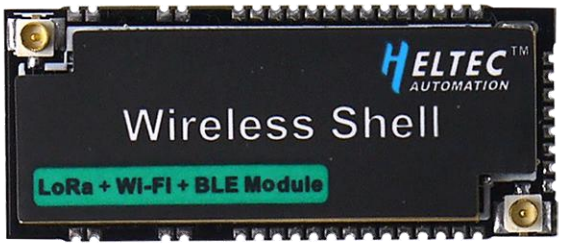
Wireless Shell

LoRa Node Development Kit



Document version

Version	Time	Description
V1.0	2019-12-15	Documents creating
V2.0	2022-03-30	Document structure update

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Content

1. Description

1.1 Overview

“Wireless Shell” is an ESP32-PICO + SX1276 module. provide Wi-Fi, BLE and LoRa solution. You can regard it is the module version “Wireless Stick Lite” with better low power feature(10uA in deep sleep). 38.4 x 16.1 x 3.2(mm) size with 1.27mm stamp holes package makes it’s can be assembled into your PCB or products directly.

Wireless Shell are available in two product variants:

Table 1.1 Product model list

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

1.2 Product features

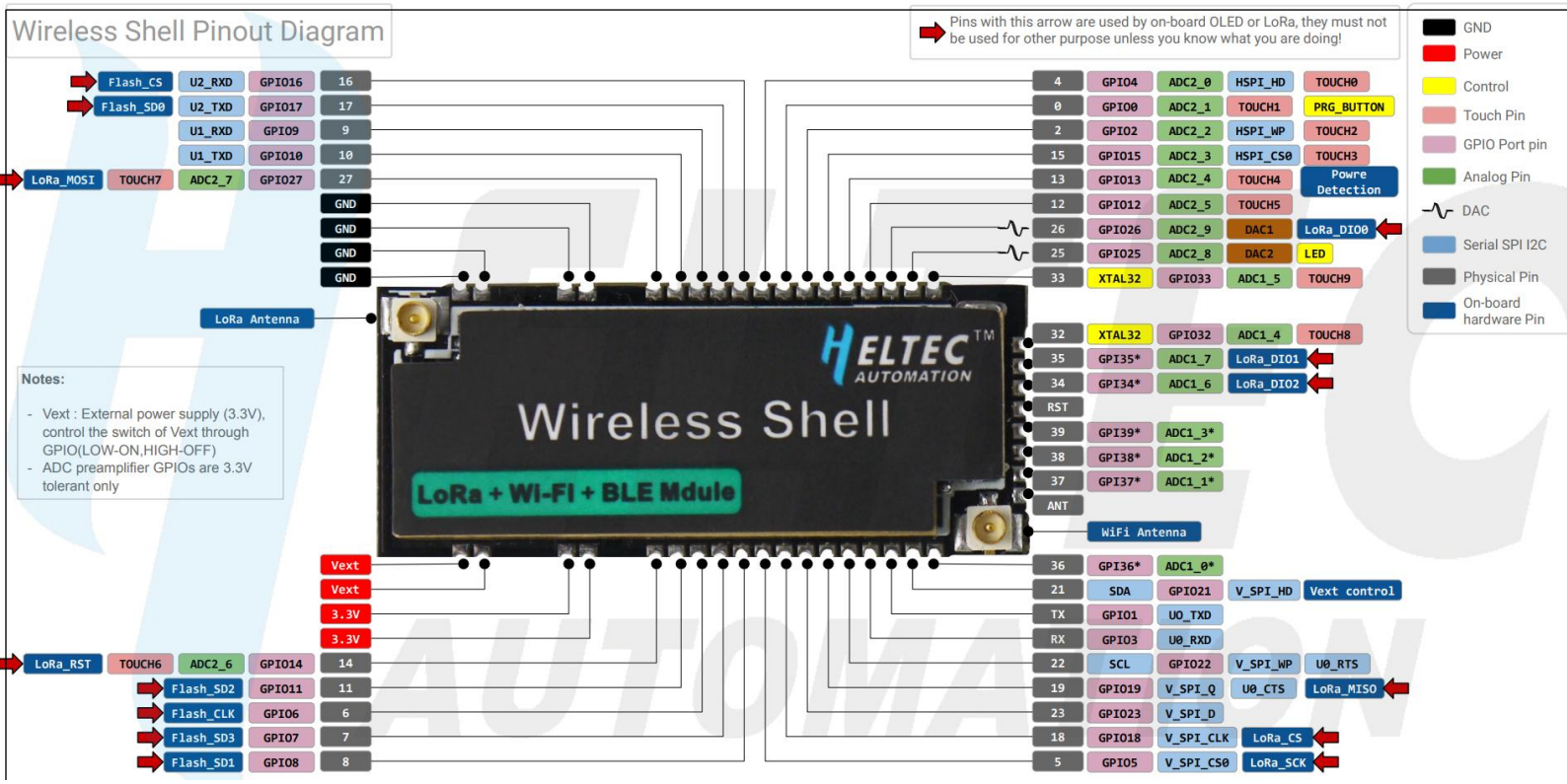
- CE Certificate;
- Main control chip ESP32-PICO (dual-core 32-bit MCU + ULP core), with LoRa node chip SX1276;
- RF shielding(contain a shield shell) and other protection measures;
- Integrated WiFi, LoRa, Bluetooth network connections, both of them are IPEX

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: 10uA theoretically), it is convenient for IoT application vendors to quickly verify solutions and deploy applications.

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, connect 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].
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.

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

[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

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.

3. Specifications

3.1 General specifications

Table 3-1: General specifications

Parameters	Description
Master Chip	ESP32-PICO-D4(240MHz Tensilica LX6 dual-core + 1 ULP, 600 DMIPS)
LoRa Chipset	SX1276
Frequency	470~510 MHz, 863~923 MHz
Max TX Power	19dB ± 1dB
Receiving sensitivity	-135 dBm
Wi-Fi	802.11 b/g/n (802.11n up to 150 Mbps)
Bluetooth	Bluetooth V4.2 BR/EDR and Bluetooth LE specification
Hardware Resource	UART x 3; SPI x 2; I2C x 2; I2S x 1; 12-bits ADC input x 18; 8-bits DAC output x 2; GPIO x 28， GPI x 6
Memory	4MB(32M-bits) internal SPI FLASH; 520KB internal SRAM
Interface	Micro USB x 1; LoRa Antenna interface(IPEX) x 1; WiFi /Bluetooth Antenna interface(IPEX) x 1; (14 x 2 + 8 x 1 + 2 x 4) x 1.27 stamp edge

Operating temperature	-20 ~ 70 ℃
Dimensions	38.4 x 16.1 x 3.6mm
Low Power	Deep Sleep 10uA

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
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
External device power control (Vext 3.3V）			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		135		mA
Power	LoRa 10dB output		100		mA

Consumption(mA)	LoRa 12dB output		105		mA
	LoRa 15dB output		120		mA
	LoRa 20dB output		145		mA

3.5 LoRa RF characteristics

3.5.1 Transmit power

Table3-5 Transmit power

Operating frequency band	Maximum power value/[dBm]
470~510	19 ± 1
867~870	19 ± 1
902~928	19 ± 1

3.5.2 Receiving sensitivity

The following table gives typically sensitivity level of the Wireless Shell-(L/H).

Table3-6: Receiving sensitivity

Signal Bandwidth/[KHz]	Spreading Factor	Sensitivity/[dBm]
125	SF12	-135
125	SF10	-130
125	SF7	-124

3.6 Operation Frequencies

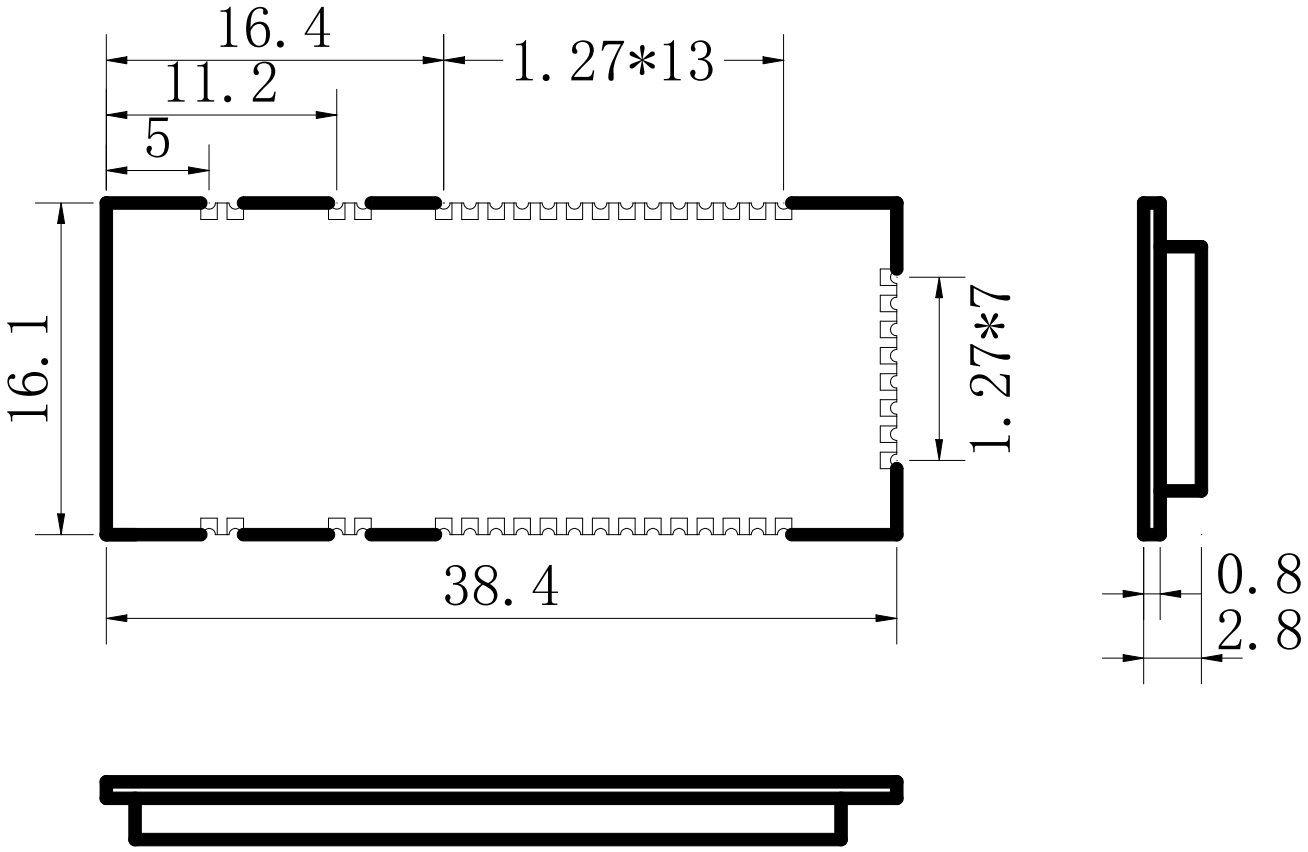
Wireless Shell(F) supports LoRaWAN frequency channels and models corresponding table.

Table3-7: Operation Frequencies

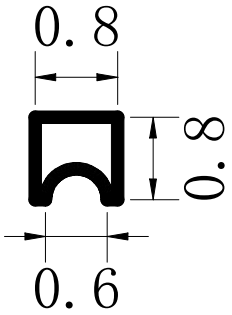
Region	Frequency (MHz)	Model
EU433	433.175~434.665	Wireless Shell-L
CN470	470~510	Wireless Shell-L
IN868	865~867	Wireless Shell-F
EU868	863~870	Wireless Shell-F
US915	902~928	Wireless Shell-F
AU915	915~928	Wireless Shell-F
KR920	920~923	Wireless Shell-F
AS923	920~925	Wireless Shell-F

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
- Schematic diagram
- Pin map
- Downloadable resource

5.2 Contact Information

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