Customer's Name 客户名称：	File. No 立项编号： Version 版本：A/0 Date 日期：2021-01-13

Type 类型：LiFePO4 battery 磷酸铁锂电池

Model 型号：18650/3.2V /1500mAh

Customer Approval 客户确认		
Checked By/Date **审 核/日 期**	**Approved By/Date** **批 准/日 期**	**Company Stamp** **公司印章**

DONGGUAN LARGE ELECTRONICS CO., LTD 东莞市钜大电子有限公司		
Prepared By/Date **编 制/日 期**	**Checked By/Date** **审 核/日 期**	**Approved By/Date** **批 准/日 期**

LARGE BATTERY

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Product Summary 产品概要

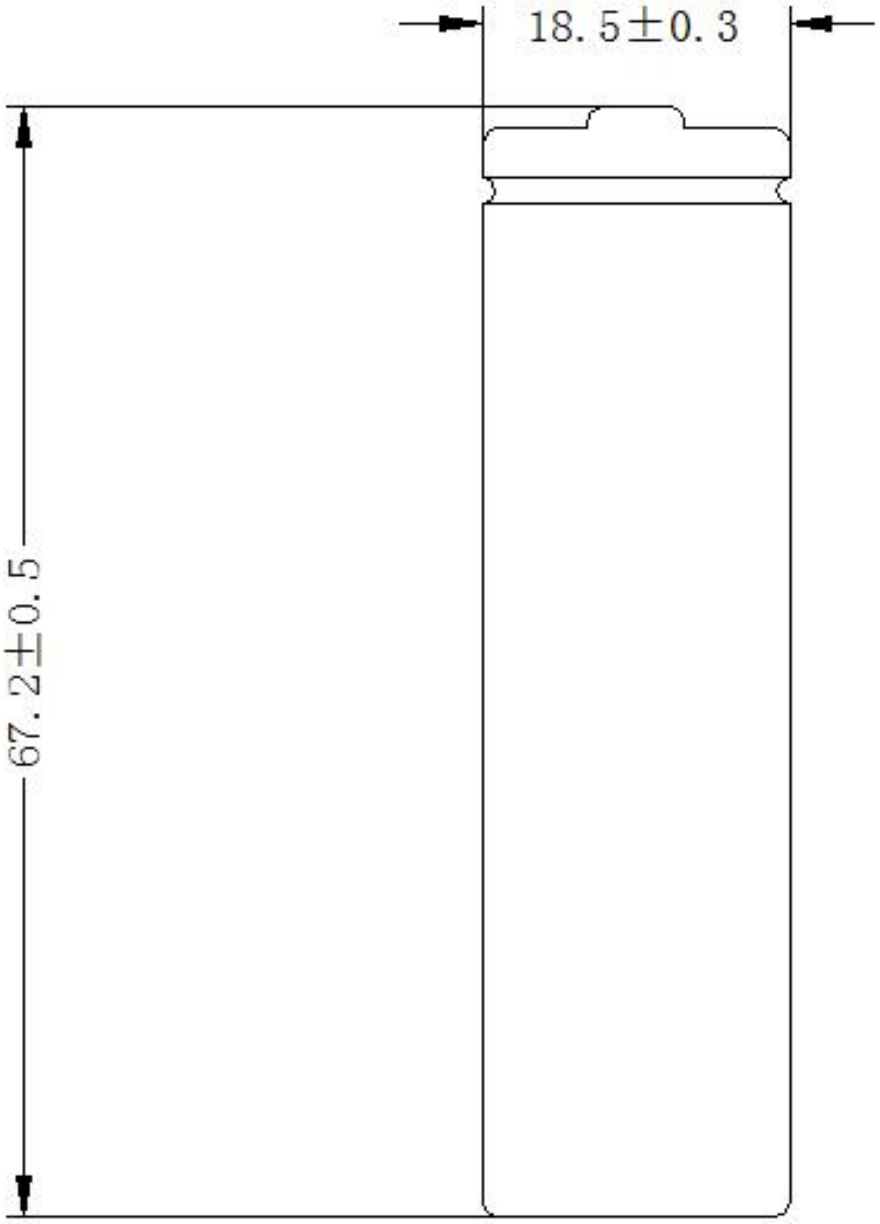
1、Production description 产品描述

a) Name 名称：Cylindrical Lithium-ion Battery 锂离子圆柱电池

b) Cell 电芯：18650/3.2V /1500mAh

c) Shelf period 保质期限：1 年

d) Structure Drawing 电池结构图：



1、Scope and standard 适用范围及依据标准

1.1 Scope 适用范围

This specification is applied to Cylindrical Lithium-ion Battery manufactured by Large Electronics Co., Ltd.

本产品规格书适用于东莞市钜大电子有限公司提供的锂离子圆柱电池。

2、Specification 主要技术参数

序号 No.	Items/项目	Specifications/规格		Remark 备注
1	Nominal capacity 典型容量	1500mAh		0.2C Standard discharge 0.2C 标准放电
	Minimum Capacity 最小容量	1500mAh		
2	Nominal Voltage 标称电压	3.2V		Mean Operation Voltage 即工作电压
3	Delivery voltage 交货电压	3.25~3.45V		Within 10 days from Factory 在出厂 10 天内
4	Charge Ceiling Voltage 充电上限电压	3.65V		By standard charge method 标准充电方式
5	Discharge Cut-off Voltage 放电终止电压	2.0V		
6	Internal Impedance 内阻	≤60mΩ		Internal resistance measured at AC 1KHz after 50% charge 半电态下用交流法测量内阻
7	Charge current 充电电流	0.2C		Standard charge current 标准充电电流
		1C		Continuous max charge current 持续最大充电电流
8	Discharge current 放电电流	0.2C		Standard discharge current 标准放电电流
		2C		Continuous max discharge current 持续最大放电电流
9	Operation Temperature and relative humidity Range 工作温度和湿度范围	Charge/充电	0~+45℃	relative humidity Range≤85%R.H. 相对湿度≤85%R.H.
		Discharge/放电	-20~+50℃	
10	Storage temperature for a long time 长时间储存温度	Less than 1 month: -20~+50℃ （小于 1 个月： -20~+50℃）		60±25%R.H.
		Less than 3 month:-10~+35℃ （小于 3 个月： -10~+35℃）		
		less than 6month: 0~+25℃ （小于 6 个月：0~+25℃）		
11	Weight 重量	About 43g		

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3. Battery Performance Test 电池性能检查及测试

3.1 Appearance 外观

There shall be no such defect as scratch, bur and other mechanical scratch, and the connector should be no rust dirt.

电池的表面应无明显的划痕毛刺及其其它机械划伤，外露的金属端子应无锈蚀污垢。

3.2 Test Equipment 测试设备要求

(1) Dimension Measuring Instrument 尺寸测量设备

The dimension measurement shall be implemented by instruments with accuracy no less than 0.01mm.

测量尺寸的仪器的精度应不小于 0.01mm。

(2) Voltmeter 电压表

Class with national standard or more sensitive class with inner impedance not less than 10 KΩ/V.

国家标准或更灵敏等级,内阻不小于 10 KΩ/V。

(3) Ammeter 电流表

Class with national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω.

国家标准或更灵敏等级，外部总体内阻包括电流表和导线应小于 0.01Ω。

(4) Impedance Meter 内阻测试仪

Impedance shall be measured by a AC impedance method (AC 1kHz LCR meter).

内阻测试仪测试方法为交流阻抗法(AC 1kHz LCR)。

3.3 Standard Test Condition 标准的测试条件

Test should be conducted with new batteries within one month after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise defined, test and measurement shall be done under temperature of 25±3℃ and relative humidity of 60±25%.

测试电池必须是本公司出厂时间不超过一个月的新电池，且电池未进行过五次以上充放电循环。除非其它特殊要求，本产品规格书规定的测试的环境条件为：温度 25±3℃，相对湿度 60±25%。

3.4 Standard Charge 标准充电

0.2C=0.3A Full charge condition: At 25±3℃,Constant current 0.5C, Constant voltage 3.65V till charge current is less than 0.02C ,charging time is about 6.5hours.

0.2C=0.3A 充电状态：在 25±3℃下， 0.5C 恒流恒压充电至 3.65V，终止电流 0.02C，充电时间约 6.5 小时。

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3.5 Common Performance 产品的常规性能

No.序号	Item 项目	Test Method 测试方法	Criteria 检验标准
1	Temperature discharge Performance 不同温度放电特性	Under the temperature of 25±3℃, after charging the battery with 0.5C, then put the battery into the constant temperature and humidity oven with -20±2℃ for 4h, then discharge with 0.2C to 2.0V. 在 25±3℃条件下，电池按 0.5C 充电结束后，将电池放入-20±2℃的恒温恒湿箱中恒温 4h，然后以 0.2C 电流放电至 2.0V。	Surplus Capacity≥60% of Initial Capacity and the battery should no deformation and smoking. 剩余容量≥初始容量的 50%，且电池外观无变形、冒烟。
		Under the temperature of 25±3℃, after charging the battery with 0.5C, then put the battery into the constant temperature and humidity oven with -10±2℃ for 4h, then discharge with 0.2C to 2.0V. 在 25±3℃条件下，电池按 0.5C 充电结束后，将电池放入-10±2℃的恒温恒湿箱中恒温 4h，然后以 0.2C 电流放电至 2.0V。	Surplus Capacity≥60% of Initial Capacity and the battery should no deformation and smoking. 剩余容量≥初始容量的 60%，且电池外观无变形、冒烟。
		At 25℃,discharge current of 0.2C constant current with 2.0V cut-off voltage 25℃0.2C 恒流放电至 2.0V	Discharge Capacity100% 放电容量 100%
		a)Testing Initial Capacity and Standard Charge; b) Raising the chamber temperature to 50±2℃ within 30 min and maintaining this temperature for 2h. c) Testing Surplus Capacity. a)测试标称容量，标准充电；b）将样品放入烘箱中，30 分钟内升温至 50±2℃，恒温保持 2 小时； c）测试剩余容量。	Surplus Capacity≥95% of Initial Capacity 剩余容量≥初始容量的 95%
2	Storage performance@25℃ 常温荷电保持	After the standard charge; rest under the temperature of 25±3℃ for 28days then discharge with 0.2C to2.0V. 电池标准充电后，将电池开路放置在 25±3℃条件下 28 天后，以 0.2C 放电至 2.0V。	The discharge time is required ≥255mins. 要求放电时间≥255mins
3	Cycle life@25℃ 常温循环寿命	A battery unit shall be repeated 1000 charge/discharge cycles at RT,charged at CC-CV 0.2C to 3.65V , laying the battery 5min, discharged at 0.2C to 2.0V end voltage. After 2000 cycles, recording the discharging capacity. 室温下电池用 0.5C 恒流恒压充满电至 3.65V，搁置 5min，用 0.2C 电流放电至 2.0V，记录放电容量，循环 1000 次。	80% of Nominal capacity 标称容量的 80% Cycle life≥1000 times 循环寿命≥1000 次

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3.6 Safety Performance 安全性能

No.序号	Items/项目	Test Method 测试方法	Criteria 检验标准
1	Overcharge Characteristics 过充电性能	Charging the cell initially with constant current at 3C till voltage to 4.6V， Then charged at 4.6V constant voltage. Stop the test when the surface temperature of the cell decays to about 20% from the maximum or continuous charging time up to 7 hours . 以 3C 的电流恒流充电至 4.6V，再恒压 4.6V 充电。当电芯表面温度比峰值低约 20%，或者持续充电时间达到 7 小时后停止测试	No fire, no explosion 电芯不起火、不爆炸
2	Over-discharge Characteristics 过放电性能	Under the temperature of 25±3 ℃, after discharging the battery with 0.2C to 2.0V, then connect the load with 30Ω and discharge for 24h.在 25±3℃条件下，电池按 0.2C 放电至 2.0V 后，外接 30Ω负载再放电 24h。	No leakage, No fire, No smoking,No explosion 电芯不漏液、不起火、不冒烟、不爆炸
3	Short-circuit Characteristics 短路性能	Under the temperature of 25±3 ℃, after full-charging the battery with 0.2C, then make the battery's anode and cathode short-circuit for 1h (the connecting resistance is smaller than 100mΩ), then cut the anode and cathode, 在 25±3℃条件下，电池按 0.2C 充满电后，将电池正负极短路（外接电阻小于 100mΩ）持续 1h，再将电池正负极断开，	No leakage, No fire, No smoking,No explosion 电芯不漏液、不起火、不冒烟、不爆炸
4	Drop Test 跌落实验	Under the temperature of 25±3℃, after full-charging the battery with 0.2C, then drop it freely from 1 meter height onto the hard board which 18~20mm thick (6 times each of X, Y, Z with positive and negative directions). 在 25±3℃条件下，电池按 0.2C 充满电后，将电池从 1 米高度自由跌落至厚度为 18～20mm 的硬木板上(X、Y、Z 正负方向 6 个方向每个方向分别朝下跌落一次)。	No fire, no explosion 电芯不起火、不爆炸
5	Vibration Test 振动测试	After standard charging, fixed the cell 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 cell shall be vibrated for 30 minutes per axis of X,Y,Z axes. 将标准充电后的电池固定在振动台上，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。	No fire, no explosion 电芯不起火、不爆炸
4	Puncture 针 刺	Test battery at 20±5 ℃ and 55±5℃, put battery joining thermocouple(fix contact of thermocouple fixed on center surface of battery) into fume hood and puncture battery with a antirust steel needle of diameter 3m and 20mm~40mm/s speed and keep 1min.	No fire, no explosion, battery surface no more than 150℃. 不起火、不爆炸、电池表面温度不高于 150℃

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		标准充电后，在 20±5℃的环境温度下，将接有热电偶的电池（热电偶的触点固定在电池大表面的中心部位）置于通风橱中，用直径 3mm 的无锈蚀钢针以 20mm~40mm/s 的速度刺穿电池最大表面的中心位置，并保持 1min。	
5	Heavy shock 重物冲击	After standard charging, put battery onto platform and locate Φ15.8mm iron bar on center of battery which is parallel to vertical axis of iron bar, drop freely 9.1kg heavy thing from 610mm onto iron bar.标准充电后，将电池放置于一平面上，将一Φ15.8mm 的钢柱置于电池中心，钢柱的纵轴平行于平面，让质量 9.1kg 的重物从 610mm 高度自由落到钢柱上。	No fire, no explosion 不起火、不爆炸
6	Squeeze 挤压	After standard charging, put battery between two squeeze device and increase pressure gradually to 13kN and keep pressure for 1 min. 标准充电后，将电池放在挤压设备的两个挤压平面之间，逐渐增加压力至 13kN，保持压力 1min。	No fire, no explosion 不起火、不爆炸

3.7 Rest Period 搁置时间

Unless otherwise defined, 30 min, rest period after charge; 30 mins, rest period after discharge.
如无特殊要求，电池充放电间隔为 30mins。

4、 Storage and Others 贮存及其它事项

4.1 Long Time Storage 长期贮存

If stored for a long time (exceed three months), the cell should be stored in dry and cooling place. The cell's storage voltage should be 3.25V~3.45V and the cell is to be stored in a condition as appendix No. 4
长期贮存的电池（超过 3 个月）须置于干燥、凉爽处。贮存电压为 3.25V~3.45V 且贮存环境要求如附录 4

4.2 Others 其它事项

Any matters that this specification does not cover should be conferred between the customer and LARGE.
任何本说明书中未提及的事项，须经双方协商确定。

Appendix 附录

Handling Precautions and Guideline
For LIP (Lithium-Ion) Rechargeable Batteries
锂离子充电电池操作指示及注意事项

Preface 前言

This document of 'Handling Precautions and Guideline LI Rechargeable Batteries' shall be

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applied to the battery cells manufactured by Dongguan Large Electronics Co., Ltd.
本档“锂离子可充电电池操作指示及注意事项”仅适用于东莞市钜大电子有限公司生产的电池。

Note (1) ：声明一

The customer is requested to contact Dongguan Large Electronics Co., Ltd in advance, if and when the customer needs other applications or operating conditions than those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.
客户若需要将电池用于超出本规格书规定以外的设备，或在本规格书规定以外的使用条件下使用电池，应事先联系东莞市钜大电子有限公司，因为需要进行特定的实验测试以核实电池在该使用条件下的性能及安全性。

Note (2) ：声明二

Dongguan Large Electronics Co., Ltd will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.
对于在超出本规格书规定以外的条件下使用电池而造成的任何意外事故，东莞市钜大电子有限公司概不负责。

Note (3)：声明三

Dongguan Large Electronics Co., Ltd will inform, in a written form, the customer of improvement(s) regarding proper use and handling of the cell, if it is deemed necessary.
如有必要，东莞市钜大电子有限公司会以书面形式告知客户有关正确操作使用电池的改进措施。

1、Charging 充电

1.1 Charging current 充电电流

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.
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池的充放电性能、机械性能和安全性能的问题，并可能会导致发热或泄漏。

1.2 Charging voltage 充电电压

Charging shall be done by voltage less than that specified in the Product Specification (3.65V/battery). Charging beyond 3.68V, which is the absolute maximum voltage, must be strictly prohibited. The charger shall be designed to comply with this condition.
充电电压不得超过本规格书中规定的额定电压（3.65V/电池）。3.65V 为充电电压最高极限，充电器的设计应满足此条件。
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.
电池电压高于额定电压值时，将可能引起电池的充放电性能、机械性能和安全性能的问题，可能会导致发热或泄漏。

1.3 Charging temperature 充电温度

The cell shall be charged within 0～+45℃ range in the Product Specification.
电池必须在 0～+45℃的环境温度范围内进行充电。

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1.4 Prohibition of reverse charging 禁止反向充电

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

2、Discharging 放电

2.1 Discharging current 放电电流

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.
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。

2.2 Discharging temperature 放电温度

The cell shall be discharged within -20～50℃ range specified in the Product Specification.
电池必须在-20～50℃的环境温度范围内进行放电。

2.3 Over-discharging 过放电

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 3.25V～3.45V。
需要注意的是，在电池长期未使用期间，它可能会因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 3.25V～3.45V 之间。
Over-discharging may causes loss of cell performance, characteristics, or battery functions
过放电会导致电芯性能、电池功能的丧失。

Charger should be installed to prevent the battery discharge below the cut-off voltage to this specification. In addition, the charger should also device to preventrepeated charging. The steps are as follows: the battery in the fast charge before,should first with a small current (0.02C) pre charging for 15~35 minutes, so that thebattery voltage reaches above2.5V for rapid charging, a timer to achieve the precharge process. If in the pre charge time, battery voltage does not rise more than 2.5V, the charger should be able to stop the next step fast charging, and display the electric core / battery is in a non normal state.
充电器应有装置来防止电池放电至低于本规格书规定的截止电压。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（0.02C）预充电 15~30 分钟，以使电池的电压达到 2.5V 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，电池的电压仍未升到 2.5V 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。

3、Storage 贮存

The battery shall be storied within -20～45℃ range environmental condition.

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电池储存温度必须在 -20～45℃ 的范围内。

If the battery has to be storied for a long time (≤6 个月), the environmental condition should be: Temperature: +15~+25℃, Humidity: 65±20％RH.

长期存储电池（≤6 个月） 须置于温度为+15~+25℃、湿度为 65±20％RH 的环境中。

The voltage for a long time storage(≤6 months) shall be 3.25V～3.45V range.

贮存电压为 3.25V～3.45V 。

5、Handling Instructions 电池的注意事项

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

认真阅读下面的注意事项，确保正确使用锂离子电池。东莞市钜大电子有限公司对违反下述注意事项而产生的任何问题不予负责。

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Danger!
危险！

— Do not immerse the battery in water or allow it to get wet.
— 勿将电池投入水中或将其弄湿！
— Do not use or store the battery near sources of heat such as a fire or heater.
— 禁止在火源或极热条件下给电池充电！勿在热源（如火或加热器）附近使用或贮存电池！如果电池泄漏或发出异味，应立即将其从接近明火处移开；
— Do not use any chargers other than those recommended.
— 请使用专用充电器！
— Do not reverse the positive (+) and negative (-) terminals.
— 勿将正负极接反！
— Do not connect the battery directly to wall outlets or car cigarette-lighter sockets.
— 勿将电池直接连接到墙上插座或车载点烟式插座上！
— Do not put the battery into a fire or apply direct heat to it.
— 勿将电池投入火中或给电池加热！
— Do not short-circuit the battery by connecting wires or other metal objects to the positive (+) and negative (-) terminals.
— 禁止用导线或其它金属物体将电池正负极短路，禁止将电池与项链、发夹或其它金属物体一起运输或贮存！
— Do not pierce the battery casing with a nail or other sharp object, break it open with a hammer, or step on it.
— 禁止用钉子或其它尖锐物体刺穿电池壳体，禁止锤击或脚踏电池！
— Do not strike, throw or subject the battery to sever physical shock.
— 禁止撞击、投掷或者使电池受到机械震动
— Do not directly solder the battery terminals.
— 禁止直接焊接电池端子！
— Do not attempt to disassemble or modify the battery in any way.
— 禁止以任何方式分解电池！
— Do not place the battery in a microwave oven or pressurized container.
— 禁止将电池置入微波炉或压力容器中！
— Do not use the battery in combination with primary batteries (such as dry-cell batteries) or batteries of different Capacity type or brand.
— 禁止与一次电池（如干电池）或不同容量、型号、品种电池组合使用！
— Do not use the battery if it gives off an odor, generates heat, becomes discolored or deformed, or appears abnormal in any way. If the battery is in use or being recharged, remove it from the device or charger immediately and discontinue use.
— 如果电池发出异味、发热、变形、变色或出现其它任何异常现象时不得使用；如果电池正在使用或充电，应立即从用电器中或充电器上取出并停止使用！

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Caution!
注意！

Do not use or store the battery where is exposed to extremely hot, such as under window of a car in direct sunlight in a hot day. Otherwise, the battery may be overheated. This can also reduce battery performance and/or shorten service life.
不要使用处于极热环境中的电池，如阳光直射或热天的车内。否则，电池会过热，可能着火（点燃），这样就会影响电池的性能、缩短电池的使用寿命。

If the battery leaks and electrolyte gets in your eyes, do not rub them. Instead, rinse them with clean running water and immediately seek medical attention. If left as is, electrolyte can cause eye injury.
如果电池漏液后电解液进入眼睛，不要擦拭，应用水冲洗，立即寻求医疗救助。如不及时处理，眼睛将会受到伤害。

Use the battery only under the following environmental conditions. Failure to do so can result in reduced performance or a shorten service life. Recharging the battery outside of these temperatures can cause the battery to overheat, explode or catch fire.
只能在下述条件下使用电池，否则将会降低电池的性能或缩短电池的使用寿命。

Operating environment:
工作环境:

When charging the battery: 0～+45℃
充电： 0～+45℃
When discharging the battery: -20～+50℃
放电: -20～+50℃
When stored up to 30 days: -20～+50℃
储存 30 天：-20～+50℃
When stored up to 90 days: -10～+35℃
储存 90 天：-10～+35℃
When stored up to 6 months: 0～+25℃
储存 6 个月：0～+25℃

6、Amendment of this Specification 产品规格书的修订

This specification is subject to change with prior notice.
本公司有权对本产品规格书进行修订，在对产品规格书修订后东莞市钜大电子有限公司将会通知客户。

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