Capsule Sensor V3

-Tiny fun IoT Device

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Document version

Version	Time	Description	Remark
V1.0	2024-01-16	Documents creating	Richard

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Content

1. Description

1.1 Overview

Capsule Sensor V3 is a tiny portable LoRa/LoRaWAN device based on ESP32-S3 and SX1262. Modular design allows it to adapt to different sensors, so you can easily build applications without being an expert in IoT.

Thanks to WirelessBoot[1] technology, Capsule Sensor V3 is small, stylish, waterproof, and has a 250mA rechargeable battery, making it perfect for complex environments. Whether you want to build your applications or run open-source programs like Meshtastic[2] , Capsule Sensor V3 is a great choice.

Capsule Sensor are available in two product variants:

Table 1.1: Product model list

No.	Model	Description
1	Capsule Sensor - 433	For 433MHz LoRa frequency
2	Capsule Sensor - 470to510	For 470~510MHz working LoRa frequency, used for China mainland (CN470) LPW band.
3	Capsule Sensor - 863to870	For EU868, IN865 and other LPW networks with operating frequencies between 863~870MHz.
4	Capsule Sensor - 902to928	For US915, AU915, AS923, KR920 and other LPW networks with operating frequencies between 902~928MHz

[1] You can understand it as a special OTA program, but it can running in the devices' Boot loader.

[2] We programmed Meshtastick to be low power and equipped with a 'Type-C to magnetic suction' charging cable.

1.2 Product features

- ESP32-S3 + SX1262.
- Wireless communication method include Wi-Fi, Bluetooth and LoRa.
- Modular design, with a BTB interface reserved at the bottom, capable of connecting and replacing different sensors.
- Built in 250mAh rechargeable battery, magnetic suction charging port.
- Built in LoRa and Wi-Fi/BLE antennas, stylish appearance, compact and light.
- High strength plastic, IP65 waterproof.
- Support Heltec Wireless Boot system, download firmware, exchange information, and print logs through Wi-Fi.
- Meshtastic compatible.
- Secondary development can be done through Arduino, Platform.io, etc.

1.3 Application scenarios

CapSule's application is mainly realized by replacing the sensor module, and here are just some typical application scenarios.

- Environmental monitoring;
- Data converter;
- Asset/pet/person tracking;
- Children education;
- Meshtastic;
- As a common Arduino development board.

2. Specifications

2.1 General specifications

Table 2-1: General specifications

Parameters	Description
MCU	ESP32-S3FN8
LoRa Chip	SX-1262
Memory	384KB ROM; 512KB SRAM; 16KB RTC SRAM; 8MB SiP
Frequency	433MHz, 470~510MHz, 863~870MHz, 902~928MHz
Max TX Power	21 ± 1dBm
Receiving sensitivity	-135dBm
Wi-Fi	802.11 b/g/n
Bluetooth	Bluetooth LE: Bluetooth 5, Bluetooth mesh
Charging	5V, Magnetic 2P-2.54mm
Battery	150mAh
Protection grade	IP65
Operating temperature	-20 ~ 60℃
Dimensions	47mm * 26mm Φ

2.2 Flash Partitions

Name	Type	SubType	Offset	Size
nvs	data	nvs	0x009000	0x005000
otadata	data	ota	0x00e000	0x002000

app	app	ota_0	0x010000	0x250000
flashApp	app	ota_1	0x260000	0x0A0000
spiffs	data	spiffs	0x300000	0x100000
factory	app	factory	0x400000	0x100000
secondApp	app	ota_2	0x500000	0x2D0000

2.3 Electrical Characteristics

Table 2-2: Power supply

Parameter		Typical	Unit
Power Supply	Charging	5	V
	Battery	3.0~4.2	V
Consumption	LoRa Sending	230	mA
	LoRa Receiving	90	mA
	Sleep	18	uA

2.4 LoRa RF Characteristics

2.4.1 Transmit Power

Table2-3-1: Transmit power

Operating frequency band	Maximum power value/[dBm]
470~510	21 ± 1
867~870	21 ± 1
902~928	21 ± 1

2.4.2 Receiving Sensitivity

The following table gives typically sensitivity level of the Capsule Sensor.

Table2-3-2: Receiving sensitivity

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

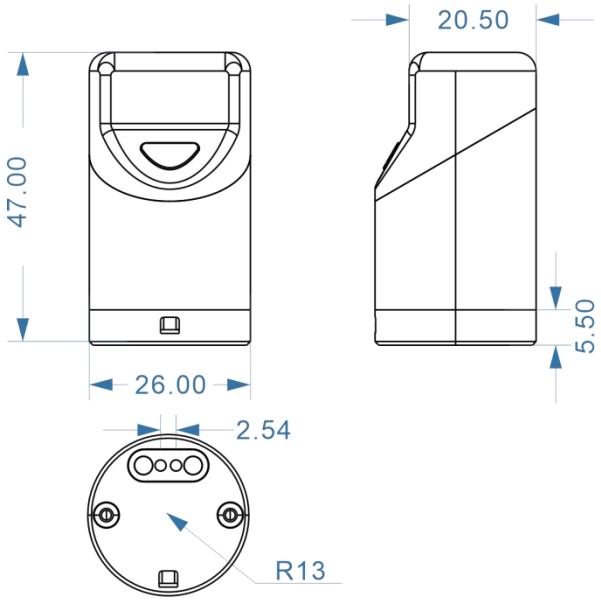
2.4.3 Operation Frequencies

Capsule supports LoRaWAN frequency channels and models corresponding table.

Table2-3-3: Operation Frequencies

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

3. Physical Dimensions



4. Resource

4.1 Relevant Resource

- Heltec ESP32 framework (Already included Heltec ESP32 LoRaWAN library)
- Heltec LoRaWAN test server based on TTS V3
- User Manual Document
- Wireless Boot instructions

4.2 Contact Information

Heltec Automation Technology Co., Ltd

Chengdu, Sichuan, China

Email: support@heltec.cn

Phone: +86-028-62374838

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