可充式锂离子电池规格书

Specification of Li-ion Rechargeable Battery

产品型号：LP-422339-PACK

Model No.: LP-422339-PACK

客户型号 **(Customer P/N)：**	

编制 **Compile by**	审核 **Checked by**	批准 **Approved by**	客户确认 **Customer confirmed**
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变更记录

AMENDMENT RECOREDS

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A0	初版发行 The first edition	2021-1-18	陈开金
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1. Scope 概述

This specification describes the type and dimension, performance, technical characteristics, warning and caution of the lithium ion rechargeable battery. The specification only applies to Lithium batteries supplied by Shenzhen BAK Technology Co.Ltd.

本规格书描述了锂离子充电电池的型号、尺寸、性能、技术要求及注意事项。本标准适用于深圳市比克电池有限公司生产的锂离子电池。

2. Product basic information 产品基本信息

Below data shall be based on the testing for fresh battery unless otherwise specified

除非有特殊说明，以下参数均为新电池的测试结果

序号 No.	项目 Items	规格 Specification	
1	Normal Voltage 标称电压	3.7V	
2	Nominal Capacity 标称容量	370mAh	Standard charge & discharge 标准充放电
3	Minimum Capacity 最小容量	350mAh	
4	Max Charge Voltage 上限充电电压	4.2V (标准充电方法:恒流/恒压/ Standard Charging Method CC/CV)	
5	Discharge cut-off voltage 放电终止电压	2.75V (limited by PCB)	
6	Standard Charge 标准充电	0.2C (恒流充电至4.2V，然后4.2V 恒压充电至电流0.02C截止/ CC charge to 4.2V, then CV to 0.02C cut off)	10~45℃
7	Standard Discharge 标准放电	0.2C (CC Discharge to 2.75V / 恒流放电至2.75V) (limited by PCB)	-20~60℃
8	Max. Charge Current / 最大充电电流	0.2C（10~20℃） 0.5C (20~45℃)	
9	Max. Discharge Current / 最大放电电流	1C	
10	Humidity range 湿度范围	0-85% RH (non-condensing 不冷凝)	
11	Impedance 内阻	≤210mΩ (AC Impedance, 1000 Hz)	
12	Battery Weight 电池重量	Approx:8.8g 约: 8.8g	
13	Battery Dimension 电池尺寸	L(长):40.5mm Max W(宽):24mm Max T(厚):4.4mm Max	

14	As of shipment Voltage 出货状态电压	3.7-3.8V (or according to customer's required/ 或按客户要求）
15	Storage condition 储存条件	-10～45℃, 60% RH: 3month（3 个月） -10～30℃, 60% RH: 12month（12 个月） Storage in a 50% charged state; (Do NOT storage at fully charged state; Over long storage periods batteries should be cycled every 90 days, The method is to do a charge-discharge cycle with standard method. (Under normal storage conditions, long time storage can lead to decrease of capacity and cycle life, it will be caused more decreasing of the capacity and the cycle life if the storage condition out of the normal condition.) 50%充电态贮存； 不要在满电状态下储存；过长时间存储的电芯，应隔90天用标准方法适时地进行一次充放电循环 (在正常要求的储存环境下长时间存储会导致容量衰减和循环寿命的下降，如超出存储环境要求则会进一步加剧容量的衰减和循环寿命的下降)
16	Shipment Requirement 运输要求	To prevent violent vibration, impact or crush during transportation, avoid direct exposure under the sun or the rain. 电芯在运输过程中应防止剧烈震动、冲击或挤压、防止日晒雨淋。

3. Visual inspection 外观检测

The surface is clear and no scratch, no mechanical abrasion, deformations.

电池外表面清洁，无擦伤，无机械损伤，不变形。

4. Electrical characteristics 电性能 (for cell 电芯）

4.1 Definition 定义

Standard charge method 标准充电方式

At 25±2℃ The battery shall be charged to 4.20V with a constant current of 0.2C and then continually charged at constant voltage of 4.20V; the charging process should be cut off till the charging current is less than 0.02C.

在25±2℃下，电池应以0.2C 的恒定电流充到4.20V；然后继续以4.20V 的恒定电压充电直到充电电流小于0.02C，结束充电过程。

Standard discharge method 标准放电方式

At 25±2℃, after fully charged by standard charging method, discharged the battery to 2.75 V（discharge to 2.8V for battery pack） under 0.2C constant current.

在 25±2℃下，以标准充电方式给电池充满电后，再以 0.2C 恒流放电至 2.75V，(电池组放电至 2.8V)

4.2 Requirement of the testing equipment 测量仪表要求

a. The dimension measurement shall be implemented by instruments with equal or more precision seal of 0.01mm.
测量尺寸的仪器精度应大于等于0.01mm。

b. Standard class specified in the national standard or more sensitive class having inner impedance more than10k Ω/v.
万用表测量电压及电流的准确度应不低于0.5级；测电压时内阻不应小于10kΩ/v。

c. Impedance shall be measured by a sinusoidal alternating current method(1kHz LCR meter).
内阻测试仪测量原理应为交流阻抗法(1kHz LCR)。

d. The current measurement shall be implemented by instrument with equal to more precision scale of ± 0.1% and the constant voltage precision should be implemented with ± 0.5%; and the timing precision should be not below ±0.1%.
电池测试系统的电流精度应在±0.1%以上；恒压精度±0.5%,计时精度不低于±0.1%。

e. The temperature measurement shall be implemented by instrument with equal or more precision seal of ±0.5℃.
温度测量的仪表准确度应不低于± 0.5℃。

4.3 Electrical characteristics 电性能

(Fresh cells, tested at 25±2℃,standard charge and discharge unless otherwise specified.
（除非有特殊说明，否则所有测试要求为：温度在 25±2℃条件下，样品为新电池，充放电制度为标准充电和标准放电）

Items **项目**	**Conditions** **测试条件**	**Criteria** **判定标准**
0.2C Capacity 0.2C放电容量	1.(For cell)The test shall be conducted in an ambient temperature of 25±2℃. Discharge at 0.2C down to 2.75V, rest 30 minutes; and then charge at 0.2C/4.2V CC/CV mode cut-off current 0.02C. Rest 30 minutes, and then discharge at 0.2C to 2.75V. （电芯）本测试在 25±2℃下进行。以 0.2C 放电至 2.75V,然后静置 30 分钟，0.2C/4.2V 恒流恒压模式直至充电电流 0.02C。静置 30 分钟后，以 0.2C 放电至 2.75V 2. (For battery pack)The test shall be conducted in an ambient temperature of 25±2℃. Discharge at 0.2C down to 2.8V, rest 30 minutes; and then charge at 0.2C/4.2V CC/CV mode cut-off current 0.02C. Rest 30 minutes, and then discharge at	1.The discharge time should ≥300mins 放电时间大于 300mins 2.The discharge time for battery pack should ≥290mins 成品电池组放电时间≥290mins

	0.2C to 2.8V. 2.（电池组）本测试在 25±2℃下进行。以 0.2C 放电至 2.8V,然后静置 30 分钟，0.2C/4.2V 恒流恒压模式直至充电电流 0.02C。静置 30 分钟后，以 0.2C 放电至 2.8V	
Storage Characteristic 荷电保持	Test condition: Charge: Standard charge method stored at 25℃ for 30 days Discharge: Standard discharge method 测试条件： 充电： 标准充电方式 储存电池在25℃环境下30 天 放电: 标准放电方式	residual capacity after 30 days storage≥95% recover capacity after 30 days storage≥97% 存储30天后残余容量≥95% 存储30天后恢复容量≥97%
Cycle Life 循环寿命 (for cell/电芯)	Charge: 0.2C constant current charge to 4.2V followed by 4.2 V constant voltage charge to cut-off current ≤ 0.02C Discharge: 0.2C constant current discharge to cut-off voltage ≤ 2.75V. 充电：以 0.2 C 恒流充电至 4.2V 后，以 4.2 V 恒压充电至电流≤ 0.02 C 放电：以 0.2C 恒流放电至截止电压≤ 2.75V	discharge capacity of 301th cycle≥80% 第301次循环的放电容量≥80%

5. Safety performance 安全性能 (for cell 电芯）

Items 项目	Conditions 测试条件	Criteria 判定标准
Overcharge test 过充测试	After fully charged according to the standard charge method, the cell is charged at 1 C till the ending conditions: the cell voltage reaches 1.5 times of the cut-off voltage of standard charge or the 1 C charge time reaches 60 min. The cell is observed for 60 min afterwards. 电芯以标准充电方式充满电，然后以 1 C 充电至电压达到充电终止电 压的 1.5 倍或充电时间达 60 min 后停止充电，观察 60 min	The battery must has no explosion, no fire 电池应不爆炸、不起火.

Over discharge test 过放测试	After fully discharged according to the standard discharge method, the cell is discharged at 1 C for 90 min. 电芯按标准放电结束后，再以1 C 电流放电90 min。	The battery must has no explosion, no fire 电池应不爆炸、不起火.
130 ℃ hot oven test 130 ℃热箱测试	After fully charged according to the standard charge method, the cell is put in a oven at a heating speed of 5 ℃ per minute until the temperatures of both the cell and the oven reach 130 ℃. The cell shall be maintained at 130 ℃ for 30 min or until a fire or explosion is obtained. 电芯按照标准充电方式充满电后，将电芯放进热箱里，然后将热箱按5℃/min 升温到130℃，当电芯的温度也达到130℃时，电芯在热箱130℃环境下保持30 min 或者电芯起火爆炸止。	The battery must has no explosion, no fire. 电池应不爆炸、不起火。
Crush test 挤压测试	After fully charged according to the standard charge method, the battery is crushed with a half cylinder, of which the radius is 75 mm and which is longer than the battery. The direction of the crushing force shall be vertical to axis of the cylinder. Stop testing when the battery voltage reaches 0V or the deformation extent reaches 30% or the crushing force reaches 200kN, and the battery is observed for 1 h. 电池以标准充电方式充满电，按垂直于电池极板方向施压，挤压头为半径 75 mm 的半圆柱体，半圆柱体长度（L）大于被挤压电池的尺寸，当受挤压电池电压达到 0 V 或变形量达到 30 %或挤压力达到 200 kN 后停止挤压，观察 1 h。	The battery has no explosion, no fire. 电池应不爆炸、不起火。
Short circuit test 短路测试	After fully charged according to the standard charge method, when the cell surface temperature reaches 20℃±5℃ and keeps for 30mins, then short-circuited by connecting the positive and negative terminals with acopper wire for 24h or the temperature decreases by 20% of the peak value.. The wire resistance shall be 80±20mΩ. 以标准充电方式充满电后，电芯表面温度达 20℃±5℃ 30 分钟后， 用内阻 80±20mΩ 的电线将电芯正、负极外部短路 24h 或电池温度下降到比峰值低 20%。	The battery has no explosion, no fire. 电池应不爆炸、不起火。
Note 备注	Unless otherwise specified, above tests above shall be conducted in ventilated environment at 25 ± 2 ℃ and under protective equipment. 除特殊说明，以上所有安全测试均应在 25 ± 2 ℃通风橱中，且附带有保护装置的条件下进行。	

6. Environmental performance 环境性能

<table>
<tr><th>Items
项目</th><th>Conditions
测试条件</th><th>Criteria
判定标准</th></tr>
<tr><td>Vibration Test
振动测试</td><td>After fully charged according to the standard charge method, the cell is put on the platform vibrator, then tested according to the following parameters.
12cycles should be done by every direction of axis and radius for 3h.
<table>
<tr><th colspan="2">频率</th><th rowspan="2">振动参数</th><th rowspan="2">对数扫频循环时间
(7 Hz-200 Hz-7 Hz)</th><th rowspan="2">轴向</th><th rowspan="2">振动周期数</th></tr>
<tr><th>起始</th><th>至</th></tr>
<tr><td>f_1=7 Hz</td><td>f_2</td><td>a_1=1 g_n</td><td rowspan="4">15 min</td><td>X</td><td>12</td></tr>
<tr><td>f_2</td><td>f_3</td><td>S=0.8 mm</td><td>Y</td><td>12</td></tr>
<tr><td>f_3</td><td>f_4=200 Hz</td><td>a_2=8 g_n</td><td>Z</td><td>12</td></tr>
<tr><td colspan="3">返回至 f_1=7 Hz</td><td>总计</td><td>36</td></tr>
<tr><td colspan="6">f_1、f_4——下限、上限频率；
f_2、f_3——交越点频率(f_2≈17.62 Hz、f_3≈49.84 Hz)；
a_1、a_2——加速度幅度；
S ——位移幅度。</td></tr>
<tr><td colspan="6">注：振动参数是指位移或加速度的最大绝对数值，例如：位移量为 0.8 mm 对应的峰—峰值的位移量为 1.6 mm。</td></tr>
</table>
电芯以标准充电方式充满电后，紧固在振动试验台上，按上表中参数进行振动测试。径向和轴向每个方向进行 12 个循环，每个方向循环时间总计 3h。</td><td>The battery has no distortion, no leakage, no smoking and no explosion.
电池外观应无明显损伤、漏液、冒烟或爆炸。</td></tr>
<tr><td>Drop Testing
跌落测试</td><td>Procedure: After fully charged, the battery is dropped from a high 1.0m away free onto concrete land once of each side，total sex times.
将电池样品由高度（最低点高度）为1000mm的位置自由跌落到置于水泥地面上的18mm～20mm厚的水泥地上，从X、Y、Z正负方向（六个方向）每个方向自由跌落1次。</td><td>The battery has no leakage, no smoking, no fire no explosion.
电池应不漏液、不冒烟、不起火、不爆炸.</td></tr>
<tr><td>Note
备注</td><td colspan="2">Unless otherwise specified, above tests above shall be conducted in ventilated environment at 25±2℃. 除特殊说明，以上所有安全测试均应在 25 ± 2 ℃的环境下进行。</td></tr>
</table>

7. The Main Materials List of Battery 电池主要部件清单

序号 N0.	名称 Material	型号及规格 Specification	备注 Remark
1	Cell 电芯	422339P/3.7V/350-370mAh	
2	PCM 保护板	1S Li-ion battery PCM / 1 串锂电池保护板	
3	Connector 连接器	51021-3P 插头 UL1571 AWG28	

8. Electric protect features（25℃） 电路保护板参数（25℃）

检测项目/Test Item	Min	Typ	Max	Unit
过充保护电压 Overcharge protection voltage	4.175	4.20	4.225	V
过充释放电压 Overcharge release voltage	4.075	4.10	4.125	V
过充保护延迟时间 Delay time of overcharge protection	960	1200	1400	ms
过放保护电压 Over-discharge protection voltage	2.75	2.80	2.85	V
过放释放电压 Over-discharge release voltage	2.85	2.90	2.95	V
过放保护延迟时间 Delay time of over-discharge protection	115	144	173	ms
过流保护 Over-current protection current	2		5	A
过流保护延迟时间 Delay time of over-current protection	7.2	9	11	ms
静态电流 Static current			6	uA
保护板内阻 Resistance of PCM			60	mΩ
短路保护 Short protection	有，自恢复/Yes, self-recovery			
短路保护延迟时间 Short protection	150	320	540	us

9.Warranty 质量保证

The Warranty period of battery is 12 months since delivery date.

此电池保质期为出货之日起 12 个月。

However, even though the problem occurs within this period, BAK Technology won't replace a new one for free as long as the problem is not due to the failure of BAK Technology manufacturing process or is due to customer's abuse or misuse.

但是,在此期限内,如果非比克科技公司的制程原因，而是客户的误用造成的电池质量问题,比克科技公司不承诺免费更换.

BAK Technology will not be responsible for trouble occurred by handling outside of the precautions in instructions.

比克科技公司对违反安全守则操作所产生的问题不承担任何责任.

10.Battery precautions and safety instructions 电池使用注意事项及安全说明

Lithium-Ion rechargeable batteries subject to abusive conditions can cause damage to the cell and/or personal injury. Please read and observe the standard cell precautions below before using utilization.

滥用锂离子充电电池可能会造成电芯的损害或人身的伤害.在使用锂离子充电电池以前,请仔细阅读以下的安全守则：

Note 1. The customer is required to contact BAK Technology in advance, if and when the customer needs other

applications or operating conditions than those described in this document.

注释1. 如果客户需要其它应用程序或本文档中描述之外的操作条件，客户需要提前联系比克科技。

Note 2. BAK Technology will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.

注释2.在该文件说明的条件之外使用该电芯而产生的事故，比克科技公司不承担任何责任.

Note3. When the batteries are not be used for a long time, please store them safely so that they will stay in a half-charged state. Please wrap the batteries with non-conductive materials in order that metallic materials will not contact the batteries directly, which may result in damage to the batteries. Keep the batteries in a cool and dry place.

注释3. 长期不用时，请将电池储存完好，让电池处于半荷电状态。请用不导电材料包裹电池，以避免金属直接接触电池，造成电池损坏，将电池保存阴凉干燥处。

Warning 警告

Danger warning (it should be described in manual or instruction for users, indicated especially) to prevent the possibility of the battery from leaking, heating, explosion. Please observe the following precautions:

危险警告：（应在使用说明手册或说明书中，特别注明）为防止电池可能发生泄漏，发热，爆炸，请注意

以下预防措施：

- Don’t immerse the battery in water and seawater, damping of the battery is prohibited. Please put it in cool and dry environment if no using.
- 严禁将电池浸入海水或水中，禁止弄湿电池。 保存不用时，应放置在阴凉干燥的环境中。
- Don’t use and leave the cell near a heat source such as fire or heater.
- 禁止将电芯在热高温源旁，如火，加热器等旁边使用和留置。
- Do not use or leave the cell under the blazing sun (or in heated car by sunshine).
- 不要将电芯放置在太阳光直射的地方.
- Avoid to charge battery near a fire source or in direct sunlight
- 避免在火源附近或阳光直射下充电
- Being charged, using the battery charger specifically for that purpose.
- 充电时请选用锂离子电芯专用充电器。
- Don’t reverse the positive and negative terminals
- 严禁颠倒正负极后使用电池。
- Do not disassemble or modify the battery.
- 不要拆卸或修整电池。
- Do not use the cell with conspicuous damage or deformation..
- 不要使电芯受到明显的损害或变形.
- Don’t connect the battery to an electrical outlet directly.
- 严禁将电池直接插入电源插座。
- Don’t discard the battery in fire or heater.
- 禁止将电池丢入火或加热器中。
- Do not short circuit, over-charge or over-discharge the battery.
- 不要将电池短路,过充或过放.
- Don’t transport and store the battery together with metal objects such as necklaces, hairpins.
- 禁止将电池与金属，如发卡、项链等一起运输或存储。
- Do not use lithium ion battery and others different lithium battery model in mixture.
- 禁止与液态锂离子或不同型号的锂电池混合使用。
- Keep the battery away from babies.
- 电池应远离小孩.
- Don’t strike, throw or trample the battery.
- 禁止敲击，抛掷或踩踏电池等。
- Prohibition of use of damaged battery.
- 禁止使用已损坏的电池。
- Battery pack designing and packing Prohibition injury batteries.
- 电池外壳设计和包装禁止损伤电池。
- The battery replacement shall be done only by either cells supplier or device supplier and never be

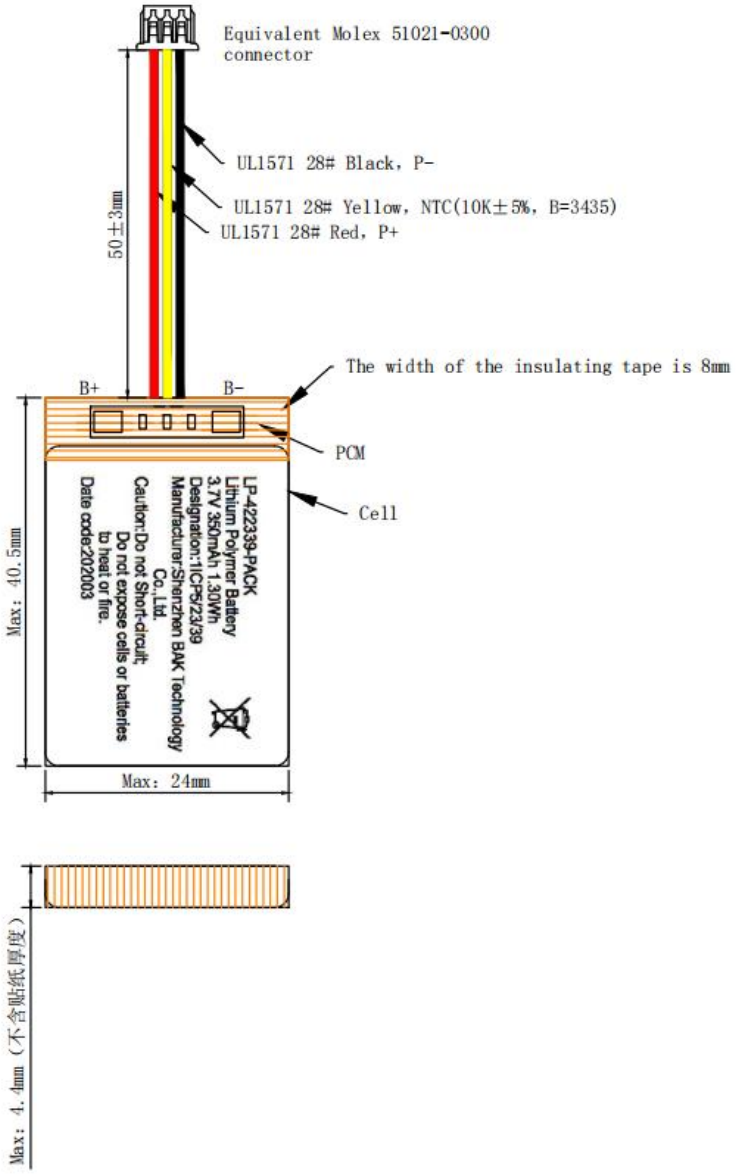
done by the user.

- 更换电池应由电池供应商或设备供应商完成，用户不得自行更换。
- Be aware discharged batteries may cause fire; tape the terminals to insulate them..
- 废弃之电池应用绝缘纸包住电极，以防起火，爆炸。
- Do not use it in a location where is electrostatic and magnetic greatly, 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。
- Do not directly solder the battery and pierce the battery with a nail or other sharp object.
- 禁止直接焊接电池和用钉子或其它利器刺穿电池。
- When disposing of secondary cells, keep cells of different electrochemical systems separate from each other.
- 二次电池处理时，请将电池和其他电化学体系的产品分开。

Caution 小心

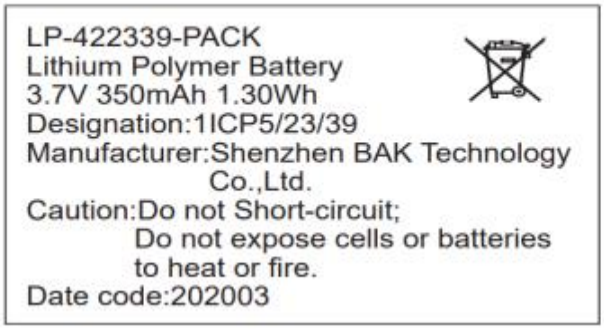
- Do not use or leave the battery at very high temperature conditions (for example, strong direct sunlight or a vehicle in extremely hot conditions). Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.
- 禁止在高温下（直热的阳光下或很热的汽车中）使用或放置电池，否则可能会引起电池过热，起火或 功能失效，寿命减短。
- If the battery leaks and the electrolyte get into the eyes, don't wipe eyes, instead, thoroughly rinse the eyes with clean running water for at least 15 minutes, and immediately seek medical attention. Otherwise, eyes injury can result.
- 如果电池发生泄露，电解液进入眼睛，请不要搓揉，应用清水冲洗眼睛不少于 15min，必要时请立即前往医院接受治疗，否则会伤害眼睛。
- If the battery gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during usage, recharging or storage, immediately remove it from the device or battery charger and stop using it.
- 如果电池发出异味，发热，变色，变形或使用、存储、充电过程中出现任何异常现象，立即将电池从 装置或充电器中移开并停用。
- In case the battery 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.
- 如果电池弄脏，使用前应用干布抹净，否则可能会导致接触不良功能失效。

11.Battery outline drawing 电池外形尺寸图



12. Battery label 电池标贴

尺寸：30*20mm 消银龙材质



Date code:YYYYMM