

Li-ion Polymer Battery Pack Specification

锂离子圆柱电池组合规格书

Model:
型 号: 18650-3S2P

Nominal Capacity:
标 称 容 量: 5200mAh

Customer's Model:
客 户 型 号: HJ1103J

Customer:
客 户: 望圆智能

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Customer approval(客户承认)	
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Audit signature :	审核签名
Signature of approval :	批准签名
compile date :	编制日期

Approved 核准	Countersign 会签		Checked 审核	Prepared 制定
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1.Modified list 修订履历

Product modified record list
产品变更履历表

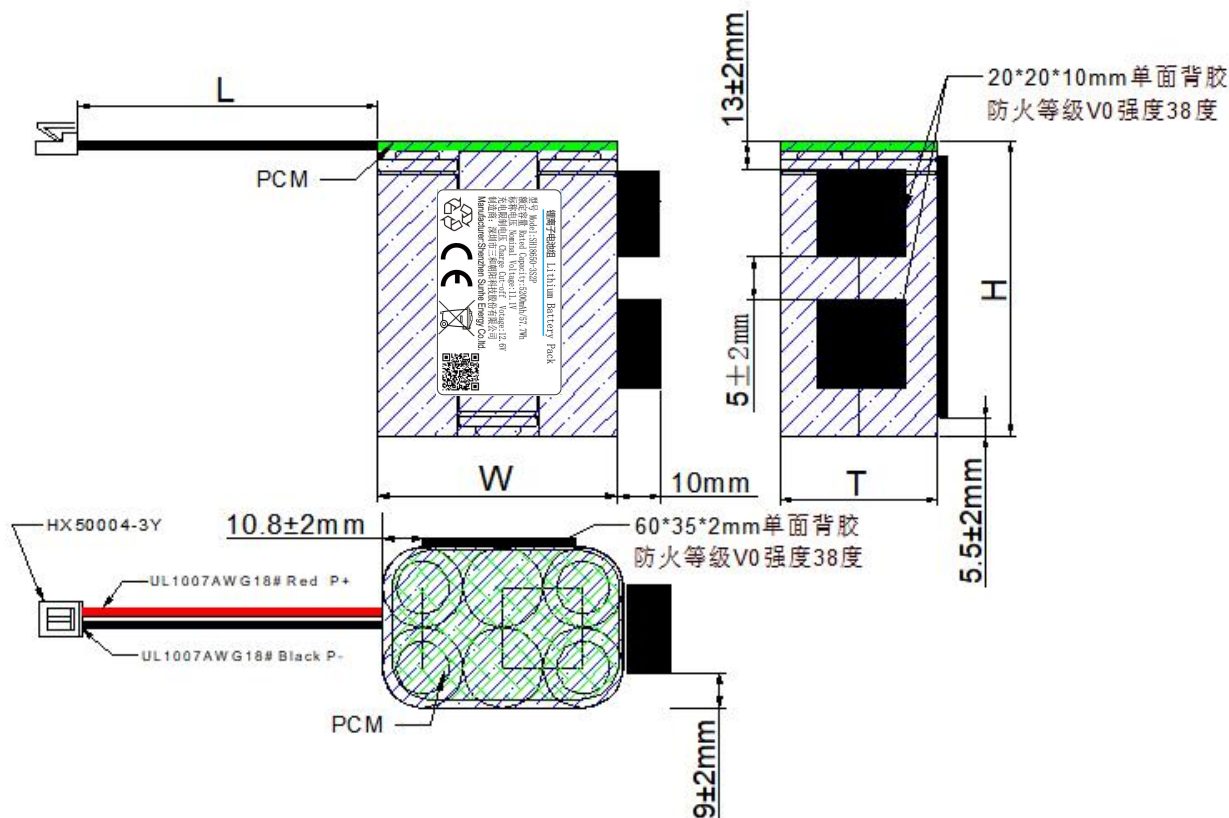
Revision 版本	Date 日期	Mark 标记	Modified content 变更内容	Approved by 批准
A0	2020-03-26	/	NEW RELEASE	
A1	2020-05-25	/	更新重量，内阻，包装	
A2	2020-6-18	/	更新循环，温度，储存信息	
A3	2021-11-11	/	电芯巴特威更改为卓能，保护板更改为过UL板	
A4	2022-07-06	/	电芯由卓能改为凯德	
A5	2024-12-04	/	标贴增加CE标示	
A6	2025-2-14	/	标贴更改二维码	

2.Scope 适用范围

This specification describes the basic performance,technical requirement ,testing method ,warning and caution of the Li- ion Cylindrical rechargeable battery.The specification only applies to Shenzhen Sunhe Energy Co., Ltd.

本标准规定了锂离子聚合物可充电电池的基本性能、技术要求、测试方法及注意事项，本标准只适用于深圳市三和朝阳科技股份有限公司所生产的电池。

3. Initial dimension 初始尺寸



标贴：标贴内容详见 9.2 标贴

光身电芯尺寸:Max18.4mm (φ)×65.1mm (L)

包装方式：双层蓝色 PVC 膜

Unit 单位 (mm)

T（厚度）	Max:38.5	W（宽度）	Max:57.5	H（高度）	Max:70.5
L(引线长度)	160±5	Connector (连接器)	HX50004-3Y 正向/UL1007AWG18#/红黑		
PCM (保护板)	CW1244ALBS+CW1051ALCM+AGM405A*2+AO3400A+NTC（10K, B=3435）+12A 三端保险丝+R003				
电芯	凯德 INR18650E 26				

4.Specification 产品规格

Item 项目		Specification 参数	Remark※备注
4.1.1 Typical Capacity 标称容量		5200mAh	室温倍率放电性能： 0.5C≥99% 1C≥95% 2C≥90% 3C≥80%
Minimum Capacity 最小容量	less than 7 day 小于 7 天	5150mAh (0.5C)	
	less than 3 month 三个月以内	4940mAh (1C)	
	less than 6 month 六个月以内	4680mAh (2C)	
	less than 1 year 一年以内	4160mAh (3C)	
4.1.2 Nominal Voltage 标称电压		11.1V	
4.1.3 End Voltage 放电截至电压		8.25V	
4.1.4 Charging Current (Std.) 标准充电电流		0.5CA= (2600mA)	Ambient temperature 环境温度 0~+45°C
4.1.5 Charging Current (Max.) 最大充电电流		5A	Ambient temperature 环境温度 0~+45°C
4.1.6 Charging Voltage 充电截至电压		12.6V	
4.1.7 Charging Time (Std.) 标准充电时间		2~3.0 hours	
4.1.8 Charging Time (Max.) 快速充电时间		1~2.0 hours	
4.1.9 Discharging Current (Std.) 标准放电电流		0.5CA= (2600mA)	Ambient temperature 环境温度 -20~+60°C
4.1.10 Continuous Discharging Current (Max.) 最大持续放电电流		5A	Ambient temperature 环境温度 0~+60°C
4.1.11 Soft Pack Internal Resistance 成品内阻(25°C)		<120mΩ	AC Impedance 交流内阻 1KHz
4.1.12 Soft pack Weight 成品重量		≤310g	
4.1.13 Temperature range for storage 储存温度范围	less than 7 day 小于 7 天	-20~+55°C	60±25%R.H. at the shipment state (出货状态时的湿度范围)
	less than 3 month 三个月以内	-10~+40°C	
	less than 6 month 六个月以内	5~+35°C	
	less than 1 year 一年以内	15~30°C	
4.1.14 Open Circuit Voltage 出货电压		11.1~11.7V	Measure with voltmeter. 使用电压表进行测量

5.General performance 常规性能

No.	Item 项目	Test methods and condition 测试方法和条件							Criteria 标准
5.1	0.2C Capacity 0.2C 容量	After standard charging, rest battery for 10min, then discharging at 0.2C to voltage 8.25V, recording the discharging time. 标准充电后,搁置 10 分钟,然后用 0.2C 电流放电至 8.25V, 所记录放电时间							≥300min
5.2	0.5C Capacity 0.5C 容量	After standard charging, rest battery for 10min, then discharging at 0.5C to voltage 8.25V, recording the discharging time. 标准充电后,搁置 10 分钟,然后用 0.5C 电流放电至 8.25V, 记录放电时间.							≥114min
5.3	Cycle life 循环寿命	Constant current 0.5C charge to 12.6V, then constant voltage charge to current declines to 0.01C, rest 10min , constant current 0.5C discharge to 8.25V , rest 10min. Repeat above steps till continuously discharging capacity Higher than 80% of the Initial Capacities of the Cells 先用 0.5 C 恒流充电至 12.6V, 再恒压 12.6V 充电直至充电电流≤0.01C,搁置 10 分钟,再用 0.2C 电流放电至 8.25V;又搁置 10 分钟,重复以上步骤,直到放电容量是初始容量的 80%							≥500 times
5.4	Capability of keeping electricity 荷电保持能力	20±5°C, After standard charging, rest the battery 28days, discharging at 0.2C to voltage 8.25V, recording the discharging time. 在 20±5°C 状态下,标准充电后,电芯搁置 28 天,然后用 0.2C 放电至 8.25V,所记录放电时间.							≥240min
5.5	Battercycle times and capacity comparison table 电循环次数与容量对照	循环次数	50	100	200	300	400	500	环境温度 20-25°C, 0.5C 标准充放电为一个循环
		容量百分比	95%	93%	90%	88%	86%	83%	

6. Environment performance 环境性能

No.	Item 项目	Test methods and condition 测试方法和条件							Criteria 标准
6.1	Discharge at high temperature 高温放电	After standard charging, rest the cells 2h at 55±2°C, then discharging at 1C to voltage 8.25V, recording the discharging time. 标准充电后, 在 55±2°C 条件下贮存 2h, 然后用 1C 放电至 8.25V,所记录放电时间.							≥54min
6.2	Discharge at low temperature 低温放电	After standard charging, rest the cells for 16h at -10±2°C, then discharging at 0.2C to voltage 8.25V, recording the discharging time.							≥180min

		标准充电后, 在-10±2℃条件下贮存 16h, 然后用 0.2C 放电至 8.25V, 所记录放电时间.						
6.3	Altitude Simulation) Test 高空低压模拟	The full-charged batteries are to be stored for 6 hours at an absolute pressure of 11.6 kPa and a temperature of 25 ±2 °C. 将电池放入真空箱中, 逐渐抽真空至气压小于或等于 11.6KPa, 并在此气压下保存 6H						No fire, No explosion, No leakage 不起火,不爆炸,不 泄漏
6.4	Vibration Test 振动测试	A full-charged battery is to be subjected to simple harmonic motion with an amplitude of 1.6 mm total maximum excursion. The frequency is to be varied at the rate of 1 hertz per minute between 10 and 55 hertz. The cell shall be vibrated for 45 minutes along vertical axis to each other. 将满充电后的电芯固定在振动台上, 沿相互垂直的 两个轴各振动 45 分钟, 振幅 1.6mm, 振动频率为 10Hz~55Hz, 每分钟变化 1Hz。						No fire, No explosion, No leakage 不起火,不爆炸,不 泄漏
6.5	Battery capacity-temperature characteristic 电池容量温度特性	温度℃	-10℃	0℃	25℃	30℃	55℃	电池组在 25℃ 0.5C 恒流恒压充至 12.6V, 终止电流 0.01C 后, 分别在 -10℃, 0℃, 25℃, 30℃, 55℃ 搁置 4H 再以 0.5C 放电至 8.25V, 记录放电容量
		容量比%	65%	85%	100%	100%	98%	
6.6	Storage characteristics table 存放性能表	常温下	满电搁置 1 个月		满电搁置 2 个月		满电搁置 3 个月	0.5C 循环一次记录初始容量, 0.5C 恒流恒压充至 12.6V, 每隔一个月, 0.5C 放至 8.25V 记录容量为残余容量, 再次循环容量为恢复容量。
		荷电保持率	95%		90%		85%	
		容量恢复率	99%		98%		95%	

7.Safe characteristic 安全性能

No.	Item 项目	Test methods and condition 测试方法和条件	Criteria 标准
7.1	Overcharge testing 过充测试	At 23±5℃, charging cells with constant current 3C to voltage 13.8V, then with constant voltage 13.8V till current decline to 0. Stop test till cells temperature 10℃ lower than max temperature. 在 23±5℃状态下, 电池用 3C 电流充电至 13.8V, 然后恒压 13.8V 让电流下降接近为 0A, 监视电池温度变化, 当电池温度下降一峰值低约 10℃时, 停止实验.	No fire, no explosion 不起火, 不爆炸

7.2	Over-discharge testing 过放测试	At 23±5°C, According to the requirements of standard charge,the cells will be discharge to cut-off voltage, then connect with external load of 30 ohm for 24 hours. 在 23±5°C状态下, 按标准放电的要求放电至终止电压后, 外接 30Ω负载放电 24 小时.	No fire, no explosion, no leakage. 无起火,无爆炸,无泄液
7.3	Short Circuit (短路试验)	After standard charging,connect the positive and negative terminals of the battery with a copper wire with a maximum internal resistance of 0.1 ω or less 标准充电后, 用最大内阻不超过 0.1 Ω 的铜线连接电池的正负极	No fire, no explosion,The Temperature of the surface of Cells are lower than 150°C 无起火,无爆炸,电池表面温度应低于 150°C
7.4	Thermal shock 热冲击	Put the cells in the oven. The temperature of the oven is to be raised at 5±2°C per minute to a temperature of 130±2°C and remains 10 minutes. 将电池放进烘箱内, 以 5±2°C/min 速度升高烘箱内温度至 130±2°C后,恒温 10min.	No fire, no explosion 不起火,不爆炸

※ Above testing of safe characteristic must be with protective equipment.(安全性能测试应在有保护措施下进行)

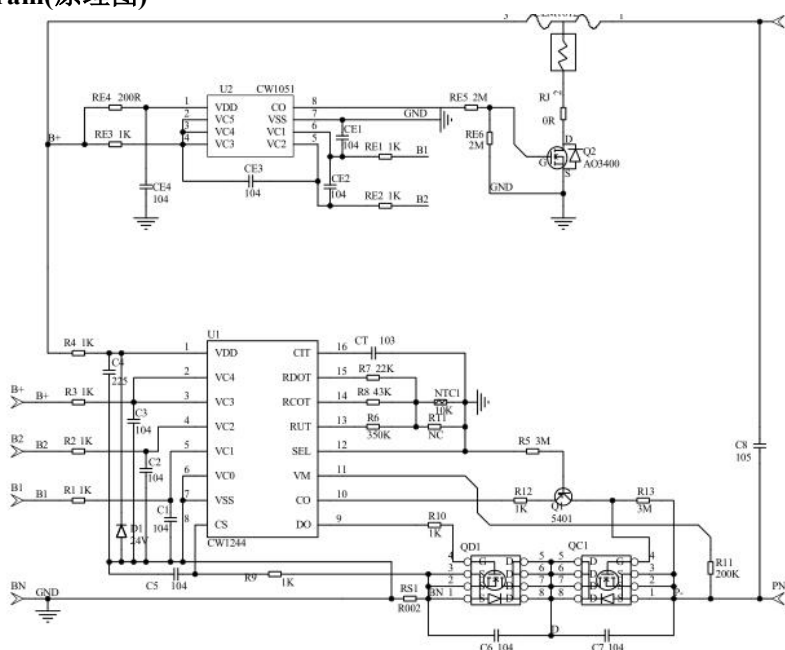
8.Battery Protection 保护电路

8.1 PCM Standard (保护板标准)

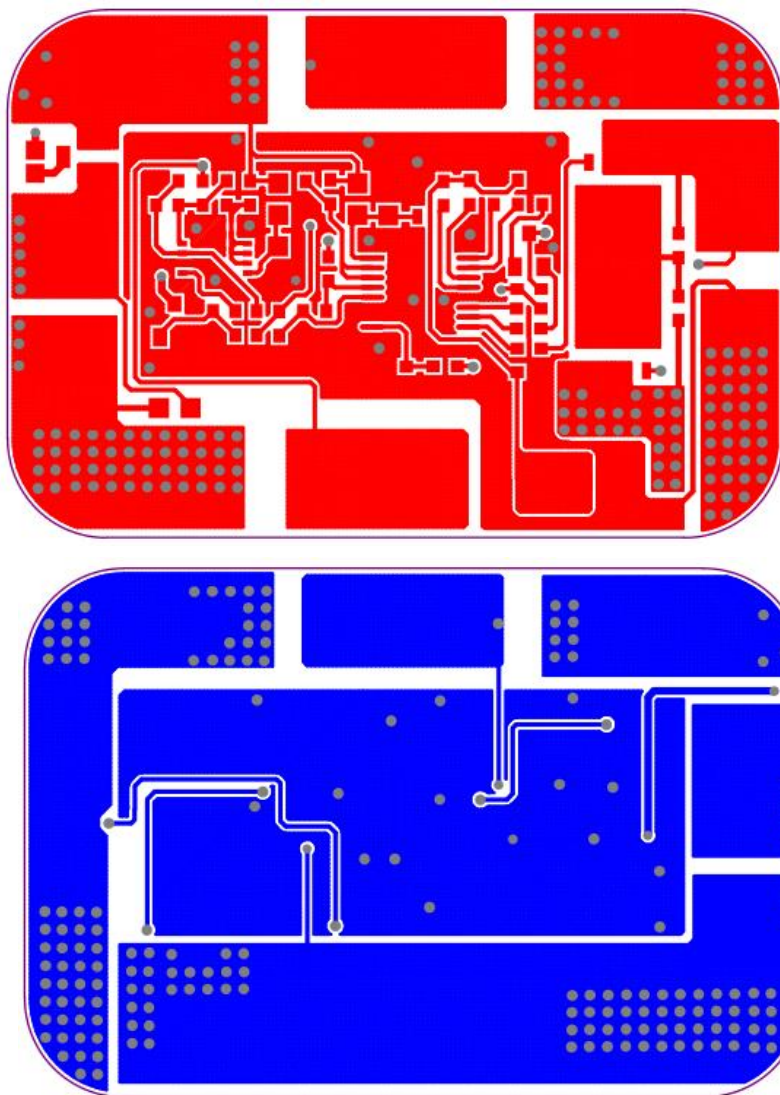
Item 项目	Content 详细内容	Criterion 标准
Over charge Protection 过充保护	Over charge detection voltage 1 一级过充电检测电压	4.25±0.025V
	Over charge detection delay time 过充电检测延迟时间	0.8~1.5S
	Over charge detection voltage 2 二级 过充电检测电压	4.35±0.05V
	Over charge detection delay time 过充电检测延迟时间	0.8~1.5S
	Over charge release voltage 过充电解除电压	4.15±0.05V
Current 电流	Current consumption 自耗电流	≤35uA
	Max continues charge current 最大持续充电电流	≤5A
	Max continues discharge current 最大持续放电电流	≤5A
	maximum dischargeing current(time) 最大放电电流(时间)	10A (5S)
Over discharge protection 过放保护	Over discharge detection voltage 过放电检测电压	2.7±0.08V

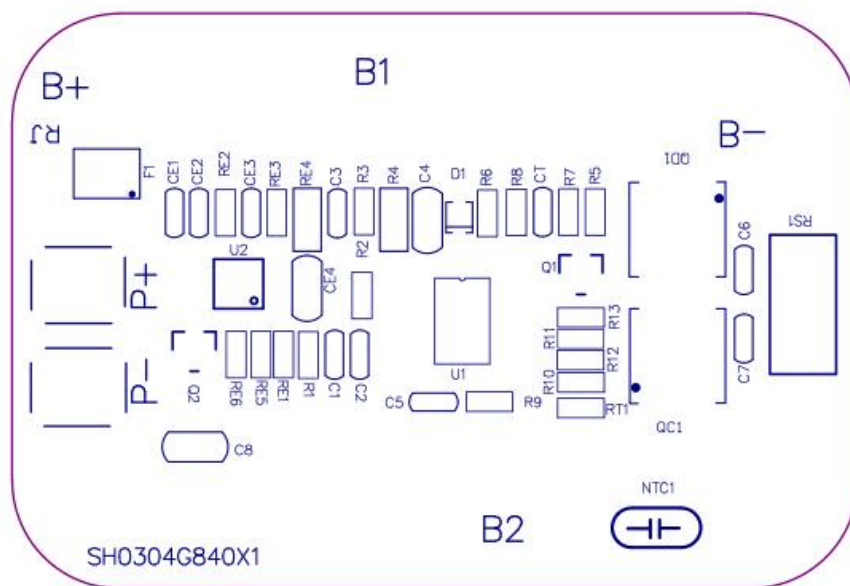
	Over discharge detection delay time 过放电检测延迟时间	5000~1800mS
	Over discharge release voltage 过放解除电压	3.0±0.10V
Over current protection 过流保护	Over discharge current detection 过放电流保护	16±2A
	Detection delay time1 检测延迟时间1	50~180mS
	Detection delay time2 检测延迟时间2	5~18mS
	Over charge current detection current 过充电流保护电流	6±1.7A
	Detection delay time 检测延迟时间	300~800mS
Short protection 短路保护	Short Circuit Protection Current 短路保护电流	约90A
	Detection delay time 检测延迟时间	300~800uS
	Detection condition 保护条件	3.Exterior short circuit外部 电路短路 &10AH/10C&25°C
	Release condition 保护解除条件	Cut load,Auto Recovery 断开负载，自动恢复
Temperature 温度	Detect the temperature of the Mosfet MOS管温度保护	/
	Charging high temperature protection 充电高温保护	55±5°C
	Charging low temperature protection 充电低温保护	0±5°C
	Discharge high temperature protection 放电高温保护	50±5°C
	Discharge low temperature protection 放电低温保护	-25±5°C
	Temperature protection release condition 温度保护解除条件	Drop to 45°C, charge 下降至45度，充电解除
	Storage temperature range 储存温度范围	-20~+80°C
	Storage temperature range 储存温度范围	0~60°C
内阻	Main loop electrify resistance 主回路通态电阻	≤25m Ω

8.2 Schematic diagram(原理图)



8.3 PCB Layout 保护板线路图



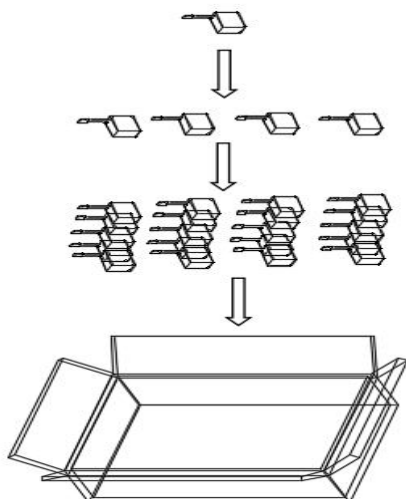


8.4 Parts list 元件清单

NO	Location 元件编号	Part name 元件名称	Specification 元件规格	Pack type 封装式	Q' ty 数量	Maker/Remark 厂商/备注
1	U1	保护 IC	CW1244ALBS	SOOP-16	1	
2	U2	保护 IC	CW1051ALCM	MSOP8L	1	
3	QC1,QC2	贴片 NMOS	AGM405A1/40V/8A/5mR	DFN5x6	2	
4	RS1	电阻	R003/1%/2W	2521	1	
5	D1	稳压二极管	BZT52C18SWL/18V5mA	SOD323	1	
6	Q1	PNP 三极管	MMBT5401-2L/-150V/-0.6A	SOT23-3	1	
7	C1,C2,C3,C5, C6,C7,CE1-C E3	积层电容	104/50V10%/X7R	0603	9	
8	C4/C8	积层电容	105/25V/10%/X7R	0603	2	
9	R1,R2,R3,R9. R10,R12,RE1 -RE3	陶瓷电阻	1K/5%/0.1W	0603	9	
10	R4,RE4	陶瓷电阻	1k/5%/0.12W	0805	2	
11	R5,R13	陶瓷电阻	3M/5%/0.1W	0603	2	
12	R11,RE6	陶瓷电阻	200K/5%/0.1W	0603	2	
13	R6	陶瓷电阻	348K/1%/0.1W	0603	1	
14	R8	陶瓷电阻	34.8K/1%/0.1W	0603	1	
15	R7	陶瓷电阻	22K/1%/0.06W	0402	1	
16	CT	积层电容	103/50V/10%	0603	1	
17	NTC1	贴片 NTC	10K/1%/B=3435	0603	1	
18	F1	保险丝	12A 三端保险丝		1	
19	Q2	贴片 NMOS	AO3400A/30V/1.7A/32mR	SOT23-3	1	
20	RE5	陶瓷电阻	100K/0603/5%/0.1W	0603	1	
21	CE4	积层电容	104/50V/0.1W	0603	1	

9 Packing Signal and Label 包装详情及标贴

9.1 Packing Signal 包装示意图



9.2 Label 标贴



10. Caution in use 使用警告

To ensure proper use of the battery please read the manual carefully before using it. Handling

为了使电池安全的使用及处理请在使用前认真的阅读操作说明

- Do not expose to, dispose of the battery in fire.
- 不能把电池曝晒或丢在火中

- Do not put the battery in a charger or equipment with wrong terminals connected.
- 电池充电时不能把正负极性装反
- Avoid shorting the battery
- 避免短路电池
- Avoid excessive physical shock or vibration.
- 避免过分的物理震动和冲击电池
- Do not disassemble or deform the battery.
- 不能拆解或使电池变形
- Do not immerse in water.
- 不能将电池浸入水中
- Do not use the battery mixed with other different make, type, or model batteries.
- 不能将其它不同厂家, 类型, 型号的电池混合使用
- Keep out of the reach of children.
- 禁止小孩接触电池

. charge and discharge 充放电

- Battery must be charged in appropriate charger only.
- 电池必须在合适的条件下充电
- Never use a modified or damaged charger.
- 决不能用故障的充电器给电池充电
- Do not leave battery in charger over 24 hours.
- 电池持续充电不能超过 24H

. storage 贮存

- Store the battery in a cool, dry and well-ventilated area.
- 电池贮藏在通风干燥的环境中

. disposal 处理

- Regulations vary for different countries. Dispose of in accordance with local regulations.
- 不同国家法规的不同, 处理时根据当地的法规。

11. Battery operation instruction 电池操作说明

11.1 Charging 充电

Charging current: Cannot surpass the biggest charging current which in this specification book stipulated.

充电电流: 不能超过规格书规定的最大的充电电流

Charging voltage: Does not have to surpass the highest amount which in this specification book stipulated to decide the voltage.

充电电压: 不能超过规格书规定的最高的限制电压

Charge temperature: The battery must carry on the charge in the ambient temperature scope which this specification book stipulated.

充电温度: 电池充电温度必须按照规格书的温度范围执行

Uses the constant electric current and the constant voltage way charge, the prohibition reverse charges. If the battery positive electrode and the cathode meet instead, can damage the battery.

先恒流后恒压方式充电, 禁止颠倒的方式充电。如果电池正负极颠倒充电会带来危险。

11.2 Discharging current 放电电流

The cell shall be discharged at less than the maximum discharge current specified in the Product Specification. High discharging current may reduce the discharging capacity significantly or cause over-heat.

放电电流不得超过本标准书规定的最大放电电流, 大电流放电会导致电芯容量剧减并导致过热。

11.3 discharge temperature 放电温度

The battery discharge must carry on in the ambient temperature scope which this specification book stipulated

电池放电温度必须按照规格书的温度范围执行

11.4 Over-discharges 过放电

It should be noted that the cell would be at over-discharged state by its self-discharge

characteristics in case the cell is not used for long time. In order to prevent over-discharging,

the cell shall be charged periodically to maintain between 3.6V and 3.9V. Over-discharging may causes loss of cell performance, characteristics, or battery functions. The charger shall be equipped with a device to prevent further discharging exceeding a cut-off voyage specified in the Product Specification. Also the charger shall be equipped with a device to control the recharging procedures as follows:

The cell battery pack shall start with a low current (0.01C) for 15-30 minutes, i.e.-charging, before rapid charging starts. The rapid charging shall be started after the (individual) cell voltage has been reached above 3V within 15-30 minutes that can be determined with the use of an appropriate timer for pre-charging. In case the (individual) cell voltage does not rise to 3V within the pre-charging time, then the charger shall have functions to stop further charging and display the cell/pack is at abnormal state.

需要注意的是，在电芯长期未使用期间，它可能会用其它自放电特性而处于某种过放电状态。为防止放电的发生，电芯应定期充电，将其电压维持在 3.6V 至 3.9V 之间。过放电会导致电芯性能、电池功能的丧失。充电器应有装置来防止电池放电至低于本标准书规定的截止电压。此外，充电器还应有装置以防止重复充电，步骤如下：

电池在快速充电之前，应先以一小电流（0.01C）预充电 15~30 分钟，以使（每个）电芯的电压达到 3V 以上，再进行快速充电。可用一记时器来实现该预充电步骤。如果在预充电规定时间内，（个别）电芯的电压仍未升到 2.75V 以上，充电器应能够停止下一步快速充电，并显示该电芯/电池正处于非正常状态。

11.5 Storing the Batteries 贮存电池。

If the cell has to be storied for a long time (Over 1 months), the environmental condition should be; Temperature: 23±5°C Humidity: 65±20%RH, The voltage for a long time storage shall be 11.1V~11.7V range.

长期存储电池（超过 3 个月）须置于温度为 23±5°C、湿度为 65±20%RH 的环境中，贮存电压为 11.1V~11.7V

12. Period of Warranty 保质期

The period of warranty is 12 months from the date of shipment. SUNHE guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customer's abuse and misuse.

电池保质期为出厂后 12 个月。SUNHE 承诺如果在保质期内由于电池本身的质量问题，本公司将负责进行调换，如果是由于用户误用或进行破坏性测试而产生的问题，恕不负责。

13. Other The Chemical Reaction 其它化学反应

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change the battery.

由于电池是利用化学反应的原理，所以随时间的增加电池的性能会降低，即使是存放很长一段时间而不使用。如果使用条件如充电、放电及周围环境温度等情形不在指定的使用范围内，也会缩短电池的使用寿命，或者产生漏液导致设备损坏。如果电池长周期不能充电，即使充电方法正确，这样需要更换电池了。

14.Note: 备注

Any other items which are not covered in this specification shall be agreed by both parties.

本说明书未包括事项应由双方协议确定。