

Specification Approval Sheet(CELL)

产品规格确认书

CELL Type :GRP160722-3.7V-15mAh

电芯型号 :GRP160722-3.7V-15mAh

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|-----------------------------|----------------------------|-----------------------------|
| Prepared By/Date 编 制/日 期 | Checked By/Date 审 核/日 期 | Approved By/Date 批 准/日 期 |
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| | |
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| Customer Approval 客户批准 | Company Name(公司名称) |
| | |
| | Signature/Date(签名/日期) |
| | |
| | Company Stamp(公司印章) |
| | |

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1. 序言 PREFACE

此规格书适用于深圳格瑞普电池有限公司的锂聚合物可充电电池产品

The specification is suitable for the performance of Lithium-Polymer (LIP) rechargeable cell produced by the SHENZHEN GREPOW BATTERY CO., LTD.

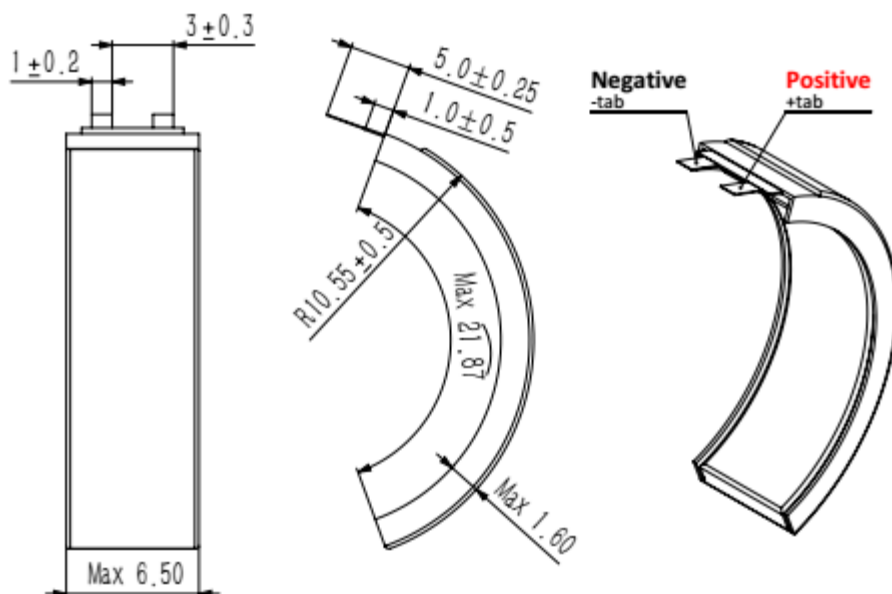
2. 型号 MODEL

GRP160722 15mAh

3. 主要技术参数 SPECIFICATION

| 序号 NO. | 项目 Item | | 参数 Data |
|---------------|--|--------------------|---|
| 1 | 标称容量 Typical Capacity ① | | 15mAh |
| 2 | 最小容量 Minimum Capacity | | 14mAh |
| 3 | 标称电压 Nominal Voltage | | 3.7V |
| 4 | 充电 Charge | | 1C (15mA) Max. Charging acceptable |
| 5 | 最大充电电压 Max. Charge Voltage | | 4.2V |
| 6 | 标准持续放电电流 Nominal Continuous Discharge Current | | 0.5C (7.5mA) Constant |
| 7 | 最大放电电流 Max. Discharge Current | | 1C (15mA) Constant, 2.5C (37.5mA) Peak acceptable |
| 8 | 放电截止电压 Cut-off Voltage | | 3.0V |
| 9 | 标准内阻 Impedance | | $\leq 1000 \text{ m}\Omega$ (Ref) |
| 10 | 使用温度 Operating Temp. | 充电 Charge | 10°C~45°C |
| | | 放电 Discharge | -20°C~60°C |
| 11 | 尺寸 Dimension | 宽度 Width | Max 6.50 mm |
| | | 长度 Length | Max 21.87 mm |
| | | 厚度 Thickness | Max 1.60 mm |
| | | 内径 Internal Radius | 10.55±0.5 mm |
| 12 | 重量 Weight | | 0.4±0.1g (Ref) |
| 13 | 出货状态 Delivery Condition | | 3.75~3.90V |
| 14 | 折边方式：从外向内折 Fold direction is from outside to inside of curvature | | |
| 备注 Remarks | ① 标称容量：0.2CmA,4.2~3.0V@23°C±2°C Typical Capacity:0.2CmA,4.2~3.0V@23°C±2°C | | |

4. 电芯结构与尺寸示意图 STRUCTURE AND DIMENSION



5. 电芯性能检查及测试 CELL PERFORMANCE CRITERIA

5.1 在进行下列各项测试前每颗电池应用 0.5C 放至 3.0V。如果没有特别规定，测试应在电池交付 1 个月内按以下各项条件进行：

Before proceed the following tests, the cells should be discharged at 0.5C to 3.0V cut-off. Unless otherwise stated, tests should be done within one month of delivery under the following conditions:

环境温度 Ambient temperature: $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$

相对湿度 Relative Humidity: $65 \pm 20\% \text{RH}$

5.2 标准充放电制式如下 Standard Charge/Discharge Conditions:

充电:以 0.5C 电流恒流充电至限制电压 4.2V 时,改为恒压充电,直到截止电流为 0.05C 时停止充电

Charge : The cell will be charged to 4.2V with 0.5C constant current to constant voltage, when the current is 0.05C, stop charging.

放电:0.5C 恒流放电，截止电压 3.0V。

Discharge : 0.5C constant current, cut-off voltage to 3.0V.

5.3 电性能测试 ELECTRICAL PERFORMANCE

| 测试项目 Test Items | 单位 Unit | 规格 Specification | 条件 Condition | 备注 Remarks |
|------------------------------------|------------|------------------------|---|--|
| 容量 Capacity | mAh | $\geq 15(0.2\text{C})$ | 标准充放电 Standard Charge / Discharge | 允许循环 3 次 Up to 3 cycles are allowed |
| 开路电压 Open Circuit Voltage (OCV) | V | ≥ 4.15 | 标准充电后 1 个小时内 Within 1 hour after standard charge | 颗 Unit cell |
| 内阻 Internal Impedance (RI) | mΩ | ≤ 1000 (Ref) | 充满电后用 1kHz 测试 Upon 1kHz after fully charged | * |
| 倍率放电性能 Rate Discharge | min | ≥ 54 | 标准充电/休息 5 分钟 用 1C 放电至 3.0V | 允许循环 3 次 Up to 3 cycles |

| | | | | | |
|--|--------------------------|--|--|---|-------------------------|
| | | | | Standard Charge/rest 5 min discharge at 1C to 3.0V | are allowed |
| 不同温度下放电特性 Different Temperature Discharge Performance | 常温 Normal Temperature | | 100% | 标准充放电 Standard Charge / Discharge | Cut-off voltage to 3.0V |
| | 高温 High Temperature | | ≥95% | 标准充电后贮藏在 60±2℃环境中 2 小时然后用 0.5C 放电 Standard charge Storage:2hrs at 60±2℃ 0.5C discharge at 60±2℃ | |
| | 低温 Low Temperature | | ≥70% | 标准充电后贮藏在 -20±2℃环境中 2 小时然后用 0.2C 放电 Standard charge Storage:4hrs at -20±2℃ 0.2C discharge at -20±2℃ | |
| 储存性能 Storage Performance | 常温 30 天 23℃ 30days | | 剩余容量 ≥ 85% 初始容量 Residual capacity ≥ 85% First Capacity | 标准充满电后 23 度贮藏 30 天，标准 0.5C 放电，所得容量为剩余容量 Standard charge , storage at 23 degree for 30 days , Standard discharge (0.5C) to test residual capacity | Cut-off voltage to 3.0V |
| | | | 恢复容量 ≥95%初始容量 Recovery Capacity ≥95% First Capacity | 按标准充放电制式循环 3 次，取最大值为恢复容量 Standard charge/discharge for 3 cycles , to test recovery capacity | |
| | 60℃4 小时 60℃ 4hrs | | 剩余容量 ≥95%初始容量 Residual capacity ≥ 95% First capacity | 标准充电后贮藏在 60±2℃环境中 4 小时然后常温下 0.5C 放电，所得容量为剩余容量 Standard charge Storage:4hrs at 60±2℃ 0.5C discharge at 23 ± 2℃ to test residual capacity | |
| | | | 恢复容量 ≥ 95% 初始容量 Recovery capacity ≥95% First capacity | 按标准充放电制式循环 3 次，取最大值为恢复容量 Standard charge/discharge for 3 cycles , to test recovery capacity | |
| | | | | | |
| | | | | | |

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|-------------------------|-------|------|---|-----------------------|
| 寿命测试 Cycle Life Test | Cycle | ≥500 | 充电：0.5C 充电至 4.2V， 放电：0.5C 放电至 3.0V，当放电容 量降至 0.5C 容量的 80%时，所 完成的循环次数定义为该电芯的循 环寿命 Charge:0.5C to 4.2V， Discharge:0.5C to 3.0V, 80% or more of 1st cycle capacity at 0.5C discharge of operation | Temperature： 23±2℃ |
|-------------------------|-------|------|---|-----------------------|

5.4 安全性能测试 SAFETY TEST

| 测试项目 Test Items | 规格 Specification | 条件 Condition | 备注 Remarks |
|---------------------------|------------------------------------|--|---------------|
| 短路 Short Circuit | 不着火不爆炸 No fire and no explosion | 将标准充电后的电池置于通风橱中，短路其正负 极（线路总电阻不大于 100mΩ），实验过程中监 视电池温度变化，当电池温度下降到接近初始室 温时，结束实验 After standard charge, the cell located in a fume hood is to be short-circuited by connecting the positive and negative terminals with an external load of less than 100 mΩ, End the test till the cell case temperature has returned to near ambient temperature. | * |
| 过充 Over-Charge | 不着火不爆炸 No fire and no explosion | 将电池 1C 放电至 3.0V 后，放入防爆箱中，以 1C 充电至 4.8V（或 4.8V 以上），再恒压充电，时间 不小于 7 小时 After 1C discharge to 3.0V cut-off voltage, the cell is put into explosion proof box, 1C constant current to 4.8V(or above), then constant voltage charge for no less than 7hrs | * |
| 热冲击 Thermal Shock Test | 不着火不爆炸 No fire and no explosion | 以标准方式充电结束后，电池放置于热箱中，温 度以 5℃/min 的速率升至 130±2℃并保温 10min. After standard charge, the cell is placed in an oven and is heated up at a rate of 5℃/min until the temperature reaches 130±2℃. The temperature shall be maintained for 10 minutes. | * |

5.5 机械性能测试 MECHANICAL CHARACTER

| 测试项目 Test Items | 规格 Specification | 条件 Condition | 备注 Remarks |
|--------------------|---------------------|-----------------|---------------|
|--------------------|---------------------|-----------------|---------------|

| | | | |
|-------------------|---|---|---|
| 振动 Vibration | 不着火不爆炸 No fire and no explosion | 将标准充电后的电芯固定在振动台上，沿 X、Y、Z 三个方向各振动 30 分钟，振幅 1.6 mm，振动频率为 10Hz~55Hz，每分钟变化为 1Hz。 After standard charge, the cell is fixed to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz~ 55Hz, the excursion of the vibration is 1.6mm.The cell shall be vibrated for 30 minutes per axis of XYZ axes. | * |
| 自由跌落 Drop Test | 1.不着火不爆炸 No fire and no explosion 2. 剩余容量 ≥95%初始容量 Residual capacity≥ 95% First capacity | 将标准充电后的电芯从 1m 高度（最低点高度）位置自由跌落到置于水泥地面上的 18~20 mm厚的硬木板上，从 X、Y、Z 正负方向（六个方向）每个方向自由跌落 1 次；结束后将电池以 0.5C 电流放电至 3.0V 测试放电容量。 After standard charge, the cell is dropped to the wood board with a thickness of 18mm to 20mm on the cement ground, the height shall be 1m measured from the lowest point of the cell to the wood board surface. Drop the cell from X, Y, Z direction (including face side and reverse side direction each) each time, then measure the capacity at 0.5C discharge current to 3.0V. | * |

6. 贮存及其它事项 STORAGE AND OTHERS

6.1 Storage Requirement

| 项目 Items | 要求 | 时间/Time |
|--------------------------|---------|-----------------|
| 湿度 Humidity | ≤75%RH | / |
| 环境温度 Ambient Temperature | -20~35℃ | / |
| 电池电压 Cell Voltage | 3.7~3.9 | 一年/for one year |
| | ≥3.9 | ≤7 天/≤7 days |

6.2 请每隔 3 个月按下面方法激活电池一次:

0.2C 充电至 4.2V，休息 5 分钟，然后用 0.2C 放电至每颗电池 3.0V，休息 5 分钟，0.2C 充电 3.9V。

Please activate the cell once every 3 months according to the following method:

Charge at 0.2C to 4.2V, rest for 5 min, then discharge with 0.2C to 3.0V/cell, rest for 5 min, then charge at 0.2C to 3.9V.

7. 聚合物锂离子充电电芯操作指示及注意事项 HANDLING PRECAUTIONS AND GUIDLINE

声明一：

客户若需要将电芯用于超出文件规定以外的设备，或在文件规定以外的使用条件下使用电芯，应事先联系格瑞普，因为需要进行特定的实验测试以核实电芯在该使用条件下的性能及安全性。

Note (1):

The customer is requested to contact GREPOW in advance, if the customer needs other applications or operating conditions than those described in this document. Additional experimentation may be required to verify cell performance and safety performance under such conditions.

声明二：

对于在超出文件规定以外的条件下使用电芯而造成的任何意外事故，格瑞普概不负责。

Note (2):

GREPOW will take no responsibility for any accident when the cell is used under other conditions than those described in this document.

声明三：

如有必要，格瑞普会以书面形式告之客户有关正确操作使用电芯的改进措施。

Note (3):

If necessary, GREPOW will inform, in a written form, the customer of improvement(s) regarding proper use and handling of the cell.

7.1. 充电 Charging

7.1.1 充电电流 Charging current:

充电电流不得超过本标准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.

7.1.2. 充电电压 Charging voltage:

充电电压不得超过本标准书中规定的额定电压（4.2V/电芯）。4.25V 为充电电压最高极限，充电器的设计应满足此条件；电芯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 (4.2V/cell). Charging beyond 4.25V, which is the absolute maximum voltage, must be strictly prohibited. The charger shall be designed to comply with this condition. Charging with higher voltage than maximum voltage is very dangerous that may cause damage to the cell electrical, mechanical safety performance and could lead to heat generation or leakage.

7.1.3. 充电温度 Charging temperature:

电芯必须在 10℃~45℃的环境温度范围内进行充电

The cell shall be charged within 10℃~45℃ range.

7.1.4. 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 extremely 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 it could cause heat generation or leakage.

7.2 . 放电 Discharging

7.2.1. 放电电流 Discharging current

放电电流不得超过本标准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. Higher discharge current may reduce the discharge capacity significantly or cause over-heating.

7.2.2. 放电温度 Discharging temperature

电芯必须在-20℃~60℃的环境温度范围内进行放电。

The cell shall be discharged within -20℃~60℃ range.

7.2.3. 过放电 Over-discharging:

需要注意的是，在电芯长期未使用期间，它可能会用其它自放电特性而处于某种过放电状态。为防止放电的发生，电芯应定期充电，将其电压维持在 3.6V 至 3.9V 之间。

过放电会导致电芯性能、电池功能的丧失。

充电器应有装置来防止电池放电至低于本标准书规定的截止电压。此外，充电器还应有装置以防止重复充电，步骤如下：

电池在快速充电之前，应先以一小电流 (0.01C) 预充电 15~30 分钟，以使 (每个) 电芯的电压达到 3V 以上，再进行快速充电。可用一记时器来实现该预充电步骤。如果在预充电规定时间内，(个别) 电芯的电压仍未升到 3.0V 以上，充电器应能够停止下一步快速充电，并显示该电芯/电池正处于非正常状态。

It should be noted that, the cell would be at over-discharged state by self-discharge characteristics in case the cell is not used for a long time. In order to prevent over-discharging, the cell shall be charged periodically to maintain between 3.6V to 3.9V.

Over-discharging may causes loss of cell performance, characteristics, or cell functions. The charger shall be equipped with a device to prevent further discharging exceeding a cut-off voltage specified in the Product Specification. Also the charger shall be equipped with a device to control the recharging procedures as follows:

The cell cell pack shall start with a low current (0.01C) for 15-30 minutes, i.e.-charging, before rapid charging starts. The rapid charging shall be started after the (individual) cell voltage has been reached above 3V within 15-30 minutes that can be determined with the use of an appropriate timer for pre-charging. In case the (individual) cell voltage does not rise to 3V within the pre-charging time, then the charger shall have functions to stop further charging and display the cell/pack is at abnormal state.

7.3 贮存 Storage:

The cell shall be stored within range environmental condition of specification.

电芯贮存必须是在本规格书规定的环境条件范围内贮存。

7.4 . 电芯操作注意事项 Handling of Cells:

由于电芯属于软包装，为保证电芯的性能不受损害，必须小心对电芯进行操作。

Since the cell is packed in soft package, to ensure its better performance, it's very important to handle the cell carefully.

7.4.1 铝箔包装材料易被尖锐部件损伤，诸如镍片，尖针。

The soft aluminum packing foil is very easily damaged by sharp edge parts such as Ni-tabs, pins and needles.

·禁止用尖锐部件碰撞电池;

Don't strike cell with any sharp edge parts.

·取放电芯时, 请修短指甲或戴上手套;

Trim your nail or wear glove before taking the cell.

·应清洁工作环境, 避免有尖锐物体存在;

Clean worktable to make sure no any sharp particle.

7.4.2 禁止弯折顶封边。

Don't bend or fold sealing edge.

7.4.3 禁止打开或破坏折边。

Don't open or deform folding edge;

7.4.4 禁止弯折极耳

Don't bend the tabs

7.4.5 禁止坠落、冲击、弯折电芯。

Don't fall, hit or bend cell body;

7.4.6 任何时候禁止短路电芯, 它会导致电芯严重损坏。

Short terminals of cell is strictly prohibited, it may damage cell;

7.5 电池外壳设计 Notice for Designing of Cell Case;

电池外壳应有足够的机械强度以保证其内部电芯免受机械撞击;

Cell case should have sufficient strength and cell should be protected from mechanical shock.

外壳内安装电芯的部位不应有锋利的边角;

No sharp edge components exists inside the case that containing the cell.

7.6 . 电芯与外壳组装注意事项 Notice for Assembling of Cell Case

7.6.1 电芯的连接 Tab connection

建议使用超声波焊接或点焊技术来连接电芯与保护电路模块或其它部分。如使用手工锡焊, 须注意以下事项, 以保证电芯的功能:

Ultrasonic welding or spot welding is recommended to connect cell with PCM or other parts. If apply manual solder method to connect tab with PCM, below notice is very important to ensure cell performance.

a) 烙铁的温度可控能防静电;

The solder iron temperature should be controlled and ESD safe

b) 烙铁温度不能超过 350℃

Soldering temperature should not exceed 350℃

c) 锡焊时间不能超过 3 秒;

Soldering time should not be longer than 3s

d) 锡焊次数不能超过 5 次;

Soldering should not exceed 5 times

e) 必须在极耳冷却后再进行二次焊接, 禁止直接加热电芯, 高于 100℃会导致电芯损坏。

Keep cell tab cold down before next soldering, directly heat cell body is strictly prohibited, cell may be damaged by heat above approx.100℃

7.6.2. 电芯的安装 Cell fixing

应将电芯的宽面安装在外壳内;

The cell should be fixed to the cell pack by its large surface area

电芯不得在壳内活动。

No cell movement in the cell pack is allowed

8. 其它事项 OTHERS

8.1 防止电池内短路 Prevention of short circuit within a cell pack

使用足够的绝缘材料对线路进行保护

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection.

8.2 严禁拆卸电芯 Prohibition of disassembly

8.2.1 拆卸电芯可能会导致内部短路，进而引起鼓气、着火及其它问题

The disassembling may generate internal short circuit inner the cell, which may cause gassing, firing or other problems.

8.2.2 聚合物锂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，应立即用清水冲洗电解液并就医

LIP cell should not have liquid from electrolyte flowing, but in case the electrolyte come into contact with the skin or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.

8.3 在任何情况下，不得燃烧电芯或将电芯投入火中，否则会引起电芯燃烧，这是非常危险的，应绝对禁止

Never incinerate nor dispose the cells in fire. These may cause firing of the cells, which is very dangerous and is prohibited.

8.4 不得将电芯浸泡液体，如淡水、海水、饮料(果汁、咖啡)等

The cells shall never be soaked with liquids such as water, seawater, drinks (such as juice, coffee) or others.

8.5 更换电芯应由电芯供应商或设备供应商完成，用户不得自行更换

The cell replacement shall be done only by either cell supplier or device supplier and never be done by the user.

8.6 禁止使用已损坏的电芯 Prohibition of using of damaged cells

电芯在运输过程中可能因撞击等原因而损坏，若发现电芯有任何异常特征，如电芯塑料封边损坏，外壳破损，闻到电解液气体，电解液泄漏等，该电芯不得使用。

有电解液泄漏或散发电解液气味的电池应远离火源以避免着火。

The cells might be damaged during shipping by shock. If any abnormal features of the cells are found such as damages in a plastic envelop of the cell, deformation of the cell package, smelling of electrolyte, electrolyte leakage and others, the cells shall never be used any more.

The cell with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing.