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|  | <b>锂离子聚合物电池规格书</b><br>Specification of Li-ion Polymer Battery | 编 号: PN-GC-0504-001<br>版 本: A/0<br>页 码: 1/14 |
|  | Model:PN502470-820mAh 电池                                      |  |

Specification of Li-ion Polymer Battery

锂离子聚合物电池规格书

Model: PN502470-820mAh

|                    |                   |                    |
|--------------------|-------------------|--------------------|
| <u>Prepared by</u> | <u>Checked by</u> | <u>Approved by</u> |
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|                                      |                                 |
|--------------------------------------|---------------------------------|
| <u>Customer Confirmation</u><br>客户确认 | <u>Customer Name(客户名称):</u>     |
|                                      | <u>Customer No (客户料号):</u>      |
|                                      | <u>Comment (备注):</u>            |
|                                      | <u>Customer Approval(客户批准):</u> |

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|  | Model:PN502470-820mAh 电池                                      |  |

**AMENDMENT RECORDS**

| <b><u>REVISION</u></b> | <b><u>DATE</u></b>         | <b><u>ORIGINATOR</u></b>     | <b><u>REASON FOR REVISION</u></b> |
|------------------------|----------------------------|------------------------------|-----------------------------------|
| <a href="#">A/0</a>    | <a href="#">2016-12-07</a> | <a href="#">xiaozhijun</a>   |                                   |
| <a href="#">A/1</a>    | <a href="#">2018/10/18</a> | <a href="#">__xiaozhijun</a> |                                   |
| <a href="#">A/2</a>    | <a href="#">2019/8/07</a>  | <a href="#">__xiaozhijun</a> |                                   |
|                        |                            |                              |                                   |
|                        |                            |                              |                                   |

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|  | Model:PN502470-820mAh 电池                                      |  |

1. Scope 范围

This specification describes the performance, testing method, warning and caution of the lithium-ion rechargeable battery.

The specification applies to polymer battery supplied by Shenzhen Pinnuo Energy Co., Ltd

本标准描述了锂离子电池的性能、测试方法及注意事项。

本标准适用于深圳市品诺能源有限公司生产的聚合物锂离子电池

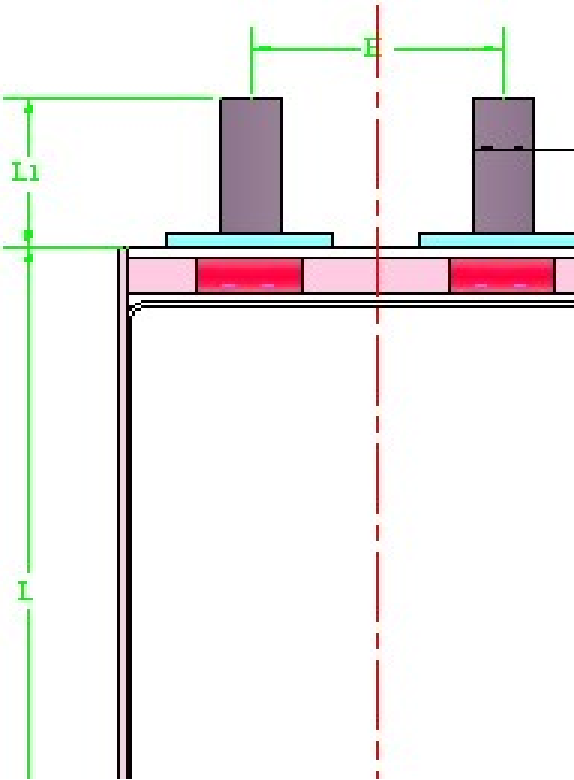
2. Reference Standard 参考标准

The standard refer to GB/T18287-2000and the other technology standard.

本标准参考国标 GB/T18287-2000 等技术标准规范编制而成。

3. Picture of battery 电池图

3.1 Picture of single cell 单体电芯图



| 厚度(T)        | 宽度(W)         | 长度(L)       |
|--------------|---------------|-------------|
| MAX: 5±0.2mm | MAX: 24±0.2mm | MAX: 70±1mm |
| 单位: mm       |               |             |

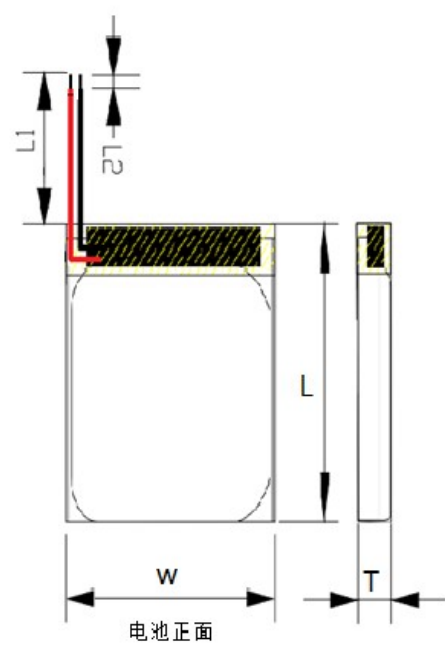
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Fig. (1) The Dimension of Single Cell

图(1) 组合电池尺寸图 The Dimension of Assembled Battery

|  |   |  |
|--|---|--|
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|  | Model:PN502470-820mAh 电池                                      |  |

3.2 Picture of assembled battery
单体电池图



Remark:   Date   根据客户订单对日期描述,确认喷码内容.

| PACK thickness<br>(T) | PACK width<br>(W) | PACK length<br>(L) | Wire length<br>( L1) | Length<br>( L2) | 引线型号<br>Wire size |
|-----------------------|-------------------|--------------------|----------------------|-----------------|-------------------|
| MAX:5±0.3mm           | MAX:24±0.3mm      | MAX:70±1.5mm       |                      |                 |                   |
| UNIT 单位: mm           |                   |                    |                      |                 |                   |

Fig. (2)   Picture of assembled battery

|  |   |  |
|--|---|--|
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图（2）单体电池外形尺寸图

4. Basic of performance    基本性能

4.1 Single cell parameters    单体电芯参数

| No. | Item 项目                                | Specification 性能   |
|-----|--|--|
| 1   | Rated Capacity<br>额定容量                 | 820mAh , 0.2 C discharging   |
| 2   | Minimum Capacity<br>最小容量               | 820mAh , 0.2 C discharging   |
| 3   | Normal Voltage<br>标称电压                 | 3.70V  |
| 4   | O.C.V    出厂电压                          | 3.80～4.10V   |
| 5   | Charge Ending Voltage<br>充电截止电压        | 4.20V  |
| 6   | Discharge Ending Voltage<br>放电截止电压     | 2.75V  |
| 7   | Standard charging method<br>标准充电方式     | 0℃～45℃  0.2C constant current charge to 4.2V, then constant voltage 4.2V charge till charged current declines to ≤ 0.01C |
| 8   | Charge current<br>充电电流                 | Standard charge:0.2C   |
|     |  | Rapid charge:0.5C  |
| 9   | charging Time<br>充电时间                  | Standard charge:5.5～6.5 h  |
|     |  | Rapid charge:1.5～2.5 h   |
| 10  | Max. Charging    Current<br>最大充电电流     | 0.5C (5℃～+45℃)   |
| 11  | Standard discharging Current<br>标准放电电流 | -10℃～+60℃(0.2C constant current discharge to 2.75V)  |
| 12  | Max. Discharging Current<br>最大放电电流     | 0.5C (-20℃～+60℃)   |
| 13  | Operating environment<br>工作环境          | Charging: 0℃～45℃, max.90%RH<br>Discharging: -20℃～60℃, max.90%RH  |

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|  | Model:PN502470-820mAh 电池                                      |  |

|    |                         |                                   |
|----|-------------------------|-----------------------------------|
| 14 | Cell Impedance<br>单电芯内阻 | ≤210 m Ω, (4.2V AC 1KHz measured) |
|----|-------------------------|-----------------------------------|

4.2 Assembled cell parameters 包装后电芯组参数

| 序号 | Item 项目   | Specification 性能                  |
|----|---|-----------------------------------|
| 1  | Assembled Mode<br>组合方式                              | 单体                                |
| 2  | Normal Capacity<br>标称容量                             | 820mAh, h (0.2 C discharging)     |
| 3  | O.C.V<br>出厂电压                                       | 3.80~4.10V                        |
| 4  | Impedance<br>成品内阻                                   | ≤320 m Ω, (4.2V AC 1KHz measured) |
| 5  | Continuous Charge current Standard<br>标准持续充电电流      | 0.2C (5°C~+45°C)                  |
| 6  | Max Continuous Charging Current<br>最大持续充电电流         | 0.5C 5°C~+45°C)                   |
| 7  | Continuous discharging Current Standard<br>标准持续放电电流 | 0.2C(-20°C~+0°C)                  |
| 8  | Max. Standard Discharging Current<br>最大持续放电电流       | 0.5C (-20°C~+60°C)                |

5. Electrical Characteristics of Cell 电芯电性能

5.1 Normal Test Conditions 标准测试条件

Temperature: 15~35°C  
Relative Humidity: 45-85%RH  
Atmospheric pressure: 86 -106 KPa  
除非另有规定，本规格书中的各项测试应在标准大气条件下进行：  
温度：15~35 °C  
相对湿度：45-85%RH  
大气压力：86 ~106 KPa

5.2 Electrochemical Characteristics 电化学性能

| NO.<br>序号 | Item<br>项目                                | Criterion<br>性能标准                                     | Test Method<br>测试方法  |
|-----------|---|---|--|
| 1         | 0.2C discharging<br>capacity<br>0.2C 放电性能 | Discharging<br>capacity is not<br>less than<br>normal | After Standard Charging, rest 5 minutes ,then 0.2C<br>200mAh discharge to ending voltage<br>标准充电后，电芯放置 5 分钟，再 0.2C 200mAh 放<br>电至终止电压。 |



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|  | Model:PN502470-820mAh 电池                                      |  |

|   |                                    |   |   |
|---|------------------------------------|---|---|
|   |                                    | capacity.<br>放电容量应不小于标称容量   |   |
| 2 | 1C discharging capacity<br>1C 放电性能 | Discharging capacity is not less than 90% normal capacity.<br>放电容量应不小于标称容量的 90% | After Standard Charging, rest 5 minutes ,then 1C discharge to ending voltage<br>标准充电后, 电芯放置 5 分钟, 再 1C 1000mAh 放电至终止电压。   |
| 3 | Cycle life<br>循环寿命                 | The cycle times is not less than 300<br>循环次数不小于 300 次                           | Test condition:<br>Charge: 0.2C to 4.2V<br>Discharge: 0.2C to 3.0V<br>When the discharge capacity reduced to 80% of rated capacity, Stop testing<br>测试条件:<br>充电: 0.2C 充电到 4.2V<br>放电: 0.2C 放电到 3.0V<br>当放电容量降至额定容量的 80%时, 停止测试。 |
| 4 | Self-Discharge<br>自放电              | Discharging capacity is not less than 90% initial capacity<br>放电容量应不低于初始容量的 90% | After Standard Charging, test condition:<br>Temperature: 20±5℃<br>Storage Time: 28days<br>Then 0.2C discharge to ending voltage<br>标准充电后, 测试条件如下:<br>温度: 20±5℃<br>搁置时间: 28 天<br>再以 0.2C 放电至终止电压。                                |

5.3 Environment Characteristics 环境适应性能

| NO<br>序号 | Item<br>项目  | Criterion<br>性能标准   | Test Method<br>测试方法  |
|----------|---|---|--|
| 1        | Constant temperature and constant humidity test<br>恒定湿热 | No explosion, no fire , no leakage.<br>Discharging capacity is not less than 85% initial capacity<br>不起火、不爆炸、不泄漏。<br>放电容量不低于初始容量的 85% | After Standard Charging, test condition:<br>Temperature: 40±5℃<br>Relative Humidity: 90~95%RH<br>Storage Time: 96 hours<br>Then return to room temperature for 2 hours , Then 1C 1000mAhdischarged to ending voltage<br>标准充电后, 测试条件如下:<br>温度: 40±5℃<br>相对湿度: 90~95%<br>放置时间: 96 小时 |

|  |   |  |
|--|---|--|
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|  | <b>Model:PN502470-820mAh 电池</b>                               |  |

|   |                      |   |   |
|---|----------------------|---|---|
|   |                      |   | 电芯取出在室温下放置 2 小时, 然后以 1C 电流放电至终止电压。  |
| 2 | Vibration test<br>振动 | No explosion, no fire, no leakage<br>不起火、不爆炸、不泄漏。 | After Standard Charging, fixed the cell to vibration table, then subjected to vibration test for 30 minutes per axis of XYZ axes<br>Frequency rate: 1oct/min<br>Vibration frequency: 10Hz-55Hz<br>Excursion (single amplitude): 0.8mm<br>电芯按标准充电后, 固定在振动台上, 然后沿 XYZ 每个坐标方向振动 30 分钟<br>扫频速率: 1oct/min<br>振动频率: 10Hz~55Hz<br>位移幅值(单振幅): 0.8mm |
| 3 | Shock test<br>碰撞     | No explosion, no fire, no leakage<br>不起火、不爆炸、不泄漏。 | After Standard Charging, test condition:<br>Acceleration: 100m/s <sup>2</sup><br>Pulse lasting time: <16ms<br>Shock times: 1000±10 times<br>标准充电后, 测试条件如下:<br>加速度: 100m/s <sup>2</sup><br>脉冲持续时间: <16ms<br>碰撞次数: 1000±10 次  |

5.4 Safety Characteristics 安全性能

| NO<br>序号 | Item<br>项目                | Criterion<br>性能指标   | Test Method<br>测试方法  |
|----------|---------------------------|---|--|
| 1        | Over charge test<br>过充电性能 | No explosion, no fire<br>不起火、不爆炸  | Discharge :1C to 3.0V<br>Charge : 1C charge to 4.8V, and maintain 8 h<br>放电: 1C 放电至 3.0V<br>充电: 1C 充电 4.8V, 保持 8 小时  |
| 2        | Short circuit test<br>短路  | No explosion, no fire, The temperature of the surface of the Cells are lower than 150℃<br>不起火、不爆炸,电芯表面温度不超过 150℃。 | After Standard Charging, Short circuit the positive and negative, and the resistance of copper wire is not more than 100mΩ。<br>标准充电后, 使用总内阻不大于 100mΩ 的导线短路正负极。 |

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Model:PN502470-820mAh 电池

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|   |                          |  |  |
|---|--------------------------|--|--|
| 3 | Forced discharge<br>过放试验 | No explosion, no fire<br>不起火、不爆炸                       | Discharge at a current of 1 C for 2.5h.<br>以 1C 的电流放电 2.5 小时   |
| 4 | Free fall test<br>自由跌落   | No Leakage ,no explosion,<br>no fire 。<br>不漏液，不爆炸，不起火。 | The battery to be fully charged with standard charging<br>condition ,then fall from height of 1.0m and hit onto<br>concrete ground 2 times<br>电池标准充电后，让其从 1.0m 高处自由落下，跌落<br>在混凝土地面上 2 次。 |

Note: Above testing of safe characteristics must be with protective equipment.  
备注：以上安全性能实验应在有保护措施的条件下进行。

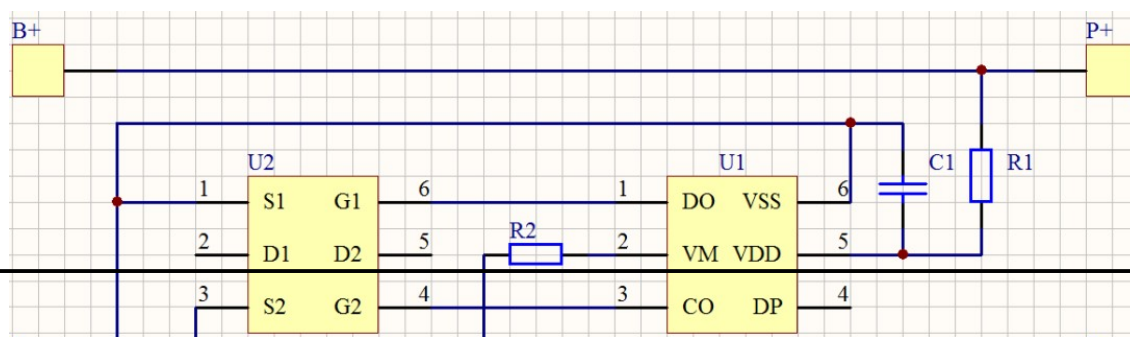
## 6. PCM Specification PCM 规格

### 6.1 Electrical Characteristics 电性能

(Normal temperature, Relative humidity $\leq$ 90%)  
(室温，湿度 $\leq$ 90%)

| NO.序号 | Item 项目                                      | Specifications 规格   |
|-------|--|---------------------|
| 1     | Over-charging Protection<br>过充检测电压           | 4.25 $\pm$ 0.025V   |
| 2     | Over-charging Protection Delay<br>过充保护延时     | 1 $\sim$ 1.2S       |
| 3     | Over-discharging Protection<br>过放检测电压        | 2.7 $\pm$ 0.075V    |
| 4     | Over-discharging Protection Delay<br>过放保护延时  | 100 $\sim$ 168 mS   |
| 5     | Discharge Current Protection<br>过流保护电流       | 2-3A                |
| 6     | Discharge Current Protection Delay<br>过流保护延时 | 5 $\sim$ 15mS       |
| 7     | Internal Resistance<br>正常工作时导通内阻             | $\leq$ 60m $\Omega$ |
| 8     | The static Current<br>静态电流                   | $\leq$ 6.0uA        |

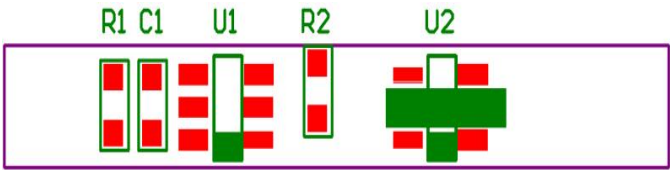
### 6.2 Circuit Diagram 电路图



|  |   |                                 |
|--|---|---------------------------------|
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6.3 Circuit topology Drawing and PIN Explanation 电路布线图和焊盘说明

Front 正面



Contrary 反面



6.4 PCM BOM 保护板物料清单

| 序号 | 元件编号  | 元件名称   | 规格                       | 封装形式     | 数量 | 单位  | 备注 |
|----|-------|--------|--------------------------|----------|----|-----|----|
| 1  | R1    | 电阻     | 100 Ω （101）              | 0603     | 1  | PCS |    |
| 2  | R2    | 电阻     | 1K Ω （102）               | 0603     | 1  | PCS |    |
| 3  | C1    | 电容     | 0.1uF （104） 16V          | 0603     | 1  | PCS |    |
| 4  | U1    | IC     | DW01                     | SOT-23-6 | 1  | PCS |    |
| 5  | U2    | MOSFET | 8205                     | SOT-23-6 | 1  | PCS |    |
| 6  | B+ B- | 镍片     | /                        |          | /  | PCS |    |
| 7  |       | PCB    | BTR-8437 （8.4*3.7*0.6MM） |          | 1  | PCS |    |

7. Storage and Shipment Requirement 存储及运输要求

|      |             |
|------|-------------|
| Item | Requirement |
|------|-------------|

|  |   |  |
|--|---|--|
|  | <b>锂离子聚合物电池规格书</b>                      | <b>编 号: PN-GC-0504-001</b><br><b>版 本: A/0</b><br><b>页 码: 13/14</b> |
|  | Specification of Li-ion Polymer Battery |  |
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| 项目  | 要求                          |
|---|-----------------------------|
| Short period less than 1 month<br>短期少于一个月   | -20° C ~ +45° C, 65%±25%RH  |
| Long period less than half year<br>长期小于半年   | -20° C ~ + 35° C, 65%±25%RH |
| Long period less than 1 year<br>长期小于一年  | 0° C~+30° C, 65%±25%RH      |
| Long time storage :<br>If the cell is stored for a long time, the cell' s storage voltage should be 3.70-3.95V and the cell is to be stored in a condition as above requirement. Also, it is recommended to charge the cell every six months. |                             |

## 8.Period of Warranty 保质期

The period of warranty is one a year from the date of shipment. Within the battery idle for at least six months to charge the battery activation time, because if the idle time is too long and that the battery performance of the company is not responsible for any damage, BIYATE guarantees to give a replacement in case of battery with defects proven due to manufacturing process instead of the customers abuse and misuse.

电池的保质期从出货之日算起为一年。电池闲置六个月之内至少给电池充电激活一次，如果因为闲置时间过长而导致电池性能受损本公司概不负责，如果证明电池的缺陷是在我们公司制造过程中造成的而不是客户滥用或错误使用造成，本公司负责退换电池。

## 9. Warning and Cautions 警告及注意事项

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. Please put it in cool and dry environment if no using.

严禁将电池浸入海水或水中，保存不用时，应放置在阴凉干燥的环境中。

Do not discard or leave the battery near a heat source as fire or heater

禁止将电池在热高温源（如火、加热器）旁等使用、留置或丢入。

Being charged, using the battery charger specifically for that purpose

充电时请选用锂离子电池专用充电器。

Don' t reverse the positive and negative terminals

严禁颠倒正负极使用电池。

Don' t connect the battery to an electrical outlet directly.

严禁将电池直接接入电源插座。

Don' t connect the positive and negative terminal directly with metal objects such as wire. Short terminals of battery is strictly prohibited, it may damage battery.

禁止用金属直接连接电池正负极短路，任何时候禁止短路电芯，它会导致电芯严重损坏。

Do not transport and store the battery together with metal objects such as necklaces, hairpins.

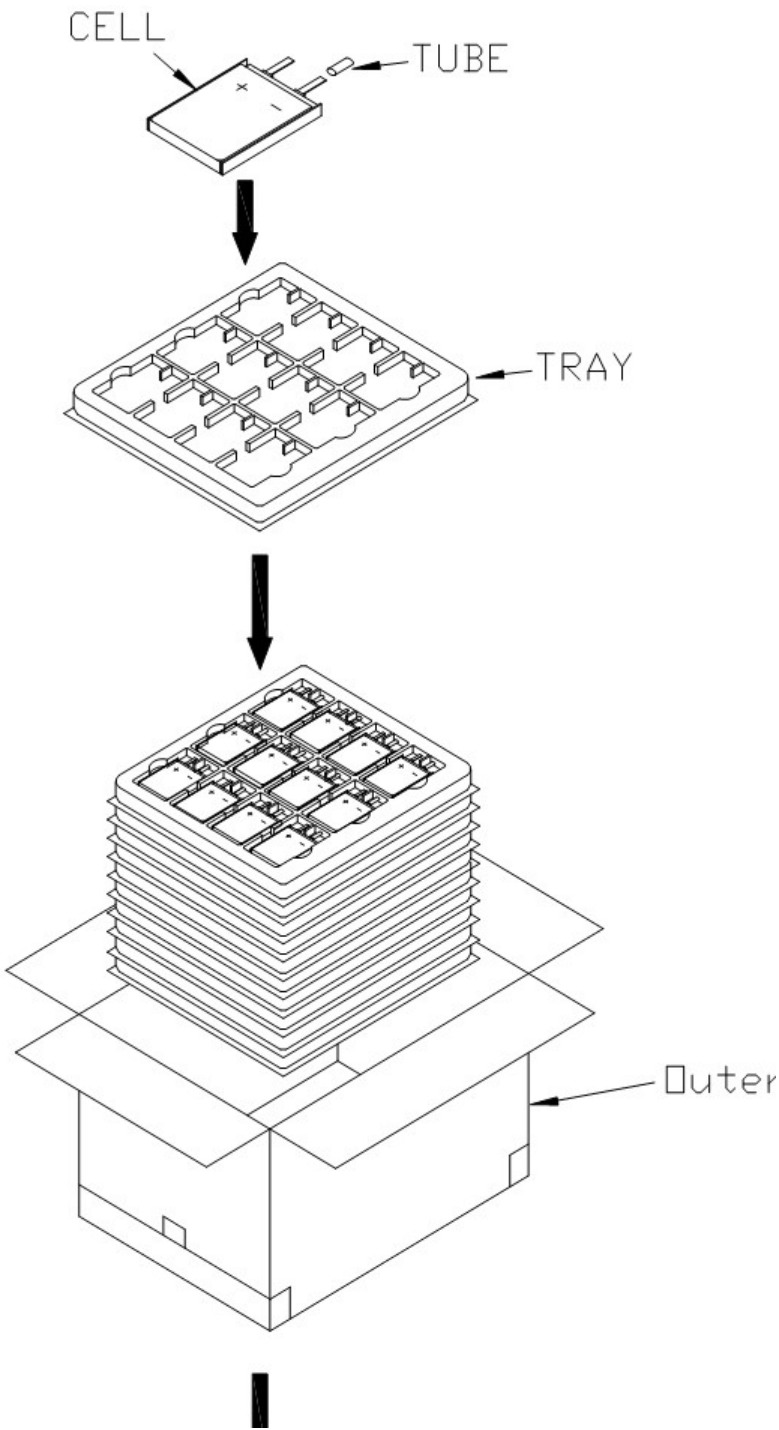
禁止将电池与金属，如发夹，项链等一起运输或贮存。

Do not strike , throw or trample the battery.

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|  | <div>锂离子聚合物电池规格书</div> <div>Specification of Li-ion Polymer Battery</div> | <div>编 号: PN-GC-0504-001</div> <div>版 本: A/0</div> <div>页 码: 14/14</div> |
|  | Model:PN502470-820mAh 电池  |  |
| <div>禁止敲击或抛掷，踩踏电池等。</div> <div>Do not directly solder the battery and pierce the battery with a nail or other sharp object</div> <div>禁止直接焊接电池和用钉子或其它利器刺穿电池。</div> <div>Do not use lithium ion battery and others different lithium polymer battery model in mixture</div> <div>禁止与液态锂离子或不同型号的聚合物锂电池混合使用</div> <div>Prohibition of use of damaged cells</div> <div>禁止使用已损坏的电芯</div> <div>Don’ t bend or fold sealing edge. Don’ t open or deform folding edge Don’ t fillet the end of the folding edge</div> <div>禁止弯折顶封边，禁止打开或破坏折边，禁止导折电芯折边底部</div> <div>Don’ t fall, hit, bend battery body.</div> <div>禁止坠落、冲击、弯折电芯。</div> <div>Battery pack designing and packing Prohibition injury batteries.</div> <div>电池外壳设计和包装禁止损伤电池。</div> <div>Never disassemble the cells</div> <div>在任何情况下不得拆卸电芯</div> <div>The battery replacement shall be done only by either cells supplier or device supplier and never be done by the user.</div> <div>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。</div> <div>Keep the battery away from babies.</div> <div>电池应远离小孩。</div> <div>Caution 小心</div> <div>◆ 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.</div> <div>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。</div> <div>◆ 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.</div> <div>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。</div> <div>◆ If the battery leaks, and the electrolyte get into the eyes. Do not wipe eyes, instead, rinse the eyes with clean running water, and immediately seek medical attention. Otherwise, eyes injury can result.</div> <div>如果电池发生泄漏，电解液进入眼睛，请不要揉擦，应用清水冲洗眼睛，并立即送医治疗，否则会伤害眼睛。</div> <div>◆ 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 charge and stop using it.</div> <div>如果电池发出异味，发热，变色，变形或使用，贮存，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离并停用。</div> <div>◆ 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.</div> <div>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。</div> <div>Prohibition of use of damaged cells</div> <div>禁止使用已损坏的电芯</div> <div>◆ Be aware discharged batteries may cause fire; tape the terminals to insulate them.</div> <div>废弃之电池应用绝缘纸包住电极，以防起火，爆炸。</div> |   |  |

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|  | Model:PN502470-820mAh 电池                                      |   |
| <p>10. Note 声明</p> <p>Note (1): The customer is requested to contact in advance if and when the variations of the operating conditions described in this document. Additional experimentation may be required to verify performance and safety under such conditions.</p> <p>声明一:</p> <p>客户若需要将电芯用于超出文件以外的设备, 或在文件规定以外的使用条件下使用电芯, 应事先联系。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。</p> <p>Note (2): take no responsibility for any accident when the cell is used under conditions outside of this specification.</p> <p>声明二:</p> <p>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, 概不负责。</p> <p>Note (3): inform the customer in writing of improvement(s) regarding proper use and handling of the cell if it is deemed necessary. Energy reserves the right to revise this specification before the customer signs the Data sheet. If a revision is required, notify the customer.</p> <p>声明三:</p> <p>如有必要会以书面形式告知客户有关正确操作使用电芯的改进措施。</p> <p>在规格书未签确前, 本公司有权对本产品规格书进行修订, 如有必要修订后将会通知客户。</p> |   |   |

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