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|  赛富德<br>SAFD 深圳市根巨科技有限公司 | 文件编号 | SAFD 18500 DB |
|                                                                                                          | 版本号  | A/0           |
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|                                                                                                          |      | 2022-09-14    |

# SHENZHEN GENJU TECHNOLOGY CO.,LTD

## 深圳市根巨科技有限公司

### Specification For Approval

#### 产品规格书

Model 型号:

**SAFD 18500 DB**试行版  
(2400mAh 3.6V)

|                                                                                                                 |      |               |
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## 1. 基本信息(General Information)

### 1.1适用范围(Scope)

本规格书适用于深圳市根巨科技有限公司生产的锂离子电池

This specification shall be applied to Lithium ion rechargeable battery cell supplied by Shenzhen Genju Technology co.ltd.

### 1.2产品类型(Product classification)

圆柱型锂离子电池

Cylindrical Battery

### 1.3产品名称(Modelname)

SAFD 18500 DB

## 2. 标准规格(Nominal Specification)

| 技术参数 ( Technical Parameters ) | 规格 Specification                                                                      |       |
|-------------------------------|---------------------------------------------------------------------------------------|-------|
| 2.1标称容量<br>Nominal Capacity   | 2400mAh (0.2C <sub>5</sub> , 2.5V 放电)<br>2400mAh (0.2C <sub>5</sub> , 2.5V discharge) |       |
| 2.2最小容量<br>Minimum Capacity   | 2300mAh (0.2C <sub>5</sub> , 2.5V 放电)<br>2300mAh (0.2C <sub>5</sub> , 2.5V discharge) |       |
| 2.3倍率容量<br>Rated Capacity     | 0.2C, 2.50V 放电<br>0.2C, 2.50Vdischarge                                                | ≥100% |
|                               | 1.0C, 2.50V 放电<br>1.0C, 2.50Vdischarge                                                | ≥92%  |
|                               | 3C, 2.50V放电<br>3C, 2.50Vdischarge                                                     | ≥90%  |
| 2.4标称能量<br>Nominal Energy     | 8.64Wh (0.2C, 2.5V 放电)<br>8.64Wh (0.2C, 2.5V discharge)                               |       |
| 2.5标称电压<br>Nominal Voltage    | 3.6V (0.2C, 2.5V 放电)<br>3.6V (0.2C, 2.5V discharge)                                   |       |
| 2.6标准充电<br>Standard Charge    | 方法: 恒流恒压                                                                              |       |
|                               | Method: CC-CV                                                                         |       |
|                               | 充电电压: 4.2V                                                                            |       |
|                               | Charging Voltage: 4.2V                                                                |       |
|                               | 充电电流: 0.5C (1200mA)<br>Charging Current: 0.5C (1200mA)                                |       |

|                                                                                                                 |      |               |
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|-------------------------------------------------|---------------------------------------------------------------------|
| 2.7 最大充电电流<br>Maximum Charge Current            | 截止电流：0.01C（24mA）<br>Cut-off Current：0.01C（24mA）<br><br>1.0C（2400mA） |
| 2.8标准放电Standard Discharge                       | 方法：恒流<br>Method：CC                                                  |
|                                                 | 放电终止电压：2.5V<br>Discharge Cut-off Voltage：2.5V                       |
|                                                 | 放电电流：0.2C（480mA）<br>Discharging Current：0.2C（480mA）                 |
| 2.9最大放电电流Maximum Discharge Current              | 2.0C（4800mA）                                                        |
| 2.10重量Weight                                    | ≤35±2.0 g                                                           |
| 2.11使用温度，充电<br>Operating Temperature， Charge    | 0~45℃                                                               |
| 2.12使用温度，放电<br>Operating Temperature， Discharge | -20~60℃                                                             |
| 2.13保存温度Storage Temperature                     | 一个月（1 month）： -20~45℃                                               |
|                                                 | 三个月（3 months）： -20~35℃                                              |
|                                                 | 一年（1 year）： -20~25℃                                                 |

## 3.外观及尺寸（AppearanceandDimension）

### 3.1 外观（Appearance）

不得有严重的划伤、生锈、变色或者漏液等这些可能会造成电池外观不良的现象。

There shall be no such as deep scratch, rust, discoloration or leakage, which may adversely affect the commercial value of the cell.

|                         |      |                    |
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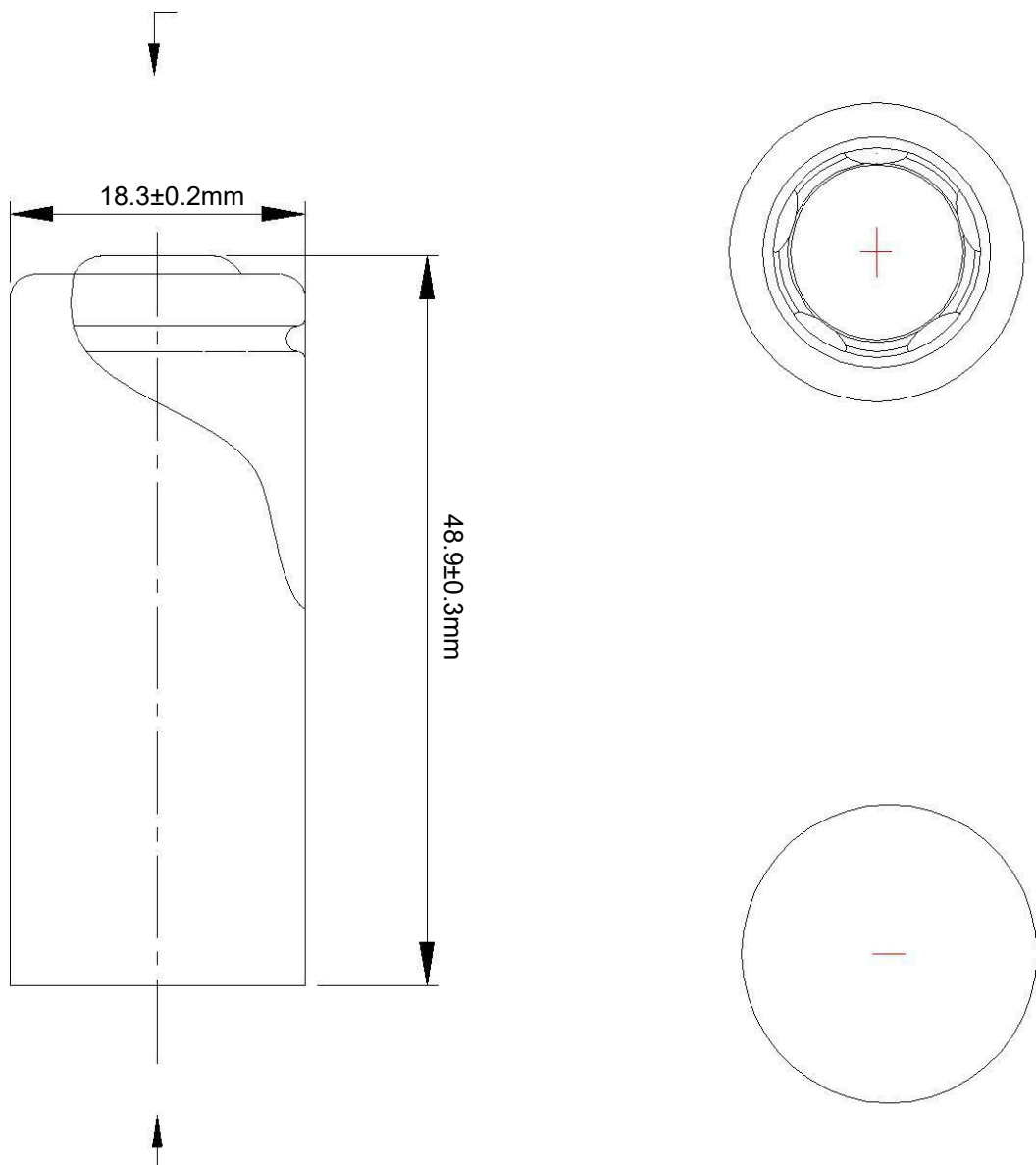
### 3.2 尺寸 (Dimension)

直径 (Diameter) :  $18.30 \pm 0.20\text{mm}$  (最大值 Max. 18.50mm)

高度 (Height) :  $48.90 \pm 0.30\text{mm}$  (最大值 Max. 49.20mm)

#### Attached drawing 1 Outline Dimensions

附图 1: 规格尺寸外形图



|                                                                                                          |      |               |
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## 4.性能规格 (PerformanceSpecification)

### 4.1标准测试条件 (Standardtestcondition)

#### 4.1.1 标准充电 (StandardCharge)

“标准充电”的意思是在  $25\pm2^{\circ}\text{C}$  下以  $0.5\text{C}$  ( $1200\text{mA}$ ) 恒流恒压充电至  $4.20\text{V}$ ，截止电流为  $0.01\text{C}$  ( $24\text{mA}$ )。

“Standard Charge” means charging the cell with charge current of  $0.5\text{C}$  ( $1200\text{mA}$ ) and constant voltage  $4.20\text{V}$  at  $25\pm2^{\circ}\text{C}$ ,  $0.01\text{C}$  ( $24\text{mA}$ ) cut-off.

#### 4.1.2 标准放电 (StandardDischarge)

“标准放电”的意思是在  $25\pm2^{\circ}\text{C}$  以  $0.2\text{C}$  ( $480\text{mA}$ ) 放电至  $2.5\text{V}$ 。

“Standard Discharge” means discharging the cell with discharge current of  $0.2\text{C}$  ( $480\text{mA}$ ) at  $25\pm2^{\circ}\text{C}$ ,  $2.5\text{V}$  cut-off.

#### 4.1.3 测试环境(TestingEnvironment)

除非特别要求，本文件所有的测试均在  $25^{\circ}\text{C}\pm2^{\circ}\text{C}$  环境下进行：

Unless otherwise specified, all tests stated in this document shall be performed at  $25^{\circ}\text{C}\pm2^{\circ}\text{C}$ .

### 4.2 电规格 (ElectricalSpecification)

| 项目 Item                            | 测试条件 Test Condition                                                                                                                                                                                                                                                                                                                                                                                           | 规格 Specification                                                                                                                                                                                     |
|------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 4.2.1 交流内阻<br>Initial AC Impedance | 交流四线法 (1kHz) 测定。<br>The cell impedance shall be measured by AC method (1kHz).                                                                                                                                                                                                                                                                                                                                 | $55\text{m}\Omega$ 或以下<br>$55\text{m}\Omega$ or less                                                                                                                                                 |
| 4.2.2 额定容量<br>Rated capacity       | 标准充电后，标准放电<br>Standard charge and discharge                                                                                                                                                                                                                                                                                                                                                                   | 2400mAh                                                                                                                                                                                              |
| 4.2.3 开路电压<br>Open circuit voltage | 出货后 1 周以内测定<br>Voltage within 1 week after delivery                                                                                                                                                                                                                                                                                                                                                           | 3.58V 及以上<br>3.58V or more                                                                                                                                                                           |
| 4.2.4 循环寿命<br>Cycle Life           | 充电（恒流恒压）： $0.5\text{C}$ ( $1200\text{mA}$ ) , $4.20\text{V}$ ， $24\text{mA}$ 截止，休止 10 分钟。<br>放电（恒流）： $1\text{C}$ ( $2400\text{mA}$ ) , $2.5\text{V}$ 截止，休止 20 分钟。<br>Charge (CC/CV) : $0.5\text{C}$ ( $1200\text{mA}$ ) , $4.20\text{V}$ ， $24\text{mA}$ cut-off, rest time 10min.<br>cut-off, rest time 10min.<br>Discharge (CC) : $1\text{C}$ ( $2400\text{mA}$ ) , $2.5\text{V}$ cut-off, rest time 20min. | 300次放电容量/初始放电容量 $\geq 80\%$<br>初始容量为前三次循环容量均值。<br>The ratio of the 300th discharge capacity and the first cycle $\geq 80\%$<br>The initial capacity is the mean value of first three cycle capacity. |

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#### 4.3 温度特性 (Temperature-ratePerformance)

| 项目 Item                                    | 测试条件 Test Condition                                                                                                                                                                                                                                                                            | 规格 Specification                                |
|--------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|
| 4.3.1 温度特性<br>Temperature-rate performance | 1) 常温下标准充电<br>Standard CH atR.T<br>将测试电池放入-20°C 恒温箱, 搁置 4 小时<br>Keep batteries in a icebox with ambient temperature of -20°C for 4 hours. -20°C<br>下 0.2C 放电至终止电压, 计算放电容量与标称容量的百分比。<br>DCH at 0.2C to the end of DCH voltage at -20°C, Calculate the capacity ratio with the nominal capacity. | 容量百分比 $\geq 70\%$<br>Capacity ratio $\geq 70\%$ |
|                                            | 2) 常温下标准充电<br>Standard CH atR.T<br>将测试电池放入 0°C 恒温箱, 搁置 4 小时<br>Keep batteries in a icebox with ambient temperature of 0°C for 4 hours.<br>0°C 下 0.2C 放电至终止电压, 计算与标称容量的百分比。<br>DCH at 0.2C to the end of DCH voltage at 0°C; Calculate the capacity ratio with the nominal capacity.            | 容量百分比 $\geq 85\%$<br>Capacity ratio $\geq 85\%$ |
|                                            | 3) 常温下标准充电<br>Standard CH atR.T<br>将测试电池放入 60°C 恒温箱, 搁置 4 小时<br>Keep batteries in a icebox with ambient temperature of 60°C for 4 hours. 60°C<br>下0.2C标准放电至终止电压, 计算与标称容量的百分比。<br>DCH at 0.2C to the end of DCH voltage at 60°C; Calculate the capacity ratio with the nominal capacity.        | 容量百分比 $\geq 95\%$<br>Capacity ratio $\geq 95\%$ |

#### 4.4 安全特性 (Safetyperformance)

| 项目 Item                          | 测试条件 Test Condition                                                                                                        | 规格 Specification                                       |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| 4.4.1 过放电<br>Over discharge Test | 标准充电后, 接 55Ω 电阻负荷, 24 小时连续放电。<br>The cell shall be standard charged, and discharged<br>With55Ω resistor load for 24 hours. | 不起火, 不爆炸,<br>不漏液<br>No fire, No explode,<br>No leakage |
|                                  |                                                                                                                            |                                                        |

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| 4.4.2 过充电<br>Over charge                       | <p>标准充电后，以 2400mA 的电流，10V 连续充电 2.5 小时。</p> <p>After standard charged, the cell shall be charged for 2.5 hours using 10V, 2400mA power supply.</p>                                                                                                                                                                                                                                                                                                   | <p>不起火，不爆炸</p> <p>No fire, No explode</p>                 |
| 4.4.3 外部短路测试<br>External Short-Circuiting Test | <p>标准充电后电池正负极间接 <math>80 \pm 20\text{m}\Omega</math> 以下内阻电线短路 1 小时以上。</p> <p>The cell shall be standard charged. The plus and minus terminals of the cell shall be short circuited with a wire having <math>80 \pm 20\text{m}\Omega</math> or less resistance, and left for 1 hour.</p>                                                                                                                                                             | <p>不起火，不爆炸</p> <p>No fire, No explode</p>                 |
| 4.4.4 跌落测试<br>Drop Test                        | <p>标准充电后，电池从 100cm 高处落下到硬木上，X、Y、Z 面各落下一次。</p> <p>The cell shall be standard charged and then dropped onto hard wood from the height of 100 cm in 3 directions X, Y, and Z once at each direction.</p>                                                                                                                                                                                                                                               | <p>不起火，不爆炸，不漏液</p> <p>No fire, No explode, No leakage</p> |
| 4.4.5 加热测试<br>Heating Test                     | <p>将充满电的电池放在重力对流或循环空气的烘箱中进行加热，烘箱的温度以每分 <math>5 \pm 2^\circ\text{C}</math> 的速率上升到 <math>130 \pm 2^\circ\text{C}</math> 后保温 30 分钟。</p> <p>The charged batteries are heated in a gravity convection or circulating air oven. The temperature of the oven is to be raised at a rate of <math>5 \pm 2^\circ\text{C}</math> per minute. The oven is to remain for 30 minutes at <math>130 \pm 2^\circ\text{C}</math> before the test is discontinued.</p> | <p>不起火，不爆炸</p> <p>No fire, No explode</p>                 |
| 4.4.6 挤压实验<br>Crush test                       | <p>将电池置于两个平面内，垂直于极板方向进行挤压，两平板间施加 <math>13.0\text{N} \pm 0.78\text{KN}</math> 的挤压力。一旦压力达到最大值即可停止挤压试验。</p> <p>A battery is to be crushed between two flat surfaces. The flat surfaces are to be brought in contact with the cells and the crushing is to be continued until an applied force of <math>13 \pm 0.78\text{kN}</math> is reached. Once the maximum force has been obtained it is to be released.</p>                                      | <p>不起火，不爆炸。</p> <p>No fire, nor explosion</p>             |

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| 4.4.7 振动<br>Vibration | <p>标准充电，按以下条件振动</p> <p>振动波 正弦波</p> <p>振动频率 16.7Hz</p> <p>振动时间 1 小时</p> <p>振动方向 任意</p> <p>振幅 1mm</p> <p>振动后，电池进行标准充电，标准放电。</p> <p>A standard charged cell shall be vibrated as specified here under.</p> <p>Vibration waveform: sinusoidal.</p> <p>Frequency: 16.7Hz.</p> <p>Test time: 1 hours.</p> <p>Vibration direction: arbitrary.</p> <p>Total amplitude: 1mm.</p> <p>After vibration application, the cell shall be standard CH, and then standard DCH.</p> | <p>无变形、破裂、发火；<br/>可继续充放电</p> <p>No explosion and flame,<br/>no deformation.</p> <p>Possible to be charged and<br/>discharged.</p> |
|-----------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|

## 5.电池焊接部位(Welding allowable part on a cell)

电池侧壁不可焊接。

Welding is not allowed on cell side wall.

## 6.绝缘 (Insulation)

电池罐上端（正极盖帽侧）及侧面用绝缘材料包覆。

Can top face (positive terminal) and side is covered with insulation tubing.

## 7.出货前电池充电态(Charge State of Battery before shipment)

约 30%带电态。

Approximately 30% state of charge.

## 8.储存 (Storage)

请将电池存放在常温（建议存储温度-20~35℃）、低湿、无粉尘、无腐蚀性气体的环境中。

Store the battery at low normal temperature (Recommend storage temperature -20~35℃), low humidity, no dust and no corrosive gas atmosphere.

## 9.保证 (Warranty)

电池出货 1 年内由于本公司制造原因导致不良发生，本公司将无偿修理或更换新电池。

Our corporation will repair the cells or batteries for free or replace with new product if there is any fault which is due to material or workmanship during one year from the date of delivery.

|                                                                                                                        |      |               |
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## 10 锂离子二次电池的使用操作禁止及注意事项

### Handling Precaution and Prohibitions of Lithium Ion Rechargeable Cells and Batteries

#### 10.1 危险 (Danger)

##### 10.1.1 防止电气误用 (Electricalmisusage)

必须使用专用充电器。

Use dedicated charger.

电池只能用于指定的用途。

Use or charge the battery only in the dedicated application.

不要对电池反向充电。

Don't charge the battery reversely.

##### 10.1.2 防止环境误用 (Environmentalmisusage)

请勿将电池靠近火源或热源。

Don't leave the battery near the fire or a heated source.

不要将电池投入火中。

Don't throw the battery into the fire.

不要在温度超过 60°C 的地方使用电池或对其充电。

Don't charge or use the battery in a car or similar place where inside of temperature may be over 60°C.

不要将电池沾湿，或将其浸泡或投进水或海水中。

Don't immerse, throw, wet the battery in water/seawater.

##### 10.1.3 其他 (Others)

不要把电池储存在装有钥匙、项链、发夹、硬币、金属物体的口袋中，或与螺丝包在一起。

Don't store the battery in a pocket or a bag together with metallic objects such as keys, necklaces, hairpins, coins, or screws.

不要用金属导体短路电池正负极。

Don't short circuit (+) and (-) terminals with metallic object intentionally.

不要用烙铁等对电池进行局部加热。

Don't heat partial area of the battery with heated objects such as soldering iron.

不要用重物捶打电池。

Don't hit with heavy objects such as a hammer, weight.

不要踩踏电池，或将其扔或掉在硬地板上，以避免机械冲击。

Don't step on the battery and throw or drop the battery on the hard floor to avoid mechanical shock.

不要对电池包括保护电路进行拆卸或改装。

Don't disassemble the battery or modify the battery design including electric circuit.

不要使用严重扭曲或变形的电池。

Don't use seriously scared or deformed battery.

不要把电池放进微波炉、烘干机或高压容器中。

Don't put the battery into a microwave oven, dryer or high-pressure container.

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不要与其他制造商生产的电池、不同类型或不同规格的电池(如干电池、镍氢电池或镍镉电池) 一同使用或组合。

Don't use or assemble the battery with other makers' batteries, different types and/or models of batteries such as dry batteries, nickel-metal hydride batteries, or nickel-cadmium batteries.

## 10.2 警告 (Warning)

不要将新旧电池混用或组装。

Don't use or assemble old and new batteries together.

若在规定时间内充电仍未完成，要停止电池充电

Stop charging the battery if charging isn't completed within the specified time.

在使用、充电或储存过程中，若发现电池发热异常、变色、变形或其他反常情况，请停止使用电池。

Stop using the battery if the battery becomes abnormally hot, discoloration, deformation, or abnormal conditions is detected during use, charge, or storage.

若电池漏液或产生臭味，请将其立刻远离火源。

Keep away from fire immediately when leakage or foul odors are detected.

如果液体粘到皮肤或衣服上，立即用清水冲洗。若液体进入到眼睛，不要揉擦，用清水冲洗并马上就医。

If liquid leaks onto your skin or cloths, wash well with fresh water immediately. If liquid leaking from the battery gets into your eyes, don't rub your eyes and wash them with clean water and go to see a doctor immediately.

若电池端子脏污，请用干布擦拭后再使用电池。

If the terminals of the battery become dirty, wipe with a dry cloth before using the battery.

电池在以下温度范围内使用。不要超出这个范围。

The battery can be used within the following temperature ranges. Don't exceed these ranges.

充电温度范围：0~45°C

Charge temperature ranges: 0~45°C

放电温度范围：-20~60°C

Discharge Temperature ranges: -20~60°C

储存电池温度不得高于 60°C

Store the battery at temperature below 60°C

## 10.3 注意 (Caution)

### 10.3.1 防止电气误用 (Electrical misuse)

电池必须以恒流恒压 (CC/CV) 模式充电。

Battery must be charged with constant current-constant voltage (CC/CV).

充电电流必须控制在电池规格书规定值内。

Charge current must be controlled by specified value in Cell specification.

放电电流必须控制在电池规格书指定范围内。放电截止电压不得低于 2.5V/只。

Discharge current must be controlled by specified value in Cell's specification. Cut-off voltage of discharging must be over 2.5V/cell.

请将电池放在远离孩童的地方，避免发生吞食意外。若是年幼者使用电池，其监护人应为其解释适当的处理方法和预防措施。

Keep the battery away from babies and children to avoid any accidents such as swallow. If younger

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children use the battery, their guardians should explain the proper handling method and precaution before using.

在使用电池前，请务必阅读用户手册和处理防范措施。

Before using the battery, be sure to read the user's manual and precaution of it's handling.

在使用充电器前，请务必阅读充电器用户手册。

Before using charger, be sure to read the user's manual of the charger.

在安装和移除工作态的电池前，请务必阅读用户手册。

Before installing and removing the battery from application, be sure to read user's manual of the application.

若电池使用时间比平常短，请更换。废弃电池前，用绝缘胶带缠住电池终端。

Replace the battery when using time of battery becomes much shorter than usual. Cover terminals with insulating tape before proper disposal.

若电池需要长期保存，电池应退出使用，存储在温度、湿度都较低的地方。

If the battery is needed to be stored for a long period, battery should be removed from the application and stored in a place where humidity and temperature are low.

电池在充电、使用和储存时，请将其远离带有静电的物体材料。

While the battery is charged, used and stored, keep it away from object materials with static electric chargers.

### 10.3.2 有关电池组在用电器具或充电器中的位置设计

#### Design of positioning the battery pack in application and charger

为了防止由高温引起的电池性能恶化，电池应放置在远离使用和充电过程中的发热区域。

To prevent the deterioration of the battery performance caused by heat, battery shall be positioned away from the area where heat is generated in the application and the charger