Classification: Class C-Secret ★

Shenzhen Jiabaida Electronic Technology Co., Ltd.

SHENZHEN JIABAIDA ELECTRONICS TECHNOLOGY.CO.,LTD

Specification Sheet

JBD-UP16S010-L16S-200A-200A-BURC

Customer name:	
Customer _	
product name:	
Sample Name	16 strings of LiFePO4 200A Smart BMS
Product number:	
Model Name	JBD-UP16S010-L16S-200A-200A-BURC
Submission date:	
date	2023-03-24
Version:	
V ersion	A03
Customer signature and seal:	
SIGNATURES	

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Version	Page/Chapter	Editor	Revise Date	Revision content	Mark
A01	full text	Yan Xiaopeng	2022.09.09		
A02	full text	Yan Xiaopeng	2023.03.13	Added descriptions of LED, key switch, and 232 communication ports	
A 03	Pages 3 and 9	Yan Xiaopeng	2023.03.24	Function profile sheet corrects Bluetooth and heating as unsupported; Dip switch table correction	

prepared by: Yan Xiaopeng Audit: Wang Ligang approve:

change log

Catalogue

1. Product introduction

JBD- UP16S010 is a software protection board solution specially designed for 16-series battery packs, which can be applied to lithium batteries with different chemical properties, such as lithium ion, lithium polymer, lithium iron phosphate, etc.

The whole system adopts O2 's analog front-end acquisition chip + MCU, external communication port, some parameters can be flexibly adjusted through the host computer according to customer needs.

2. Function configuration

Function	configuration	Function	configuration
Number of strings supported	16S	485 Communication (Isolation)	Standard
Support continuous current	200A	UART interface (isolated)	none
Number of NTCs	2 built-in, 4 external	CAN communication	Standard
Balance function	Standard configuration (passive equalization)	232 communication	Standard
UART interface (non-isolated)	Standard	GPS module	not support
Weak current switch function	Standard	Heating film function	not support
Charging current limiting function	Standard	bluetooth module	not support
Battery packs used in parallel	support	Battery packs used in series	not support
History storage function	Standard	Secondary protection function	not support
Pre-discharge function	Standard	LCD display	Standard
buzzer	not support	LED indicator	Standard

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

3. Technical Parameters

3.1. Basic parameters

Cell specification	16 strings of lithium iron
Interface Type	Charge and discharge at the same port
Charging recommended	3.6V*16
Single voltage range	2.7~3.65V
Continuous charging	200A _
continuous discharge	200A _
Operating power	≤40mA _
Sleep power	≤0.4mA
Protection board	≤ 10mR _
Operating temperature	-2 0 ℃~ 75 ℃
Protection plate size	300(±0.5)*100(±0.5)*38(±2)mm(length*width*height)

Note: The test needs to be performed in an environment with a temperature of 25 ± 2 ℃ and a relative humidity of 65 ± 20%.

3.2. The main parameters

	project	Specification			unit
		minimum value	typical value	maximum value	
Function	Overvoltage protection voltage	3.620	3.650	3.680	V
	Overcharge protection delay time	10 00	20 00	30 00	M
	Overcharge protection recovery voltage	3.330	3.380	3.430	V
	Over-discharge protection voltage	2.600	2.70	2.800	V

	Over-discharge protection delay time	1000	2000	3000	M
	Over-discharge protection recovery voltage	2.85	2.95	3.05	V
	Over -discharge protection recovery condition	Voltage self-recovery or charge recovery			
Charging overcurrent protection	Charging overcurrent protection value	210	23 0	250	A
	Charge overcurrent delay	0.5	1	1.5	S
	Charge overcurrent release condition	Automatic recovery after 60S delay			
Discharge overcurrent protection	Discharge overcurrent 1 protection value	210	23 0	250	A
	Discharge overcurrent 1 protection delay	5	10	15	S
	Discharge overcurrent 2 protection value	500	650	800	A
	Discharge overcurrent 2 protection delay	250	500	750	M
	Discharge overcurrent protection recovery condition	Delay 60S automatic release			
	Short circuit protection current		1800		A
	Short circuit protection delay time	200	300	600	u
	short circuit protection recovery	after disconnecting the load .			

	Description of short circuit	Short-circuit description: short-circuit current less than the minimum value or higher than the maximum value may cause short-circuit protection failure, short-circuit current exceeds 3000 **A**, short-circuit protection is not guaranteed, and short-circuit protection testing is not recommended.			
Discharge high temperature protection (external)	temperature protection value	67	70	73	℃
	Temperature protection release value	57	60	63	℃
Discharge low temperature protection (external)	temperature protection value	-twenty three	-20	-17	℃
	Temperature protection release value	-18	-15	-12	℃
Charging high temperature protection (external)	temperature protection value	62	65	68	℃
	Temperature protection release value	52	55	58	℃
Charging low temperature protection (external)	temperature protection value	-8	-5	-2	℃
	Temperature protection release value	-3	0	3	℃
FET discharge high temperature protection Protection (built-in curing)	temperature protection value	110	115	120	℃
	Temperature protection release value	80	85	90	℃
Environmental	temperature protection	72	75	78	℃

high temperature protection (built-in)	value				
	Temperature protection release value	62	65	68	℃
Environmental low temperature protection (built-in)	temperature protection value	-twenty three	-20	-17	
	Temperature protection release value	-18	-15	-12	
Balance function	Iron-lithium balanced turn-on voltage	3.470	3.500	3.530	V
	Opening pressure drop of iron lithium	-	30	-	mV
	Balance current	20		60	mA
	balanced way	Static/charge equalization			
	Balance type	Time-sharing equalization \pulse equalization			
Charging current limiting function	Charging current limit is on	Turn on after charging overcurrent protection			
	Charge current limit	20±2A			
	Charge current limit off	Charging current <1A or overvoltage protection			

Note: The test needs to be performed in an environment with a temperature of 25 ± 2 ℃ and a relative humidity of 65 ± 20%.

4. Function Description

4.1. Overcharge Protection and Recovery

4.1.1. Cell overcharge protection and recovery

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

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

4.1.2. Overall overcharge protection and recovery

When the overall voltage is higher than the overall overvoltage setting value, and the duration reaches the overall overcharge delay, the system enters the overcharge protection state, turns off the charging MOS, and cannot charge the battery. When the overall voltage drops below the total voltage overvoltage protection recovery value, the overcharge protection state will be released, and it can also be released by discharge.

4.2. Overdischarge Protection and Recovery

4.2.1. Monomer over-discharge protection and recovery

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

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

4.2.2. Overall over-discharge protection and recovery

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

After the overall over-discharge protection occurs, charging the battery pack can release the over-discharge protection status.

4.3. Charge Overcurrent Protection and Recovery

When the charging current exceeds the charging overcurrent 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 charging over-current protection occurs, it will automatically recover with a delay. If you need to automatically recover, you can set the corresponding release time longer; discharging can also release the charging over-current state.

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 charge overcurrent protection state and turns off the discharge MOS. The system will automatically recover 32 seconds after the discharge overcurrent occurs, and the corresponding release time can be set longer if automatic recovery is not required. Charging can also release the discharge overcurrent state. Discharge has two-level overcurrent protection function, which has different response speeds to different current values, and can protect 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 surface temperature of the cell is higher than the set high temperature protection temperature 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 cell surface drops to the high temperature recovery set value, the management system recovers from the high temperature state and turns on the charging and discharging MOS again.

4.5.2. Charge and discharge low temperature protection and recovery

When the NTC detects that the surface temperature of the cell is lower than the set low temperature protection temperature during charging and discharging, the management system enters the low temperature protection state, and 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 setting value, the management system recovers from the low temperature state and turns on the charging and discharging MOS again.

4.5.3. In static state (no charging and discharging), if the temperature rises or falls to the protection board, the protection board will not take any protection action until the system detects that there is current, and then take the corresponding protection action.

4.6. Balance function

The management system adopts 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 balanced starting voltage value, and the voltage difference between the minimum voltage and the highest voltage of the single cells of the battery pack is greater than the set value. When the value is set, the cell equalization function that meets the conditions is turned on, and the two adjacent equalizers cannot be turned on at the same time.

Equalization stops when the cell voltage difference is less than the set value or the cell voltage is lower than the equalization start voltage. Charge balance mode and static balance mode can be set.

4.7. Capacity Calculation

The SOC calculation of the battery pack can be accurately calculated by integrating the 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 will increase by one.

Note: For newly installed batteries, please set the nominal capacity and cycle capacity according to the battery capacity, and perform a capacity learning, otherwise the capacity may not be accurate. Capacity

learning operation: first fully charge to overvoltage protection, then discharge to undervoltage protection, and then charge again.

4.8. Sleep function

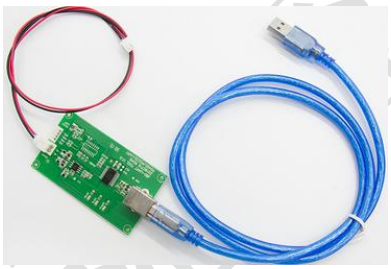
When the protection board is in a static state (no communication, no current, no balance and overvoltage protection.) After a delay of 5 minutes, it enters a dormant state. After entering this state, the protection board only reduces the frequency of detecting voltage and current and its own power consumption. Communication, switching, charging and discharging can automatically exit the sleep mode.

4.9. communication function

4.9.1. RS485 communication & UART communication

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 .

UART communication box



RS485 communication box

(UART communication box)

(RS485 communication box)

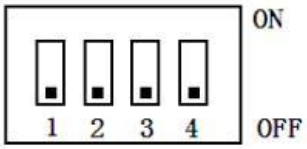
4.9.2. CAN bus communication

Environment configuration: To install the USBCAN Driver to the computer, you first need to check the computer operating system. The 32-bit operating system and the 64-bit operating system match different driver files. (32-bit operating systems match the file suffix "x86", 64-bit operating systems match the file suffix "x64"). Finally, you can view the port in the device manager of the computer to check whether the installation is successful.

Connection method: Insert the USB cable of the communication box into the USB port of the computer, and connect the other end to the corresponding interface of the battery protection board.

Communication format: CAN_ID_0 is selected by default for ID, CAN device is selected according to the type of communication box, baud rate is 500K by default, and channel selection is 0 by default.

4.9.3. DIP switch



When PACKs are used in parallel, different PACKs can be distinguished by setting the address through the DIP switch on the BMS. It is necessary to avoid setting the same address. For the definition of the BMS DIP switch, refer to the table below

address bits (binary) Binary Address	switch position				illustrate explain
	4	3	2	1	
0000(0)	OFF	OFF	OFF	OFF	Select "MASTER(0000)" when using 485 alone for communication, Serve as the master in parallel communication.
0001(1)	OFF	OFF	OFF	ON	Select "SLAVE1(0001)" for single-channel 485 communication
0010(2)	OFF	OFF	ON	OFF	Select "SLAVE2(0010)" for single-channel 485 communication
0011(3)	OFF	OFF	ON	ON	Select "SLAVE3(0011)" for single-channel 485 communication
0100(4)	OFF	ON	OFF	OFF	Select "SLAVE4(0100)" for single-channel 485 communication
0101(5)	OFF	ON	OFF	ON	Select "SLAVE4(0101)" for single-channel 485 communication
0110(6)	OFF	ON	ON	OFF	Select "SLAVE4(0110)" for single-channel 485 communication
0111(7)	OFF	ON	ON	ON	Select "SLAVE4(0111)" for single-channel 485 communication
1000(8)	ON	OFF	OFF	OFF	Select "SLAVE4(1000)" for single-channel 485 communication
1001(9)	ON	OFF	OFF	ON	Select "SLAVE4(1001)" for single-channel 485 communication
1010(10)	ON	OFF	ON	OFF	Select "SLAVE4(1010)" for single-channel 485 communication
1011(11)	ON	OFF	ON	ON	Select "SLAVE4(1011)" for single-channel 485 communication
1100(12)	ON	ON	OFF	OFF	Select "SLAVE4(1100)" for single-channel 485 communication
1101(13)	ON	ON	OFF	ON	Select "SLAVE4(1101)" for single-channel 485 communication
1110(14)	ON	ON	ON	OFF	Select "SLAVE4(1110)" for single-channel 485 communication
1111(15)	ON	ON	ON	ON	Select "SLAVE15(1111)" for single-channel 485 communication

4.10. LED instructions

Table 1 LED working status indication

state	Normal/Alarm/Protection	ON/OFF (LED 9)	RUN (LED 8)	ALM (LED 7)	Battery indicator LED (LED 6~1)						illustrate
		●	●	●	●	●	●	●	●	●	
shutdo	sleep	off	off	off	off	off	off	off	off	off	wipe out
standby	normal	always	Flash 1	off	According to the battery indicator						standby mode
	alarm	always	Flash 1	Flash 3							module low voltage
Charge	normal	always	always	off	According to the battery indicator						The highest battery LED is flashing (flashing 2) ALM when overcharge alarm
	alarm	always on	always on	Flash 3	(The battery indicator LED flashes 2 at the highest level)						
	overcharge protection	always on	always on	off	always on	always on	always on	always on	always on	always on	If there is no mains power, the indicator light turns to
	Temperature, overcurrent, failsafe	always on	off	always on	off	off	off	off	off	off	stop charging
discharge	normal	always	Flash 3	off	According to the battery indicator						
	alarm	always	Flash 3	Flash 3							
	undervoltage protection	off	Flash 2	off	off	off	off	off	off	off	Stop discharging
	Temperature, overcurrent, short	always on	off	always on	off	off	off	off	off	off	Stop discharging
fail		off	off	always	off	off	off	off	off	off	Stop charging and discharging

Table 2 Capacity Instructions

state		Charge						discharge					
capacity indicator		L6 ●	L5 ●	L4 ●	L3 ●	L2 ●	L1 ●	L6 ●	L5 ●	L4 ●	L3 ●	L2 ●	L1 ●
Power (%)	0 ~ 16.6%	off	off	off	off	off	Flash 2	off	off	off	off	off	always on
	16.6 ~ 33.2%	off	off	off	off	Flash 2	always	off	off	off	off	always	always
	33.2 ~ 49.8%	off	off	off	Flash 2	always	always	off	off	off	always	always	always
	49.8 ~ 66.4%	off	off	Flash 2	always	always	always	off	off	always	always	always	always
	66.4 ~ 83.0%	off	Flash 2	always	always	always	always	off	always	always	always	always	always
	83.0— 100%	Flash 2	always	always	always	always	always	always	always	always	always	always	always
Running indicator ●		always on						Flashing (flashing 3)					

Table 3 Description of LED flashing

flashing mode	Bright	off
Flash 1	0.25S	3.75S
Flash 2	0.5S	0.5S
Flash 3	0.5S	1.5S

4.11. Buzzer Action Description

When there is a fault, it will beep for 0.25S every 1S;

During protection, it beeps for 0.25S every 2S (except for overvoltage protection) ;

When alarming, beep 0.25S every 3S (except for overvoltage alarm) ;

4.12. Key switch description

When the BMS is in the dormant state, press the button (3~6S) and release it, the protection board is activated, and the LED indicator lights up for 0.5 seconds sequentially from "RUN".

the BMS is activated, press the button (3~6S) and then release it, the protection board will be dormant, and the LED indicators will light up for 0.5 seconds from the lowest battery indicator.

the BMS is activated, press the button (6~10S) and then release it, the protection board will be reset, and all LED lights will light up simultaneously for 1.5 seconds.

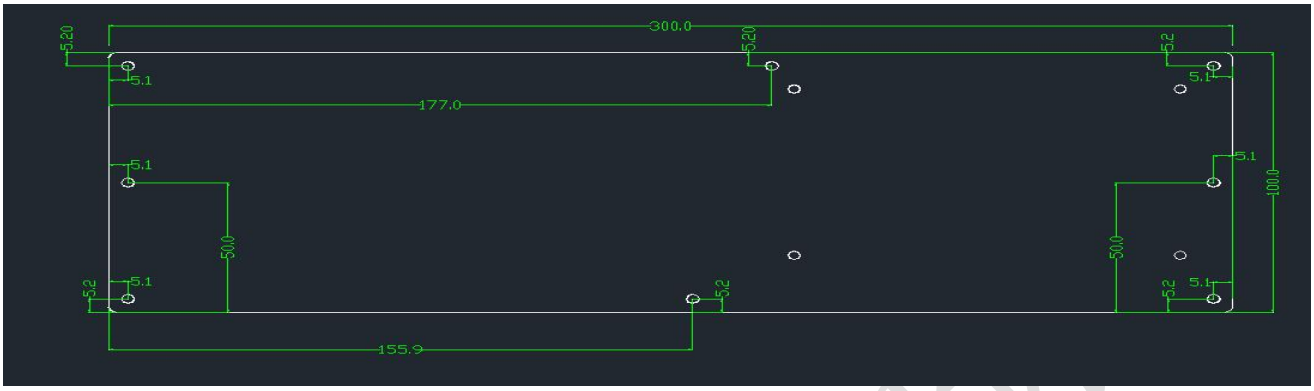
5. main material

serial number	Material name	quantity	Manufacturer
1	IC\QFP\OZ3717\LQFP48L	1 PCS	O 2Micro
2	IC\QFP\HC32L072KATA\LQFP64	1 PCS	BGI
3	HYG017N10NS1TA or BLP 014N10	32pcs	Hua Yiwei or Bei Ling
4	JBD-UP16S010 V1.2 (protection board)	1PCS	JBD
5	JBD-UP16S010-CM V1.2 (current limiting board)	1 PCS	JBD
Accessories			
1	Sampling line\6PIN\HY2.0\with buckle\24AWG\800mm (with a 10K NTC)	2pcs	
2	Sampling line\7PIN\HY2.0\with buckle\24AWG\800 mm (with a 10K NTC)	2pcs	
3	JBD-UP16S010-CON V1.2 (transition board)	1 PCS	
4	Adapter cable\16PIN\HY2.0\24AWG\300MM\double-headed cable\same direction\black, white and red	1 PCS	
5	Adapter cable\13PIN\HY2.0\24AWG\300MM\double-headed cable\reverse\black, white and red	1PCS	
6	Adapter cable\10PIN\HY2.0\24AWG\300MM\double-headed cable\reverse\black, white and red	1PCS	
7	Switch line\2PIN\HY2.0\with buckle\24AWG\420MM\black red	1PCS	
8	Screw\M5\height 8MM\hexapodal terminal with product number 40050078	4pcs	

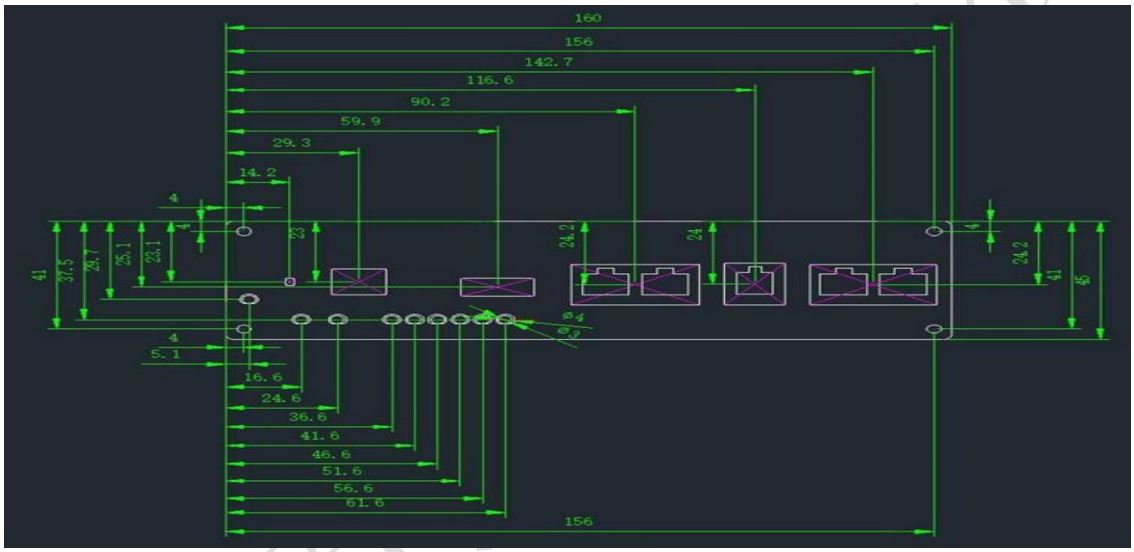
Note: The above materials may be replaced by materials with the same specifications or better specifications. If there is a certification requirement, it is not allowed to replace the materials. You need to notify our business to re-send samples, controlled specifications, and the final interpretation right belongs to Jiabaida .

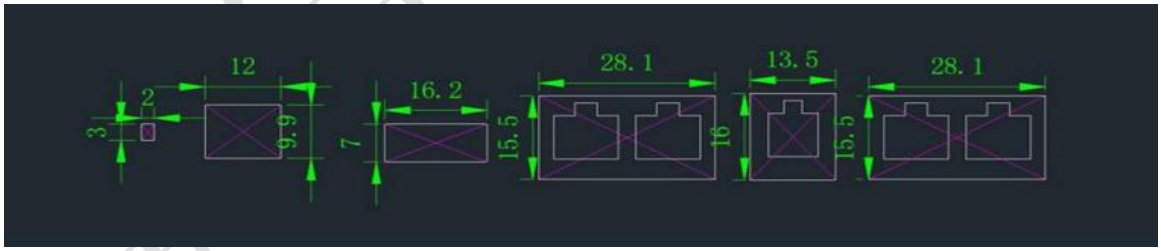
6. Schematic and Dimensions

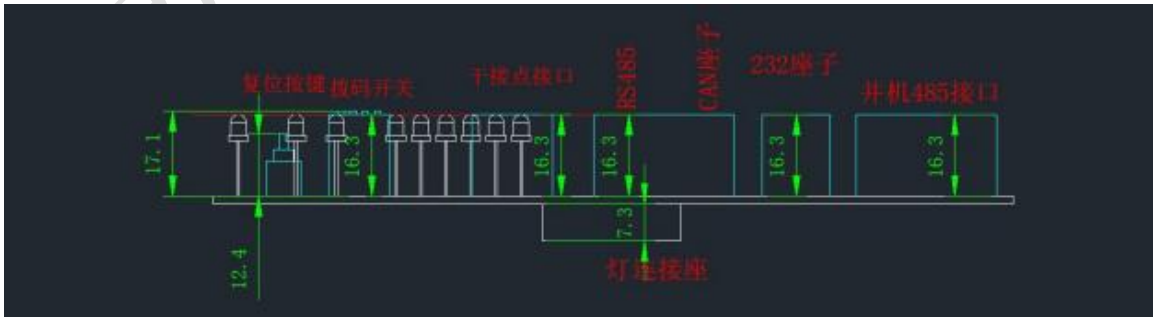
6.1. Motherboard Dimensions



6.2. Adapter board dimension drawing

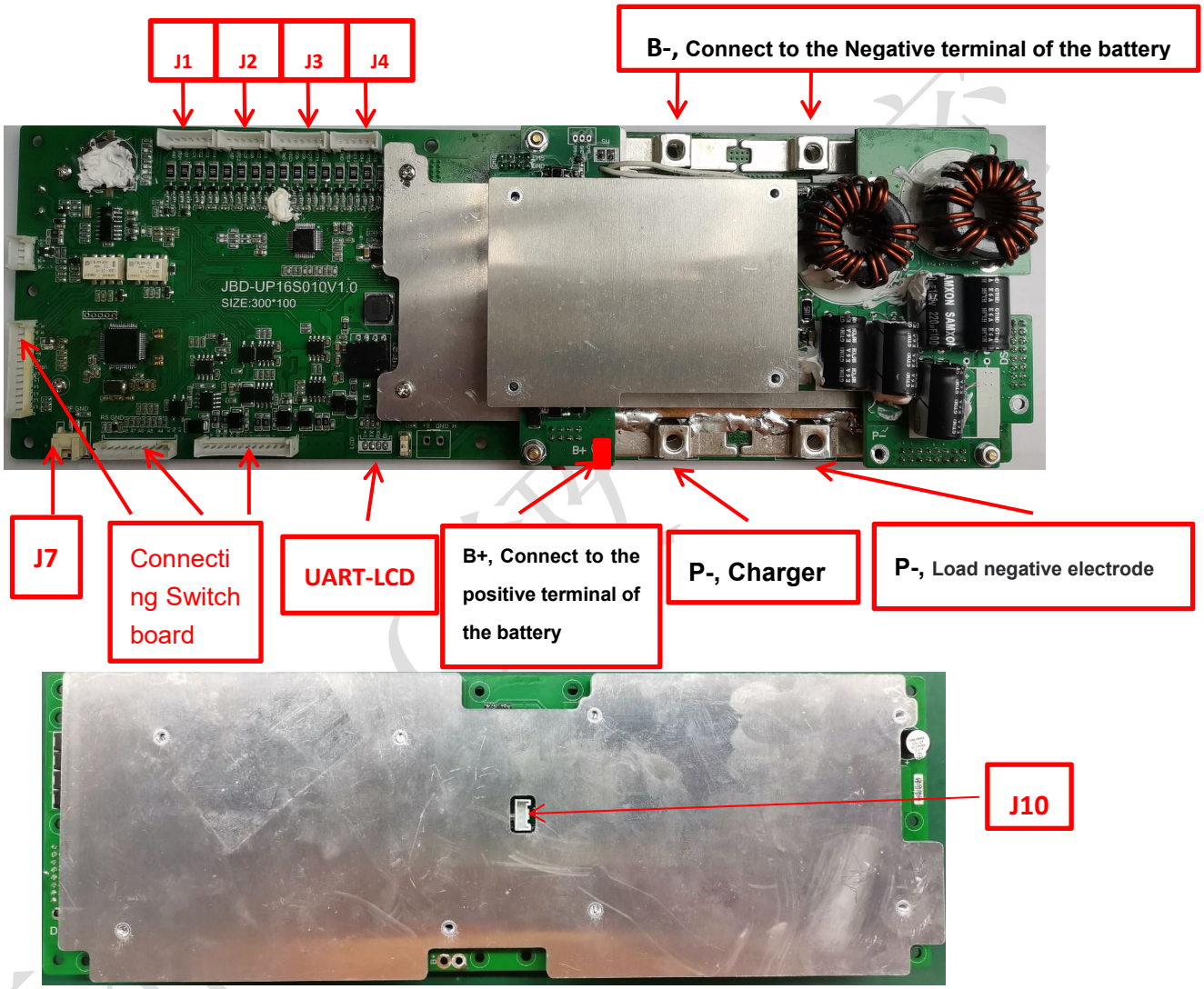






7. Signal port definition

7.1. The schematic diagram marks the interface label (refer to the figure below)



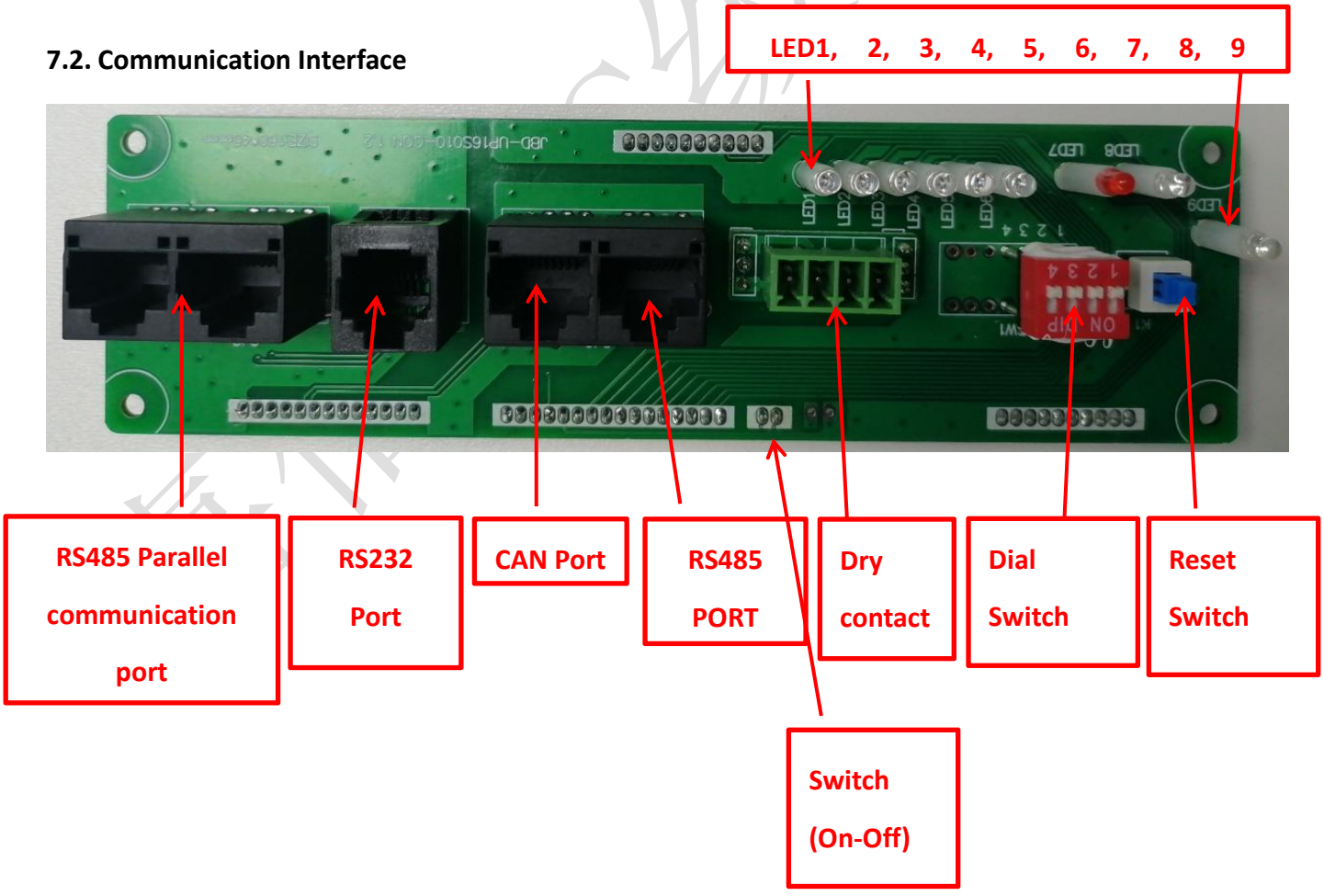
label	bit number	Connector function	Connector diagram	Pin definition	PIN function definition	illustrate
1	J1 (HY2.0-7P) (with	Voltage detection		1	Connect the temperature probe	
				2		
				3	Connect to the	

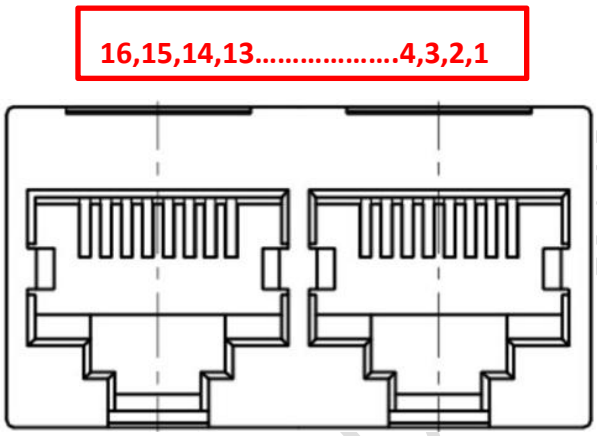
	buckle)	socket			negative pole of the lowest battery	
				4	Connect the positive pole of the first cell	
				5	Connect to the positive pole of the second cell	
				6	Connect to the positive pole of the third cell	
				7	Connect to the positive pole of the fourth cell	
2	J2 (HY2.0-6P) (with buckle)	Voltage detection socket		1	Connect the temperature probe	
				2		
				3	Connect to the positive pole of the fifth cell	
				4	Connect to the positive pole of the sixth cell	
				5	Connect to the positive pole of the seventh cell	
				6	Connect to the positive pole of the eighth cell	
3	J3	Voltage		1	Connect the	

	(HY2.0-7P) (with buckle)	detection socket		2	temperature probe	
				3	Connect to the negative pole of the ninth cell	
				4	Connect to the positive pole of the ninth cell	
				5	Connect to the positive pole of the tenth cell	
				6	Connect to the positive electrode of the eleventh cell	
				7	Connect to the positive electrode of the twelfth cell	
4	J4 (HY2.0-6P) (with buckle)	Voltage detection socket		1	Connect the temperature probe	
				2		
				3	Connect to the positive electrode of the thirteenth cell	
				4	Connect to the positive pole of the fourteenth cell	
				5	Connect to the positive pole of the fifteenth cell	
				6	Connect to the	

					positive pole of the sixteenth cell	
5	J7 (HY2.0-2P) (with buckle)	Secondary protection signal output terminal		1	Overcharge protection ground	
				2	Overcharge current limiting high potential	
6	J10 (HY2.0-4P) (with buckle)	External pre-discharge resistor interface		1	External pre-discharge resistor-1	
				2		
				3	External pre-discharge resistor-2	
				4		

7.2. Communication Interface



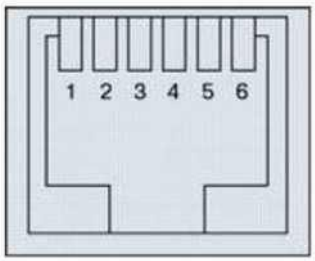


RS485--8P8C vertical RJ45 socket __		CAN-- Adopt 8P8C vertical RJ45 socket	
RJ45 pin	Definition	RJ45 pin	Definition
1，8	RS485-B1	9，10，11，14，16	NC
2，7	RS485-A1	12	CANL
3，6	GND	13	CANH
4，5	NC	15	GND

CAN and RS485 interface

RS485--8P8C vertical RJ45 socket __		RS485 -- using 8P8C vertical RJ45 socket	
RJ45 pin	Definition	RJ45 pin	Definition
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



RS232--6P6C vertical RJ1 1 socket _ _	
RJ11 pin	Definition
1, 2, 6	NC
3	TX (single board)
4	RX (single board)
5	GND

232 communication port

8. Environmental suitability

8.1. working conditions:

The BMS protection board is allowed to work normally under the following conditions:

Ambient temperature: -20 ° C ~+75 ° C ;

Relative humidity: 5 % ~ 90 %;

Atmospheric pressure: 86kPa~106kPa;

8.2. storage environment

The BMS 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 no more than 70%, and no corrosive gases or media that affect electrical insulation in the air, and must not be affected by any Mechanical shock or heavy pressure. It should not be exposed to direct sunlight, and the distance from heat sources (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

9.1. The BMS protective board shall have the following clear and durable marks:

1) Product name, model

2) Cell model

3) Date of manufacture and serial number

9.2. Package

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

9.3. transportation

1) During transportation, the product shall not be corroded by severe mechanical impact, sun exposure, rain, chemical corrosive substances and harmful gas; 5.3.2 During the loading and unloading process, the product shall be handled with care, and throwing and heavy pressure are strictly prohibited.
2) The stacking height of packing boxes is less than 5 layers.

10. Precautions

1) This management system cannot be used in series.
2) When multiple battery packs using this management system are connected in parallel, it should be ensured that the maximum voltage difference of each battery pack before parallel connection is lower than 3V.
3) When multiple battery packs using this management system are used in parallel, the total charging surge current of the adapter may be applied to a single battery pack. It should be ensured that the total charging surge current of the adapter does not exceed the maximum charging surge 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 conditions. When the total internal resistance of the battery pack and the short-circuit circuit is lower than 40mΩ, the capacity of the battery pack exceeds 20% of the rated value, the short-circuit current exceeds 1800A, the inductance of the short-circuit circuit is very large, or the total length of the short-circuit wire is very long, please test to determine whether This management system can be used.

5) When welding the battery leads, there must be no wrong connection or reverse connection. If it is indeed wrongly connected, 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) Be careful not to touch the components on the circuit board with the lead wire, soldering iron, solder, etc. during use, otherwise the circuit board may be damaged.
8) Pay attention to anti-static, moisture-proof, waterproof, etc. during use.
9) Please follow the design parameters and conditions of use during use, and do not exceed the values in this specification, otherwise the management system may be damaged.
10) After combining the battery pack and the management system, if there is no voltage output or no charging when powering on for the first time, please check whether the wiring is correct.
11) The parameters, functions and appearance in this specification are for reference only, and the actual protection board shall prevail.