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深圳市科恩瑟尔电池有限公司

**Shenzhen Coincell Battery CO., LTD.**

**Specification For Approval**

**Model 型号 : 18650-4S1P-2600**

Approval 批准	Checked 审核	Draft 制定
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**History of specification**

规格书修订记录

Date 日期	Contents 内容	Remarks 备注
2022-09-02	First issue	A
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## 1. Scope 适用范围

The specification shall be applied to Li-ion battery pack of 18650-4S1P-2600, which is manufactured by SHENZHEN COINCELL BATTERY CO., LTD. The product is ROHS compliant.

本规格书适用于深圳市科恩瑟尔电池有限公司生产的 18650-4S1P-2600 锂离子可充电电池,产品满足 ROHS 要求。

## 2. Battery Pack Specification 电池组参数

NO	Items	Criteria	Remarks
2.1	Nominal Capacity 标称容量	2600mAh	0.2C discharge 0.2C 放电 cut-off voltage 11.2V 截止电压 11.2V
	Minimum Capacity 最小容量	2500mAh	
2.2	Nominal Voltage 标称电压	14.6V	
2.3	Shipment voltage 出货电压	≥15.2V	Within 10 days from Factory 在出厂 10 天内
2.4	Internal Impedance 内阻	≤300mΩ	@AC Imp
2.5	Charge cut-off voltage 充电截止电压	16.8V	
2.6	Standard charging Method 标准充电方式	0.2C CC to 16.8V, CV to 0.02C	
2.7	Max. Charge Current 最大充电电流	2.0A	@15-45°C
		0.2C	@0-15°C
2.8	Standard discharge Method 标准放电方式	0.2C CC to 11.2V	
2.9	Max. discharge current 最大放电电流	4.0A	@10~60°C
		0.2C	@-20~10°C
	Peak Current Pulse 峰值电流	5.0A	
2.10	Discharge cut-off voltage 放电截止电压	11.2V	
2.11	Operating Temperature 工作温度	0~+45°C	Charging 充电
		-20~+60°C	Discharging 放电
2.12	Storage Temperature 贮存温度 (30%SOC)	-20°C~+50°C	Less than 1 month 小于一个月 Recovery



## Product Specification

## 18650-4S1P-2600

		-10°C ~ +45°C	Less than 3 months 小于三个月	capacity after the storage $\geq$ 80% of minimum energy(or capacity)
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### 3. The main parts list 主要零部件清单

序号 number	物料名称 Material name	型号/规格 type/specification	单位 Unit	数量 Quantity
1	电芯 Cell	INR18650-26E (DMEGC)	pcs	4
2	保护板 PCBA	KE-F048_PCM	pcs	1
3	连接器	C3001-H04 (Molex 仿品)	pcs	1
4	商标		pcs	1

### 4. Battery Performance Criteria 电池性能检查及测试

#### 4.1 Appearance 外观和结构

There shall be no such defect as scratch, bur and other mechanical scratch, and the connector should be no rust dirt. The structure and dimensions see attached drawing of the battery.

电池的表面应无明显的划痕毛刺及其其它机械划伤，外露的金属端子应无锈蚀污垢。结构尺寸见电池的外形尺寸图；

#### 4.2 Measurement Apparatus 测试设备要求

##### (1) Dimension Measuring Instrument 尺寸测量设备

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

测量尺寸的仪器的精度应不小于 0.01mm

##### (2) Voltmeter 电压表

Standard class specified in the national standard or more sensitive class having inner impedance not less than 10 K $\Omega$ /V.

国家标准或更灵敏等级,内阻不小于 10K $\Omega$ /V.

##### (3) Ammeter 电流表

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01 $\Omega$ .

国家标准或更灵敏等级，外部总体内阻包括电流表和导线应小于 0.01 $\Omega$ .

##### (4) Impedance Meter 内阻测试仪

Impedance shall be measured by a sinusoidal alternating current method (AC 1kHz LCR meter).

内阻测试仪测试方法为交流阻抗法(AC 1kHz LCR).

#### 4.3 Standard Test Condition 标准的测试条件

Test should be conducted with new batteries within one month after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise defined, test and measurement shall be done under temperature of 23 $\pm$ 2°C and relative humidity of 45~85%.

测试电池必须是本公司出厂时间不超过一个月的新电池，且电池未进行过五次以上充放电循环。除非其它特殊要求，本产品规格书规定的测试的环境条件为：温度  $23\pm 2^{\circ}\text{C}$ ，相对湿度 45%~85%。

## 4.4 Conventional performance 常规性能

No.	Items 项目	Testing method and determinant standard 测试方法和判定标准	Decision criteria 判定标准
1	Charge Performance 充电性能	The standard charge mode :under the temperature of $23\pm 2^{\circ}\text{C}$ ,charge the battery with the current of 0.2C until the voltage reaches up to 16.8V,then charge with constant voltage until the charge current $\leq 0.02\text{C}$ , then stop charging. 标准充电模式：在 $23\pm 2^{\circ}\text{C}$ 条件下，电池用 0.2C 充电，当电池电压达到 16.8V 时改为恒压充电，直到充电电流小于或等于 0.02C 时停止充电。	$\leq 8\text{h}$
2	0.2C Discharge performance 0.2C 放电性能	After standard charging, aging for 0.5 hour, using 0.2 C current constant discharge to 11.2V during $(23\pm 2)^{\circ}\text{C}$ condition. 标准充电完成后，搁置 0.5h，在环境温度为 $(23\pm 2)^{\circ}\text{C}$ 条件下,以 0.2C 电流恒流放电到 11.2V。	$\geq 300\text{min}$
3	Charge/Discharge Cycle 充放电循环	Test condition ( $23\pm 2^{\circ}\text{C}$ ): A cycle is defined as a Standard Charge, 10 minute-rest and Standard Discharge, 10 minute-rest. The battery is to be cycled for 500 times. 测试条件 ( $23\pm 2^{\circ}\text{C}$ ): 一个充放电循环被定义为：电池标准充电后，静止 10min，然后标准放电,静止 10 分钟。按照此定义将电池循环 500 次。	Discharge capacity(500th cycle) $\geq 80\%$ of nominal capacity 第 500 周放电容量 $\geq$ 标称容量的 80%
4	Retention Capability 荷电保持能力	After full charging, storing the battery 28 days with $23\pm 2^{\circ}\text{C}$ condition, and then staying 1 hours with discharge current of 0.2C till 11.2V cut-off voltage. 充满电后，在 $23\pm 2^{\circ}\text{C}$ 的环境条件下存放 28 天，搁置 1h 后以 0.2C 电流连续放电至 11.2V 终止电压。	Capacity $\geq 85\%$ 容量 $\geq 85\%$

## 4.5 Safety Test 安全试验

No.	Items 项目	Testing method and determinant standard 测试方法和判定标准	判定标准 Decision criteria
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1	<p>Overcharge Protection</p> <p>Characteristics</p> <p>过充电保护性能</p>	<p>Standard charging is completed, set the constant current and voltage supplier with 2times of the nominal voltage and current, then load it to the battery for 7h.</p> <p>电池充满电后，用恒流恒压源持续给电池加载 7h，恒流恒压源电压设定为 2 倍标称电压，电流设定为 2C 的外接电流。</p>	<p>No fire</p> <p>No explosion</p> <p>不起火，不爆炸</p>
2	<p>Over-discharge Protection</p> <p>Characteristics</p> <p>过放电保护性能</p>	<p>Under the temperature of <math>23\pm 2^{\circ}\text{C}</math>, after discharging the battery with 0.2C to final voltage, then connect the load with <math>(n*30)\Omega</math> then discharge for 7h.</p> <p>电池在环境温度为 <math>23^{\circ}\text{C} \pm 2^{\circ}\text{C}</math> 的条件下，以 0.2C 放电至终止电压后，外接<math>(n*30 \Omega)</math>负载放电 7h</p>	<p>No fire</p> <p>No explosion</p> <p>不起火，不爆炸</p>
3	<p>High temp. short-circuit test</p> <p>高温短路测试</p>	<p>The battery is to be short-circuited by connecting the positive and negative terminals of the cell with copper wire with a resistance load of <math>80\pm 20\text{m}\Omega</math> at an ambient temperature of <math>55^{\circ}\text{C} \pm 5^{\circ}\text{C}</math>. Monitor its temperature while testing, the cell is to be discharged until that last 24h or the temperature is less than 20% of peak temperature.</p> <p>将接有热电偶的电池置于通风橱中,用铜线短路其正负极(短路导线线路电阻 <math>80\pm 20</math> 毫欧), 实验在 <math>55\pm 5^{\circ}\text{C}</math> 的环境中进行,实验过程中监视电芯温度变化, 当短路时间达到 24h 或电芯温度下降到比峰值低 20%时, 结束试验。</p>	<p>No fire、</p> <p>No explosion and high temperature is less than <math>150^{\circ}\text{C}</math></p> <p>不起火、不爆炸, 外部温度不得高于 <math>150^{\circ}\text{C}</math></p>
4	<p>重物冲击</p> <p>Heavy impact</p>	<p>Battery in the impact, 10 kg weight from 1 m high free fall, impact has been fixed in the battery in the jig</p> <p>电池放置于冲击台上，将 10Kg 重锤自 1m 高度自由落下，冲击已固定在夹具中的电池。</p>	<p>No fire,</p> <p>No explosion</p> <p>不起火、不爆炸</p>
5	<p>Hot impact</p> <p>热冲击</p>	<p>After the standard charge ,The battery is to be heated in a circulating air oven, the temperature of the oven is to be raised at a rate of <math>5\pm 2^{\circ}\text{C}</math> per minute to <math>130\pm 2^{\circ}\text{C}</math> and remain for 30 minutes at that temperature.</p> <p>将标准充电后的电池放在鼓风烘箱中，温度以 <math>5\pm 2^{\circ}\text{C}/\text{min}</math> 的速率上升到 <math>130\pm 2^{\circ}\text{C}</math> 并保持 30 分钟。</p>	<p>No fire</p> <p>No explosion</p> <p>不起火，不爆炸</p>

**4.6 Environment Characteristic 环境适应性能**

6	<p>Constant humidity and temperature characteristics 恒定湿热性能</p>	<p>Standard charging is completed, then put the battery into the constant temperature and humidity oven with <math>40\pm 2^{\circ}\text{C}</math> and 90~95% for 48h, the battery should be no obvious deformation, leakage, rust, smoking and explosion. After testing take out the battery then rest for 2h under the temperature of <math>23\pm 2^{\circ}\text{C}</math>, discharge with 0.5C to 11.2V. 标准充电结束后, 将电池放入 <math>(40\pm 2)^{\circ}\text{C}</math>, 相对湿度为 90%-95% 的恒温恒湿箱中搁置 48h 后, 将电池取出在环境温度 <math>(23\pm 2)^{\circ}\text{C}</math> 的条件下搁置 2h, 目测电池外观, 再以 0.5C 电流放电至 11.2V</p>	<p>The discharge time is required <math>\geq 36\text{min}</math>. Appearance No deformation, No leakage, No explosion. 放电时间 <math>\geq 36\text{min}</math> 外观无变形、漏液、爆炸。</p>
7	<p>Drop Test 跌落实验</p>	<p>Under the temperature of <math>25\pm 3^{\circ}\text{C}</math>, after full-charging the battery with 0.2C, then drop it freely from 1 meter height onto the hard board which concrete board(6 times each of X,Y,Z with positive and negative directions). 在 <math>25\pm 3^{\circ}\text{C}</math> 条件下, 电池按 0.2C 充满电后, 将电池从 1 米高度自由跌落至混凝土板上 (X、Y、Z 正负方向 6 个方向每个方向分别朝下跌落一次)</p>	<p>不漏液, 不起火, 不爆炸 No leakage. No fire No explosion 备注: 不适应聚合物电池 Don't adapt to polymer battery</p>
8	<p>低气压 Low pressure</p>	<p>A full battery to 0.2C, its use in the vacuum chamber, the vacuum box closed gradually reduce the internal pressure to less than 11.6kPa and keep 6h. 电池以 0.2C 充满电后, 将其搁置在真空箱中, 真空箱密闭后逐渐减少其内部压力至不高于 11.6kPa 并保持 6h</p>	<p>No leakage, No rupture, No fume, No explosion. 电芯不漏液、不泄压、不起火、不爆炸</p>

Note: "n" represents the number of series circuits

备注: “n” 代表串联电路个数

**5. Storage and Others 贮存及其它事项**

**5.1 Long Time Storage 长期贮存**

If stored for a long time, the cell should be stored in drying and cooling place. The cell's storage voltage should be  $(3.7\sim 3.9\text{V}) * n$

长期贮存的电池须置于干燥、凉爽处, 贮存电压为  $(3.7\sim 3.9\text{V}) * n$ 。

It needs to be charged with standard charging current every three months, and the voltage is maintained at  $(3.7\sim 3.9\text{V}) * n$

每三个月需要以标准充电电流进行充电, 电压保持在  $(3.7\sim 3.9\text{V}) * n$

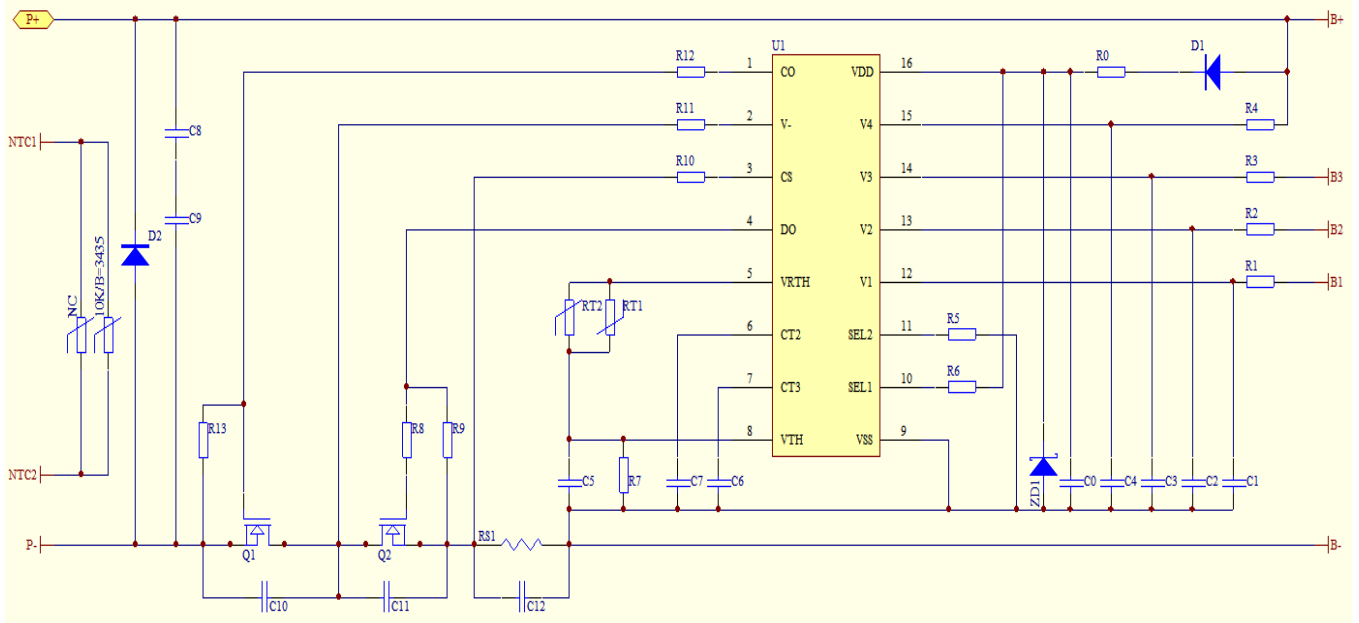
**5.2 Others 其它事项**

Any matters that this specification does not cover should be conferred between the customer and COINCELL. 任何本说明书中未提及的事项, 须经双方协商确定。



## 6. Protection Circuit 保护电路

### 6.1 Circuit Diagram 电路原理图



### 6.2 PCB Parts List 保护板零件清单

序号 NO.	物料名称/品牌 Description/vendor	代号 Symbol	规格/型号 Spec./Model	单位 unit	数量 Q'ty
1	PCB/JWT(无铅)	/	T2-KE-F048-V1/2 层/喷锡/36.3*36.3*1.2mm/内阻 $\leq 15m\Omega$ /绿色	PCS	1
2	IC/新德(无铅)	U1	NT3501-FQAP1/P1-16L	PCS	1
3	MOSFET/德普威(无铅)	Q2,Q3	FH3090G/DFN5*6L	PCS	2
4	贴片电容/国巨/华科(无铅)	C1~C4, C7~C12	0603/0.1UF/±10%/50V	PCS	10
5	贴片电容/国巨/华科(无铅)	C0	0805/2.2uF/±10%/50V	PCS	1
6	贴片电容/国巨/华科(无铅)	C5,C6	0603/0.001UF/±10%/50V	PCS	2
7	贴片电阻/国巨/华科(无铅)	R1~R6	0603/1K $\Omega$ /±1%/1/10W	PCS	6
8	贴片电阻/国巨/华科(无铅)	R0	0805/470 $\Omega$ /±5%/1/8W	PCS	1
9	贴片电阻/国巨/华科(无铅)	R7	0603/39K $\Omega$ /±1%/1/10W	PCS	1
10	贴片电阻/国巨/华科(无铅)	R8	0603/100 $\Omega$ /±5%/1/10W	PCS	1
11	贴片电阻/国巨/华科(无铅)	R9	0603/10M $\Omega$ /±5%/1/10W	PCS	1
12	贴片电阻/国巨/华科(无铅)	R13	0603/7.5M $\Omega$ /±5%/1/10W	PCS	1
13	贴片电阻/国巨/华科(无铅)	R10,R11,	0603/2.2K $\Omega$ /±5%/1/10W	PCS	3



## Product Specification

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		R12			
14	合金电阻/大毅(无铅)	RS1	2512/12mΩ(0.012R)±1%/2W-合金	PCS	1
15	贴片 NTC/顺络(无铅)	RT2,NTC2	10KΩ±1%/B=3435±1%/ L=35mm (UL3302 30AWG)/剥线 1.5~2.0mm	PCS	2
16	贴片二极管/CJ(无铅)	D1	1N4148WS/SOD-323	PCS	1
17	贴片稳压管/CJ(无铅)	ZD1	BZT52C30S/SOD-323	PCS	1
18	三防漆	元器件	所有元器件刷三防漆	g	

### 6.3 Electric Protect Features 电路保护参数

保护 IC: Protection IC:	NT3501-FQA	参数值 parameter value			
		常温 25℃ General temperature 25℃			
		最小值 Min.	典型值 Type value	最大值 Max.	单位 Unit
过充保护电压 Over charge protection voltage		4.225	4.250	4.275	V
过充保护恢复电压 Over charge release voltage		4.100	4.150	4.200	V
过放保护电压 Over discharge protection voltage		2.720	2.800	2.880	V
过放保护恢复电压 Over discharge release voltage		2.900	3.000	3.100	V
放电过流检测电压 Over current detection voltage		0.090	0.100	0.110	V
放电过流保护电流 Over current protection current		6.0	-	10.0	A
充电过流检测电压 Over current detection voltage		-0.110	-0.100	-0.090	V
充电过流保护电流 Over current protection current		6.0	-	10.0	A
过充保护延迟时间 Over charge protection delay time		500	1000	1500	ms
过放保护延迟时间 Over discharge protection delay time		500	1000	1500	ms
放电过流保护延迟时间 Over current protection delay time		30	60	90	ms
短路保护延迟时间 Short protection delay time		125	250	500	us
正常状态下静态电流				50	uA

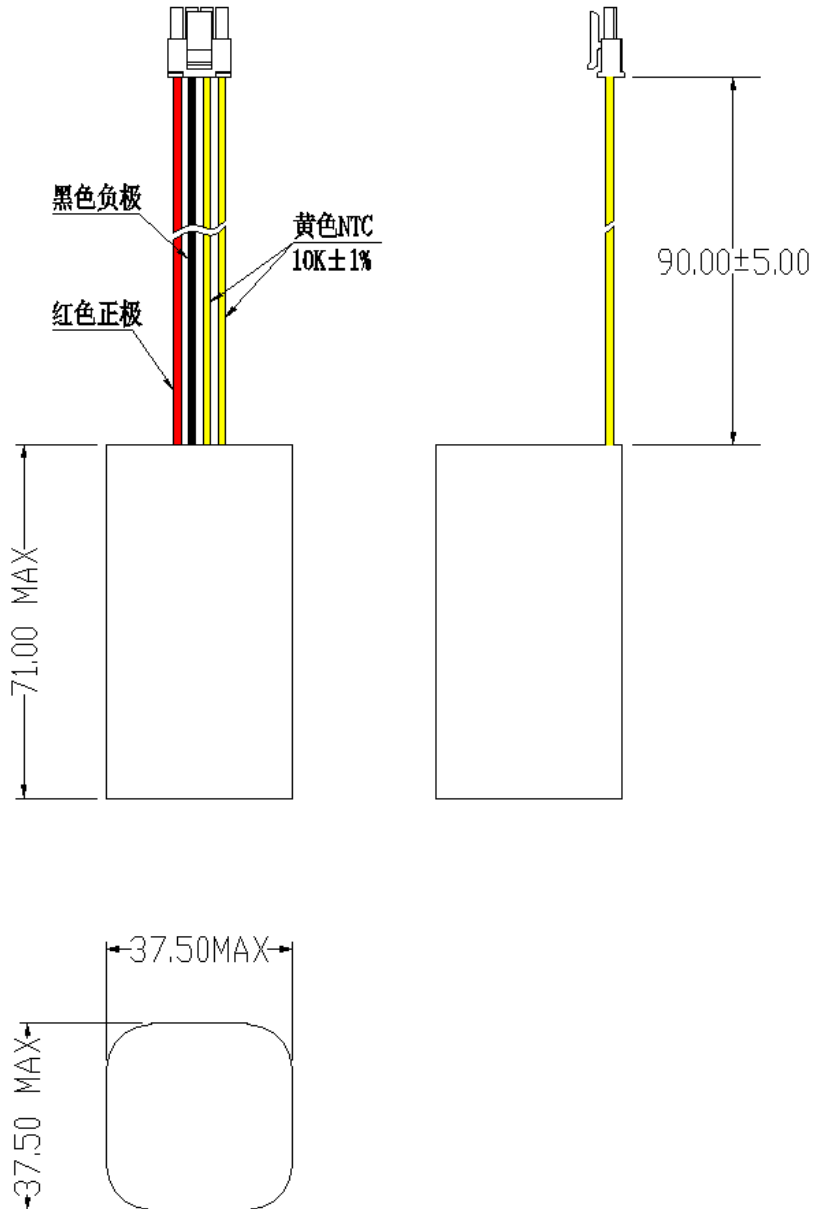


## Product Specification

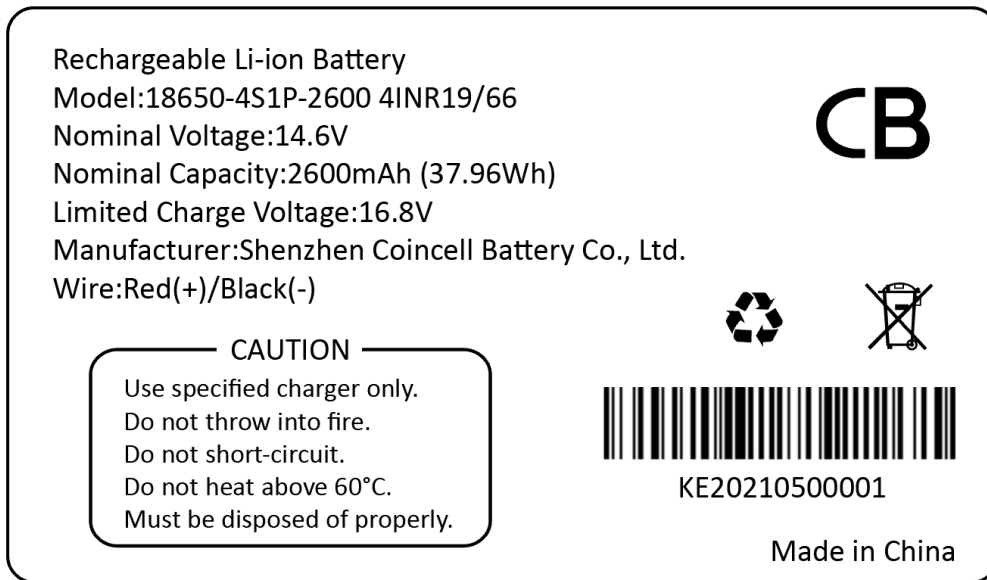
## 18650-4S1P-2600

Current consumption (Operation)				
过放状态下静态电流 Current consumption (Power down)			0.1	uA
导通内阻 Impedance			65	mΩ
输入电压 (B+与 B-间) Input voltage (B+ to B-)	-0.3		35	V
0V 电池充电功能 0V battery charge function	允许 Available			
NTC2-NTC 阻值 (25℃)	10K/±1%/B=3435			
放电过温检测	65	70	75	℃
放电过温解除	55	60	65	℃
充电过温检测	45	50	55	℃
充电过温解除	40	45	50	℃
充电低温检测	-15	-10	-5	℃
充电低温解除	-10	-5	0	℃

7. Assembly Drawing 装配图纸(Reference)



## 8. Label 标签



条形码:

KE 固定, 202105 代表年月随生产时间变化, 00001 代表流水码

## 9. Package 包装

### Appendix 附录

#### 电池组使用注意事项及安全说明 Battery Precautions and Safety Instructions

Please be sure to take to comply with the specifications and the following precautions to use with batteries, did not follow the specifications for the operation caused any accidents, SHENZHEN COINCELL BATTERY CO., LTD.. will not accept any responsibility.

请您务必遵守本规格书和以下使用注意事项使用电池, 对于没有按照规格书进行操作所造成的任何意外事故, 深圳市科恩瑟尔电池有限公司将不承担任何责任.

#### 1.警告及注意事项 Warnings and cautions

##### 警告 Warnings

严禁拆解或者修理电池。

Do not disassemble or modify the battery.

将电池放置在远离儿童的地方。

Keep the battery away from children.

严禁直接接触泄露的电池。

Do no touch a leaked battery directly.

严禁使用有明显的损伤或者变形等缺陷的电池。

Do not use the battery with defect such as conspicuous damage or deformation.

严禁将电池的正极 (+) 和负极 (-) 端子颠倒操作。

Do not reverse the positive (+) and negative (-) terminals.

必须使用为该电池专用配套的充电器充电。

When recharging, use the battery charger specifically for that purpose.

严禁在明火或者其它热源附近使用电池，严禁将电池放在明火或者其它热源附近。

Do not use or leave the battery near a heat source such as fire or heater.

严禁采用电线等金属物品直接短路电池的正极 (+) 和负极 (-) 端子。

Do not short-circuit the battery by directly connecting the positive (+) and negative (-) terminals with metal objects such as wire.

严禁将电池和项链、发夹等金属物品一起运输或者一起存放。

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

严禁对着坚硬的表面敲击或者扔电池。

Do not strike or throw the battery against hard surface.

严禁直接焊接电池，严禁使用钉子或者其它尖锐物刺穿电池。

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

严禁将电池浸入水或者盐水中，不使用时请将电池保存在凉爽干燥的环境中。

Do not immerse the battery in water or seawater and keep the battery in a cool dry environment during stands by period.

严禁将电池和电源插座直接连接。

Do not connect the battery to an electrical outlet.

严禁将电池投入火中或者热源中。

Do not dispose the battery in fire or heat.

深圳市科恩瑟尔电池有限公司对最终经过分析确认为与电路，电池组，充电器搭配使用所产生的问题不承担任何责任。

After analysis on final confirmation, SHENZHEN COINCELL BATTERY CO., LTD. will not be responsible for trouble occurred by matching electric circuit, cell pack and charger.

## **注意事项cautions**

使用前请阅读具体的电池充电器说明书。

Please read the specific charger manual before usage.

如无特殊说明，电池的标准测试环境温度要求为 $20 \pm 5^{\circ}\text{C}$ 。

Unless otherwise specified, the standard test temperature of the battery should be  $20 \pm 5^{\circ}\text{C}$ .

电池长期储存（3个月以上）情况下，应半充电状态储存在低湿度且不含腐蚀性气体的环境中，温度 $-10 \sim 35^{\circ}\text{C}$ 。

In case of long time storage(more than 3 months), the battery should be in a low humidity ,no corrosive gas area and at  $-10 \sim 35^{\circ}\text{C}$  at half charged stage.



## Product Specification

18650-4S1P-2600

请在0~45°C温度范围内对电池充电，过低的温度条件下充电会缩短电池的循环寿命，严重时发生泄漏、爆炸。  
Charge the battery at operating temperature range of 0~45°C, the cycle life of the battery will be shortened when charged at low temperatures, Serious will occur leakage, explosion.

请在-20~60°C温度范围内对电池放电。  
Discharge the battery at operating temperature range of -20 ~ 60°C.

不要在非常高温（如阳光直射或者高温的车辆内）的环境下使用或者放置电池，否则电池会过热、起火或者性能会退化，使用寿命会缩短。  
Do not use or leave the battery at very high temperature (for example ,at strong direct sunlight or in a vehicle in extremely hot weather).Otherwise ,it can overheat or fire or its performance will be degenerate and its service life will be shortened.

请不要在静电量大的地方使用电池，否则安全装置会被破坏，造成危险。  
Do not use the battery in a location where static electricity is rich, otherwise, the safety devices may be damaged, causing a harmful situation.

如果因电池电解液泄漏进入眼睛，请不要揉眼睛，用干净的自来水冲洗眼睛，并立即就医。否则，可能会损害眼睛或导致失明。  
In case the electrolyte get into the eyes due to the leakage of battery ,do not rub the eyes, rinse the eyes with clean running water, and seek medical attention immediately .Otherwise, it may injure eyes or cause a loss of sight.

如果在充电或储存过程中电池发出异味，发热，变色或变形，或以任何方式出现异常，立即将电池从设备或电池充电器中取出，并放置在诸如金属盒的容器中。  
If the battery gives 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 charger and place it in an contained vessel such as a metal box.

如果电池的端子被污染，在使用前请用干布擦拭干净，否则由于电池与电子仪器之间的电路接触不良可能导致电源故障或充电故障。  
In case the battery terminals are contaminated clean the terminals with a dry cloth before use. Otherwise power failure or charge failure may occur due to the poor connection between the battery and electronic circuitry of the instrument.