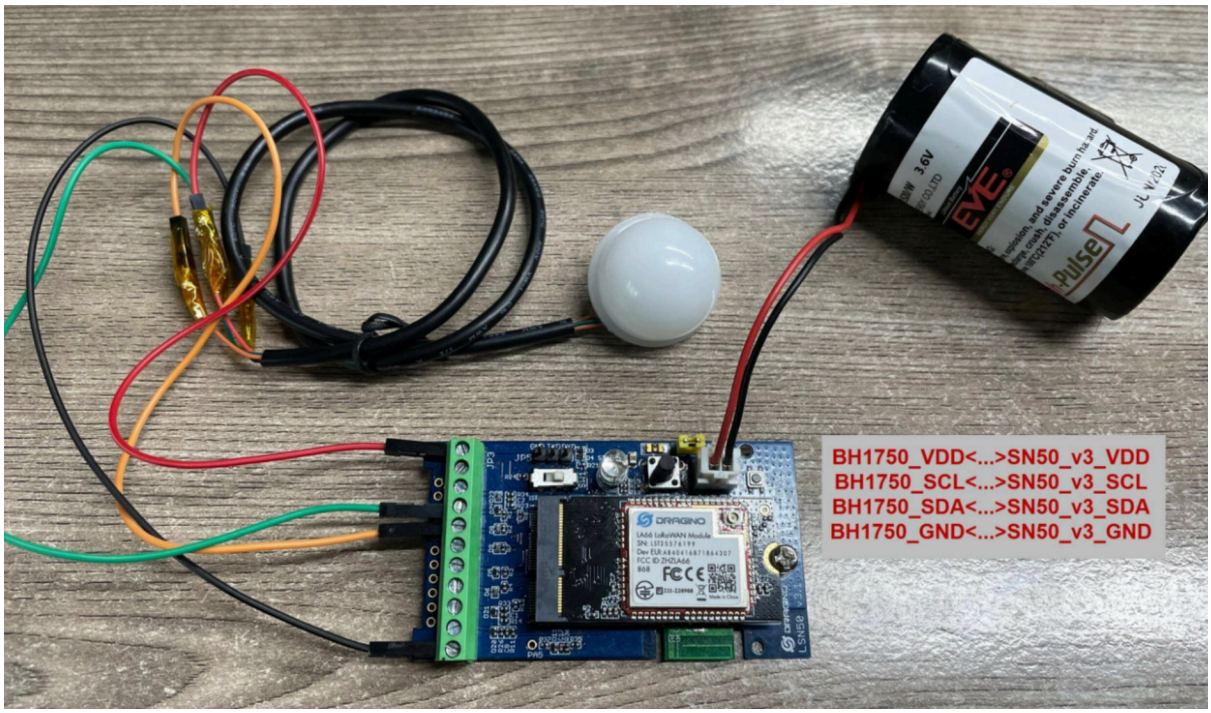
AT+5VT=1000

Means set 5V valid time to have 1000ms. So the real 5V output will actually have 1000ms + sampling time for other sensors.

By default the **AT+5VT=500**. If the external sensor which require 5v and require more time to get stable state, user can use this command to increase the power ON duration for this sensor.

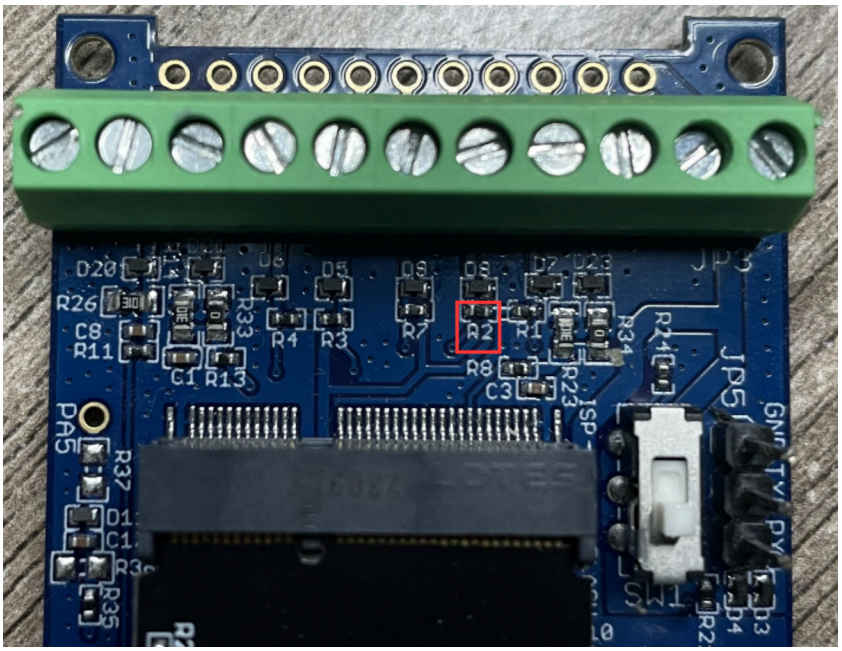
2.3.3.11 BH1750 Illumination Sensor

MOD=1 support this sensor. The sensor value is in the 8th and 9th bytes.



2.3.3.12 PWM MOD

- The maximum voltage that the SDA pin of SN50v3 can withstand is 3.6V, and it cannot exceed this voltage value, otherwise the chip may be burned.
- If the PWM pin connected to the SDA pin cannot maintain a high level when it is not working, you need to remove the resistor R2 or replace it with a resistor with a larger resistance, otherwise a sleep current of about 360uA will be generated. The position of the resistor is shown in the figure below:



- The signal captured by the input should preferably be processed by hardware filtering and then connected in. The software processing method is to capture four values, discard the first captured value, and then take the middle value of the second, third, and fourth captured values.
- Since the device can only detect a pulse period of 50ms when AT+PWMSET=0 (counting in microseconds), it is necessary to change the value of PWMSET according to the frequency of input capture.

2.3.3.13 Working MOD

The working MOD info is contained in the Digital in & Digital Interrupt byte (7th Byte).

User can use the 3rd ~ 7th bit of this byte to see the working mod:

Case 7th Byte >> 2 & 0x1f:

- 0: MOD1
- 1: MOD2
- 2: MOD3
- 3: MOD4
- 4: MOD5
- 5: MOD6
- 6: MOD7
- 7: MOD8
- 8: MOD9
- 9: MOD10

2.4 Payload Decoder file

In TTN, use can add a custom payload so it shows friendly reading

In the page **Applications --> Payload Formats --> Custom --> decoder** to add the decoder from:

https://github.com/dragino/dragino-end-node-decoder/tree/main/SN50_v3-LB

2.5 Frequency Plans

The SN50v3-LB uses OTAA mode and below frequency plans by default. If user want to use it with different frequency plan, please refer the AT command sets.

http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20Frequency%20Band/

3. Configure SN50v3-LB

3.1 Configure Methods

SN50v3-LB supports below configure method:

- AT Command via Bluetooth Connection (**Recommended**): BLE Configure Instruction.
- AT Command via UART Connection : See UART Connection.
- LoRaWAN Downlink. Instruction for different platforms: See IoT LoRaWAN Server section.

3.2 General Commands

These commands are to configure:

- General system settings like: uplink interval.
- LoRaWAN protocol & radio related command.

They are same for all Dragino Devices which support DLWS-005 LoRaWAN Stack. These commands can be found on the wiki:

http://wiki.dragino.com/xwiki/bin/view/Main/End%20Device%20AT%20Commands%20and%20Downlink%20Command/

3.3 Commands special design for SN50v3-LB

These commands only valid for SN50v3-LB, as below:

3.3.1 Set Transmit Interval Time

Feature: Change LoRaWAN End Node Transmit Interval.

AT Command: AT+TDC

Command Example	Function	Response
AT+TDC=?	Show current transmit Interval	30000 OK the interval is 30000ms = 30s
AT+TDC=60000	Set Transmit Interval	OK Set transmit interval to 60000ms = 60 seconds

Downlink Command: 0x01

Format: Command Code (0x01) followed by 3 bytes time value.

If the downlink payload=0100003C, it means set the END Node's Transmit Interval to 0x00003C=60(S), while type code is 01.

- Example 1: Downlink Payload: 0100001E // Set Transmit Interval (TDC) = 30 seconds
- Example 2: Downlink Payload: 0100003C // Set Transmit Interval (TDC) = 60 seconds

3.3.2 Get Device Status

Send a LoRaWAN downlink to ask the device to send its status.

Downlink Payload: 0x26 01

Sensor will upload Device Status via **FPORT=5**. See payload section for detail.

3.3.3 Set Interrupt Mode

Feature, Set Interrupt mode for GPIO_EXIT.

AT Command: AT+INTMOD1, AT+INTMOD2, AT+INTMOD3

Command Example	Function	Response
AT+INTMOD1=?	Show current interrupt mode	0 OK the mode is 0 =Disable Interrupt
AT+INTMOD1=2	Set Transmit Interval 0. (Disable Interrupt), 1. (Trigger by rising and falling edge) 2. (Trigger by falling edge) 3. (Trigger by rising edge)	OK

AT+INTMOD2=3	Set Transmit Interval trigger by rising edge.	OK
AT+INTMOD3=0	Disable Interrupt	OK

Downlink Command: 0x06

Format: Command Code (0x06) followed by 3 bytes.

This means that the interrupt mode of the end node is set to 0x000003=3 (rising edge trigger), and the type code is 06.

- Example 1: Downlink Payload: 06000000 **--->** AT+INTMOD1=0
- Example 2: Downlink Payload: 06000003 **--->** AT+INTMOD1=3
- Example 3: Downlink Payload: 06000102 **--->** AT+INTMOD2=2
- Example 4: Downlink Payload: 06000201 **--->** AT+INTMOD3=1

3.3.4 Set Power Output Duration

Control the output duration 5V . Before each sampling, device will

1. first enable the power output to external sensor,

2. keep it on as per duration, read sensor value and construct uplink payload

3. final, close the power output.

AT Command: AT+5VT

Command Example	Function	Response
AT+5VT=?	Show 5V open time.	500(default) OK
AT+5VT=1000	Close after a delay of 1000 milliseconds.	OK

Downlink Command: 0x07

Format: Command Code (0x07) followed by 2 bytes.

The first and second bytes are the time to turn on.

- Example 1: Downlink Payload: 070000 **--->** AT+5VT=0
- Example 2: Downlink Payload: 0701F4 **--->** AT+5VT=500

3.3.5 Set Weighing parameters

Feature: Working mode 5 is effective, weight initialization and weight factor setting of HX711.

AT Command: AT+WEIGRE,AT+WEIGAP

Command Example	Function	Response
AT+WEIGRE	Weight is initialized to 0.	OK
AT+WEIGAP=?	400.0	OK(default)
AT+WEIGAP=400.3	Set the factor to 400.3.	OK

Downlink Command: 0x08

Format: Command Code (0x08) followed by 2 bytes or 4 bytes.

Use AT+WEIGRE when the first byte is 1, only 1 byte. When it is 2, use AT+WEIGAP, there are 3 bytes.

The second and third bytes are multiplied by 10 times to be the AT+WEIGAP value.

- Example 1: Downlink Payload: 0801 **--->** AT+WEIGRE
- Example 2: Downlink Payload: 08020FA3 **--->** AT+WEIGAP=400.3
- Example 3: Downlink Payload: 08020FA0 **--->** AT+WEIGAP=400.0

3.3.6 Set Digital pulse count value

Feature: Set the pulse count value.

Count 1 is PA8 pin of mode 6 and mode 9. Count 2 is PA4 pin of mode 9.

AT Command: AT+SETCNT

Command Example	Function	Response
AT+SETCNT=1,100	Initialize the count value 1 to 100.	OK
AT+SETCNT=2,0	Initialize the count value 2 to 0.	OK

Downlink Command: 0x09

Format: Command Code (0x09) followed by 5 bytes.

The first byte is to select which count value to initialize, and the next four bytes are the count value to be initialized.

- Example 1: Downlink Payload: 090100000000 **--->** AT+SETCNT=1,0
- Example 2: Downlink Payload: 0902000003E8 **--->** AT+SETCNT=2,1000

3.3.7 Set Workmode

Feature: Switch working mode.

AT Command: AT+MOD

Command Example	Function	Response
AT+MOD=?	Get the current working mode.	OK
AT+MOD=4	Set the working mode to 3DS18B20s.	OK Attention:Take effect after ATZ

Downlink Command: 0x0A

Format: Command Code (0x0A) followed by 1 bytes.

- Example 1: Downlink Payload: 0A01 **--->** AT+MOD=1
- Example 2: Downlink Payload: 0A04 **--->** AT+MOD=4

3.3.8 PWM setting

Feature: Set the time acquisition unit for PWM input capture.

AT Command: AT+PWMSET

Command Example	Function	Response
AT+PWMSET=?	0	0(default) OK
AT+PWMSET=0	The unit of PWM capture time is microsecond. The capture frequency range is between 20HZ and 100000HZ.	OK
AT+PWMSET=1	The unit of PWM capture time is millisecond. The capture frequency range is between 5HZ and 250HZ.	OK

Downlink Command: 0x0C

Format: Command Code (0x0C) followed by 1 bytes.

- Example 1: Downlink Payload: 0C00 **--->** AT+PWMSET=0
- Example 2: Downlink Payload: 0C01 **--->** AT+PWMSET=1

4. Battery & Power Consumption

SN50v3-LB use ER26500 + SPC1520 battery pack. See below link for detail information about the battery info and how to replace.

Battery Info & Power Consumption Analyze .

5. OTA Firmware update

User can change firmware SN50v3-LB to:

- Change Frequency band/ region.
- Update with new features.
- Fix bugs.

Firmware and changelog can be downloaded from : Firmware download link

Methods to Update Firmware:

- (Recommanded way) OTA firmware update via wireless: **http://wiki.dragino.com/xwiki/bin/view/Main/Firmware%20OTA%20Update%20for%20Sensors/**
- Update through UART TTL interface: **Instruction**.

6. FAQ

6.1 Where can i find source code of SN50v3-LB?

- **Hardware Source Files**.
- **Software Source Code & Compile instruction**.

6.2 How to generate PWM Output in SN50v3-LB?

See this document: **Generate PWM Output on SN50v3**.

6.3 How to put several sensors to a SN50v3-LB?

When we want to put several sensors to A SN50v3-LB, the waterproof at the grand connector will become an issue. User can try to exchange the grand connector to below type.

Reference Supplier.

Cable Gland Rubber Seal

Size: the size is suitable for YSC cable glands, special sizes can b ordered. We can make new models as your requirements.
Material: EPDM

Send Inquiry

7. Order Info

Part Number: **SN50v3-LB-XX-YY**

XX: The default frequency band

- **AS923**: LoRaWAN AS923 band
- **AU915**: LoRaWAN AU915 band
- **EU433**: LoRaWAN EU433 band
- **EU868**: LoRaWAN EU868 band
- **KR920**: LoRaWAN KR920 band
- **US915**: LoRaWAN US915 band
- **IN865**: LoRaWAN IN865 band
- **CN470**: LoRaWAN CN470 band

YY: Hole Option

- **12**: With M12 waterproof cable hole
- **16**: With M16 waterproof cable hole
- **20**: With M20 waterproof cable hole
- **NH**: No Hole

8. Packing Info

Package Includes:

- SN50v3-LB LoRaWAN Generic Node

Dimension and weight:

- Device Size: cm
- Device Weight: g
- Package Size / pcs : cm
- Weight / pcs : g

9. Support

- Support is provided Monday to Friday, from 09:00 to 18:00 GMT+8. Due to different timezones we cannot offer live support. However, your questions will be answered as soon as possible in the before-mentioned schedule.
- Provide as much information as possible regarding your enquiry (product models, accurately describe your problem and steps to replicate it etc) and send a mail to support@dragino.cc

10. FCC Warning

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.

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.

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.