



HTIT-Wsh V3

LoRa module





Document version

| Version | Time | Description | Remark |
|----------|-----------|--------------------------|--------|
| Rev. 1.0 | 2022-8-16 | Preliminary version | 肖鸿 |
| Rev. 1.1 | 2022-9-17 | Typographic modification | Aaron |

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1. Description

1.1 Overview

HTIT-Wsh(Wireless shell) is a long communication range, high receive sensitivity, low power consumption(9uA) and low cost LoRa node module. The HTIT-Wsh is composed up of an MCU (ESP32-S3FN8) and Semtech LoRa Transceivers (SX1262). 38.4 x 16.1 x 3.2(mm) size with 1.27mm stamp holes package makes it can be assembled into your PCB or products directly.

HTIT-Wsh is provide Wi-Fi, BLE and LoRa solution, 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-Wsh_V1/V2 | HTIT-Wsh_V3 |
|---|-----------------------------|---|
| MCU | ESP32-D0 | ESP32-S3 |
| LoRa Chip | SX1276 | SX1262 |
| 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. |

HTIT-Wsh are available in two product variants:

Table 1.1-2: Product model list

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

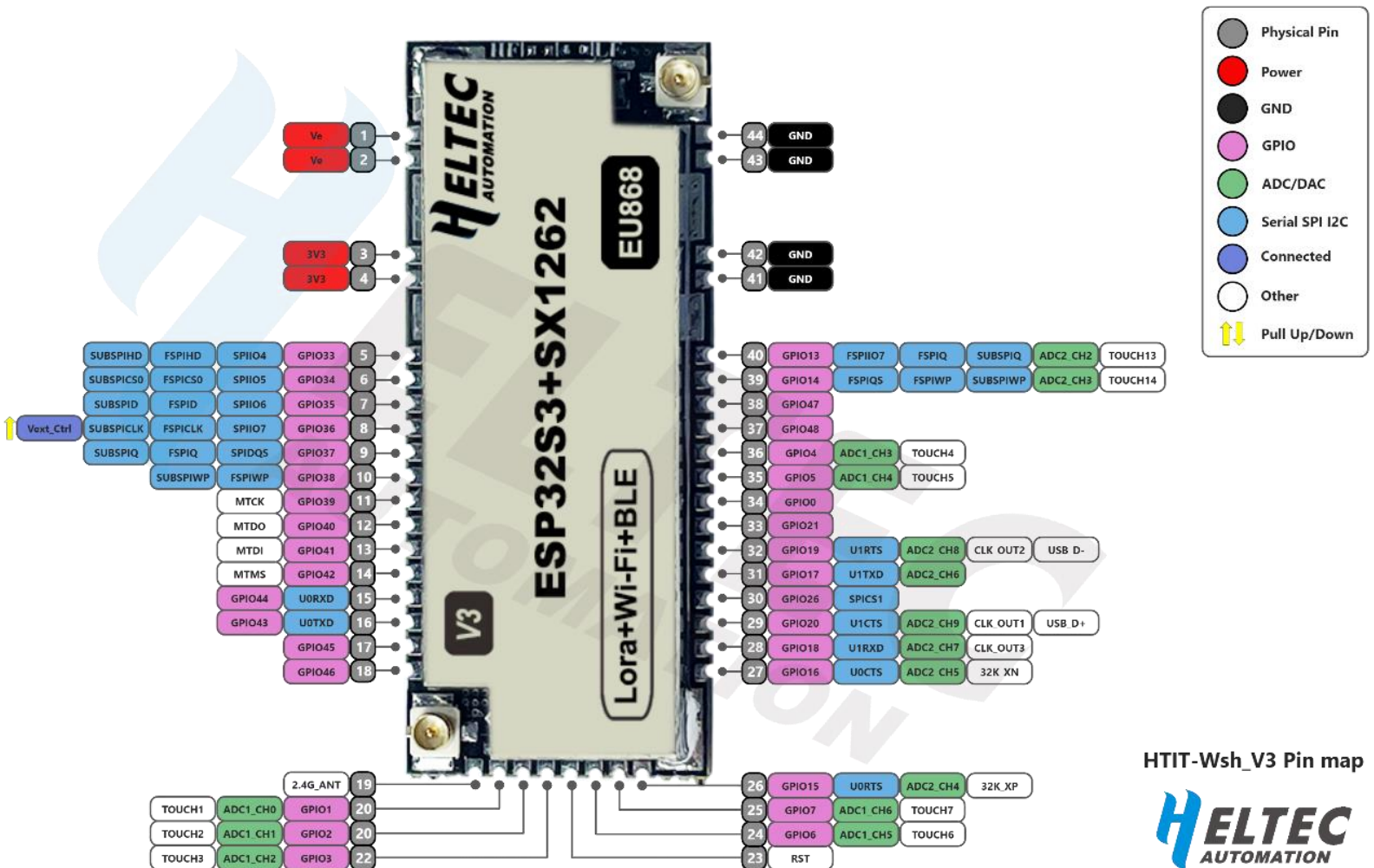
1.2 Product features

- CE Certificate;
- Microprocessor: ESP32-S3FN8 (Xtensa[®] 32-bit LX7 dual core processor, five stage pipeline rack Structure, main frequency up to 240 MHz), with LoRa node chip SX1262;
- RF shielding (contain a shield shell) and other protection measures;
- Integrated WiFi, LoRa, Bluetooth network connections, both of them are IPEX socket;
- Support the [Arduino development environment](#);
- (Exclusive) Supports the Arduino version of the ESP32 + LoRaWAN protocol routine provided by Heltec. This is a standard LoRaWAN protocol that can communicate with any gateway/base station running the LoRaWAN protocol (requires serial number activation, only the development of the company) The board is available, the serial number can be queried on [this page](#));
- With good RF circuit design and basic low-power design (sleep current: 9uA theoretically), it is convenient for IoT application vendors to quickly verify solutions and deploy applications.

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2. Pin Definition

2.1 Pin assignment



HTIT-Wsh_V3 Pin map



2.2 Pin description

Table 2.2: Pin description

| No. | Name | Type | Function |
|-----|------|------|--|
| 1 | VEXT | P | Output 3.3V, power supply for external sensor. |
| 2 | VEXT | P | Output 3.3V, power supply for external sensor. |
| 3 | 3V3 | P | 3.3V Power Supply. |
| 4 | 3V3 | P | 3.3V Power Supply. |



| | | | |
|----|----------|-----|---|
| 5 | 33 | I/O | GPIO33, SPIIO4, FSPiHD, SUBSPiHD. |
| 6 | 34 | I/O | GPIO34, SPIIO5, FSPiCS0, SUBSPiCS0. |
| 7 | 35 | I/O | GPIO35, SPIIO6, FSPiD, SUBSPiD. |
| 8 | 36 | I/O | GPIO36, SPIIO7, FSPiCLK, SUBSPiCLK, connected to external power (3.3V) control pin. |
| 9 | 37 | I/O | GPIO37, SPiDQS, FSPiQ, SUBSPiQ. |
| 10 | 38 | I/O | GPIO38, FSPiWP, SUBSPiWP. |
| 11 | 39 | I/O | GPIO39, MTCK. |
| 12 | 40 | I/O | GPIO40, MTDO. |
| 13 | 41 | I/O | GPIO41, MTDI. |
| 14 | 42 | I/O | GPIO42, MTMS. |
| 15 | RXD | I/O | GPIO44, U0RXD. |
| 16 | TXD | I/O | GPIO43, U0TXD. |
| 17 | 45 | I/O | GPIO45. |
| 18 | 46 | I/O | GPIO46 |
| 19 | ANT_2.4G | O | 2.4G ANT Output. |
| 20 | 1 | I/O | GPIO1, ADC1_CH0, TOUCH1. |
| 21 | 2 | I/O | GPIO2, ADC1_CH1, TOUCH2. |
| 22 | 3 | I/O | GPIO3, ADC1_CH2, TOUCH3. |
| 23 | EN | I | CHIP_PU. |
| 24 | 6 | I/O | GPIO6, ADC1_CH5, TOUCH6. |
| 25 | 7 | I/O | GPIO7, ADC1_CH6, TOUCH7. |



| | | | |
|-----------|-----|-----|---|
| 26 | 15 | I/O | GPIO15, UORTS, ADC2_CH4, XTAL_32K_P. |
| 27 | 16 | I/O | GPIO16, UOCTS, ADC2_CH5, XTAL_32K_N. |
| 28 | 18 | I/O | GPIO18, U1RXD, ADC2_CH7, CLK_OUT3. |
| 29 | 20 | I/O | GPIO20, U1CTS, ADC2_CH9, CLK_OUT1, USB_D+. |
| 30 | 26 | I/O | GPIO26, SPICS1. |
| 31 | 17 | I/O | GPIO17, U1TXD, ADC2_CH6. |
| 32 | 19 | I/O | GPIO19, U1RTS, ADC2_CH8, CLK_OUT2, USB_D-. |
| 33 | 21 | I/O | GPIO21. |
| 34 | 0 | I/O | GPIO0. |
| 35 | 5 | I/O | GPIO5, ADC1_CH4, TOUCH5. |
| 36 | 4 | I/O | GPIO4, ADC1_CH3, TOUCH4. |
| 37 | 48 | I/O | GPIO48, SPICLK_N_DIFF, SUBSPICLK_N_DIFF. |
| 38 | 47 | I/O | GPIO47, SPICLK_P_DIFF, SUBSPICLK_P_DIFF. |
| 39 | 14 | I/O | GPIO14, ADC2_CH3, TOUCH14, FSPIDQS, SUBSPIWP, FSPIWP. |
| 40 | 13 | I/O | GPIO13, ADC2_CH2, TOUCH13, FSPIIO7, SUBSPIQ, FSPIQ. |
| 41 | GND | P | Ground. |
| 42 | GND | P | Ground. |
| 43 | GND | P | Ground. |
| 44 | GND | P | Ground. |



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 |
| Frequency | 470~510MHz, 863~928MHz |
| Max TX Power | 21±1dBm |
| Max. Receiving sensitivity | -139dBm |
| WiFi | 802.11 b/g/n, up to 150Mbps |
| Bluetooth | Bluetooth LE: Bluetooth 5, Bluetooth mesh |
| Hardware Resource | 7*ADC1+8*ADC2; 9*Touch; 3*UART; 2*I2C; 2*SPI; etc. |
| Memory | 384KB ROM; 512KB SRAM; 16KB RTC SRAM; 8MB SiP Flash |
| Interface | LoRa ANT(IPEX1.0); 2.4G ANT (IPEX1.0); 1.27 spacing Stamp hole. |
| Power consumption | 9uA |
| Operating temperature | -40~85°C |
| Dimensions | 38.4 * 16.1* 2.8 mm |
| Package | Tape & Reel Packaging |



3.2 Electrical characteristics

3.2.1 Power supply

Table 3.2.1: Power supply

| Power supply mode | Minimum | Typical | Maximum | Company |
|---------------------------------|---------|---------|---------|---------|
| 3V3 pin ($\geq 150\text{mA}$) | 2.7 | 3.3 | 3.5 | V |

3.2.2 Power characteristics

Table3.2.2: Power characteristics

| Mode | Condition | Min. | Typical | Max. | Company |
|-----------|-----------------------------|------|---------|------|---------------|
| WiFi Scan | 3.3V powered | | 100 | | mA |
| WiFi AP | 3.3V powered | | 140 | | mA |
| BT | 3.3V powered | | 105 | | mA |
| TX | 868MHz, 3.3V powered, 14dBm | | 200 | | mA |
| | 868MHz, 3.3V powered, 17dBm | | 220 | | mA |
| | 868MHz, 3.3V powered, 22dBm | | 235 | | mA |
| RX | 868MHz, 3.3V powered | | 75 | | mA |
| Sleep | 3.3V powered | | 9 | | μA |

3.3 RF characteristics

3.3.1 Transmit power

Table3.3.1: Transmit power

| Operating frequency band (MHz) | Maximum power value/[dBm] |
|--------------------------------|---------------------------|
| 470~510 | 21 ± 1 |

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| | |
|----------------|---------------|
| 863~870 | 21 ± 1 |
| 902~928 | 21 ± 1 |

3.3.2 Receiving sensitivity

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

Table3.3.2: Receiving sensitivity

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

3.4 Operation frequencies

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

Table3.4: Operation frequencies

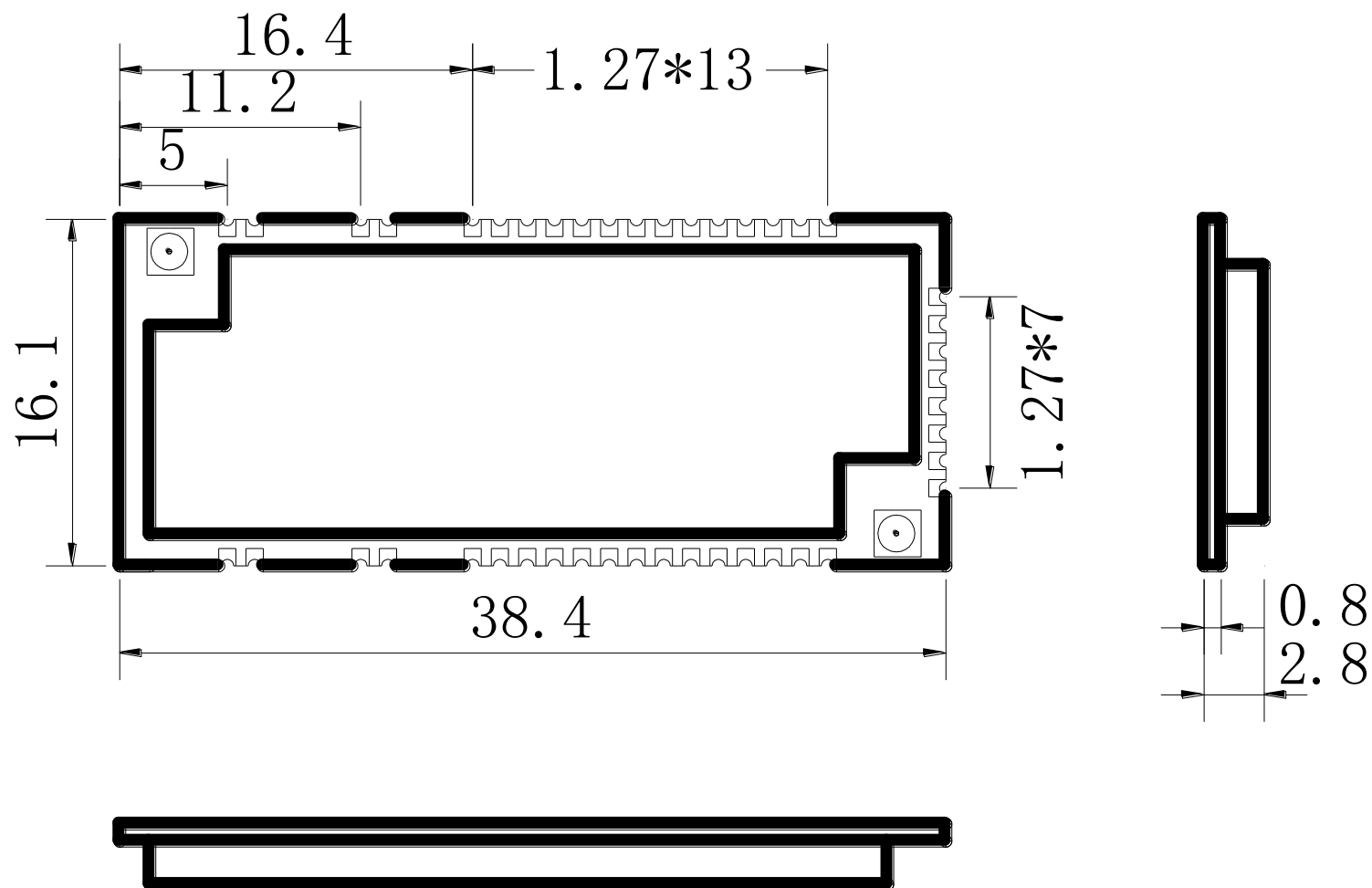
| Region | Frequency (MHz) | Model |
|---------------|------------------------|--------------|
| EU433 | 433.175~434.665 | HTIT-Wsh-LF |
| CN470 | 470~510 | HTIT-Wsh-LF |
| IN868 | 865~867 | HTIT-Wsh-HF |
| EU868 | 863~870 | HTIT-Wsh-HF |
| US915 | 902~928 | HTIT-Wsh-HF |
| AU915 | 915~928 | HTIT-Wsh-HF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

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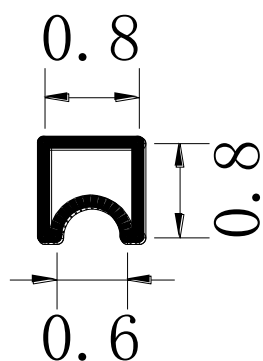


4. Hardware resource

4.1 Physical dimensions



PAD





5. Resource

5.1 Relevant Resource

- Source Code
 - [Heltec ESP \(ESP32 & ESP8266\) framework](#) (Already included Heltec ESP32 LoRaWAN library)
 - [Heltec ESP32 library](#)
- [Recommend hardware design](#)
- [Pin map](#)
- [Downloadable resource](#)
- [Footprint](#)

5.2 Contact Information

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