

**Model 型号 : ZS645060-2F-R02**

**Type 类型 : 聚合物锂离子电池**

**Specification 主要技术参数**

NO	Items	Criteria	Remarks
2.1	Typical Capacity 典型容量	2000mAh	Discharge:0.2CmA cut-off voltage:6.0V 0.2C 放电至 6.0V 截止
	Minimum Capacity 最小容量	2000mAh	
2.2	Energy 能量	14.8Wh	
2.3	Nominal Voltage 标称电压	7.4V	
2.4	Open Circuit Voltage 出厂电压	7.60V-8.00	
2.5	Internal Impedance 内阻	Cell 电芯: $\leq 60\text{m}\Omega$	AC 1KHz after standard charge 标准充电后 AC 1KHz 测 试
		Battery 成品: $\leq 180\text{m}\Omega$	
2.6	Charge voltage 充电电压	8.4V (任意一单节 4.2V)	
2.7	Standard charge current 标准充电电流	1000mA	0.5C
2.8	Max. charge current 最大充电电流	2000mA	
2.9	Standard discharge current 标准放电电流	1000mA	0.5C
2.10	Max. discharge current 最大放电电流	2000mA	
2.11	Discharge cut-off voltage 放电截止电压	6.0V(任意一单节 3.0V)	
2.12	Operating Temperature 工作温度	0~+45°C	Charging 充电
		-10~+50°C	Discharging 放电
2.13	Storage Temperature 贮存温度	-10°C~+45°C	Less than 1 month 小于一个月
		-10°C~+35°C	Less than 6 months 小于六个月

### 3. Battery configuration 电池组成

NO	Item	Criteria	Remarks
3.1	Cell 电芯	ZS645060 2000mAh*2	Li-ion
3.2	PCM 保护板	S8242aay+Ao8820	
3.3	WIRE 导线	UL 1007 20#	侧出外露 50±5mm
3.4	Connector 插头	无	
3.5	蓝色胶		
3.6	贴肖银龙贴纸		

### 4. Battery Performance Criteria 电池性能检查及测试

#### 4.1 Appearance 外观和结构

There shall be no such defect as scratch, bur and other mechanical scratch. The structure and dimensions see attached drawing of the battery.

电池的表面应无明显的划痕毛刺及其其它机械划伤。结构尺寸见电池的外形尺寸图；

#### 8.4 Measurement Apparatus 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 equal or more precision scale of 0.01mm.

测量尺寸的仪器的精度应不小于 0.01mm

##### (2) Voltmeter 电压表

Standard class specified in the national standard or more sensitive class having 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

Standard class specified in the 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 sinusoidal alternating current method (AC 1kHz LCR meter).

内阻测试仪测试方法为交流阻抗法(AC 1kHz LCR).

#### 4.3 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 20±5°C and relative humidity of 45~85%.

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 20±5°C, 相对湿度 45%~85%。

#### 4.4 Standard Charge 标准充电

0.2C CC (constant current) charge to 8.4V, then CV (constant voltage 8.4V) charge till charge current decline to ≤0.05C.

0.2C CC (恒流)充电至 8.4V, 再 CV (恒压 8.4V) 充电至充电电流 ≤0.05C.

### 4.5 Common Performance 产品的常规性能(cell 电芯)

No	Items/项目	Testing method and determinant standard /测试方法和判定标准
1	Charge Performance 充电性能	The battery can be charged when using the original charger. The standard charge mode :under the temperature of 20±5°C, charge the battery with the current of 0.2C until the voltage reaches up to 8.4V, then charge with constant voltage until the charge current ≤ 0.01C, then stop charging. 使用原装充电器, 能够充电。标准充电模式: 在 20±5°C 条件下, 电池用 0.2C 充电, 当电池电压达到 8.4V 时改为恒压充电, 直到充电电流小于或等于 0.01C 时停止充电。

2	Discharge Performance 放电性能	When connecting with load, the battery can supply power. Charge the battery with standard charge mode, then rest for 0.5h, then discharge with 1C until the voltage is 6.0V, and the discharge time is required $\geq 51$ min. 电池外接负载,能够供电。将电池按标准充电模式充好电后,开路搁置 0.5h,再以 1C 放电至 6.0V,要求放电时间 $\geq 51$ min
3	Cycle Performance 循环寿命	Under the temperature of $20\pm 5^{\circ}\text{C}$ ,charge the battery with 0.5C/0.2C, when the voltage reaches up to 8.4V charge with constant voltage until the charge current $\leq 20\text{mA}$ , then stop charging, then rest for 0.5h, then discharge with 0.2C to 6.0V. Cycle with the above mode, when the continuous discharge time $< 80\%$ stop cycling. The cycle life is required $\geq 300$ times. 在 $20\pm 5^{\circ}\text{C}$ 条件下电池按 0.5.C/0.2C 充电,当电压达到 8.4V 时改为恒压充电,直到充电电流小于或等于 20mA 时停止充电,静置 0.5h 后,0.2C 放电至 6.0V 的方式进行循环,当连续三次放电容量 $<$ 初始容量 80%时寿命为终止,要求循环寿命 $\geq 300$ 次。
4	Charged Storage Characteristics 荷电保持能力	Charge the battery with 0.2C, then shift to charge with constant voltage until the voltage reaches up to 8.4V, when the charge current $\leq 0.01\text{C}$ stop charging; rest under the temperature of $20\pm 5^{\circ}\text{C}$ for 28d then discharge with 0.2C to 6.0V. The discharge time is required $\geq 8.45\text{h}$ . 电池按 0.2C 充电,当端电压达到 8.4V 时改为恒压充电,充电电流小于或等于 0.01C 时,充电停止;将电池开路放置在 $20\pm 5^{\circ}\text{C}$ 条件下 28 天后,以 0.2C 放电至 6.0V,要求放电时间 $\geq 8.45\text{h}$ 。
5	Storage Characteristics 存放性能	Charge the battery ,which is new manufactured shorter than 3 months, with 1C/0.2C until the capacity reaches to 40~50%, after resting for 12 months under the temperature of $20\pm 5^{\circ}\text{C}$ and the humidity of 45~75%, then charge with 0.2C to 8.4V then shift to charge with constant voltage, after full-charge rest for 0.5h,then discharge with 0.2C to 6.0V. The discharge time is required $\geq 4\text{h}$ . 将生产日期到实验日期不足 3 个月的电池按 1C/0.2C 充入 40~50%容量后,放置在温度 $20\pm 5^{\circ}\text{C}$ 、湿度为 45~75%的环境中开路存放 12 个月后,电池按 0.2C 充电至 8.4V 时改为恒压充电,充饱后;静置 0.5h,再以 0.2C 放电至 6.0V,要求放电时间 $\geq 4\text{h}$ 。

#### 4.6 Safety Performance 产品可靠性

No	Items/项目	Testing method and determinant standard /测试方法和判定标准
1	High Temperature Characteristics 高温性能	Under the temperature of $20\pm 5^{\circ}\text{C}$ , after charging the battery with 1C/0.2C, then put the battery into the constant temperature and humidity oven with $55\pm 2^{\circ}\text{C}$ for 2h,then discharge with 0.2C to 6.0V. The discharge time is required $\geq 51\text{min}$ and the battery should no deformation and smoking. 在 $20\pm 5^{\circ}\text{C}$ 条件下,电池按 1C/0.2C 充电结束后,将电池放入 $55\pm 2^{\circ}\text{C}$ 的恒温恒湿箱中恒温 2h 后,然后以 0.2C 电流放电至 6.0V,要求放电时间 $\geq 51\text{min}$ ,且电池外观无变形、冒烟。
2	Low Temperature Characteristics 低温性能	Under the temperature of $20\pm 5^{\circ}\text{C}$ , after charging the battery with 1C/0.2C, then put the battery into the constant temperature and humidity oven with $-10\pm 2^{\circ}\text{C}$ for 16~24h,then discharge with 0.2C to 6.0V. The discharge time is required $\geq 3\text{h}$ and the battery should no deformation and smoking. 在 $20\pm 5^{\circ}\text{C}$ 条件下,电池按 1C/0.2C 充电结束后,将电池放入 $-10\pm 2^{\circ}\text{C}$ 的恒温恒湿箱中恒温 16~24h,然后以 0.2C 电流放电至 6.0V,要求放电时间 $\geq 3\text{h}$ ,且电池外观无变形、冒烟。

3	Overcharge Protection Characteristics 过充电保护性能	After full-charging the battery with 0.2C and set the constant current and voltage supplier with 2times of the nominal voltage and current, then load it to the battery for 8h. It is required the battery should be no leakage, deformation, smoking and explosion during the test processes. 电池按 0.2C 充满电后, 再将恒流恒压源设定为 2 倍标称电压、电流,然后加载于电池上 8h,要求试验过程中电池不漏液、变形、冒烟和爆炸。
4	Over-discharge Protection Characteristics 过放电保护性能	Under the temperature of 20±5℃,after discharging the battery with 0.2C to 6.0V, then connect the load with 30Ω then discharge for 24h. It is required the battery should be no leakage, in fire, smoking and explosion during the test processes. 在 20±5℃条件下,电池按 0.2C 放电至 6.0V 后,外接 30Ω 负载再放电 24h,要求实验过程中电池不漏液、起火、冒烟和爆炸
5	Short-circuit Protection Characteristics 短路保护性能	Under the temperature of 20±5℃,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, After the battery momentary charge by 0.5C current, the voltage should come back to 3.6V,and there should be no leakage, deformation, smoking and explosion during the test processes.在 20±5℃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, 电池以 0.5C 瞬时充电后电压应不小于 3.6V, 且试验过程中电池不漏液、变形、冒烟和爆炸。
6	Constant Humidity and Temperature Characteristics 恒定湿热性能	Under the temperature of 20±5℃, after charging the battery with 0.2C, then put the battery into the constant temperature and humidity oven with 55±2℃ and 90~95% for 48h, the battery should be no obvious deformation, leakage, rust, smoking and explosion. After testing take out the battery then rest for 2h under the temperature of 20±5℃, discharge with 0.5C to 6.0V. The discharge time is required ≥36min. 在 20±5℃条件下, 电池按 0.2C 充电结束后, 放入 40±2℃, 湿度 90~95%的恒温恒湿箱内 48h, 电池应无明显变形、漏液、生锈、冒烟或爆炸, 试验结束后将电池取出搁置 2h, 在 20±5℃条件下, 以 0.5C 放电至 6.0V, 要求放电时间≥36min。

#### 4.7 Rest Period 搁置时间

Unless otherwise defined, 30min,rest period after charge,30min,rest period after discharge.

如无特殊要求, 电池充放电间隔为 30min。

## 5. Storage and Others 贮存及其它事项

### 5.1 Long Time Storage 长期贮存

If stored for a long time (exceed three months), the battery should be stored in drying and cooling place. The battery's storage voltage should be 7.4~7.8V 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 7.4~7.8V 且贮存环境要求如附录 4

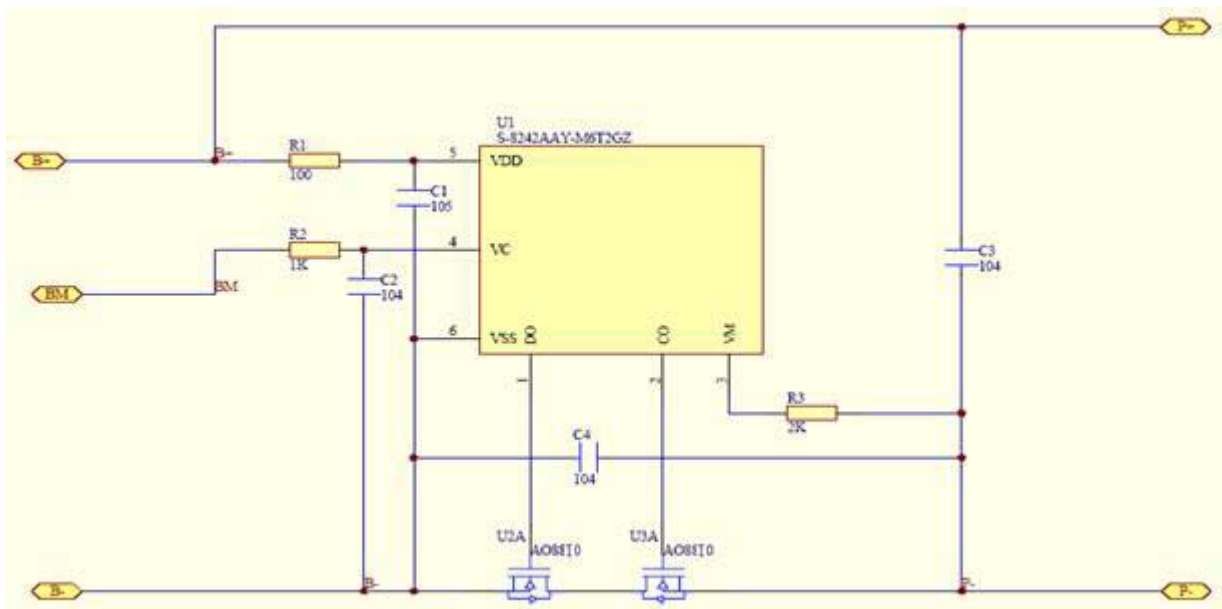
### 5.2 Others 其它事项

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

任何本说明书中未提及的事项, 须经双方协商确定。

## 6. Protection Circuit 保护电路

### 6.1 Circuit Diagram 电路原理图



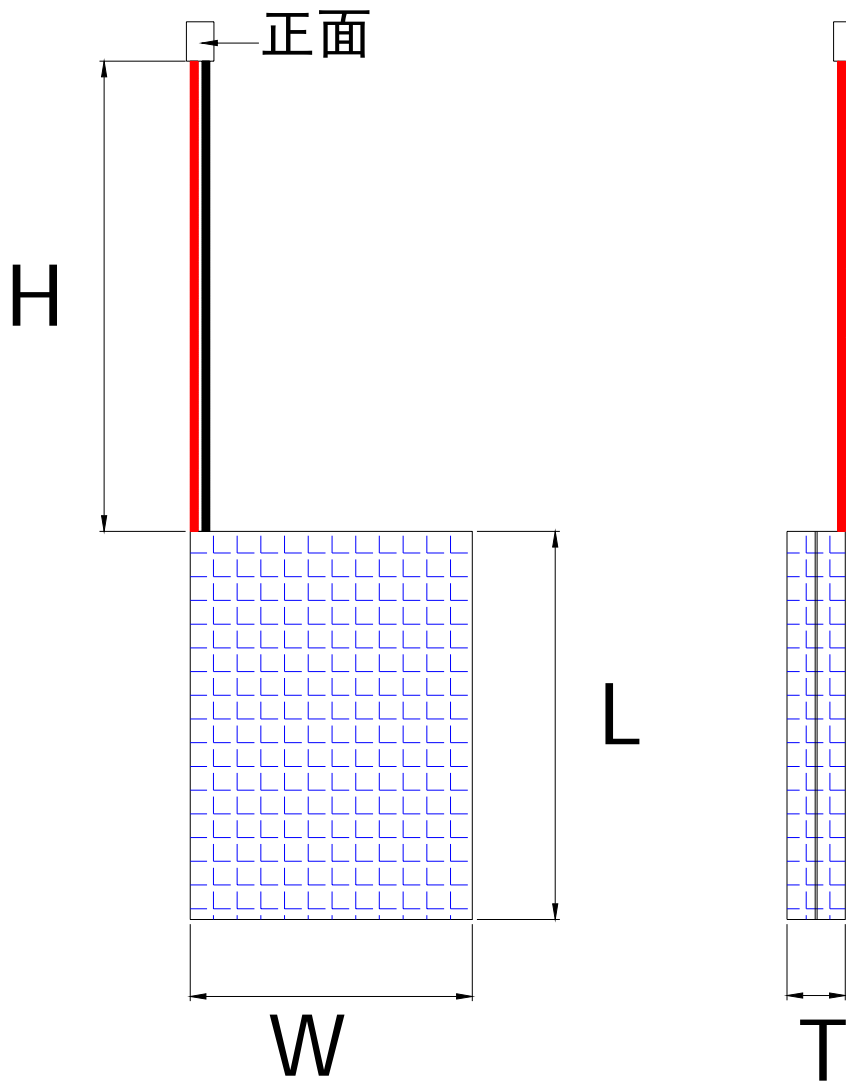
## 6.2 PCM BOM

序号	物料编码	物料名称	规格	封装	数量	备注
1	U1	Protection IC	S-8242AAY-M6T2 GZ	SOT-23-6	1	
2	U2	MOSFET	AO8820	TSSOP-8	1	
3	R1	SMD 电阻	100 Ohm±5%	0603	2	
4	R2	SMD 电阻	1K Ohm±5%	0402	1	
5	C1	SMD 电容	105/25V Y5V	0603	1	
6	C2	SMD 电容	104/50V Y5V	0402	1	
7	PCB	PCB	HT-BN34-9N		1	
8	R3	SMD 电阻	2K Ohm±5%	0402	1	

## 6.3 PCM parameter PCM 参数

NO	Item 项目	Criteria 标准
1	Over-charge Protection Voltage 过充电保护电压	4.25±0.025V
2	Over-discharge protection Voltage 过放保护电压	3±0.05V
3	Over current protection current 放电过流保护电流	4-8A
4	Current consumption in normal operation 工作时消耗电流	10.0uA MAX

## 7. Assembly Drawing 装配图纸



L(mm)	W(mm)	T(mm)	H(mm)
62max	50max	13.2max	50±5

## Appendix 附录

### 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。

#### 1.2 Charging voltage 充电电压

Charging shall be done by voltage less than that specified in the Product Specification (8.4V/cell). Charging beyond 4.30V, 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刊号中规定的额定电压（8.4V/电芯）。4.30V 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。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。

#### 1.3 Charging temperature 充电温度

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

电池必须在 0°C~45 °C 的环境温度范围内进行充电。

#### 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。

### 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 -10°C~50 °C range specified in the Product Specification.

电池必须在 -10°C~50 °C 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 7.4V and 7.8V.

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 7.4V 至 7.8V 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。

### 3. Protection Circuit Module 保护电路模块

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

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

### 3.1 overcharging protection: 过充保护电压

Overcharging protection function shall stop charging if any one of the cells of the battery pack reaches  $4.30\pm 0.05V$ ;

当电池中任一电芯的电压达到  $4.30\pm 0.05V$  时，过充电保护功能应立即启动并停止充电。

### 3.2 over-discharging protection: 过放电保护

Over-discharging prevention function shall work to avoid further drop in cell voltage of  $2.3\pm 0.05V$

Or less per cell in any cell of the battery pack. |

当电池中任一电芯的电压降至  $2.3\pm 0.05V$  以下时，过放保护功能应起保护作用以避免电芯的深度放电。

## 4. Storage 贮存

The cell shall be storied within  $-10^{\circ}C\sim 45^{\circ}C$  range environmental condition.

电芯储存温度必须在  $-10^{\circ}C\sim 45^{\circ}C$  的范围内。

If the cell has to be storied for a long time (Over 3 months), the environmental condition should be:

Temperature:  $23\pm 5^{\circ}C$

Humidity:  $65\pm 20\%RH$

长期存储电池（超过 3 个月）须置于温度为  $23\pm 5^{\circ}C$ 、湿度为  $65\pm 20\%RH$  的环境中。

The voltage for a long time storage shall be  $7.4V\sim 7.8V$  range.

贮存电压为  $7.4V\sim 7.8V$  。

## 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，确保正确使用聚合物锂离子电池。正负能源科技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。

**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！

## 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，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°C~45°C

充电: 0°C~45°C

When discharging the battery: -10°C~50°C

放电: -10°C~50°C

When stored up to 30 days: -10°C~45°C

储存 30 天: -10°C~45°C

When stored up to 90 days: -10°C~35°C

储存 90 天: -10°C~35°C