

产品规格书

Product Specification

产品名称： 16串家储锂电池管理系统

Product: 16 parallels Home Energy Storage Lithium Battery Management System

产品型号： TP-BMS48200-LT-55

Model: TP-BMS48200-LT-55

版 本： V1.0

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客户名称：

Customer:

制作 Draft	审 核 Checked	批 准 Approved
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客户承认 Customer Confirmed (签字盖章) Signature and seal		

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基本配置 Basic Configuration

基本功能 Basic Function	电芯类型 Type of Cell	磷酸铁锂 LiFePO4
	额定容量 Rated Capacity	200AH
	电池串数 Parallels of Batteries	16串/15串可设 16/15 Parallels Settable
	额定充放电电流 Rated Charge and Discharge Current	200A
	最大限流充电功能 Maximum Current Limit Charging Function	10A <input type="checkbox"/> 20A <input checked="" type="checkbox"/>
	最高充电电压 Maximum Charging Voltage	58V
均衡功能 Equalization Function	均衡类型 Type of Equalization	被动均衡 Passive Equalization
	均衡电流 Equalization Current	60mA
温度采集 Temperature	电芯温度 Cell Temperature	4路 (采样精度 $\pm 2^{\circ}\text{C}$) 4 Channels (Accuracy of Sampling $\pm 2^{\circ}\text{C}$)
	MOS温度	1路 (采样精度 $\pm 2^{\circ}\text{C}$)

Data Collection	MOS Temperature	1 Channel (Accuracy of Sampling $\pm 2^{\circ}\text{C}$)
	环境温度 Environment Temperature	1路 (采样精度 $\pm 2^{\circ}\text{C}$) 1 Channel (Accuracy of Sampling $\pm 2^{\circ}\text{C}$)
通信功能 Communication Function	通信接口1 Communication Interface 1	RS485_1 电池组内并联 RS485_1 Battery Pack Parallel
	通信接口2 Communication Interface 2	RS232 上位机通信或调试 RS232 Upper Computer Communication or Debugging
	通信接口3 Communication Interface 3	RS485_2 逆变器通信 RS485_2 Inverter Communication
	通信接口4 Communication Interface 4	CAN 逆变器通信 CAN Inverter Communication
其它功能 (打勾为标配, 其它为选配) Other Functions (✓ as standard, others as optional)	预充功能 Pre-charge Function	无 <input type="checkbox"/> 有 <input checked="" type="checkbox"/> No Yes
	数据存储 Data Storage	EEPROM (1000条) <input checked="" type="checkbox"/> FLASH <input type="checkbox"/> (可选配大容量FLASH存储) Large-capacity FLASH Storage is Optional
	反接保护 Protection of Opposite Connection	无 <input type="checkbox"/> 有 <input checked="" type="checkbox"/> No Yes
	蜂鸣器 Buzzer	无 <input type="checkbox"/> 有 <input checked="" type="checkbox"/> No Yes
	LED指示 LED Display	无 <input type="checkbox"/> 有 <input checked="" type="checkbox"/> No Yes
	干接点 Dry Contact	无 <input type="checkbox"/> 有 <input checked="" type="checkbox"/> No Yes
	弱电开关 Weak Current Switch	无 <input type="checkbox"/> 有 <input checked="" type="checkbox"/> No Yes
	复位/休眠/唤醒 Reset/Sleep/Wake Up	无 <input type="checkbox"/> 有 <input checked="" type="checkbox"/> No Yes
	显示屏 Display Screen	无 <input type="checkbox"/> 中英文切换 <input checked="" type="checkbox"/> No With English and Chinese
脱扣器 (主功率二级保护) Trip Device (primary power secondary protection)	无 <input checked="" type="checkbox"/> 有 <input type="checkbox"/> No Yes	

	加热膜 Heating Film	无 <input type="checkbox"/> 有 <input type="checkbox"/> 二次保护 <input type="checkbox"/> No Yes Secondary Protection
	陀螺仪 Gyroscope Instrument	无 <input type="checkbox"/> 有 <input type="checkbox"/> No Yes
	蓝牙/GPS Bluetooth/GPS	无 <input type="checkbox"/> 有 <input type="checkbox"/> No Yes
	2路I/O 2 Channels I/O	支持其它功能定制开发 Support other functions development
逆变器协议支持 Inverter Protocol Support	CAN	派能、固德威、古瑞瓦特、锦浪、鹏城、Victron、首航、科士达 Pylontech, Goodwe, Growatt, Ginlong, Luxpower, Victron, Sofar, Kstar
	RS485	硕日、派能、日月元、德业、古瑞瓦特 SRNE、Pylontech、Voltronicpower、Deye、Growatt
	其它 Other	可定制开发 Customizable

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1. 概述 Overview

本产品适用于 16 串及以下家储磷酸铁锂电池管理，对电池组提供过压、欠压、过流、高温、低温，短路及充电反接等保护与恢复功能。实现充放电过程中的 SOC 精确计量, SOH 健康状态统计。实现充电过程电压均衡。通过上位机软件人机交互，显示及设置电压、电流、温度等告警保护参数，存储及显示电池的运行状态实时数据和历史数据。具有多种休眠及唤醒方式。通过 RS485 总线实现电池包间并机通讯。通过高速 CAN 通讯或 RS485 通讯与逆变器进行数据通讯。经由上位机软件人机交互进行参数配置和数据监控。可广泛应用在室内室外家庭储能电池管理，如太阳能家庭储能、风能家庭储能及其它形式的微电网储能等储能应用。

This product is suitable for the management of domestic storage lithium iron phosphate batteries of 16 series or less, providing protection and recovery functions for the battery pack, such as over voltage, under voltage, over current, high temperature, low temperature, short circuit and charge opposite connection. Accurate measurement of SOC and statistics of SOH health status are realized in the process of charge and discharge. Realize voltage balance in charging process. Display and set alarm protection parameters, such as voltage, current and temperature, store and display real-time and historical data of battery operating status through human-computer interaction of the upper computer software. Has a variety of sleep and wake up modes. The parallel communication between cells is realized by RS485 bus. Communicate with inverter through high-speed CAN communication or RS485 communication. Parameter configuration and data monitoring are carried out through computer software human-computer interaction. It can be widely used in indoor and outdoor household energy storage battery management, such as solar energy storage, wind energy storage and other forms of micro-grid energy storage and other energy storage applications.

2. 功能特性 Function Features

2.1 电芯和电池包电压检测 Cell and Battery Pack Voltage Detection

电芯和电池包过压、低压告警及过压、欠压保护。电芯的电压检测精度在 -10°C 至 50°C 条件下为 $\pm 5\text{mV}$ ，其它条件下为 $\pm 10\text{mV}$ 。

Overvoltage, low-voltage warning and over-voltage and under-voltage protection of cells and battery packs. The voltage detection accuracy of the cell is $\pm 5\text{ mV}$ from -10°C to 50°C , and other conditions $\pm 10\text{mV}$.

2.2 电池包充放电电流检测 Battery Packs Charge and Discharge Current Detection

电池包充放电电流的过流告警及保护，电池包输出短路保护。持续充放电电流 100A，温升小于 50°C ，电流检测精度优于 1%。

Overcurrent alarm and protection of battery pack charge and discharge current, battery pack output short circuit protection. The continuous charge and discharge current is 100A, the temperature rise is less than 50°C , and the current detection accuracy is better than 1%.

2.3 电芯、环境及功率 MOS 温度检测 Cell Environment and MOS Temperature Detection

6 路温度监测：4 路电芯温度检测，1 路环境温度检测，1 路 MOS 温度检测，温度检测精度为 $\pm 2^{\circ}\text{C}$ 。

电芯、MOS 高温、低温告警，高温、低温保护。

环境温度高温告警。

6-channel temperature monitoring: 4-channel cell temperature detection, 1-channel ambient temperature detection, 1-channel MOS temperature detection, temperature detection accuracy of $\pm 2^{\circ}\text{C}$.

Battery, MOS high temperature, low temperature alarm, high temperature, low temperature protection.

Ambient temperature high temperature alarm.

2.4 电池容量及循环次数 Battery Capacity and Cycles

实时电池剩余容量的计算，一次完整充放电循环（触发 BMS 设置的过放，过充/满充保护）后完成对电池包总容量的学习，容量估算精度优于 5%。能自动配置和记录充放电循环次数。

安时积分和先进的电池容量计算模型（模型需要客户准确的电芯参数）实现对电池 SOC 的精确计算。

支持开路电压静态校准法、充电和放电动态校准法进行 SOC 修正。

Real-time calculation of the remaining battery capacity, a complete charge and discharge cycle (triggering the over-discharge of the BMS setting, overcharge/full charge protection) to complete the learning of the total capacity of the battery pack, the capacity estimation accuracy is better than 5%. The number of charge and discharge cycles can be automatically configured and recorded.

Ampere-hour integration and advanced battery capacity calculation models (models require accurate cell parameters for customers) enable accurate calculation of battery SOC.

SOC correction is supported by open circuit voltage static calibration method and charge and discharge dynamic calibration method.

2.5 充、放电 MOSFET 开关 Charge and Discharge MOSFET Switch

低内阻、大电流，针对逆变器应用的大容性负载开机、零切换、高充电耐压的优化设计。

Low internal resistance, high current, optimized design for large capacitive load start-up, zero switching, and high charging withstand voltage for inverter applications.

2.6 智能单体电芯的均衡 Equalization of Intelligent Cell

充电均衡策略可灵活设置，能够有效提高电池的使用时间和循环寿命。

The charge equalization strategy can be set flexibly to effectively improve battery life and cycle life.

2.7 LED 灯状态指示 LED Light Status Indication

6 个 LED 指示电池剩余容量、工作模式及告警保护状态。

6 LED indicate the remaining battery capacity, operating mode and alarm protection status.

2.8 开机、关机、复位按键 Power On, Power Off, Reset Button

弱电开关：智能的一键开关设计，关机状态时可手动开机启动系统，任何状态下时可手动关机，复位及休眠按键：非备电状态下长按按键 3-6S 可实现休眠，休闲状态下长按 3-6S 唤醒。

Weak current switch: intelligent one-key switch design, can manually turn on and start the system when it is turned off, and can be manually shut down when it is in any state,

Reset and sleep button: Long press the button 3-6S in non-backup state to sleep, and long press 3-6S to wake up in leisure state.

2.9 RS232, RS485, CAN 通讯接口 RS232, RS485, CAN Communication Port

PC 机或智能前端可通过低速 RS485 或 RS232 通信进行遥测、遥信、遥调、遥控等命令实现电池的数据监控、运行控制和参数设定。通过低速 RS485 实现电池级联的监控与管理。

逆变器或终端可以通过高速 CAN 或 RS485 通讯实现对电池状态数据的获取及自身输出的调节。

The PC or intelligent front end can realize battery data monitoring, operation control and parameter setting through low-speed RS485 or RS232 communication for telemetry, remote signaling, remote adjustment, remote control and other commands. Low-speed RS485 realizes battery cascade monitoring and management.

The inverter or terminal can realize the acquisition of battery status data and the adjustment of its own output through high-speed CAN or RS485 communication.

2.10 各项电池管理参数设置 Set of Battery Management Parameters

单体电池过欠压、电池总压过欠压、充电过流、放电过流、电芯高低温、环境高低温、均衡策略、电池串联节数、电池容量等各项电池管理参数都可以通过上位机来重新进行设定。

The battery management parameters such as over-and under-voltage of single battery, total battery over-under-voltage, charging overcurrent, discharge overcurrent, cell high and low temperature, environmental high and low temperature, balance strategy, battery series number of cells, battery capacity and so on can be reset by the upper computer.

2.11 各项功能开关控制 Switch Control of Functions

可通过上位机打开和关闭放电 MOS, 充电 MOS, 限流功能开关, 蜂鸣器告警开关, 强制休眠开关等。

It can open and close the discharge MOS, charge MOS, current limit function switch, buzzer alarm switch, forced sleep switch, etc. through the upper computer.

2.12 限流功能 Current Limiting Function

可配置 10A/20 限流模块，上位机设置充电限流模式：不限流、被动限流、主动限流。

It can be configured with 10A/20 current limiting module, and the upper computer can set the charging current limit mode: no current limit, passive current limit, and active current limit.

2.13 硬件看门狗功能 Hardware Watchdog Function

BMS 设计配有独特的硬件看门狗保护电路。保证 BMS 在条件更恶劣的环境下能安全可靠的长时间运行。

The BMS design is equipped with a unique hardware watchdog protection circuitry. Ensure that the BMS can operate safely and reliably for a long time in harsher environments.

2.14 数据存储功能 Data Storage Function

BMS 系统可以通过设置，使能系统进行运行数据的实时存储。用于系统的监控、分析与维护。

EEPROM: 最大支持 1000 条历史记录。

FLASH: 最大支持 2 万条历史记录，此大容量存储功能可选。

The BMS system can be set to enable the system to store operation data in real time, for system monitoring, analysis and maintenance.

EEPROM: Supports up to 1000 historical records.

FLASH: Supports up to 20,000 historical records, this mass storage function is optional.

2.15 系统升级功能 System Upgrade Function

BMS 系统可以通过串口（高速 RS485 通信和低速 RS485 通信）实现系统软件的在线升级。

The BMS system can realize online upgrade of the system software through the serial port (high-speed RS485 communication and low-speed RS485 communication).

2.16 干接点功能 Dry Contact Function

支持 2 路干接点输出。正常状态下，2 路干接点处于常开状态，出现异常后，相应干接点闭合。关联告警可根据客户需求定义。

干接点 1: 短路、放电过流、充放电过温、环温高低、MOS 高温、充放 MOS 故障、采样 AFE 故障、温度断线

干接点 2: 容量低（低于 5%）

Support 2 dry contact outputs. Under normal conditions, the 2-way dry contact is in the normally open state, and after an abnormality, the corresponding dry contact is closed. Associated alarms can be defined based on customer needs.

Dry contact 1: short circuit, discharge overcurrent, charge and discharge overtemperature, ambient temperature, MOS high temperature, charge and discharge MOS fault, sampling AFE fault, temperature disconnection

Dry contact 2: Low capacity (less than 5%)

2.17 加热功能 Heating Function

具有电池低温加热功能，加热电路具有二级保护功能，在加热电路异常下可彻底断开加热膜。

It has a low-temperature heating function of the battery, and the heating circuit has a secondary protection function, and the heating film can be completely disconnected under the abnormal heating circuit.

2.18 防反接功能 Anti-reverse Connection Function

具有防反接电路，当外接电源的正负极性与 BMS 的正负极性接反时，BMS 不损坏且告警并进入切断保护状态。

With anti-reverse circuit, when the positive and negative polarity of the external power supply is reversed with the positive and negative polarity of the BMS, the BMS is not damaged and alarmed and enters the cut-off protection state.

2.19 二次保护功能 Secondary Protection Function

BMS 可以在充放电 MOS 故障或单体电芯电压过高或过低时驱动脱扣器动作断开对外输出回路，达到二次保护的效果。

BMS can drive the trip device to disconnect the external output loop when the charge and discharge MOS fault or the voltage of the single cell is too high or too low, so as to achieve the effect of secondary protection.

2. 电气特性 Electrical Characteristics

3.1 电气属性 Electrical Properties

项目	Min	Type	Max	Unit
正常工作电压 Normal Operating Voltage	36	48	60	V
正常充电电压 Normal Charging Voltage	42	54	60	V
工作温度范围 Operating Temperature Range	-40	25	80	°C

工作湿度范围 Operating Humidity Range	10	-	85	%
持续充电电流 Continuous Charging Current	-	200	210	A
持续放电电流 Continuous Discharge Current	-	200	210	A
放电输出内阻 Discharge Output Internal Resistance	≤10			mΩ
正常运行功耗 Normal Operating Power Consumption	≤40			mA
休眠总功耗 Total Sleep Power Consumption	-	≤180		uA
关机总功耗 Total Shutdown Power Consumption		≤80		uA

3.2 基本功能设定 Basic Function Set

功能名称 Function Name	功能有效 Function Valid	项目列表 Item List	缺省值 Default Value	设置说明 Setting Description	备注 Remarks
充电限流 Charge Current Limit	充电限流值 Charging Current Limit Value		20A	可选 10A 或 20A Optional: 10A or 20A	
放电过流自动恢复 Discharge Overcurrent Automatically Recovery	自动恢复延时 Automatic Recovery Delay		15 mins	15 分钟后自动恢复 System automatically recovers after 15 minutes	无次数限制, 不锁定 No limit of times, no lock
电芯均衡功能	开启	待机和充电	非放电状态, 同时满足下述电压条		

Cell Equalization Function	Open	均衡 Standby and Charge Equalization	件 Non-discharge state, and meet the following voltage conditions		
		均衡开启电压 Equalization Open Voltage	3.45V	可设 Can be set	
		均衡开启压差 Equalization Open Differential Pressure	30mV	可设 Can be set	
		均衡电流 Current Equalization	-	不可设置 Can not be set	
电池容量设置 Battery Capacity Setting	电池额定满容量 Battery Rated Full Capacity		200Ah	可设 Can be set	
	电池剩余容量 Remaining Battery Capacity		120AH	可设 Can be set	
SOC 告警 SOC Alarm	开启	SOC 低告警 SOC Low Alarm	5%	可设 Can be set	
		SOC 低告警恢复 SOC low alarm is cleared	10%		
自动休眠 Automatic Sleep	休眠电压 Voltage of Sleep		3.15V	可设 Can be set	无充放电电流，无通信，最低单体电压低于限值经过设定的延时时间后自动进入休眠模式 No charge-discharge current, no communication, the lowest voltage of a single cell is lower than the limit after the set delay time automatically enters the sleep mode
	休眠延时 Delay of Sleep		1H	可设 Can be set	

满充设置 Full Charge Setting	可设 Can be set	恒压值 Constant Pressure Value	56.0 V		恒压充电时，当总体电压大于恒压值并且电流小于恒流值，BMS 会认为电池容量已经充饱，充电 MOSFET 会被切断。 During constant voltage charging, when the overall voltage is greater than the constant voltage value and the current is less than the constant current value, the BMS will consider the battery capacity to be full and the charging MOSFET will be cut off.
		恒流值 Constant Current Value	4000mA		
间歇充电 Intermittent Charging	开启	间歇充电 (待机时间)	5 天 5 Day	可设 Can be set	为保证电池容量，电池满充保护后，隔固定时间，会对电池强制恢复充电。 To ensure the capacity of the battery, after the battery is fully charged, the battery will be forcibly charged at a fixed interval.

3.3 基本参数设定 Basic Parameters Set

功能名称 Feature Name	功能有效 Function Works	项目列表 Items	缺省值 Default Value	设置说明 Setup Instructions	设置 Set Up
单体电压告警 Cell Voltage Alarm	开启 Open	过压告警电压 Overvoltage Warning Voltage	3550 mV	以下参数均可根据客户电芯要求定制。 The following parameters can be customized according to customer cell requirements.	可设 Can Be Set
	开启 Open	欠压告警电压 Undervoltage Alarm Voltage	2900 mV		可设 Can Be Set

单体过压保护 Cell Overvoltage Protection	开启 Open	过压保护电压 Overvoltage Protection Voltage	3700 mV		可设 Can Be Set
		过压保护延时 Overvoltage Protection Delay	1S		可设 Can Be Set
		过压恢复电压 Overvoltage Recovery Voltage	3380 mV		可设 Can Be Set
单体欠压保护 Cell Undervoltage Protection	开启 Open	欠压保护电压 Undervoltage Protection Voltage	2700 mV		可设 Can Be Set
		欠压保护延时 Undervoltage Protection Delay	1 S		可设 Can Be Set
		欠压恢复电压 Undervoltage Recovery Voltage	2950 mV		可设 Can Be Set
总体电压告警 Overall Voltage Alarm	开启 Open	过压告警电压 Overvoltage Warning Voltage	56.80 V		可设 Can Be Set
	开启 Open	欠压告警电压 Undervoltage Alarm Voltage	46.40 V		可设 Can Be Set
总体过压保护 Overall Overvoltage Protection	开启 Open	过压保护电压 Overvoltage Protection Voltage	58.40 V		可设 Can Be Set
		过压保护延时 Overvoltage Protection Delay	1 S		可设 Can Be Set
		过压恢复电压 Overvoltage Recovery	54.0 V		可设 Can Be Set

		Voltage			
总体欠压保护 Overall Undervoltage Protection	开启 Open	欠压保护电压 Undervoltage Protection Voltage	43.2 V		可设 Can Be Set
		欠压保护延时 Undervoltage Protection Delay	1S		可设 Can Be Set
		欠压恢复电压 Undervoltage Recovery Voltage	47.2 V		可设 Can Be Set
电芯温度告警 Cell Temperature Alarm	开启 Open	充电高温告警 Charging high Temperature Alarm	60 °C		可设 Can Be Set
		充电低温告警 Charging Low Temperature Alarm	0 °C		可设 Can Be Set
		放电高温告警 Discharge High Temperature Alarm	65 °C		可设 Can Be Set
		放电低温告警 Discharge Low Temperature Alarm	-15 °C		可设 Can Be Set
电芯温度禁充 Cell Temperature Charge-prohibited	开启 Open	充电高温保护 Charging High Temperature Protection	65 °C		可设 Can Be Set
		充电高温恢复 Charging High Temperature Recovery	55 °C		可设 Can Be Set
		充电低温保护 Charging Low Temperature Protection	-5 °C		可设 Can Be Set

		充电低温恢复 Charging Low Temperature Recovery	0℃		可设 Can Be Set
电芯温度禁放 Cell Temperature Discharge-prohibited	开启 Open	放电高温保护 Discharge High Temperature Protection	70℃		可设 Can Be Set
		放电高温恢复 Discharge High Temperature Recovery	60℃		可设 Can Be Set
		放电低温保护 Discharge Low Temperature Protection	-20℃		可设 Can Be Set
		放电低温恢复 Discharge Low Temperature Recovery	-15℃		可设 Can Be Set
环境温度告警 Ambient Temperature Alarm	开启 Open	环境高温告警 Ambient High Temperature Alarm	65℃		可设 Can Be Set
		环境低温告警 Environmental Low Temperature Alarm	-20℃		可设 Can Be Set
环境温度保护 Ambient Temperature Protection	可设 Can Be Set	环境高温保护 Ambient High Temperature Protection	70℃		可设 Can Be Set
		环境高温保护恢复 Ambient High Temperature Protection Recovery	65℃		可设 Can Be Set
		环境低温保护 Environmental Low	-25℃		可设 Can Be Set

		Temperature Protection			
		环境低温保护恢复 Environmental Low Temperature Protection Recover	-20 °C		可设 Can Be Set
功率高温告警 Power High Temperature Alarm	开启 Open	功率高温告警 Power High Temperature Alarm	100 °C		可设 Can Be Set
功率高温保护 Power High Temperature Protection	开启 Open	功率高温保护 Power High Temperature Protection Recovery	110 °C		可设 Can Be Set
		功率高温保护恢复 Power High Temperature Protection Recovery	85 °C		可设 Can Be Set
充电过流告警 Charging Overcurrent Alarm	开启 Open	充电告警电流 Charging Alarm Current	205 A		可设 Can Be Set
充电过流保护 Charging Overcurrent Protection	开启 Open	充电保护电流 Charging Protection	210 A		可设 Can Be Set
		充电过流延时 Charging Overcurrent Delay	5 S		可设 Can Be Set
放电过流告警 Discharge Overcurrent Alarm	开启 Open	放电告警电流 Discharge Alarm Current	205 A		可设 Can Be Set
放电过流保护 Discharge Overcurrent	开启 Open	放电保护电流 Discharge Protection	210 A		可设 Can Be Set

		放电过流延时 Discharge Overcurrent Delay	10 S		可设 Can Be Set
二级过流保护 Secondary Overcurrent Protection	开启 Open	二级保护电流 Secondary Protection Current	≥250 A		可设 Can Be Set
		二级过流延时 Secondary Overcurrent Delay	500 ms		可设 Can Be Set

3.4 LED 指示灯定义 LED Indicator Light Definition

待加入图片









3.4.1 容量指示 Capacity Indication









状态	充电						放电					
容量指示灯	L1 ●	L2 ●	L3 ●	L4 ●	L5 ●	L6 ●	L1 ●	L2 ●	L3 ●	L4 ●	L5 ●	L6 ●
0~16.6%	常亮	灭	灭	灭	灭	灭	常亮	灭	灭	灭	灭	灭
16.6~33.2%	常亮	常亮	灭	灭	灭	灭	常亮	常亮	灭	灭	灭	灭
33.2~49.8%	常亮	常亮	常亮	灭	灭	灭	常亮	常亮	常亮	灭	灭	灭
49.8~66.4%	常亮	常亮	常亮	常亮	灭	灭	常亮	常亮	常亮	常亮	灭	灭
66.4~83.0%	常亮	常亮	常亮	常亮	常亮	灭	常亮	常亮	常亮	常亮	常亮	灭
83.0~100%	常亮	常亮	常亮	常亮	常亮	常亮	常亮	常亮	常亮	常亮	常亮	常亮

State	Charge						Discharge					
Capacity Indicator	L1 ●	L2 ●	L3 ●	L4 ●	L5 ●	L6 ●	L1 ●	L2 ●	L3 ●	L4 ●	L5 ●	L6 ●
0~16.6%	On	Off	Off	Off	Off	Off	On	Off	Off	Off	Off	Off
16.6~33.2%	On	On	Off	Off	Off	Off	On	On	Off	Off	Off	Off
33.2~49.8%	On	On	On	Off	Off	Off	On	On	On	Off	Off	Off
49.8~66.4%	On	On	On	On	Off	Off	On	On	On	On	Off	Off
66.4~83.0%	On	On	On	On	On	Off	On	On	On	On	On	Off

83.0~100%	On	On	On	On	On	On	On	On	On	On	On	On
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3.4.2 状态指示 Status Indication

系统状态	正常/告警/保护	RUN	ALM	电量 LED						说明
										
关机	休眠	灭	灭	全灭						
待机	正常	闪烁 1	灭	依据电量指示						待机状态
	告警	闪烁 1	灭							温度告警 ALM 闪 3
充电	正常	闪烁 2	灭							
	告警 (不含温度)	闪烁 2	灭							温度告警 ALM 闪 3
	过充保护	闪烁 1	灭							过充保护 ALM 灭
	过温、欠温、过流保护	闪烁 1	闪烁 2							
	限流充电	常亮	灭							
放电	正常	常亮	灭							
	告警	常亮	闪烁 3							放电过流告警 ALM 灭
	过放保护	闪烁 1	灭							过放保护 ALM 灭
	过温、欠温、过流、短路、反接保护	闪烁 1	闪烁 2							
失效	故障	灭	常亮	全灭						故障指 BMS 电压采样器件、充电 MOS 损坏，温度传感器断线等硬件故障

System Status	Normal/Alarm/Protect	RUN	Alpine Pasture	Power LED						Illustrate
										
Shut Down	Sleep	Off	Off	All Off						
Standby	Normal	Flashing 1	Off	According to the power indicator						Standby
	Alarm	Flashing 1	Off							Temperature Alarm ALM flash 3
Charge	Normal	Flashing 2	Off							

	Alarms (excluding temperature).	Flashing 2	Off		Temperature alarm ALM flash 3
	Overcharge Protection	Flashing 1	Off		Overcharge protects ALM off
	Over-temperature, Under-temperature, Over-current Protection	Flashing 1	Flashing 2		
	Current-limiting Charging	On	Off		
Discharge	Normal	On	Off		
	Alarm	On	Flashing 3		Discharge Overcurrent Alarm ALM off
	Over-discharge Protection	Flashing 1	Off		Overdischarge Protects ALM Off
	Over-temperature, Under-temperature, Over-current, Short Circuit, Reverse Connection Protection	Flashing 1	Flashing 2		
Lapse	Fault	Off	On	All Off	Fault refers to hardware failures such as damage to BMS voltage sampling devices, charging MOS, and disconnection of temperature sensors

3.4.3 闪烁说明 Flashing Instructions

闪动方式	亮	灭
闪烁 1	0.25 S	3.75 S
闪烁 2	0.5 S	0.5 S
闪烁 3	0.5 S	1.5 S

Flash Mode	On	Off
Flashing 1	0.25 S	3.75 S
Flashing 2	0.5 S	0.5 S
Flashing 3	0.5 S	1.5 S

4. 工作模式 Working Mode

4.1 基本模式 Basic Mode

4.1.1 充电模式 Charging Mode

BMS 在检测到外部有充电电压且 $\geq 48V$ ，同时电芯电压及温度均在可充电范围内时，开启充电 MOSFET 进行充电。充电电流达到有效充电电流时，进入充电模式。充电模式下充、放电 MOSFET 都导通。

When the BMS detects an external charging voltage that is $\geq 48V$, and the cell voltage and temperature are within the rechargeable range, it turns on the charging MOSFET for charging. When the charging current reaches the effective charge current, it enters charging mode. Both charging and discharging MOSFETs are turned on in charge mode.

4.1.2 放电模式 Discharge Mode

BMS 在检测到负载连接且电芯电压及温度在可放电范围内，放电电流达到有效放电电流时进入放电模式。放电模式下充放电 MOS 都导通。

The BMS enters discharge mode when it detects that the load is connected and the cell voltage and temperature are within the dischargeable range, and the discharge current reaches the effective discharge current. The charge and discharge MOS are all on in discharge mode.

4.1.3 待机模式 Standby Mode

以上两种模式都不满足时，进入待机模式。

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

4.1.4 休眠模式 Sleep Mode

进入休眠的条件：

- 1) 电池触发欠压保护后 30MIN;
- 2) 到设定的休眠电压和休眠延时后;
- 3) 执行按键休眠或执行上位机休眠命令，BMS 进入休眠模式。

Conditions for entering hibernation:

- 1) 30 min after battery trigger undervoltage protection,
- 2) After the set sleep voltage and sleep delay,
- 3) Execute the button to sleep or execute the host computer sleep command, and the BMS enters sleep mode.

4.1.5 关机模式 Shutdown Mode

断开弱电开关，BMS 进入关机模式，只能通过闭合弱电开关开机。

Disconnect the flea current switch, BMS enters the shutdown mode, and can only be turned on by closing the flea current switch.

4.2 蜂鸣器 (Buzzer) 动作说明 Description of Buzzer

故障时：

蜂鸣器功能可通过上位机使能或禁止，出厂默认是禁止的。

In the event of a failure:

The buzzer function can be enabled or disabled by the host computer, and the factory default is disabled.

4.3 复位键按键说明 Reset Key Description

BMS 处于休眠状态时，按下按键 3S 后松开，保护板被激活，LED 指示灯从“L1”开始依次点亮 0.5 秒，后根据 BMS 检测电池状态显示。

BMS 处于激活状态时，按下按键 3S 后松开，保护板被休眠，LED 指示灯从“RUN”依次点亮 0.5 秒，后全部熄灭
BMS 处于休眠或开机状态时，按下按键 10S 后松开，保护板被复位。LED 灯先全闪 0.5S 一次后从“L1”依次点亮 0.5 秒。

When the BMS is asleep, press the button 3S and release, the protection board is activated, and the LED indicator lights up sequentially for 0.5 seconds from "L1", and then according to it BMS detects the battery status display.

When the BMS is active, press the button 3S and release, the protection board is asleep, and the LED indicator lights up sequentially from "RUN" for 0.5 seconds, and then all go out

When the BMS is in sleep or powered on, press the button 10S and release it, and the protection board is reset. The LED light flashes all 0.5S once and then lights up sequentially from "L1" for 0.5 seconds.

4.4 休眠及唤醒 Sleep and Wake-up

4.4.1 休眠 Sleep

当满足以下任意一条件时，系统进入低功耗模式：

- 1) 单体电压低于 3.3V，持续 60 分钟后进入休眠。（无充放电、无通讯）
- 2) 按下按键达 3 秒钟后松开按键。
- 3) 通过上位机软件强制关机。
- 4) 最低单体电压低于单体过放保护值或者总压低于总体过放保护值，30 分钟后，进入欠压休眠。

The system enters a low-power mode when any of the following conditions are true:

- 1) The cell voltage is lower than 3.3V, and it goes into sleep after 60 minutes. (No charge and discharge, no communication).
- 2) Press the button for 3 seconds and release the button.
- 3) Force shutdown through the upper computer software.
- 4) The minimum cell voltage is lower than the monomer overdischarge protection value or the total voltage is lower than the overall overdischarge protection value, and after 30 minutes, it enters undervoltage sleep.

4.4.2 唤醒 Wake-up

当系统处于低功耗模式，满足以下任意一条件时，系统将退出低功耗模式，进入正常运行模式：

- 1) 接入充电器，充电器输出电压需大于等于 48V。（由于 PCS 储能逆变器电源停电并且电池过放引起的休眠，在 PCS 储能逆变器通电源恢复正常后，充电器输出电压大于等于 48V 时，系统退出低功耗模式）
- 2) 按下按键 3S，松开按键后。
- 3) 接入 RS232 通讯线，开启上位机软件。

当系统定义为充电结束后，待机 2 天（时间可设）后仍未达到恢复电压，强制充电至再次充电结束。

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

- 1) Connect to the charger, the output voltage of the charger should be greater than or equal to 48V. (Due to sleep caused by PCS energy storage inverter power failure and battery overdischarge, the system exits the low-power mode when the charger output voltage is greater than or equal to 48V after the PCS energy storage inverter power returns to normal.)

2) Press button 3S and release the button.

3) Connect to the RS232 communication line and turn on the upper computer software.

When the system is defined as after the end of charging, the recovery voltage is not reached after 2 days of standby (time can be set), and the charging is forced until the end of recharging.

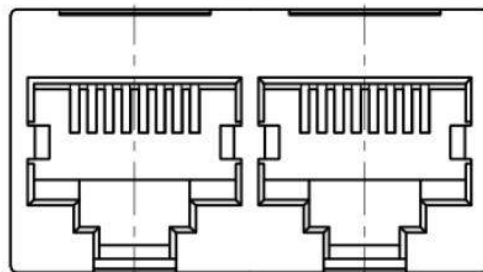
5 通讯 Communications

具有与上位机通讯的 RS232 接口;具有 BMS 组内并联通信 RS485 接口, 可以进行多机并联通讯; 具有与逆变器或终端通讯的 RS485 和 CAN 接口
通讯规范需参考通讯协议说明书。

RS232 interface with communication with upper computer; With RS 485 interface for parallel communication in BMS group, multi-machine parallel communication can be carried out; RS485 and CAN interface for communication with inverters or terminals.

Communication specifications should refer to the communication protocol manual.

5.1 接口图示 Interface Diagram

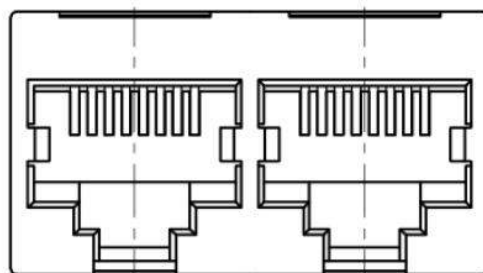


CAN 和 RS485 接口

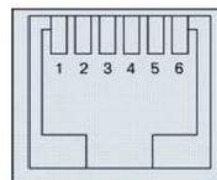


1 2 3 4

干接点



并联通讯端口



RS232 通讯接口

5.2 电气接口定义 Electrical Interface Definition

RS232--采用 6P6C 立式 RJ11 插座	
RJ11 引脚	定义说明
2	NC
3	TX (单板)
4	RX (单板)
5	GND

RS485--采用 8P8C 立式 RJ45 插座		CAN--采用 8P8C 立式 RJ45 插座	
RJ45 引脚	定义说明	RJ45 引脚	定义说明
1、8	RS485-B1	9、10、11、14、16	NC
2、7	RS485-A1	12	CANL
3、6	GND	13	CANH
4、5	NC	15	GND

CAN 和 RS485 接口

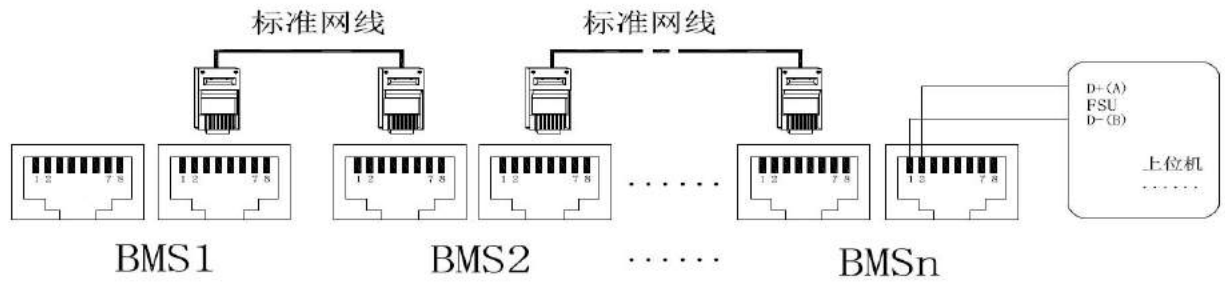
RS485--采用 8P8C 立式 RJ45 插座		RS485--采用 8P8C 立式 RJ45 插座	
RJ45 引脚	定义说明	RJ45 引脚	定义说明
1、8	RS485-B	9、16	RS485-B
2、7	RS485-A	10、15	RS485-A
3、6	GND	11、14	GND
4、5	NC	12、13	NC

并联通讯端口

5.3 并机接口 Parallel Interface

BMS 电池包间通过 RS485 总线并联通讯，亦可与具有 RS485 总线的设备通讯，而 RS232 接口实现与 PC 或者其它智能终端通讯，人机交互 RS485 总线所并联的任一电池包信息，多机并联总线接口见下图所示。

The BMS battery pack communicates in parallel via the RS485 bus, and can also communicate with devices with the RS485 bus. The RS232 interface realizes communication with PC or other intelligent terminals, and the human-computer interaction RS485 bus is. The information of any battery pack connected in parallel, the multi-machine parallel bus interface is shown in the figure below.






5.4 地址拨码开关 Address DIP Switch

支持四位或六位拨码。




Supports four- or six-digit dialing.

5.4.1 拨码设置 Dialing Settings

(1) 在进行多机并联通讯操作时，需要先进行各 PACK 的拨码地址配置。拨码采用 BCD 码格式，地址为 0 的定义为  ON (黑点是 0 FF 状态，空白是 ON 状态，以下同)，地址 1  OFF，地址 2  OFF，其他地址以此类推。

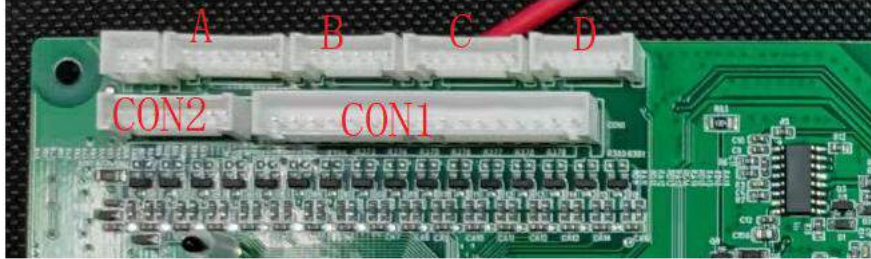
(2) 主机需要拨为 0，从机拨为 1-15。

(1) When multiple machines communicate in parallel, you need to configure the DIP address of each PACK first. Dip

code adopts BCD code format. Address 0 is defined as  ON (black dot is 0 FF state, blank is ON state, the same as below) address 0 and address 1  OFF, Address 2,  OFF binary, other addresses and so on.

(2)The master needs to dial 0 and the slave dial 1-15.

6 接口描述 Interface Description



6.1 接口定义 Interface Definition

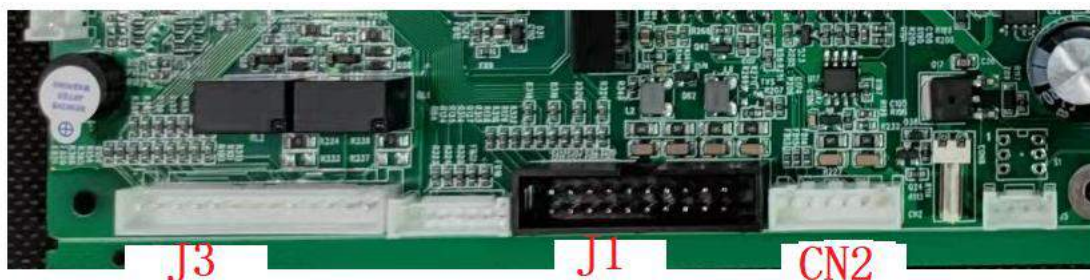
主板正面包含 4 个传统的 7P, 6P, 7P, 6P, 2.0mm 间距插座 A, B, C, D 用于采集 16 路电芯电压和 4 路电芯温度，也可使用具有物理防呆的 17P+8P, 2.5mm 间距的 CON1, CON2 插座。从左到右依次：

The front of the motherboard contains 4 traditional 7P, 6P, 7P, 6P, 2.0mm pitch sockets A, B, C, D for collecting 16 cell voltages and 4 cell temperatures, and can also be used with physical foolproof 17P+8P, 2.5mm pitch CON1, CON2 socket. From left to right:

管脚 Pins				标识 logotype	定义 definition
A	J2-1	CON2	CON2-1	NT1	
	J2-2		CON2-2	GND	
	J2-3	CON1	CON1-1	B0	
	J2-4		CON1-2	B1	
	J2-5		CON1-3	B2	
	J2-6		CON1-4	B3	
	J2-7		CON1-5	B4	
B	J4-1	CON2	CON2-3	NT2	
	J4-2		CON2-4	GND	
	J4-3	CON1	CON1-6	B5	
	J4-4		CON1-7	B6	
	J4-5		CON1-8	B7	
	J4-6		CON1-9	B8	
C	J5-1	CON2	CON2-5	NT3	
	J5-2		CON2-6	GND	
	J5-3			B8	

	J5-4	CON1	CON1-10	B9	
	J5-5		CON1-11	B10	
	J5-6		CON1-12	B11	
	J5-7		CON1-13	B12	
D	J6-1	CON2	CON2-7	NT4	
	J6-2		CON2-8	GND	
	J6-3	CON1	CON1-14	B13	
	J6-4		CON1-15	B14	
	J6-5		CON1-16	B15	
	J6-6		CON1-17	B16	

6.2 主板上的转接板接口定义 Interposer Board Interface Definition on the Motherboard



J3 从左到右依次定义 J3 is defined from left to right as:

管脚	定义	管脚	定义
J3-1	3.3V	J3-8	LED8 (容量指示 6 绿)
J3-2	扩展 I/O 未定义	J3-9	LED7 (容量指示 5 绿)
J3-3	扩展 I/O 未定义	J3-10	COM2 (干接点 2)
J3-4	GND	J3-11	N02 (干接点 2)
J3-5	K6 (预留拨码 6)	J3-12	COM1 (干接点 1)
J3-6	K5 (预留拨码 5)	J3-13	N01 (干接点 1)
J3-7	LED9 (预留状态指示绿)		

Pins	Definition	Pins	Definition
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J3-1	3.3V	J3-8	LED8 (capacity indication 6 green).
J3-2	Extended I/O is undefined	J3-9	LED7 (capacity indication 5 green).
D 3-3	Extended I/O is undefined	J3-10	COM2 (dry junction 2).
D 3-4	GND	J 3-11	NO2 (dry junction 2).
J 3-5	K6 (reserved dial code 6).	J 3-12	COM1 (dry junction 1).
J 3-6	K5 (reserved dial code 5).	J 3-13	NO1 (dry junction 1).
D 3-7	LED9 (reserved status indicates green).		

J1 第一排从左到右，第二排从左到右 J1 first row from left to right, second row from left to right:

管脚	定义	管脚	定义
J1-1	LAMP1 (运行指示绿)	J1-11	NRST
J1-2	LAMP2 (告警指示红)	J1-12	ACT 弱电开关按键
J1-3	LAMP3 (容量指示 1 绿)	J1-13	K4
J1-4	LAMP4 (容量指示 2 绿)	J1-14	K3
J1-5	LAMP5 (容量指示 3 绿)	J1-15	K2
J1-6	LAMP6 (容量指示 4 绿)	J1-16	K1
J1-7	GND (RS485 和 CAN 通信地)	J1-17	GND (RS485 和 CAN 通信地)
J1-8	1-RS485-A	J1-18	1-RS485-B
J1-9	GND (系统非隔离地)	J1-19	GND (系统非隔离地)
J1-10	CAN-H	J1-20	CAN-L

Pins	Definition	Pins	Definition
D 1-1	LAMP1 (running indicator green).	J 1-11	NRST
J 1-2	LAMP2 (Alarm Indicator Red).	J 1-12	ACT flea current switch button
D 1-3	LAMP3 (capacity indication 1 green).	J 1-13	K4
D 1-4	LAMP4 (capacity indication 2	J 1-14	K3

	green).		
J 1-5	LAMP5 (capacity indication 3 green).	J 1-15	K2
J 1-6	LAMP6 (capacity indication 4 green).	J 1-16	K1
J 1-7	GND (RS485 and CAN communication place).	J 1-17	GND (RS485 and CAN communication place).
J 1-8	1-RS485-A	J 1-18	1-RS485-B
J 1-9	GND (System Non-Isolated Ground).	J 1-19	GND (System Non-Isolated Ground).
D 1-10	CAN-H	J 1-20	CAN-L

CN2 从左到右 CN2 from left to right:

管脚	定义	管脚	定义
CN2-1	GND	CN2-4	RS-RX (RS232 通信 RX)
CN2-2	GND	CN2-5	2-RS485-A
CN2-3	RS-TX (RS232 通信 TX)	CN2-6	2-RS485-B

Pins	Definition	Pins	Definition
CN2-1	GND	CN2-4	RS-RX (RS232 Communication RX).
CN2-2	GND	CN2-5	2-RS485-A
CN2-3	RS-TX (RS232 通信 TX)	CN2-6	2-RS485-B

6.3 上下电顺序 (重要) Power-on and Power-off Sequence (IMPORTANT).

上电务必遵守顺序：先连接主板 B-，再接 B+，依次接排线 E，F (或 A, B, C, D) 最后再连接 P-、P+ 到负载或充电器。

下电顺序则完全相反：先断开充电器或负载，依此断开 F，E (或 D, C, B, A) 排线，再断开 B+，再到 B-。

Power-on must follow the order: first connect the motherboard B-, then B+, and then connect the cables E, F (or A, B, C, D). Then connect P-, P+ to the load or charger.

The order of the power-off is completely opposite: first disconnect the charger or load Disconnect the F, E (or D, C, B, A) cable, and then disconnect it again B+, then B-.

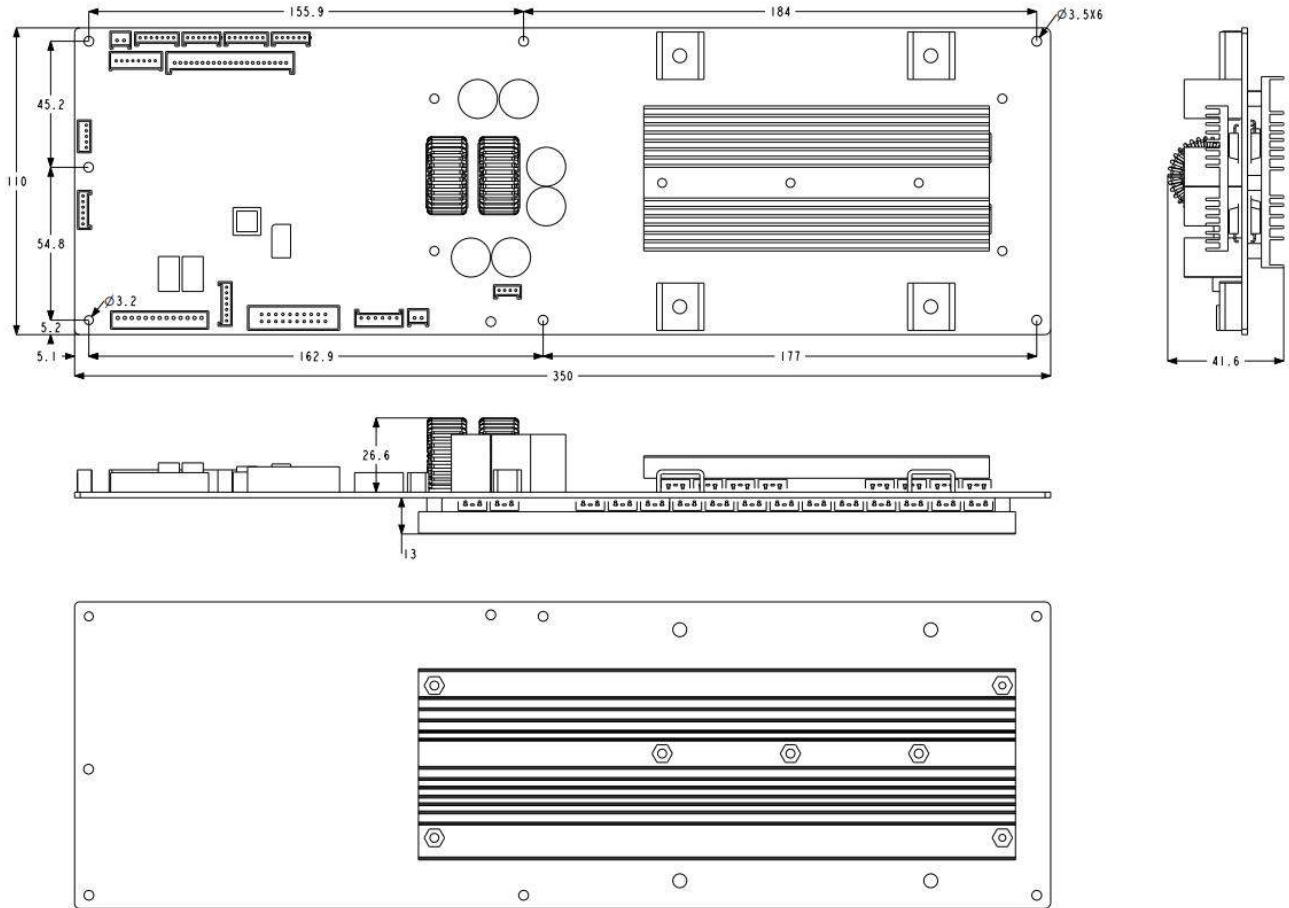
6.4 干接点 Dry Contacts



1 2 3 4

干接点 Dry contact	干接点 1 (Pin1 to Pin2) :短路保护、放电过流保护、充放电过温保护、环温高低保护、MOS 高温保护、充放 MOS 故障保护、采样 AFE 故障、温度断线 Dry contact 1 (Pin1 to Pin2): short circuit protection, discharge overcurrent protection, charge and discharge overtemperature protection, ambient temperature high and low protection, MOS high temperature protection, charge and discharge MOS fault protection, sampling AFE Fault, temperature disconnection.
	干接点 2 (Pin3 to Pin4) :容量低 (<5%) Dry contact2 (Pin3 to Pin4) :Low capacity (<5%)

7 板框尺寸 Board Frame Size



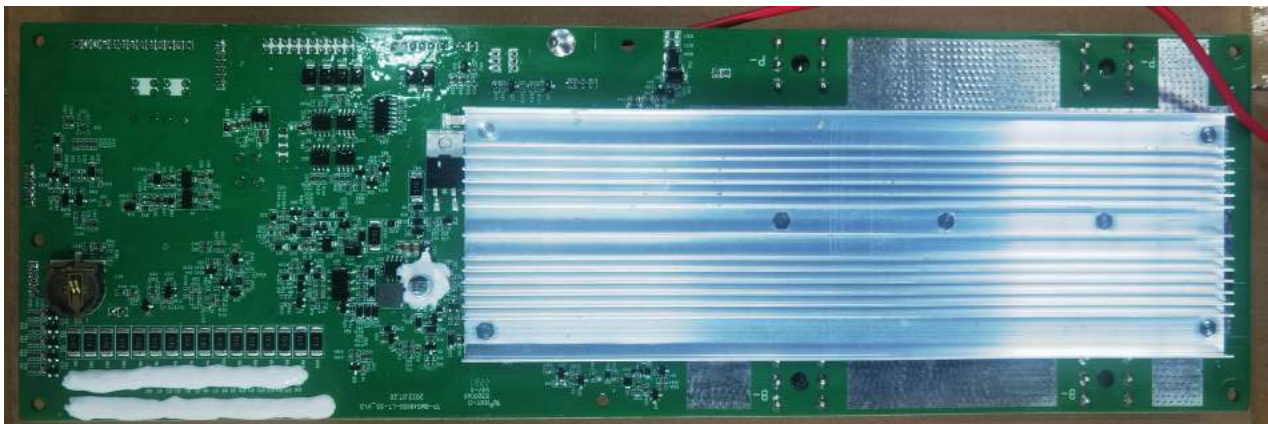
8 PCBA 技术指标 PCBA Specifications

8.1 PCBA 指标 PCBA Indicators

PCB 板尺寸 (mm) PCB Board Size (mm).	主板: 350.0mm*110.0mm*2.0mm (长*宽*厚) 接口板尺寸: 158*45*1.6mm (长*宽*厚) Main Board: 350.0mm*110.0mm*2.0mm(L*W*H) Interface Board: 158*45*1.6mm(L*W*H)
尺寸公差 (mm) Dimensional Tolerance (mm).	长宽 ± 0.2 mm, 板厚 ± 0.2 mm Length and Width ± 0.2 mm, Plate Thickness ± 0.2 mm
板材 Plate	FR-4
丝印 Silk Screening	白丝印, 覆绿油 White silk screen, covered with green oil

铜箔厚度 Copper Foil Thickness	主板: 20Z; 接口板: 10Z; Motherboard: 20Z; Interface Board: 10Z;
板面处理 Panel Treatment	无铅喷锡 Lead-free tin spraying
过孔 Vias	阻焊, 覆绿油塞孔 Solder mask, covered with green oil plug holes
边缘 Edge	电脑铣边 Computer edge milling
产品尺寸 (mm) Product Size	主板: 350.0mm*110.0mm*40.0mm (长*宽*高) Main Board: 350.0mm*110.0mm*40.0mm(L*W*H).
产品尺寸公差 (mm) Product Dimensional Tolerance (mm).	长宽±0.2mm, 板厚±0.2mm, 高度±2mm Length and Width± 0.2mm, Plate Thickness± 0.2mm, Height ±2mm

9 BMS 实物图 BMS Physical Image





备注：实际产品与上述参考实物图可能存在一定差异，图片仅供参考；

Note: There may be certain differences between the actual product and the above reference physical picture, and the pictures are for reference only.

10 上位机系统 Upper Computer System

提供上位机软件支持，监控平台可通过 RS232 接口直接与 BMS 通讯，能够获得实时的电池电压、电流、温度、状态、SOC 等信息。上位机通过 RS485 级联访问不同电池系统的监控实时数据和历史数据。可以进行配置参数的导入与导出。可以保存监控相关数据到报表等。

Provide upper computer software support, the monitoring platform can communicate directly with the BMS through the RS232 interface, and can obtain real-time battery voltage, current, temperature, status, SOC and other information. The upper computer accesses the monitoring real-time data and historical data of different battery systems through RS485 cascade. You can import and export configuration parameters. You can save monitoring-related data to reports, etc.

11 组装及使用注意事项 Precautions for Assembly and Use

(1) 接电下电，必须按上下电顺序操作。

(2) 连接电池包时，切勿接错甚至反接，连接不上上位机，或者线路板上主要芯片发热明显，请迅速下电，此时线路板可能已经不良，需更换维修。

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- (3) 组装时严禁线头、焊锡等碰触线路板元件，万一碰触有可能损伤线路元件，造成不良。
 - (4) 严格遵循规格书要求的设计参数要求，否则可能损坏线路板。
 - (5) 使用中注意防潮、防水、防静电。

- (1) Power-on and power-off, it must be operated in the order of power on and off.
- (2) When connecting the battery pack, do not connect the wrong or even reverse, can not connect to the host computer, or the main chip on the circuit board is obviously hot, please power off quickly, at this time the circuit board may be defective, need to replace and repair.
- (3) It is strictly forbidden to touch the circuit board components such as wire head, solder, etc. during assembly, in case of touching, the line components may be damaged and cause defects.
- (4) Strictly follow the design parameters required by the specification, otherwise the circuit board may be damaged.
- (5) Pay attention to moisture-proof, waterproof and anti-static during use.