Specification

Customer Name				
Customer Model				
Customer Number				
Model	**P16S100A-PC1447-20A-K4EN-ZJ**			
Revision	**1.0**			
DATE	**2021-08-07**			
Parts list	**Number**	**Designation**	**Model**	**Quantity**
	1	Sampling wire	#1-700mm-7P-2.0S-tin-REV1.0	1
	2	Sampling wire	#2-700mm-6P-2.0S-tin-REV1.0	1
	3	Sampling wire	#3-700mm-7P-2.0S-tin-REV1.0	1
	4	Sampling wire	#4-700mm-6P-2.0S-tin-REV1.0	1
	5	B+	3.5P-245mm-tin-16AWG-REV1.0	1
	6	screw	M5*10	4
	7	Connecting wire	6P-300mm-6P-2.54X-REV1.0	1
	8	Connecting wire	10P(2.0S)-300mm-10P(2.54X)-REV1.0	1
	9	Connecting wire	10P*2-300mm-10P*2-2.54S-REV1.0	1
	10	Switch	420mm-2P-2.5S-SW-REV1.0	1
	11	Dry contact	2EDG381-4K	1
PACE BMS			**Customer**	
Prepared by:	**Zhong**		**Checked by:**	
Checked by:	**Mo**		**Approved by:**	

Configuration table

Function	storage	☐NO ☑storage 400items ☐storage ____items	
	Charging current limit	☐NO ☐5A ☐10A ☑20A ☐___A	
		Definition: Default off, charging current ⩾100A on.	
	LCD	☐NO ☐CNZN ☑ENZN ☐ _____	
	Dry contact	☐NO ☑YES	
		Definition: pin1 to pin2 Normally open, low battery closed; pin3 to pin4 Normally open, closed during fault protection.	
	Heating film	☐NO ☑YES	
		Definition: The temperature is lower than 0 degrees to turn on the heating; the temperature is higher than 15 degrees to turn off the	
	Reverse Connection	☑NO ☐YES	
	Weak switch	☐NO ☑YES	
	Buzzer	☐NO ☑YES	
	GPS	☑NO ☐YES ____	
	Sampling socket	☑Vertical ☐Horizontal	
	Battery	☐50AH ☑100AH ☐150AH ☐____AH	
	bar code	☑PACE ☐Neutral ☐____	
	Special functions	1	Pre-charge function 30000uF.
		2	
Communication	communication interface	☑RS232 ☑RS485 ☑ Parallel dual RS485 ☑CAN	
	upgrade way	☑RS232	
	Transmission Control Protocol	☑ PACE RS232 communication protocol (PACE-RS232-TY16S)-20180705 ☑ PACE RS485 communication protocol (PACE-RS485-MS)-20180615 ☑ PACE BMS Modbus Protocol for RS485 V1.3(2017-06-27) ☑ PACE CAN communication protocol(PACE-CAN-TY)-20161216	

Change History

Date	Rev	Revision note	Prepared by	Checked by
2021-08-07	1.0	New issue.	Zhong	Mo

目录

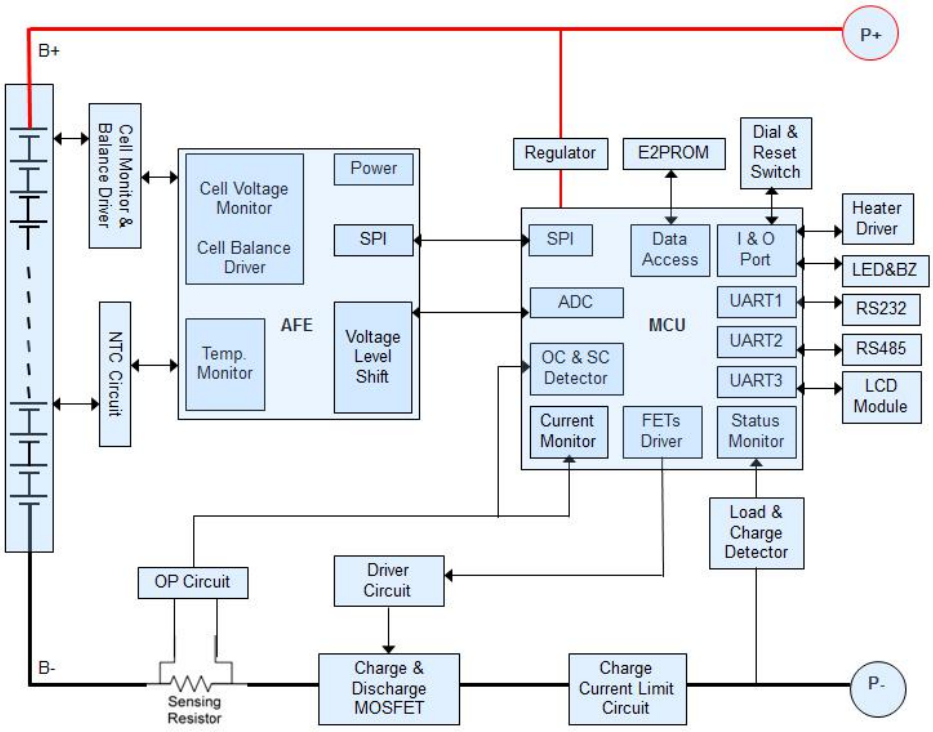
1. Summary

With the wide application of lithium iron battery in household energy storage industry, the requirements of high performance, high reliability and high cost performance are put forward for battery management system. This product is a BMS specially designed for household energy storage batteries, which can be widely used in household energy storage

2. Functional features

- Highly integrated analog front end
- Isolated power supply circuit
- Integrated serial port IC
- High voltage accuracy (≤20mV)
- High current accuracy (≤2%@FS)
- 4-way battery temperature detection (≤2℃)
- SOC Estimation function
- SOH Estimation function
- Short circuit protection function
- Adjustable overcurrent protection
- With a variety of sleep and wake-up methods
- Low power consumption
- Dual RS485 communication
- Adjustable parameter settings
- Buzzer alarm function
- LED status indication function
- With charge equalization function
-

3. Functional Block Diagram



4. Environmental requirements

Item	Parameter	unit
Operation Temperature	- 20 ~ 75	℃
Storage Temperature	- 20 ~ 75	℃
Operation Humidity	10 ~ 85	%RH
Storage Humidity	10 ~ 85	%RH

5. Electrical Characteristics

5.1. Basic parameter setting

(Note: The following parameters shall be tested at 25℃ cyclic temperature unless otherwise specified.)

No.	Item		Factory default parameter	Could you set	Remark
1	Cell Over-charge Protection	Cell Over-charge Voltage Alarm	3600mV	Can be set	
		Cell Over-charge Voltage Protection	3700mV	Can be set	
		Cell Over-charge Protection Delay Time	1.0S	Can be set	
	Cell Over-voltage Protection Release	Cell Over-charge Protection Release voltage	3380mV	Can be set	
		Capacity Release	SOC < 96%	Can be set	
		Release Once Discharge	Discharge Current > 1A		
2	Cell Over-discharge Protection	Cell Over-discharge Voltage Alarm	2800mV	Can be set	After 30 seconds of over-discharge protection,
		Cell Over-discharge Voltage Protection	2700mV	Can be set	

		Cell Over-discharge Protection Delay Time	1.0S	Can be set	it will enter low-power mode if it still cannot recover
	Cell Over-discharge Protection Release	Cell Over-discharge Protection Release Voltage	2950mV	Can be set	
		Release when Charging	Charger Connection is detected		
3	Pack Over-charge Protection	Pack Over-charge Voltage Alarm	57.6V	Can be set	
		Pack Over-charge Voltage Protection	58.4V	Can be set	
		Pack Over-charge Protection Delay Time	1.0S	Can be set	
	Overall Over-voltage Protection Release	Pack Over-charge Protection Release Voltage	54V	Can be set	
		Capacity Release	SOC < 96%	Can be set	
		Release Once Discharge	Discharge Current > 1A		
4	Pack Over-discharge Protection	Pack Over-discharge Voltage Alarm	44.8V	Can be set	Over-discharge protection after 30 seconds, still can not recover, will enter the low power mode
		Pack Over-discharge Voltage Protection	43.2V	Can be set	
		Pack Over-discharge Protection Delay Time	1.0S	Can be set	
	Pack Over-discharge Protection Release	Pack Over-discharge Protection Release Voltage	47.2V	Can be set	
		Release Once Charge	Charger Connection is detected		

5	Charging current limit function	Charging current limit	20A		Current opening can be set, the maximum opening current value is 100A
6	Over-current Charge Protection	Over-current Charge Alarm	105A	Can be set	After 10 times, the state will be locked and no longer automatically release
		Over-current Charge Protection	110A	Can be set	
		Over-current Protection Delay Time	1.0S	Can be set	
	Over-current Charge Protection Release	Auto Release	Auto release after 1 min		
		Release Once Discharge	Discharge Current > 1A		
7	Over-current-1 Discharge Protection	Over-current-1 Discharge Alarm	105A	Can be set	After 10 times, the state will be locked and no longer automatically release
		Over-current-1 Discharge Protection	110A	Can be set	
		Over-current Protection Delay Time	1.0S	Can be set	
	Over-current-1 Discharge Protection Release	Auto Release	Auto release after 1 min		
		Release Once Charge	Charge Current > 1A		
8	Over-current-2 Discharge	Over-current-2 Discharge Protection	≥150A	Can be set	After 10 times, the state will be

		Over-current-2 Protection Delay Time	100mS	Can be set	locked and no longer automatically release
	Over-current-2 Protection Release	Auto Release	Auto release after 1 min		
		Release Once Charge	Charge Current > 1A		
9	Short Circuit Protection	Short Circuit Protection Function	≥350A		
		Short Circuit Current Protection Delay Time	≤300μs		
		Short Circuit Current Protection Release	When there is charging, the short circuit protection is lifted		
			When the load is removed, it will be removed automatically		
10	MOS Over -Temperature Protection	MOS Over Temperature Alarm	90℃	Can be set	
		MOS Over Temperature Protection	115℃	Can be set	
		MOS Over Temperature Protection Release	85℃	Can be set	
11	Cell Temperature Protection	Under Temperature Charge Alarm	0℃	Can be set	
		Under Temperature Charge Protection	-5℃	Can be set	
		Under Temperature Charge Protection Release	0℃	Can be set	
		Over Temperature Charge Alarm	60℃	Can be set	
		Over Temperature Charge Protection	65℃	Can be set	

		Over Temperature Charge Protection Release	55℃	Can be set	
		Under Temperature Discharge Alarm	-15℃	Can be set	
		Under Temperature Discharge Protection	-20℃	Can be set	
		Under Temperature Discharge Protection Release	-15℃	Can be set	
		Over Temperature Discharge Alarm	65℃	Can be set	
		Over Temperature Discharge Protection	70℃	Can be set	
		Over Temperature Discharge Protection Release	60℃	Can be set	
12	ENV Temperature Alarm	ENV Under Temperature Alarm	-15℃	Can be set	
		ENV Under Temperature Protection	-20℃	Can be set	
		ENV Under Temperature Protection Release	-15℃	Can be set	
		ENV Over Temperature Alarm	65℃	Can be set	
		ENV Over Temperature Protection	75℃	Can be set	
		ENV Over Temperature Protection Release	65℃	Can be set	
13	Consumption Current	Operation Mode	≤40mA （ with LCD ）		
			≤35mA （ without LCD ）		
		Low Power Mode	≤150μA		
14	Cell Balance	Balance Threshold	3500mV	Can be set	
		ΔVcell	30mV	Can be set	
15	Capacity default	Low power alarm	SOC < 5%	Can be set	No alarm

	Settings				when charging
16	Sleep	sleep voltage	3150mV	Can be set	
		Delay time	5min	Can be set	
17	Cell failure protection	ΔVcell	Δcell > 1V	Do not set	Charging and discharging is not allowed
18	Filled judgment	Full charge pressure	> 56V	Can be set	
		Cut-off current	< 2A	Can be set	

5.2. LED Instructions

Table 1 LED Working status indication

State	Normal / Alarm / Protection	ON/ OFF	RUN	ALM	SOC Indication LEDs						Instructions
		●	●	●	●	●	●	●	●	●	
Power Off	Sleep	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	All off
Standby	Normal	ON	flash1	OFF	Indication by SOC						Standby
	Alarm	ON	flash1	Flash3							Cell low voltage
Charge	Normal	ON	ON	OFF	Indication by SOC (The top SOC Led Flash 2)						Maximum power LED flash(flash 2),ALM does not flash for over-charge warning
	Alarm	ON	ON	Flash3							
	Over Charge Protection	ON	ON	OFF	ON	ON	ON	ON	ON	ON	If no mains supply, LED as standby
	Temperature. Over-current	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	Close charge

	Fault Protection										
Discharge	Normal	ON	Flash3	OFF	Indication by SOC						
	Alarm	ON	Flash3	Flash3							
	Under-voltage Protection	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	Close discharge
	Temperature. Over-current. Short Circuit Fault Protection	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	Close discharge
Fault		OFF	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	Close charge Close discharge

Table2 Capacity indication

State		Charge						Discharge					
Capacity indicator light		L6 ●	L5 ●	L4 ●	L3 ●	L2 ●	L1 ●	L6 ●	L5 ●	L4 ●	L3 ●	L2 ●	L1 ●
electricity (%)	0 ~ 17%	OFF	OFF	OFF	OFF	OFF	flash2	OFF	OFF	OFF	OFF	OFF	ON
	18 ~ 33%	OFF	OFF	OFF	OFF	flash2	ON	OFF	OFF	OFF	OFF	ON	ON
	34 ~ 50%	OFF	OFF	OFF	flash2	ON	ON	OFF	OFF	OFF	ON	ON	ON
	51 ~ 66%	OFF	OFF	flash2	ON	ON	ON	OFF	OFF	ON	ON	ON	ON
	67 ~ 83%	OFF	flash2	ON	ON	ON	ON	OFF	ON	ON	ON	ON	ON
	84~100%	flash2	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON	ON
Running light ●		ON						flash(flash 3)					

Table 3 LED Flash description

FLASH	ON	OFF
FLASH 1	0.25S	3.75S
FLASH 2	0.5S	0.5S
FLASH 3	0.5S	1.5S

Note：Can be enabled by the upper computer or disable the LED indicator alarm, the factory default is enabled

5.3. Buzzer Operation

Fault: Buzzing 0.25S per 1S;
Protection: Buzzing 0.25S per 2S（except for over-voltage protection）;
Alarm: Buzzing 0.25S per 3S（except for over-voltage alarm）;
Buzzer function can be controlled by the upper computer software , the default is off.

5.4. Switch Operation

When BMS sleeping, push the switch 3S~6S, BMS will be active， LED indicator light will be on for 0.5S successively from "RUN".

When BMS activating, push the switch 3S~6S, BMS will go to sleep，LED indicator light will be lit for 0.5S from the lowest power light.

When BMS activating, push the switch 6S~10S, BMS will reset， LED lights are lit for 1.5S at the same time.

After THE BMS is reset, the parameters and functions set by the upper computer are still retained. If the original parameters need to be restored, they can be achieved by the "default value of recovery" of the upper computer, but the relevant operation records and storage data remain unchanged (such as power quantity, cycle times, protection records, etc.).

5.5. Dormancy and awakening

5.5.1 Dormancy

When any of the following conditions are met, the system enters the low-power mode：

1） Cell or Pack over-discharge protection has not been released within 30s.
2） Press the button for 3S-6S and then release it.
3） The lowest monomer voltage is lower than the sleep voltage, and the duration reaches the resting delay time (at the same time, no communication, no protection, no equalization, no current).
4） Standby time more than 24 hours (without communication, no charge and discharge, no mains power).
5） Through the upper computer software forced shutdown.

Before entering hibernation, make sure there is no charger access, otherwise you will not be able to enter the low-power mode.

5.5.2 Awaken

When the system is in low-power mode and meets any of the following conditions, the system will exit low-power mode and enter normal operation mode：

1） Connect the charger, and the output voltage of the charger shall be greater than 48V.
2） Press the button (3S-6S) and release the button.
3） 232 Communication activation.

Note: After the monolithic or overall over-discharge protection, it enters the low-power mode, and wakes up at a regular time every 4 hours. If the charge-discharge MOS can be charged, it will exit the dormant state and enter the normal charging state. If it fails to charge for 10 consecutive times, it will no longer wake up automatically.

When the system is defined as the end of charging, Standby for 2 days (Standby time setting value) the recovery voltage is still not reached, forced to resume charging until the end of rechar.

6. Communication instructions

6.1 RS232

BMS can communicate with the host computer through the RS232 interface, so that various information of the battery can be monitored through the host computer, including battery voltage, current, temperature, status and battery production information, etc. The default baud rate is 9600bps.

6.2 CAN

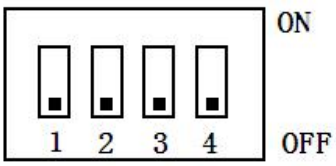
CAN communication, the default communication rate is 500K.

6.3 RS485

With dual RS485 interfaces, you can view PACK information, and the default baud rate is 9600bps. If you need to communicate with the monitoring device via RS485, the monitoring device serves as the host and polls the data according to the address. The address setting range is 2-15.

6.4 Dial Switch

When PACK is used in parallel, different PACK can be distinguished by setting the address of dip switch on BMS, and it is necessary to avoid setting the address to be the same. For the definition of BMS dip switch, refer to the following table.

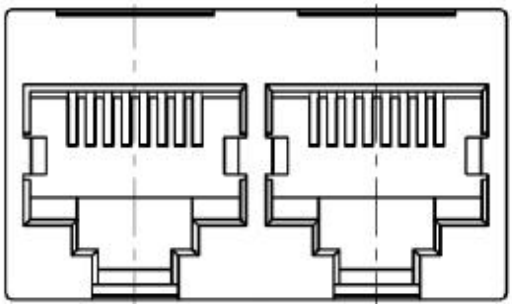


地址	拨码开关位置			
	#1	#2	#3	#4
0	OFF	OFF	OFF	OFF
1	ON	OFF	OFF	OFF
2	OFF	ON	OFF	OFF

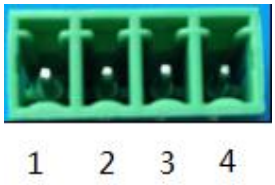
3	ON	ON	OFF	OFF
4	OFF	OFF	ON	OFF
5	ON	OFF	ON	OFF
6	OFF	ON	ON	OFF
7	ON	ON	ON	OFF
8	OFF	OFF	OFF	ON
9	ON	OFF	OFF	ON
10	OFF	ON	OFF	ON
11	ON	ON	OFF	ON
12	OFF	OFF	ON	ON
13	ON	OFF	ON	ON
14	OFF	ON	ON	ON
15	ON	ON	ON	ON

7. Interface Definition

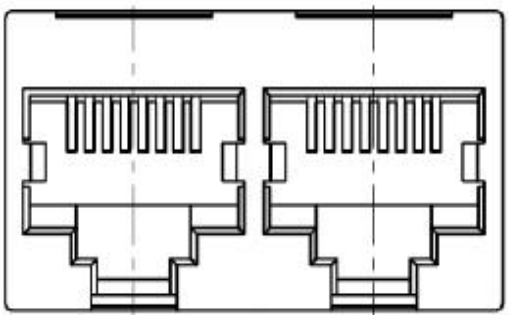
7.1 Communication Interface Diagram

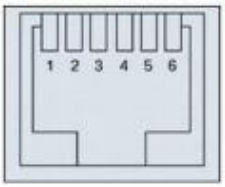


RS485 and CAN



Dry contact





Parallel communication port RS232

7.2 Electrical Interface Definition

RS232--Adopt 6P6C vertical RJ11 socket	
RJ11 pin	Definition description
2	NC
3	TX（veneer）
4	RX（veneer）
5	GND

RS485--Adopt 8P8C vertical RJ45 socket		RS485-- Adopt 8P8C vertical RJ45 socket	
RJ45 pin	Definition description	RJ45 pin	Definition description
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 and RS485

RS485-- Adopt 8P8C vertical RJ45 socket		RS485-- Adopt 8P8C vertical RJ45 socket	
RJ45 pin	Definition description	RJ45 pin	Definition description
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

Parallel communication port

Interface	**Definition**
B+	The positive pole of the battery PACK is used to supply power to the BMS; the positive power P+ is directly connected to the positive pole of the battery
B-	Battery PACK negative pole

P-	The negative electrode of the battery PACK, that is, both the negative electrode for charging and the negative electrode for discharging (the same port for charging and discharging)			
Cell & NTC	J2-1	NTC1	J4-1	NTC2
	J2-2	NTC	J4-2	NTC
	J2-3	CELL1-	J4-3	CELL5+
	J2-4	CELL1+	J4-4	CELL6+
	J2-5	CELL2+	J4-5	CELL7+
	J2-6	CELL3+	J4-6	CELL8+
	J2-7	CELL4+		
	J5-1	NTC3	J6-1	NTC4
	J5-2	NTC	J6-2	NTC
	J5-3	NC	J6-3	CELL13+
	J5-4	CELL9+	J6-4	CELL14+
	J5-5	CELL10+	J6-5	CELL15+
	J5-6	CELL11+	J6-6	CELL16+
	J5-7	CELL12+		

7.3 Installation and Connection Instructions

There are strict requirements for the order of power on the protection plate. First, weld B-, P -, B+, P+, and then connect the battery sampling line connector from low to high in sequence. After power on, it is necessary to charge or press the button to activate all the connecting lines before loading or charger is installed。

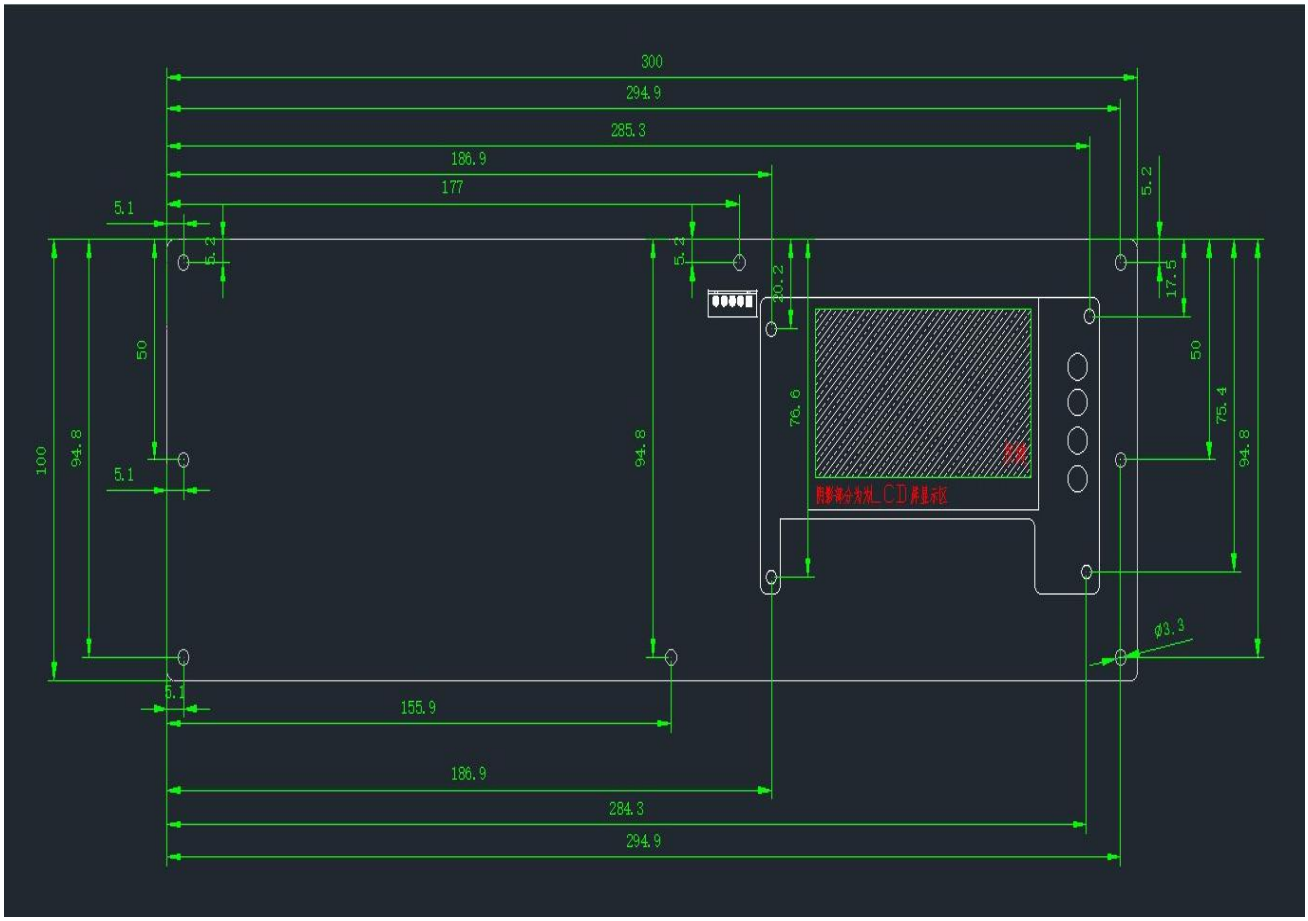
When dismantling, unplug the charger or load first, remove the battery sampling line connector in order from high to low, and finally remove B+, P+, B-, P -.

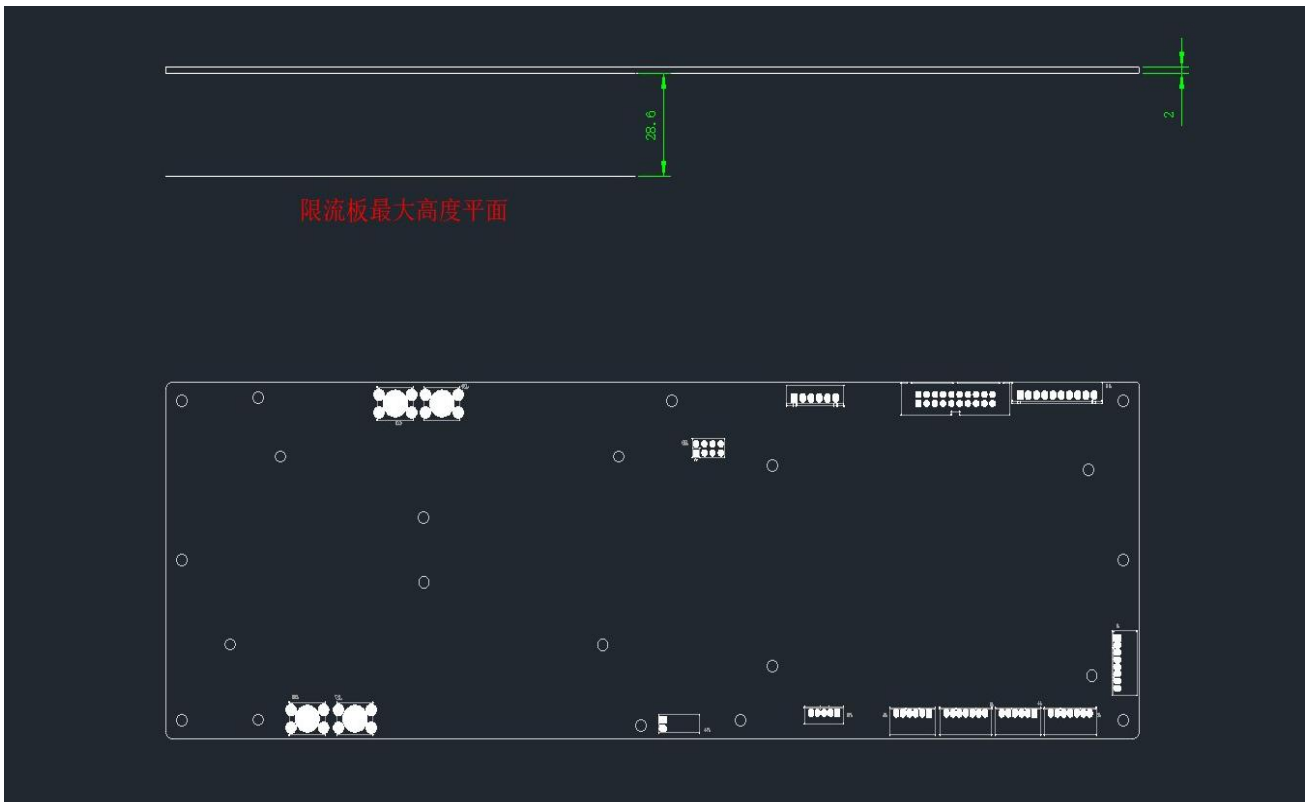
8. BMS Pictures and Structure Size

Reference Pictures: (Pictures for reference only, subject to our existing products.)

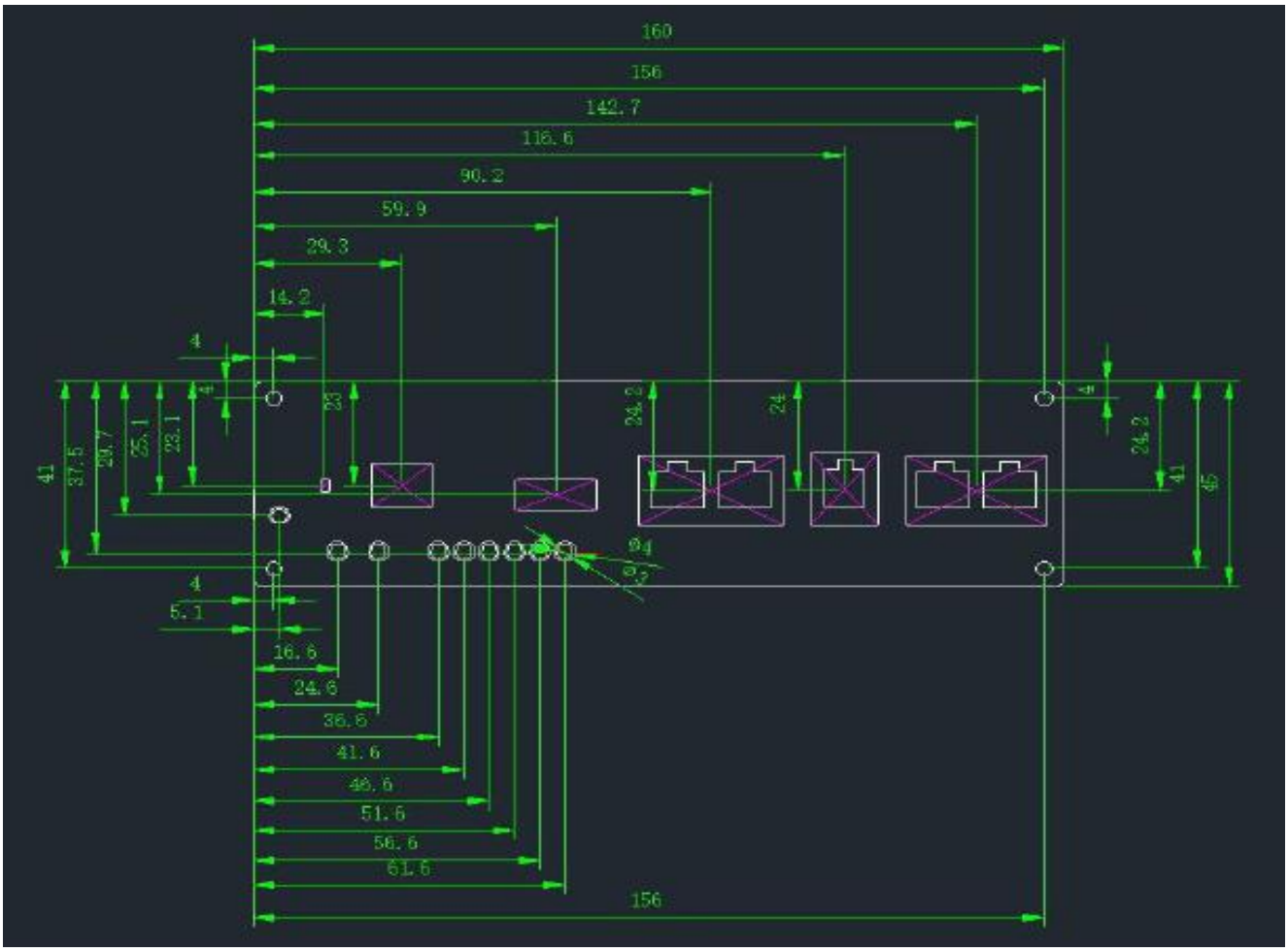
Not yet

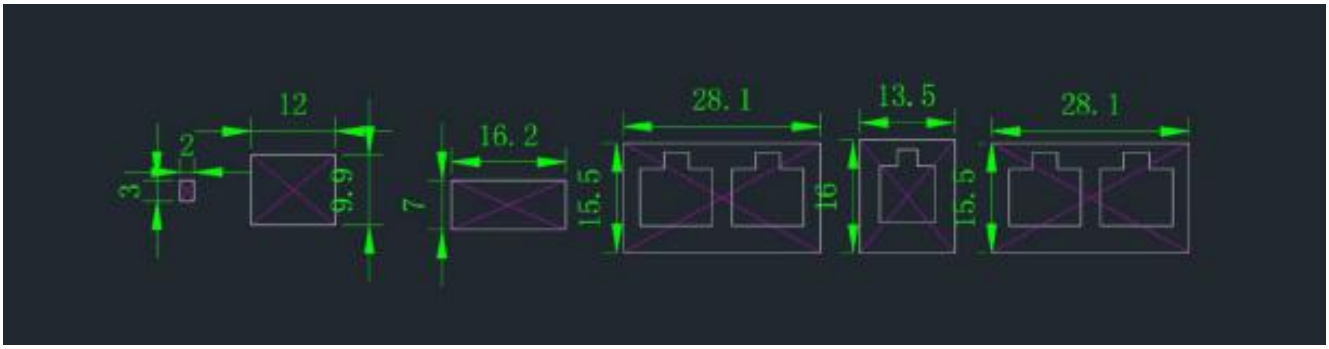
Protection plate size: (The structural drawing shall prevail)

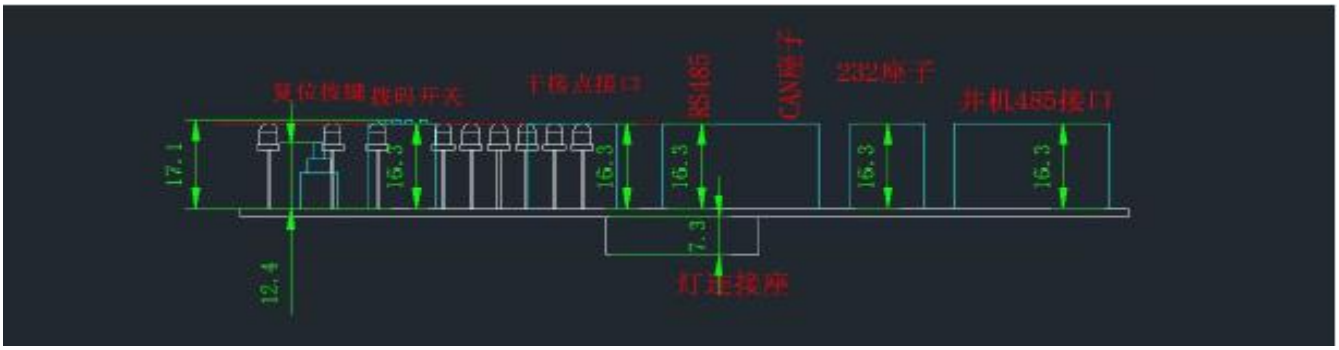




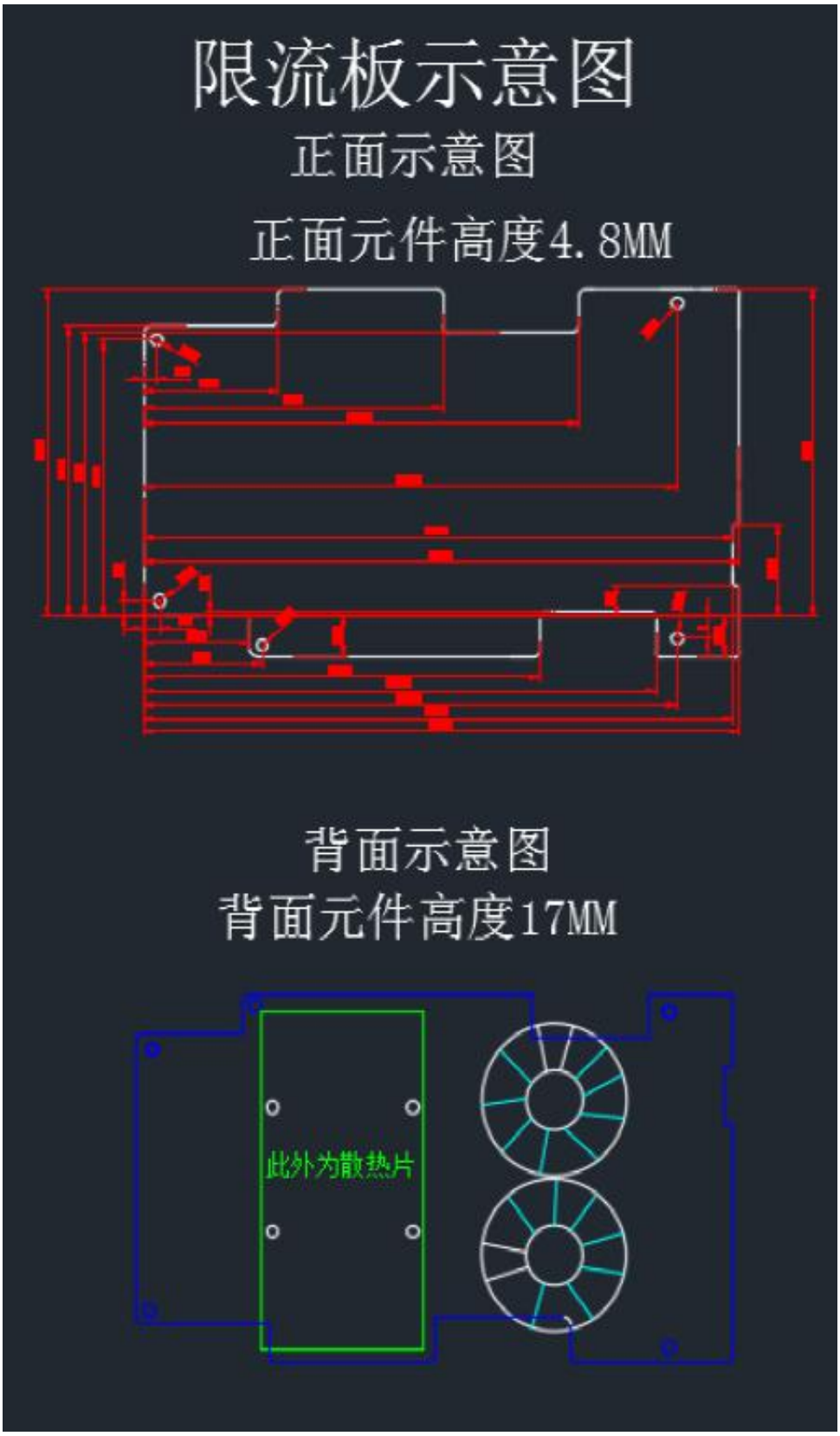
Adapter plate size: (The structural drawing shall prevail)



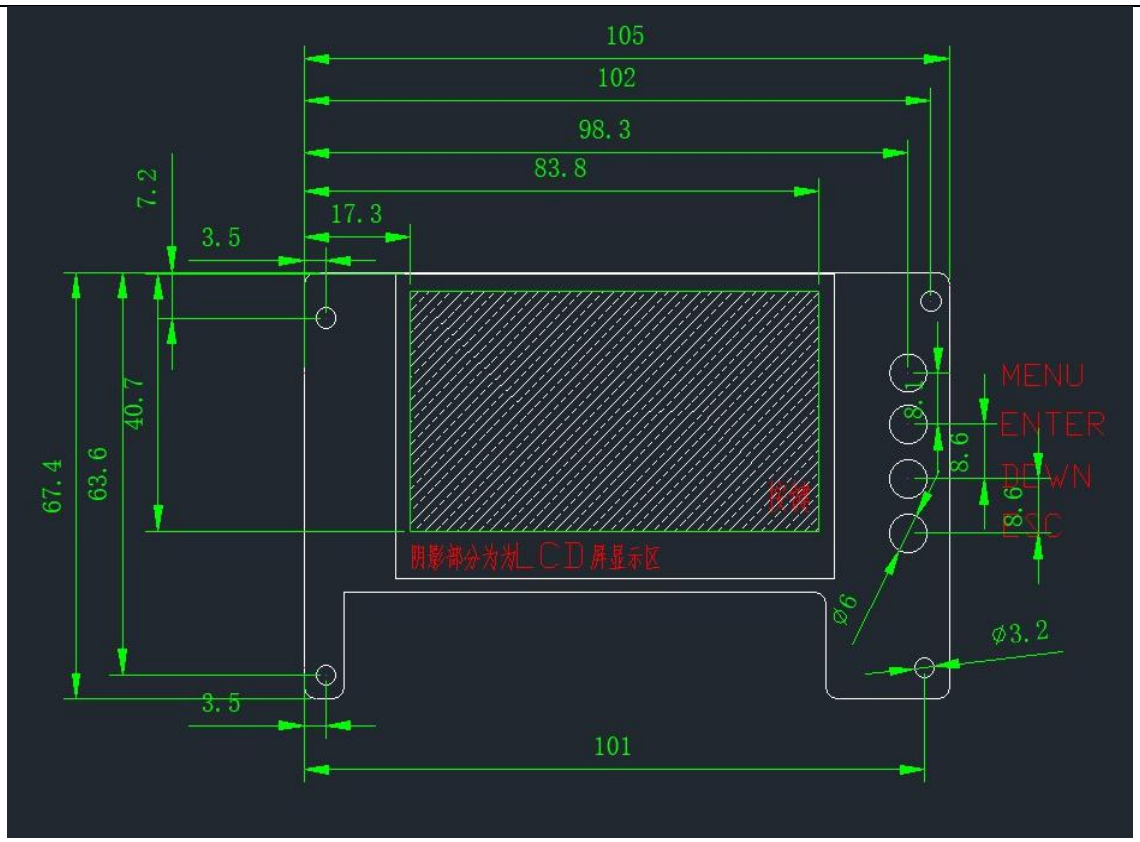


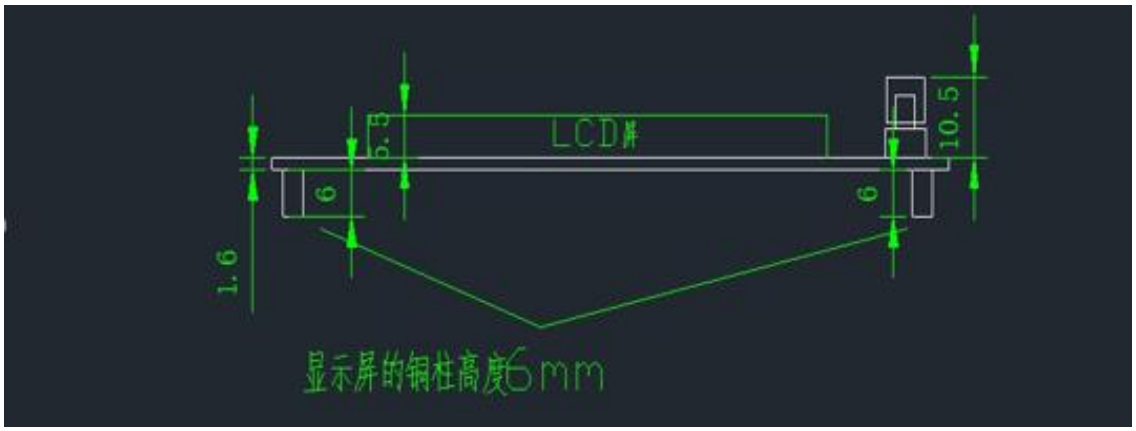


Limiting plate size: (The structural drawing shall prevail)



Display size: (The structural drawing shall prevail)





9. Note

- When welding the battery lead, there must be no wrong connection or reverse connection. If it is indeed a wrong connection, this circuit board may be damaged, and it needs to be re-tested before it can be used.
- During assembly, the protection plate should not directly touch the surface of the cell, so as not to damage the cell. The assembly must be firm and reliable.
- In use, pay attention to the lead iron soldering tin and other components on the circuit board do not touch, otherwise it may damage the circuit board.
- Attention should be paid to anti-static, moisture-proof and waterproof during the use process.
- Please follow the design parameters and use conditions in the process of use, shall not exceed the value in this specification book, otherwise it may damage the protection plate.

- After the battery pack and protection plate are combined, if there is no voltage output or charging is not available for the first time, please check whether the wiring is correct.

10. Attachment

None.