ThinkNode M2

Meshtastic Transceiver Device

Powered By ESP32-S3

DataSheet

V1.0

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1 Overview

1.1 Description

The ThinkNode-M2 is a high-performance LoRa communication transceiver. It uses the ESP32 - S3 - WROOM - 1 - N4R8 microcontroller and the Semtech SX1262 radio - frequency transceiver, and is equipped with a TCXO clock source, enabling efficient and low - power LoRa signal transmission and reception.

This device is equipped with a 1.3 - inch OLED display screen, which provides clear information display, making it convenient for users to view the device status and data in real - time. It is suitable for embedded designs. It supports low - power battery power supply and lithium - battery charging. It is applicable in areas without cellular network coverage or in emergency situations, and can be used as an independent means of communication to provide security.

Notes:

The device is available in two versions: **with a casing and without a casing**, allowing users to choose the appropriate option based on their requirements.

1.2 Features

- **MCU:** Utilizes the ESP32-S3-WROOM-1-N4R8, supporting Meshtastic firmware, offering robust processing capabilities and low power consumption.

- **RF Module:** Integrates the Semtech SX1262 long-range, low-power RF transceiver, equipped with a TCXO clock source to ensure efficient LoRa signal transmission and reception.
- **Auxiliary Microcontroller:** Features an ultra-high-speed 8051 core (1T) based on the STC8G1K08A for auxiliary function control.
- **Display:** 1.3-inch OLED screen, providing clear information display for real-time monitoring of device status and data.
- **Compatibility with Official Meshtastic App:** Users can configure parameters, communicate messages, share maps and locations, monitor network status, log and export data, and customize settings via the App.
- **User Interaction:** Equipped with 4 buttons for convenient user operation.
- **Low Power Design:** Supports lithium battery power supply with charging functionality, suitable for prolonged operation.
- **Interface:** 1 Type-C USB port for ESP32-S3 programming and debugging.
- **Enclosure Design:** User-friendly, with a built-in PCB antenna, available in both enclosed and non-enclosed versions.
- **Compact Dimensions:** 57×46.3×23.8 mm without antenna enclosure, 88.5×46.3×23.8 mm with antenna enclosure.

1.3 Application Areas

- Outdoor adventure
- Technology enthusiasts
- Emergency communications
- Fleet management
- Community networking

Figure 1:Application scenario diagram

2 Product Appearance Diagram

Figure 2:Front view with the casing

Figure 3:Rear view with the casing

3 Product Dimension Diagram

Figure 4:Dimension diagram with the casing

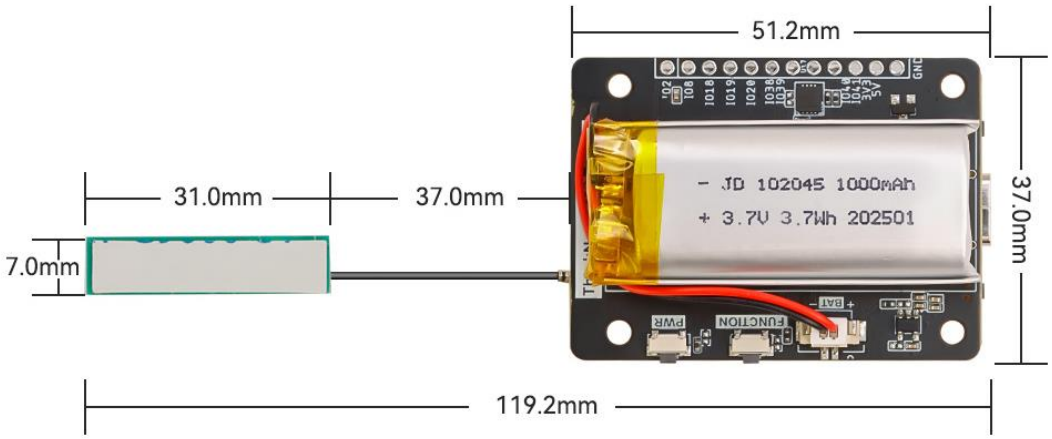
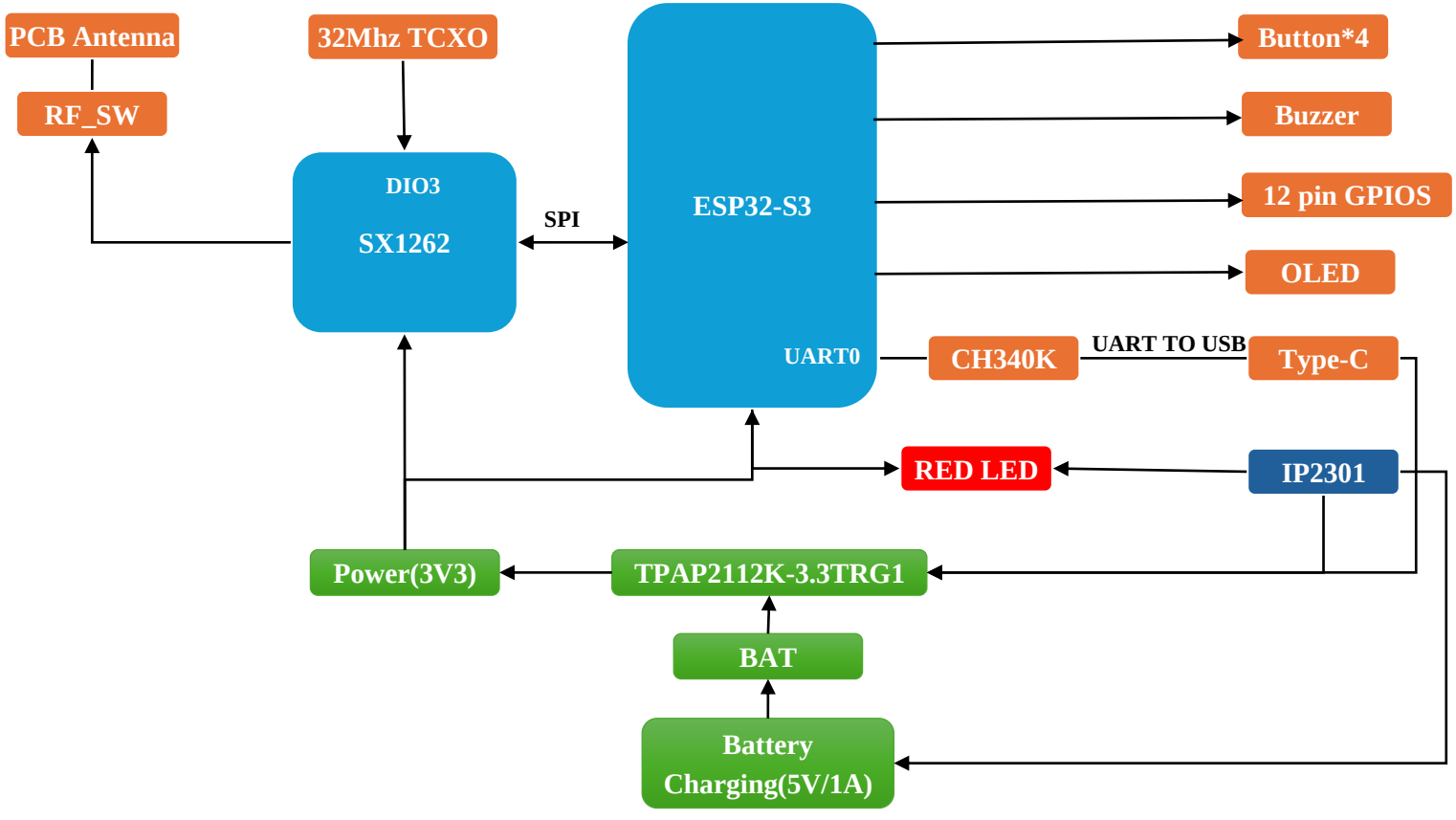


Figure 5:Dimension diagram without the casing

4 System Block Diagram



5 Hardware Overview

The hardware overview discusses the pin layouts and corresponding functions of various interfaces, buttons, and switches on the ThinkNode-M2 motherboard.

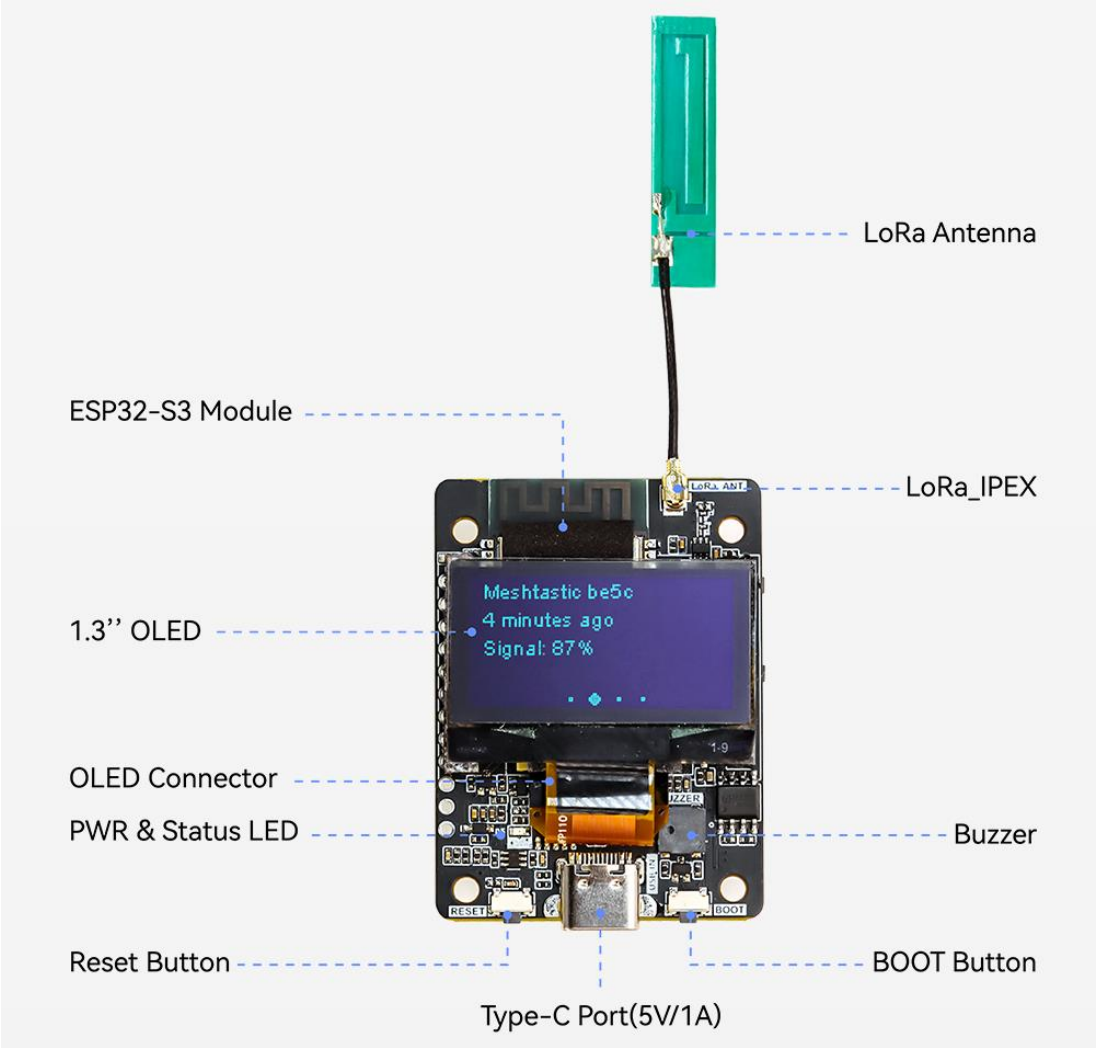


Figure 6:Components in the front view of the motherboard

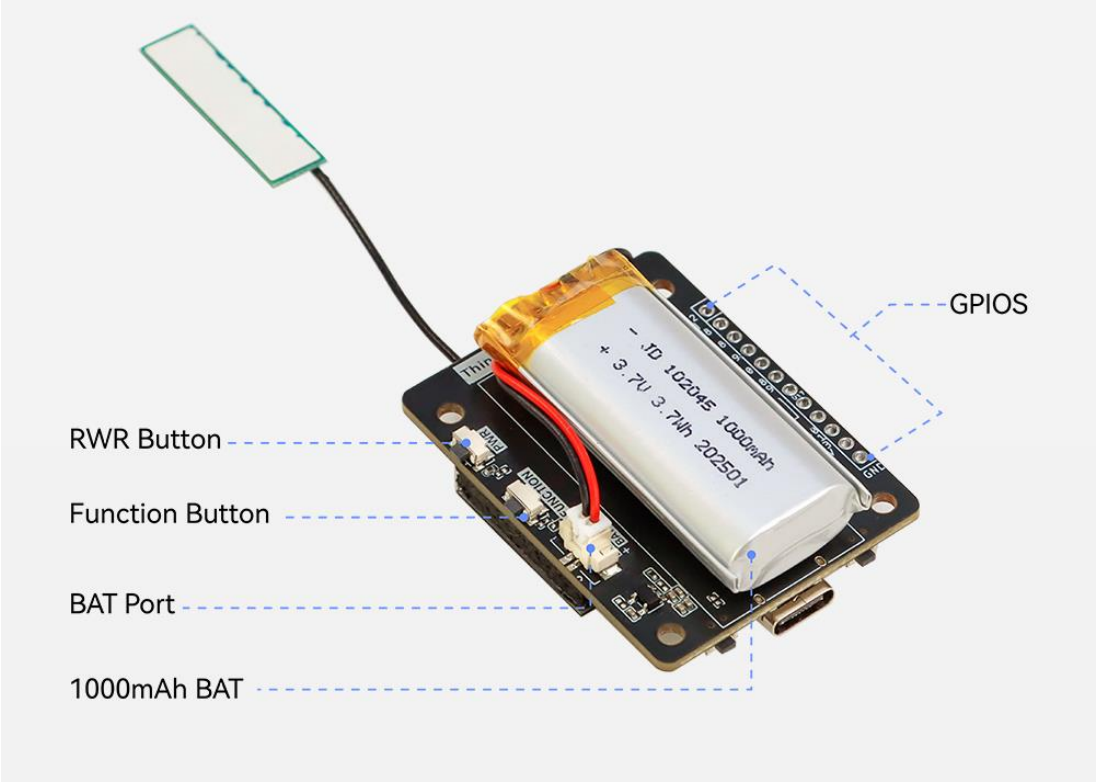


Figure 7:Components in the rear view of the motherboard

5.1 PWR & Status Indicators

No.	Name	Silk-screen Printing	Signal	Master Control Signal	Color	Description
1	PWR & Status Indicator Light	PWR	IO1_LED CHGLED	IO1	RED	➢ Device Power On: The indicator light remains steadily lit. ➢ Lithium Battery Charging: The indicator light blinks rapidly; when charging is complete, the indicator light remains steadily lit. ➢ Low Battery: The indicator light blinks slowly. ➢ Buzzer Alarm Activated: The indicator light blinks in conjunction with the buzzer alarm.

5.2 Interfaces & Buttons

No.	Name	Silk - screen Printing	Pin	Master Control Signal	Function
1	PWR Button	PWR	P3.3_IO4_POWER	IO4	Short Press to Power On / Long Press for 3 Seconds to Power Off: After powering on, a short press turns off the screen.
2	Function Button	FUNCTION	IO47_FUNCTION	IO47	➢ Single Click: Scroll down to switch between screen display pages. ➢ Double Click: Send a temporary PING with the device's location to the network. ➢ Triple Click: Trigger an SOS alarm signal (three short, three long, three short beeps). The buzzer sounds, and the indicator light blinks.
3	BAT Port	BAT	/	/	Powers the board when a battery is connected.
4	Type-C Port	USB-IN	ESP32_TXD0 ESP32_RXD0	IO43 IO44	Used for programming and debugging the ESP32-S3, while also charging the battery with a charging current of 1A.

5	OLED Connector	/	IO46 SCL SDA	IO46 IO15_SCL IO16_SDA	IO46: Controls the screen's on/off function. IO15_SCL and IO16_SDA: Control the screen display.
6	RESET Button	RESET	EN	EN	Restart ESP32 - S3
7	BOOT Button	BOOT	BOOT	IO0	When pressed simultaneously with the RESET button, users can perform debugging and programming
8	LORA_IPEX	LORA_ANT	/	/	Connect the LoRa antenna

5.3 GPIOs

No.	Silk - screen Printing	Pin	Master Control Signal	Description
1	IO2	IO2	IO2	RTC_GPIO2, GPIO2, TOUCH2, ADC1_CH1
2	IO8	IO8	IO8	RTC_GPIO8, GPIO8, TOUCH8, ADC1_CH7, SUBSPICS1
3	IO18	IO18	IO18	RTC_GPIO18, GPIO18, U1RXD, ADC2_CH7, CLK_OUT3
4	IO19	IO19	IO19	RTC_GPIO19, GPIO19, U1RTS, ADC2_CH8, CLK_OUT2, USB_D
5	IO20	IO20	IO20	RTC_GPIO20, GPIO20, U1CTS, ADC2_CH9, CLK_OUT1, USB_D+
6	IO38	IO38	IO38	GPIO38, FSPIWP, SUBSPIWP
7	IO39	IO39	IO39	MTCK, GPIO39, CLK_OUT3, SUBSPICS1

8	IO40	IO40	IO40	MTDO, GPIO40, CLK_OUT2
9	IO41	IO41	IO41	MTDI, GPIO41, CLK_OUT1
10	3V3	3V3	/	3.3V 供电
11	5V	VBUS	/	5V 供电
12	GND	GND	/	GND

5.4 SX1262 Pins

No.	Pin	Type	Master Control Signal	Description
1	SX126X_CS	I/O	IO10	It is used to select the SX126X chip for communication. When this pin is pulled low, the SX126X chip is selected for SPI communication.
2	SX126X_SCK	I/O	IO12	The clock line of the SPI interface, which is applied to synchronize data transmission.
3	SX126X_MOSI	O	IO11	The master device data output line of the SPI interface, which is used to send data from the microcontroller to the SX126X.
4	SX126X_MISO	I	IO13	The master device data input line of the SPI interface, which is utilized to receive data from the SX126X into the microcontroller.
5	SX126X_RESET	I/O	IO21	Reset the SX126X chip. When this pin is pulled low, the SX126X chip will be reset.
6	SX126X_BUSY	I/O	IO14	Indicate whether the SX126X chip is busy. When this pin is at a high level, it indicates that the chip is busy.
7	SX126X_DIO1	I/O	IO3	Digital input/output pin.
8	SX126X_DIO2	I/O	/	DIO2 is connected to RF_SW and set as the control pin of the RF single-pole switch to control the reception and transmission of RF signals.
9	DIO3	P	/	DIO3 is used to supply power to the TCXO.

5.5 Buzzer

No.	Pin	Type	Master Control Signal	Description
1	IO5	I	IO5	The master control signal controls the buzzer to give an alarm.

6 Transceiver Specifications

No.	Item Group	Item	Specifications
1	ESP32-S3-WROOM-1-N4R8	MCU	Xtensa® 双核 32 位 LX7 微处理器，支持高达 240 MHz 的时钟频率
2		FLASH	4 MB
3		PSRAM	8 MB
4		Wi-Fi	Supports 802.11a/b/g/n，2.4GHz
5		蓝牙	Supports Bluetooth 5.0 and Bluetooth mesh, with data rates of 125 Kbps, 500 Kbps, 1 Mbps, 2 Mbps
6	LoRa Transceiver	Protocol	LoRa/LoRaWAN
7		LoRa Communication	SX1262 LoRa Transceiver, Long Range, Low Power Consumption
8		Frequency Band	868 Mhz /915Mhz
9		communication distance	大于 5km
10		Receive Sensitivity	-124.5dBm@868Mhz -124.5 dBm @915Mhz
11		Transmit Power	21.2 dBm @868Mhz 21.4 dBm @915Mhz
12		Power Input	DC 5V/1A, supports USB or 3.3 - 4.2V lithium - battery power supply
13	Current	Shutdown Current	5uA
14		Current - Receive	150mA
15		Current - Transmit	60mA
16	Other	Interface	Type - C interface, IPEX - 1 antenna connector (internal) (BWU.FL), BAT battery connector (internal)
17		Buttons	PWR button, function button, BOOT button, reset button
18		LED Indicator	PWR & Status Indicator Light
19		Lithium Battery	Nominal Voltage: 3.7V
20			Capacity: 1000mAh

7 Display Screen Specifications

No.	Item	Specifications	Unit
1	Screen size	1.3	Inch
2	Display panel	OLED	
3	Driver IC	SH1106	
4	Display color	BLUE	
5	Resolution	128（H）x 64（V）	Pixel
6	Effective display area	29.42 x 14.7	mm
7	Overall dimensions	34.5 x 23	mm
8	Operating voltage	3.3	V
9	Communication interface	I2C	

8 Electrical Characteristics

The power consumption of the whole device: (DC 4.2V)

No.	Item	Conditions	Power Consumption
1	Leakage current (shutdown state)	Connected to battery	5uA
2	Screen - off	Not connected to battery, in standby state or when the power button is pressed briefly	136mA
3	Normal operation (maximum power consumption)	Sending data	217mA
4		Receiving data	188mA
5	After all functions are enabled (maximum power consumption)	Connected to battery	260mA

9 Environmental Characteristics

No.	Item	Specifications	Unit
1	Operating Temperature	-40 ~ 65	℃
2	Storage Temperature	-40 ~ 105	℃

10 Mechanical Characteristics

No.	Item	Specifications	Unit
1	Casing Dimensions	Without antenna casing: 57×46.3×23.8 With antenna casing: 88.5×46.3×23.8	mm
2	Dimensions without Casing (including battery, excluding antenna)	51.2*37*20	mm
3	Dimensions without Casing (including battery and antenna)	119.2*37*20	mm
4	Casing Material	ABS+PC	
5	Installation Method	Secured by screws	
6	Weight (with the casing)	45.3	g
7	Weight (without Casing)	29.7	g

11 Certifications

12 Related Documents and Resources

- **ThinkNode-M2 Product Link**
- **ESP32-S3-WROOM-1 DataSheet**
- **SX1261/2 Datasheet**

13 Revision History

Date	Version	Release Notes
2025/4/16	V1.0	Initial release