HTIT-WSL_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

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Content

1. Description

1.1 Overview

HTIT-WSL is a development board for Wi-Fi, Bluetooth and LoRa. Because some customers do not need OLED screen when using WiFi Lora32, we launched this product. The HTIT-WSL 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-WSL (V2)	HTIT-WSL (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	30uA	<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-WSL-LF	470~510MHz working LoRa frequency, used for China mainland (CN470) LPW band.
2	HTIT-WSL-HF	For EU868, IN865, US915, AU915, AS923, KR920 and other LPW networks with operating frequencies between 863~928MHz.

1.2 Product features

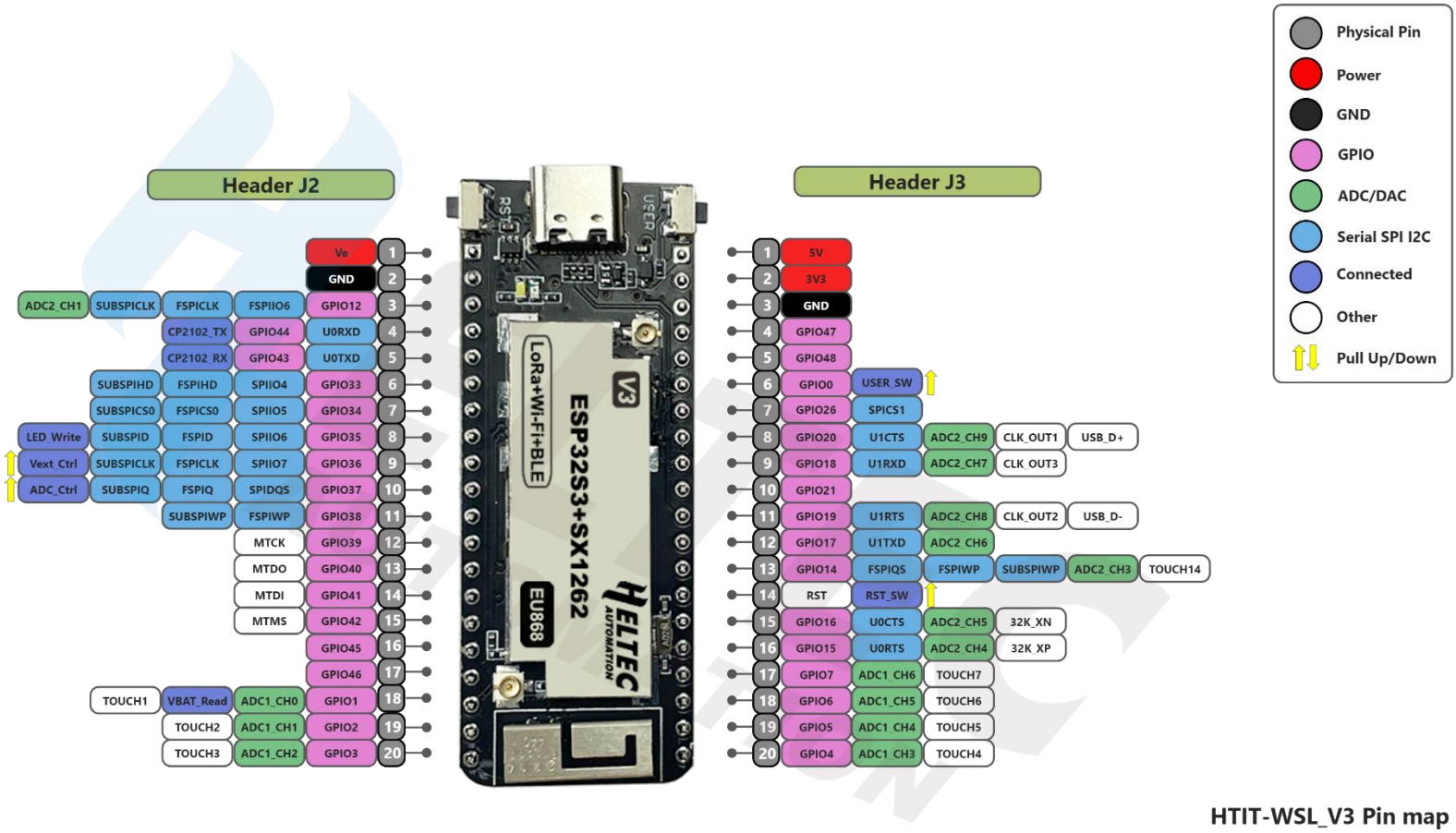
- Microprocessor: ESP32-S3FN8 (Xtensa® 32-bit LX7 dual core processor, five stage pipeline rack Structure, main frequency up to 240 MHz).
- SX1262 LoRa node chip.
- Type-C USB interface with a complete voltage regulator, ESD protection, short circuit protection, RF shielding, and other protection measures.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



HTIT-WSL_V3 Pin map

2.2 Pin description

- **Header J2**

Table 2.2-1: Pin description

No.	Name	Type	Function
1	Ve	P	Output 3.3V, power supply for external sensor.
2	GND	P	Ground.
3	12	I/O	GPIO12, ADC2_CH1, TOUCH12, FSPIIO6, SUBSPICLK, FSPICLK.
4	RX	I/O	GPIO44, U0RXD, connected to CP2102 TXD.
5	TX	I/O	GPIO43, U0RXD, connected to CP2102 RXD.
6	33	I/O	GPIO33, SPIIO4, FSPIHD, SUBSPIHD.
7	34	I/O	GPIO34, SPIIO5, FSPICS0, SUBSPICS0.
8	35	I/O	GPIO35, SPIIO6, FSPID, SUBSPID, LED Write Ctrl.
9	36	I/O	GPIO36, SPIIO7, FSPICLK, SUBSPICLK, Vext Ctrl.
10	37	I/O	GPIO37, SPIDQS, FSPIQ, SUBSPIQ, ADC Ctrl.
11	38	I/O	GPIO38, FSPIWP, SUBSPIWP.
12	39	I/O	GPIO39, MTCK.
13	40	I/O	GPIO40, MTDO.
14	41	I/O	GPIO41, MTDI.
15	42	I/O	GPIO42, MTMS.
16	45	I/O	GPIO45.
17	46	I/O	GPIO46.

18	1	I/O	GPIO1, ADC1_CH0, TOUCH1, Read VBAT Voltage[1].
19	2	I/O	GPIO2, ADC1_CH1, TOUCH2.
20	3	I/O	GPIO3, ADC1_CH2, TOUCH3.

Header J3

Table 2.2-2: Pin description

No.	Name	Type	Function
1	5V	P	5V Power Supply.
2	3V3	P	3.3V Power Supply.
3	GND	P	Ground.
4	47	I/O	GPIO47, SPICLK_P_DIFF, SUBSPICLK_P_DIFF.
5	48	I/O	GPIO48, SPICLK_N_DIFF, SUBSPICLK_N_DIFF.
6	0	I/O	GPIO0, connected to PRG switch.
7	26	I/O	GPIO26, SPICS1.
8	20	I/O	GPIO20, U1CTS, ADC2_CH9, CLK_OUT1, USB_D+[2].
9	18	I/O	GPIO18, U1RXD, ADC2_CH7, CLK_OUT3.
10	21	I/O	GPIO21.
11	19	I/O	GPIO19, U1RTS, ADC2_CH8, CLK_OUT2, USB_D-[3].
12	17	I/O	GPIO17, U1TXD, ADC2_CH6.

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

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

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

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

13	14	I/O	GPIO14, ADC2_CH3, TOUCH14, FSPIDQS, SUBSPIWP, FSPIWP.
14	RST	I	CHIP_PU, connected to RST switch.
15	16	I/O	GPIO16, U0CTS, ADC2_CH5, XTAL_32K_N.
16	15	I/O	GPIO15, U0RTS, ADC2_CH4, XTAL_32K_P.
17	7	I/O	GPIO7, ADC1_CH6, TOUCH7.
18	6	I/O	GPIO6, ADC1_CH5, TOUCH6.
19	5	I/O	GPIO5, ADC1_CH4, TOUCH5.
20	4	I/O	GPIO4, ADC1_CH3, TOUCH4.

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

Hardware Resource	7*ADC1 + 9*ADC2; 8*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); 2.4G ANT(IPEX1.0); 2*20*2.54 Header Pin
Battery	3.7V lithium battery power supply and charging
Operating temperature	-20 ~ 70 ℃
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(≥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	Min.	Typical	Max.	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-WSL.

Table3.5.2: Receiving sensitivity

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

3.6 Operation Frequencies

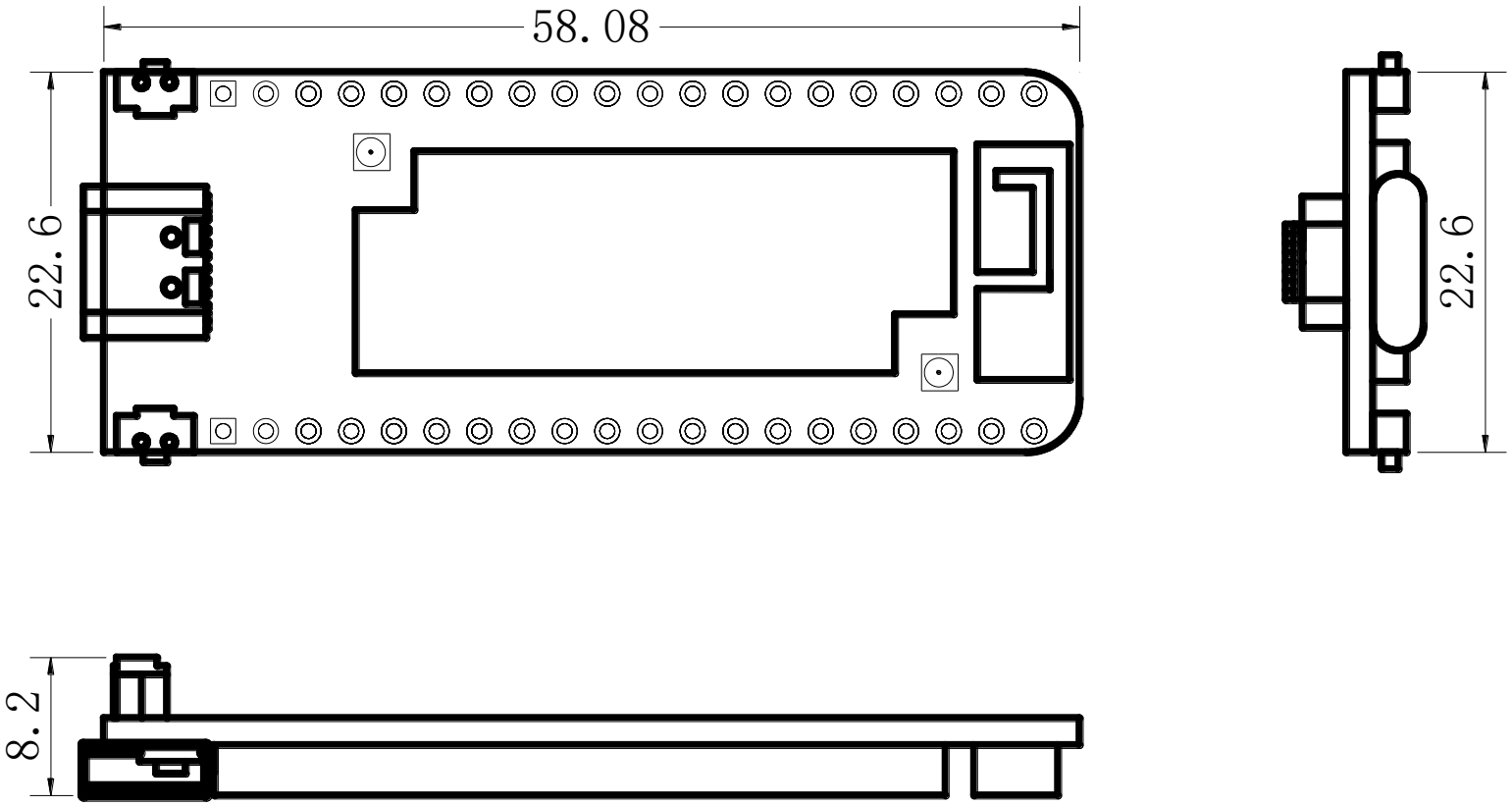
HTIT-WSL supports LoRaWAN frequency channels and models corresponding table.

Table3.6: Operation Frequencies

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

Heltec Automation Technology Co., Ltd

Chengdu, Sichuan, China

Email: support@heltec.cn

Phone: +86-028-62374838

https://heltec.org