Product Specification

Product name: BMS

Product number: LX3081

Product model: 16S100A-10A-V1.0

Customer model:

Initial issue:

File version: V1.0

Establishment	Examine	Approve

Configuration Table

Configuration Function	Functional Information	Configuration Function	Parameter Information
Number of Cells in Series	16S	Cell Type	LiFePO4
Continuous Charging Current	100A	Continuous Discharging Current	100A
Charge/Discharge Interface	Common Port	Storage Capacity	10000 Records
Charging Current Limitation	10A Charging Current Limitation **Definition**: When the charging current is ⩾110A, the 10A current limitation is activated. It remains in effect until the charging process is complete. There is interruption logic to recheck and judge the charging current.		
Indicator Board	6 x SOC (Green) Battery Level Indicators 1 x ALM (Red) Alarm Indicator 1 x RUN (Green) Running Indicator 1 x Low Battery Switch ON/OFF (Green) Indicator		
Display Screen	Reserved interface and functionality, display screen optional.		
Dry Contacts	Passive dry contacts Dry Contact 1 (PIN1 to PIN2): Normally open, closed during fault or protection. Dry Contact 2 (PIN3 to PIN4): Normally open, closed during low battery alarm.		
Secondary Protection	The system includes secondary protection functionality, featuring an external secondary protection disconnector for controlling output interfaces and detecting disconnection status. Disconnector Logic: Triggers charging or discharging MOSFET failure (the corresponding charging or discharging MOSFET should be disconnected when triggering charging or discharging protection. If the MOSFET cannot be disconnected and current is detected), triggering disconnector protection. Triggers current limiting board failure (the corresponding current limiting MOSFET should be disconnected when triggering protection under current limiting charging status), thereby triggering disconnector protection.		
Anti-theft Function	Optional		
Hardware Watchdog Function	Equipped with an external hardware watchdog reset function. The BMS initializes the hardware watchdog upon startup. If the watchdog is not fed for 1.6 seconds, it will generate a reset signal to reset the MCU.		
Heating Film	Definition: When the minimum temperature of the cells during charging is below 5° C, heating is initiated until the minimum cell temperature rises above 15° C, at which point heating is stopped.		
Weak Electric Switch	Boat-shaped self-locking switch with corresponding ON/OFF indicator light.		
Buzzer Switch	Default off (BMS default is off at the factory, can be turned on via upper computer).		
DIP Switch	4 bits.		
Cell Capacity	100AH		

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Pre-charge Capability	The pre-charge circuit can handle a maximum capacitive load of 30000uF.		
Communication 1	RS485-1	Communication 2	RS485-2
Communication 3	CAN	Communication 4	RS232RS232 (Upgrade Interface)
UPS RS485 Protocol	1、PYLON low voltage Protocol RS485-V3.5(2019-08-07)		
	2、Victron		
	3、Growatt BMS RS485 Protocol for 1xSxxP ESS-V2.01(2019-02-13)		
	4、PACE BMS Modbus Protocol for RS485-V1.3(2017-06-27)		
UPS CAN Protocol	1、CAN-Bus-protocol-PYLON-low-voltage-V1.3-20190301		
	2、Growatt BMS CAN-Bus-protocol-low-voltage-V1.09(2020-10-22)		
	3、Victron energy canbus_bms_protocol		
	4、GoodWe Low-voltage BMS Protocol CAN-V1.7(2020-02-28)		
	5、Shenzhen MEGARAY Technology Hybrid Inverter_5K_BMS Protocol V1.01 MEGARAY Protocol		
Temperature Monitoring	6 channels (1 channel for ambient, 1 channel for MOS, 4 channels for cells)	Sampling Socket	Vertical with card lock, 2.0 spacing (7+6+7+6)

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Parts List

Item	No. Name	Model	Quantity
1	Protection board	16S100A-10A-V1.0	1 pcs
2	Adapter board	TR1001-V1.0	1pcs
3	Display screen	NC	NC
4	Sampling line 1	#1-900mm-7P-2.0S-tin-1.0	1
5	Sampling line 2	#2-900mm-6P-2.0S-tin-1.0	1
6	Sampling line 3	#3-900mm-7P-2.0S-tin-1.0	1
7	Sampling line 4	#4-900mm-6P-2.0S-tin-1.0	1
8	B+ line	3.5P-245mm-tin-16AWG-1.0	1
9	Adapter line	6P-300mm-6P-2.5X-1.0	1
10	Adapter line	10P(2.0S)-300mm-10P(2.5X)-1.0	1
11	Display screen adapter line	5P-300mm-5P-2.5X-1.0	1
12	Colorful ribbon cable	10Px2-300mm-10Px2-2.5S-1.0	1
13	Weak power switch line	420mm-2P-2.5S-R19A-1.0	1
14	Screws	M5*10	4
15	Dry contact terminal	KF2EDGK-3.81-4P	1
16	Trip coil terminal	KF2EDGK-3.81-3P	1
17	Heating film terminal	KF2EDGK-3.81-2P	1

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Product Revision History

Date	Version	Revision Description	Responsible Person	Reviewer
2022-6-5	1.0	New version	Chris	Karin

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1. Application Scope

This product is suitable for the management of 8S-16S lithium batteries, employing an integrated design that integrates functions such as collection, management, and communication. It can provide protection functions such as overcharge, overdischarge, overcurrent, overtemperature, undertemperature, and short circuit protection for lithium battery packs, as well as voltage balancing during charging. It can store information such as charge and discharge voltage and current and communicate through communication ports. Parameters can be configured and data monitored through upper computer software. It can be widely used in indoor and outdoor base stations, energy storage, and other fields.

2.Function Features

2.1 Voltage Detection and Protection Function

Single cell voltage and total voltage detection, overvoltage and undervoltage alarm and protection functions.

2.2 Current Detection and Protection Function

Charging and discharging current detection, alarm, and protection functions. Charging current is displayed as positive, and discharging current is displayed as negative.

2.3 Temperature Detection and Protection Function

Battery cell, ambient, and PCB temperature detection functions, with alarm and protection during high and low-temperature charging and discharging.

2.4 Short Circuit Protection Function

Detection and protection function for output short circuit.

2.5 Reverse Connection Protection Function (Optional)

Detection and protection function for charger reverse connection.

2.6 Activation Wake-Up Function

Multiple activation wake-up functions: charger activation, RS232 communication activation, reset button activation.

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2.7 Buzzer Alarm Function

Buzzer alarm function.

2.8 Dry Contact

Two dry contact relays: can control the output of two switch signals.

2.9 Heating Film Function

Heating film function, supports heating film output with a current of less than 5A; with heating film circuit short circuit secondary protection and heating film MOS failure protection functions.

2.10 Secondary Protection Function

Secondary protection function, with external secondary protection tripping control output interface and tripping status detection function.

2.11 Anti-Theft Function (Optional)

Acceleration anti-theft function.

2.12 Hardware Watchdog

External hardware watchdog reset function.

2.13 Charging Current Limiting Function

Supports 10A charging current limiting function.

2.14 Battery Pack Capacity Calculation Function

Accurate calculation of battery pack SOC through current and time integration. Battery pack full capacity and current capacity can be set through the upper computer software, and the capacity can be automatically updated after a complete charge and discharge cycle.
With charge and discharge cycle count function, when the accumulated discharge capacity of the battery pack reaches 80% of the set full capacity, the cycle count increases by one.

2.15 Cell Charging Balancing Function

Can balance unbalanced cells during charging: when the highest cell voltage reaches the start balancing voltage during battery pack charging, and the maximum voltage difference is greater than the balancing voltage difference, the balancing function of the corresponding single cell is activated.
Balancing activation voltage and balancing voltage difference can be set through the upper computer software.

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2.16 LED Indication Function

With 9 LED indicators, including 6 green indicators for battery level indication to indicate the current battery pack SOC, 1 red indicator for fault indication to indicate alarms and faults, 1 green running indicator to indicate the standby, charging, and discharging status of the battery pack. 1 green indicator displays the state of the weak power switch.

2.17 Historical Record Storage Function

With historical record storage function, storage capacity of no less than 10,000 records. Storage time period, time interval can be set, and storage content adopts the first-in-first-out principle. The storage content can be read and stored as an Excel document through the upper computer software.

2.18 Communication and Parallel Function

Equipped with RS485 communication function, RS232 communication function, CAN communication function can realize parallel use of battery packs, communicate with external inverters, and monitor the status of BMS and battery packs in real-time. Battery pack parallel address is compatible with automatic and manual settings.

2.19 Upper Computer Control Function

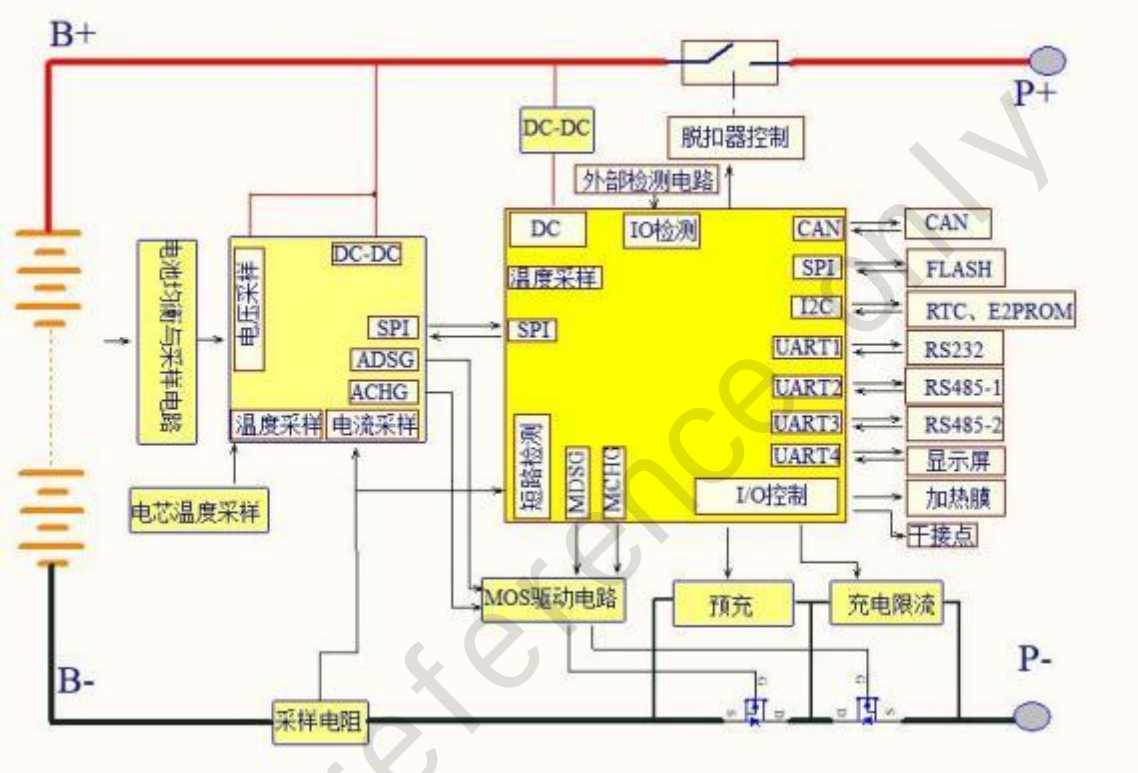
With a user-friendly upper computer interface, you can conveniently set protection parameters such as overvoltage, undervoltage, overcurrent, overtemperature, undertemperature, short circuit, balance, sleep, capacity, storage, and various alarm parameters through the upper computer.

Appendix: Display Accuracy Requirements (25℃)

Voltage	Error in individual cell charging and discharging voltage above 50% of range ≤10mV.
Current	Error in charging and discharging current above 50% of range ≤2%.
Capacity	Error in battery pack capacity above 50% of range ≤5%.
Temperature	Error in temperature display above 50% of range should be ≤2° C.

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3.Functional Block Diagram



4.Environmental Requirements

Project	Parameters	Unit
Operating Temperature	- 20～75	℃
Storage Temperature	- 40～75	℃
Operating Humidity	≤95（45℃±2℃)	%RH
Storage Humidity	≤95（45℃±2℃)	%RH
Temperature Measurement	-40 ～125	℃
Atmospheric Pressure	70~106	kPa

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5.Basic Parameter Settings

(Note: Unless otherwise specified, the following parameters are tested at an ambient temperature of 25℃.)

Number	Functional Name	Project Information	Set Value		Remarks
1	Cell High Voltage	Cell High Voltage Alarm Voltage	3600mV	Can be set	
		Cell High Voltage Protection Voltage	3700mV	Can be set	
		Cell High Voltage Protection Delay	1.0S	Can be set	
2	Cell High Voltage Protection Release Conditions	Cell High Voltage Protection Release Voltage	3380mV	Can be set	
		Discharge Release	Discharge Current > 1A		
3	Cell Low Voltage	Cell Low Voltage Alarm Voltage	2800mV	Can be set	After 30 seconds of overcharge protection without recovery, the system will enter low-power mode.
		Cell Low Voltage Protection Voltage	2700mV	Can be set	
		Cell Low Voltage Protection Delay	1.0S	Can be set	
4	Cell Low Voltage Protection Release	Cell Overdischarge Protection Release Voltage	2950mV	Can be set	
		Release when charging	Activation upon connecting charger		
5	Overall Overcharge Protection	Overall Overcharge Alarm Voltage	57.6 V	Can be set	
		Overall Overcharge Protection Voltage	59.2V	Can be set	
		Overall Overcharge Protection Delay	1.0S	Can be set	
6	Overall Overvoltage Protection Release	Overall Overcharge Protection Release Voltage	54V	Can be set	
		Release upon discharge	Discharge Current > 1A		
7	Overall Low Voltage	Overall Low Voltage Alarm Voltage	44.8V	Can be set	
		Overall Low Voltage Protection Voltage	43.2 V	Can be set	
		Overall Overdischarge Protection Delay	1.0S	Can be set	

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8	Overall Low Voltage Protection Release	Overall Overdischarge Protection Release Voltage	47.2V	Can be set	
		Release when charging	Release when charging		
9	Effective Current	Effective Charging Current	>1A		
		Effective Discharging Current	>1A		
10	Overcurrent Charging Protection	Overcurrent Charging Alarm Current	105A	Can be set	
		Overcurrent Charging Protection Current	110A	Can be set	
		Overcurrent Charging Protection Delay	1.0S	Can be set	
11	Overcurrent Charging Protection Release	Automatic Release	Automatic release after 1 minute		Locked in this state after 10 consecutive occurrences, no automatic release
		Discharge Release	Discharge Current > 1A		
12	Discharge Overcurrent 1 Protection	Discharge Overcurrent 1 Alarm Current	105A	Can be set	
		Discharge Overcurrent 1 Protection Current	110A	Can be set	
		Discharge Overcurrent 1 Protection Delay	1 S	Can be set	
13	Discharge Overcurrent 1 Protection Release	Automatic Release	Automatic release after 1 minute		Locked in this state after 10 consecutive occurrences, no automatic release
		Release by Charging	Charging current > 1A		
14	Discharge Overcurrent 2	Discharge Overcurrent 2 Protection Current	≥150A	Can be set	
		Discharge Overcurrent 2 Protection Delay	100mS	Can be set	
15	Discharge Overcurrent 2 Protection Release	Automatic Release	Automatic release after 1 minute		Locked in this state after 10 consecutive occurrences, no automatic release
		Release by Charging	Charging current > 1A		
16	Short Circuit Protection	Short Circuit Protection Current	≥360A		
		Short Circuit Protection Delay	< 300μS		
		Short Circuit Protection Release	Short Circuit Protection Release when valid charging current is detected.		

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			Automatically release after load removal.		
17	MOS High Temperature Protection	MOS Overtemperature Alarm Temperature	100℃	Can be set	
		MOS Overtemperature Protection Temperature	115℃	Can be set	
		MOS Protection Release Temperature	90℃	Can be set	
18	Cell Charging Low Temperature	Charging Low Temperature Alarm Temperature	-0℃	Can be set	
		Charging Low Temperature Protection Temperature	-5℃	Can be set	
		Charging Low Temperature Protection Release Temperature	-0℃	Can be set	
19	Cell Charging High Temperature	Charging High Temperature Alarm Temperature	60℃	Can be set	
		Charging High Temperature Protection Temperature	65℃	Can be set	
		Charging High Temperature Protection Release Temperature	55℃	Can be set	
20	Cell Discharge Low Temperature	Discharge Low Temperature Alarm Temperature	-15℃	Can be set	
		Discharge Low Temperature Protection Temperature	-20℃	Can be set	
		Discharge Low Temperature Protection Release Temperature	-15℃	Can be set	
21	Cell Discharge High Temperature	Discharge High Temperature Alarm Temperature	65℃	Can be set	
		Discharge High Temperature Protection Temperature	70℃	Can be set	
		Discharge High Temperature Protection Release Temperature	60℃	Can be set	
22	Ambient Low Temperature	Ambient Low Temperature Alarm Temperature	-15℃	Can be set	
		Ambient Low Temperature Protection Temperature	-20℃	Can be set	
		Ambient Low Temperature Protection Release Temperature	-15℃	Can be set	

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23	Ambient High Temperature	Ambient High Temperature Alarm Temperature	65℃	Can be set	
		Ambient High Temperature Protection Temperature	75℃	Can be set	
		Ambient High Temperature Protection Release Temperature	65℃	Can be set	
24	Consumption Current	Self-consumption Current during Operation	≤50mA (With Display Screen)		
			≤45mA (Without Display Screen)		
		Low-Power Mode Current	≤200μA		
25	Balancing Function	Balancing Activation Voltage	3500mV	Can be set	
		Activation Voltage Difference	30mV	Can be set	
26	Capacity Default Settings	Low Battery Warning	SOC＜5%	Can be set	No Warning During Charging
		Full Capacity Setting	100AH	Can be set	
27	Current Limiting Function	Charging Current Limit	10A		
28	Sleep Function	Sleep Voltage	3150mV	Can be set	
		Delay Time	5min	Can be set	
29	Cell Failure Protection	Single Cell Voltage Difference	Voltage Difference ＞ 1V	Can't be set	
30	Full Charge Detection	Full Charge Voltage	>56V	Can be set	Stop charging when both conditions are met and update SOC to 100%.
		Cutoff Current	<2A	Can be set	

For reference only

6. LED Indicator Description

Table 1 LED Operational Status Indicators

Status	Normal/Alarm/Protection	ON/OFF	RUN	ALM	Battery Level Indicator LED						Note
		●	●	●	●	●	●	●	●	●	
Shutdown	Sleep	Off	Off	Off	Off	Off	Off	Off	Off	Off	All LEDs are turned off
Standby	Normal	Steady On	Blinks Once	Off	Based on Battery Level Indication						Standby State
	Alarm	Steady On	Blinks Once	Blinks Three Times							Module Low Voltage
Charging	Normal	Steady On	Steady On	Off	Battery Level Indication (Highest Battery Level LED Blinks Twice)						Highest Battery Level LED Blinking (Flash Twice), Overcharge Alarm ALM Not Blinking
	Alarm	Steady On	Steady On	Blinks Three Times							
	Overcharge Protection	Steady On	Steady On	Off	Steady On	Steady On	Steady On	Steady On	Steady On	Steady On	If there is no mains power, the indicator light is in standby state
	Temperature, Overcurrent, Failure Protection	Steady On	Off	Steady On	Off	Off	Off	Off	Off	Off	Stop Charging
Discharging	Normal	Steady On	Blinks Three Times	Off	Battery Level Indication						
	Alarm	Steady On	Blinks Three Times	Blinks Three Times							
	Undervoltage Protection	Steady On	Off	Off	Off	Off	Off	Off	Off	Off	Stop Discharging
	Temperature, Overcurrent, Short Circuit, Reverse Connection, Failure Protection	Steady On	Off	Steady On	Off	Off	Off	Off	Off	Off	Stop Discharging
Failure		Steady On	Off	Steady On	Off	Off	Off	Off	Off	Off	Stop Charging and Discharging

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Table 2. Capacity Indicator Description

Status	Charging						Discharging					
Capacity Indicator Light	L6	L5	L4	L3	L2	L1	L6	L5	L4	L3	L2	L1
	●	●	●	●	●	●	●	●	●	●	●	●

Battery Level (%)	0～16.7%	Off	Off	Off	Off	Off	Blinks Twice	Off	Off	Off	Off	Off	Steady On
	16.7～33.3%	Off	Off	Off	Off	Blinks Twice	Steady On	Off	Off	Off	Off	Steady On	Steady On
	33.3～50%	Off	Off	Off	Blinks Twice	Steady On	Steady On	Off	Off	Off	Steady On	Steady On	Steady On
	50～66.7%	Off	Off	Blinks Twice	Steady On	Steady On	Steady On	Off	Off	Steady On	Steady On	Steady On	Steady On
	66.7～83.4%	Off	Blinks Twice	Steady On	Steady On	Steady On	Steady On	Off	Steady On	Steady On	Steady On	Steady On	Steady On
	83.4～100%	Blinks Twice	Steady On	Steady On	Steady On	Steady On	Steady On	Steady On	Steady On	Steady On	Steady On	Steady On	Steady On
Operational Indicator Light ●		Steady On						Flashing (Flashes 3 times))					

Table 3 LED Flashing Explanation

Flashing Pattern	On	Off
Blinks Once	0.25S	3.75S
Blinks Twice	0.5S	0.5S
Blinks Three times	0.5S	1.5S

Note: LED indicator alarms can be enabled or disabled via the upper computer. The default setting upon factory delivery is enabled.

6.2 Buzzer Action Explanation

During fault, beep for 0.25 seconds every 1 second.
During protection, beep for 0.25 seconds every 2 seconds (except for overvoltage protection).
During alarm, beep for 0.25 seconds every 3 seconds (except for overvoltage alarm).
Buzzer functionality can be enabled or disabled via the upper computer. The default setting upon factory delivery is disabled.

6.3 Button Explanation

When the BMS is in sleep mode, press the button for 3~6 seconds and release it, the protection board is activated, and the LED indicator lights up sequentially starting from "RUN" for 0.5 seconds.

When the BMS is in active state, press the button for 3~6 seconds and release it, the protection board is put to sleep, and the LED indicator lights up sequentially starting from the lowest battery level light for 0.5 seconds.

When the BMS is in active state, press the button for 6~10 seconds and release it, the protection board is reset, and all LED lights light up simultaneously for 1.5 seconds.
After the BMS is reset, the parameters and functions set via the upper computer are retained. If you need to restore to the initial parameters, you can achieve this by using the "Restore Defaults" function in the upper computer, but relevant operation records and stored data remain unchanged (such as battery level, cycle times, protection records, etc.).

For reference only

7.Sleep and Wake-up

7.1 Sleep Mode

The system enters low-power mode under any of the following conditions:

1) Single cell or overall overdischarge protection remains unresolved for 30 seconds.

2) Pressing and releasing the button for 3 seconds.

3) Lowest single cell voltage falls below the sleep voltage and remains for the sleep delay time (while simultaneously meeting no communication, no protection, no balancing, no current).

4) Standby time exceeds 24 hours (no communication, no charging or discharging, no mains power).

5) Forced shutdown via upper computer software.

6) Disconnection of the low-voltage switch can control sleep mode.

Before entering sleep mode, ensure that no external voltage is applied to the input terminal; otherwise, low-power mode cannot be entered.

7.2 Wake-up

When the system is in low-power mode, it exits low-power mode and enters normal operation mode under any of the following conditions:

1) Connect the charger, and the charger output voltage must be greater than 48V.

2) Press the button for 3 seconds and release it.

3) Connect the communication cable and open the upper computer software (this method cannot wake up the protection board if it entered sleep mode due to overdischarge protection).

Note: After single cell or overall overdischarge protection enters low-power mode, the system wakes up every 4 hours, activating the charging and discharging MOSFETs. If charging is possible, it exits sleep mode and enters normal charging mode; if automatic wake-up fails to charge for 10 consecutive times, it will no longer automatically wake up.

When the system is defined as charging finished, if after standby for 2 days/48 hours (standby time setting) the recovery voltage is still not reached, it will be forced to resume charging until it reaches charging completion again.

For reference only

8.Communication Description

8.1 RS232

BMS can communicate with the upper computer through the RS232 interface, allowing monitoring of various battery information such as battery voltage, current, temperature, status, SOC, SOH, and battery production information at the upper computer end. The default baud rate is 9600 bps.

8.2 RS485

It has two RS485 interfaces. One can be used for communication between the main pack and the secondary pack when the battery pack is in parallel. Through the RS485 interface of the main pack, all pack information can be viewed via RS232. The RS485 interface cannot be used for parameter setting or corresponding control operations.

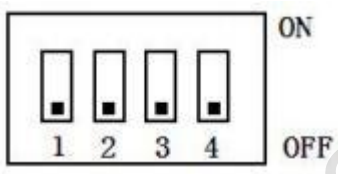
The other RS485 interface can be connected to an upper computer or external device.

8.3 CAN

It has a CAN communication interface, which can be used for communication between battery packs when they are in parallel or connected to external devices. It enables the exchange of relevant information.

8.4 DIP Switch Settings

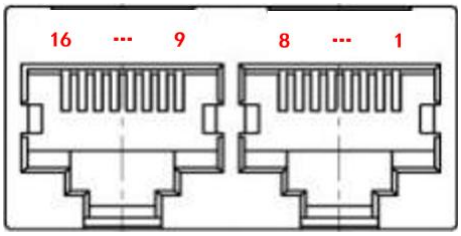
When using battery packs in parallel, different packs can be distinguished by hardware addresses. The hardware address of each pack in the entire battery stack is unique. The hardware address can be set sequentially through the DIP switches on the board. The definition of the switches is as follows:



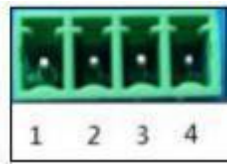
Address	DIP Switch Position				Description
	#1	#2	#3	#4	
0	OFF	OFF	OFF	OFF	No Cascading, Standalone Use
1	ON	OFF	OFF	OFF	Set as Pack1 (Main)
2	OFF	ON	OFF	OFF	Set as Pack2
3	ON	ON	OFF	OFF	Set as Pack3
4	OFF	OFF	ON	OFF	Set as Pack4
5	ON	OFF	ON	OFF	Set as Pack5
6	OFF	ON	ON	OFF	Set as Pack6
7	ON	ON	ON	OFF	Set as Pack7
8	OFF	OFF	OFF	ON	Set as Pack8
9	ON	OFF	OFF	ON	Set as Pack9
10	OFF	ON	OFF	ON	Set as Pack10
11	ON	ON	OFF	ON	Set as Pack11
12	OFF	OFF	ON	ON	Set as Pack12
13	ON	OFF	ON	ON	Set as Pack13
14	OFF	ON	ON	ON	Set as Pack14
15	ON	ON	ON	ON	Set as Pack15

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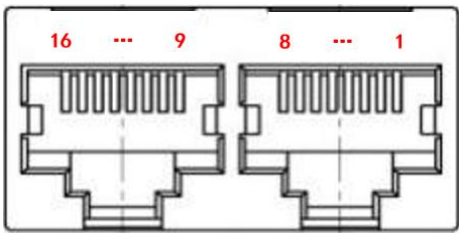
8.5 Communication Interface Diagram



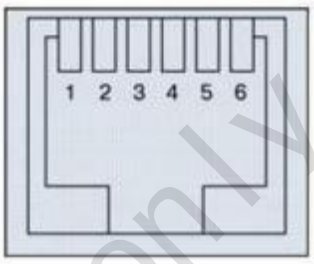
CAN & RS485



Dry Contact



RS485 Parallel Interface



RS232

RS232--Using a 6P6C Vertical RJ11 Socket	
RJ11 Pin	Note
1、2、6	NC
3	TX (Signal)
4	RX (Signal)
5	GND

CAN--Using a 8P8C Vertical RJ45 Socket		RS485--Using a 8P8C Vertical RJ45 Socket	
RJ45 Pin	Note	RJ45 Pin	Note
1、8	RS485-B1	9、16	RS485-B1
2、7	RS485-A1	10、15	RS485-A1
3、6	GND	11、14	GND
4	CANL	12	CANL
5	CANH	13	CANH

AN

RS485--Using a 8P8C Vertical RJ45 Socket		RS485--Using a 8P8C Vertical RJ45 Socket	
RJ45 Pin	Note	RJ45 Pin	Note
1、8	RS485-B	9、16	RS485-B
2、7	RS485-A	10、15	RS485-A
3、6	GND	11、14、	GND
4	Automatic DIP Switch Input IN_DP+	12	Automatic DIP Switch Output ON_DP+
5	Automatic DIP Switch Input IN_DP-	13	Automatic DIP Switch Output ON_DP-

For reference only

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9.Mainboard Interface Description

Interface	Remarks
B+	Used to power the BMS; the power positive terminal P+ is directly connected to the positive terminal of the cell.
B-	Negative terminal of the cell
P-	Serves as both the negative terminal for charging and discharging (charging and discharging share the same terminal).
JP5	Pin1: GND Pin2: NTC1+ Temperature Sensor Pin3: Connects to the negative terminal of the first series of batteries Pin4: Connects to the positive terminal of the first series of batteries Pin5: Connects to the positive terminal of the second series of batteries Pin6: Connects to the positive terminal of the third series of batteries Pin7: Connects to the positive terminal of the fourth series of batteries
JP4	Pin1: GND Pin2: NTC2+ Temperature Sensor Pin3: Connects to the positive terminal of the fifth series of batteries Pin4: Connects to the positive terminal of the sixth series of batteries Pin5: Connects to the positive terminal of the seventh series of batteries Pin6: Connects to the positive terminal of the eighth series of batteries
JP3	Pin1: GND Pin2: NTC3+ Temperature Sensor Pin3: Connects to the negative terminal of the ninth series of batteries Pin4: Connects to the positive terminal of the ninth series of batteries Pin5: Connects to the positive terminal of the tenth series of batteries Pin6: Connects to the positive terminal of the eleventh series of batteries Pin7: Connects to the positive terminal of the twelfth series of batteries
JP1	Pin1: GND Pin2: NTC4+ Temperature Sensor Pin3: Connects to the positive terminal of the thirteenth series of batteries Pin4: Connects to the positive terminal of the fourteenth series of batteries Pin5: Connects to the positive terminal of the fifteenth series of batteries Pin6: Connects to the positive terminal of the sixteenth series of batteries
JP9 （Weak Power Switch）	Pin1: GND Pin2: PW_OFF Weak Power Switch
JP22 （Trip Device）	Pin1: TC - Trip Device Trip Feedback Terminal Pin2: TK- - Trip Device Negative Power Supply Terminal Pin3: KT+ - Trip Device Positive Power Supply Terminal

For reference only

JP8 （Display SCreem）	Pin1: Display Screen TX Pin2: Display Screen RX Pin3: Display Screen VCC Pin4: Display Screen GND Pin5: Display Screen GND
JP25 (Heating Film)	Pin1: HT- - Heating Film Negative Terminal Pin2: HT+ - Heating Film Positive Terminal
JP19 (Dry Contact, Indicator Light, DIP Switch): Connect to Connector JP1	Pin1: CON1 Dry Contact 1 Pin2: CON1 Dry Contact 1 Pin3: CON2 Dry Contact 2 Pin4: CON2 Dry Contact 2 Pin5: LED7 Indicator Light Pin6: LED8 Indicator Light Pin7: LED9 Indicator Light Pin8: K5 DIP Switch Pin9: K6 DIP Switch Pin10: GND
JP21 (RS485, RS232): Connect to Connector JP3	Pin1: 485_B - RS485 B Pin2: 485_A - RS485 A Pin3: RS232_RX - RS232 Communication Receive Terminal Pin4: RS232_TX - RS232 Communication Transmit Terminal Pin5: ISO_GND - Isolation Ground Pin6: ISO_GND - Isolation Ground
JP20 (CAN, 485-1, Indicator Light, DIP Switch): Connect to Connector JP2	Pin1: CAN_L - CAN Communication Pin2: CAN_H - CAN Communication Pin3: CAN_GND - Isolation Ground Pin4: CAN_GND - Isolation Ground Pin5: 485_B1 - External 485 Communication Pin6: 485_A1 - External 485 Communication Pin7: GND - System Ground Pin8: GND - System Ground Pin9: K1 - DIP Switch Pin10: LED6 - Indicator Light Pin11: K2 - DIP Switch Pin12: LED5 - Indicator Light Pin13: K3 - DIP Switch Pin14: LED4 - Indicator Light Pin15: K4 - DIP Switch Pin16: LED3 - Indicator Light Pin17: PW_OFF - Weak Power Switch Pin18: LED2 - Indicator Light Pin19: RESET - Reset Button Pin20: LED1 - Indicator Light
JP23 (Automatic DIP Switch)	NC

Note: The mainboard weak power switch interface is reserved and generally not connected. The matching weak power switch needs to be connected to the adapter board JP4.

For reference only

Installation and Connection Instructions

There are strict sequence requirements for powering up the protection board. First, solder B- and P- connections, then B+ and P+ connections. Next, connect the battery sampling line connectors from low to high sequentially. After powering up, charging or activation by pressing a button may be required. Load or charger should only be added after all connection lines are installed.

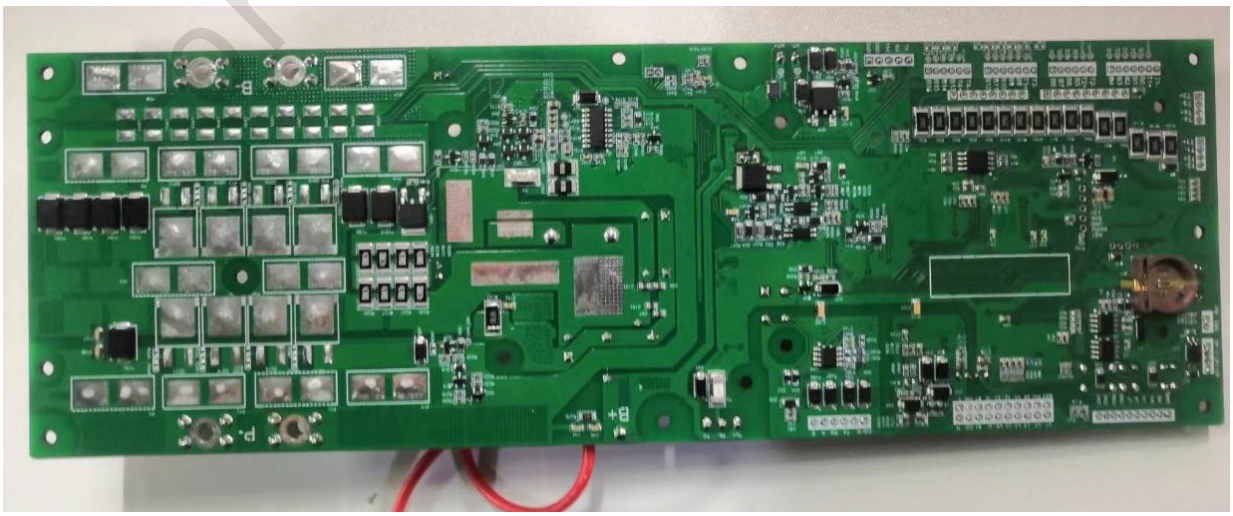
When removing, first disconnect the charger or load, then disconnect the battery sampling line connectors from high to low sequentially. Finally, remove B+, P+, B-, and P- connections.

10. Real photo and dimension drawing

Reference photo:

Mainboard:

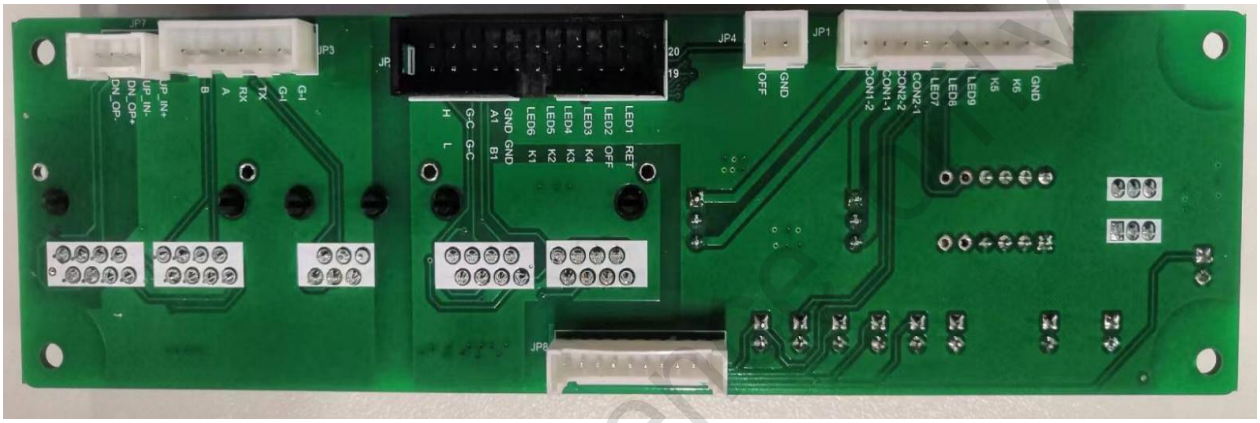




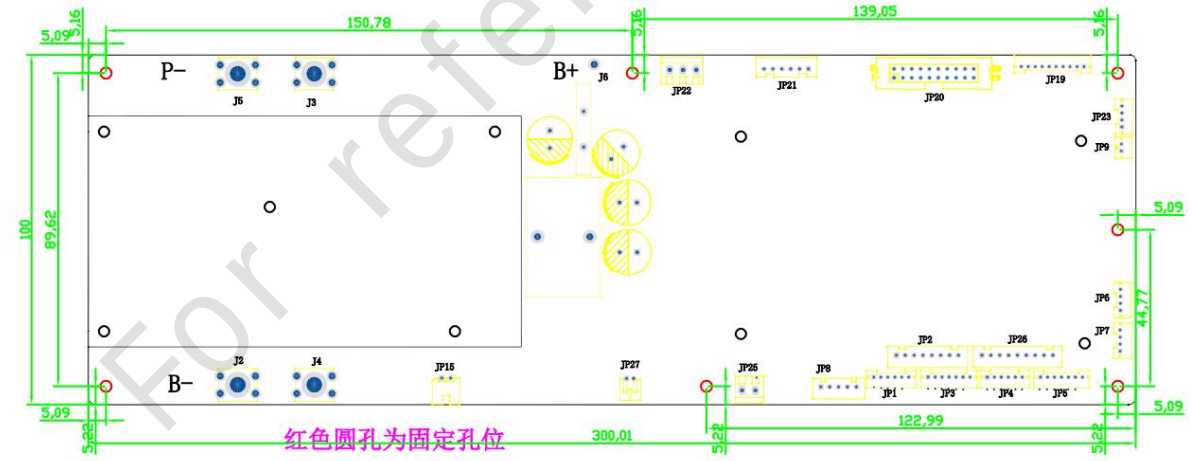
For reference only

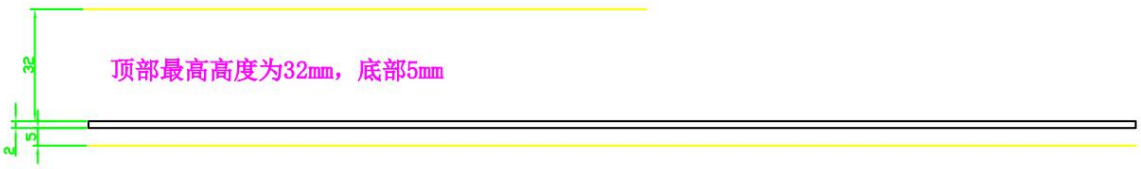
Adapter board:

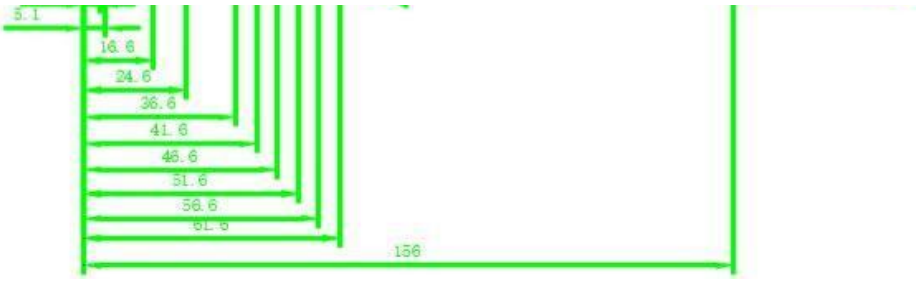




Note: The actual product may differ from the reference photo above. The images are for reference only.

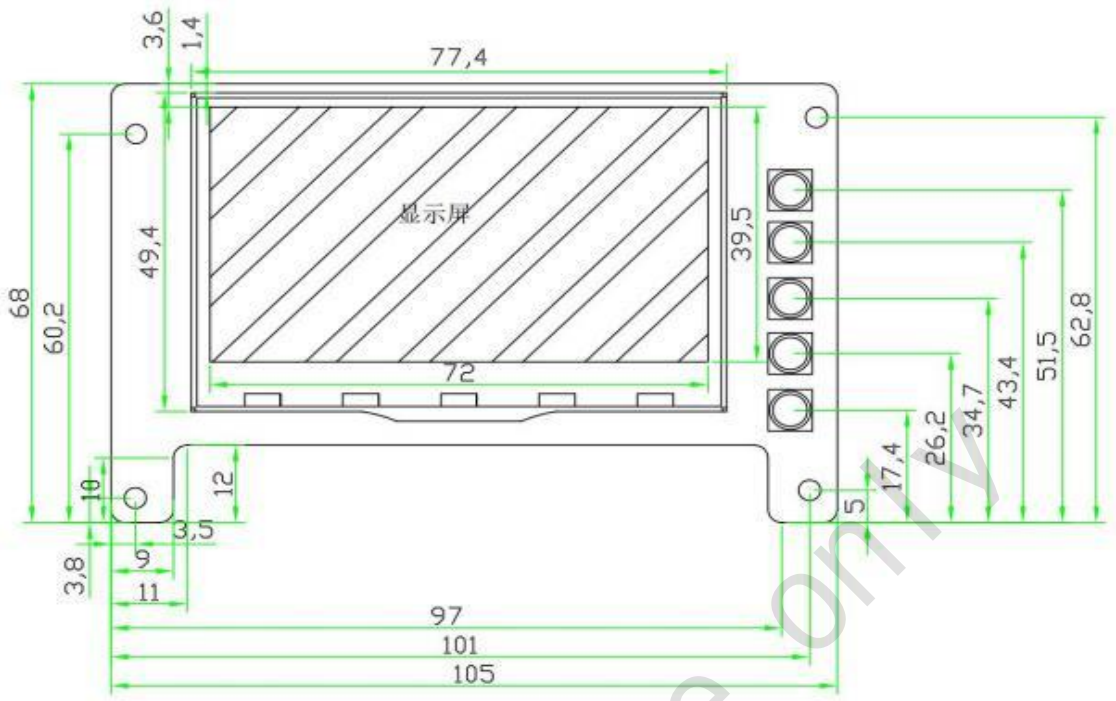






For reference only

Display Screen:



11.Usage Notes:

For reference only

- Before use, please communicate fully with the supplier to ensure suitability. Otherwise, it may cause damage to the batteries and this circuit board.
- This circuit board cannot be used in series.
- When soldering battery leads, make sure there are no wrong or reverse connections. If there is indeed a wrong connection, this circuit board may be damaged and needs to be retested before use.
- When assembling, do not let the protection board directly contact the surface of the battery cells to avoid damaging them. Assembly should be firm and reliable.
- During use, be careful not to let wire ends, soldering irons, solder, etc., touch the components on the circuit board, as this may damage the circuit board.
- Pay attention to anti-static, moisture-proof, and waterproof measures during use.
- During use, follow the design parameters and conditions. Do not exceed the values specified in this specification document, as this may damage the protection board.
- After combining the battery pack and protection board, if there is no voltage output or the battery cannot be charged during the initial power-up, please check if the wiring is correct.
- If the total internal resistance of the battery pack's short-circuit loop is less than 40mΩ, the battery pack's capacity exceeds the rated value by 20%, the short-circuit current exceeds 1500A, the inductance of the short-circuit loop is very large, or the total length of the short-circuit wire is very long, please test it yourself to determine if this BMS can be used.