LR1302 868M/915M LoRaWAN Hat for RPI Datasheet

V1.0

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1 Overview

1.1 Product Description

The LR1302 LoRaWAN HAT is a high-performance expansion board specifically designed for Raspberry Pi series motherboards (compatible up to RPi 5). It integrates the SX1302 LoRaWAN gateway module and enables industrial-grade Internet of Things (IoT) communication through a mini-PCIe interface. The onboard L76K GPS module enhances the timing and positioning accuracy of the gateway module, and the built-in cooling fan optimizes the heat dissipation efficiency of the motherboard. In addition, it supports the mini-PCIe interface of the LR1302 and automatically adapts the standard 52-pin gold finger to the 40-pin GPIO connector of the Raspberry Pi, simplifying the development process and facilitating the rapid integration of the LR1302 functions. It is widely applicable to IoT scenarios such as smart agriculture and smart cities.

1.2 Core Features

- **Positioning System:** The onboard L76K (GNSS) module supports satellite systems such as Beidou, GPS, and GLONASS, providing precise positioning and time synchronization.
- **Thermal Management:** The built-in cooling fan can effectively dissipate heat for the Raspberry Pi, enhancing the performance of the Raspberry Pi.
- **Communication Performance:** Integrated with the SX1302 LoRaWAN gateway module, it supports industrial-grade Internet of Things (IoT) communication.
- **Status Indication:** There are 4 onboard LED indicator lights that provide real-time feedback on the operating status of the module.
- **Compatibility and Expandability:** Based on the 40 PIN GPIO interface of the Raspberry Pi. This interface is a standard one for the Raspberry Pi, featuring excellent universality and is suitable for Raspberry Pi series motherboards.
- **Power Management:** It supports dual power supply methods (Raspberry Pi bus / USB-C interface).
- **Efficient and Compact LoRaWAN Wireless Communication Gateway:** The combination of the LR1302 LoRaWAN HAT, the LR1302 gateway module, and the Raspberry Pi provides users with an efficient and compact LoRaWAN wireless communication gateway.

1.3 Application Scenarios

- Application Areas:
- Smart Cities
- Smart Homes
- Smart Agriculture
- Smart Cities
- Logistics and Tracking
- Industry and Security
- Smart Buildings
- Community Networks

Applications:

- Development of LoRaWAN Gateway Devices/Hotspots
- Development of Long-distance Wireless Communication Applications
- Any Learning and Experiments Based on Raspberry Pi
- Learning and Research on LoRa and LoRaWAN Applications

2 Dimension Diagram

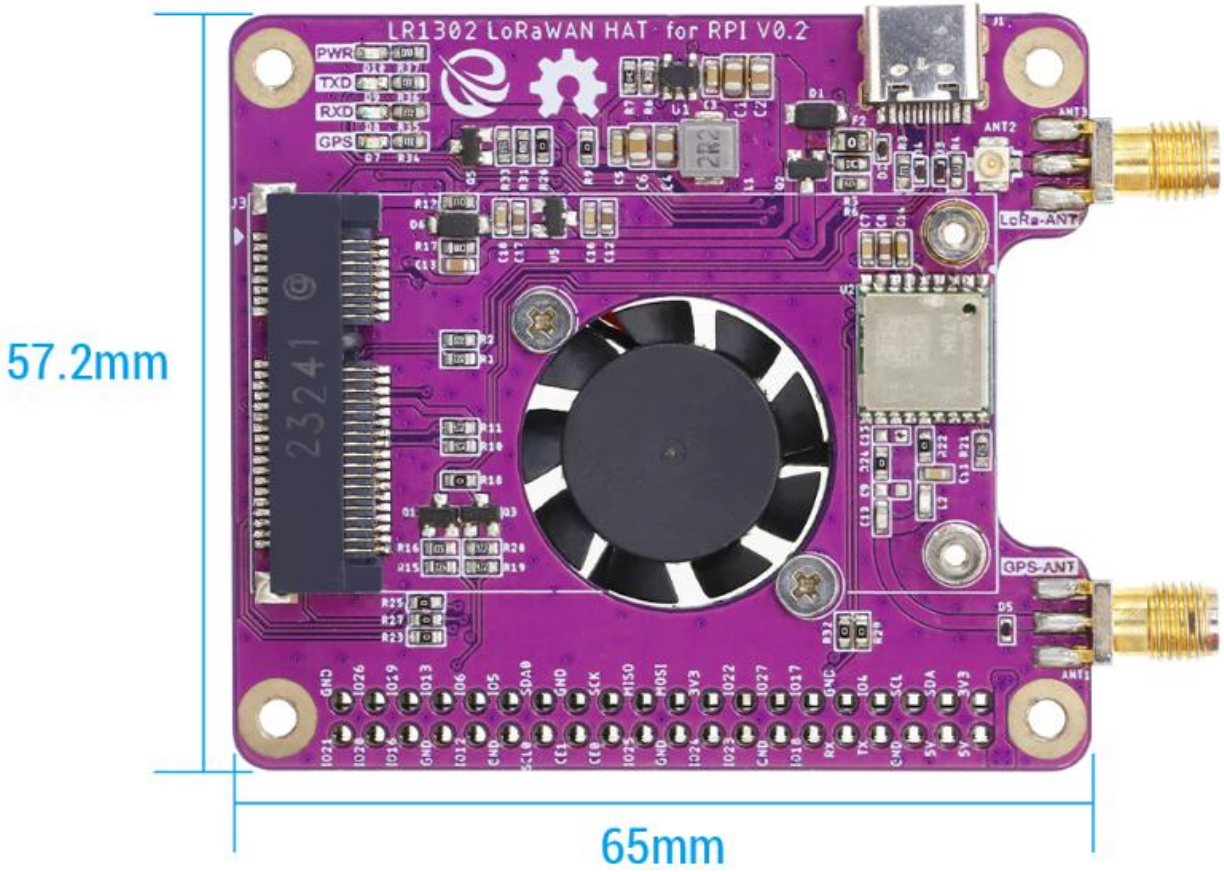

Figure 1:Dimension Diagram

3 Assembly Schematic Diagram

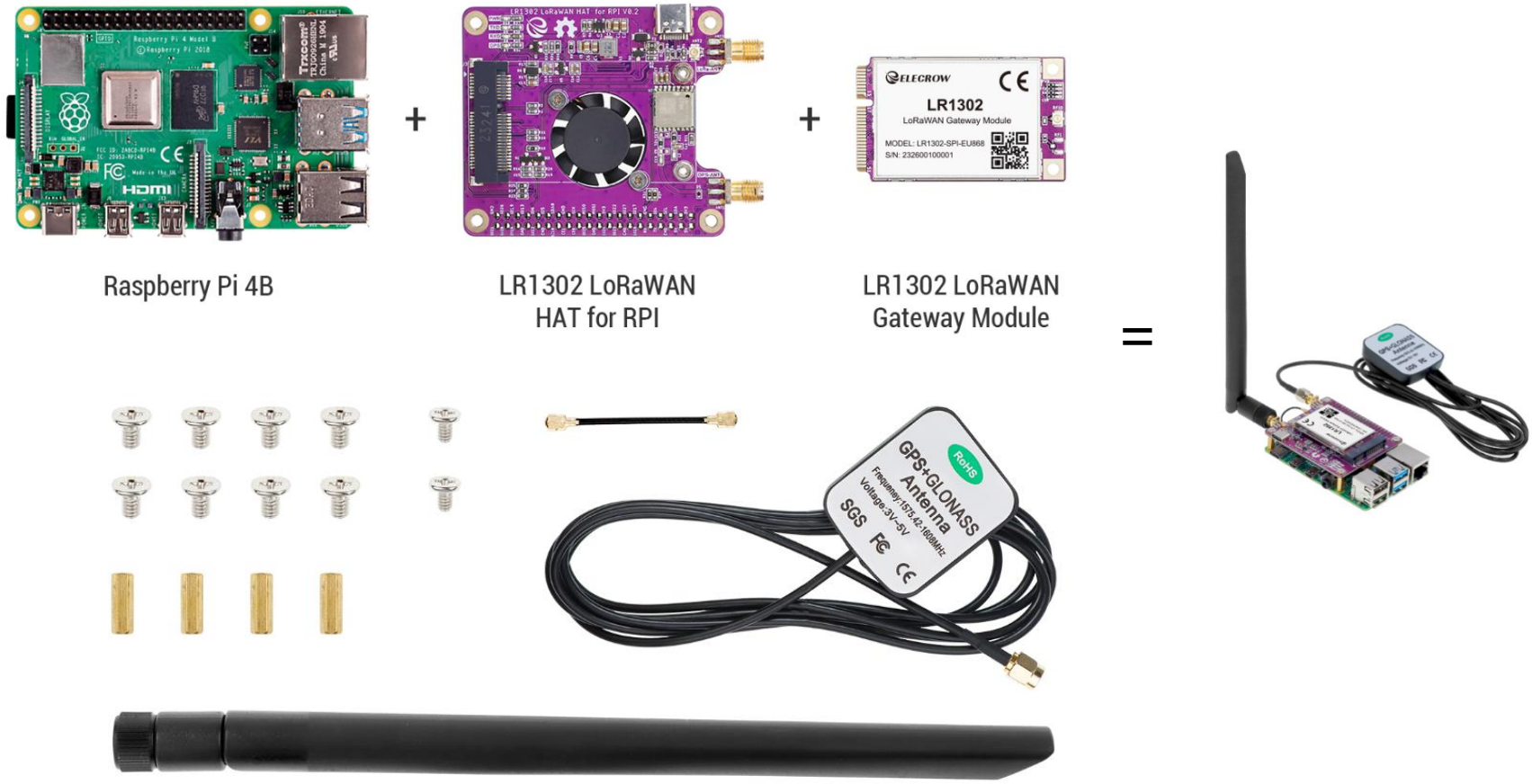

Figure 2：Schematic Diagram of LoRaWAN Gateway Assembly

4 System Block Diagram

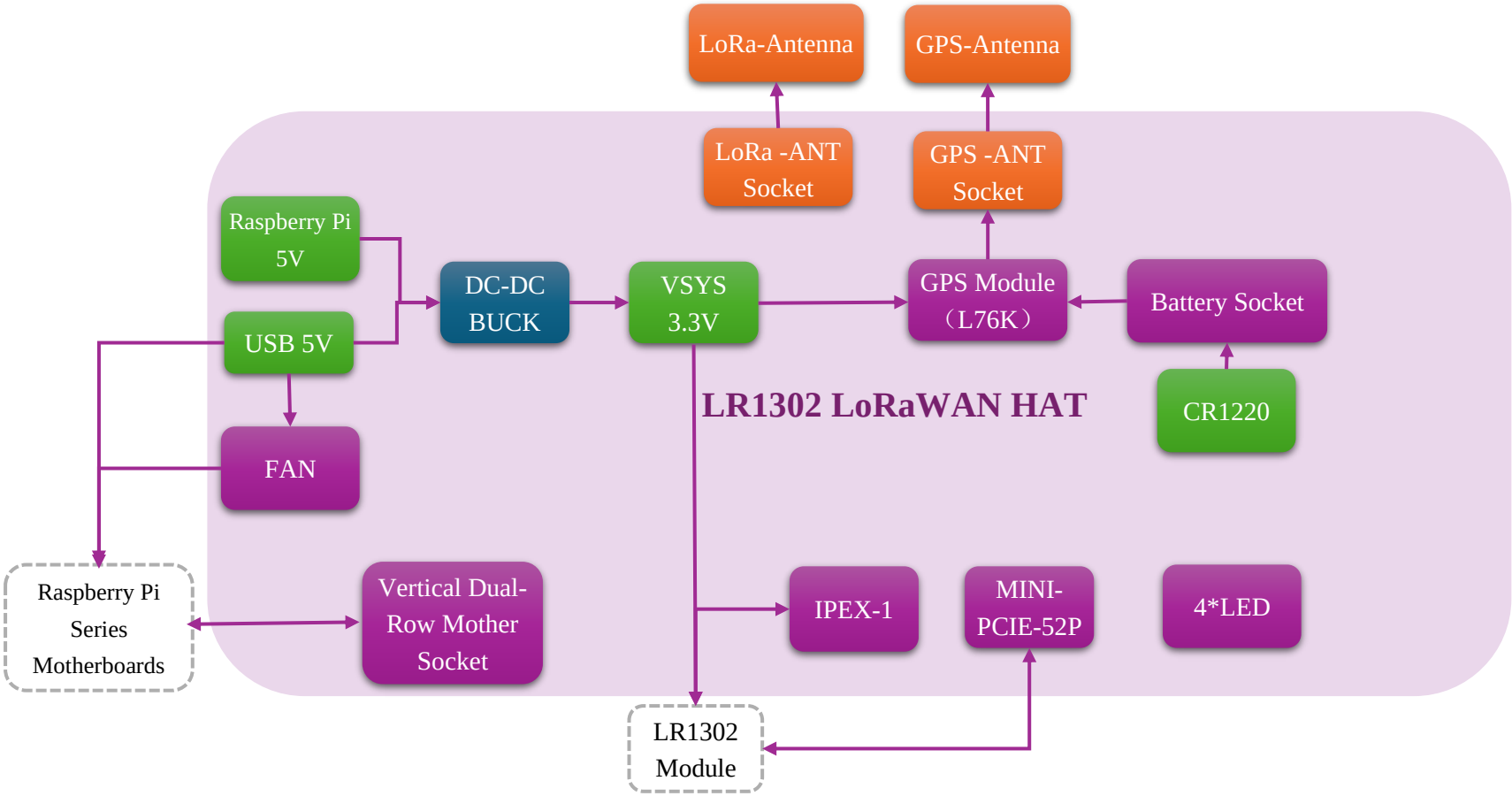

Figure 3： System Block Diagram

5 Technical Specifications

No.	Item	Parameter	
1	Power Input	DC 5V/1A	
2	Power Supply Method	Powered through Raspberry Pi or via USB	
3	Clock	Equipped with both logical master clock and real-time clock functions	
4	Fan	Built-in（DC 5V）,used for dissipating heat of the Raspberry Pi	
5	Raspberry Pi Compatibility	Supports RPi 5, RPi 4 B, RPi 3 A+/B/B+, RPi 2 B, RPi A+/B+	
6	PCIE Connector	52-pin Mini-PCIe connector	
7	L76K Multi-system Positioning (GNSS Module)	Supported Systems	Supports time synchronization and multiple positioning modes, including satellite systems such as GPS L1, BeiDou B1, GLONASS L1, etc.
8		Frequency Bands	GPS L1 C/A：1575.42 ±1.023 MHz BeiDou B1I：1561.098 ±2.046 MHz GLONASS L1：1597.78~1605.66 MHz
9		Positioning Accuracy	< 2.0 m CEP
10		Receiving Sensitivity (GPS + BeiDou)	➢ Acquisition: -148 dBm ➢ Re-acquisition: -160 dBm ➢ Tracking: -162 dBm
11		Communication Interface	UART interface
12	Battery	CR1220（3V）	
13	LED Indicator Lights	PWR: Green TXD: Green RXD: Blue GPS: Green	
14	Physical Parameters	Weight: 28 g (excluding the antenna)	
15		Dimensions: 65*57.2mm	
16	Reserved Interfaces	➢ Type-C interface (for power supply) ➢ mSata connector (to connect to Raspberry Pi) ➢ SMA antenna interface (to connect 868MHz/915MHz antenna) ➢ GPS antenna interface (to connect GPS+BD dual-mode	

antenna)

- Vertical double-row female header
- Battery holder

6 Hardware Overview

6.1 Electrical Interfaces

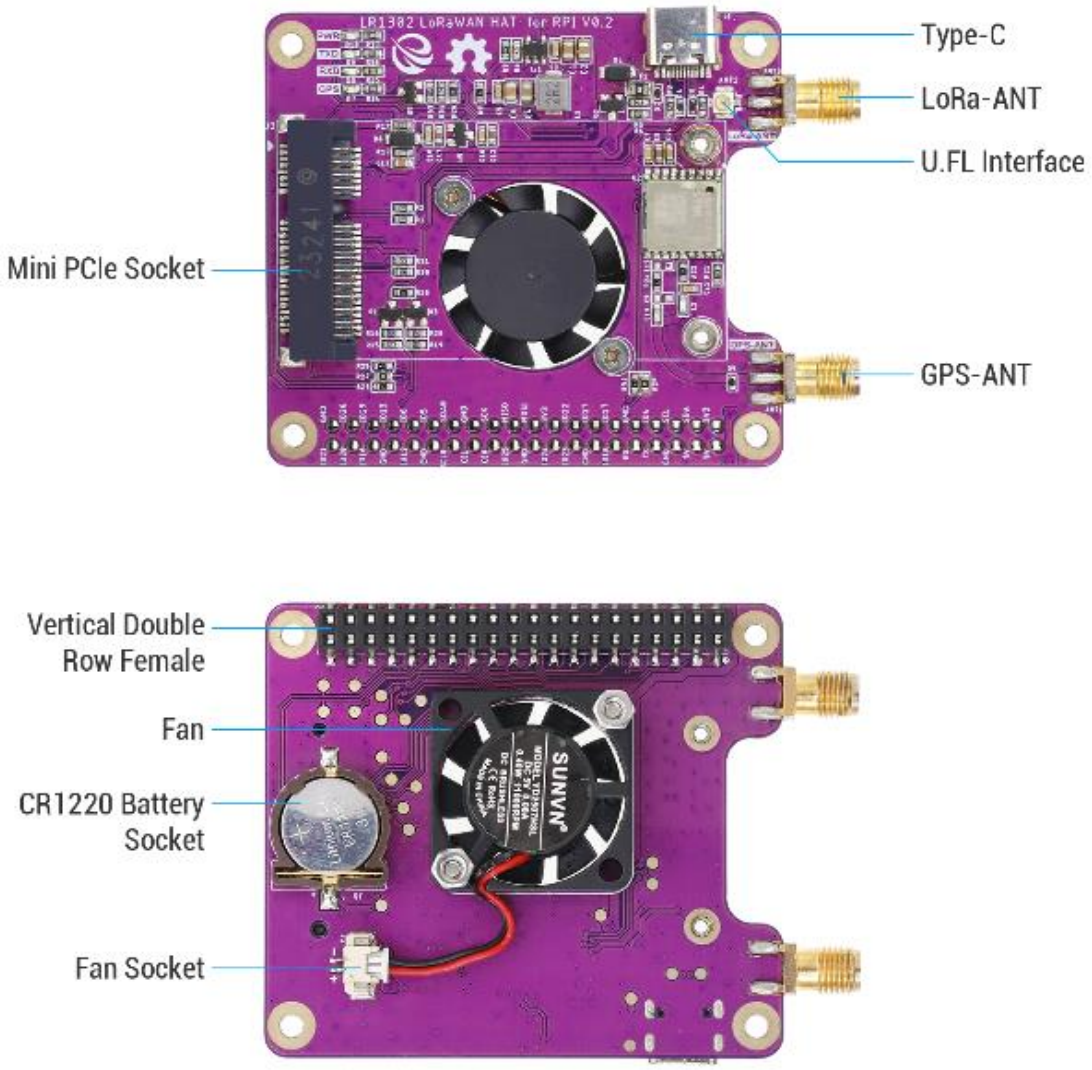

Figure 4：Schematic Diagram of the Interface

No.	Interface	Protocol Supported	Function
1	Type-C Interface	USB 2.0	In SPI version: for power supply In USB version: used for communication between the USB interface and the USB interface of the Raspberry Pi
2	Mini PCIe Socket	PCIe	52 pins, assembled with the baseband LR1302 module. The mPCIe card is fixed by screws or buckles on the right side to meet

			network communication requirements.
3	Vertical Double-row Female Header (2*20 pins)	/	Connects the Raspberry Pi and the expansion board module in a board-to-board manner, and the 40-pin GPIO ports are connected.
4	U.FL Interface	IPEX-1	Uses a double-ended IPEX-1 cable to connect the expansion board and the U.FL port of the LR1302 module for communication.
5	LoRa-ANT Interface	50Ω Impedance	connects an external rubber rod antenna (868MHz/915MHz antenna) to increase the gain and signal coverage.
6	GPS-ANT Interface	50Ω Impedance	Connects a GPS+BD dual-mode antenna.
7	CR1220 Battery Socket	Capacity:17mAh	Equipped with an ML1220 button battery (DC 3V), used to save ephemeris data when power is off and for hot start (saving positioning data and time information).
8	Fan	PWM	DC 5V/0.08A, dissipates heat for the Raspberry Pi.
9	Fan Socket	/	2P *1.25mm, connects the fan.

6.2 Pin Layout of LR1302 Pi Hat

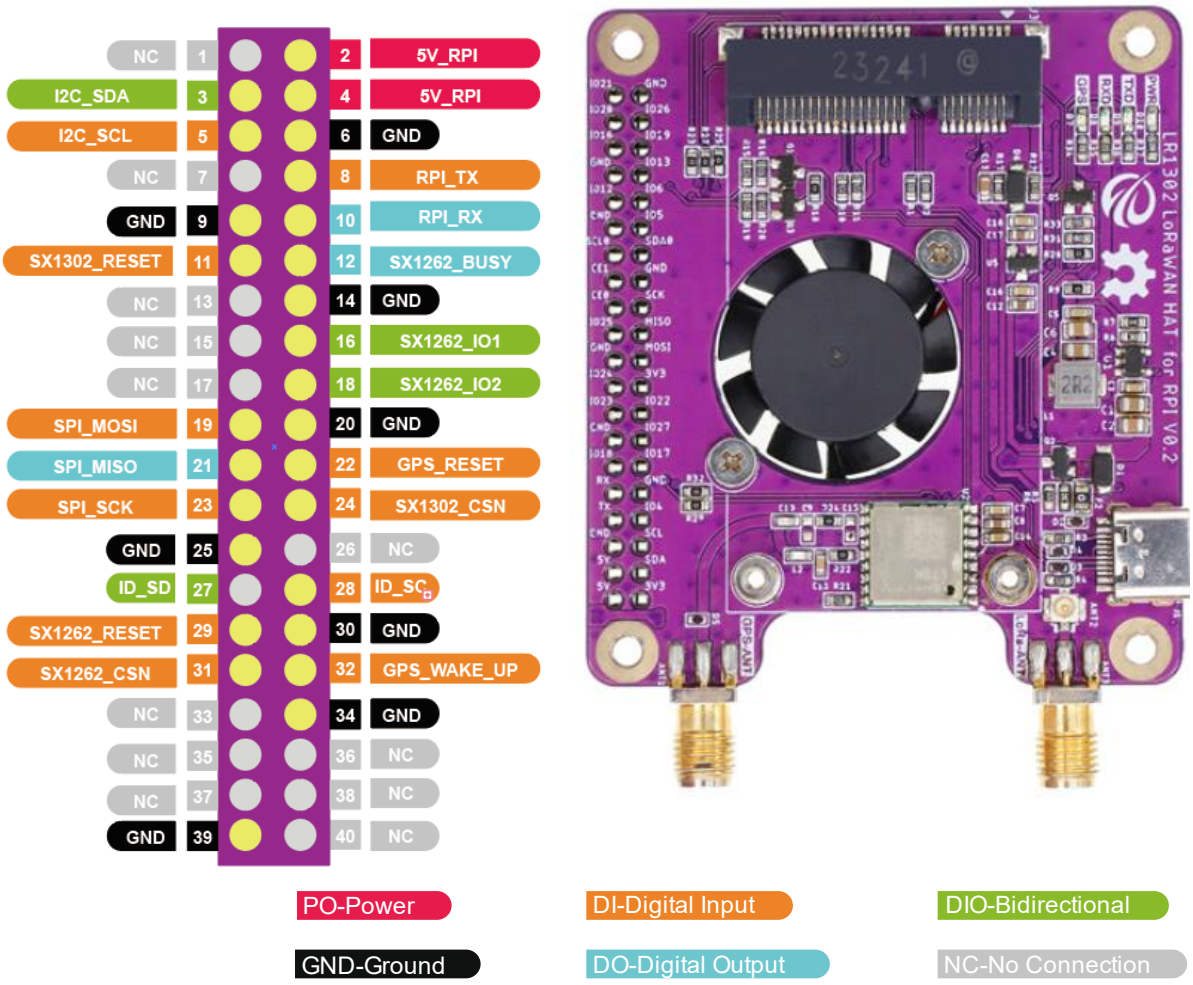

Figure 5：Pin Layout of LR1302 Pi Hat

Detailed Definition of Pins:

NO.	Raspberry Pi GPIO	LR1302 PI HAT PIN NAME	IO TYPE	Function
1	3V3 power	NC		
2	5V power	5V	power	Raspberry Pi Supply Voltage: 5V
3	GPIO 2(SDA)	I2C_SDA	DIO	SPI Version: Temperature Sensor I2C Data
4	5V power	5V	Power	Raspberry Pi Supply Voltage: 5V
5	GPIO 3(SCL)	I2C_SCL	DI	SPI Version Temperature Sensor I2C Clock
6	Ground	GND	Ground	Ground
7	GPIO 4(GPCLKO)	NC		
8	GPIO 14(TXD)	GPS_RXD	DI	GPS Serial Interface: UART Receive (UART_RXD)
9	Ground	GND	Ground	Ground
10	GPIO 15(RXD)	GPS_TXD	DO	GPS Serial Interface UART Transmit (UART_TXD)
11	GPIO 17	RESET	DI	SX1302 Chip Reset Pin High level effective for SPI version Low level effective for USB version
12	GPIO 18(PCM_CLK)	SX1262_BUSY	DO	SX1262 BUSY Pin
13	GPIO 27	NC		
14	Ground	GND	Ground	Ground
15	GPIO 22	NC		
16	GPIO 23	SX1262_IO1	DIO	SX1262 DIO1 Pin
17	3V3 power	NC		
18	GPIO 24	SX1262_IO2	DIO	SX1262 DIO2 Pin
19	GPIO 10(MOSD)	SPI_MOSI	DI	SPI MOSI
20	Ground	GND	Ground	Ground
21	GPIO 9(MISO)	SPI_MISO	D0	SPI MISO

22	GPIO 25	GPS_RST	DI	Low level effective
23	GPIO 11(SCLK)	SPI_SCK	DI	SPI Clock
24	GPIO 8(CE0)	SX1302_CSN	DI	SX1302 Chip select
25	Ground	GND	Ground	Ground
26	GPIO 7(CE1)	NC		
27	GPIO O(ID_SD)	ID_SD	DIO	I2C Data for EEPROM
28	GPIO 1(ID_SC)	ID_SC	DIO	I2C Clock for EEPROM
29	GPIO 5	SX1262_RST	DI	SX1262 Reset Pin
30	Ground	GND	Ground	Ground
31	GPIO 6	SX1262_CSN	DI	SX1262 Chip select
32	GPIO 12(PWM0)	GPS_WAKE UP	DI	Low level effective to enter/exit Standby mode
33	GPIO 13(PWM1)	NC		
34	Ground	GND	Ground	Ground
35	GPIO 19(PCM_FS)	NC		
36	GPIO 16	NC		
37	GPIO 26	NC		
38	GPIO 20(PCM_DIN)	NC		
39	Ground	GND	Ground	Ground
40	GPIO 21(PCM_DOU)	NC		

6.3 Status Indicator Lights

No.	Signal	Silk Screen	LEDs	Color	Description
1	PWR	PWR	PWR	Green	Indicates the working status of the module. It remains constantly on in green after powering on.
2	GPS_RX	RXD	RXD	Blue	Indicates the reception of the RX serial port. The working status light turns on in blue when there is downward signal data transmission.
3	GPS_TX	TXD	TXD	Green	Indicates the transmission of the TX serial port. The working status light turns on in green when there is upward signal data transmission.
4	GPS_1PPS	GPS	GPS	Green	**Flashing:** Indicates that the module has successfully achieved positioning. **Constantly off:** Indicates that positioning has not been achieved.

7 Related Documents

- **LR1302 868M/915M LoRaWAN Hat for RPI Product Link**
- **LR1302 LoRaWAN Gateway Module SPI EU868 Product Link**
- **LR1302 LoRaWAN Gateway Module SPI US915 Product Link**
- **Raspberry_Pi_5 Datasheet**

8 Revision History

Date	Version	Release Note
2025/4/17	V1.0	Initial release