

## 1、Product Specification (产品技术规格)

Table 1 (表 1)

No. 序号	Item 项目	General Parameter 常规参数	Remark 备注
1	Rated Capacity 额定容量	Customized	Standard discharge 0.2C <sub>5</sub> A after Standard charge 标准充电后 0.2C <sub>5</sub> A 标准放电
2	Nominal Voltage 标称电压	Customized	
3	Voltage at end of Discharge 放电终止电压	2.0V for each cell	Discharge Cut-off Voltage 放电截止电压
4	Battery limit voltage 充电限制电压	3.6V for each cell	最大值
5	Internal Impedance 内阻	50-265mΩ according to different battery	Internal resistance measured at AC 1KHz after 50% charge (半电态下用交流法测量内阻) The measure must uses the new batteries that within one week after shipment and cycles less than 5 times 使用出货后不到一个星期及循环 次数少于 5 次的新电池测量
6	Standard charge 标准充电	Constant Current 0.25C <sub>5</sub> A Constant Voltage 8.4V 0.02C <sub>5</sub> A cut-off 持续电流：0.25C <sub>5</sub> A 持续电压：8.4V 截止电流：0.02 C <sub>5</sub> A	Charge time : Approx7.0h 充电时间：大约 7 个小时
7	Standard discharge 标准放电	Constant current 0.5 C <sub>5</sub> A end voltage 4.8V 持续电流：0.5C <sub>5</sub> A 截止电压：4.8V	Discharge time : Approx2.0h 放电时间：大约 2 个小时
8	Fast charge 快速充电	Constant Current0.5C <sub>5</sub> A Constant Voltage 8.4V 0.02 C <sub>5</sub> A cut-off 持续电流：0.5C <sub>5</sub> A 持续电压：8.4V 截止电流：0.02 C <sub>5</sub> A	Charge time : Approx3.0h 充电时间：大约 3 个小时

Continuous the table 1 (续表 1)

No. (序号)	Item (项目)	General Parameter (常规参数)	Remark (备注)
9	Maximum Continuous Charge Current 最大充电持续电流	2C <sub>5</sub> A	
10	Maximum Continuous Discharge Current 最大放电持续电流	1C <sub>5</sub> A	
11	Peak current 峰值电流	According to different battery	
12	Operation Temperature Range 工作温度范围	Charge 充电: 0~45°C	60±25%R.H. Bare Cell 单体电池储存湿度范围
		Discharge 放电: -20~60°C	
13	Storage Temperature 储存温度	Less than 1 months -20~60°C 小于 1 月: -20~60°C	60±15%R.H. at the shipment state 出货状态时的湿度范围
		less than 6 months: -20~30°C 小于 6 个月: -20~30°C	
		Charge quantity 50%~60% 荷电量 50%~60%	
14	Cycle Life 循环寿命 0.2C <sub>5</sub> A	Higher than 80% of the Initial Capacities of the Cells 初始容量的 80%	Carry out 1000 cycle Charging/Discharging in the below condition. ◆Charge: Standard Charge, per 4.3.1 ◆Discharge: Standard discharge, per 4.3.2 ◆Rest Time between charge/discharge: 30min. ◆Temperature: 20±5°C 循环 1000 次 充放电按以下条件: ◆充电: 标准充电, 按 4.3.1 规定 ◆放电: 标准放电, 按 4.3.2 规定 ◆搁置: 30min. ◆温度: 20±5°C

## 2、Mechanical characteristics and Safety Test (安全测试及机械特性)

Table 2 (表 2)

Mechanical characteristics

No. 序号	Items 项目	Test Method and Condition 测试方法及条件	Criteria 标准
1	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 an 55Hz, the excursion of the vibration is 1.6mm. The cell shall be vibrated for 30 minutes per axis of XYZ axes. 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 1.6mm，振动频率为 10Hz~55Hz，每分钟变化 1Hz。	No leakage 无泄漏 No fire 不起火
2	Drop Test 跌落测试	The cell is to be dropped from a height of 1 meter twice onto concrete ground. 将标准充电后的电芯从 1 米高度跌落至混凝土地面 2 次	No explosion, No fire, no leakage. 无爆炸、无起火、无泄漏
3	Collisions 碰撞	After the vibration test, according to X.Y.Z each battery average three vertical pulse peak acceleration, the setting for the 100m/s <sup>2</sup> , every minute, 40 ~ 80 collision frequency, pulse duration 16ms collision frequency ± 10 thousand. 振动试验结束后,将电池平均按 X.Y.Z 三个互相垂直轴向上,设置脉冲峰值加速度为 100m/s <sup>2</sup> ,每分钟碰撞次数 40~80,脉冲持续时间 16ms,碰撞次数 1500±10.	No explosion, No fire, no leakage. 无爆炸、无起火、无泄漏

Table 3 (表 3)

No. 序号	Item 项目	Battery Condition 电池要求	Test Method 测试方法	Requirements 要求
4	Crush 挤压试验	Fresh,Fully charged (充满电的新电池)	Crush between two flat plates. Applied force is about 13kN(1.72Mpa) for 30min. 电池放置在两块平面金属板间，施加 13KN 1.72Mpa 的作用力，且持续保持 30 分钟	No explosion, No fire 无起火无爆炸

5	Short Circuit 短路试验	Remove,outer protective circuit 撤除外部保护电路	This test will be placed the battery electric dipole in the fume hood, short-circuit the anode (total resistance is not more than 50m lines $\Omega$ ), monitor temperature changes, when the battery is low temperature dropped to about 10 degrees than peak, the end of experiment. 本项试验将接有电热偶的电池置于通风橱中,短路其正负极(线路总电阻不大于 50m $\Omega$ ),监视温度变化,当电池温度下降到比峰值低约 10 $^{\circ}$ 时,试验结束.	No explosion, No fire The Temperature of the surface of the Cells are lower than 150 $^{\circ}$ C 无起火无爆炸 电池表面温度应低于 150 $^{\circ}$ C
6	Impact 重物冲击	Fresh,Fully charged 充满电的新电池	A 56mm diameter bar is inlaid into the bottom of a 10kg weight. And the weight is to be dropped from a height of 1m onto a sample battery and then the bar will be across the center of the sample. (用一条直径为 56mm 的圆棒放置在电池中央,将一 10Kg 的重锤从 1m 的高度垂直落下在电池的中心位置)	No explosion, No fire 无起火无爆炸
7	Thermal shock 热冲击	Fresh,Fully charged 充满电的新电池	Batteries in hot box Temperature in 5 $\pm$ 2 $^{\circ}$ C /min, rising to150 $\pm$ 2 $^{\circ}$ (keep 30min). 电池置于热箱中,温度以 5 $\pm$ 2 $^{\circ}$ C/min,升至 150 $\pm$ 2 $^{\circ}$ C 并保持 30min.	No explosion, No fire 无起火无爆炸
8	Forced Discharge 过放试验	Fresh,Fully charged 充满电的新电池	Discharge at a current of 0.5C <sub>5</sub> A for 2.5h. 以 0.5C <sub>5</sub> A 的电流放电 2.5 小时	No explosion, No fire 无起火无爆炸

Table 4 (表 4)

No. 序号	Item 项目	Battery Condition 电池要求	Test Method 测试方法	Requirements 要求
9	High temperature performance 高温性能	Fresh,Fully charged 充满电的新电池	After charging Will a battery into 55 $\pm$ 2 $^{\circ}$ C In the case of high temperature 2h Batteries in 55 $\pm$ 2 $^{\circ}$ 0.5C <sub>5</sub> A discharge current to the termination voltage, discharge time should not below 108min,Battery will in environmental temperature 20 $\pm$ 5 $^{\circ}$ place 2h 充电结束后. 将电池放入 55 $\pm$ 2 $^{\circ}$ C 的高温箱中恒温 2h, 电池在 55 $\pm$ 2 $^{\circ}$ C 下 0.5C <sub>5</sub> A 电流放电至终止电压, 放电时间应不低于 108min,将电池取出在环境温度 20 $\pm$ 5 $^{\circ}$ C 的条件下搁置 2h	No explosion, No fire 无起火无爆炸

10	Low temperature performance 低温性能	Fresh,Fully charged 充满电的新电池	After charging, will be a battery into - 20± 2°C degrees Celsius in the box, then 16h constant 24h ~ 0.2 C <sub>5</sub> A with discharge current to the termination voltage, discharge time should not below 3h. After the experiment, the battery will in environmental temperature of 20 ± 5 ° c condition 2h aside 充电结束后，将电池放入-20±2°C的低温箱中恒温 16h~24h，然后以 0.2 C <sub>5</sub> A 电流放电至终止电压，放电时间应不低于 3h。该试验结束后，将电池取出在环境温度 20±5°C 下搁置 2h	No deformation and burst 无变形无爆炸
11	Charged 荷电保持	Fresh,Fully charged (充满电的新电池)	A full battery, at ambient temperature 20 ±5°C Under the conditions of the battery will be open to 28d aside, 0.2 C <sub>5</sub> A to terminate discharge current voltage, 标准充电结束后，在环境温度 20±5°C 的条件下，将电池开路搁置 28d，再以 0.2 C <sub>5</sub> A 电流进行放电至终止电压。	the discharge time not below 4.0 h.放电时间不低于 4.0h
12	Constant damp performance 恒定湿热性能	Fresh,Fully charged 充满电的新电池	Standard after the battery, Will a battery into 40±2°C Relative humidity 90~95% At constant temperature and humidity box after 48h Battery will in environmental temperature 20±5°C Aside 2h, 0.5 C <sub>5</sub> A to terminate discharge current voltage, 标准充电结束后，将电池放入 40±2°C 相对湿度为 90~95% 的恒温恒湿箱中搁置 48h 后，将电池取出在环境温度 20±5°C 的条件下搁置 2h，再以 0.5 C <sub>5</sub> A 电流放电至终止电压。	No obvious deformation, hands rust,smoke, explosion, discharge time not less than 72 min 无明显变形、锈蚀、冒烟或爆炸；放电时间不低于 72min

### 3、Handling of Cells (电池操作注意事项)

#### 3.1 Prohibition short circuit (禁止电池短路)

Never make short circuit cell. It generates very high current which causes heating of the cells and may cause electrolyte leakage, gassing or explosion that are very dangerous. The LI tabs may be easily short-circuited by putting them on conductive surface. Such outershort circuit may lead to heat generation and damage of the cell. An appropriate circuitry with PCB shall be employed to protect accidental short circuit of the battery pack.

避免电池短路。短路会产生很高的电流而使电池发热以及电解液泄漏，产生有毒气体或爆炸是非常危险的。极片连接在导电物体表面很容易短路，外部短路会导致发热及损害电池。选用一个适当的保护电路可以在意外短路时保护电池。

#### 3.2 Mechanical shock (机械撞击)

Falling, hitting, bending, etc. may cause degradation of LI characteristics.

跌落、碰撞、弯曲等等都可能会降低锂电池的性能。

#### 4、Notice for Designing Battery Pack（电池外壳设计注意事项）

##### 4.1 Pack toughness 外壳坚韧度

Battery pack should have sufficient strength and the LI cell inside should be protected from mechanical shocks.

电池外壳应该有足够的机械强度使电池免受机械撞击。

##### 4.2 Cell fixing 电池的固定

The LI cell should be fixed to the battery pack by its large surface area. No cell movement in the battery pack should be allowed.

电池最大面积的一面应该固定在外壳上，安装后电池不能有松动。

##### 4.3 Inside design 外壳内部设计

No sharp edge components should be inside the pack containing the LI cell.

外壳内安装电池的部位不应有锋锐边。

##### 4.4 For mishaps（针对意外事件）

Battery pack should be designed not to generate heat even when leakage occurs due to mishaps.

1) Isolate PCB (Protection Circuit Module) from leaked electrolyte as perfectly as possible.

2) Avoid narrow spacing between bare circuit patterns with different voltage. (Including around connector)

3) LI battery should not have liquid from electrolyte, but in case if leaked electrolyte touch bare circuit patterns, higher potential terminal material may dissolve and precipitate at the lower potential terminal, and may cause short circuit. The design of the PCB must have this covered.

发生意外时外壳设计应考虑即使在电池出现漏液时也不会发热。

1、尽量把保护电路与渗漏的电解液隔离开。

2、在不同的电压情况下避免出现小间距的裸露电路——包括插头周围。

3、电池不应该有来自电解液的液体，但是一旦发生电解液渗漏触及裸露电路，高电势端子材料可能会溶解然后沉淀到低电势端子，可能会造成短路。保护板的设计必须含有覆盖保护层。

#### 5、Notice for Assembling Battery Pack（电池装配注意事项）

Shocks, high temperature, or contacts of sharp edge components should not be allowed in battery pack assembling process.

在电池装配过程中不允许撞击、高温或接触尖锐部分。

#### 6、Others（其它）

##### 6.1 Prevention of short circuit within a battery pack（电池内部的短路预防）

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

The battery pack shall be structured with no short circuit within the battery pack, which may cause generation of smoke or firing.

在电池和引线之间应该有足够的绝缘层用于安全保护。电池的包装构成应没有导致起烟起火的短路情况。

##### 6.2 Prohibition of disassembly（禁止拆卸）

1) Never disassemble the cells

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

2) Electrolyte is harmful

LI battery 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.

1)不要拆卸电池。

拆卸电池会发生电池内部短路，会引起起火、爆炸、有害气体或者其它问题。

2)电解液是有害的

万一电解液沾到皮肤、进入眼睛，应立即用清水冲洗以及求助医生。

6.3 Prohibition of dumping of cells into fire (不要把电池倾倒入火中)

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

不要焚毁电池，否则会致电池爆炸,这个危险，必须禁止。

6.4 Prohibition of cells immersion into liquid such as water (禁止浸泡电池)

The cells shall never be soaked with liquids such as water, seawater, drinks such as soft drinks, juices, coffee or others.

请不要把电池浸泡在液体当中，像清水、海水，及非酒精饮料、果汁、咖啡或者其它的饮料。

6.5 Battery cells replacement (更换电池)

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

更换电池应由电池生产商或设备供应商完成，用户不要自行更换。

6.6 Prohibition of use of damaged cells (禁止使用损坏的电池)

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 an electrolyte, an electrolyte leakage and others, the cells shall never be used any more. The Cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing or explosion.

电池可能在出货途中碰撞而受损。如果发现电池有异常，例如包装损坏、电池包裹变形，有电解液的味道、发现漏液等等，不要再使用这些电池。电池如果有电解液的味道或者出现漏液，电池放置应该远离火源避免起火及爆炸。

7、Period of Warranty (保质期)

The delivery period from battery date for 12 months If the battery is proved in manufacturing process defect formation rather than the user abuse and error caused by use of this company is responsible for replacement battery.

电池的保质期从出货之日算起为 12 个月。如果证明电池的缺陷是在制造过程中形成的而不是由于用户滥用及错误使用造成，本公司负责维修电池。

8、Storing the Batteries (电池的存放)

The batteries should be stored at room temperature, charged to about 30% to 50% of capacity.

We recommend that batteries be charged about once per half 3 months to prevent over discharge.

电池应当在室温下存放，应充到 30%至 50%的电量。如长时间储存，建议每三个月充一次电以防止电池过放电。

9、Other The Chemical Reaction (其它的化学反应)

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of

the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change the battery.

由于电池是利用化学反应的原理，所以随着时间的增加电池的性能会降低，即使是存放很长一段时间而不使用。如果使用条件如充电、放电及周围环境温度等情形不在指定的使用范围内，会使缩短电池的使用寿命，或者会产生漏液导致设备损坏。如果电池长周期不能充电，即使充电方法正确，也需要更换电池。