

Specification of Rechargeable Li-ion Polymer Cell

可充电聚合物锂离子电池规格书

Cell Model 电池型号: 052330

Product Description产品描述: Single Cell (单体电池)

Product No.产品编码:A01XXXXXXXXA

Prepared by (R&D) 编制(R&D)	Checked by (R&D) 审核(R&D)	Approved by (R&D、QA) 批准(R&D、QA)	
Junjie Liang			
2023.10.20	2023.10.20	2023.10.20	2023.10.20

Customer Approval 客户确认	Signature/Date 签名/日期	
	Company Name/Stamp 公司名称/盖章	
	Customer material number: 客户物料编号:	

AMENDMENT RECORDS

规格变更记录

Revision 版本	Description 描述	Prepared by (R&D) 编制(R&D)	Date 日期
V01	New release 新发放	Junjie Liang	2023.10.20

**1. Scope/范围**

This document describes the product specification and using condition of the rechargeable Li-ion polymer cell supplied by ZG (Shenzhen Zhonggeng Technology Co., Ltd.).

本文件描述了深圳市中耕技术有限公司生产的可充电聚合物锂离子电池的产品性能及使用条件。

**2. Product/产品**

2.1 Name : Rechargeable Li-ion polymer cell

名称: 可充电聚合物锂离子电池

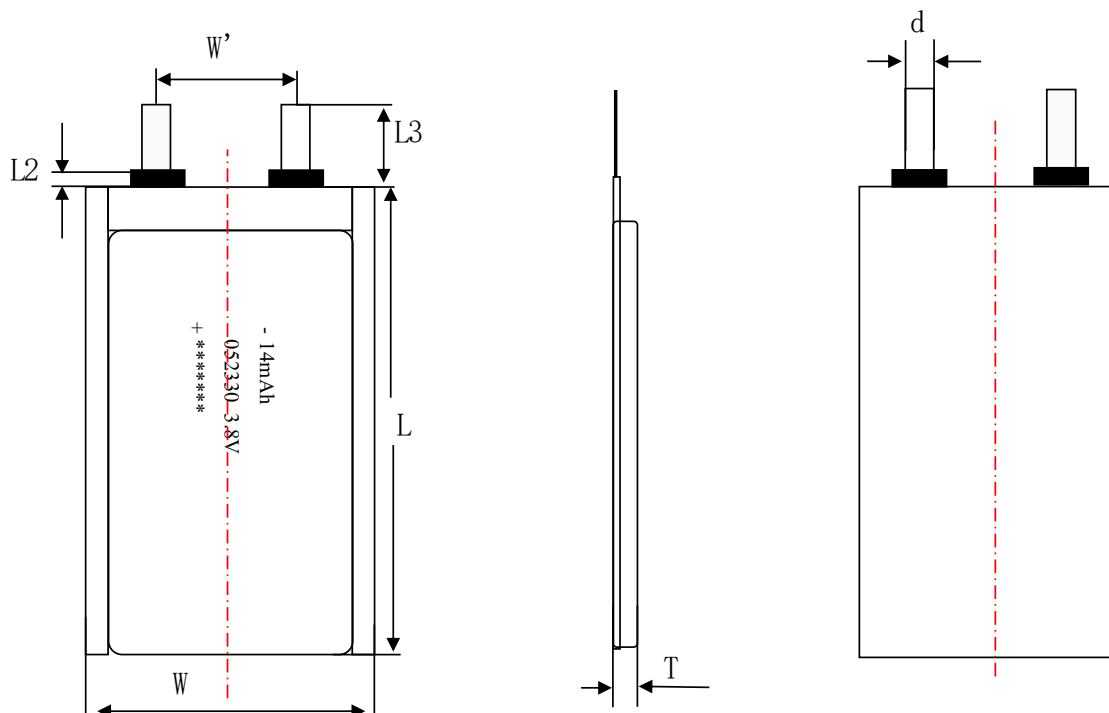
2.2 Cell Model/电池型号 052330

Product Description/产品描述: Single Cell (单体电池)

**3. Specification /规格**

Item 项目	Specification 规格				
3.1 Nominal Voltage 标称电压	3.80      V				
3.2 * Rated Capacity 额定容量	14	mAh	Charging the cell at constant current 0.5C to 4.35V, then charging it at constant voltage 4.35V till 0.025C. Standing within 1hour, the cell will be discharged to 3.0V at 0.2C.		
Typical Capacity 典型容量	15		0.5C恒流充电至4.35V, 再4.35V恒压充电至0.025C截止. 静置不超过1小时, 再以0.2C放电至3.0V截止		
3.3 * Cell Impedance 电池内阻	≤ 1800	mΩ	Measured at AC 1kHz (RT) 测试条件为AC 1kHz (常温下, 25±3℃)		
3.4 * Shipment Voltage 出货电压	3.70~3.90	V	As of shipment. 出厂时的电压		
3.5 Limited Charging Voltage 充电限制电压	4.35	V	充电截止电压 (Charging Cut-off Voltage)		
3.6 Maximum Charging Current 最大充电电流	Ambient temperature 环境温度	Relative humidity 相对湿度	Charging current 充电电流	Limited Charging Voltage 充电限制电压	Cut-off current of CV 恒压截止电流
	0℃ ~ 15℃	65±20%	0.2C	Max. 4.35V	0.050C
	15℃ ~ 45℃	65±20%	1.0C	Max. 4.35V	0.025C
3.7 Maximum Discharging Current 最大放电电流	Ambient temperature 环境温度	Relative humidity 相对湿度	Discharging current 放电电流	Limited Discharging Voltage 放电限制电压	
	-20℃ ~ 0℃	65±20%	Max. 0.2C	3.0V	
	0℃ ~ 60℃	65±20%	Max. 1.0C	3.0V	
3.8 Recommendation Charging Current 推荐充电电流	0.5C	7	mA		
3.9 Recommendation Discharging Current 推荐放电电流	0.2C	2.8	mA		
3.10 Discharge Cut-off Voltage 放电截止电压	3.0	V			
3.11 Operating temperature Range 工作温度范围	Charge temperature 充电温度: 0~45℃ Discharge temperature 放电温度: -20~60℃				
3.12 Storage Environment (30% State of Charge ) 储存环境(30%电量)	-20℃ ~ 45℃ in three months 25±3℃ over three months, battery voltage shall be 3.6V to 3.9V Humidity: 65±20%RH 储存期在3个月内: 温度-20℃ ~ 45℃, 湿度65±20%RH 储存期超过3个月: 温度25±3℃, 湿度65±20%RH, 电压3.6~3.9V				
3.13 Weight (Approx.) 预计重量	0.8	g	(For reference only)		

#### 4. Outward appearance and Dimension /外型 and 物理尺寸



备注： 厚度使用PPG以4.9N(500gf)测量.

Notes: Thickness is define with 4.9N(500gf) by PPG

Item检测项目	Specifications技术规格	Item检测项目	Specifications技术规格
MAX T (最大厚度)	0.45 mm	W' (极耳中心距)	12.0 ± 2.0 mm
MAX W (最大宽度)	23.0 mm		
MAX L (最大长度)	30.0 mm		
L2 (极耳胶高度)	0.2 ~ 2.0 mm		
L3 (极耳长度)	4.0 ± 0.5 mm		
d (极耳宽度)	3.0 ± 0.1 mm		

## 5. Test method/测试方法

### 5.1 Standard environmental test condition/测试条件

Unless otherwise specified, all tests stated in this PACK SPECIFICATION are conducted at below conditions.

Temperature:  $25\pm 3^{\circ}\text{C}$ ; Relative humidity :  $65\pm 20\%$ ; Atmosphere pressure: 86kPa~106kPa.

除特别说明外, 本规格书中所有测试均在以下环境中进行.

温度:  $25\pm 3^{\circ}\text{C}$ ; 相对湿度:  $65\pm 20\%$ ; 大气压力: 86kPa~106kPa.

### 5.2 Specification compliance conditions/规格符合性条件

Throughout this Document, numeric criteria annotated by “\*” means such criteria are only applical Product within 30 days from manufacture by ZG. Products either have been used or stored for a period longer than 30 days by Customer and/or its customer may exhibit an inferior numeric parameter than such criteria. Customer agrees that such occurrence does not constitute nonconformance of specification.

本产品规格书中, 所有标 “\*” 的项目是指仅适用于 “未使用的且从 ZG 制造日起30天内的产品”。如果产品已被客户使用或存储时间超过30天, 可能表现出低于标准规格, 客户同意并接受产品表现出低于标准规格, 客户同意并接受产品不构成不符合规格。

### 5.3 Measuring Equipment/测量仪表与设备要求

Requirement of voltage meter: The accuracy is not less than  $\pm 0.5\%$ .

测量电压的仪表准确度应不低于 $\pm 0.5\%$ .

Requirement of ampere meter: The accuracy is not less than  $\pm 0.5\%$ .

测量电流的仪表准确度应不低于 $\pm 0.5\%$ .

Requirement of time meter: The accuracy is not less than  $\pm 0.1\%$ .

测量时间的仪表准确度不低于 $\pm 0.1\%$ .

Requirement of thermometer: The accuracy is not less than  $\pm 0.5^{\circ}\text{C}$ .

测量温度的仪表准确度不低于 $\pm 0.5^{\circ}\text{C}$ .

Constant current resource is constantly adjustable, which alters within  $\pm 1\%$ .

恒流源的电流恒定可调, 在充电或放电过程中, 其电流变化应在 $\pm 1\%$ 范围内.

Constant voltage resource is constantly adjustable, which alters within  $\pm 0.5\%$ .

恒压源的电压可调, 其电压变化范围为 $\pm 0.5\%$ .

## 6. Visual Inspection/外观

There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of the cell .

不允许有任何影响电池性能的外观缺陷, 如裂纹、裂缝、泄漏等。

## 7. Cell Performance Specification/电池性能规格

### 7.1 Electrical characteristics

电性能

Items	Test Method and Condition				Criteria
7.1.1 Full charge 满充电	Charge to 4.35V with 0.5C, then go on charging with constant voltage 4.35V till charge current declines to 0.025C . 以0.5C电流恒流充至4.35V, 再4.35V恒压充电至电流小于0.025C。				/
7.1.2 * Rated capacity 额定容量	The capacity means the discharge capacity of the CELL that was discharged to 3.0V with discharge current of 0.2C within 1h after the full charge. 电池满充电后1小时内用0.2C电流放电, 放电至3.0V截止的放电容量。				$\geq 14 \text{ mAh}$
7.1.3 RT Cycle life 常温循环寿命	Cycle life is the capacity of the cell that was repeated 300 cycles with full charge and then discharging to 3.0V with discharge current of 0.5C. 电池满充电后以0.5C放至3.0V, 充放电循环300次后的放电容量。				$\geq 80\%$ Minimum capacity
7.1.4 Temperature capacity test 温度性能	Temperature capacity test is the discharging ability at 0.2C of the CELL in different temperature as follow after fully charged in a temperature of $25^{\circ}\text{C}$ , the time between charging and dis beyond 3 hours. 不同温度条件下的放电容量对比, 即在 $25^{\circ}\text{C}$ 常温条件下电池满充电后, 在下表所示温度下以0.2C放至3.0V的容量。如果充电和放电温度不是同一温度时, 温度变化的间隔时间要求是3小时。				
	Charge temperature 充电温度		Discharge temperature 放电温度		
	$25^{\circ}\text{C}$		$-10^{\circ}\text{C}$	$0^{\circ}\text{C}$	$25^{\circ}\text{C}$
			$\geq 60\%$	$\geq 80\%$	$100\%$

7.1.5 Self-discharge 自放电	The fully-charged cell stores under the conditions as Item 5 for 28 days and discharges with 0.2C till 3.0V. Testing the capacity after the discharge. 满充电后在如第5项所述的测试条件下储存28天，检测0.2C放电至3.0V的容量。					Capacity ≥80% Minimum capacity
7.1.6 Storage characteristics 存储特性	SOC 荷电状态	The cell store at different SOC, the initial capacity VS time (25℃) 电池不同荷电状态条件下存储，初始容量随时间变化如下 (25℃)				
		Storage duration 存储时间	3 months	6 months	9 months	12 months
	Approx. 30% charge state (3.68< OCV≤3. 83V)	Recovered capacity (%) 容量恢复率	95.5%	93.5%	91.5%	90.5%
		Recovered impedance (%) 内阻恢复率	120.00%	130.00%	135.00%	140.00%
	Approx. 50% charge state (3.83< OCV≤3. 98V)	Recovered capacity (%) 容量恢复率	95.00%	93.00%	91.00%	90.00%
		Recovered impedance (%) 内阻恢复率	120.00%	130.00%	135.00%	140.00%
	Approx. 70% charge state (3.98< OCV≤4. 13V)	Recovered capacity (%) 容量恢复率	92.00%	88.00%	86.00%	85.00%
		Recovered impedance (%) 内阻恢复率	125.00%	135.00%	145.00%	150.00%
	Approx. 100% charge state (4.13< OCV≤4. 35V)	Recovered capacity (%) 容量恢复率	90.00%	85.00%	82.00%	80.00%
		Recovered impedance (%) 内阻恢复率	130.00%	140.00%	150.00%	160.00%

## 7.2 Mechanical specification/机械特性

Items	Test method and condition	Criteria
7.2.1 Vibration test 振动	Batteries are firmly secured to the platform of the vibration machine without distorting the batteries in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.  试验电池和电池组紧固在振动机上，所受振动为正弦波形，频率在7Hz和200Hz之间摆动再回到7Hz的对数扫频为时15min。这一过程须在三个互相垂直的电池安装方位的每一方向都重复进行12次，总共为时3h。其中一个振动方向必须与端面垂直。	No explosion, no fire, no leakage. 不爆炸，不起火，不漏液
7.2.2 Drop test 跌落	The cell is to be dropped onto concrete ground from a height of 1.0 meter six times.  电池从1.0m高处自由落于混凝土板上，共进行6次。	No explosion, no fire 不爆炸，不起火

## 7.3 Cell safety 电池安全测试

Items	Test method and condition	Criteria
7.3.1 Crush test 挤压	The pressure on the surface of the fully charged cell do not stop being raised until 17.2 Mpa when the cell is crushed by two flat surfaces.(Max. 13kN)  满充电电池被两平板挤压。挤压的最大压强为17.2Mpa,最大作用力为13kN。当达到最大值即停止。	No explosion, no fire. 不爆炸，不起火
7.3.2 Forced discharge 强制放电	Discharge the cell to the cut-off voltage with 0.2C current and then reverse charge the cell for more than 90 mins with 1C current.  电池先以0.2C放电至终止电压，再以1C电流，对电池进行反向充电，90min以上	No explosion, no fire. 不爆炸，不起火

7.3.3 RT Short-Circuit test 常温短路	After full charge, the positive and negative tabs are connected together by a copper wire whose resistance is $80 \pm 20 \text{m}\Omega$ . 满充电电池用 $80 \pm 20 \text{m}\Omega$ 电阻的铜导线连接其正负极至电池体温度接近室温。	No explosion, no fire . 不爆炸，不起火
7.3.4 Over-charge test 过充	The cell is overcharged to 4.6V with a current of 3C and then charged with constant voltage 4.6V until continuous charging time to 7 hours. 电池在3C恒流恒压下过充至4.6V，直至持续充电时间达到7 小时。	No explosion, no fire . 不爆炸，不起火
7.3.5 Low Pressure 低压测试	Place the fully charged cell in vacuum chamber at an ambient temperature of $20 \sim 25^\circ\text{C}$ . Seal the chamber and reduce the pressure to or less than 11.6kPa(simulated an altitude of 15240 m), then held for 6 h. 电池放在一个模拟真空的空间放置6小时，环境温度为 $20 \sim 25^\circ\text{C}$ ，真空环境压力 $\leq 11.6 \text{kPa}$ ，模拟15240m高空低压环境。	No leakage, no explosion, no fire . 不泄漏，不爆炸，不起火

## 8. Charging/充电

Charging current and charging voltage should be less than specified in the CELL SPECIFICATION.

The charger shall be designed to comply with CELL SPECIFICATION.

It is dangerous that charging with higher current or voltage than Product Specification may cause damage to the cell electrical/mechanical safety performance.

充电电流和充电电压不得超出本规格书中所规定的最大值。

充电器的设计应满足本规格书的要求。

使用超出本规格书要求的电流和电压范围可能引起电池充放电性能、机械性能和安全性能的问题。

## 9. Warranty/品质保证

Period of warranty: 12 months after shipment;

产品保质期: 自交货期开始算起后的12个月;

Range of warranty: Operating within the specified current , voltage ranges and working temperature range, the cell performs normally without swelling, 0V and electrolyte-leaking. Cell damage caused by misuse or incorrect storage cannot apply the Warranty.

If the life cycle meets the requirement of the Specification, the cell is invalid in advance.

保 质 范 围: 在规格书规定的充放电电压范围、电流范围、工作温度等正常使用及存放条件下电池可进行充放电，无气鼓、零电压、漏液等不良现象。不当使用或存放造成电池不良不在保质范围内。当循环寿命达到规格书中要求后，电池提前过保质期。

## 10. Liability/产品责任

Please use the Lithium ion cells supplied by ZG under the product specification .It may cause fire or expansion if the cells are used incorrect .We(ZG) will not guarantee the safety unless the cells are used under the product specification.

请客户务必按照所提供的规格说明书和所附的注意条款来使用深圳市中耕技术有限公司生产的电池。不正确地使用电池，可能会导致电池性能异常、发热、着火或破裂现象。对于客户在超出规格说明书以外的情况下使用电池，深圳市中耕技术有限公司不保证其使用性能和安全性能。

## 11. Identification/成品电池块（组）上标识

Warnings would better be marked on the surface of the better which is tied up by certain cells:

\*Using the charger designated by the manufacturer(AEC).

\*Don't throw the better in fire or heat it .

\*Don't short-circuit by connecting the positive and negative polarities together.

\*Don't unpack the battery or change its structure.

对用于制作电池块（组），请在电池块（组）上标记以下警告：

\*使用（制造厂商）指定的充电器。

\*禁止将电池投入火中或对电池加热。

\*禁止将电池正负极短路。

\*禁止拆开，改变电池（组）结构。

## 12. Notice for Designing CELL Pack / 电池块设计注意事项

### 12.1 Battery design

#### 电池块设计

12.1.1 cell shell should be with enough mechanical strength, to protect the inner cell from mechanical shock;

电池外壳应有足够的机械强度以保证其内部电池免受机械撞击;

12.1.2 No cell movement in the CELL pack should be allowed;

电池不得在壳内活动;

12.1.3 No Sharp edge or bulge components should be inside the pack containing the CELL ;

外壳内安装电池的部位不应有锋利的边角或凸起;

12.2 Avoid some components to contact the edge of packing foil of batteries ;

避免导电元件与电池包装铝箔的边缘接触;

### 12.3 Tab connection

#### 电池的连接

12.3.1 Ultrasonic welding or spot welding is recommended to connect CELL with PCM or other parts;

建议使用超声波焊接或点焊技术来连接电池与保护电路模块或其它部分;

12.3.2 The tab is not very firm. Don't bend it especially at the positive pole. It will rupture easily;

电池极耳的机械强度并非十分坚固,弯折容易断裂,尤其是正极耳.禁止多次弯折极耳;

12.3.3 If apply manual solder method to connect tab with PCM, below notice is very important to ensure CELL performance:

如使用手工锡焊,须注意以下事项,以保证电池的功能:

1). The solder iron should be temperature controlled and ESD safe;

烙铁的温度可控且防静电;

2). Soldering temperature should below 350°C;

烙铁温度应该小于 350°C;

3). Soldering time should not be longer than 3s ;

锡焊时间不能超过 3 秒;

4). Soldering times should not exceed 3 times ,secondary welding should be done after the poles are cooling;

锡焊次数不能超过 3 次,必须在极耳冷却后再进行二次焊接;

5). Heating up the cell is strictly prohibited, and the cell will be completely destroyed at 100°C.

禁止直接加热电池,高于 100°C会导致电池损坏;

6). Don't let the electric iron contact the surface of the cell.

禁止电烙铁头接触电池表面。



Please use the cell according to the provisions as below ,Incorrect using of the cell may cause fire or expansion,and destroy its performance.

请仔细阅读并遵照以下条款安装使用电池，不正确的使用可能会导致电池气鼓、着火等，降低了电池的性能或破坏电池。

### 13. Warnings 警告

- 13.1 Don't throw the cell in fire or heat it or store it in high temperature place ;

请勿将电池放入火中，或对电池加热，请勿在高温下储存电池；

- 13.2 Don' t operate or use the cell under high temperature or next to the heating material. Don' t throw the

禁止在高温环境下或热源旁操作或者使用电池,禁止将电池加热或者投入火中；

- 13.3. Don't fix the positive and negative of the cell reversely to the electrical equipment ;

安装电池时请勿将正负极反接；

- 13.4 Don't connect the positive and negative polarities by metallic conductor such as a metallic wire;

请勿将电池正负极用金属物体（如导线）直接连接等方式造成电池短路；

- 13.5 Don' t impact or scrape the surface of the cell by spiculate parts;

禁止用尖锐部件碰撞或刮擦电池表面；

- 13.6 Don't stab it with a needle,beating,treading,fold or other way;

请勿用针刺、用锤敲打、用力踩踏、弯折或其它方式对电池进行撞击；

- 13.7 Don' t drop or fling the cell randomly;

禁止坠落、抛掷电池；

- 13.8 Keep the cell sealed!(Don't open or deform folding edge,Don't bend or fold sealing edge,etc);

请勿破坏电池密封(包括打开折边、弯折封边等)；

- 13.9 Don't unpack the CELL or change its structure!;

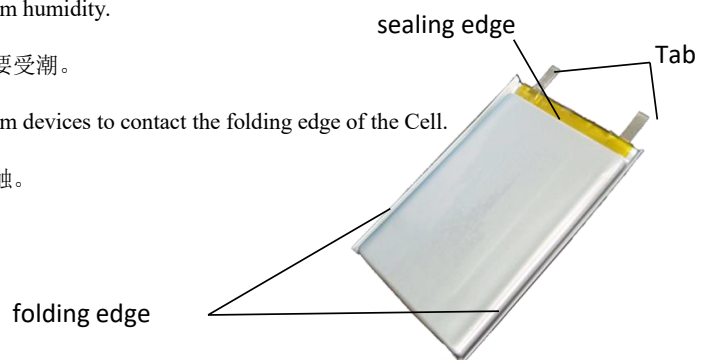
请勿乱拆电池，请勿随意改变电池结构；

- 13.10 Don't throw the cell in water,please keep it from humidity.

请勿将电池放入水中，储存时注意电池不要受潮。

- 13.11 Avoid any components or conductive plate from devices to contact the folding edge of the Cell.

避免导电元件与电芯包装铝塑膜的边缘接触。





**14. Attention注意**

- 14.1 Please use the qualified equipment to charge and discharge the cell, and follow the right instructions.  
充放电时请勿用不合格设备，并遵循正确的使用说明。
- 14.2 Don't use cells of different types or cells supplied by different manufacturer together. Don't use the old and new cells together.  
请勿将不同厂家或不同种类、型号的电池以及新旧电池混用。
- 14.3 Don't charge or discharge the hot, inflation, distorted or electrolyte-leakage cell.  
请勿将发热、气鼓、变形或漏液电池放入设备中充放电。
- 14.4 Don't let the cell over-charge or over-discharge.  
在充放电时，不能超出本规格书规定的电压、电流范围。

**15. Reminding提醒**

- 15.1 Don't use the damaged cells (the sealing edge was damaged, the pack was damaged, the electrolyte leakage etc.). If the cell heating when using, go far away from the cell, it may avoid unnecessary damage;  
禁止使用已损坏的电池(电池封口封边损坏,外壳破损,闻到电解液,电解液泄漏等). 操作电池时,如果发现电芯发热,要立即远离该电池以免造成不必要的伤害;
- 15.2 Theoretically, there is not flowing electrolyte in the cell, but if the leakage of electrolyte happen, or the electrolyte splash down to the skin, eyes or other parts of the body, wash with water and go to hospital immediately;  
聚合物锂离子电池理论上不存在流动的电解液,但万一有电解液泄漏而接触到皮肤、眼睛或身体其它部位,应立即用清水冲洗并就医;
- 15.3 The cells supplied by AEC (Apower Electronics Co.,Ltd.) had passed the QC before sales, If there is any abnormal problem such as unidentified heating, expansion and peculiar smell, please contact with us;  
电池出货前已由QC严格检查, 如客户发现所购电池有发热、气鼓或异味现象, 请与我司联系;
- 15.4 The inspection for IQC of customer should be done within 7 days after the cells have been received.  
客户收到电池后, 应在7天内完成进料检验。
- 15.5 Battery rests for a long time will lead to over discharged state due to cell, PCM and product's self consumption current.  
To avoid this, battery should be charged regularly. Battery is recommended to be charged every 3 months using 0.5C current until to 3.7~3.9V.  
电池长期未使用会因电芯、保护板和主机的自放电特性而处于过放电状态。为防止过放电的发生, 电池应定期充电。推荐电池储存每超过三个月, 对电池用0.5C电流充电至单个电池电压3.7~3.9V。
- 15.6 Over discharge will cause battery ineffective. While battery voltage is between 0~2V, 0.05C charging current is recommended, maximum 0.1C. While battery voltage is 2.0~3.0V, 0.2C charging current is recommended.  
过放电会导致电芯性能、电池功能的丧失。电池电压0~2.0V时推荐使用0.05C电流充电, 最大0.1C充电; 电池电压2.0~3.0V时推荐使用0.2C充电。
- 15.7 If single cell voltage is less than 2.5V, and can't be charged to 3.0V with current 0.2C within 30min, then should stop charging, and the cell should't be used again.

## 16.Package/包装

Package sketch map/包装示意图

