SHENZHEN JIABAIDA ELECTRONICS TECHNOLOGY.CO.,LTD

Product specification

（CUSTOMER）：		
（SAMPLE NAME）：	7~21S 200~300A MosFet Version	
（MODEL NAME）：	JBD-AP21S002-LiFePO4 type	
（DATE）：	2023-03-09	
（VERSION）：	A03	
（SIGNATURES）：		
（compiler）	（Reviewer）	（Approver）
刘厚伟	王礼刚	张桥桥

1. Product introduction

JBD-AP21S002 is a software protection board scheme specially designed for 7~21 strings of lithium battery packs. The product adopts architecture of front-end acquisition chip + MCU, and some parameters can be flexibly adjusted through the host computer according to customer needs.

2. Configuration

Function	Configuration	Function	Configuration
(Number of strings supported)	7~21S	485 communication (isolated)	(Optional)
(Continuous current)	200~300A	UART interface (isolated)	/
(Number of NTCs)	(1 built-in, 4 external, Default two-way external)	(CAN communication)	(Optional)
(Balance Function)	(Standard option)	(232 Communication)	/
UART (non-isolated)	(Standard option)	(Heating function)	(Optional, external heating module is required)
(Switch function)	(Optional)	(Module of Bluetooth)	(Optional)
(Charging current limit)	/	(Battery packs in series)	(Not supported)
(Battery packs in parallel)	(Not supported)	(Secondary protection)	/
(History storage)	(Optional)	LCD display)	Optional)
Buzzer	(Standard option)	(LED indicator interface)	/

Note: The UART interface (non-isolated) does not support communication with chargers or loads.

The battery pack can be used in series, but the total number of strings after series is required to be less than or equal to 32.

7 ~ 21 battery cells are protected in series, and the number of battery strings is automatically identified.

3. Parameter Setting

3.1. Basic parameter

Cell specifications	7~21 strings of Lithium Iron Battery
Interface type	Charge and discharge are both at the same port
charging voltage	3.60V*Number of strings
Cell voltage range	2.2~3.75V
Continuous charging current	200~300A
Continuous discharging current	200~300A
Consumption of running	≤300mA
Consumption of sleep	≤1000uA
Sleep conditions	Delay 65000s under no current \ communication \ protection state (settable)
Circuit resistance	≤10mR
Operating temperature	-20℃~75℃
Structure size of PCB	
size	200±2mm * 114.5±0.5mm * 51±1mm (Length*Width*Height)

Note: Test should be at temperature25±2°C, and relative humidity 65±20% of surroundings.

Supplementary note: continuous standing for 65000s (settable) will automatically disconnect the relay and reduce the standby power consumption of BMS. A large charge discharge current will be identified through the pre charge discharge circuit, and then close the relay.

3.2. Main parameter

	Project	Specification			Unit
		MIN	TYP	MAX	
(Overvoltage and undervoltage protection)	Overvoltage	3.70	3.75	3.80	V
	Overvoltage delay	1000	2000	3000	mS
	Overvoltage release	3.40	3.45	3.50	V
	Undervoltage	2.10	2.20	2.30	V
	Undervoltage delay	1000	2000	3000	mS
	Undervoltage release	2.60	2.70	2.80	V
	Undervoltage release conditions	60S voltage self-recovery or charge recovery			
Overcurrent Charge	Overcurrent Charge protection value	See the configuration table of overcurrent protection value below			
	Overcurrent Charge delay	5	10	15	S
	Charge over current release conditions	Automatic recover after a delay of 32S			
Overcurrent Discharge	1th Overcurrent Discharge	See the configuration table of overcurrent protection value below			
	1th Overcurrent Discharge delay	5	10	15	S
	2th Overcurrent Discharge	See the configuration table of overcurrent protection value below			
	2th Overcurrent Discharge delay	110	310	510	mS
	Overcurrent Discharge release	Automatic recover after a delay of 32S			
Short Circuit Discharge	Short circuit protection current	See the configuration table of overcurrent protection value below			
	Short circuit protection delay time	200	400	800	uS
	Short circuit protection recovery	Recover after 5S delay after disconnecting the load.			
	Short-circuit description: The short circuit will cause the relay to stick and keep the relay open. It is recommended not to conduct the short circuit protection test.				
	Temperature protection value	62	65	68	℃

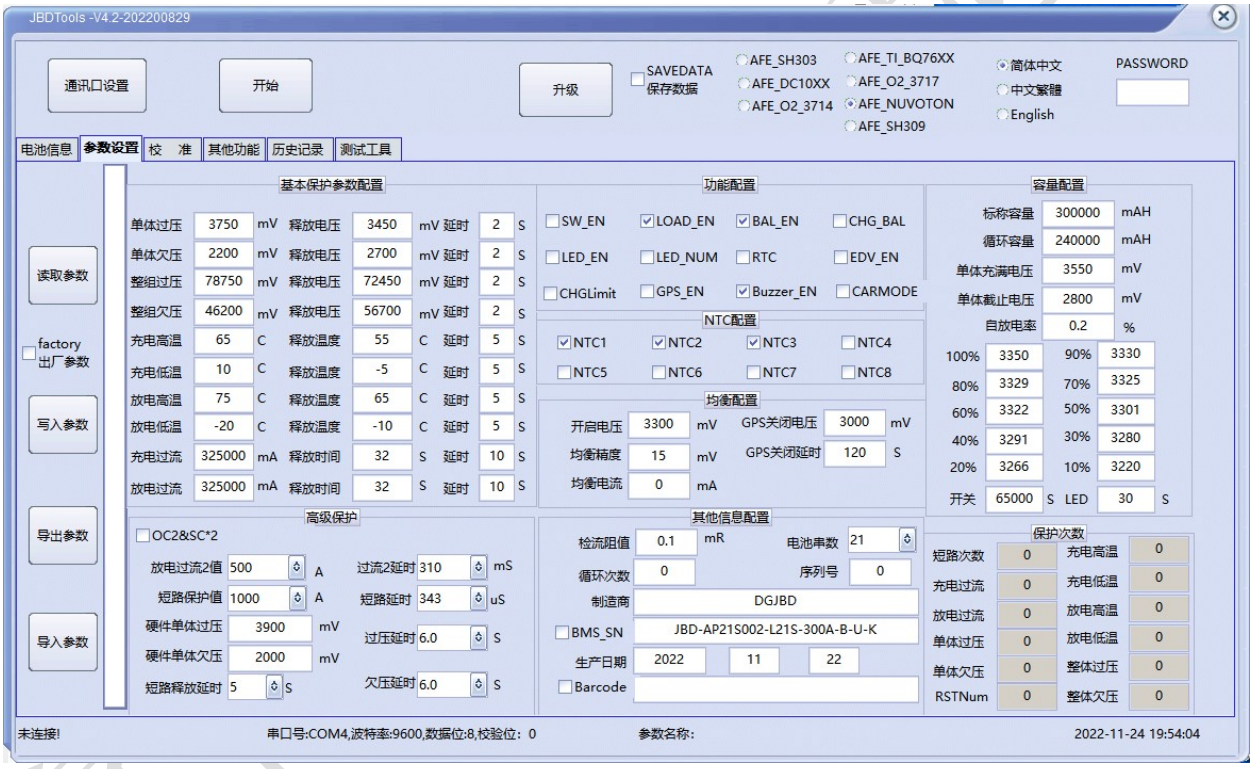
Overtemperature Charge	Temperature protection release value	52	55	58	℃
Undertemperature Charge (no heating function)	Temperature protection value	-15	-10	-5	℃
	Temperature protection release value	-10	-5	0	℃
Undertemperature Charge (with heating function)	Temperature protection value	-3	0	3	℃
	Temperature protection release value	2	5	8	℃
Overtemperature Discharge	Temperature protection value	72	75	78	℃
	Temperature protection release value	62	65	68	℃
Undertemperature Discharge	Temperature protection value	-25	-20	-15	℃
	Temperature protection release value	-15	-10	-5	℃
high temperature protection of FET(Built-in)	Temperature protection value	85	90	95	℃
	Temperature protection release value	65	70	75	℃
Balance Function	Equalization turn-on voltage	3.25	3.30	3.35	V
	Difference opening voltage value		15		mV
	Balance current	80	160	240	mA
	Balance model	Idle/Charge/Discharge equalization			
	Balance type	Pulsed model			

Note: Test should be at temperature25±2℃, and relative humidity 65±20% of surroundings.

3. 3. Overcurrent protection value configuration table

Continuous current	Charge over current protection value	The first discharge over current protection value	The second discharge over current protection value	Shor circuit protection value
200A	300±15A	300±15A	1000±200A	2000±400A
300A	325±20A	325±20A	1400±300A	2800±500A

3.3. parameter settings



The diagram of upper computer

4. Function Description

4.1. Overcharge protection and recovery

4.1.1. Cell overcharge protection and recovery

When the voltage of any cell is higher than the set value of the cell overcharge voltage, and the duration reaches the cell overcharge delay, the system enters the overcharge protection state, the charging MOS is turned off, and the battery cannot be charged.

After the cell overcharge protection, when the voltage of all cells drops below the cell overcharge recovery value, the overcharge protection state is released. It can also be released by discharge.

4.1.2. Entire overcharge protection and recovery

When the entire voltage is higher than the entire overvoltage set value, and the duration reaches the entire overcharge delay, the system enters the overcharge protection state, turns off the charging MOS, and cannot charge the battery.

When the entire voltage drops below the recovery value of the entire voltage overvoltage protection, the overcharge protection state is released, and it can also be released by discharge.

4.2. Over-discharge protection and recovery

4.2.1. Cell over-discharge protection and recovery

When the minimum cell voltage is lower than the set value of the over-discharge voltage of the cell, and the duration reaches the over-discharge delay of the cell, the system enters the over-discharge protection state , turns off the discharge MOS, and cannot discharge the battery.

After the cell over-discharge protection occurs, charging the battery pack can release the over-discharge protection state.

4.2.2. Entire over-discharge protection and recovery

When the entire voltage is lower than the entire over-discharge voltage set value, and the duration reaches the entire over-discharge delay, the system enters the over-discharge protection state, turns off the discharge MOS, and cannot discharge the battery.

After the entire over-discharge protection occurs, charging the battery pack can release the over-discharge protection state.

4.3. Charging overcurrent protection and recovery

When the charging current exceeds the charging protection current and the duration reaches the overcurrent detection delay time, the system enters the charging overcurrent protection state and cannot charge the battery. After the charging overcurrent protection occurs, it will automatically recover after a delay. If you want to automatically recover or not, you can set the corresponding release time to be longer;
the charging overcurrent state can also be released by discharging.

4.4. Discharge overcurrent protection and recovery

When the discharge current exceeds the discharge overcurrent protection current and the duration reaches the overcurrent detection delay time, the system enters the discharge overcurrent protection state and turns off the discharge MOS. Delayed automatic recovery after discharge overcurrent occurs, and the corresponding release time can be set longer if automatic recovery is required. Charging can also release the discharge overcurrent condition. Discharge has two-level overcurrent protection function
which has different response speeds for different current values, and protects the battery more reliably.

4.5. Temperature Protection and Recovery

4.5.1. Charge and discharge high temperature protection and recovery

When the NTC detects that the temperature of the battery cell surface is higher than the setting of high temperature protection value during charging and discharging, the management system enters the high temperature protection state, the charging or discharging MOSFET is turned off, and the battery pack cannot be charged or discharged in this state.

When the temperature of the surface of the cell drops to the high temperature recovery set value, the management system recovers from the high temperature state and turns on the charge and discharge MOS again.

4.5.2. Charge and discharge low temperature protection and recovery

When the NTC detects that the temperature of the cell surface is lower than the setting of low temperature protection value during charging and discharging, the management system enters the low temperature protection state, the charging or discharging MOSFET is turned off.
and the battery pack cannot be charged or discharged in this state.

When the temperature of the cell surface rises to the low temperature recovery set value, the management system recovers from the low temperature state and turns on the charge and discharge MOS again.

4.6. Balance function

The management system uses the resistance bypass method to balance the cells. During the charging process, the voltage of the highest single cell of the battery pack reaches the set equilibrium starting voltage value, and the voltage difference between the minimum voltage and the maximum voltage of the single cell of the battery pack is greater than the set value. When the value is set, the equalization function of the cells that meet the conditions is enabled, and the two adjacent equalizers cannot be enabled at the same time.
The equalization stops when the cell voltage difference is less than the set value or the cell voltage is less than the equalization turn-on voltage.

4.7. Capacity calculation

The SOC calculation of the battery pack can be accurately performed by integrating current and time. The full capacity and cycle capacity of the battery pack can be set through the host computer, and the capacity can be automatically updated after a complete charge and discharge cycle.It has the function of calculating the number of charge and discharge cycles. When the cumulative discharge capacity of the battery pack reaches the set cycle capacity, the number of cycles increases once.

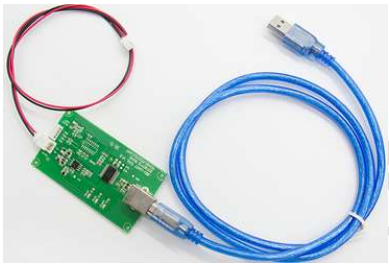
Note: For newly installed batteries, please set the nominal capacity and cycle capacity according to the battery capacity, and conduct a capacity study, otherwise the capacity inaccuracy may occur. Capacity learning operation: first fully charge to overvoltage protection, then discharge to under-voltage protection, and then charge it again.

4.8. Sleep function When the protection board is in static state (no communication, no current, no balance and overvoltage protection) . After a delay of 1 minute, it will enter the sleep state. After entering this state, the protection board will only reduce the frequency of detecting voltage and current and its own power consumption. Communication, dial switch, charging and discharging can automatically exit the sleep mode.

4.9. Communication

The protection board can be connected to the computer through the communication box. The communication format is 9600, 8, N, 1. The upper computer receives the protection board data.

(UART communication box)



(RS485 communication box)

(Bluetooth module)

Note: The above three tools need to be purchased separately.

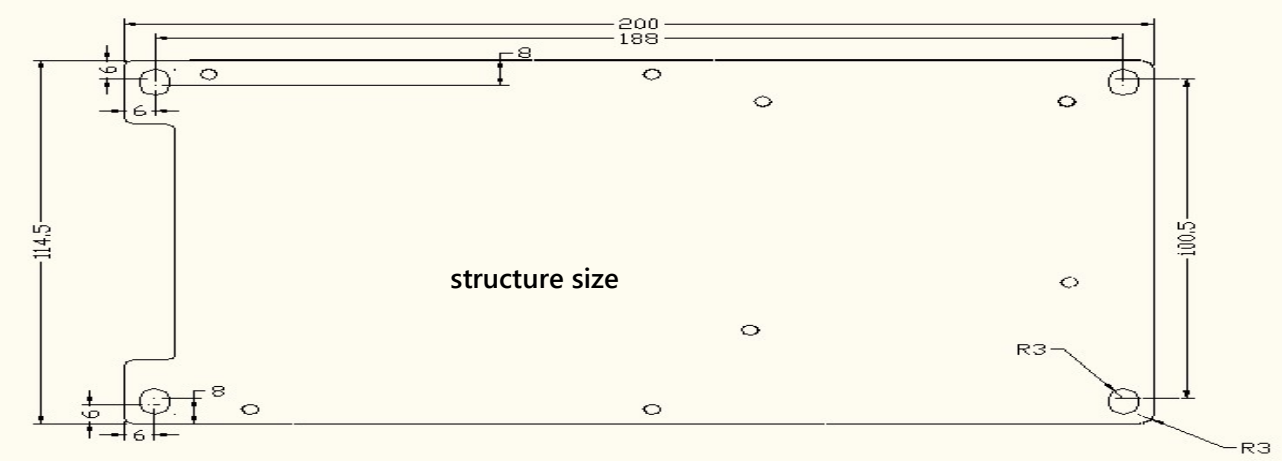
The connection method: after installing the special driver for our communication box on the computer, insert the USB end of the communication box into the USB port of the computer, and connect the other end to the corresponding interface of the protection board that has been connected to the battery. Open the host computer, click the communication port settings, select the CMO port corresponding to the communication box, and do not change other options. After confirming, click Start to read the data in the protection. If you need to change the parameters of the protection board, you must first click on the parameter page to read the parameters, and then change the parameters.

5. main material

(Number)	(Name of Material)	生 (Manufacturer)	(Quantity)
1	KA49522A	nuvoton 唐	1PCS
2	HC32L072KATA	华大	1PCS
3			
Accessories			
1	14PIN\HY2.0\24AWG\800MM ROHS	---	1PCS
2	9PIN\HY2.0\24AWG\800MM ROHS	---	1PCS
3	70*20\400A ---	1PCS	
4	2PIN\HY2.0\24AWG\550MM ---	1PCS	
5	2PIN\HY2.0\24AWG\550MM\485 / ROHS	---	1~2PCS (CAN optional 1PCS)

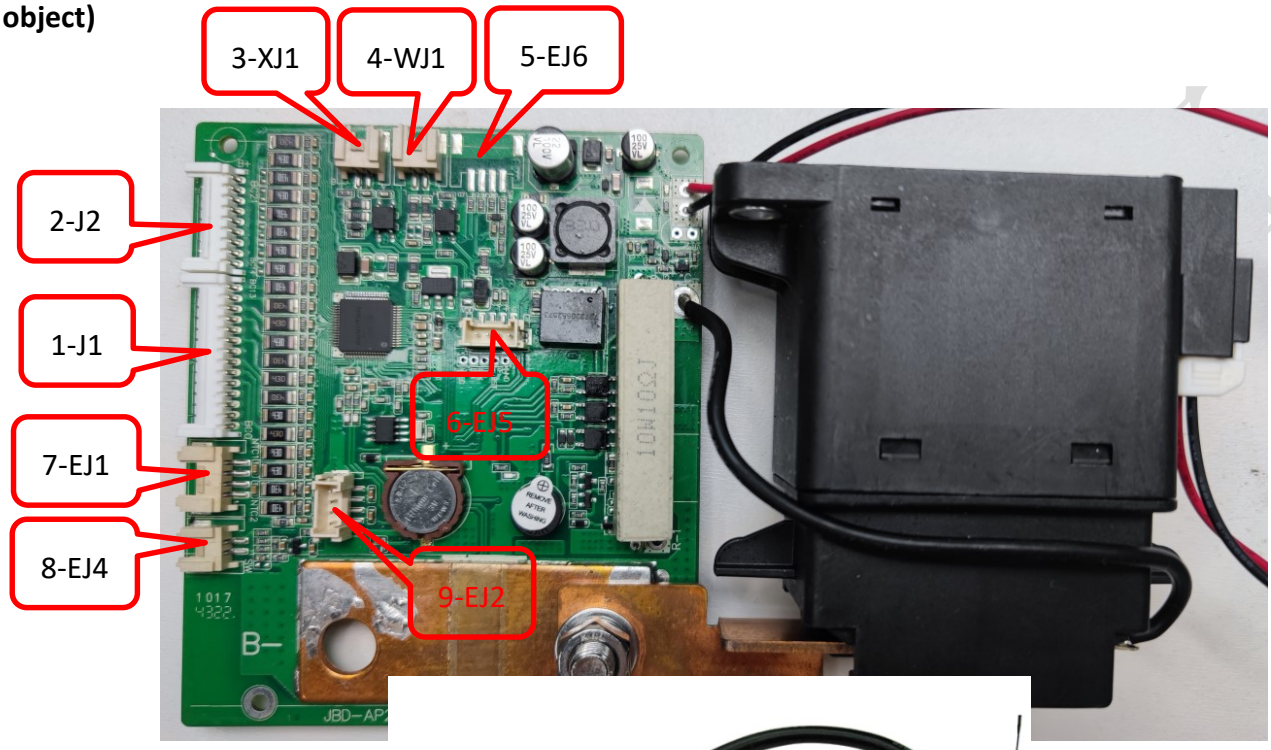
Note: The above materials may be replaced by materials with the same specifications or better specifications. If there are certification requirements, the replacement of materials is not allowed, and we need to notify our business to send samples again. The controlled specifications, the final interpretation right belongs to Jiabaida.

6.1. Dimensions and installation point drawing



7. Signal port definition

Schematic marking the interface label **(the picture is a wiring diagram, the shape is subject to the actual object)**



B-,

Battery

negative

C-,

Load and

charger

negative

(Label)	(Tag number)	(Connector)	(Schematic diagram)	PIN	(Pin function)	(Note)
1	J1 (HY2.0-14P)	Voltage detection socket		1	Connect to Negative Side of Cell 1.	BC0
				2	Connect to Positive Side of Cell 1	BC1
				3	Connect to Positive Side of Cell 2	BC2
				4	Connect to Positive Side of Cell 3	BC3
				5	Connect to Positive Side of Cell 4	BC4
				6	Connect to Positive Side of Cell 5	BC5
				7	Connect to Positive Side of Cell 6	BC6
				8	Connect to Positive Side of Cell 7	BC7
				9	Connect to Positive Side of Cell 8	BC8
				10	Connect to Positive Side of Cell 9	BC9
				11	Connect to Positive Side of Cell 10	BC10
				12	Connect to Positive Side of Cell 11	BC11
				13	Connect to Positive Side of Cell 12	BC12
				14	Connect to Positive Side of Cell 13	BC13
2	J2 (HY2.0-9P)	Voltage detection socket		1	Connect to Positive Side of Cell 14	BC14
				2	Connect to Positive Side of Cell 15	BC15
				3	Connect to Positive Side of Cell 16	BC16
				4	Connect to Positive Side of Cell 17	BC17
				5	Connect to Positive Side of Cell 18	BC18

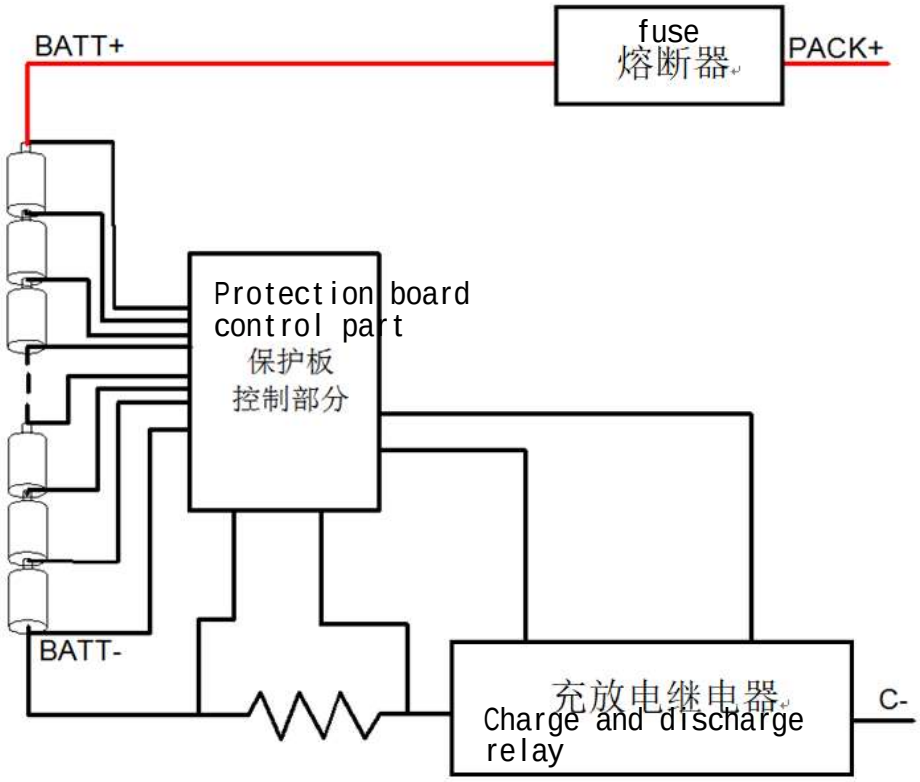
				6	Connect to Positive Side of Cell 19	BC19
				7	Connect to Positive Side of Cell 20	BC20
				8	Connect to Positive Side of Cell 21	BC21
				9	Connect to Positive Side of Cell 21	B+
3	XJ1 (HY2.0-2P)	RS485 interface		1	RS485-B	
				2	RS485-A	
4	WJ1 (HY2.0-2P)	CAN interface		1	CANL	
				2	CANH	
5	EJ6 (HY2.0-4P)	(LED indicator / heating module / current limiting module control interface)		1	LED-C Control interface of current limiting module	
				2	JR-ER Heating module control interface	
				3	GND	
				4	SW+ LED indicator interface	
6	EJ5 (HY2.0-4P)	UART \ Bluetooth interface		1	UART-GND	
				2	RXD-BMS	
				3	TXD-BMS	
				4	Bluetooth power supply	
7	EJ1 (HY2.0-4P)	External temperature probe interface		1	NTC1 temperature probe	
				2		
				3	NTC2 temperature probe	
				4		

8	EJ4 (HY2.0-2P)	Self locking discharge switch interface		1	SW- Switch negative interface	
				2	SW+ Switch positive interface	
7	EJ2 (HY2.0-4P)	External temperature probe interface		1	NTC3 temperature probe	
				2		
				3	NTC4 temperature probe	
				4		

21S	no short-circuite	
20S	BC18&BC19 short-circuited together and connected to the positive pole of the 18th string	
19S	BC17&BC19 short-circuited together and connected to the positive pole of the 17th string	
18S	BC16&BC19 short-circuited together and connected to the positive pole of the 16th string	
17S	BC15&BC19 short-circuited together and connected to the positive pole of the 15th string	
16S	BC14&BC19 short-circuited together and connected to the positive pole of the 14th string	
15S	BC13&BC19 short-circuited together and connected to the positive pole of the 13th string	
14S	BC12&BC19 short-circuited together and connected to the positive pole of the 12th string	
13S	BC11 &BC19 Short-circuited together and connected to the positive pole of the 11st string	
12S	BC10 &BC19short-circuited together and connected to the positive pole of the 10th string	
11S	BC9&BC19 short-circuited together and connected to the positive pole of the 9th string	
10S	BC8&BC19 short-circuited together and connected to the positive pole of the 8th string	
9S	BC7&BC19 short-circuited together and connected to the positive pole of the 7th string	
8S	BC6 & BC19short-circuited together and connected to the positive pole of the 6th string	
7S	BC5&BC19 short-circuited together and connected to the positive pole of the 5th string	

7.2.

Fuse wiring diagram delivered



8. Environmental suitability

8.1. The environment of working

- BMS The protective plate allows normal operation under the following conditions:
- Ambient temperature: -30°C ~+75°C;
- Relative humidity: 5% ~ 90%;
- Atmospheric pressure: 86kPa~106kPa;

8.2. The environment of storage

BMS The protection board should be stored in a clean and well-ventilated warehouse with an ambient temperature of -5°C~+40°C, a relative humidity of not more than 70%, and the air must not contain corrosive gases and media that affect electrical insulation, and must not be affected by any mechanical Shock or heavy pressure. Not subject to direct sunlight, and the
distance from the heat source (heating equipment, etc.) should not be less than 2m. Under the above storage conditions, the BMS protection board can be stored for one year.

9. Packing and shipping

9.2. Package

- The packaging should meet the requirements of moisture-proof and anti-vibration, the packing box should be firm and reliable, the inside of the box should be lined with moisture-proof material, and the product should not move in the box.
- External carton box, veneer anti-static bag plus bubble bag packaging;

9.3. transportation

- During transportation, the product shall not be subject to severe mechanical impact, exposure to the sun, rain, chemical corrosive substances and harmful gases; 5.3.2 During the loading and unloading process, the product should be handled with care, and it is strictly forbidden to throw or press it.
- The height of the packing boxes shall be less than 5 layers.

10. Precautions

1) This battery management system cannot be used in series in general, and requires a customized version to support series use.

2) When multiple battery packs using this management system are connected in parallel make sure that the maximum voltage difference of each battery pack is lower than 3V before parallel connection.

3) When multiple battery packs using this management system are used in parallel, the total charging inrush current of the adapter may be applied to a single battery pack. It should be ensured that the total charging inrush current of the adapter does not exceed the maximum charging inrush current of a single management system.

4) The short-circuit protection function of this management system is suitable for a variety of application scenarios, but it does not guarantee that it can be short-circuited under any conditionsWhen the total internal resistance of the battery pack and theshort-circuit loop is lower than 40mΩ, the capacity of the battery pack exceeds the rated value by 20%, the short-circuit current exceeds 1800A, the inductance of theshort-circuit loop is very large, or the total length of the short-circuit wire is very long, please test yourself to determine whether This management system can be used.

5) When soldering the battery leads, there must be no wrong or reverse connection. If it is indeed connected incorrectly, the circuit board may be damaged and needs to be re-tested before it can be used.

6) When assembling, the management system should not directly touch the surface of the cell to avoid damage to the circuit board. Assembly should be firm and reliable.

7) During use, be careful not to touch the components on the circuit board such as lead tips, soldering iron, solder, etc., otherwise the circuit board may be damaged. Please do not use paste flux when soldering this circuit board, otherwise it may cause this circuit board to work abnormally.

8) During use, pay attention to anti-static, moisture-proof, waterproof, etc.

9) During use, please follow the design parameters and conditions of use, and must not exceed the values in this specification, otherwise the management system may be damaged.

10) After the battery pack and the management system are combined, please check whether the wiring is correct if you find that there is no voltage output or charging fails when the battery is powered on for the first time.

11) The parameters, functions and appearances in this specification are for reference only, and the actual protection board shall prevail.