
九江恒通自动控制器有限公司

Jiujiang Hengtong Automatic Controller Co., Ltd

产 品 规 格 书

Product specification

客 户 名 (CUSTOMER): _____

产 品 名 (SAMPLE NAME): _____ 13-16 S 40 A 同口硬件板 _____

产 品 型 号 (MODEINAME): _____ P16S40A1TNS 三元系列 _____

呈 送 日 期 (DATE): _____

版 本 (VERSION): _____ V1.0 _____

客户签名盖章 (SIGNATURES) :

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规格书版本修正记录(Revision Record of Specification Version)

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1.产品简介 (Product introduction)

● P16S40A1TNS 是专门针对16串三元电池包设计的保护板方案，该产品采用中颖采集芯片。部分参数可以根据客户需求，通过上位机灵活调整。

● P16S40A1TNS is a protection board solution specifically designed for 16 string ternary battery packs, which uses the SinoWealth acquisition chip. Some parameters can be flexibly adjusted through the upper computer according to customer needs.

2.功能配置(Configuration)

功能 (Function)	配置 (Configuration)	功能 (Function)	配置 (Configuration)
支持串数 (Number of series supported)	(13-16S) for option	持续电流 (Maximum continuous current)	(40A) for option
温度监测 (Temperature detection)	1路内置，1路外置 (1 internal, 1 external)	均衡功能 (Balance Function)	被动均衡 (Passive balance)
适用电池 (Applicable battery)	三元 (Ternary Lithium Battery)		

3.参数设置 (Parameter Setting)

3.1.基本参数 (Basic parameter)

电芯规格 (Cell specifications)	16串三元电池 (16 series of ternary battery)
接口类型 (Interface type)	充放电同口 (Charge and discharge are both at the same port)
充电电压 (Charging voltage)	4.2V * 串数 (4.2V*Number of series)
单体电压范围 (Cell voltage range)	2.70 ~ 4.25V
持续充电电流 (Continuous charging current)	≤ 40A
持续放电电流 (Continuous discharging current)	≤ 40A
回路内阻(Circuit resistance)	≤10mΩ
工作温度(Operating temperature)	-20℃ ~ 75℃
保护板结构尺寸(Structure size of PCB)	
尺寸(size)	95±1mm*54±1mm*15±2mm (长度*宽度*高度)(Length*Width*Height)

注：测试需在温度25±2℃,相对湿度65±20%的环境

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

3.2.主要参数 (Main parameter)

	项目 (Project)	规格 (Specification)			单位 (Unit)
		最小值 MIN	典型值 TYPE	最大值 MAX	
过压和欠压保护 (Overvoltage and undervoltage protection)	过充保护电压 (Over-voltage)	4.200	4.250	4.300	V
	过充保护延时 (Over-voltage delay)	500	1000	2000	mS
	过充保护释放 (Over-voltage release)	4.150	4.200	4.250	V
	过放保护电压 (Under-voltage)temp ≥0℃	2.650	2.700	2.750	V
	过放保护延时 (Under-voltage delay)	500	1000	2000	mS
	过放保护释放 (Under-voltage release)temp ≥0℃	2.810	2.860	2.910	V
	过放保护释放条件 (Under-voltage release conditions)	断开负载或者充电恢复 Disconnect load or charge release			
	充电过流保护值 (Over-current Charge protection value)	56 A (±5A)			
	充电过流延迟 (Over-current Charge delay)	500	1000	1500	mS
	充电过流释放条件 (Over-current Charge release conditions)	断开充电器 Disconnect the charger			
	一级放电过流保护值 (1st Over-current Discharge value)	84 A (±10A)			
	一级放电过流保护延迟 (1st Over-current Discharge delay)	500	1000	2000	mS
	二级放电过流保护电流值 (2nd Over-current Discharge value)	200 A (±40A)			
	二级放电过流保护延迟时间 (2nd Over-current Discharge delay)	50	100	200	mS
	放电过流保护恢复条件 (Over-current Discharge release)	断开负载或者充电恢复 Disconnect load or charge release			
短路保护 (Short circuit protection)	短路保护电流 (Short circuit protection current value)	400 A (±100A)			
	短路保护延迟时间 (Short circuit protection delay time)	200	256	800	uS
	短路保护恢复 (Short circuit protection recovery)	断开负载或者充电恢复 Disconnect load or charge release			
温度保护 (Temperature Protection)	充电高温保护值 (High temperature protection value in charging)	60	65	70	℃
	充电高温保护释放值 (High temperature protection release value in charging)	50	55	60	℃
	充电低温保护值 (Low temperature protection value in charging)	-20	-15	-10	℃
	充电低温保护释放值 (Low temperature protection release value in charging)	-15	-10	-5	℃

	放电高温保护值 (High temperature protection value in discharging)	70	75	80	°C
	放电高温保护释放值 (High temperature protection release value in discharging)	60	65	70	°C
	放电低温保护值 (Low temperature protection value in discharging)	-25	-20	-15	°C
	放电低温保护释放值 (Low temperature protection release value in discharging)	-15	-10	-5	°C
FET 高温保护 (内置) of FET (Built-in)	温度保护值 (Temperature protection value)	90	95	100	°C
	温度保护释放 (Temperature protection release value)	70	75	80	°C
	放电高温保护释放条件 (Overtemperature Discharge protection release conditions)	断开负载或者充电恢复 (Disconnect load or charge release)			
均衡功能 (Balance Function)	均衡开启电压 (Balance function turn-on voltage)	3.750	3.800	3.850	V
	均衡电流 (Balance current)	28	38	48	mA
	均衡类型 (Balance type)	脉冲模式 (Pulsed model)			

注：测试需在温度 $25\pm 2^{\circ}\text{C}$,相对湿度 $65\pm 20\%$ 的环境。

Note: Test should be at temperature $25\pm 2^{\circ}\text{C}$, and relative humidity $65\pm 20\%$ of surroundings.

3.2.参数设置界面 (Parameter Settings Interface)



中颖烧写上位机-II V1.33-SH3676016B

文件(F) 选项(O) 帮助(H)

SINO WEALTH

页面选择

EEPROM

寄存器

加载E2

保存E2

加载参数

保存参数

成功 0

失败 0

计数复位

设备检测

产品信息

用户ID 01

电池节数 16

系统配置

充放电MOS强制开启 On

欠压强开放电 MOS恢复延时 On

刹车反充防过充及充电温保 On

均衡条件 No-Dsg

充电状态检测电压 500uV

放电过流定时恢复 On

过充电充电器锁定 Yes

过放电负载锁定 No

断线功能 On

TS3温度检测 OTD-Only

电压保护

过充电保护电压 4250 mV

过充电保护延时 1S

过充电恢复电压 4200 mV

均衡开启电压 3800 mV

均衡开启压差 20mV

均衡进入延时 5S

过放电恢复电压 2860 mV

过放电保护电压 2700 mV

过放电保护延时 1S

低压禁止充电电压 None

电流保护

放电过流1保护电压 42mV

放电过流1保护延时 1S

放电过流2保护电压 100mV

放电过流2保护延时 100mS

短路保护电压 200mV

短路保护延时 256uS

充电过流保护电压 28mV

充电过流保护延时 1S

温度保护

Hex

充电高温保护 65 °C

充电高温保护释放 55 °C

充电低温保护 -15 °C

充电低温保护释放 -10 °C

放电高温保护 75 °C

放电高温保护释放 65 °C

放电低温保护 -20 °C

放电低温保护释放 -10 °C

充电时充电温度延时 3S

热敏电阻类型选择 Temp_103AT3950

在线烧写

烧写参数

读取参数

脱机烧写

下载脱机信息

读取脱机信息

在线烧写校验

CRC码值: 0x008B

CheckSum: 0x0965

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4.功能说明(Function Description)

4.1. 过充保护和恢复(Overcharge protection and recovery)

4.1.1. 单体过充保护及恢复(Cell overcharge protection and recovery)

当任意一节电芯电压高于单体过充电压设定值，并且持续时间达到单体过充延时，系统进入过充保护状态，关闭充电MOS不能对电池充电。

单体过充保护后，当所有单体电压降到单体过充恢复值以下时，解除过充保护状态。

When the voltage of any cell is higher than the set value of the cell over-charge voltage, and the duration reaches the cell overcharge delay, the system enters the overcharge protection state, the charging MOS will turn 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.

4.2. 过放保护和恢复(Over-discharge protection and recovery)

4.2.1. 单体过放保护及恢复(Cell over-discharge protection and recovery)

当最低节电压低于单体过放电压设定值，并且持续时间达到单体过放延时，系统进入过放保护状态，关闭放电 MOS，不能对电池放电。

发生单体过放保护后，对电池组充电可以解除过放保护状态。

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.

4.3. 充电过流保护和恢复(Over-current protection and recovery in charging)

当充电电流超过充电过流保护电流且持续的时间达到过流检测延迟时间，系统进入到充电过流保护状态，不能对电池进行充电。

When the charging current exceeds the charging over-current protection threshold and this condition persists for the duration of the over-current detection delay, the system enters the charging over-current protection state, preventing the battery from being charged.

4.4. 放电过流保护和恢复(Over-current protection and recovery in discharging)

当放电电流超过放电过流保护电流且持续的时间达到过流检测延迟时间，系统进入到放电过流保护状态，关闭放电 MOS。放电有两级过流保护功能，对不同的电流值具有不同的响应速度，更加可靠地保护电池。

When the discharge current exceeds the discharge overcurrent protection current and persists for the duration of the overcurrent detection delay time, the system enters the discharge overcurrent protection state and shuts down the discharge MOS. The discharge feature includes two-stage overcurrent protection functions, which respond at different speeds to varying current levels, providing more reliable battery protection.

4.5.温度保护和恢复(Temperature Protection and Recovery)

4.5.1.充放电高温保护及恢复(High temperature protection and recovery in charging and discharging)

当充放电时 NTC 检测电芯表面的温度高于设定的高温保护温度时，管理系统进入高温保护状态，充电或放电 MOSFET 关闭，在该状态不能对电池包充电或放电。

当电芯表面的温度下降到高温恢复设定值时，管理系统从高温状态恢复，重新导通充放电 MOS。

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.充放电低温保护和恢复(Low temperature protection and recovery in charging and discharging)

当充放电时 NTC 检测电芯表面的温度低于设定的低温保护温度时，管理系统进入低温保护状态，充电或放电 MOSFET 关闭，在该状态不能对电池包充电或放电。

当电芯表面的温度上升到低温恢复设定值时，管理系统从低温状态恢复，重新导通充放电 MOS。

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.均衡功能(Balance function)

管理系统采用电阻旁路的方式进行电芯均衡，充电静置过程中电池组最高节单体电芯电压达到设定的均衡启动电压值，且电池组单体电芯最低电压与最高电压压差大于设定值时，达到条件的电芯均衡功能开启，相邻的两路均衡不能同时开启。

当电芯压差小于设定值或者电芯电压小于均衡开启电压时均衡停止。

The management system adopts a resistor bypass method for cell balancing. During the charging/quiescent process, when the highest single cell-voltage of the battery pack reaches the set equilibrium starting voltage value, and the difference between the lowest and highest voltage of the single cell of the battery pack is greater than the set value, the cell balancing function that meets the conditions is activated, and adjacent two equalization circuits cannot be activated simultaneously.

When the voltage difference of the battery cell is less than the set value or the voltage of the battery cell is less than the equalizing start voltage, the equalizing stops.

5. 主要物料 (Main material)

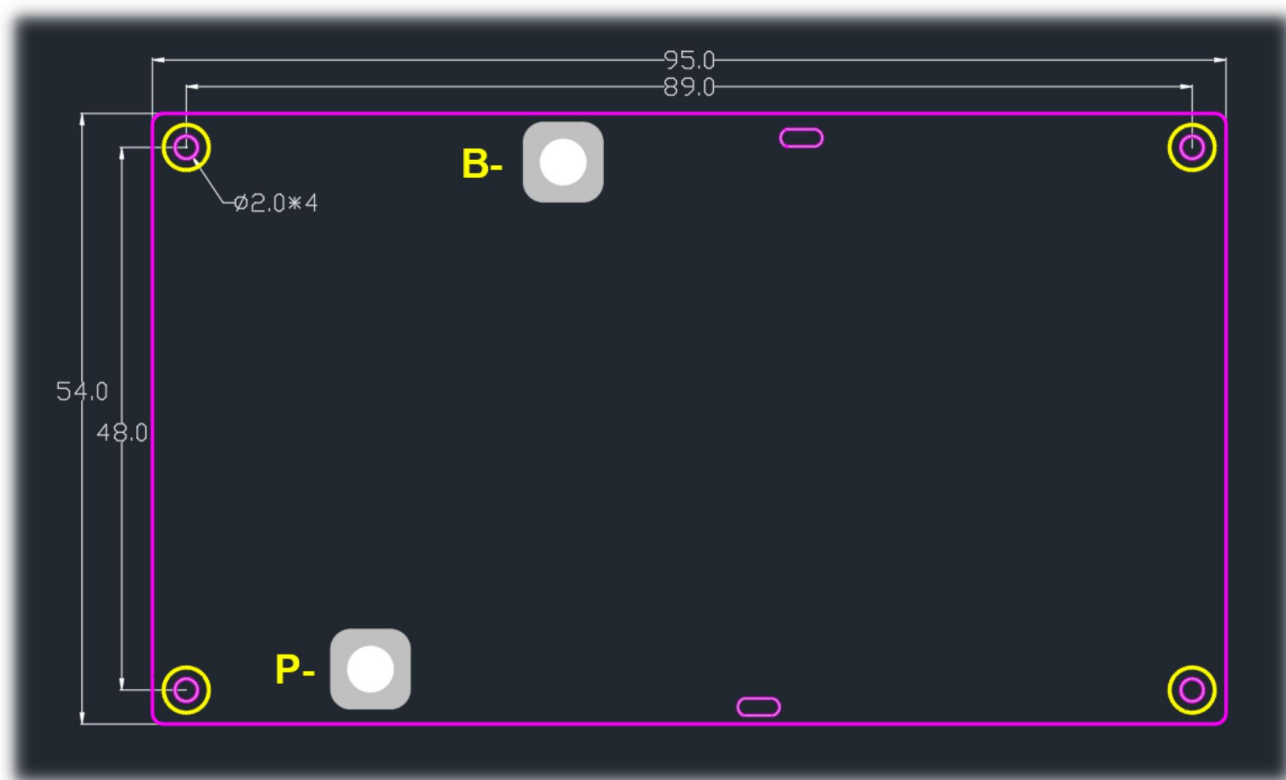
序号 (Number)	料类型 Material type	物料名称 (Name of Material)	生产厂家 (Manufacturer)	数量 (Quantity)
1	前端芯片	SH3676016BP	中颖	1PCS
2	MOS	KCT017N10N	KIA	6 PCS

注：以上物料可能用同等规格参数或者更好的规格参数的物料替代，如有认证需求不允许更换物料，需要通知我司业务重新送样，受控规格书，最终解释权归九江恒通所有。

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 and the final interpretation right belongs to JJHT.

6. 示意图及尺寸 (Schematic and Dimensions)

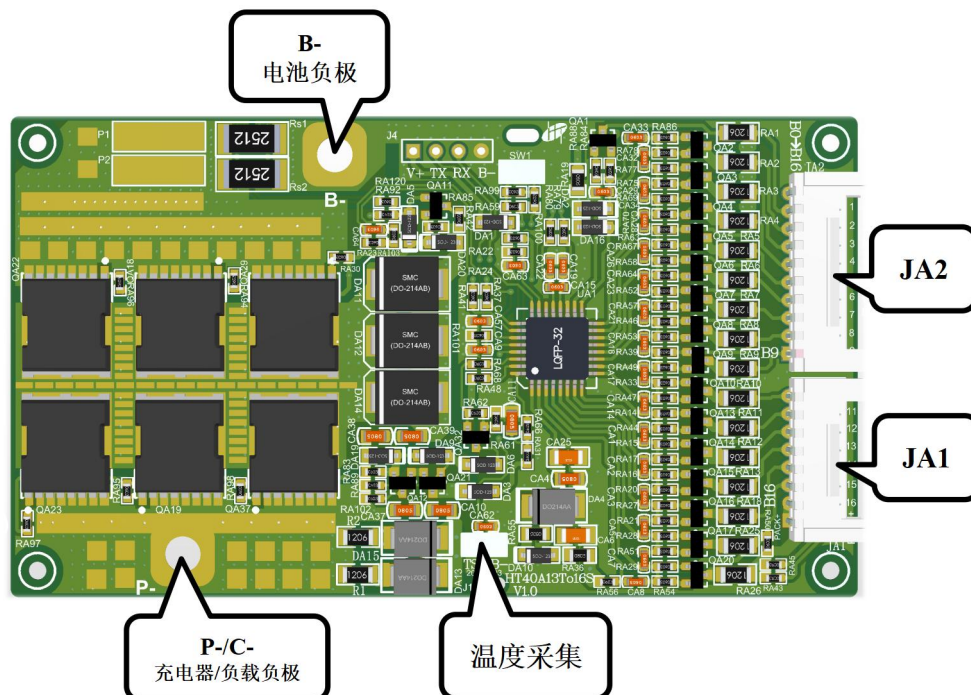
6.1. 尺寸及安装点标注图(Dimensions and installation point drawing)



结构尺寸图 (单位：毫米)
Figure of structure size (Unit:mm)

7. 信号口定义(Definition of signal port)

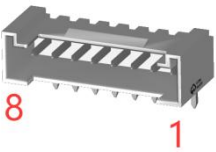
7.1. 示意图标注接口标号(Illustration annotation)



Port definition

Label	Definition	Notes
B-	接电池组负极 Negative of battery pack	
P-/C-	接充电器、负载负极 Negative of Charger/Load	

标号 (Label)	位号 (Tag number)	接插件 功能 (Connector)	接插件示意图 (Schematic diagram)	PIN	PIN功能定义 (Pin definition)	备注 (Note)
1	JA2 (HY2.0 10P) (带卡扣)	电压检测 插座 (Voltage detection)		1	接最低节电芯负极 Connect to Negative Side of Cell 1	B-
				2	接第1节电芯正极 Connect to Positive Side of Cell 1	
				3	接第2节电芯正极 Connect to Positive Side of Cell 2	
				4	接第3节电芯正极 Connect to Positive Side of Cell 3	
				5	接第4节电芯正极 Connect to Positive Side of Cell 4	
				6	接第5节电芯正极 Connect to Positive Side of Cell 5	
				7	接第6节电芯正极 Connect to Positive Side of Cell 6	
				8	接第7节电芯正极 Connect to Positive Side of Cell 7	
				9	接第8节电芯正极 Connect to Positive Side of Cell 8	
				10	接第9节电芯正极 Connect to Positive Side of Cell 9	

2	JA1 (HY2.0 8P) (带卡扣)	电压检测 插座 (Voltage detection)		1	接第10节电芯正极 Connect to Positive Side of Cell 10	
				2	接第11节电芯正极 Connect to Positive Side of Cell 11	
				3	接第12节电芯正极 Connect to Positive Side of Cell 12	
				4	接第13节电芯正极 Connect to Positive Side of Cell 13	
				5	接第14节电芯正极 Connect to Positive Side of Cell 14	
				6	接第15节电芯正极 Connect to Positive Side of Cell 15	
				7	接第16节电芯正极 Connect to Positive Side of Cell 16	B+
				8	接第16节电芯正极 Connect to Positive Side of Cell 16	B+

7.2. 备用配置串数(Configuring alternative cell-counts)

13-16串接线配置

Cell Input	13S	14S	15S	16S
PACK+	Cell 13+	Cell 14+	Cell 15+	Cell 16+
BC 16	NC	NC	NC	Cell 16+
BC 15	NC	NC	Cell 15+	Cell 15+
BC 14	NC	Cell 14+	Cell 14+	Cell 14+
BC 13	Cell 13+	Cell 13+	Cell 13+	Cell 13+
BC 12	Cell 12+	Cell 12+	Cell 12+	Cell 12+
BC 11	Cell 11+	Cell 11+	Cell 11+	Cell 11+
BC 10	Cell 10+	Cell 10+	Cell 10+	Cell 10+
BC 9	Cell 9+	Cell 9+	Cell 9+	Cell 9+
BC 8	Cell 8+	Cell 8+	Cell 8+	Cell 8+
BC 7	Cell 7+	Cell 7+	Cell 7+	Cell 7+
BC 6	Cell 6+	Cell 6+	Cell 6+	Cell 6+
BC 5	Cell 5+	Cell 5+	Cell 5+	Cell 5+
BC 4	Cell 4+	Cell 4+	Cell 4+	Cell 4+
BC 3	Cell 3+	Cell 3+	Cell 3+	Cell 3+
BC 2	Cell 2+	Cell 2+	Cell 2+	Cell 2+
BC 1	Cell 1+	Cell 1+	Cell 1+	Cell 1+
BC 0	Cell 1-	Cell 1-	Cell 1-	Cell 1-

注：Cell x- 指该串数的负极。 Cell x-refers to the negative electrode of the string number.
Cell x+ 指该串数的正极。 Cell x+refers to the positive pole of the string number.

8. 环境适用性(Environmental suitability)

8.1.工作环境(The environment of working)

- BMS 保护板允许在下列条件下正常工作:
- 环境温度: -20℃~75℃;
- 相对湿度: 5%~90%;
- 大气压力: 86kPa~106kPa;

-
- BMS The protective plate allows normal operation under the following conditions:
 - Ambient temperature:-20℃~75℃;
 - Relative humidity:5%~90%;
 - Atmospheric pressure:86kPa~106kPa;

8.2.存储环境(The environment of storage)

● BMS 保护板应存储在环境温度为-5℃~+40℃、相对湿度不大于70%、清洁通风良好的库房内,空气中不得含有腐蚀性气体及影响电气绝缘的介质,不得受任何机械冲击或重压。不受阳光直射,与热源(暖气设备等)之间的距离不得少于2m。在以上存储条件下,BMS 保护板可存放一年。

● BMS should be stored in a clean and well-ventilated warehouse with an ambient temperature of -5℃~+40℃,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 BMS can be stored for one year.

9.包装运输(Packing and shipping)

9.1. 标志(Logo)

保护板应有下列清晰耐久标志:

- 产品名称、型号
- 电芯型号
- 出厂日期及编号

The following marks should be clearly display on this product:

- Name and model of product
- Model of battery cell
- Manufacture date and number

9.2. 包装(Package)

- 包装应符合防潮、防振动的要求, 包装箱应牢固可靠, 箱内应衬有防潮材料, 产品在箱内不应窜动。

- 外部纸箱包装箱, 单板防静电袋加气泡袋包装;

● 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,vencer anti-static bag plus bubble bag packaging;

9.3. 运输(transportation)

● 在运输中, 产品不得受剧烈机械冲撞、暴晒、雨淋、化学腐蚀性物品及有害气体侵蚀; 在装卸过程中, 产品轻搬轻放, 严禁摔掷、重压。

- 包装箱码放高度小于5层。

● During transportation,the product shall not be subject to severe mechanical impact,exposure to the sun,rain, chemical corrosive substances and harmful gases;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.注意事项(Precautions)

- 1.本电池管理系统是不能串联使用的。
- 2.本管理系统的短路保护功能适用于多种应用情景，但并不能保证可以在任意条件下短路。当电池包和短路回路的内阻 值总和低于40mΩ、电池组容量超出额定值20%、短路电流超过2000 A、短路回路的电感非常大或者短路的导线总长度非常长时，请自行测试确定是否可以使用本管理系统。
- 3.焊接电池引线时，一定不可有错接或反接。如果确实已接错，这块电路板可能已损坏，需要重新测试合格后才可使用。
- 4.装配时管理系统不要直接接触到电芯表面，以免损坏电路板。装配要牢固可靠。
- 5.使用中注意引线头、烙铁、焊锡等不要碰到电路板上的元器件，否则有可能损坏本电路板。焊接本电路板请不要使用 膏状助焊剂，否则有可能导致本电路板工作不正常。
- 6.使用过程要注意防静电、防潮、防水等。
- 7.使用过程中请遵循设计参数及使用条件，不得超过本规格书中的值，否则有可能损坏管理系统。
- 8.将电池组和管理系统组合好以后，初次上电如发现无电压输出或充不进电，请检查接线是否正确。
- 9.本规格书中的参数、功能和外形仅供参考，请以保护板实物为准。

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- 1.This battery management system cannot be used in series.
 - 2.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 loop is lower than 40mΩ,the capacity of the battery pack exceeds the rated value by 20%,the short-circuit current exceeds 2000A,the inductance of the short-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.
 - 3.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.
 - 4.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.
 - 5.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.
 - 6.Pay attention to anti-static,moisture-proof,waterproof and so on while using this product.
 - 7.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.
 - 8.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.
 - 9.The Parameter,function and outlook of BMS in this specification are for reference only,please refer to actual product.