



# Wireless Tracker V2

WiFi/BLE/LoRa/GNSS

Development Board





## Document Version

Version	Time	Description	Remark
V2.3	2025-9-5	TX power upgraded from $21\pm 1$ dBm to $28\pm 1$ dBm.	Ashley



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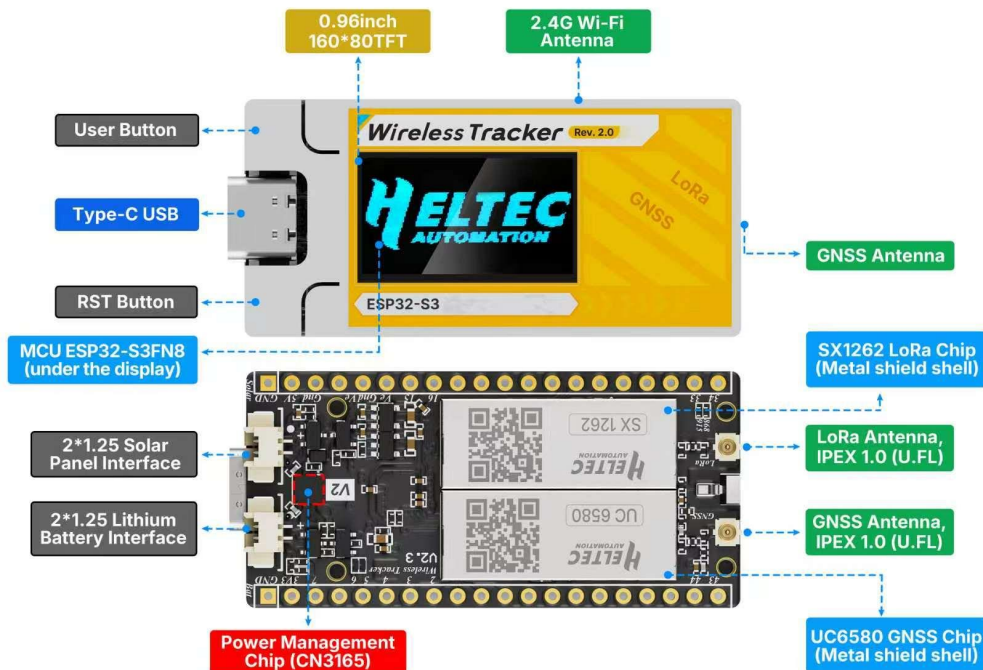
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# 1. Description

## 1.1 Overview

Wireless Tracker V2 integrates the Semtech SX1262 LoRa transceiver and UC6580 GNSS module, powered by the high-performance ESP32-S3FN8 platform to deliver reliable long-range communication and high-precision positioning in a compact, developer-friendly IoT solution.

With its maximum TX power increased to  $28 \pm 1$  dBm (upgraded from  $21 \pm 1$  dBm), combined with an upgraded RF front-end architecture and optimized PCB layout, Wireless Tracker V2 achieves extended communication range, enhanced signal penetration, improved link robustness, and greater overall system stability—making it ideal for demanding and large-scale tracking deployments.



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## 1.2 Upgrade and Enhancement

- Maximum TX Power: Increased from  $21 \pm 1$  dBm to  $28 \pm 1$  dBm, enabling extended communication range and improved link reliability.
- FEM Upgrade: Replaced the RF front-end module to support higher output power and enhance transmission efficiency and receiver sensitivity.
- RF Filter Added: Added an RF filter to improve EMC performance.
- GNSS Active Antenna Upgrade: Enhanced with an upgraded low-noise amplifier (LNA) to achieve stronger signal reception and higher positioning accuracy.
- SX1262 Ground Optimization: Implemented full ground shielding around the SX1262 to improve RF stability and reduce interference.
- Ground Structure Redesign: Adopted a unified ground plane to optimize return paths and enhance anti-interference performance.
- LoRa Pin Layout Optimization: Adjusted GPIO33 and GPIO34 routing to reduce layer crossover and minimize signal interference near the LoRa driver pins.
- Power Layout Optimization: Improved power trace routing and minimized adjacent-layer crossover to enhance system stability.
- Header Footprint Update: Reduced the package size of the last four header pins and updated the PCB footprint to improve manufacturability.
- Display Protection: Equipped with a dedicated plastic bracket to provide additional mechanical protection for the screen during operation.
- Solar Interface Added: Newly added solar power interface to support sustainable outdoor operation and extended battery life.

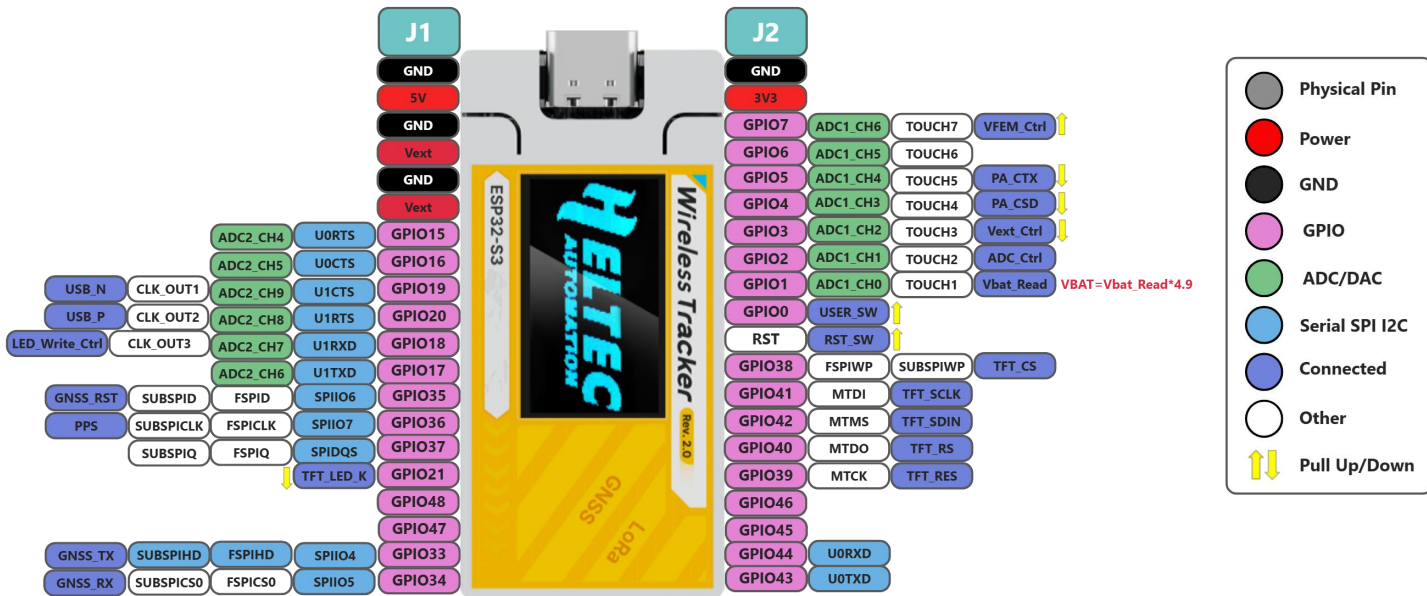
### 1.3 Product Features

- ✧ ESP32-S3FN8+SX1262+UC6580 Chipset, supports Wi-Fi, LoRa, Bluetooth, GNSS.
- ✧ High-power version with LoRa transmission power increased to  $28\pm 1\text{dBm}$ .
- ✧ Low power design of dual-frequency multi-system based on 22nm technology.
- ✧ Supports L1, supports GPS, GLONASS, BDS, Galileo, NAVIC, QZSS multi-system joint positioning.<sup>1</sup>
- ✧ Type-C USB interface with a complete voltage regulator, ESD protection, short circuit protection, RF shielding, and other protection measures.
- ✧ Onboard SH1.25-2 lithium battery and solar interfaces with integrated management for charging, overcharge protection, power monitoring, and automatic USB/battery switching.
- ✧ Onboard Wi-Fi, Bluetooth dedicated 2.4GHz metal spring antenna, reserved IPEX (U.FL) interface for LoRa and GNSS use.
- ✧ Onboard 0.96-inch  $80 \times 160$  RGB TFT-LCD for displaying debugging, battery status, and more, equipped with a dedicated plastic bracket for added protection.
- ✧ The GNSS active antenna is enhanced with an upgraded low-noise amplifier (LNA), providing stronger signal reception and improved positioning accuracy.

<sup>1</sup> See the [GNSS module manual](#) for details on supported projects.

## 2. Pin Definition

### 2.1 Pin Assignment



HT-Tracker\_V2 Pin map



## 2.2 Pin Interface

### 2.2.1 Header J1

Table 2-2-1: Pin description

NO.	NAME	TYPE	FUNCTION
1	GND	P	Ground
2	5V	P	Power Supply <b>5V</b>
3	GND	P	Ground
4	Vext	P	Power supply for built-in TFT and GNSS, <b>3.3V</b>
5	GND	P	Ground
6	Vext	P	Power supply for built-in TFT and GNSS, <b>3.3V</b>
7	GPIO15	I/O	U0RTS, ADC2_CH4, XTAL_32K_P
8	GPIO16	I/O	U0CTS, ADC2_CH5, XTAL_32K_N
9	GPIO19	I/O	CLK_OUT2, ADC2_CH8, U1RTS, USB_N
10	GPIO20	I/O	CLK_OUT1, ADC2_CH9, U1CTS, USB_P
11	GPIO18	I/O	U1RXD, ADC2_CH7, CLK_OUT3, LED_Write_Ctrl
12	GPIO17	I/O	U1TXD, ADC2_CH6
13	GPIO35	I/O	SPI06, FSPID, SUBSPID, GNSS_RST
14	GPIO36	I/O	SPI07, FSPICLK, SUBSPICLK, PPS
15	GPIO37	I/O	SPIDQS, FSPIQ, SUBSPIQ
16	GPIO21	I/O	TFT_LED_K
17	GPIO48	I/O	XTAL_P
18	GPIO47	I/O	XTAL_N
19	GPIO33	I/O	SPII04, FSPIHD, SUBSPIHD, GNSS_TX
20	GPIO34	I/O	SPI05, FSPICS0, SUBSPICS0, GNSS_RX

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## 2.2.2 Header J2

Table 2-2-2: Pin description

NO.	NAME	TYPE	FUNCTION
1	GND	P	Ground
2	3V3	P	Output <b>3.3V</b>
3	GPIO7	I/O	ADC1_CH6, TOUCH7
4	GPIO6	I/O	ADC1_CH5, TOUCH6
5	GPIO5	I/O	ADC1_CH4, TOUCH5
6	GPIO4	I/O	ADC1_CH3, TOUCH4, <b>PA_CSD</b>
7	GPIO3	I/O	ADC1_CH2, TOUCH3, <b>Vext_Ctrl</b>
8	GPIO2	I/O	ADC1_CH1, TOUCH2, <b>ADC_Ctrl</b>
9	GPIO1	I/O	ADC1_CH0, TOUCH1, <b>Vbat_Read</b>
10	GPIO0	I/O	USER_SW
11	RST	I/O	RST_SW
12	GPIO38	I/O	FSPIWP, SUBSPIWP, <b>TFT_CS</b>
13	GPIO41	I/O	MTDI, <b>TFT_SCLK</b>
14	GPIO42	I/O	MTMS, <b>TFT_SDIN</b>
15	GPIO40	I/O	MTMS, <b>TFT_RS</b>
16	GPIO39	I/O	MTMS, <b>TFT_RES</b>
17	GPIO46	I/O	<b>PA_CPS</b>
18	GPIO45	I/O	
19	GPIO44	I/O	UORXD
20	GPIO43	I/O	UOTXD

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## 3. Specifications

### 3.1 General Specifications

Table 3-1: General specifications

Parameters	Description
<b>MCU</b>	ESP32-S3FN8 (Xtensa® 32-bit LX7 dual-core processor)
<b>LoRa Chip</b>	SX1262
<b>GNSS Chip</b>	UC6580
<b>Charging IC</b>	CN3165
<b>Frequency</b>	863~928 MHz
<b>Max TX Power</b>	28 ± 1dBm
<b>Receiving sensitivity</b>	-135 dBm
<b>Wi-Fi</b>	IEEE 802.11 b/g/n
<b>Bluetooth</b>	Bluetooth 5.0, Bluetooth LE, Bluetooth Mesh
<b>Interface</b>	USB Type-C; 1.25 mm Lithium Battery Connector; 1.25 mm Solar Panel Connector; LoRa Antenna (IPEX / U.FL); GNSS Antenna (IPEX / U.FL)
<b>Battery</b>	Supports 3.7V Lithium Battery and Solar Panel
<b>Operating temperature</b>	-20 ~ 70°C
<b>Dimensions</b>	53.00mm* 25.40mm* 9.37mm

### 3.2 Power Supply

The Lithium battery can be charged when USB or 5V is not connected. Only one power source should be used at a time.

Table 3-2: Power Supply

Power Supply Mode	Minimum	Typical	Maximum	Unit
USB Type-C( $\geq 500\text{mA}$ )	4.7	5	6	V
Lithium Battery( $\geq 250\text{ma}$ )	3.3	3.7	4.2	V
5V Pin( $\geq 500\text{ma}$ )	4.7	5	6	V
3V3 Pin( $\geq 150\text{ma}$ )	2.7	3.3	3.5	V

### 3.3 Power Output

Table 3-3: Power Output

Output Pin	Current	Unit
3v3 Pin	500	mA
5V Pin (USB Powered Only)	500	mA
Vext Pin	350	mA

### 3.4 Power Characteristics

Table 3-4: Power Characteristics

Mode	USB power	VBAT /battery powered	Unit
Wi-Fi Scan	79	75	mA
Wi-Fi AP	140	139	mA
BT	66	64	mA
GNSS	130	127	mA
Sleep	1.2mA	21µA	

### 3.5 LoRa Receiving Sensitivity

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

Table 3-5: Receiving Sensitivity

Signal bandwidth/[kHz]	Spreading factor	Sensitivity/[dBm]
125	SF12	-135
125	SF10	-130
125	SF7	-124

### 3.6 Operation Frequencies

Wireless Tracker supports LoRaWAN frequency channels and models corresponding table.

Table3-6: Operation Frequencies

Region	Frequency (MHz)	Model
<b>IN868</b>	865~867	Wireless Tracker-HF
<b>EU868</b>	863~870	Wireless Tracker-HF
<b>US915</b>	902~928	Wireless Tracker-HF
<b>AU915</b>	915~928	Wireless Tracker-HF
<b>KR920</b>	920~923	Wireless Tracker-HF
<b>AS923</b>	920~925	Wireless Tracker-HF

### 3.7 GNSS Characteristics

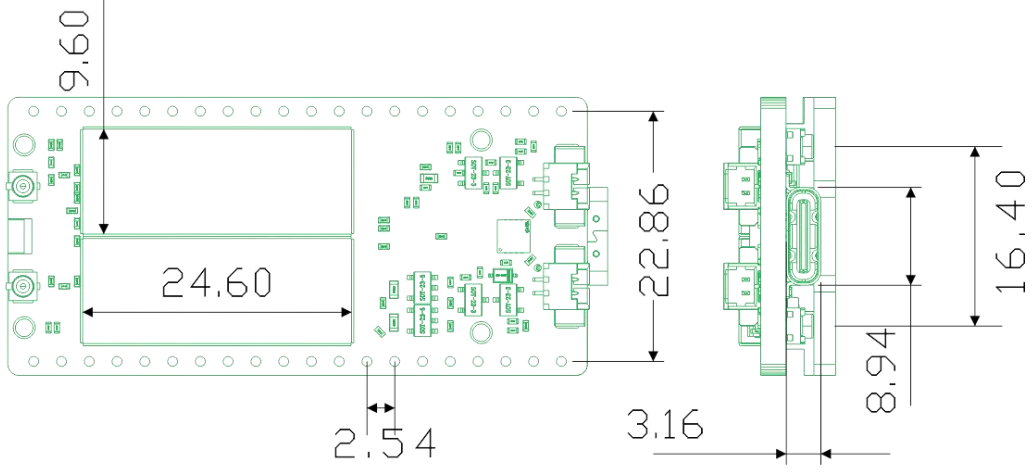
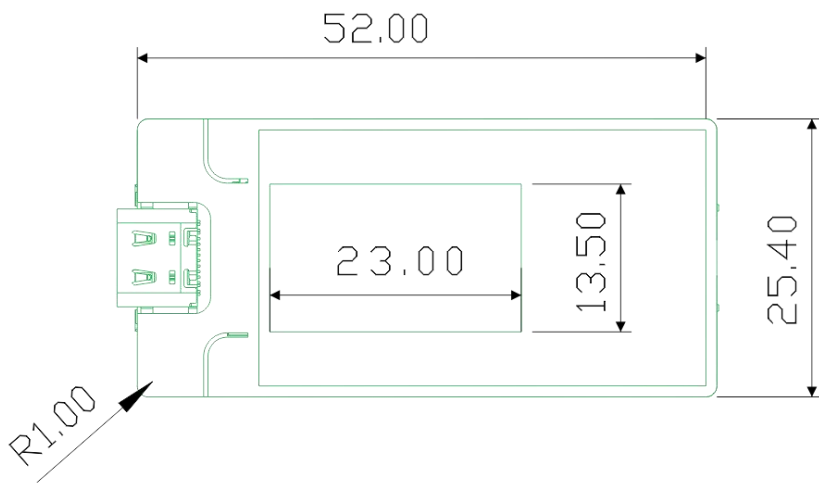
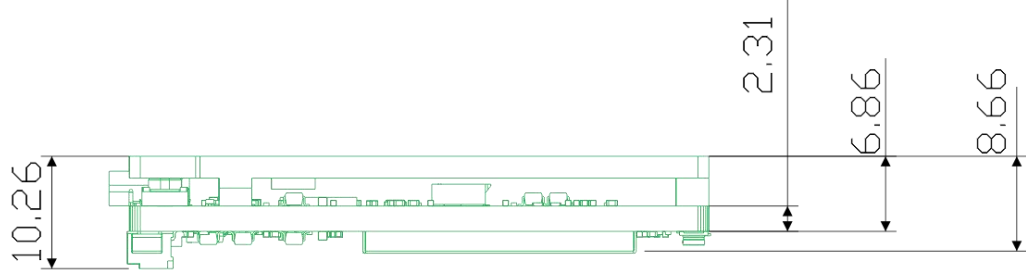
Basic Information of the GNSS Module

Table3-7: Basic information

Channel	96
Update frequency	Max 10 Hz
Data format	NMEA-0183, Unicore, RTCM 3.x
Frequency point	BDS: B2a
	GPS: L1
	GLONASS: G1
	Galileo: E1+E5a
	QZSS: L1
	SBAS: L1



# 4. Mechanical Specification (mm)



## 5. Resource

### 5.1 Relevant Resource

- [Heltec ESP32 Framework](#)
- [Heltec LoRaWAN test server based on SnapEmu](#)
- [User Guide](#)
- [GNSS Datasheet](#)
- [Display Datasheet](#)

### 5.2 Contact Information

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