



## HTIT-WS V3

# LoRa Node Development Kit



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Documents

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# Document version

Version	Time	Description	Remark
V1.0	2022-11-16	Documents creating	肖鸿

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# 1. Description

## 1.1 Overview

HTIT-WS is a development board for Wi-Fi, Bluetooth and LoRa. Its functions are basically the same as “WiFi Lora 32”, except that the screen is reduced to 0.49 inch and a shielding shell is added.

The HTIT-WS is composed up of an MCU (ESP32-S3FN8) and Semtech LoRa Transceivers (SX1262), perfectly support Arduino®. Users can easily carry out secondary development and application.

The V3 version is upgraded as follows:

Table 1.1-1: Version comparison

	HTIT-WS (V2)	HTIT-WS (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.



Wireless Stick Lite are available in two product variants:

Table 1.1-2: Product model list

No.	Model	Description
1	HTIT-WS-LF	470~510MHz working LoRa frequency, used for China mainland (CN470) LPW band.
2	HTIT-WS-HF	For EU868, IN865, US915, AU915, AS923, KR920 and other LPW networks with operating frequencies between 863~928MHz.

## 1.2 Product features

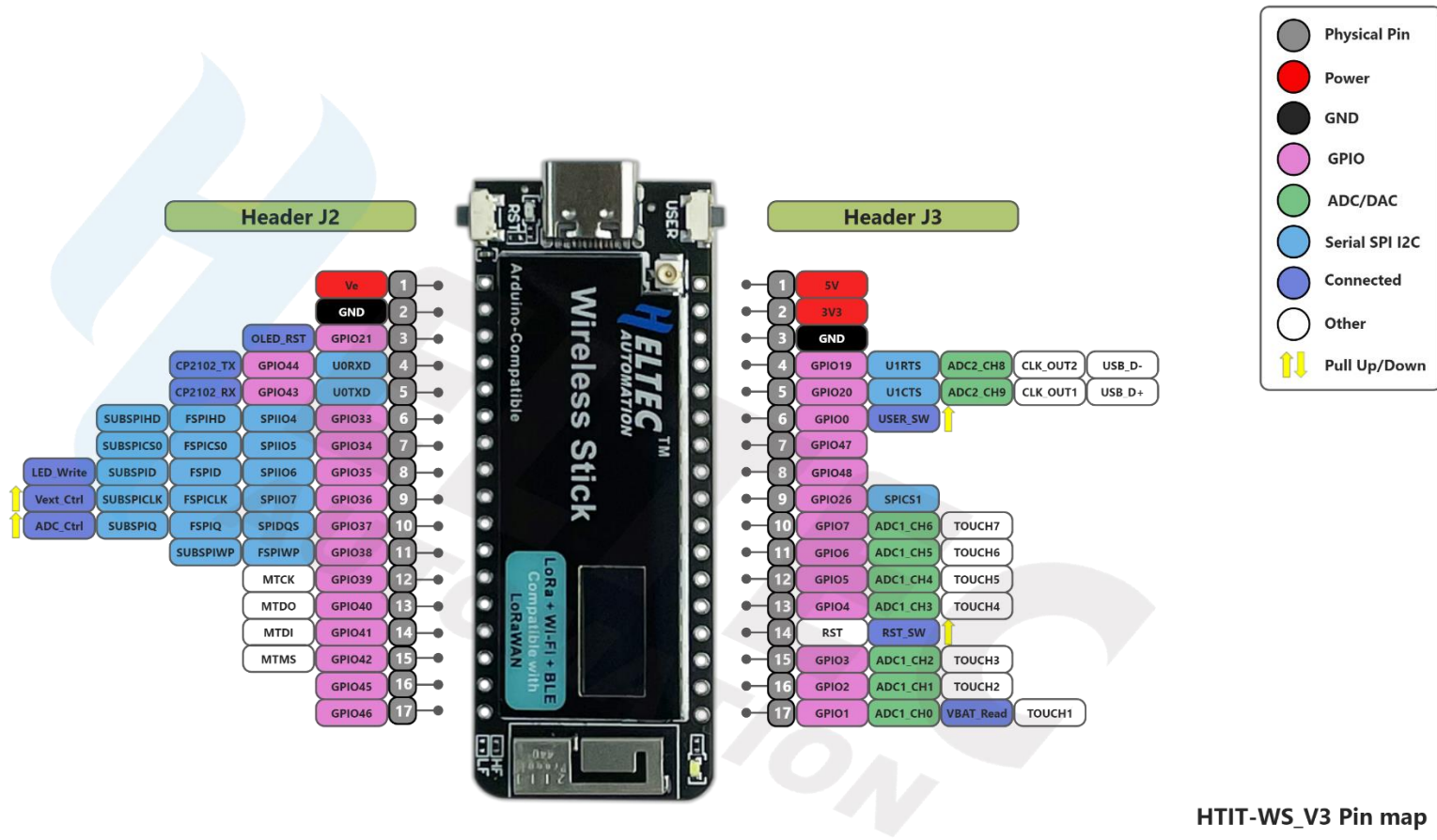
- Microprocessor: ESP32-S3FN8 (Xtensa® 32-bit LX7 dual core processor, five stage pipeline rack Structure, main frequency up to 240 MHz).
- SX1262 LoRa node chip.
- Type-C USB interface with a complete voltage regulator, ESD protection, short circuit protection, RF shielding, and other protection measures.
- 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 0.49-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 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







<b>3</b>	21	I/O	GPIO21, OLED RST
<b>4</b>	RX	I/O	GPIO44, U0RXD, connected to CP2102 TXD.
<b>5</b>	TX	I/O	GPIO43, U0RXD, connected to CP2102 RXD.
<b>6</b>	33	I/O	GPIO33, SPIIO4, FSPiHD, SUBSPiHD.
<b>7</b>	34	I/O	GPIO34, SPIIO5, FSPiCS0, SUBSPiCS0.
<b>8</b>	35	I/O	GPIO35, SPIIO6, FSPiD, SUBSPiD, LED Write Ctrl.
<b>9</b>	36	I/O	GPIO36, SPIIO7, FSPiCLK, SUBSPiCLK, Vext Ctrl.
<b>10</b>	37	I/O	GPIO37, SPiDQS, FSPiQ, SUBSPiQ, ADC Ctrl.
<b>11</b>	38	I/O	GPIO38, FSPiWP, SUBSPiWP.
<b>12</b>	39	I/O	GPIO39, MTCK.
<b>13</b>	40	I/O	GPIO40, MTDO.
<b>14</b>	41	I/O	GPIO41, MTDI.
<b>15</b>	42	I/O	GPIO42, MTMS.
<b>16</b>	45	I/O	GPIO45.
<b>17</b>	46	I/O	GPIO46.

### Header J3

Table 2.2-2: Pin description

<b>No.</b>	<b>Name</b>	<b>Type</b>	<b>Function</b>
<b>1</b>	5V	P	5V Power Supply.
<b>2</b>	3V3	P	3.3V Power Supply.
<b>3</b>	GND	P	Ground.



<b>4</b>	19	I/O	GPIO19, U1RTS, ADC2_CH8, CLK_OUT2, USB_D <sup>-1</sup> .
<b>5</b>	20	I/O	GPIO20, U1CTS, ADC2_CH9, CLK_OUT1, USB_D <sup>+2</sup> .
<b>6</b>	0	I/O	GPIO0, connected to USER switch.
<b>7</b>	47	I/O	GPIO47, SPICLK_P_DIFF, SUBSPICLK_P_DIFF.
<b>8</b>	48	I/O	GPIO48, SPICLK_N_DIFF, SUBSPICLK_N_DIFF.
<b>9</b>	26	I/O	GPIO26, SPICS1.
<b>10</b>	7	I/O	GPIO7, ADC1_CH6, TOUCH7.
<b>11</b>	6	I/O	GPIO6, ADC1_CH5, TOUCH6.
<b>12</b>	5	I/O	GPIO5, ADC1_CH4, TOUCH5.
<b>13</b>	4	I/O	GPIO4, ADC1_CH3, TOUCH4.
<b>14</b>	RST	I	CHIP_PU, connected to RST switch.
<b>15</b>	3	I/O	GPIO3, ADC1_CH2, TOUCH3.
<b>16</b>	2	I/O	GPIO2, ADC1_CH1, TOUCH2.
<b>17</b>	1	I/O	GPIO1, ADC1_CH0, TOUCH1, Read VBAT Voltage <sup>3</sup> .

<sup>1</sup> DN pin connectable to USB socket, solder R3

<sup>2</sup> DP pin connectable to USB socket, solder R29

<sup>3</sup> ADC1\_CH0 is used to read the lithium battery voltage, the voltage of the lithium battery is:

$$V_{BAT} = 100 / (100+390) * V_{ADC\_IN1}$$



### 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 Chipset	SX1262
USB to Serial Chip	CP2102
Frequency	470~510 MHz, 863~928 MHz
Max. TX Power	21 ± 1 dBm
Max. Receiving sensitivity	-134 dBm
Wi-Fi	802.11 b/g/n, up to 150Mbps
Bluetooth	Bluetooth LE: Bluetooth 5, Bluetooth mesh
Display	0.49-inch OLED
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*17*2.54 Header Pin
Battery	3.7V lithium battery power supply and charging
Operating temperature	-20 ~ 70 °C
Dimensions	58.08 * 22.6* 8.2 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( $\geq 500\text{mA}$ )	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





<b>TX</b>	14dBm, USB powered, 868		200		mA
	17dBm, USB powered, 868		210		mA
	22dBm, USB powered, 868		230		mA
<b>RX</b>	TX disabled; RX enabled		90		mA
<b>sleep</b>	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]
<b>470~510</b>	<b>21 ± 1</b>
<b>867~870</b>	<b>21 ± 1</b>
<b>902~928</b>	<b>21 ± 1</b>

### 3.5.2 Receiving sensitivity

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

Table3.5.2: Receiving sensitivity

Signal Bandwidth/[KHz]	Spreading Factor	Sensitivity/[dBm]
<b>125</b>	SF12	-134
<b>125</b>	SF10	-130
<b>125</b>	SF7	-122

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### 3.6 Operation Frequencies

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

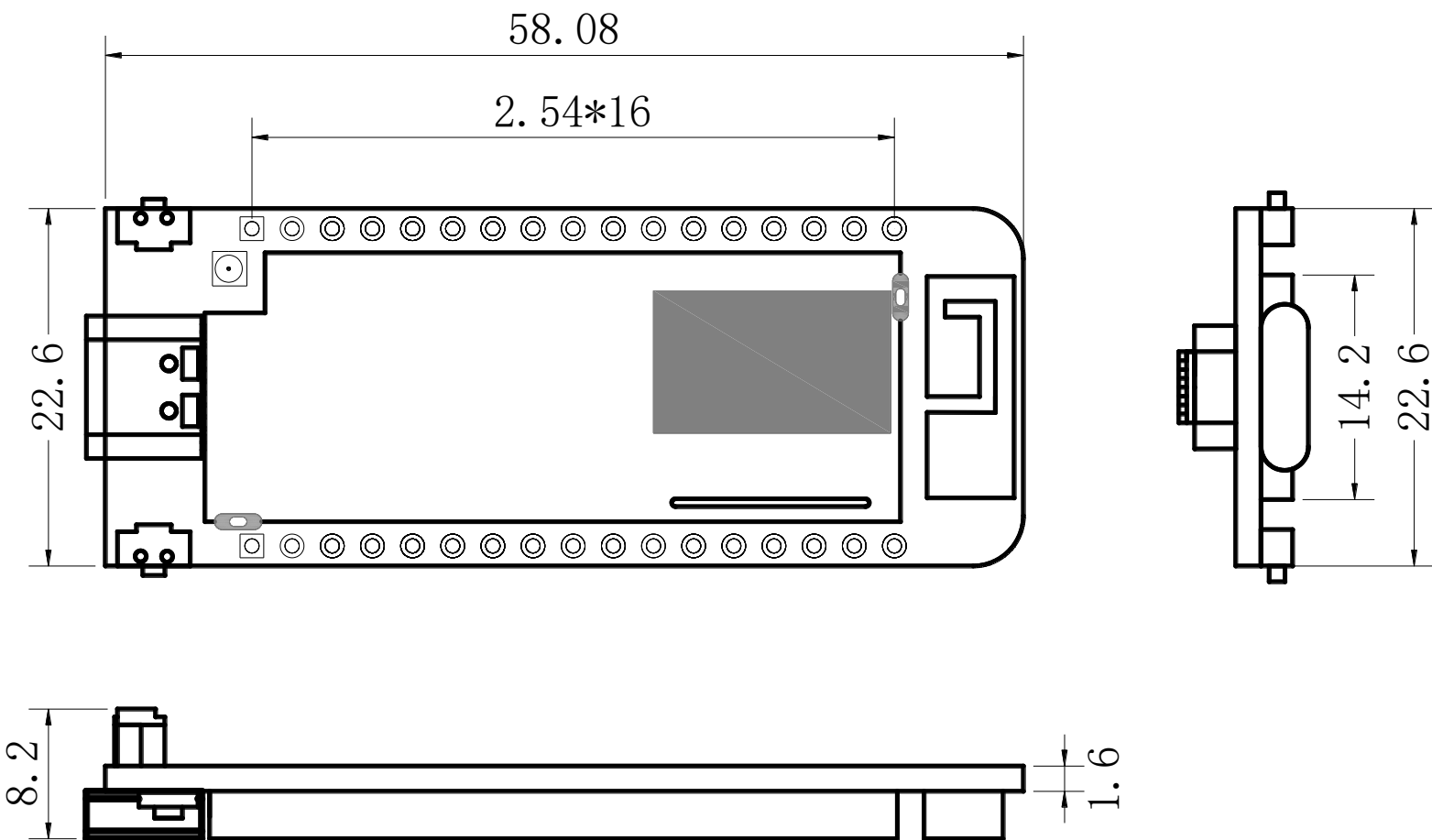
Table3.6: Operation Frequencies

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



## 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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