

Approval Sheet 聚合物锂离子电池规格承认书

型号 Model: PL 653769H 样品数量 NO.OF SAMPLES:

容量 Cap : 1900mAh

送样日期 DATE OF SENDING SAMPLE:

版本 REV : A1 客户代码 CUSTOMER CODE:

电芯制定人 Cell Prepared by	包装制定人 Pack Prepared by	审核人 Checked by	批准人 Approved by
			

客户名 CUSTOMER NAME :

业务员 THE SALESMAN : 冯萍

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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
A1	2024-03-21		首版发行	周全勇

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1 适用范围 Scope

仅适用于深圳倍特力电池有限公司生产的可充电锂离子电池或电池组, 包括锂离子电池电芯和保护组件。

This document describes the product specification of lithium ion polymer battery or module which includes cell and protection devices supplied by Shenzhen BetterPower Battery Co., Ltd.

2 电池组成 Battery Constitution

序号 No.	名称 Name	型号 Model	备注 Remark
1	1 支锂离子电芯 One piece of cell	倍特力聚合物电池 PL 653769-1900mAh	倍特力聚合物锂离子电芯 BetterPower Polymer Lithium Ion Cell
2	1 个电池保护板 One piece of protection board	IC: R5402N149KD MOSFET: 8205A NTC:100K	
3	插头线 (XH-3P 反向/黑白红) Lead wire (XH-3P Black-White-Red)	线型 UL3302-24# Wire UL3302-24#	线外露线长 $45\pm 3\text{mm}$ Lead wire length $45\pm 3\text{mm}$

3 主要技术参数 Specification

序号 NO.	项目 Items	标准 Criteria	备注 Remarks
1	典型容量 Typical capacity	2000mAh	0.2C 充放电至终止电压 0.2C charge and discharge for cut-off voltage
	最小容量 Minimum Capacity	1900mAh	
2	Energy 能量	7.03Wh	
3	标称电压 Nominal Voltage	3.70V	
4	出货电压 Shipment voltage	3.85-3.95V	
5	内阻 Internal Impedance	$\leq 70\text{m}\Omega$ (cell) $\leq 150\text{m}\Omega$ (含 PCB)	标准充电后 AC 1KHz 测试 AC 1KHz after standard charge
6	单支电池重量 Single battery weight	约 38g	
7	充电限制电压 Limited charge currunt	4.20V	
8	放电限制电压 Cut-off Voltage	3.0V	
9	标准充电电流 Standard charge current	380mA	0.2C
10	最大充电电流 Max charge current	1900mA	1.0C
11	标准放电电流 Standard dis-charge current	380mA	0.2C

12	最大持续放电电流 Max Continuous discharging current	1900mA	1.0C
13	工作温度 Operating Temperature	0°C~+15°C	最大充电 0.2C Max Charging 0.2C
		15°C~+45°C	最大充电 0.5C Max Charging 0.5C
		-10°C~+80°C	放电 Discharging
14	贮存温度 Storage Temperature	-20°C / +45°C	小于一个月 Less than 1 month
		-20°C / +35°C	小于一年 Less than one years

4 产品性能 Product Performance

4.1 产品的常规性能 Product General Performance

序号 No.	项目 Items	测试条件 Test Method and Condition	标准 Criteria
1	标准充电模式 Standard Charge	0.2C 恒流充电至 4.2V，然后恒压充电至 0.02C Charge to 4.2V at constant current 0.2C, then constant voltage charge to taper current 0.02C	总充电时间不超过 6.5 小时，其中在 25±2°C 环境下充电； Constant voltage 4.2V for 6.5hours in all at 25±2°C.
2	0.2ItA 放电性能 0.2ItA discharging Performance	将电池或电池组按标准充电模式充好电后，搁置 0.5~1h，再以标准放电模式进行放电。 The cell or battery charged with standard charge mode, deposit 0.5~1h, then discharged with standard discharge mode.	放电时间应≥5h。上述测试可以重复循环 5 次，当有一次符合要求即为合格。 The discharge time is required≥5h. The above test cycle can be repeated five times, Once is qualified to meet the requirements.
3	循环寿命 Cycle Life	(1) 充电过程：0.5C； (2) 放电过程：0.5C。 重复以上步骤 300 次。 Charge: 0.5C charge model Discharge: 0.5C discharge model Repeat the procedures below 300 cycles	300 次循环后放电容量大于等于第一次放电容量的 80%，厚度膨胀≤8% Residual capacity ≥80% after 300 cycles vs. Discharge capacity of first cycle Cell. The thickness expansion is less than or equal the first thickness, 8%
4	荷电保持能力 Charged Storage Characteristics	将电池或电池组按标准充电模式充电后，开路放置在 20±5°C 环境温度下 28 天后。The cell or battery charged with standard charge mode, Open circuit stored in 20±5°C for 28 days. Discharged with standard discharge mode.	以标准放电模式进行放电，放电时间应不低于 4.25 小时，再次以标准充电模式充电后以标准放电模式放电，放电时间应不低于 4.5 小时。 Discharge time should not be less than 4.25h. Then charged with Standard Charge mode, Discharged with standard discharge mode again. Discharge time should not be less than 4.5h.

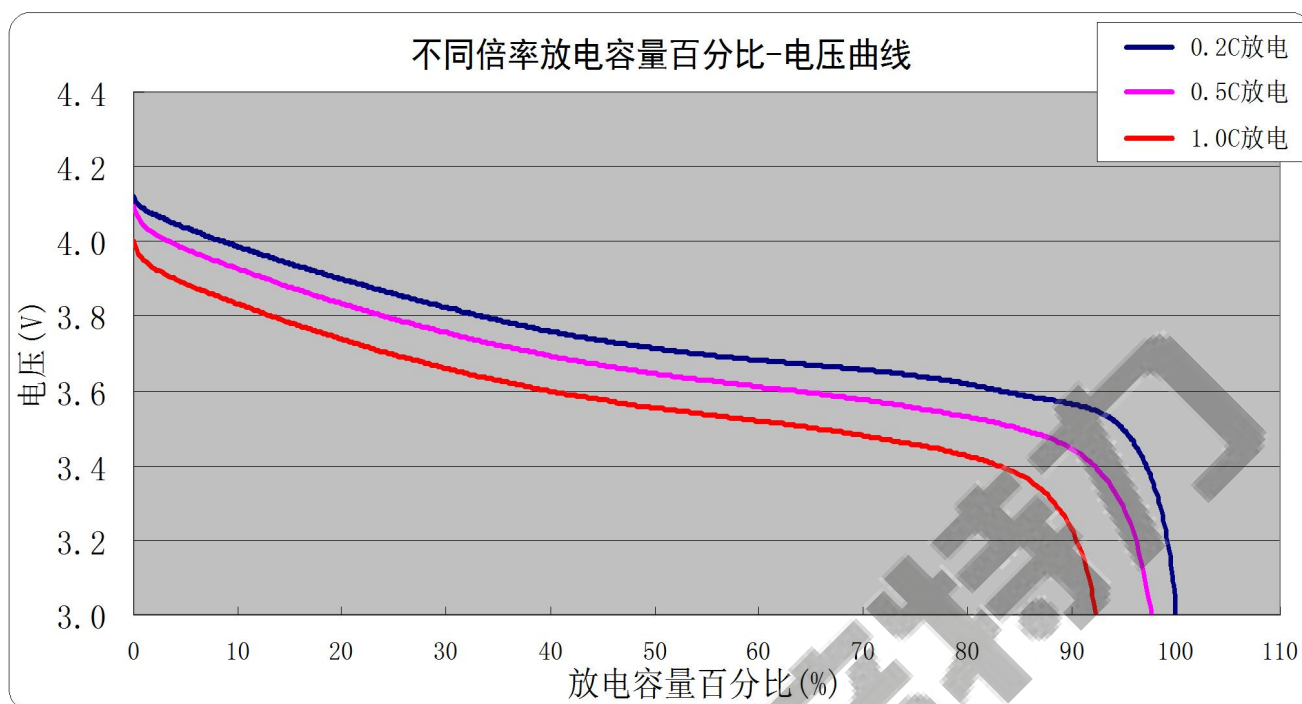
4.2 安全性能测试 Safety Performance Testing

序号 No.	项目 Items	测试条件 Testing condition	标准 Criteria
1	过充电测试 Overcharge testing	充满电的电池外接 3C/4.6V 的电源给电池持续加载 2 小时。 3C/4.6V DC power supply charge 2hrs after fully charge	不起火，不爆炸，不冒烟 No fire, no explode, no smoke
2	过放电测试 Overdischarge testing	将电池放电至终止电压后,以 30Ω负载给电池持续加载 28 小时。 Discharge 28hrs through 30Ω resistor after fully charge	不起火，不爆炸，不冒烟 No fire, no explode, no smoke

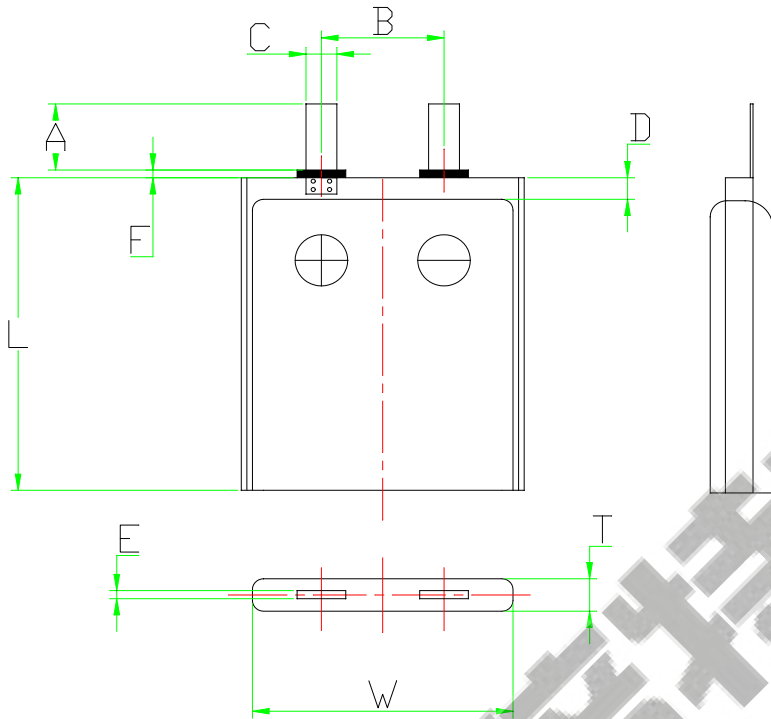
4.3 环境性能测试 Environment Performance Testing

序号 No.	项目 Items	测试条件 Testing condition	标准 Criteria
1	45℃/7 天 45℃/7 days	充满电电池在 45±2℃ 高温箱中搁置 7 天,再放电至终止电压。 Storage 7 days at 45±2℃ oven after fully charge, then discharge to 3.0V at RT	不起火，不爆炸，不冒烟 No fire, no explode, no smoke or no leakage 容量衰减 < 10%，内阻增加 < 30% Cap loss < 10%, imp increase < 30%
2	电池温度性能 Temperature Performance of Battery	充电过程：标准充电模式。 放电过程：分别在 -10℃，0℃ 和 80℃ 温度下以 0.2C 恒流放电至 3.0V。 Charge: Standard charge model Discharge: Discharge to 3.0V at 0.2C constant current at -10℃, 0℃ and 80℃ respectively	-10℃ 下，容量 ≥ 70% 0℃ 下，容量 ≥ 80% 80℃ 下，容量 ≥ 80% -10℃, capacity ≥ 70% 0℃, capacity ≥ 80% 80℃, Capacity ≥ 80%
3	振动测试 Vibration Test	充满电电池按 X、Y、Z 三个方向，每个方向上从 10HZ~55HZ 的频率循环扫描振动 90min 振动频率 10HZ~50HZ 位移幅值（单振幅 0.8mm）。 After standard charging, fixed the capacitor to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz and 55Hz, the excursion of the vibration is 1.6mm. The capacitor shall be vibrated for 30 minutes per axis of XYZ axes.	不起火，不爆炸，不冒烟 No fire, no explode, no smoke
4	跌落测试 Drop Test	电池完全充电后从 1200mm 高度由 X，Y，Z 正负 6 个方向自由跌落到置于水泥地面上 18mm-20mm 的厚木板上,每个方向跌落 1 次,最后用 0.5C 进行充放电循环 3 次。 Battery is dropped from a height of 1.2 meters 6 times at six angles (X, Y, Z plus positive, negative) to concrete ground, then cycle three times at 0.5C current.	不起火，不爆炸，不冒烟 No fire, no explode, no smoke

4.4 电芯放电曲线图 Batteries discharge curve

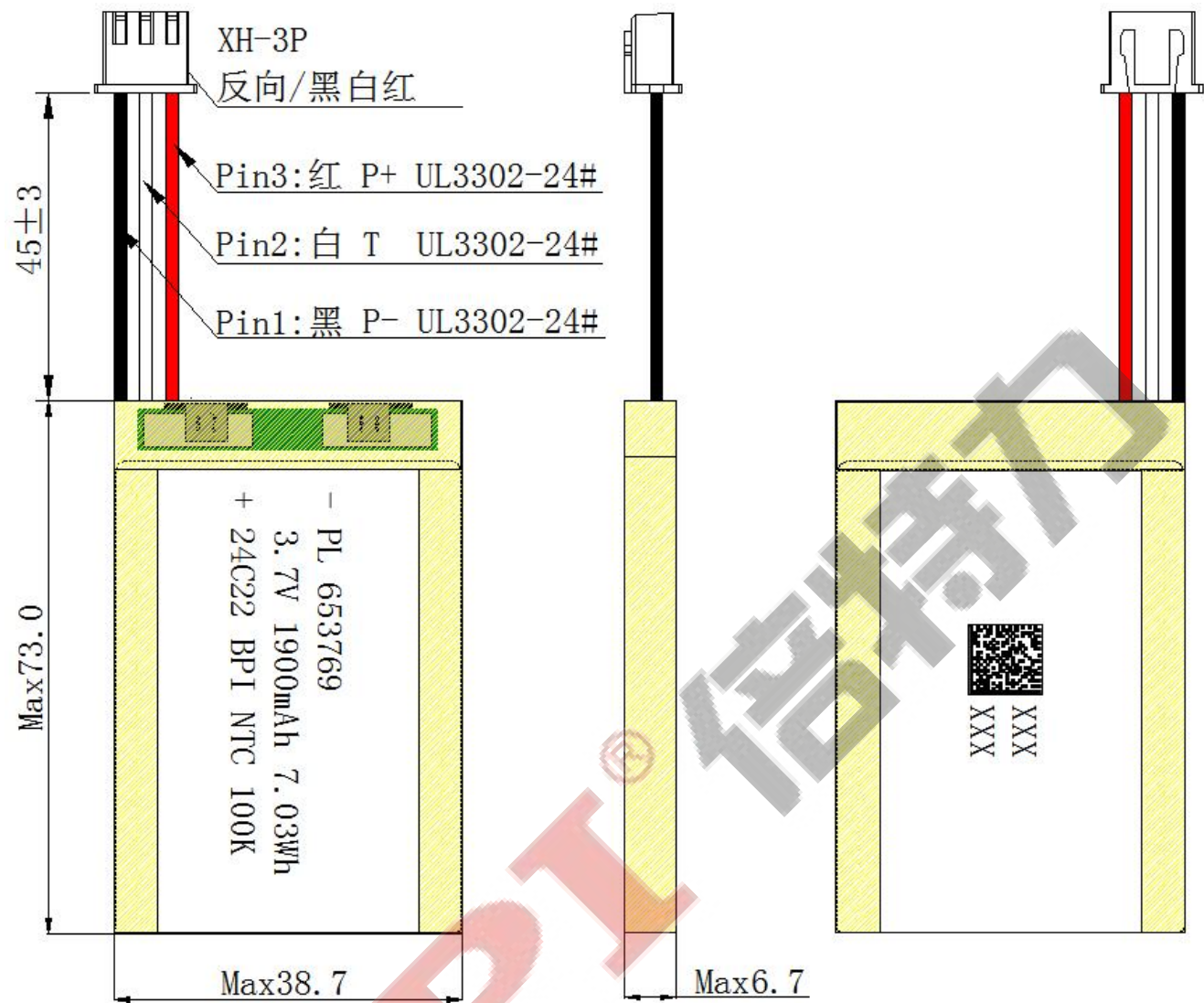


5 电芯图 （单位：mm） Cell drawing (mm)



标识 Item	描述 Description	尺寸规格 Dimension and specification
T	厚度 Thickness	最大 6.5 毫米 6.5mm Max
W	宽度 Width	最大 37.0 毫米 37.0mm Max
L	高度 Length	最大 69.0 毫米 69.0mm Max
A	极耳长度 Tab length	10.0±2.0 毫米 10.0±2.0mm
B	极耳中心距 Tab center distance	22±2.0 毫米 22±2.0mm
C	极耳宽度 Tab width	4.0±0.1 毫米 4.0±0.1mm
D	顶封位宽度 Top sealing width	3.2~4.5 毫米 3.2~4.5mm
E	极耳厚度 Tab thickness	0.1 毫米 0.1mm
F	极耳胶长度 Tab rubber length	0.2~2.0 毫米 0.2~2.0mm

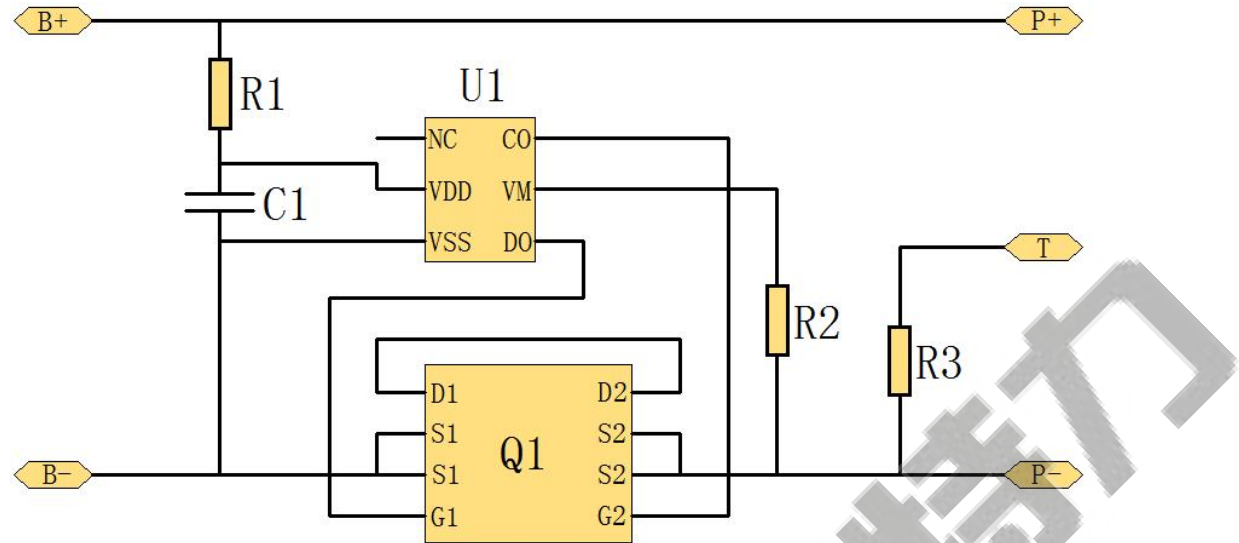
6. 电池尺寸 Battery Drawing



项目 Items	标准 Criteria
电池长度(L1) Battery length (L1)	最大 73.0 毫米 73.0mm Max.
电池宽度(W) Battery width(W)	最大 38.7 毫米 38.7mm Max.
电池厚度(T) Battery thickness(T)	最大 6.7 毫米 6.7mm Max.
插头线 (XH-3P 反向/黑白红) Lead wire (XH-3P Black-White-Red)	线型 UL3302 24# (L2) 外露长度: 45±3mm Wire UL3302 24# (L2) length 45±3mm

7. 保护板规格书 PCM specification

7.1 保护板原理图 Protection board principle diagram



7.2 保护板电气性能 Protection board electrical properties

Protection Parameters /保护参数					
Over-Charge Voltage Protection (OVP) 过充保护电压	4260	4280	4300	±20	mV
Over-Charge Voltage Protection Release 过充保护释放电压	4030	4080	4130	±50	mV
Over-Charge Voltage Protection Delay Time 过充保护电压延时	700	1000	1300		mS
Over-Discharge Voltage Protection (UVP) 过放保护电压	2827	2900	2973	±73	mV
Over-Discharge Voltage Protection Release 过放保护释放电压	3022	3100	3178	±78	mV
Over-Discharge Voltage Protection Delay Time 过放保护电压延时	14	20	26		mS
Over-Current Charge Protection Detection Voltage 充电过流保护检测电压	-115	-100	-85	±15	mV
Over-Current Charge Protection (OCC) 充电过流保护	1.2	2.2	4.5		A
Over-Current Charge Protection Delay Time 充电过流保护延时	5	8	11		mS
Over-Current Discharge Protection Detection Voltage 放电过流保护检测电压	110	125	140	±15	mV
Over-Current Discharge Protection （OCD）放电过流保护	1.5	3.0	5.5		A
Over-Current Discharge Protection Delay Time 放电过流保护延时	5	7	10		ms
Short Circuit Protection Detection Voltage (SCP) 短路保护检测电压	550	800	1000		mV
Short Circuit Protection Delay Time 短路保护延时	230	300	500		uS
Short Circuit Protection Release 短路保护释放方式	Remove Load Or Connect Charger 移除负载或连接充电器				
Current Consumption 电流消耗					
Normal Mode 正常工作模式		4.0	8.0		uA
Other Parameters 其他参数					
Impedance 导通内阻（B-&P-）	15	45	68		mΩ
Impedance 导通内阻（B+&P+）			5		mΩ
ID Resistor ID电阻		/			KΩ
NTC Resistor NTC电阻		100			KΩ
0V Battery Charge Function 0V电池充电功能	允许				

ESD Protection Function ESD静电保护功能

无

7.3 保护板元器件 Protection board component

Symbol 位号	Material name 物料名称	Specification model 规格型号	PCB footprint 封装形式	Qty 数量	Vender 品牌	Marking 丝印
U1	IC	R5402N149KD /R5492N149KL	SOT23-6	1	理光	B03
U2	MOS	EM8205A	TSSOP-8	1	宜源	8205A
R1	贴片电阻	330 Ohm±5%	0603	1	国巨/华科	
R2	贴片电阻	1K Ohm±5%	0603	1	国巨/华科	
R3	贴片 NTC	100K ±1% B=4250	0603/0402	1	村田	
C1	贴片电容	104/16V ±10%	0603	1	国巨/华科	
B+,B-	镍片	8*3*0.3mm		2	高鑫林丰	
	PCB 板	BPI-2835T A2 绿油/FR-4/锡板 28±0.15*3.5±0.1*0.8±0.1mm		1	爱升鑫/路通达	

8 贮存及其它事项 Storage and Others

8.1 长期贮存 Long Time Storage

长期贮存的电池（超过 3 个月）需对电池进行充放电一次，置于干燥、凉爽处。贮存电压为 3.75~3.95V。储存温度（-10-30℃）和湿度（45%-75%RH）。

If stored for a long time(exceed three months), Need charge and discharge battery one time, the cell should be stored in drying and cooling place.

The cell's storage voltage should be 3.75~3.95V .Storage temperature （-10-30℃）and moisture （45%-75%RH）

8.2 常温自放电 The self-discharge at normal temperature

电芯标准充电至 3.95V，在 25±2℃温度储存，电压、内阻及容量变化需满足以下要求：

When the battery has completed standard charged to 3.95V, storage at 25±2℃, the voltage,the inner impedance ,the capacity should meet the requirements listed in the below table .

时间 Times	1 个月 1 month	2 个月 2 months	3 个月 3 months	4 个月 4 months	5 个月 5 months	6 个月 6months	9 个月 9months	12 个月 12months
内阻（增长率） Resistance (growth rate)	<3%	<3%	<4%	<4%	<5%	<6%	<7%	<9%
电压（V） Voltage(V)	≥3.91	≥3.89	≥3.87	≥3.81	≥3.79	≥3.75	≥3.65	≥3.58
可恢复容量 (mAh) Recoverable capacity	≥99%	≥99%	≥98%	≥98%	≥97%	≥97%	≥95%	≥93%

8.3 其它事项 Others

任何本说明书中未提及的事项，须经双方协商确定

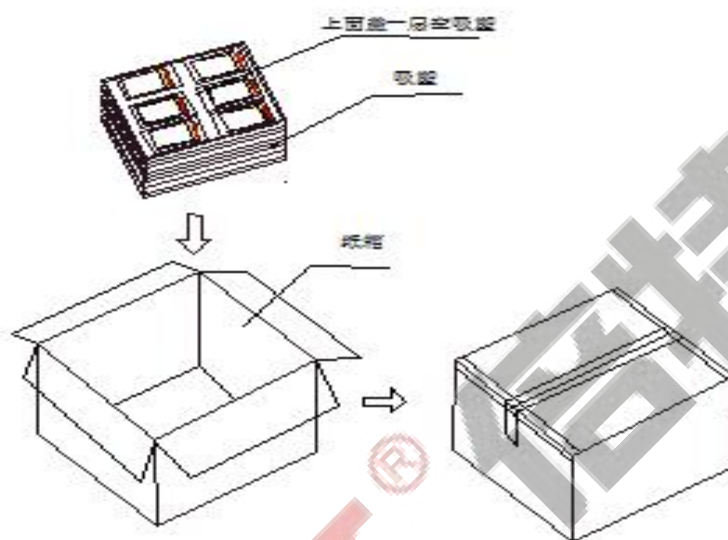
Any matters that this specification does not cover should be conferred between the customer and BPI.

8.4 保质期 Shelf life

保质期是从出厂日期(喷码)开始起十二个月.

Shelf life starts from the manufacture date (printing) within Twelve months

9 包装示意图 Packaging schematic diagram



NO	项目 Item	描述 Description	备注 Remark
1	包装方式 Packing style	外箱+吸塑盒 Carton& Plastic tray	
2	包装箱外尺寸 Outside size of the box	290*235*190	尺寸仅供参考
3	重量 Weight	≤10Kg	
4	封箱方式 Carton Sealing method	透明封箱胶带 Transparent adhesive tape	

附录 Appendix
聚合物锂离子充电电池操作指示及注意事项
Handling Precautions and Guideline
For LIP (Lithium-Ion Polymer) Rechargeable Batteries
前言 Preface

本档“聚合物锂离子充电电芯操作指示及注意事项”仅适用于 深圳倍特力电池有限公司生产电芯。

This document of 'Handling Precautions and Guideline LIP Rechargeable Batteries' shall be applied to the battery cells manufactured by BPI.

1 充电 Charging

1.1 充电电流 Charging current

充电电流不得超过本规格书中规定的最大充电电流。使用高于推荐值电流充电将可能引起电芯的充放电性能、机械性能和安全性能的问题，并可能会导致发热或泄漏。

Charging current should be less than maximum charge current specified in the Product Specification. Charging with higher current than recommended value may cause damage to cell electrical, mechanical, and safety performance and could lead to heat generation or leakage.

1.2 充电电压 Charging voltage

充电电压不得超过本规格书刊号中规定的额定电压。充电器的设计应满足此条件。电池电压高于额定电压值时，将可能引起电芯的充放电性能、机械性能和安全性能的问题，可能会导致发热或泄漏。

Charging shall be done by voltage less than that specified in the Product Specification . which is the absolute maximum voltage, must be strictly prohibited. The charger shall be designed to comply with this condition. It is very dangerous that charging with higher voltage than maximum voltage may cause damage to the cell electrical, mechanical safety performance and could lead to heat generation or leakage.

1.3 充电温度 Charging temperature

电池必须在 0℃~45℃ 的环境温度范围内进行充电。

The cell shall be charged within 0℃~45℃ range in the Product Specification.

1.4 禁止反向充电 Prohibition of reverse charging

正确连接电池的正负极，严禁反向充电。若电池正负极接反，将无法对电芯进行充电。同时，反向充电会降低电芯的充放电性能、安全性，并会导致发热、泄漏。

Reverse charging is prohibited. The cell shall be connected correctly. The polarity has to be confirmed before wiring. In case of the cell is connected improperly, the cell cannot be charged. Simultaneously, the reverse charging may cause damaging to the cell which may lead to degradation of cell performance and damage the cell safety, and could cause heat generation or leakage.

2 放电 Discharging

2.1 放电电流 Discharging current

放电电流不得超过本规格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。

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.

2.2 放电温度 Discharging temperature

电池必须在 $-10^{\circ}\text{C}\sim 80^{\circ}\text{C}$ 的环境温度范围内进行放电。

The cell shall be discharged within $-10^{\circ}\text{C}\sim 80^{\circ}\text{C}$ range specified in the Product Specification.

2.3 过放电 Over-discharging

需要注意的是，在电池长期未使用期间，它可能会用其自放电特性而处于某种过放电状态。为防止过放电的发生，电池应定期充电，将其电压维持在 3.75V 至 3.95V 之间。

It should be noted that the cell would be at an 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 3.75V and 3.95V.

过放电会导致电芯性能、电池功能的丧失。

Over-discharging may causes loss of cell performance, characteristics, or battery functions.

3 保护电路模块 Protection Circuit Module

电芯/电池包装应配有 PCM 以正确保护电芯/电池。PCM 应具有以下功能以保证安全并防止损坏电池性能：(1) 过充保护功能；(2) 过放保护功能；(3) 过流保护

The cell/battery pack shall be with a PCM that can protect cell/battery pack properly. PCM shall have functions of (1) overcharging prevention, (2) over-discharging prevention, (3) over current prevention to maintain safety and Prevent significant deterioration of cell performance. The over current can occur by external short circuit

4 电池的注意事项 Handling Instructions

认真阅读下面的注意事项，确保正确使用聚合物锂离子电池。倍特力对违反下述注意事项而产生的任何问题不予负责。

Read and observe the following warnings and precautions to ensure correct and safe use of Li-ion batteries.

危险! Danger!

安全警示及使用说明 Caution and Guideline

使用前应先阅读产品规格书以及安全警示，确保正确使用电池并确保电池使用过程中的安全。
Before using battery, please read specification and safety caution, insure proper application and safety.

安全警示 Caution

下面的操作可能导致电池泄漏，发热甚至燃烧：

Failing in following items can cause leakage, heat even fire:

禁止反向充电！

Prohibition of reverse charge of battery.

禁止过充电！

Prohibition of overcharge of battery.

禁止过放电！

Prohibition of overdischarge of battery.

禁止正负极短路！

Prohibition of short circuit of positive and negative of battery.

请使用指定的充电器充电！

Please charge by specified charger.

请不要撞击，敲打，钉刺或拆卸电池！

Don't knock, beat, nail or disassemble battery.

请保持电芯远离热源，禁止将电芯扔入火中！

Please keep away from fire or other heating sources and prohibition of dumping of battery into fire.

使用说明 Guideline

如果电解液接触到皮肤或眼睛，请立刻用清水冲洗接触的区域并寻求医生的建议！

If electrolyte comes into contact with the skin or eyes where shall flush the electrolyte immediately with fresh water and physicians' advice is to be sought.

请不要在规定的范围外使用或储存电池，否则将削弱电池的性能，缩短电池的寿命，甚至导致电池发热，起火或爆炸！

Don't use or storage battery under the circumstance beyond specified, unless will weaken battery performance and shorten battery life-span, even will cause heating, fire or explosion.

使用前请确保电池在质量保证期内。

Please insure battery in quality guarantee duration before using.

如果电池太脏，使用前请清扫它们，否则可能导致其不正常工作。

If batteries are too dirty, please clean them before using. Unless will cause abnormal work of battery.

请不要使电池的封口边缘与金属直接接触。

Please don't make the battery side edge of direct contact with the metal.