ThinkNode M1

Meshtastic Transceiver Device

Powered By nRF52840

DataSheet

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ThinkNode-M1

V1.0

Table of Contents

1 Overview

1.1 Description

The ThinkNode M1 is a high-performance LoRa transceiver specifically designed for low-power, long-range wireless communication networks. It integrates the Nordic nRF52840 microcontroller (MCU), the Semtech SX1262 LoRa® wireless communication chip, and the L76K GNSS module, enabling precise positioning and efficient signal transmission. The nRF52840 features a 32-bit ARM Cortex-M4F core, supporting multi-protocol communication with excellent performance and low power consumption. The L76K GNSS module supports multiple satellite systems, including GPS, Beidou, GLONASS, and QZSS, providing rapid and high-precision positioning services.

Equipped with a 1.54-inch EPD display screen, the ThinkNode M1 supports high-resolution information display, allowing users to conveniently monitor device status and data in real-time. This meets the needs for debugging and real-time data visualization. It also supports connections to GPS antennas and LoRa antennas, ensuring long-range, low-power communication. By integrating the Meshtastic protocol, the ThinkNode M1 can build a decentralized wireless communication network, significantly enhancing the reliability, scalability, and flexibility of the network.

The ThinkNode M1 is particularly suitable for complex scenarios such as outdoor exploration, emergency rescue, and remote sensor networks, meeting the requirements for efficient and reliable communication in IoT and wireless sensor networks.

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

➢ Nordic nRF52840 MCU, compatible with Meshtastic firmware.

➢ Semtech SX1262 long-range, low-power RF transceiver with TCXO clock source.

➢ GPS Positioning: Integrated Quectel L76K low-power, high-performance GNSS module, supporting multiple satellite systems (including GPS, BDS, GLONASS, QZSS), enabling fast and accurate positioning.

➢ GooDisplay® 1.54-inch E-ink display (with front light).

➢ Macronix MX25R1635F QSPI Flash.

➢ Low-power battery operation, supports 1200mAh lithium battery charging.

➢ 1* Type-C USB port for programming and debugging.

➢ Optional casing: Equipped with RP-SMA antenna connector, knob, and buttons.

➢ Compatible with Meshtastic APP: Users can configure and manage M1

device parameters, communicate via messages, share maps and locations, monitor network status, log and export data, and customize settings.

➢ Built-in RTC clock for faster device hot-start, supporting interrupt/wake-up functionality.

1.3 Application Fields

➢ Outdoor adventure

➢ Emergency communications

➢ Community networking

➢ Technology enthusiasts

➢ Fleet management

Figure 1: Application scenario diagram

2 Product Appearance

Figure 2: Front view with the casing

Figure 3: Rear view with the casing

3 Product Dimensions

Figure 4:Dimension diagram with the casing
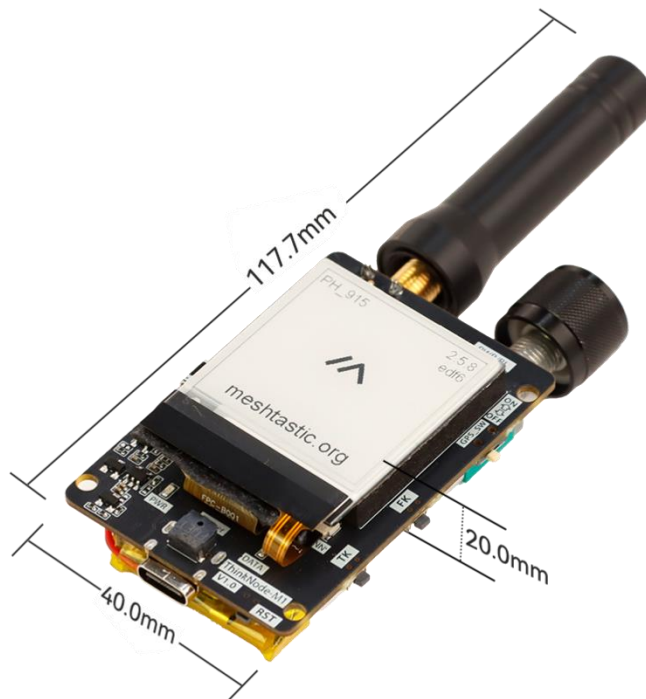
Figure 5:Dimension diagram without the casing

4 System Block Diagram

LoRa RF

TXCO

USB   Button*3   SWD   Buzzer   LED   BT   RTC

SX1262 ←SPI→ nRF52840

SPI

UART

GPS

EDP

Power SW → Power(3V3)

Charging (5V/1A) → BAT
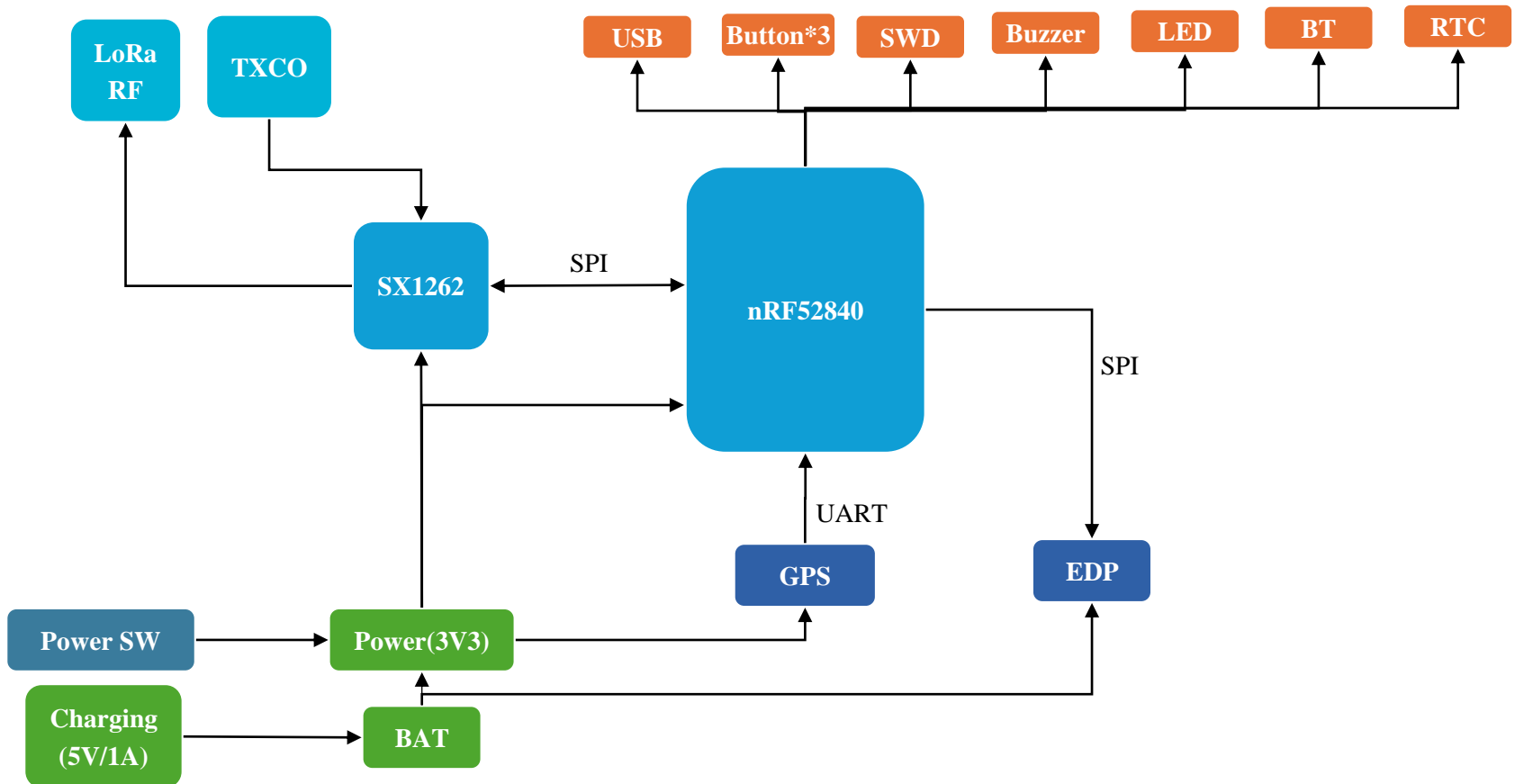
5 Hardware Overview

The hardware overview discusses the pin layouts and corresponding functions of various interfaces, buttons, and switches on the ThinkNode M1 motherboard.
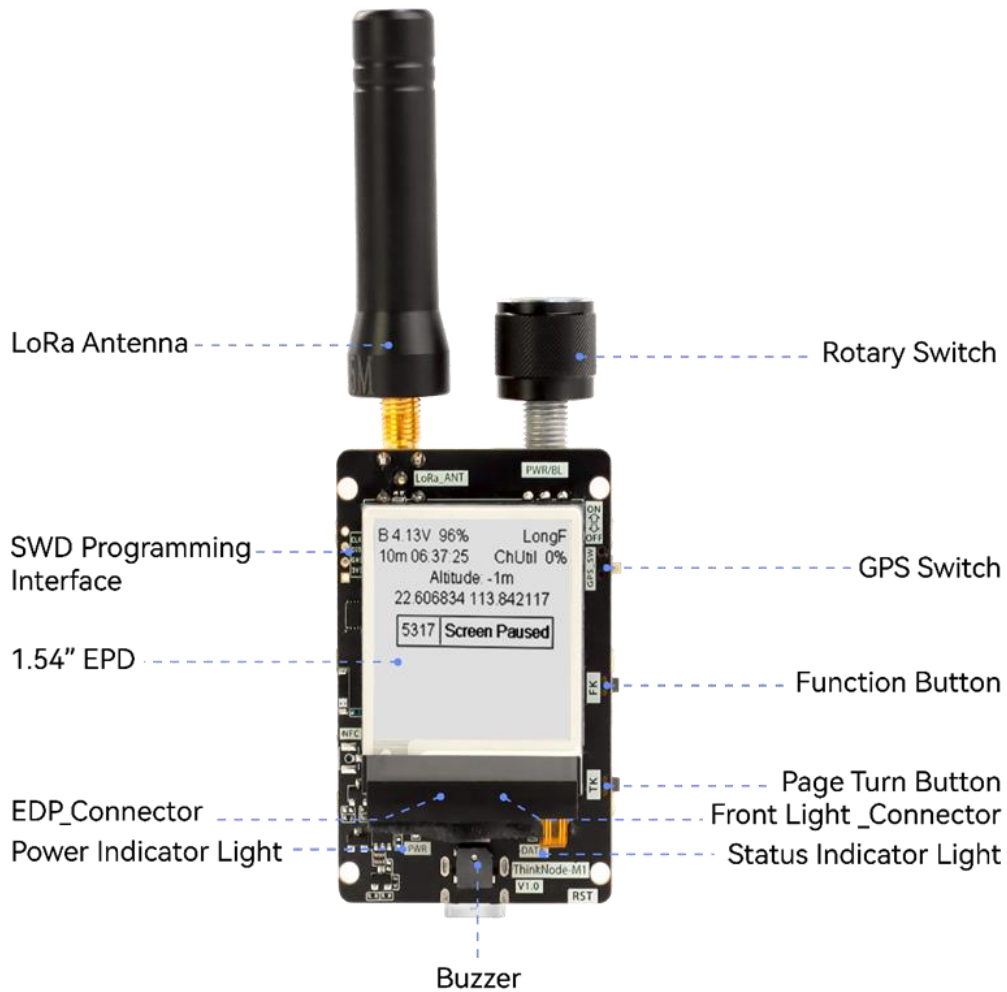
Figure 6:Components in the front view of the motherboard
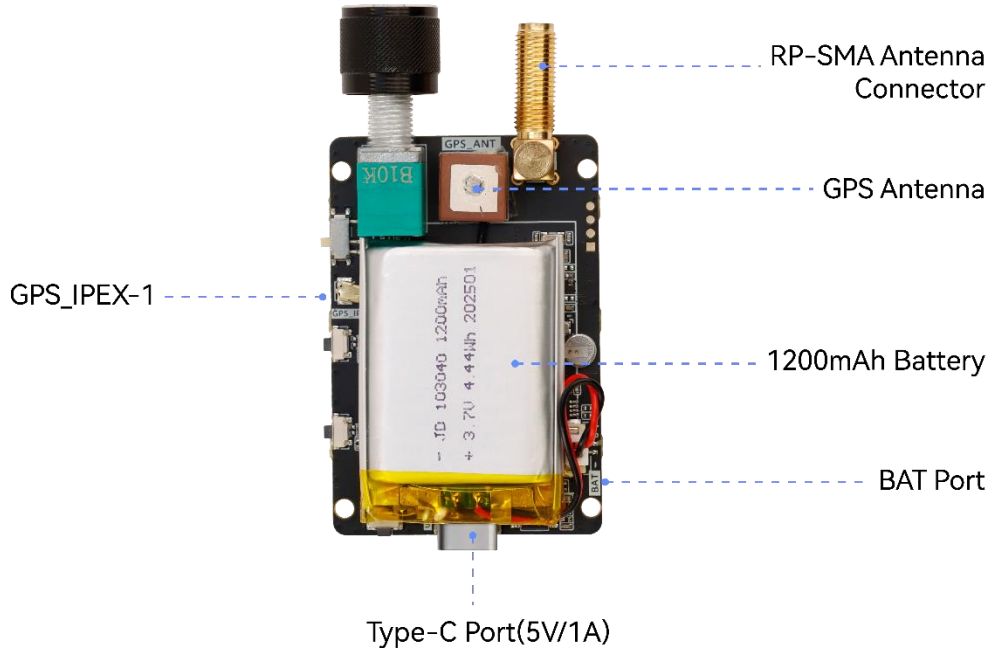
Figure 7:Components in the rear view of the motherboard

5.1 LED Indicator Lights

No.	Name	Silk-screen Printing	Signal	Master Control Signal	Color	Description
1	Power Indicator Light	PWR	LED P1.04 CHGLED	P1.06 P1.04	RED	➢ When powered off: The lithium - battery is charging, and the indicator light blinks; when fully charged, the indicator light stays on. ➢ When powered on: The light stays on; when charging, the indicator light blinks; when fully charged, the indicator light stays on. ➢ When the battery level is low, the indicator light blinks slowly; when not charging and the buzzer is in use, the indicator light blinks.

2	Status Indicator Light	DATA	LED3	P0.13	BLUE	➢ When the buzzer is in use, the indicator light blinks. ➢ When LoRa information is received, the indicator light blinks.

5.2 Switches & Buttons

No.	Name	Silk - screen Printing	Pin	Master Control Signal	Function
1	GPS Switch	ON/OFF	/	/	Turn on/off the GPS switch to enable or disable GPS positioning.
2	Function Button	FK	BUTTON_TOUCH	P1.07	➢ Single - click: Send a temporary ping of the device's location to the network. ➢ Double - click: Turn on/off the LED backlight. ➢ Triple - click: Trigger an SOS alarm signal (three short, three long, three short). The buzzer sounds, and the red and blue lights below flash alternately. ➢ Long - press: Enter the low power sleep mode, and the red light turns off.
3	Page Turn Button	TK	BUTTON1	P1.10	Single - click to switch pages.
4	Reset Button	RST	MCU_RST	P0.18/NRESET	Single - click to reset and restart; double - click to enter the burning mode.
5	Rotary Switch	PWR/BL	/	/	Turn clockwise to turn on the power switch, and turn counterclockwise to turn off the power. When turning the knob, the brightness level of the backlight LED can be adjusted.

5.3 Interfaces

No.	Name	Silk - screen Printing	Pin	Master Control Signal	Function
1	GPS Antenna	GPS_IPEX	/	/	Connect to an active antenna
2	USB Interface	USB-IN	USB_D+ USB_D-	D+ D-	USB communication / USB programming
3	BAT Port	BAT	/	/	Connect the battery
4	EPD Screen Interface	EPD_CONN	EINK_BUSY EINK_RES EINK_DC EINK_CS EINK_SCLK EINK_MOSI	P0.03/AIN1 P0.02/AIN0 P0.28/AIN4 P0.30/AIN6 P0.31/AIN7 P0.29/AIN5	Connect a 1.54 - inch e - ink screen
5	Front Light Connector	BL_CONN	EINK_EN	P1.11	Control the front - light on/off
6	RP-SMA Antenna Connector	LORA_ANT	/	/	Connect an 868/915 MHz antenna
7	SWD Programming Interface	CLK DIO GND 3V3	CLK DIO GND 3V3	SWCLK SWDIO	Programming the bootloader / perform other burning and debugging

5.4 Flash

No.	Pin	Type	Master Control Signal	Description
1	QSPI_CS	I/O	P1.15	Used to select a specific external device for communication. When this pin is pulled low, the corresponding external device is selected.
2	QSPI_IO1	I/O	P1.13	Used for data input and output.
3	QSPI_IO2	I/O	P0.07	Used for data input and output.
4	QSPI_IO0	I/O	P1.12	Used for data input and output.
5	QSPI_SCK	I/O	P1.14	The clock line of the QSPI interface, which is used to synchronize data transmission.
6	QSPI_IO3	I/O	P0.05/AIN3	Used for data input and output.
7	VDD_FLASH	P	/	Supply power to the RTC.

5.5 GPS

No.	Pin	Type	Master Control Signal	Description
1	GPS_RX	I/O	P1.09	Receive data from the GPS module (serial communication)
2	GPS_TX	I/O	P1.08	Send data to the GPS module (serial communication)
3	1PPS	I	/	Precise clock signal, for time synchronization function
4	GPS_STANDBY	I	P1.02	Control the GPS module to enter standby mode. When the pin is pulled low, the GPS module enters standby mode.
5	V_BCKP	P	/	Connect to the RTC power supply
6	VCC_GPS	P	/	Provide the main power supply for the GPS module
7	GPS_REINIT	I	P1.05	Used to reinitialize the GPS module. When this pin is pulled low, the GPS module restarts.
8	RF_IN	I	/	Connect to an active antenna to receive radio frequency signals
9	VDD_RF	P	/	Supply power to the radio frequency circuit

5.6 SX1262 Pins

No.	Pin	Type	Master Control Signal	Description
1	SX126X_CS	I/O	P0.24	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	P0.19	The clock line of the SPI interface, which is used to synchronize data transmission.
3	SX126X_MOSI	O	P0.22	The master device data output line of the SPI interface, used to send data from the microcontroller to the SX126X.
4	SX126X_MISO	I	P0.23	The master device data input line of the SPI interface, used to receive data from the SX126X into the microcontroller.
5	SX126X_RESET	I/O	P0.25	Reset the SX126X chip. When this pin is pulled low, the SX126X chip is reset.
6	SX126X_BUSY	I/O	P0.17	Indicate whether the SX126X chip is busy. When this pin is at a high level, it means the chip is busy.
7	SX126X_DIO1	I/O	P0.20	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	SX126X_DIO3	I/O	P0.21	DIO3 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.
10	DIO3	P	/	DIO3 is used to supply power to the TCXO.

5.7 Buzzer

No.	Pin	Type	Master Control Signal	Description
1	BUZZER	I	P0.06	The master control signal controls the buzzer to give an alarm.

5.8 SWD Interface

No.	Pin	Type	Master Control Signal	Description
1	SWDIO	I/O	SWDIO	SWD data pin
2	SWDCLK	I/O	SWDCLK	SWD clock pin

5.9 EPD Display Screen

No.	Pin	Type	Master Control Signal	Description
1	EINK_BUSY	I/O	P0.03/ANT1	Used to indicate whether the e-ink display screen is busy.
2	EINK_RES	I/O	P0.02/ANT0	Used to reset the e-ink display screen. When this pin is pulled low, the display screen is reset.
3	EINK_DC	I/O	P0.28/ANT4	Data/command control pin.
4	EINK_CS	I/O	P0.30/ANT6	Used to select the e-ink display screen for communication. When this pin is pulled low, the display screen is selected for SPI communication.
5	EINK_SCLK	I/O	P0.31 /ANT7	The clock line of the SPI interface, which is used to synchronize data transmission.
6	EINK_MOSI	O	P0.29 /ANT5	The master device data output line of the SPI interface, used to send data from the microcontroller to the e-ink display screen.

6 Transceiver Specifications

No.	Item Group	Item	Specifications
1	NRF52840	MCU	Integrated 32-bit Arm® Cortex™ M4 CPU with a main frequency of 64MHz and a Floating Point Unit (FPU).
2		FLASH	1MB
3		RAM	256KB
4	Bluetooth	Protocol	Low Energy Bluetooth and Bluetooth 5
5	LoRa Transceiver	LoRa Communication	SX1262 LoRa Transceiver, Long Range, Low Power Consumption
6		Frequency Band	868Mhz/915Mhz
7		communication distance	2KM (urban), 5KM+ (suburban)
8		Receive Sensitivity	-125dbm
9		Transmit Power	+22dbm
10		LoRa Antenna	868MHz (EU)/915MHz (US) (Antenna impedance: 50Ω; VSWR: ≤2; Gain: 2.5 DBI)
11	L76K Multi - System Positioning (GNSS Module)	Support System	GPS, GLONASS, Beidou, QZSS
12	Other	Interface	GPS Antenna Interface (BWU.FL) Type-C Port RP-SMA Antenna Connector BAT Battery Interface
13		Switches & Buttons	GPS switch, function button, page - turning button, reset button, Rotary Switch
14		LED Indicator	Power Indicator Light, Status Indicator Light
15		RTC Clock	Onboard RTC crystal, supports interrupt/wake-up
16		Lithium Battery	Nominal Voltage: 3.7V
17			Capacity: 1200mAh

7 E-ink Display Specifications

No.	Item	Specifications	Unit
1	Screen Size	1.54 inch - EPD (monochrome e - ink screen)	Inch
2	Display Material	E - Ink (electronic ink)	
3	Driving IC	SSD1681	
4	Resolution	200 (H) x 200 (V)	Pixel
5	Display Color	White	
6	Contrast Ratio	8:1	
7	Active Display Area	27.0（H）x 27.0（V）	mm
8	Dimensions	31.80（H）x 37.32（V）x 0.98（D）	mm
9	Pixel Pitch	0.14x0.14	mm
10	Pixel Configuration	Square	
11	Full Refresh Time	0.3	S
12	Partial Refresh Time	2	S
13	Gray Levels	2	
14	Flexible Cable	24-Pins	
15	Interface	4 - wire SPI	

8 Electrical Characteristics

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

No.	Item	Conditions	Power Consumption
1	After sleep mode is enabled (low - power state)	Sleep mode, GPS switch is off	5.825μA
2	Normal operation	When sending and receiving messages, GPS is on	54.06mA
3		When sending and receiving messages, GPS is off	25.34mA
4		When the backlight is on, GPS is on	87mA
5		When the buzzer is on, GPS is on	85mA
6		When the buzzer and backlight are on, GPS is on	118.5mA
7	After all functions are enabled	When sending a message, the buzzer is on, and the backlight brightness is adjusted to the maximum	300mA
8	Shutdown leakage current	/	0.675μA

9 Environmental Characteristics

No.	Item	Specifications	Unit
1	Operating Temperature	-20~+70	°C
2	Storage Temperature	-40~+80	°C

10 Mechanical Characteristics

No.	Item	Specifications	Unit
1	Dimension of the device with the casing (including the antenna)	118.5*52.1*25	mm
2	Dimension of the device without the casing (including the battery and the antenna)	117.7*40*20	mm
3	Casing Material	ABS+PC	
4	Installation Method	Handheld, portable	
5	Weight (with the casing)	82.5	g
6	Weight (without Casing)	58.3	g

11 Certifications

12 Related Documents and Resources

➢ **ThinkNode M1 Product Link**
➢ **NRF52840 Datasheet**
➢ **SX1261/2 Datasheet**

13 Revision History

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