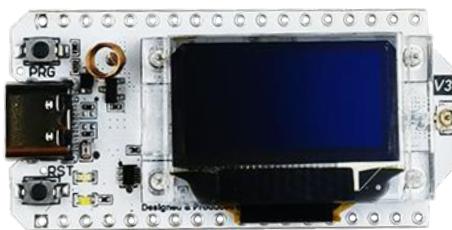




HTIT-WB32LA V3

LoRa Node Development Kit



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Documents

Rev 1.1

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Heltec Automation © Limited standard files



Document version

| Version | Time | Description | Remark |
|---------|------------|---------------------------|--------|
| V1.0 | 2022-08-16 | Documents creating | 肖鸿 |
| V1.1 | 2022-09-21 | Document structure update | Aaron |

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1. Description

1.1 Overview

WiFi LoRa 32 is a classic IoT dev-board designed & produced by Heltec Automation.

Since its launch in 2017, it has been loved by developers and makers. The newly launched V3 version has the same pin sequence as the V2 version, and retains Wi-Fi, BLE, LoRa, OLED display and other functions. On this basis, the V3 version has been upgraded as follows:

Table 1.1-1: Version comparison

| | WiFi LoRa 32 (V2) | WiFi LoRa 32 (V3) |
|---|-----------------------------|---|
| MCU | ESP32-D0 | ESP32-S3 |
| LoRa Chip | SX1276 | SX1262 |
| USB Socket | Micro USB | Type C |
| Crystal Oscillator | Ordinary crystal oscillator | High precision temperature compensated crystal oscillator |
| Low power features in deep sleep | 800uA | <10uA |
| Other | | Better impedance matching of RF circuits. |

WiFi LoRa 32 are available in two product variants:

Table 1.1-2: Product model list

| No. | Model | Description |
|-----|--------------|---|
| 1 | HTIT-WB32LAF | 470~510MHz working LoRa frequency, used for |

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| | | |
|---|-------------|--|
| | | China mainland (CN470) LPW band. |
| 2 | HTIT-WB32LA | For EU868, IN865, US915, AU915, AS923, KR920 and other LPW networks with operating frequencies between 863~928MHz. |

1.2 Product features

- Microprocessor: ESP32-S3FN8 (Xtensa® 32-bit LX7 dual core processor, five stage pipeline rack Structure, main frequency up to 240 MHz).
- SX1262 LoRa node chip.
- Type-C USB interface with a complete voltage regulator, ESD protection, short circuit protection, RF shielding, and other protection measures.
- Onboard SH1.25-2 battery interface, integrated lithium battery management system (charge and discharge management, overcharge protection, battery power detection, USB / battery power automatic switching).
- Integrated WiFi, LoRa, Bluetooth three network connections, onboard Wi-Fi, Bluetooth dedicated 2.4GHz metal spring antenna, reserved IPEX (U.FL) interface for LoRa use.
- Onboard 0.96-inch 128*64 dot matrix OLED display, which can be used to display debugging information, battery power, and other information.
- Integrated CP2102 USB to serial port chip, convenient for program downloading, debugging information printing.
- Support the [Arduino development environment](#).
- We provide [ESP32 + LoRaWAN](#) protocol Arduino® library, this is a standard

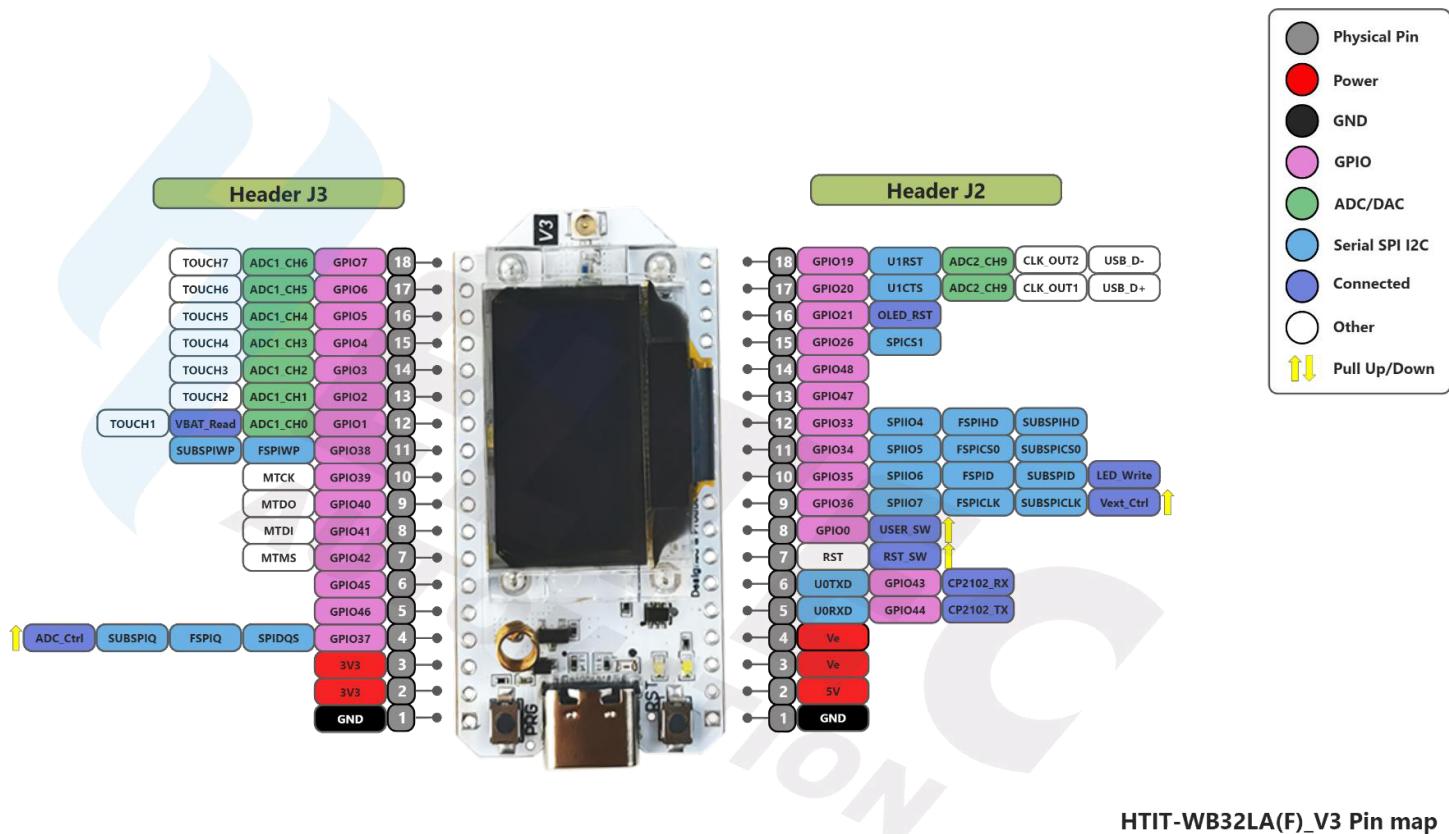
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LoRaWAN protocol that can communicate with any LoRa gateway running the LoRaWAN protocol. In order to make this code running, a unique license is needed. it can be found on [this page](#):

- With good RF circuit design and low-power design.

2. Pin Definition

2.1 Pin assignment



2.2 Pin description

- **Header J2**

Table 2.2-1: Pin description

| No. | Name | Type | Function |
|-----------|------|------|--|
| 1 | GND | P | Ground. |
| 2 | 5V | P | 5V Power Supply. |
| 3 | Ve | P | Output 3.3V, power supply for external sensor. |
| 4 | Ve | P | Output 3.3V, power supply for external sensor. |
| 5 | RX | I/O | GPIO44, U0RXD, connected to CP2102 TXD |
| 6 | TX | I/O | GPIO43, U0RXD, connected to CP2102 RXD |
| 7 | RST | I | CHIP_PU, connected to RST switch |
| 8 | 0 | I/O | GPIO0, connect to PRG switch |
| 9 | 36 | I/O | GPIO36, SPIIO7, FSPICLK, SUBSPICLK, Vext Ctrl |
| 10 | 35 | I/O | GPIO35, SPIIO6, FSPID, SUBSPID, LED Write Ctrl |
| 11 | 34 | I/O | GPIO34, SPIIO5, FSPICS0, SUBSPICS0. |
| 12 | 33 | I/O | GPIO33, SPIIO4, FSPIHD, SUBSPIHD. |
| 13 | 47 | I/O | GPIO47, SPICLK_P_DIFF, SUBSPICLK_P_DIFF. |
| 14 | 48 | I/O | GPIO48, SPICLK_N_DIFF, SUBSPICLK_N_DIFF. |
| 15 | 26 | I/O | GPIO26, SPICS1. |
| 16 | 21 | I/O | GPIO21, OLED RST |
| 17 | 20 | I/O | GPIO20, U1CTS, ADC2_CH9, CLK_OUT1, USB_D+ ¹ . |

¹ DP pin connectable to USB socket, solder R29



| | | | |
|-----------|----|-----|--|
| 18 | 19 | I/O | GPIO19, U1RTS, ADC2_CH8, CLK_OUT2, USB_D- ² . |
|-----------|----|-----|--|

Header J3

Table 2.2-2: Pin description

| No. | Name | Type | Function |
|-----------|------|------|--|
| 1 | GND | P | Ground. |
| 2 | 3V3 | P | 3.3V Power Supply. |
| 3 | 3V3 | P | 3.3V Power Supply. |
| 4 | 37 | I/O | GPIO37, SPIDQS, FSPIQ, SUBSPIQ. |
| 5 | 46 | I/O | GPIO46. |
| 6 | 45 | I/O | GPIO45. |
| 7 | 42 | I/O | GPIO42, MTMS. |
| 8 | 41 | I/O | GPIO41, MTDI. |
| 9 | 40 | I/O | GPIO40, MTDO. |
| 10 | 39 | I/O | GPIO39, MTCK. |
| 11 | 38 | I/O | GPIO38, FSPIWP, SUBSPIWP. |
| 12 | 1 | I/O | GPIO1, ADC1_CH0 ³ , TOUCH1, Read VBAT Voltage |
| 13 | 2 | I/O | GPIO2, ADC1_CH1, TOUCH2. |
| 14 | 3 | I/O | GPIO3, ADC1_CH2, TOUCH3. |
| 15 | 4 | I/O | GPIO4, ADC1_CH3, TOUCH4. |
| 16 | 5 | I/O | GPIO5, ADC1_CH4, TOUCH5. |

² DN pin connectable to USB socket, solder R3

³ ADC1_CH0 is used to read the lithium battery voltage, the voltage of the lithium battery is:

$$VBAT = 100 / (100+390) * VADC_IN1$$

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| | | | |
|-----------|---|-----|--------------------------|
| 17 | 6 | I/O | GPIO6, ADC1_CH5, TOUCH6. |
| 18 | 7 | I/O | GPIO7, ADC1_CH6, TOUCH7. |

3. Specifications

3.1 General specifications

Table 3.1: General specifications

| Parameters | Description |
|-----------------------------------|---|
| Master Chip | ESP32-S3FN8 (Xtensa®32-bit Ix7 dual core processor) |
| LoRa Chipset | SX1262 |
| USB to Serial Chip | CP2102 |
| Frequency | 470~510 MHz, 863~928 MHz |
| Max. TX Power | 21 ± 1 dBm |
| Max. Receiving sensitivity | -139 dBm |
| Wi-Fi | 802.11 b/g/n, up to 150Mbps |
| Bluetooth | Bluetooth LE: Bluetooth 5, Bluetooth mesh |
| Hardware Resource | 7*ADC1 + 2*ADC2; 7*Touch; 3*UART; 2*I2C; 2*SPI; etc. |
| Memory | 384KB ROM; 512KB SRAM; 16KB RTC SRAM; 8MB SiP Flash |
| Interface | Type-C USB; 2*1.25 lithium battery interface; LoRa ANT(IPEX1.0); 2*18*2.54 Header Pin |
| Battery | 3.7V lithium battery power supply and charging |
| Operating temperature | -20 ~ 70 °C |
| Dimensions | 50.2 * 25.5* 10.2 mm |

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3.2 Power supply

Except when USB or 5V Pin is connected separately, lithium battery can be connected to charge it. In other cases, only a single power supply can be connected.

Table 3.2: Power supply

| Power supply mode | Minimum | Typical | Maximum | Company |
|--|---------|---------|---------|---------|
| Type-C USB($\geq 500\text{mA}$) | 4.7 | 5 | 6 | V |
| Lithium battery($\geq 250\text{mA}$) | 3.3 | 3.7 | 4.2 | V |
| 5V pin($\geq 500\text{mA}$) | 4.7 | 5 | 6 | V |
| 3V3 pin($\geq 150\text{mA}$) | 2.7 | 3.3 | 3.5 | V |

3.3 Power output

Table 3.3: Power output

| Output Pin | Minimum | Typical | Maximum | Company |
|---------------------------|---------|---------|---------|---------|
| 3.3V Pin | | | 500 | mA |
| 5V Pin (USB Powered only) | | | 500 | mA |
| Vext Pin | | | 350 | mA |

3.4 Power characteristics

Table 3.4: Power characteristics

| Mode | Condition | Min. | Typical | Max. | Company |
|-----------|-------------|------|---------|------|---------|
| WiFi Scan | USB powered | | 115 | | mA |
| WiFi AP | USB powered | | 150 | | mA |
| BT | USB powered | | 115 | | mA |

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| | | | | |
|-------|-------------------------|-----|--|----|
| TX | 14dBm, USB powered, 868 | 200 | | mA |
| | 17dBm, USB powered, 868 | 210 | | mA |
| | 22dBm, USB powered, 868 | 230 | | mA |
| RX | TX disabled; RX enabled | 90 | | mA |
| sleep | USB powered | 2 | | mA |
| | VBAT/battery powered | 15 | | uA |
| | 3.3V header powered | 10 | | uA |

3.5 LoRa RF characteristics

3.5.1 Transmit power

Table3.5.1: Transmit power

| Operating frequency band | Maximum power value/[dBm] |
|--------------------------|---------------------------|
| 470~510 | 21 ± 1 |
| 867~870 | 21 ± 1 |
| 902~928 | 21 ± 1 |

3.5.2 Receiving sensitivity

The following table gives typically sensitivity level of the HTIT-WB32LA.

Table3.5.2: Receiving sensitivity

| Signal Bandwidth/[KHz] | Spreading Factor | Sensitivity/[dBm] |
|------------------------|------------------|-------------------|
| 125 | SF12 | -139 |
| 125 | SF10 | -130 |
| 125 | SF7 | -124 |

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3.6 Operation Frequencies

HTIT-WB32LA supports LoRaWAN frequency channels and models corresponding table.

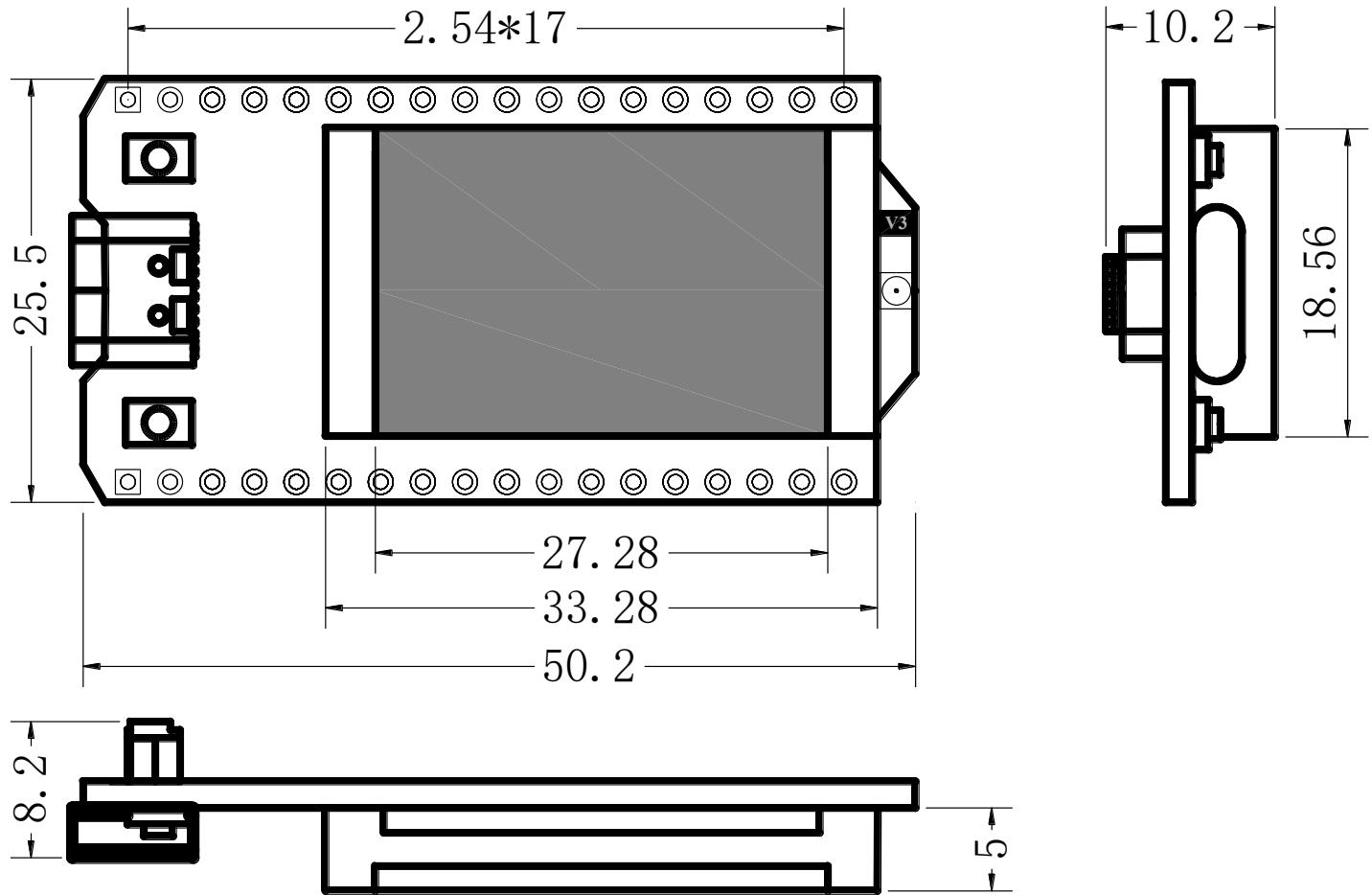
Table3.6: Operation Frequencies

| Region | Frequency (MHz) | Model |
|--------|-----------------|--------------|
| EU433 | 433.175~434.665 | HTIT-WB32LAF |
| CN470 | 470~510 | HTIT-WB32LAF |
| IN868 | 865~867 | HTIT-WB32LA |
| EU868 | 863~870 | HTIT-WB32LA |
| US915 | 902~928 | HTIT-WB32LA |
| AU915 | 915~928 | HTIT-WB32LA |
| KR920 | 920~923 | HTIT-WB32LA |
| AS923 | 920~925 | HTIT-WB32LA |



4. Hardware resource

4.1 Physical dimensions





5. Resource

5.1 Relevant Resource

- Source Code
 - [Heltec ESP \(ESP32 & ESP8266\) framework](#) (Already included Heltec ESP32 LoRaWAN library)
 - [Heltec ESP32 library](#)
- [Schematic diagram](#)
- [Pin map](#)
- [Downloadable resource](#)

5.2 Contact Information

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