

LiitoKala Power CO.,LTD	编号: Lii-001
Lii-50A 266500 -5000mAh	版本: A0 日期: 2020.5.8

Customer/客户:_____

**Li-ion Battery
Specification**
锂离子電池说明书

MODEL:Lii-50A

(5000mAh)

Prepared By/Date 编制/日期	Checked By/Date 审核/日期	Approved By/Date 批准/日期

Customer Approval	Signature/Date(签名/日期)	
	Company Name(公司名称)	
	Company Stamp(公司印章)	

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<p style="text-align: center;">Amendment Records (修正记录)</p>				
Edition (版本)	Description (记述)	Prepared by (编制)	Approved by (批准)	Date (日期)
A	First Edition			

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1. Scope (适用范围)

This specification is applied to the reference battery in this Specification and manufactured by LiitoKala Power CO.,LTD .

本说明书适用于本书中所提及 LiitoKala Power CO.,LTD 的电池。

2. 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)	Typical (额定容量)	5000mAh	Standard discharge (0.5C ₅ A after Standard charge (0.5C ₅ A 标准充电后 0.5C ₅ A 标准放电)
	Main Capacity (最小容量)	Main Capacity (最小容量)	4950mAh	
2	Nominal Voltage (正常电压)	3.6V		Mean Operation Voltage (即工作电压)
3	Voltage at end of Discharge (放电终止电压)	2.5V		Discharge Cut-off Voltage (放电截止电压)
4	Charging Voltage (充电电压)	4.2V		
5	Internal Impedance (内阻)	≤22mΩ		Internal resistance measured at AC 1KHZ after 50% charge. The measure must uses the new batteries that within one week after shipment and cycles less than 5 times (半电态下用交流法测量内阻; 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)	0.5C ₅ A CC(constant current)charge to 4.2V,then CV(constant voltage 4.2V)charge till charge currnt decline to ≤0.01C 0.5C ₅ A CC(恒流)充电至 4.2V,再 CV(恒压) 4.2V 充电直至充电电流≤0.01C ₅ A		Charge time : Approx 3.5h (充电时间: 大约 3.5 个小时)
7	Standard discharge (标准放电)	Constant current 0.5C ₅ A end voltage 2.75V (持续电流: 0.5C ₅ A 截止电压: 2.75V)		
8	Fast charge (快速充电)	Constant Current 1C ₅ A Constant Voltage 4.2V 0.01 C ₅ A cut-off (持续电流: 1C ₅ A 持续电压: 4.2V 截止电流: 0.01C ₅ A)		Charge time : Approx 90 minutes (充电时间: 大约 90 分钟)

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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)	3C(15A)	
10	Maximum Discharge Current (最大放电电流)	5C(25A)	
11	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): -30~60°C	
12	Storage Temperature Range (储存温度范围)	Less than 1 year: -30~60°C (小于一年: -30~60°C)	60±25%R.H. at the shipment state (出货状态时的湿度范围)
		less than 3 months: -30~45°C (小于3个月: -30~45°C)	
13	Weight (重量)	Approx.98 g 约 98g	cell (单支电池)
14	Cell Dimension (单体电池尺寸)	High/高度(Max): 65.4mm	Initial Dimension (初始尺寸)
		diameter/直径(Max):26.5mm	

Discharge Capacity Rate (放电倍率)

Charge Current 充电电流	Discharge Rate (放电倍率)		
1 C ₅ A	1C	2C	3C
	95%	94%	92%

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3. Performance And Test Conditions (电池性能及测试条件)

3.1 Standard Test Conditions (标准测试条件)

Test should be conducted with new batteries within one week after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise specified, test and measurement shall be done under temperature of $20 \pm 5^{\circ}\text{C}$ and relative humidity of 45~85%. If it is judged that the test results are not affected by such conditions, the tests may be conducted at temperature $15 \sim 30^{\circ}\text{C}$ and humidity 25~85%RH.

测试必须使用出厂时间不超过一个星期的新电池，且未进行过五次以上的充放电循环。除非特别说明，否则测试会在温度 $20 \pm 5^{\circ}\text{C}$ ，相对湿度 45~85%的条件下进行。如果经鉴定测试结果不受上述条件影响，测试也可以在温度 $15 \sim 30^{\circ}\text{C}$ ，相对湿度 25~85%RH 的条件下进行。

3.2 Measuring Instrument or Apparatus (测量器具及设备)

3.2.1 Dimension Measuring Instrument (尺寸测量器具)

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

尺寸测量器具的精度等级应不小于 0.01 mm。

3.2.2 Voltmeter (伏特计)

Standard class specified in the national standard or more sensitive class having inner impedance more than $10\text{k}\Omega/V$

按照国家标准指定规格等级或采用灵敏度更高的，测量电压时内阻不应小于 $10\text{k}\Omega/V$ 。

3.2.3 Ammeter (安培计)

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω .

按照国家标准指定规格等级或采用灵敏度更高的，包括电流表及电线在内的总外阻应小于 0.01Ω 。

3.2.4 Impedance Meter (电阻计)

Impedance shall be measured by a sinusoidal alternating current method(1kHz LCR meter).

内阻测试仪测量原理应为交流阻抗法 (1kHz LCR)。

3.3 Standard Charge\Discharge (标准充放电)

3.3.1 Standard Charge : $0.5C_5A$

标准充电: $0.5C_5A$

Charging shall consist of charging at a $0.5C_5A$ constant current rate until the cell reaches 4.2V. The cell shall then be charged at constant voltage of 4.2 volts while tapering the charge current. Charging shall be terminated when the charging current has tapered to $0.01 C_5A$. Charge time : Approx 3.5h, The cell shall demonstrate no permanent degradation when charged between 0°C and 45°C .

电池先以 $0.5C_5A$ 恒流充电至 4.2V，再以 4.2V 恒压充电至电流减小到 $0.01 C_5A$ ，充电时间大约为 3.5 个小时。在 $0^{\circ}\text{C} \sim 45^{\circ}\text{C}$ 内充电电池应没有永久损害。

3.3.2 Standard Discharge (标准放电)

标准放电: $0.5C_5A$

Cells shall be discharged at a constant current of $0.5C_5A$ to 2.75 volts @ $20 \pm 5^{\circ}\text{C}$

电池以 $0.5C_5A$ 恒流放电至 2.75V @ $20 \pm 5^{\circ}\text{C}$ 。

3.3.3 If no otherwise specified, the rest time between Chare and Discharge amount to 30min.

如果没有特别说明，电池充放电间隔时间为 30 分钟。

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3.4 Appearance (外观)

There shall be no such defect as flaw, crack, rust, leakage, which may adversely affect commercial value of battery.

电池外观应没有划伤、破裂、污渍、生锈、漏液等影响市场价值的缺陷存在。

3.5 Initial Performance Test (初始性能测试)

Table 2 (表 2)

Item (项目)	Test Method and Condition (测试方法及条件)	Requirements (要求)
(1) Cell Voltage 电芯电压	As of shipment 出货电压	$3.8 \pm 0.2V$
(2) Open-Circuit Voltage (开路电压)	The open-circuit voltage shall be measured within 24 hours after standard charge. (标准充电后 24 小时内测量开路电压)	$\geq 3.7V$
(3) Internal impedance (初始内阻)	Internal resistance measured at AC 1KHz after 50% charge. (半充电状态下, 测量其 AC 1KHz 下的交流阻抗)	$\leq 22m\Omega$
(4) Minimal Rated Capacity (最小额定容量)	The capacity on 0.5C _{5A} discharge till the voltage tapered to 2.75V shall be measured after rested for 30min then finish standard charge. (标准充电后, 搁置 30min, 测量 0.5C _{5A} 放电至 2.75V 截止电压所放出的容量)	Discharge Capacity (放电容量) $\geq 2000mAh$

3.6 Temperature Dependence of discharge capacity (放电温度特性)

Cells shall be charged per 3.3.1 and discharged @0.5 C_{5A} to 2.75 volts. Except to be discharged at temperatures per Table 3. Cells shall be stored for 3 hours at the test temperature prior to discharging and then shall be discharged at the test temperature. The capacity of a cell at each temperature shall be compared to the capacity achieved at 45 °C and the percentage shall be calculated. Each cell shall meet or exceed the requirements of Table 3.

电池按 3.3.1 规定充电。按表 3 的温度中放电, 电池必须先在该试验温度中放置 3 个小时。在每一个温度中的放电容量应不小于表 3 的要求。

Table 3 (表 3)

Discharge Temperature (放电温度)	-10°C	0°C	25°C	55°C
Discharge Capacity (0.5 C _{5A}) (放电容量/0.5C _{5A})	70%	80%	100%	92%

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3.7 Electric Performance/电性能		Table 4 (表 4)	
No. (序号)	Item (项目)	Criteria (标准)	Test Conditions (测试条件)
1	Cycle Life (循环寿命)	Higher than 80% of the Initial Capacities of the Cells (初始容量的 80%)	Carry out 600cycle Charging/Discharging in the below condition. ◆Charge:Standard Charge, per 3.3.1 ◆Discharge: 1C ₅ A to 2.75 V ◆Rest Time between charge/discharge:30min. ◆Temperature:20±5℃ 循环 600 次 充放电按以下条件: ◆充电: 标准充电, 按 3.3.1 规定 ◆放电: 1C ₅ A 放至 2.75V ◆搁置:30min. ◆温度:20±5℃
2	Charge Retention and capacity recovery performance (荷电性能与容量恢复性能)	剩余容量≥标称容量*85% Charge Retention ≥Nominal capacity*85% 恢复容量≥标称容量*92% Recoverable capacity ≥Nominal capacity *92%	A. 电池标准充电后, 开路放置 28 天, 以标准放电至 2.75V 或企业技术条件中规定的放电终止电压, 测量电池的剩余容量; 标准充放电测量电池的恢复容量, 可循环三次, 有一次达到标准即可。 Store for 28 daysafter standard charge, then measure final status and residual capacity at Standard Charge to 2.75V or other cut-off voltage which is specified in the technical document of the company; After standard charge/standard discharge cycle recoverable capacity will be tested. Charge/discharge cycle can be repeated for 3 times before meeting the Standards.
3	Storage performance (储存性能)	恢复容量≥标称容量*90% recoverable capacity ≥nominal capacity *90%	电池在 50%放电深度条件下室温储存 12 各月后, 以标准充放电循环 5 次, 有一次达到要求即可。 Stored for 12 months in room -temperature at 50%DOD,After storage cell shall be conducted standard charge /discharge cycle for 5 times before meeting the Standards
4	Leakage-Proof (漏液试验)	No leakage (visual inspection) (没有漏液/目测)	After full charge with standard charge, store at 60±3℃, 60±10%RH for 1 month. 标准充电条件下充满电后在温度 60±3℃, 湿度 60±10%RH 下储存一个月

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3.8 Safety Performance/安全性能		Table 5 (表 5)	
Item (项目)	Battery Condition (电池要求)	Test Method (测试方法)	Requirements (要求)
Short Circuit (短路试验 20℃)	Fresh, Fully charged (充满电的新电池)	Each test sample battery, in turn, is to be short-circuited by connecting the (+) and (-) terminals of the battery with a Cu wire for 1h having a maximum resistance load of 0.1 Ω .Tests are to be conducted at room temperature(20±2℃). 在常温下约 20±2℃ 依次把每个样品电池的正负极用铜线连接起来使电池外部短路 1 小时--线路总电阻不超过 0.1 Ω	No explosion, No fire The Temperature of the surface of the Cells are lower than 150℃ (无起火、无爆炸 电池表面温度低于 150℃)
Impact (重物冲击试验)	Fresh, Fully charged (充满电的新电池)	A 15.8mm diameter bar is inlaid into the bottom of a 9.1kg weight. And the weight is to be dropped from a height of 610mm onto a sample battery and then the bar will be across the center of the sample. (用一条直径为 15.8mm 的圆棒放置在电池中央, 将一 9.1Kg 的重锤从 610mm 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)
Overcharge (过充试验)	Fresh, Fully charged (充满电的新电池)	电池以 3C ₅ A 电流充电, 充电电压限制 10V。 Charge at 3C ₅ A constant current to 10V。	No explosion, No fire (无起火、无爆炸)
Forced Discharge (过放试验)	Fresh, Fully charged (充满电的新电池)	Discharge at a current of 1 C ₅ A for 2.5h. (以 1 C ₅ A 的电流放电 2.5 小时)	No explosion, No fire (无起火、无爆炸)
Crushing of Cells (挤压试验)	Fresh, Fully charged (充满电的新电池)	将充满电的电池放置在两平面之间, 进行挤压。当压力达到 13 kN ± 1 kN, 或电池电压下降值为原来电压的三分之一时, 停止挤压。 Each fully charged cell is crushed between two flat surfaces. The force for the crushing is applied by a hydraulic ram exerting a force of 13 kN ± 1 kN. The crushing is performed in a manner that will cause the most adverse result. Once the maximum force has been applied or an abrupt voltage drop of one -third of the original voltage has been obtained, the force is released. A cylindrical or prismatic cell is crushed with its longitudinal axis parallel to the flat surfaces of the crushing apparatus. To test both wide and narrow sides of prismatic cells, a second set of cells is tested, rotated 90° around their longitudinal axes compared to the first set.	No explosion, No fire (无起火、无爆炸)

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Continuous the table 5 (续 表 5)			
Item (项目)	Battery Condition (电池要求)	Test Method (测试方法)	Requirements (要求)
Hot oven (热冲击试验)	Fresh, Fully charged (充满电的新电池)	<p>电池标准充电后, 放置于空气流通的热箱中, 温度以 $(5 \pm 2^\circ\text{C}) / \text{min}$ 的速率升至 $130 \pm 2^\circ\text{C}$ 并保持 10min.</p> <p>After standard charge , cells are heated in a circulating air oven at a rate of $5 \pm 2^\circ\text{C}$ per minute to $130 \pm 2^\circ\text{C}$ and remained for 10 minutes.</p>	No explosion, No fire (无起火、无爆炸)
3.9 Environmental tests /环境适应性			Table 6 (表 6)
Item (项目)	Battery Condition (电池要求)	Test Method (测试方法)	Requirements (要求)
Vibration (振动试验)	Fresh, Fully charged (充满电的新电池)	<p>电池标准充电后, 固定在振动台上, 沿 X、Y 方向各震动 30min, 振动频率 10~55HZ, 扫描速率为 1 oct/min。位移幅值 0.38mm (10~30HZ); 0.19mm (30~55HZ)</p> <p>After standard charge, cells are fixed on the platform and be subjected to vibrate on following frequency 10~55HZ and amplitude vibration for 30 minutes recycling rate of 1 oct/min with direction of X,y.</p> <p>A.Vibration Frequency:10~30HZ Vibration amplitude(single swing):0.38mm.</p> <p>B.Vibration Frequency:30~55HZ Vibration amplitude(single swing):0.19mm.</p>	<p>不漏液 不起火 不爆炸 no fire, no explosion, no leakage</p>
Drop (跌落试验)	Fresh, Fully charged (充满电的新电池)	<p>电池标准充电后, 由 1m 高度自由跌落到木板上, 任意方向跌落 2 次 (共 6 次)。</p> <p>After standard charge , cells are dropped from a height of 1m to wooden board in X,Y,Z directions twice respectively (total 6 times) .</p>	No explosion, No fire (无起火、无爆炸)
Low pressure (altitude simulate) (低压性能 (高度模拟))	Fresh, Fully charged (充满电的新电池)	<p>电池标准充电后, 在 11.6kPa 气压下搁置 6h。</p> <p>After standard charge, cells are stored under the atmosphere pressure of 11.6kPa for 6h .</p>	<p>不漏液 不起火 不爆炸 no fire, no explosion, no leakage</p>

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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 PCM (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) 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 PCM 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接子，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。

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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

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 (不要把电池倾倒在火中)

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，这个很危险，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 period of warranty is half a year from the date of shipment. guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customer abuse and misuse.

电池的保质期从出货之日算起为壹年。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，本公司负责退换电池。

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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 three 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，这样需要更换电池了。

10.Note: (注释)

Any other items which are not covered in this specification shall be agreed by both parties.

本说明书未包括事项应由双方协议确定。

LiitoKala Power CO.,LTD

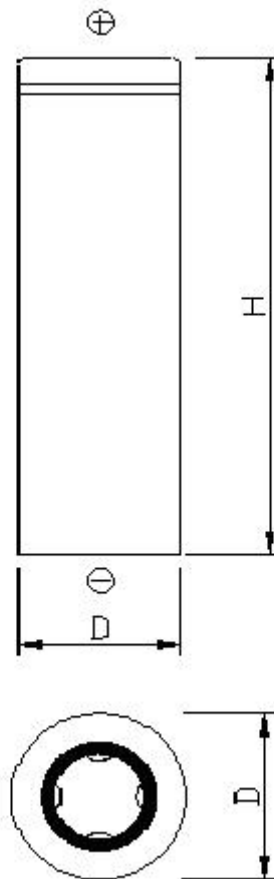
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11. Dimension (尺寸)



尺寸	D	26.3±0.2	H	65.2±0.2	单位	mm
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