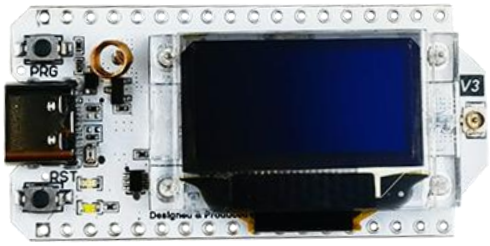


WiFi LoRa 32 V3

LoRa Node Development Kit





Document version

Version	Time	Description	Remark
V1.0	2022-08-16	Documents creating	肖鸿
V1.1	2022-09-21	Document structure update	Aaron
V1.2	2025-08-03		Richard



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1. Description

1.1 Overview

The Heltec WiFi LoRa 32 V3 is a triple-combo wireless IoT development board. It features an ESP32-S3 main controller paired with the SX1262 LoRa RF chip, integrating WiFi, BLE and LoRa communications. Equipped with an onboard OLED display and lithium battery management, it is one of the most widely used hardware platforms for LoRa mesh opensource project and LoRaWAN.

1.2 Product Features

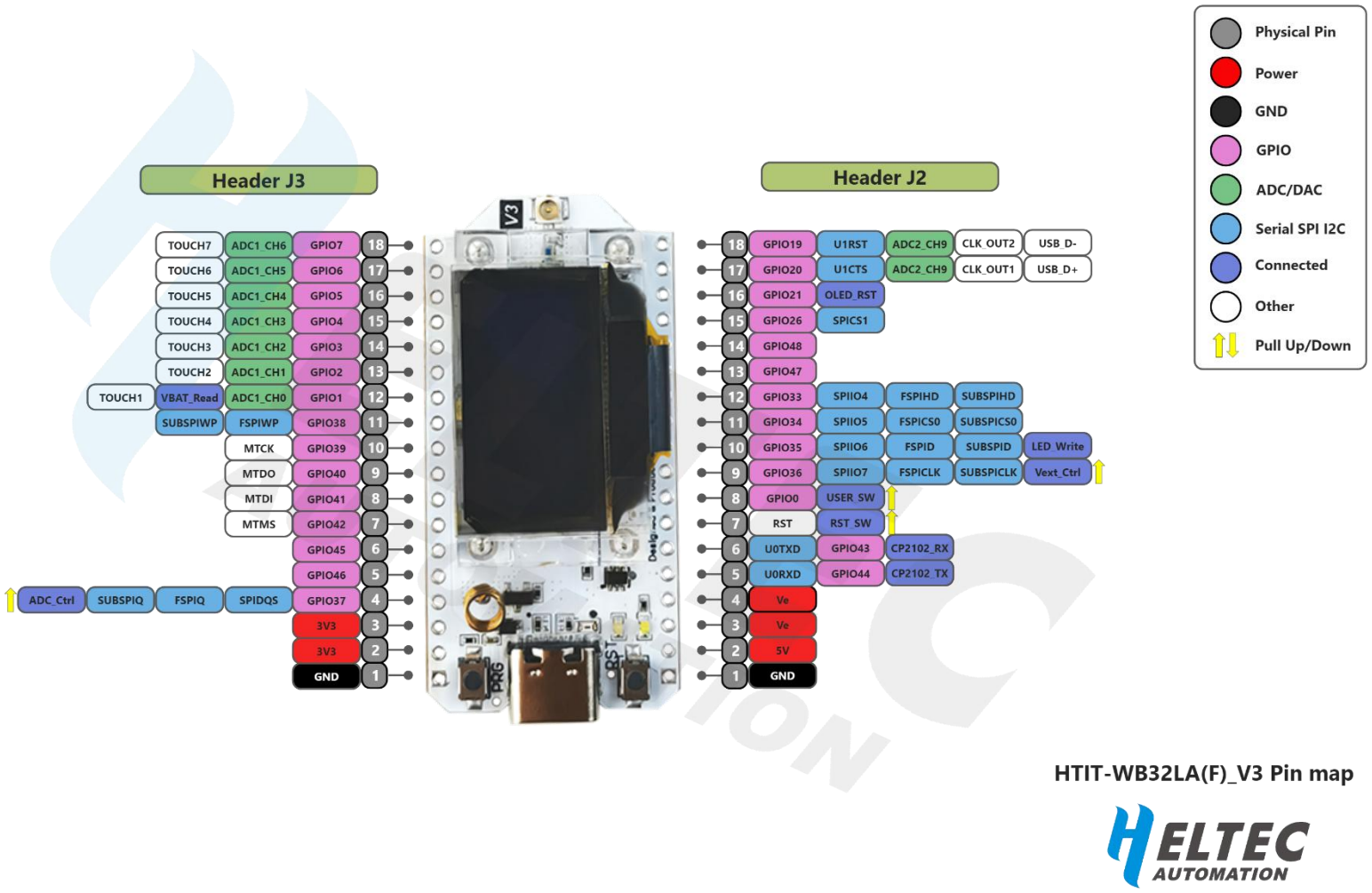
- Supports three communication methods: BLE, WiFi and LoRa.
- Low-power mode current: less than 20 μA.
- The ideal communication range can reach up to 10 km.
- USB-C integrates various circuit protections.[1]
- Onboard lithium battery charge and discharge management system.[2]
- Temperature-controlled crystal oscillator (TCXO).
- Integrated 0.96-inch OLED display.
- Equipped with CP2102 USB-to-UART chip for easy firmware flashing and debugging.
- Compatible with multiple development platforms including Arduino, PlatformIO and MicroPython.

[1] USB Type-C interface with voltage regulator, ESD protection, short circuit protection, RF shielding and other protection circuits

[2] Built-in charge and discharge management, overcharge protection, battery level detection, and automatic power switching between USB and battery.

2. Pin Definition

2.1 Pin Assignment



HTIT-WB32LA(F)_V3 Pin map

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+[3].
18	19	I/O	GPIO19, U1RTS, ADC2_CH8, CLK_OUT2, USB_D-[4].

Header J3

[3] DP pin connectable to USB socket, solder R29

[4] DN pin connectable to USB socket, solder R3

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[5], 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.
17	6	I/O	GPIO6, ADC1_CH5, TOUCH6.
18	7	I/O	GPIO7, ADC1_CH6, TOUCH7.

[5] ADC1_CH0 is used to read the lithium battery voltage, the voltage of the lithium battery is:

VBAT = 100 / (100+390) * VADC_IN1

3. Specifications

3.1 General Specifications

Table 3.1: General specifications

Parameters	Description
Master Chip	ESP32-S3FN8 (Xtensa®32-bit lx7 dual core processor)
LoRa Chip	SX1262
USB to Serial Chip	CP2102
Frequency	470~510 MHz, 863~928 MHz
Max. TX Power	21 ± 1 dBm
Max. Receiving sensitivity	-137 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 ℃
Dimensions	50.2 * 25.5* 10.2 mm

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(≥500mA)	4.7	5	6	V
Lithium battery(≥250mA)	3.3	3.7	4.2	V
5V pin(≥500mA)	4.7	5	6	V
3V3 pin(≥150mA)	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	Typical	Company
WiFi Scan	USB powered	115	mA
WiFi AP	USB powered	150	mA

BT	USB powered	115	mA
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-WB32LAF.

Table3.5.2: Receiving sensitivity

Signal Bandwidth/[KHz]	Spreading Factor	Sensitivity/[dBm]
125	SF12	-137
125	SF10	-129

125	SF7	-122

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-WB32LAF
EU868	863~870	HTIT-WB32LAF
US915	902~928	HTIT-WB32LAF
AU915	915~928	HTIT-WB32LAF
KR920	920~923	HTIT-WB32LAF
AS923	920~925	HTIT-WB32LAF

4. SDK

4.1 Installation Guide

You may refer to the link below to install the Board Manager and LoRa extension libraries:

Installation Guide: Board Manager Framework & LoRa / Peripheral Extension Libraries

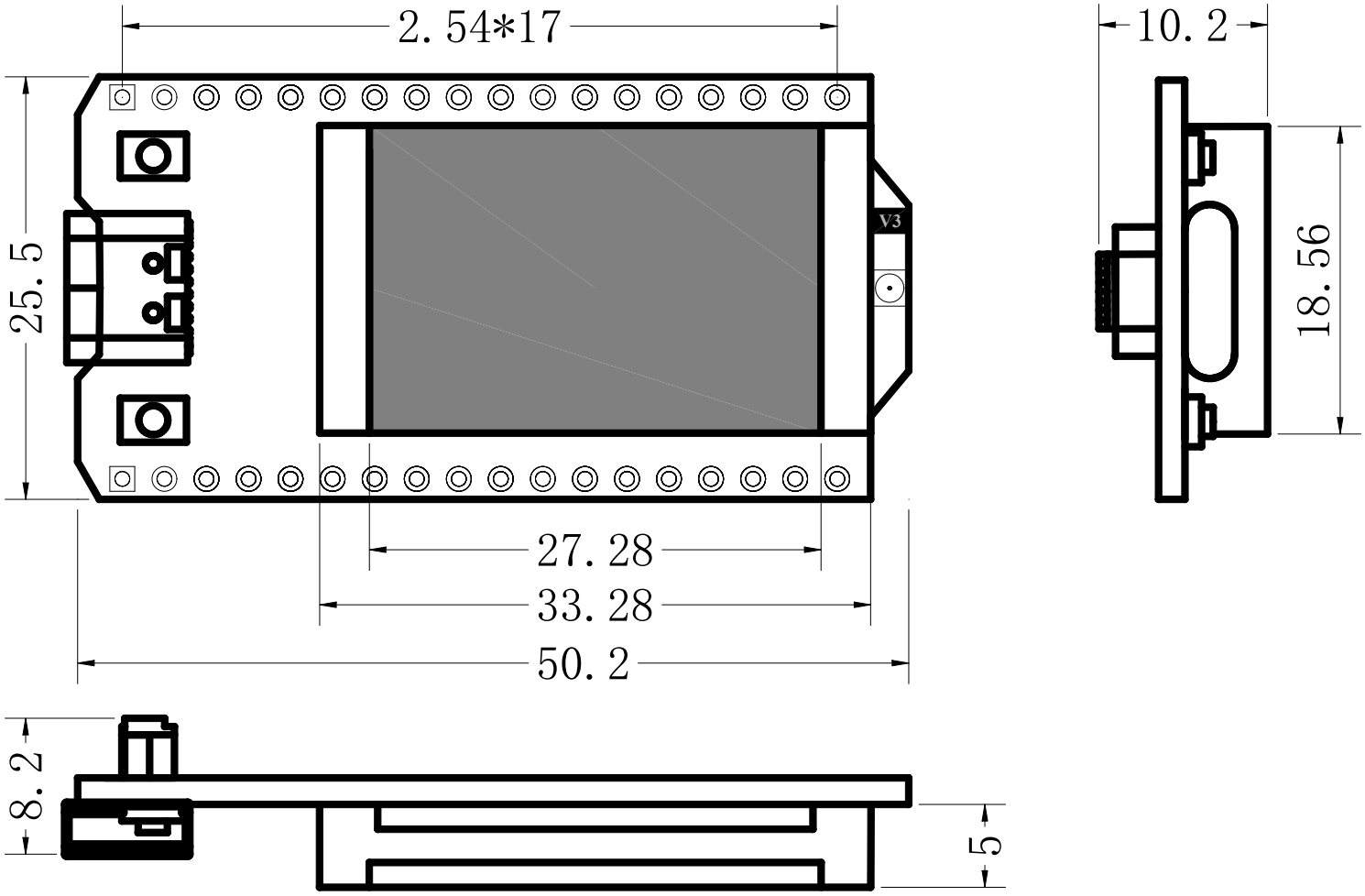
4.2 Relevant GitHub Links:

- Development framework (Board Manager, ESP32 basic example codes)

- Extension libraries (LoRa, peripherals, test code examples)
- PlatformIO development platform

5. Hardware Resource

5.1 Physical Dimensions



5.2 3D STEP Model

WiFi LoRa 32 V3 3D Step Model

6. Resource

- User guide
- Development framework (Board Manager) and extension libraries (LoRa, peripheral extensions)
- V3.2 Schematic diagram
- Pin map
- USB-to-Serial driver
- Downloadable resource
- Hardware Changelog

6.1 Contact Information

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