



MeshSolar

*Solar-Powered and BMS,
with LoRa/Bluetooth Connectivity*



Document Version

Version	Time	Description	Remark
Rev. 1.0.0	2025-6-16	Preliminary version	Richard

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1 Description

1.1 Overview

[MeshSolar](#) is an integrated power management and communication solution designed for outdoor low-power devices, consisting of a BMS(Battery Management System) Board and HT-n5262M(Main Control and Communication Module). The system features solar **MPPT charging**, multi-protocol fast charging (supporting USB PD3.0 and 18–24V DC input), intelligent **battery management** (compatible with 1–4 cells battery, with overcharge/over-discharge/short-circuit/over-temperature protection and balanced charging), and dual-mode **Bluetooth+LoRa** wireless communication (LoRa range up to 10 km with 21 ± 1 dBm transmit power). With its low-power design, extensive hardware expansion interfaces (supporting displays, GPS, and general-purpose I/O), MeshSolar is ideal for high-power or long-term stable power supply applications such as solar-powered systems, remote monitoring, and Meshtastic ecosystem.

MeshSolar is categorized into the following variants based on supported battery types and LoRa frequency bands:

HT-n5262S Hardware Version Information

Module	Frequency	Battery
HT-n5262S-I-LF	470~510MHz	Li-ion
HT-n5262S-F-LF	470~510MHz	Li-ion
HT-n5262S-I-HF	863~928MHz	LiFePO ₄
HT-n5262S-F-HF	863~928MHz	LiFePO ₄



1.2 Features

- ❏ Supports 1-4 battery configurations (single-cell or battery packs)
- ❏ Features comprehensive protection including overcharge/over-discharge/short-circuit/over-temperature safeguards
- ❏ Enables balanced charging for optimal battery performance
- ❏ Supports both Li-ion and LiFePO4 batteries (requires different hardware versions).
- ❏ Multi-mode charging options: 18~24V Solar MPPT charging, USB PD3.0 fast charging, 18~24V external DC charging
- ❏ Web-based configuration for charging/discharging parameters
- ❏ Continuous power monitoring via software interface
- ❏ LED battery level indication
- ❏ One-touch output shutdown function
- ❏ Dual-mode wireless communication: Bluetooth connectivity, LoRa long-range communication (up to 10km range at $21\pm 1\text{dBm}$)
- ❏ Expansion interfaces for displays, GPS, and general-purpose I/O
- ❏ Supports dual wireless protocols: Bluetooth & LoRa
- ❏ Excellent low-power performance

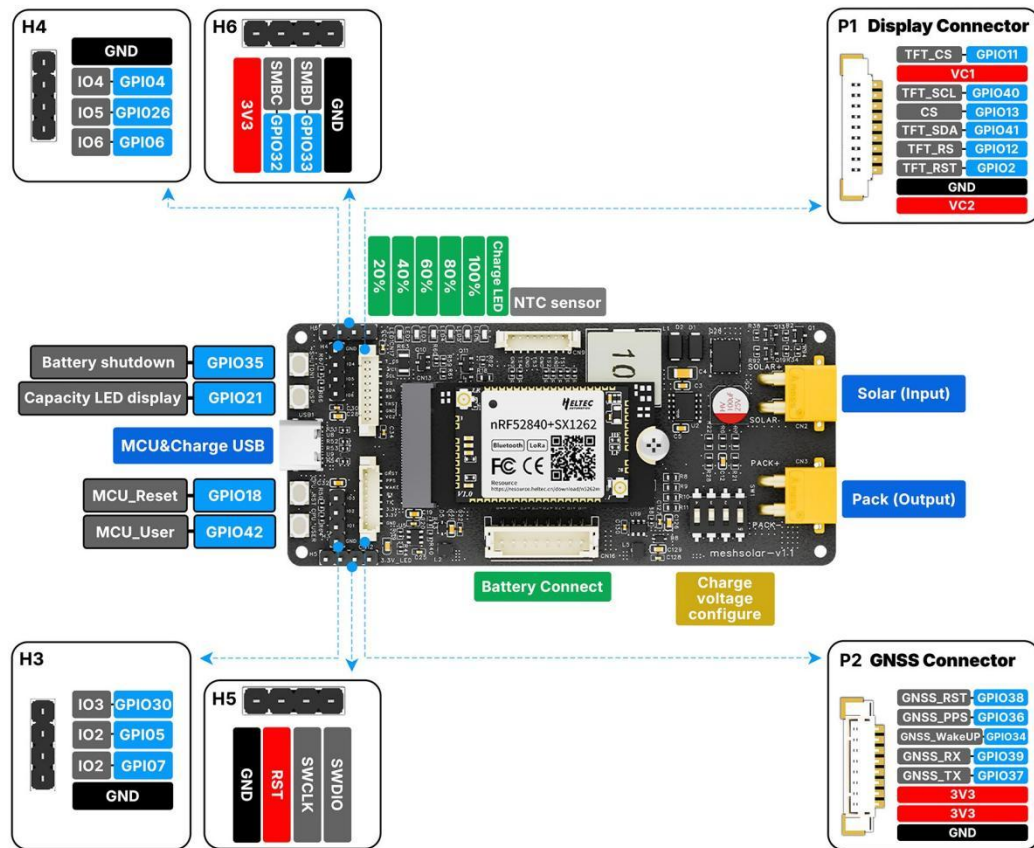
1.3 Typical Applications

- ❏ Environmental Monitoring Systems
- ❏ Smart Agriculture & Livestock Farming
- ❏ Asset Management and Tracking
- ❏ Outdoor Emergency Solutions
- ❏ Solar Street Lighting Systems
- ❏ Industrial Infrastructure Monitoring

2 Pin Definition

2.1 BMS board pins:

For more details, please refer to the schematic link: **MeshSolar Schematic**



Button

Name	Description
SHUTDN1	Battery shutdown, GPIO35
DISP	Capacity LED display, GPIO21
CPU_RST	MCU reset, GPIO18
CPU_USER	MCU user, GPIO42

H3

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Name	Description
IO3	GPIO30
IO2	GPIO5
IO1	GPIO7
GND	Ground

H4

Name	Description
GND	Ground
IO4	GPIO4
IO5	GPIO26
IO6	GPIO6

H5

Name	Description
GND	Ground
RST	MCU reset
SWCLK	SWCLK
SWDIO	SWDIO

P1

Name	Description
T_CS	TFT_CS, GPIO11
VC1	3V3
SCL	TFT_SCL, GPIO40
CS	CS, GPIO13



SDA	TFT_SDA, GPIO40
RS	TFT_RS, GPIO12
TRST	TFT_RST, GPIO2
GND	Ground
VC2	3V3

P2

Name	Description
GRST	GNSS_RST, GPIO38
PPS	GNSS_PPS, GPIO36
WAKI	GNSS_Wake_Up, GPIO34
RX	GNSS_RX, GPIO39
TX	GNSS_TX, GPIO37
3.3V	3V3
3.3V	3V3
GND	Ground

2.2 HT-N5262M Pin Description

[HT-N5162M Pin Map](#)

[HT-N5262M Schematic](#)



3 Specifications

3.1 General Specification

Table3.1: General specification

Parameters	Description
BMS chip	BQ4050, CN3795
Main Control Module	HT-n5262M(nRF52840+SX1262)
PCB Storage Condition	-30~80℃, 90%RH(No condensing)
Recommended Operating Temperature	-20~60℃(Dependent on the installed battery)
Number of Battery Cells	1-4 cells
Battery Types	Li-ion, LiFePO4 ^①
Input Voltage	18~24V(Learn More)
Battery charging current	≤1.5A
Interface	XT30 Female*2 (Solar & Pack)
	PH2.0-8P(Battery)
	MX1.25-8P(NTC)
	M.2(MCU)
	MX1.25-9P(Screen)
	MX1.25-8P(GNSS)
PD Interface	USB Type C
Dimensions	43*97*11mm

① Required hardware version varies depending on the battery type



Weight	33.30g(includes main control module, excludes accessories)
MCU Supply Current	500mA MAX.

3.2 Main Control Module Specification

Table3.2: Main Control Module specification

Parameters	Description
MCU	nRF52840 (BLE)
LoRa Chip	SX1262 (LoRa)
Memory	1M ROM; 256kB SRAM
Bluetooth	Bluetooth 5, Bluetooth mesh, BLE.
TX Power	21±1dBm
Operating temperature	-40~85℃
Operating Humidity	90%(No condensing)
Power Supply	3.3V
Power Consumption	Table3.3
Hardware Resource	3*SPI, 2*I2C, 2*UART, 4*PWM, QPSI, I2S, PDM, QDEC, Etc.
Interface	2*IPEX1.0(antenna), M.2
Dimensions	30*20*3.2 mm



4 Electrical Characteristics

4.1 Battery Parameters

Table4.1: Battery parameters

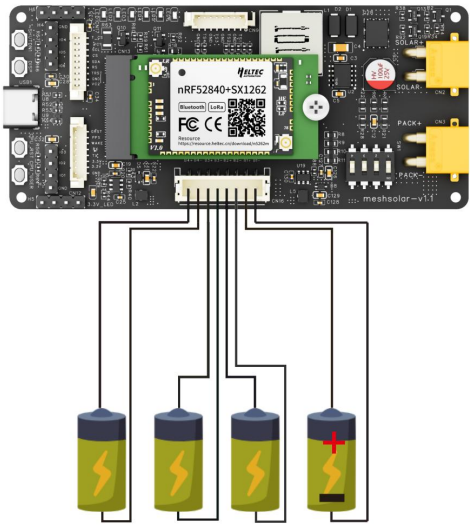
Parameter	Specification	Remarks
Number of Cells	1~4 cells	Configurable(Soldering required)
Battery Type	Li-ion, LiFePO4	Required hardware version varies depending on the battery type.
Charging Voltage	Li-ion: 4.2V/Cell LiFePO4: 3.6V/Cell	Depends on battery type
Charging Method	Constant Current (CC) Constant Voltage (CV)	CC followed by CV
Charge Current	Max 1.5A	
Discharge Current	Max 1.75A	

4.2 Battery Connection

Battery wiring:

The batteries are internally connected in series on the board. **Do not** perform any series or parallel connections externally. Instead, connect them separately and directly to their corresponding battery ports.

Interface: PH2.0-8P



Battery wiring

4.3 Voltage Input

The Solar/DC input supports both solar panel and DC power sources, with a requirement that the **Voc**(open-circuit voltage) must exceed 18V not exceed 24V. The USB-C port only enables charging functionality when it detects a PD3.0 protocol with a 20V input voltage; a 5V input is solely for powering the MCU.

Table4.3: Changing Current

Parameter	Interface	Voc Min	Vmp	Voc Max	Unit
Solar(Voc)	XT30-2P	18	18	24	V
DC	XT30-2P	18		24	V
PD3.0^②	USB-C		20		V
MCU	USB-C	4.5	5	5.5	V

4.4 Charging Current

Table4.4: Changing Current

Method	Current	Description
Solar(Voc)@18V/10W	0.55A	Depends on the solar panel's power and voltage. The minimum is >0, while the maximum = $P_{\text{solar}} / V_{\text{solar}}$
DC@18V	1.5A	Constant-current charging at 1.5A, tapering down when battery voltage reaches 4.2V(Li-ion)/3.6V(LiFePO4)
USB-C(PD3.0)	1.5A	Constant-current charging at 1.5A, tapering down when battery voltage reaches

② The USB-C port will only charge the battery when it detects the PD 3.0 protocol and the voltage reaches 20V.



		4.2V(Li-ion)/3.6V(LiFePO4)
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4.5 Pack Output

The battery pack's output voltage is equal to the sum of the series-connected batteries' voltages.

Table4.5: Pack Output

Number of Batteries	Min	Max(Li-ion)	Max(LiFePO4)	Unit
1	2.5	4.2	3.6	V
2	5	8.4	7.2	
3	7.5	12.6	10.8	
4	10	16.8	14.4	

4.6 Protection and Balancing

Some "Configurable" parameters can be configured via the software or web page provided by Heltec. Please contact your battery supplier to avoid exceeding relevant values and causing permanent damage to your battery.

Table4.6: Protection and Balancing

Function	Value	Description
Balancing Voltage	4.2V(Li-ion) 3.6V(LiFePO ₄)	Single cell reaches 4.2/3.6V
Balancing Mode		Resistive balancing
Balancing Current	100mA	Passive balancing
Overcharge	4.3V(Li-ion) 3.75V(LiFePO ₄)	Stop charging, allow discharge, recovery threshold: 4.1/3.6V
Over-discharge	2.5V	Stop discharge, allow charging, recovery threshold: 2.6V
Overcurrent	1.75A	Auto-recovery after 10S disconnection
	1.75A	Auto-recovery after 10S disconnection



Charging Over-Temperature	45°C	Charge termination (Configurable)
Charging Under-Temperature	0°C	Charge termination (Configurable)
Discharging Over-Temperature	60°C	Discharge termination (Configurable)
Discharging Under-Temperature	0°C	Discharge termination (Configurable)
Undervoltage	2.5V	Discharge termination (Configurable)

5 RF Characteristics

5.1 RF module power consumption

The test data comes from the standalone test results of the HT-N5262M, using the sample code from the official [Heltec nRF5240 library](#).

Table5.1: Transmit power

Mode	Condition	470MHz	868MHz	915MHz
LoRa_TX	5dBm	63mA	89mA	97mA
	10dBm	85mA	119mA	130mA
	15dBm	110mA	145mA	156mA
	20dBm	128mA	164mA	166mA
BT	UART	12mA		
	Scan	4mA		
Sleep		8uA		

5.2 LoRa Transmit Power

Table5.2: Transmit power



Operating frequency band	Maximum power value/[dBm]
470~510	21 ± 1
863~870	21 ± 1
902~928	21 ± 1

5.3 LoRa Receiving Sensitivity

The following table gives typically sensitivity level.

Table5.3: Receiving sensitivity

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

5.4 Operation Frequencies

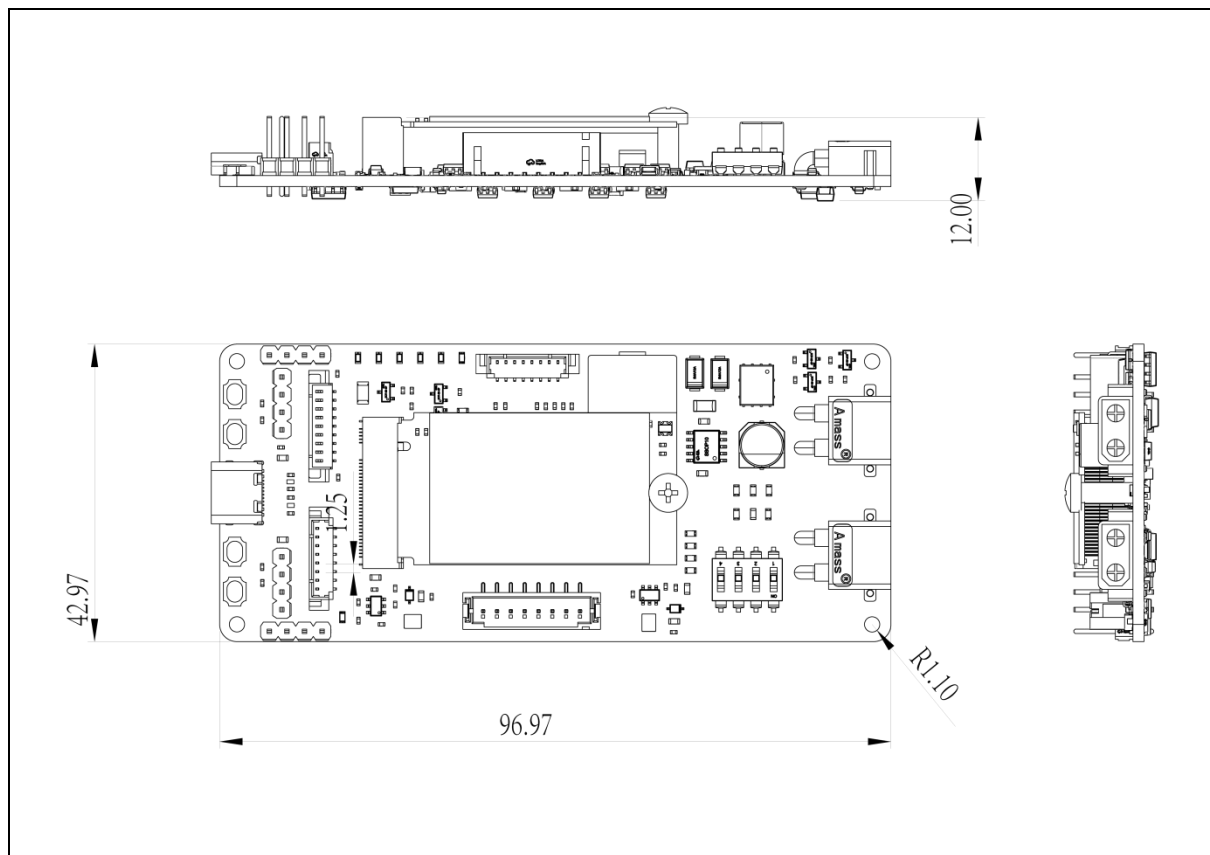
HT-N5262M supports LoRaWAN frequency channels and models corresponding table.

Table5.4: Operation Frequencies

Region	Frequency (MHz)	Model
CN470	470~510	HT-n5262S-LF
IN868	865~867	HT-n5262S-HF
EU868	863~870	HT-n5262S-HF
US915	902~928	HT-n5262S-HF
AU915	915~928	HT-n5262S-HF
KR920	920~923	HT-n5262S-HF
AS923	920~925	HT-n5262S-HF



6 Physical Dimensions



For more model details, please refer to this link: [listing_directory](#)
[/download/MeshSolar/demension](#)



7 Resource

-  [User Manual](#)
-  [MeshSolar BMS Setup Webpage](#)
-  [HT-n5262M Schematic](#)
-  [Resource Station](#)
-  [Heltec nRF52840 Framework](#)

8 Heltec Contact Information

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