上海恩阶电子科技有限公司
Shanghai **energy Electronic Technology Co., Ltd.**

Specification

Product Name: 12V150A Lithium Battery Management System

Product Model: 12150-1203-1CA

Configuration	Parameter
Single voltage platform	3.2V
PCS	4S
Capacity	150AH
External switch	N/A
Current limiting	N/A
LCD	N/A
Storage	ON
Heating	ON
Precharge	ON
Communication	RS485、CAN

Signature and seal of supplier	Signature and seal of client

Executed By	Liang xu	Checked By	Wei Qi	Approved By	Huang Bin
Date		Date		Date	

Version	Date	Editor	Version Revision Note
V1.0	2023.02.22	Liang xu	Create draft
V1.1	2023.03.22	Wang Jixin	Add series and parallel specifications
V.1.2	2023.05.07	Wang Tao	Interface definition modification
V.1.4	2023.10.30	Zhou Jun	Modify Picture

Content

1、Application scope

This product is a comprehensive 4-section single pack lithium-ion battery management system with protection and recovery functions such as individual overvoltage/undervoltage, total voltage undervoltage/overvoltage, charging/discharging overcurrent, high temperature, low temperature, and short circuit. Accurate measurement of SOC during charging and discharging processes, and statistical analysis of SOH health status. Realize voltage balance during the charging process. Data communication is carried out with the host through RS485 communication, and parameter configuration and data monitoring are carried out through human-machine interaction with the upper computer software.

150A parallel specification: 12V/150A (MOS withstand voltage 40V, not supporting series connection), can support 8 units (using dialed address, if automatic address allocation is used, it can support more than 8 units in parallel) or single machine operation.

150A supports series-parallel specifications: 12V/150A (MOS withstand voltage 100V), can support 8 units in parallel (using dial address, if automatic address allocation is used, it can support more than 8 units in parallel) or single machine operation, can support 4 units in series.

Note: It is not possible to connect both in series and parallel at the same time. The baud rate of the upper computer is 9600

2、Normative citation documents

The following documents are essential for the application of this document. The date-only version of the reference file is applicable to this file. The latest version of any undated reference file (including all modifications) applies to this file.

GB/T 191	Marking of Packaging Storage and Transportation
GB/T 2408-2008	plastic Determination of combustion properties Horizontal and vertical test
YD/T 983-2013	Electromagnetic Compatibility Limit and Measurement Method for Communication Power Equipment
GB/T 17626.5-2008	Electromagnetic compatibility test and surge (shock) immunity test for measuring technology
GB/T 17626.2-2006	Electromagnetic Compatibility Test and Measurement Technology
YD/T 2344.1—2011	Lithium iron phosphate battery pack for communications – Part 1: integrated battery pack
YD/T 2344.2—2015	Lithium iron phosphate battery pack for communications – Part 2: discrete batteries

YD/T 1363.3   Communications Bureau (Station) Power, Air Conditioning and
                     Environmental Centralized Monitoring Management System Part
                     3:Front-end Intelligent Equipment Protocol
YD/T 1058-2015   High Frequency Switching Power Supply System for Communication

3、Functional characteristics

3.1、Cell and battery voltage detection

Real time collection and monitoring of the voltage of four single group battery cells to achieve overvoltage and undervoltage alarm and protection of battery cells. The detection accuracy of individual voltage is ≤ ± 20mV under conditions of -20~70 ℃, and the detection accuracy of PACK voltage is ≤ ± 0.5% under conditions of -20~55 ℃.

Alarm and protection parameter settings can be changed through the upper computer.

3.2、Cell, environment, and power temperature detection

Through NTC, the temperature detection accuracy of 2 cell temperatures, 1 ambient temperature, and 1 power temperature is ≤ ± 2 ℃ under the condition of -20~70 ℃.

Alarm and protection parameter settings can be changed through the upper computer.

3.3、Battery charging and discharging current detection

By connecting the current detection resistor in the main charging and discharging circuit, the charging and discharging current of the battery pack is collected and monitored in real-time to achieve charging and discharging current alarm and protection. The current accuracy is within -20~70 ℃, with an error of ≤ ± 2% below 10A and ≤ ± 1% above 10A.

Alarm and protection parameter settings can be changed through the upper computer.

3.4、Short circuit protection function

Has the function of detecting and protecting the output short circuit.

3.5、Battery capacity and cycle times

Real-time calculation of battery residual capacity, complete the learning of total charging and discharging capacity at one time, SOC estimation accuracy is better than ±5%. It has the function of counting the number of charge and discharge cycles. When the accumulative discharge capacity of the battery pack reaches 80% of the set full capacity, the number of cycles will increase once.

Alarm, protection parameter setting can be changed by the upper computer.

3.6、Charge, Discharge MOSFET switch

Low internal resistance, high current, high capacitance for backup power applications load startup, zero switching, double charging voltage optimization design.

3.7、Balance of intelligent single cell

Unbalanced cells can be balanced when charging or standby, which can effectively improve the service time and cycle life of the battery.

Equalizing open voltage and equalizing differential voltage can be set by upper computer.

3.8、Dormant function

BMS has manual and automatic sleep functions;

Automatic sleep function: The battery will automatically sleep for 48 hours when there is no external charging or discharging. When the battery pack is over-discharged, the communication is maintained for 1 minute, and the BMS enters the dormant state.

Remote sleep function: When using the upper computer and communication is normal, click the "shutdown" button to enter sleep without a charger connected for charging.

Button shutdown function: When working, turn off the button switch, execute shutdown without charging, and there is no communication activation function after shutdown. 。

The standby and hibernation can be set through the host computer.

3.9、RS485 communication interface

PC or intelligent front-end can achieve battery data monitoring, operation control, and parameter setting through RS485 communication telemetry, remote signaling, remote adjustment, remote control, and other commands.

3.10、Historical data records are stored and read

Historical data is stored based on the state transition of the BMS; Real time storage of measurement data for various alarms, protection triggers, and elimination; The storage of measurement data for a certain period of time can be achieved by setting the recording start time, recording end time, and recording interval time. At present, it can store no less than 500 historical data records, which can be read from the upper computer and saved as an Excel file to the computer.

3.11、Battery Management Parameters

Various battery management parameters such as individual battery overvoltage/undervoltage, total battery voltage overvoltage/undervoltage, charging/discharging overcurrent, cell high/low temperature, environmental high/low temperature, balancing strategy, battery capacity, etc. can be reset through the upper computer.

3.12、Battery management functions

Voltage related functions, temperature related functions, current related functions (Note: The output short-circuit function does not support the shutdown setting), capacity related functions can be turned on or off through the upper computer setting.

3.13、Precharge function

The pre charging function can be activated immediately upon startup or when the discharge tube is turned on. The pre charging time can be set (1s to 7s) to cope with various

capacitive load scenarios and avoid BMS output short circuit protection.

3.14、Upper computer

The upper computer uses BatteryMonitor V2.1.8 or higher, which can switch between Chinese and English (loading the English protocol when switching between English), and load the protocol (Chinese file name: 1201-04S-V13_ADDR, English protocol name: 1201-04S-V13_ADDR-EN). Please refer to the operating instructions in the upper computer file for instructions.

3.15、Program upgrades

The main program version can be upgraded through firmware updates in the upper computer software.

The upper computer is connected to the BMS through RS485.

4、.Functional framework
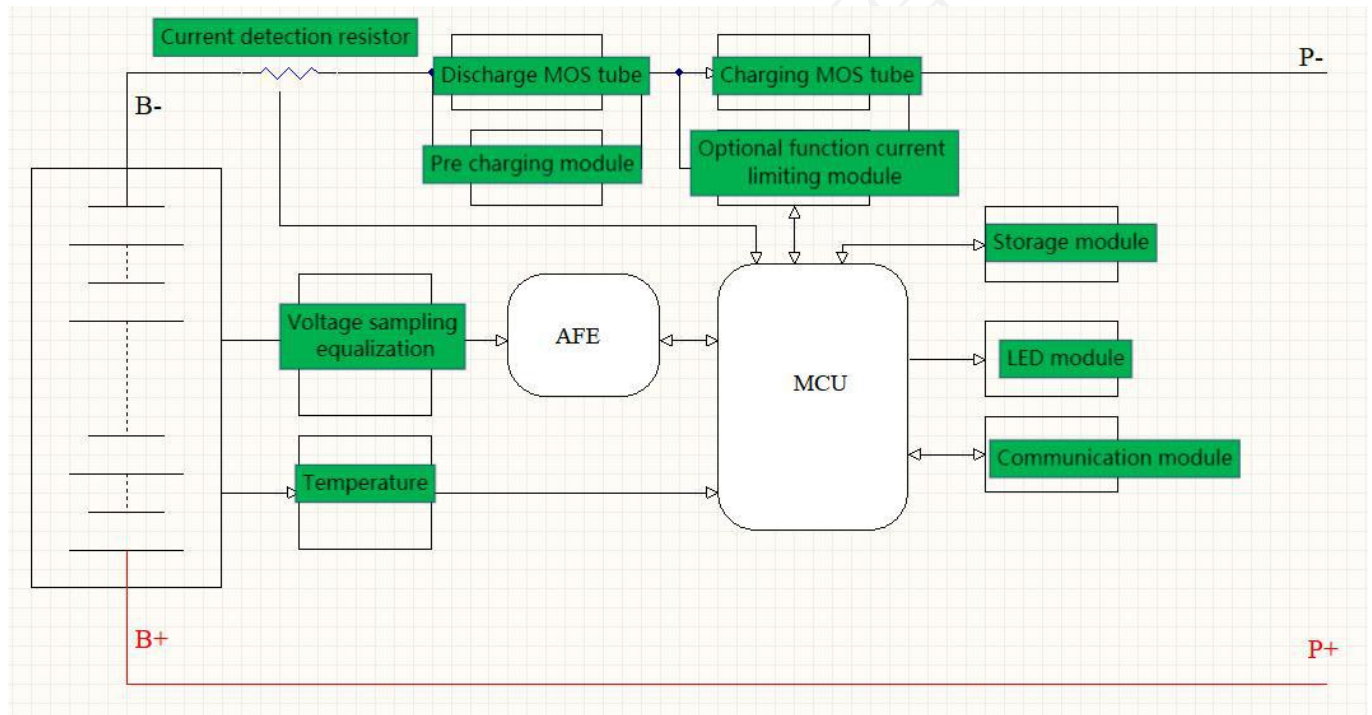
5、Electrical characteristics

Project	Min	Max	Type	Unit
Normal operating voltage	8	15	12.8	V
Normal charging voltage			11.5	V
Operating temperature range	-20	70	25	℃
Storage temperature	-40	85	25	℃
Use environment humidity	10	85	/	%
Continuous charging current	/	150	150	A

Continuous discharge current	/	160	150	A
Discharge output resistance	<2			mΩ
Normal operating power	≤50			mA
Dormancy power consumption		1	0	uA

6、Basic parameters

6.1、Basic parameter settings

Function name	Function settings	Item list	Set value	Setting range
Single voltage alarm	Close	Single voltage alarm	3500mV	Can be set
		High voltage recovery of monomer	3400mV	Can be set
	Open	Single low voltage alarm	2900mV	Can be set
		Low voltage recovery of monomer	3100mV	Can be set
Monomer overvoltage protection	Open	Monomer voltage protection	3650mV	Can be set
		Recovery of monomeric overvoltage	3400mV	Can be set
		Overvoltage recovery conditions	1.monomer voltage drop overvoltage recovery point 2.residual capacity below intermittent recharge capacity 96% **Note: Two conditions must be met to recover**	
			It is detected that the battery has a discharge current> 3A	
Monomer undervoltage protection	Open	Under voltage protection voltage	2800mV	Can be set
		Under voltage recovery voltage	3100mV	Can be set

		Single under voltage shutdown	Shut down after undervoltage protection and maintain 1 minute communication	
		Under voltage recovery conditions	Charging current detected ≥1 A	
Battery total voltage alarm	Close	Total voltage high voltage alarm	14.0V	Can be set
		Total voltage recovery	13.5V	Can be set
	Open	Total voltage Low voltage Alarm	11.8V	Can be set
		Total voltage and low voltage recovery	12.5V	Can be set
Total voltage overvoltage protection	Open	Total voltage overvoltage protection	14.5V	Can be set
		Total voltage relief	13.5V	Can be set
		Overvoltage recovery conditions	1.monomer voltage drop overvoltage recovery point 2.residual capacity below intermittent recharge capacity 96% **Note: Two conditions must be met to recover**	
			Discharging current detected ≥3 A	
Total voltage undervoltage protection	Open	Total voltage undervoltage protection	11.4V	Can be set
		Total undervoltage recovery	12.5V	Can be set
		Total undervoltage shutdown	Shut down after undervoltage protection and maintain 1 minute communication	

		Undervoltage recovery conditions	Charging current detected ≥1A	
Cell temperature forbidden to charge	Open	Charge High Temperature Alarm	50°C	Can be set
		Charging High Temperature Recovery	47°C	Can be set
		Overcharge protection	60°C	Can be set
		Overcharge recovery	50°C	Can be set
		Charge Low Temperature Alarm	2°C	Can be set
		Low temperature charging recovery	5°C	Can be set
		Undercharge protection	-10°C	Can be set
		Recovery of undercharging	0°C	Can be set
Cell temperature forbidden to discharge	Open	High Temperature Discharge Alarm	52°C	Can be set
		High temperature discharge recovery	47°C	Can be set
		Discharge overtemperature protection	60°C	Can be set
		Discharge overtemperature recovery	50°C	Can be set

		Low temperature discharge alarm	-10℃	Can be set
		Low temperature discharge recovery	3℃	Can be set
		Discharge undertemperature protection	-20℃	Can be set
		Discharge undertemperature recovery	-10℃	Can be set
Environmental temperature protection	Open	Environmental High Temperature Alarm	50℃	Can be set
		Environmental High Temperature Recovery	47℃	Can be set
		Environmental Over-temperature Protection	60℃	Can be set
		Environmental Overheating Recovery	55℃	Can be set
		Environmental Low Temperature Warning	-10℃	Can be set
		Environmental Low Temperature Recovery	3℃	Can be set
		Environmental under-temperature protection	-20℃	Can be set
		Environmental undertemperature recovery	-10℃	Can be set

Power temperature protection	Open	Power High Temperature Alarm	80°C	Can be set
		Power High Temperature Recovery	75°C	Can be set
		Overpower protection	100°C	Can be set
		Power overtemperature recovery	85°C	Can be set
Charging Current Limit	Open	Charging overcurrent alarm	130A	Can be set
		Charging overcurrent recovery	127A	Can be set
Charging Overcurrent Protection	Open	Charging Overcurrent Protection	160A	Can be set
		Charge Overcurrent Delay	10S	Can be set
		Overcurrent recovery conditions	Discharge recovered immediately or automatically after 60 S	
Effective charging current	Charge into current		300mA	
	Charge Exit Current		250mA	
Discharge overcurrent alarm	Open	Discharge Overflow Warning	-155A	Can be set
		Discharge overcurrent recovery	-153A	Can be set

Discharge overcurrent protection	Open	Discharge over-current protection	-160A	Can be set
		Discharge Overcurrent Delay	10S	Can be set
		Overcurrent recovery conditions	Charge immediately, or after 60 S automatically	
Transient overcurrent protection	Open	Transient Overcurrent Protection	-200A	Can be set
		Transient Overcurrent Delay	100mS	Can be set
		Transient Overcurrent Recovery	Charge immediately, or after 60 S automatically	
	Close	Transient Overcurrent Lock	Continuous secondary overcurrent, exceeding the number of overcurrent locks	
		Overcurrent locking times	5 times	
		Transient lockout	Connect charger	
Short Circuit Protection	Open (Close setting is currently not supported)	Short circuit protection current and delay	Write program (**Note: Cannot be set**)	
		Recovery of short circuit protection	Charge immediately, or after 60 S automatically	
	Open	Short circuit protection lock	Continuous output short circuit, over-current lock times	
		Short circuit locking times	5 times	
		Short circuit lock release	Connect charger	
Effective		Discharge into current	-200mA	

discharge current	Discharge withdrawal current	-150mA	
Cell equalization function	Open	Standby balance	Uncharged/discharge state open equilibrium	
		Standby equalization time	10hour	Can be set
	Open	Charge Balance	Open equalization in charging state and floating state	
	On voltage condition	Balanced on voltage	3400mV	Can be set
		Equilibrium Open voltage	30mV	
		Equilibrium end differential voltage	20mV	
	Open	Equilibrium temperature limits	Close the temperature range evenly according to the (**ambient alarm temperature**)	
		Equilibrium High Temperature Ban	50℃	Can be set
		Equilibrium cryogenic prohibition	0℃	
Cell failure alarm	Open	Failure voltage Differential	500mV	Can be set
		Core recovery voltage differential	300mV	
Battery capacity setting	Battery rated capacity		150Ah	5Ah~300Ah
	Battery residual capacity		Estimation of core voltage	Can be set
	Accumulated cycle capacity		80%	Number of cycles（Set）
	Open	Residual capacity alarm	15%	

	Close	Residual capacity protection	5%	Turn off output
Precharge function	2000ms	0~5000ms	BMS boot up precharge function	
BMS Power Management	Open	Maximum standby time	48h（The charger is not present and there is no effective discharge current）	
Charging high-voltage protection	Charging high-voltage protection	18V	When the charger is above 18V, BMS protection stops charging. For charging recovery below 18V (note: parameters cannot be set)	

6.2、Basic mode of work

6.2.1、Charging mode

BMS enters charging mode when it detects that the charger is connected and the external charging voltage is greater than 11.5V, and the charging current reaches the effective charging current.

6.2.2、Discharge mode

BMS enters discharge mode when it detects a load connection and the discharge current reaches the effective discharge current.

6.2.3、Standby mode

When neither of the above two modes is met, enter standby mode.

6.2.4、Shutdown mode

Normal standby for 48 hours, battery triggered undervoltage protection, button switch shutdown, BMS enters shutdown mode.

Wake up conditions for shutdown mode: 1. Charging activation; 2. Button activation; 3. 485 communication activation.

7、Functional description

7.1、Standby state

After the BMS is properly connected and powered on, without overvoltage, undervoltage, overcurrent, short circuit, over temperature, under temperature or other protective states, press the button to turn on the BMS, and it will be in standby mode.

In BMS standby mode, the running light flashes and the battery can be charged and discharged.

7.2. Over-protection and rehabilitation

7.2.1、Monomer overcharge protection and recovery

If any section of the battery core is higher than the set value of the monomer

overcharge protection, the BMS enters the overcharge protection state, and the charging equipment can not charge the battery.

After the monomer overvoltage protection, when the maximum monomer voltage drops below the monomer overcharge recovery value and the SOC is below 96%, the overcharge protection state is relieved. can also discharge release.

7.2.2、Total voltage overcharge protection and recovery

If the battery voltage is higher than the set value of the total voltage overcharge protection, the BMS enters the overcharge protection state, and the charging equipment can not charge the battery. If the total voltage drops below the recovery value and SOC below 96%, the overcharge protection is relieved. It can also be released Except.

7.3、Protection and rehabilitation
7.3.1、Protection and restoration of monomers

If any section of the battery core is lower than the set value of the monomer over-discharge protection, the BMS enters the over-discharge protection state, and the load can not discharge the battery. Hold 1 minute communication after BMS shutdown.

After over-discharge protection occurs, charging the battery pack can release the over-discharge protection state. or press the reset button, BMS will boot to re- detect whether the battery pack voltage reaches the recovery value.

7.3.2、Total voltage protection and recovery

When the battery voltage is lower than the total voltage over-discharge protection set value, the BMS enters the over-discharge protection state, and the load can not discharge the battery. Hold 1 minute communication after BMS shutdown.

After over-discharge protection occurs, charging the battery pack can release the over-discharge protection state. or press the reset button, BMS will boot to re-detect whether the battery pack voltage reaches the recovery value.

7.4、Charging overcurrent protection and recovery

Charging overcurrent protection can be triggered when there is no charging current limiting function. when the charging current exceeds the charging overcurrent protection setting value and reaches the delay time. BMS access charging overcurrent protection, charging equipment can not charge the battery.
After charging overcurrent protection occurs, the BMS automatically delays recovery and re-detects the external charger current. discharge can also remove the charging overcurrent protection.

7.5、Discharge overcurrent protection and recovery

When the discharge current exceeds the discharge overcurrent protection setting value and reaches the delay time. BMS into the discharge overcurrent protection, the load can not charge the battery.

After the discharge overcurrent protection occurs, the BMS automatically delays

recovery and re-detects the external load current. charging can also release the discharge overcurrent protection.

Discharge over-current protection has two-stage protection to achieve transient over-current protection and discharge over-current protection recovery. Transient protection occurs when the number of times the condition will be locked, recovery must be turned off in the boot or charge release.

7.6、Temperature protection and recovery

BMS there are 4 temperature detection ports, the implementation of monitoring temperature changes to achieve protection measures.

7.6.1、Charge/discharge high temperature protection and recovery

When charging and discharging state ,2 cell NTC arbitrarily one higher than the high temperature protection set value, BMS into the high temperature protection. BMS stop charging or discharging.

If the temperature of the core is lower than the high temperature recovery value, the charge or discharge BMS resume.

7.6.2、Charge/discharge low temperature protection and recovery

When charging and discharging state ,2 cell NTC randomly one lower than the low temperature protection set value, BMS into the low temperature protection. BMS stop charging or discharging.

If the core temperature is higher than the low temperature recovery value, the charge or discharge BMS resume.

7.6.3、Ambient temperature protection, power temperature protection

When the NTC detects that the ambient temperature is higher than the ambient high temperature setting value, the BMS enters the ambient high temperature protection. The BMS stops charging and discharging.

When NTC detects that the power temperature is higher than the power protection setting value, the BMS enters the power high temperature protection. The BMS stops charging and discharging.

7.7、Balanced function

BMS should have standby and charge equalization function, the system adopts energy consumption type equalization circuit, the equalization open voltage softwareis adjustable, the equalization open condition any section is higher than the equalization open voltage and the voltage difference reaches the condition together.

When stop charging or the core voltage difference is less than the set value.

7.8、Turn on and off

Serial number	Function	Definition

| 1	Boot/boot	When the BMS is in a sleep state, the restart button switch will activate the BMS
2	Shutdown / Sleep	When the BMS is in standby or discharge mode, turn off the button switch and the BMS will be hibernated. After hibernation, the BMS will have no power consumption.

7.9、Storage functions

Storage content includes: protection and alarm and its category, protection and alarm recovery time, single battery voltage, total battery voltage, charge/discharge capacity, charge/discharge current, temperature, etc.
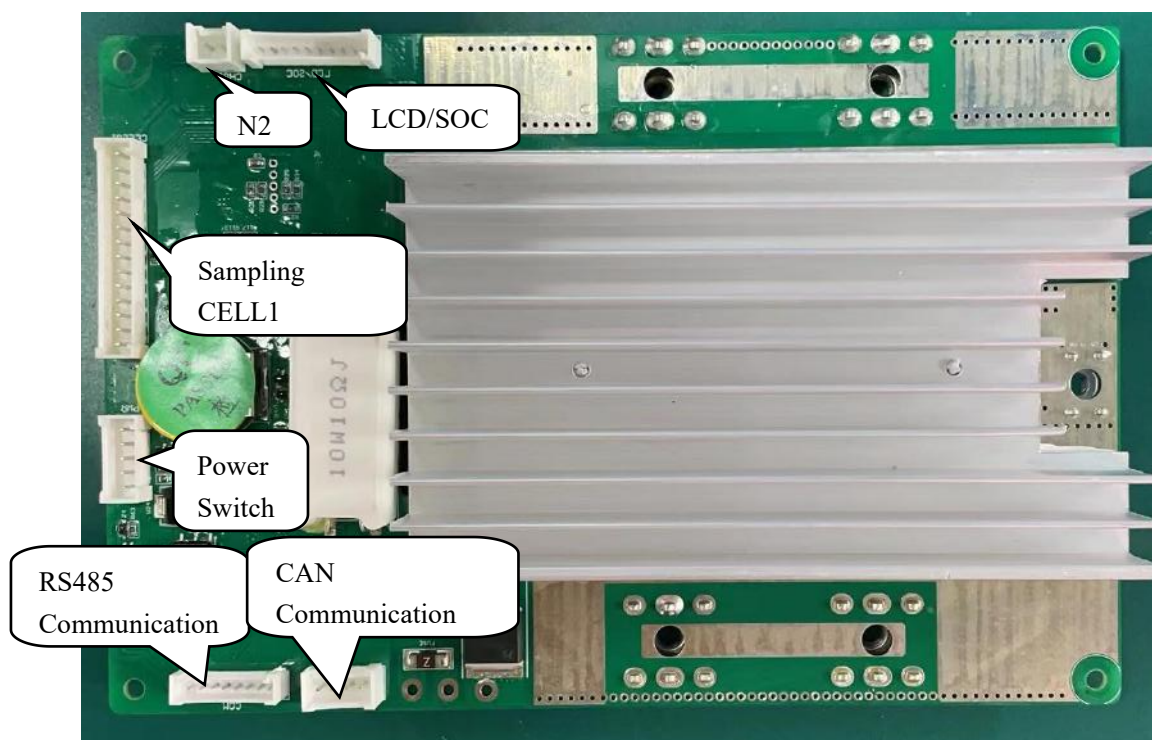
It records in year/month/day/hour/minute/second, and can also be set to record the information content within a certain period of time.

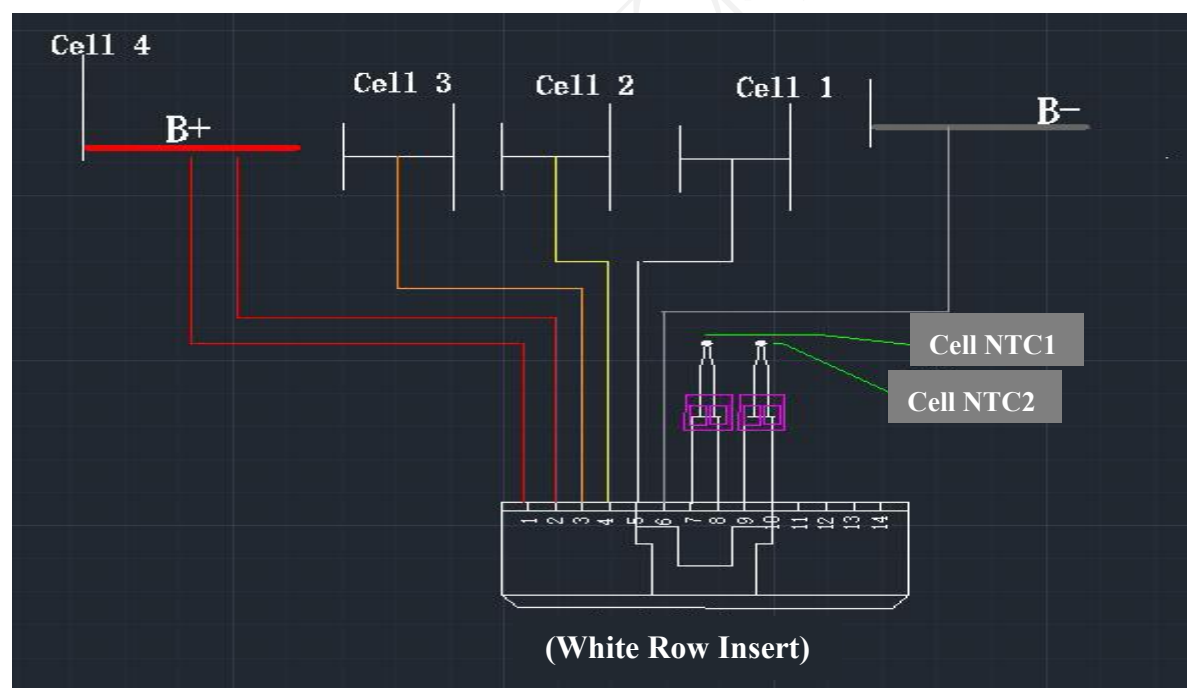The amount of information storage is not less than 500.

The historical data can be read through the host computer and saved as an excel file to the computer.

8、Reference diagram and connection instructions
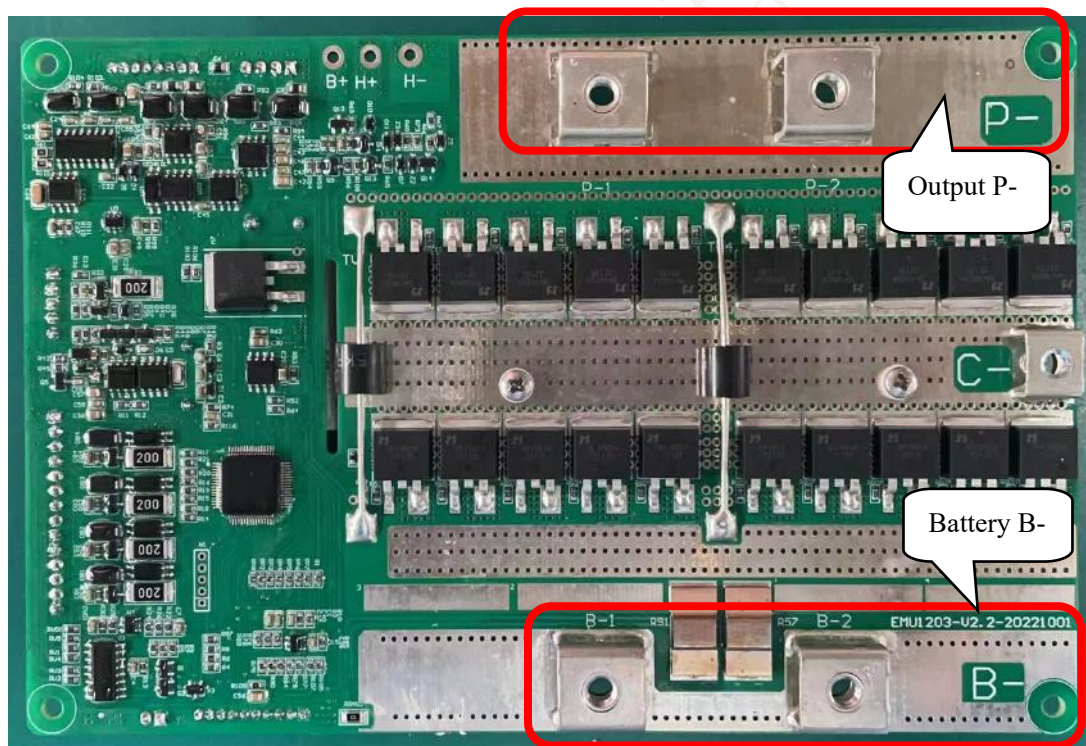
Note: There may be some differences between the actual product and the physical image of the above products

(White Row Insert)

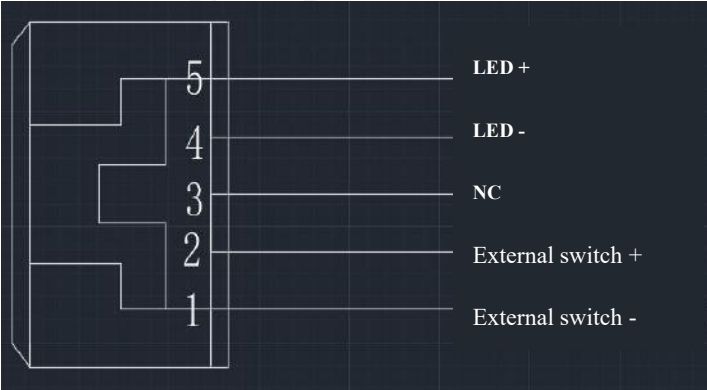## 8.1、Pin Definition

8.1.1、Sample line CELL1
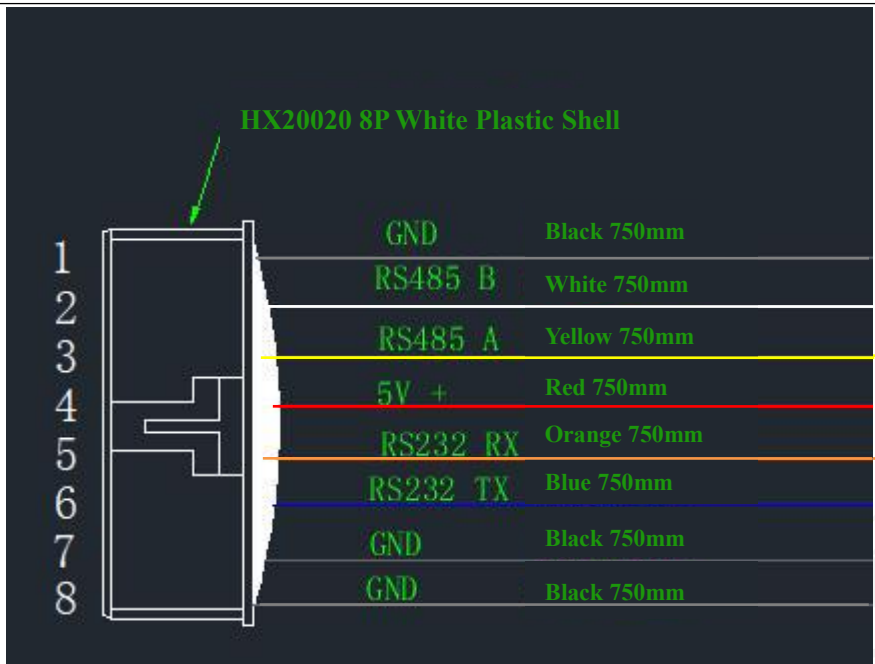
CELLS1			
	1	CELL4+	Connected to the cell 4+
	2	CELL4+	Connected to the cell 4+
	3	CELL3+	Connected to the cell 3+
	4	CELL2+	Connected to the cell 2+
	5	CELL1+	Connected to the cell 1+
	6	CELL1−	Connected to the cell 1-
	7	NTC1+	Connected to temperature sensorNTC1+
	8	NTC1−	Connected to temperature sensorNTC1-
	9	NTC2+	Connected to temperature sensorNTC2+
	10	NTC2−	Connected to temperature sensorNTC2-
	11	NC	NC
	12	NC	NC
	13	NC	NC
	14	NC	NC
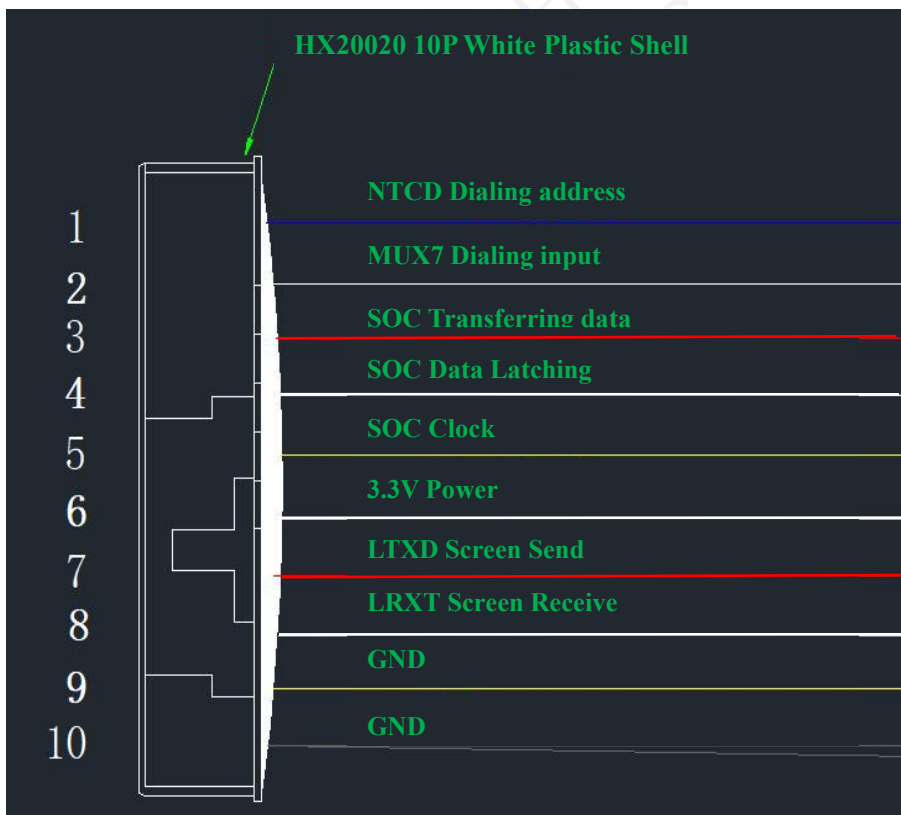
8.1.2、Switch Wire PWR

PWR		
	5	LED +
	4	LED -
	3	NC
	2	External switch +
	1	External switch -

8.1.3、RS485 Communication

COM		
	1	GND
	2	RS485/B
	3	RS485/A
	4	5V+
	5	RS232/RX
	6	RS123/TX
	7	GND
	8	GND

8.1.4、LCD/SOC Indicator Light

LCD/SOC		
	1	NTCD Dialing address
	2	MUX7 Dialing input
	3	SOC Transferring data
	4	SOC Data Latching
	5	SOC Clock
	6	3.3V Power
	7	LTXD Screen Send
	8	LRXT Screen Receive
	9	GND
	10	GND

8.1.5、N2 interface

Pin	Definition Description	Note
1	GND	
2	CHG	Current limiting plate pulse signal

8.2、Power on/off sequence

1. Power on in the following order: first connect the motherboard B -, then connect the flat cables CELLSAMP and CELLS1, and finally connect P+and P - to the charger or load (note: the motherboard is in a shutdown state after connecting the wires, and closing the external switch or charging can also activate the BMS).
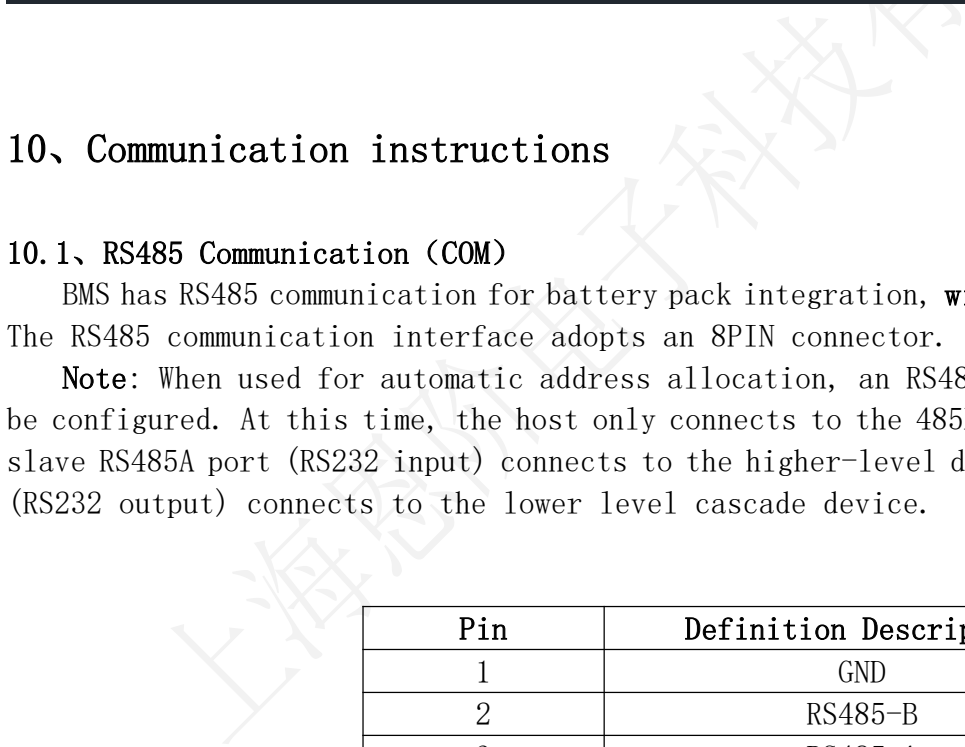
2. The power down sequence is completely opposite: first disconnect the charger or load (note: disconnect the external switch to shut down), then sequentially disconnect CELLSAMP, CELLS1, and finally disconnect B -.

3. Input output

When charging: The positive pole of the charger is connected to the total positive pole of the battery pack, and the negative pole of the charger is connected to the "P -" of the protection board.

When discharging: the positive pole of the load is connected to the total positive pole of the battery pack, and the negative pole of the load is connected to the "P -" of the protective plate.

9、Dimension

10、Communication instructions

10.1、RS485 Communication（COM）

BMS has RS485 communication for battery pack integration, **with a baud rate of 9600bps.** The RS485 communication interface adopts an 8PIN connector.

Note: When used for automatic address allocation, an RS485 expansion card needs to be configured. At this time, the host only connects to the 485B port (RS232 output), the slave RS485A port (RS232 input) connects to the higher-level device, and the RS485B port (RS232 output) connects to the lower level cascade device.

Pin	Definition Description
1	GND
2	RS485-B
3	RS485-A
4	RS485-5V
5	RS232-RX
6	RS232-TX
7	RS232-GND
8	RS232-GND

10.2、CAN communication

BMS has a CAN communication function for uploading battery packs, **with a baud rate of 500K**. The CAN communication interface adopts a 4PIN connector. Communication with inverters or CAN TEST can be achieved through the CAN interface. When the battery pack is connected, it is connected through RS485 communication, and finally, the battery pack data, status, and information are uploaded to PCS through CAN communication.

Pin	Definition Description
1	GND
2	CAN-H
3	CAN-L
4	5V

11、Points for attention

❖ Battery management systems can not be used in series.

❖ BMS power components withstand voltage 100 V.

❖ If the battery module is assembled in the form of long wire and long copper bar, it must communicate with the BMS manufacturer for impedance compensation.Otherwise, it will affect the consistency of the cell.

❖ The external switch on BMS is prohibited to connect with other equipment. If necessary, please confirm with the technology for docking. Otherwise, BMS will not bear any responsibility for damage.

❖ Do not touch the surface of the core directly when assembling, so as not to damage the core. The assembly should be firm and reliable.

❖ In use pay attention to lead wire head, soldering iron, solder and so on do not touch the components on the circuit board, otherwise it may damage the circuit board.

❖ Use process should pay attention to anti-static, moisture-proof, waterproof and so on.

❖ Please follow the design parameters and use conditions during use, must not exceed the value in this specification, otherwise it may damage the protection board.

❖ After combining the battery pack and the protection plate, if you find no voltage output or charge, please check the wiring is correct.

❖ The final interpretation right is owned by our company.