



## Li-ion 18650 Battery

### Pack Specification

#### 锂离子 18650 电池组和规格书

电池属性: 高温电池 低温电池 倍率电池 常规电池

PACK TYPE 装配类型		CELL+PCM 电芯+保护板	
CELL MODEL 电芯型号		18650H8	
CELL CAPACITY 标称容量: mAh		2500	
TOTAL PAGE 文件页数		12	
Order number 评审编号			
Customer number 客户代码		Starion	
Business code 业务代码		TR	
Registered 编制	Checked 审核	Approved 批准	Customer Approve 客户确认
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## 1.MODIFIED LIST

### 修订履历产品变更履历表

#### Product Modified Record List

Revision 版本	Date 日期	Mark 标记	Modified content 变更内容	Approved by 批准
A0	20200921	首发		

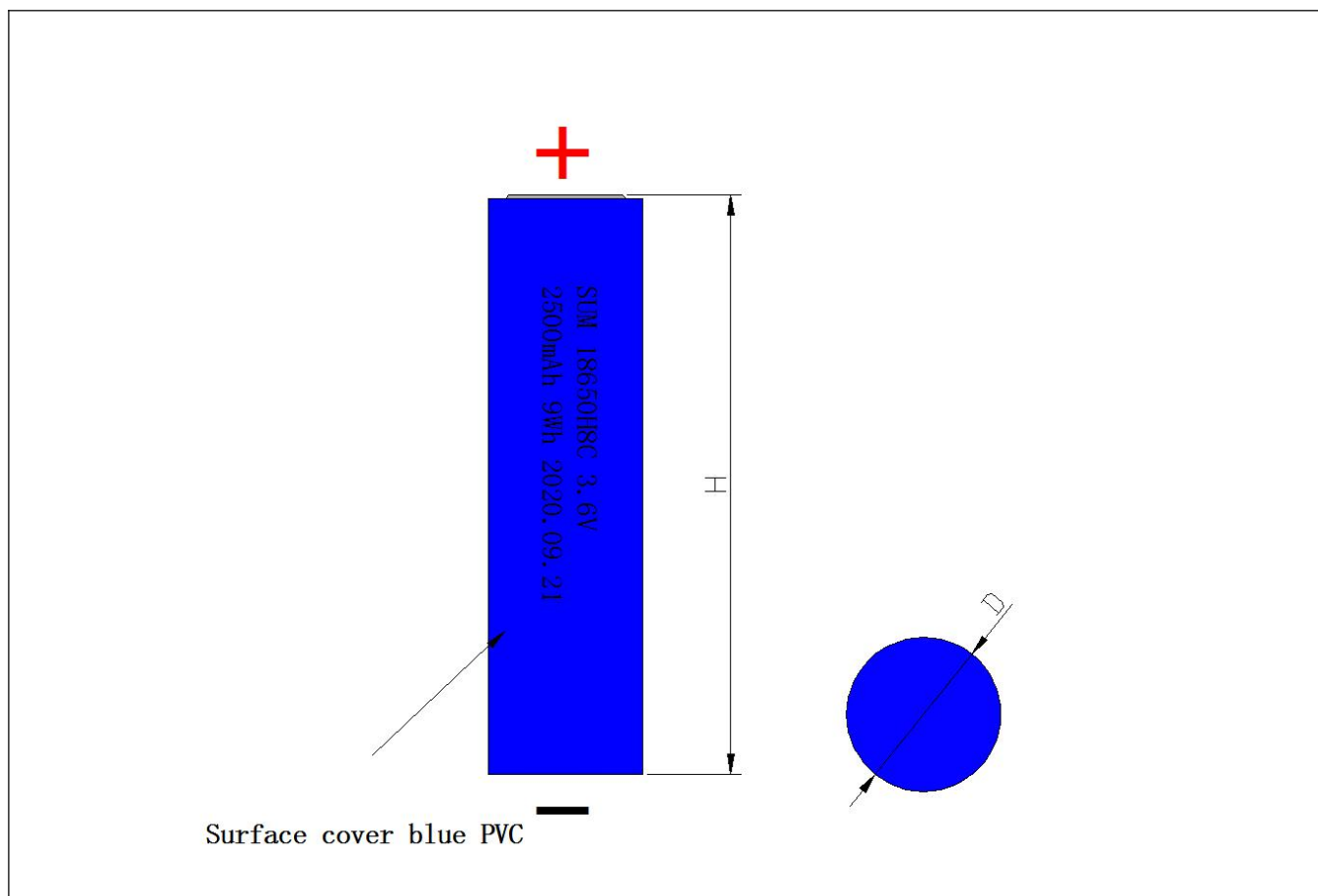
## 2.Scope 适用范围

This specification describes the basic performance, technical requirement, testing method, warning and caution of the Li-ion rechargeable battery pack, the pack defined in this documentation is an assembly which include battery, PCM and wire, the specification only applies to Dongguan SUM Electronic Technology Co., Ltd.

本标准规定了锂离子可充电电池的基本性能、技术要求、测试方法及注意事项，电池组合定义的是包括电芯，保护板和连接线的组合，本标准只适用于杉茂电子科技有限公司所生产的锂离子电池。

## 3.Initial Dimension 初始尺寸

### 3.1 成品尺寸



Unit 单位 (mm)

D(直径)MAX	≤ φ 19.0	H (高度) MAX	≤ 69.5	/	/
L (引线长)	/	WIRE (引线)	/	喷码内容	图示
PCM保护板	SUM-PCM				



## 4.Specification 产品规格

NO.	Item 项目	Specifications 规格要求		
4.1	Nominal capacity 标称容量	2500mAh @ 0.2C Discharge(放电)		
4.2	Initial Impedance 初始内阻	Pack ≤130mΩ		
4.3	Weight 重量	Approx(约): 45 g		
4.4	Nominal voltage 标称电压	3.6V		
	Cellfully charge voltage (FC) 电芯满充电电压参考	Fully charge voltage (FC)	4.2V 满充电电压参考值	
	Cellfully discharge voltage (FD) 电芯满放电电压参考	Fully discharge voltage (FD)	2.75V 满放电压参考值	
4.5	Charge current 充电电流	0.2C=500mA	Standard Charging 标准充电	
		1.0C=2500mA	Rapid charge 快速充电	
4.6	Standard charging method 标准充电方法	0.2C CC ( constant current ) charge to FC, then CV(constant voltage FC)charge till charge current decline to ≤0.01C 0.2C CC (恒流) 充电至 FC, 再 CV (恒压 FC) 充电直至充电电流≤0.01C		
4.7	Charging time 充电时间	6.5 hours(Ref.) 6.5小时 (参考值)	Standard Charging 标准充电	
		1.5 至2.5hours(Ref.) 1.5 至2.5小时 (参考值)	Rapid charge 快速充电	
4.8	Max. charge current 最大充电电流	Constant Current 1.0C Constant Voltage FC 0.01 C cut-off 持续电流: 1.0C 持续电压: FC 截止电流: 0.01 C		
4.9	Max. discharge current 最大放电电流	Constant current 20A end voltage 2.5V 持续电流: 20A 截止电压: 2.5V		
4.10	Standard Discharge Current 标准放电电流	Constant current 0.2C end voltage FD 持续电流: 0.2C 截止电压: FD		
4.11	Charge cut-off voltage 充电截止电压	Ref. 4.4 FC		
4.12	Discharge cut-off Voltage 放电截止电压	Ref. 4.4 FD		
4.13	Operating temperature 工作温度(标准)	0°C~45°C	Charging 充电	
		-20°C~60°C	Discharging 放电	
	Storage temperature 储存温度	-10°C~+45°C	less than 1 month 小于 1 个月	Recommended storage temperature: 25°C, at the shipment state 建议的储存温度: 25°C
		-10°C~+35°C	less than 6 months 小于 6 个月	



4.14	Recoverable capacity 恢复容量	Constant current 0.2C charge to FC, then constant voltage FC charge to current declines to 0.01C, rest for 10min, constant current 0.2C discharge to FD, rest for 10min. Repeat above steps 3 times, recording the maximum capacity 先用 0.2 C 恒流充电至 FC, 再恒压 FC 充电直至充电电流 $\leq 0.01C$ , 搁置 10 分钟, 再用 0.2C 电流放电至 FD; 又搁置 10 分钟, 重复以上步骤 3 次, 记录容量最大值
4.15	Storage Humidity 储存湿度	$\leq 75\% \text{ RH}$
4.16	Appearance 外观	Without distortion and leakage 无变形、电解液泄露
4.17	Standard testing condition 标准测试环境	Temperature(温度) : $23\pm 5^{\circ}\text{C}$ Humidity (湿度) : $\leq 75\% \text{ RH}$ Atmospheric Pressure (大气压) : 86-106 Kpa

Remark: From 4.1 to 4.12, the testing condition is following 4.17 (standard testing condition)  
从 4.1 至 4.12 项目, 测试环境遵从 4.17 (标准测试环境)

## 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	Standard Charge 标准充电	Charging the cell initially with constant current at 0.2C and then with constant voltage at 4.2V till charge current declines to 0.01C 先用 0.2C 恒流充电至 4.2V, 再恒压 4.2V 充电直至充电电流 $\leq 0.01C$	
5.2	Rated Capacity 初始容量	The capacity means the discharge capacity of the cell, which is measured with discharge current of 0.2C with 2.75V cut-off voltage after standard charge. 该容量是指标准充电后, 0.2C 放电至 2.75V 截止电压所放出的容量。	$\geq 2500 \text{ mAh}$
5.3	Cycle Life 循环寿命	Test condition: Charge: 0.2C to 4.2V Discharge: 0.2C to 2.75V, 80% or more of 1 <sup>st</sup> cycle capacity at 0.5C discharge of Operation 测试条件: 充电: 0.2C 充电到 4.2V 放电: 0.2C 放电到 2.75V 当放电容量降至初始容量的 80% 时, 所完成的循环次数定义为该电芯的循环寿命	$\geq 800$ 周次
5.4	Storage Characteristics 储存特性	After the standard charging, stored the cells under the condition as No.4.13 for 30 days, then measured the capacity with 0.2C till 2.75V 标准充电后, 在 No.4.13 条件下贮存 30 天, 再以 0.2C 放电至 2.75V 所放出的容量。	Residual capacity $> 85\%$ 剩余容量 $> 85\%$
5.5	Initial impedance 初始内阻	Internal resistance measured at AC 1KHz after 50% charge 半充状态下, 测量其 AC 1KHz 下的交流阻抗	$\leq 130 \text{ m}\Omega$



5.6	Pack Voltage 电池组电压	As of shipment. 出货状态	3.6~3.9V
5.7	Temperature Characteristics 温度特性	1. According to item 5.1, at 25±2°C. 2. Capacity comparison at each temperature, measured with constant discharge current 0.2C with 2.75V cut-off. Percentage as an index of the capacity compared with 100% at 25°C 1.在 25±2°C 条件下, 用 5.1 方法将电芯充电。 2.在不同温度条件下, 用 0.2C 的电流恒流放电至截止电压 2.75V。以 25°C 时放电容量为基准计算百分比。	-5°C: ≥50% 25°C: 100% 50°C: ≥85%

## 6.Safe Characteristic 安全性能

No.	Item 项目	Test Methods and Condition 测试方法和条件	Criteria 标准
6.1	Overcharge testing (NO PCM) 过充测试 (无保护板)	At standard testing condition, charging cell with constant current 1.0C to voltage 4.6V, then with constant voltage 4.6V till current decline to 0A. Stop test till cells temperature 10°C lower than max temperature. 在标准测试环境下, 电池用 1.0C 电流充电至 4.6V, 然后恒压 4.6V 让电流下降接近为 0A, 监视电池温度变化, 当电池温度下降至低于峰值 10°C 时, 停止实验.	No smoke, No fire 不起火, 不冒烟
6.2	Forced discharge 强制放电 (无保护板)	After the standard discharge of the electric core, the 1.0C current to its reverse charging, 90min 将标准放电后的电芯, 以 1.0C 的电流对其进行反向充电, 时间 90min	No fire, no explosion 不起火, 不爆炸
6.3	Short-circuit testing (NO PCM) 短路测试 (无保护板)	At standard testing condition, after standard charging, connect pack anode and cathode by wire which impedance less than 80±20mΩ, keep 24h. 在标准测试环境下, 标准充电后, 将电池组合的正负极用一根小于 80±20mΩ 的导线连接, 放置 24 小时. 或外部温度降低到最大温升的 20%	No smoke no fire 不起火, 不冒烟
6.4	Drop Test 跌落测试	After the charge of the electric core from 10 meters height fell to the ground each surface of the concrete fell 1 times a total of 6 tests 充电后的电芯从 1.0 米高度跌落至混凝土地面每个面各跌落 1 次共试验 6 次	Open circuit voltage should be no less than 90% initial voltage No fire, no leakage. 开路电压应不低于 90% 初始电压, 无起火、无泄漏

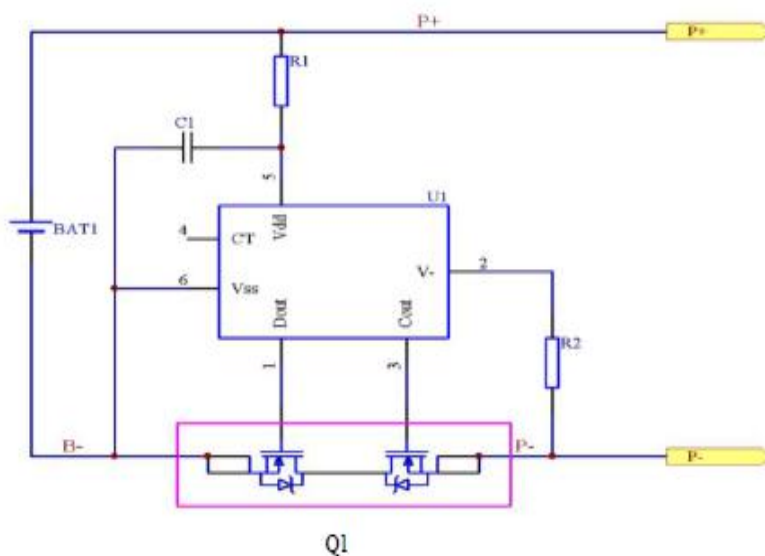
※ Above testing of safe characteristic must be with protective equipment.  
(安全性能测试应在有保护措施下进行)

## 7. Protection circuit 保护电路

### 7.1 PCM Standard (保护板标准)

Symbol (符号)	Name (名称)	MIN. (最小值)	Typical. (典型值)	MAX. (最大值)	Unit (单位)
VDET1	Over-Charge detect voltage (过充电保护电压)	4.225	4.30	4.305	V
VDET2	Over-discharge detect voltage (过放电保护电压)	2.43	2.5	2.56	V
IEC	Excess Current threshold (最大过流值)	5.0	6.0	7.0	A
IDD	Supply current (自耗电电流)	--	--	50	μA
RD	Internal resistance in normal Operation (导通内阻)	--	30	50	mΩ
RWV	Reverse withstand voltage: reverse voltage adding to pack caused by load circuit (反向耐压: 负载线路产生的, 反加在组合电芯上的电压): Max.12				V
RWI	Reverse current adding to pack caused by load circuit (反向耐电流: 负载线路产生的, 反加在组合电芯上的电流): Max.5				A

### 7.2 Schematic diagram (原理图)







## 7.3 PCM-BOM (保护板物料清单)

SPEC	NAME	QTY	用量
U1	CONTROL IC (控制芯片)	DW01	1
Q1	MOSFAT (MOS管)	8205	2
R1	RESISTANCE (贴片电阻)	100Ω,±5%,1/16W	1
R2	RESISTANCE (贴片电阻)	1KΩ,±5%,1/16W	1
C1	CAPACITOR (贴片电容)	0.1μF,+80-20%,25V	1
PCB	Print Circuit Board	SUM-PCB	1

## 8.Warning 警告

Load circuit may cause voltage and current, and the voltage or current may add to pack, the voltage or current must be controlled as lower than RWV and RWI, larger voltage or current may damage the PCM of pack.

☆负载可能产生电压和电流,该电压和电流会反加在电池组合(含PCM)上,该电压和电流不能超过保护板自身反向耐压耐流值,过高电压或电流会损坏电池组合中的保护板。

To prevent the possibility of the pack from leaking, heating, fire .please observe the following precautions:

☆为防止电池组合可能发生的泄漏,发热,起火,请注意以下预防措施:

The soft aluminum packing foil is very easily damaged by sharp edge parts such as Ni-tabs, pins and needles .Donot strike at pack with any sharp edge parts.

☆ 电池组合外包装膜易被镍片,尖针等尖锐部件损伤,禁止用尖锐部件碰伤电池。

Do not immerse the pack in water and seawater

☆ 严禁将电池组合浸入海水或水中。

Do not use and leave the pack near a heat source as fire or heater

☆ 禁止将电池组合在热高温源旁,如火,加热器等使用设备

When recharging, use the battery charger specifically for that purpose

☆ 充电时请选用锂离子电池专用充电器。

Do not reverse the position and negative terminals



☆ 禁止颠倒正负极使用电池组合

Do not connect the pack to an electrical outlet

☆ 禁止将电池组合直接接入电源插座

Do not discard the pack in fire or heat it

☆ 禁止将电池组合丢入火或加热器中

Do not short-circuit the pack by directly connecting the positive and negative terminal with metal object such wire

☆ 禁止用金属直接将电池组合的正负极进行短路连接.

Do not transport and store the battery together with metal objects such as necklaces, hairpins etc.

☆ 禁止将电池组合与金属,如发夹,项链等一起运输或贮存.

Do not strike or throw the pack.

☆ 禁止敲击或抛掷,踩踏电池组合等.

Do not directly solder the pack or battery and pierce the battery with a nail or other sharp object.

☆ 禁止直接焊接电池组合或电芯, 禁止用钉子或其它利器刺穿电池组合或电芯.

## 9.Cautions 注意

Do not use or leave the pack at very high temperature (for example, at strong direct sunlight or a vehicle in extremely hot conditions). Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.

△ 禁止在高温下(直热的阳光下或很热的汽车中)使用或放置电池组合,否则可能会引起电池过热,起火或功能失效,从而导致电池组合寿命减短.

Do not use it in a location where static electricity is great, otherwise, the safety devices in the pack may be damaged, which will cause hidden trouble of safety.

△ 禁止在强静电和强磁场的地方使用,否则易破坏电池组合的安全保护装置,带来不安全隐患.

If the pack leaks and the electrolyte get into the eyes, do not rub eyes, instead, rinse the eyes, with clean running water, and immediately seek medical attention. Otherwise, eye injury can result.

△ 如果电池发生泄漏,电解液进入眼睛,请不要揉擦,应用清水冲洗眼睛,并立即送医院治疗,否则会伤害眼睛.

If the pack takes off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use, recharging or storage, immediately remove it from the device or battery charge and stop using it.

△ 如果电池组合在使用或贮存中发出异味,发热,变色,变形,或者是在充电过程中出现任何异常现象,立即将电池从充电器或装置中移开,并停止使用.

In case the pack terminals are dirt, clean the terminals with a dry cloth before use. Otherwise



power failure or charge failure may occur due to the poor connection with the instrument.

△ 如果电池组合的连接点弄脏,使用前应用干布抹净,否则可能会因接触不良而影响性能失效.

Be aware discharged battery may cause fire or smoke, tape the terminals to insulate them.

△ 废弃之电池应用绝缘纸包住电极,以防起火, 冒烟.

The pack should be stored at room temperature, charged to about 40% to 60% of capacity. In case of over-discharge, pack should be charged for one time every 3 months while storing and batteries should be discharge and charge after being stored more than a year in order to activate it and restore energy.

△ 电池组合应当在室温下存放,应充到 40%至 60%的电量。为防止电池过放,建议每 3 个月进行一次充电,如储存时间超过一年,建议每年进行一次充、放电以激活电池。

## 10.Handling of Cells 电池操作注意事项

To prevent a possibility of the battery from leaking ,heating or explosion please observe the following precautions:

△为防止电池可能发生泄漏、发热、爆炸, 请注意以下防范措施:

Do not immerse the battery in water or seawater,and keep the battery in a cool dry surrounding if it standss by.

△严禁将电池浸入海水或水质, 保存不用时, 应放置于阴凉干燥的环境中;

Not use or leave the battery near a heat source as fire or heater.

△禁止电池在热高温源旁, 如火、加热器等使用和留置;

Use the battery charger specifically for that purpose when recharging.

△充电时请选用锂离子电池专用充电器;

Do not connect the battery to an electrical outlet.

△严禁将电池直接插入电源插座;

Do not discard the battery in fire or a heater.

△禁止将电池丢于火或加热器中;

Do not short-circuit the battery by directly connecting the positive and negative terminals with metal objects.

△禁止为金属直接连接电池正负极短路;

Do not transport or store the battery together with metal objets such as hairpins,necklaces,etc

禁止将电池与金属, 如发夹、项链等一起运输或贮存;

Do not strike,trample or throw the battery...

△禁止敲击抛掷、踩踏电池等;

Do not directly solder the battery and pierce the battery with a nail or other sharp objects.

△禁止直接焊接电池和用钉子或其它利器刺穿电池;



Do not use or leave the battery at high temperature(for example,at strong direct sunlight or in avehicle in extremely hot weather).Otherwise,it can overheat or fire or its performance will be degenerate and its service life will be decreased.

△禁止在高温下（炙热的阳光下或很热的汽车中）使用或放置电池，否则可能会引起电池过热、起火或功能失效、寿命减短；

Do not use the battery in a location where static electricity and magnetic field is great,otherwise,the safety devices may be damaged,causing hidden trouble of safety.

△禁止在强静电和强磁场的地方使用，否则易破坏电池安全保护装置，带来不安全的隐患；

If the battery happen leak,electrolyte into the eyes,please don't rub brush,flush with clear water should immediately sent eyes and medical treatment,or will hurt eyes.

△如果电池发生泄露，电解液进入眼睛，请不要揉擦，应用清水冲洗眼睛并立即送医治疗，否则会伤害眼睛；

## 11.Period of Warranty 保质期

The period of warranty is one year from the date of shipment. SUM guarantees to give a replacement in case of battery with defects proven due to manufacturing process instead of the customer abuse and misuse.

电池的保质期从出货之日算起为一年。如果证明电池的缺陷是在我们公司制造过程中造成的而不是客户滥用或错误使用造成，本公司负责退换电池；

## 12.Others 其它事项

12.1 The customer is requested to contact SUM Gin advance, if and when the customer needs other applications or operating conditions than those described in this document.

Additional experimentation may be required to verify performance and safety under such conditions.

12.1 客户若需要将电池用于超出文件规定以外的应用，或在文件规定以外的使用条件下使用电池，应事先联系杉茂电子科技有限公司，因为需要进行特定的实验测试以核实电池在该使用条件下的性能及安全性；

12.2 SUM will take no responsibility for any accident when the battery is used under other conditions than those described in this Document.

对于在超出文件规定以外的条件下使用电池而造成的任何意外事故，杉茂电子科技有限公司概不负责；

12.3 SUM will inform, in a written form, the customer of improvement(s) regarding proper use and handing of the battery, if it is deemed necessary.

如有必要，杉茂电子科技有限公司会以书面形式告之客户有关正确操作使用电池的改进措施；

12.4 Any matters that this specification does not cover should be conferred between the customer and SUM.

任何本说明书中未提及的事项，须经双方协商确定；