

	Doc.No.	TY2023080802
	Rev.	A0
	Model No.	743476-1600mAh

机密文件 禁止外泄

锂离子电池规格书

Lithium Polymer Battery Specification

产品名称: 锂离子软包电池

Product name: Cylindrical Lithium-Polymer Rechargeable batteries

产品型号: 743476-40C-1600mAh 3.7V

Product Item: 743476-40C-1600mAh 3.7V

制定 Prepared	审核 Checked	批准 Approved
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1、范围

Scope

本规格书描述了由聚合物锂离子电芯有关参考技术指标及测试方法、使用要求。

2、 This specification describes the technical parameter, testing method and using requirement of polymer Li-ion cell

3、主要技术参数

Main Technical Parameter

2.1 电芯规格参数 Technical Parameter Of Cell

项目 Item		电芯参数 Parameter of cell	备注 Remark
1、容量 Capacity	典型容量 (C _{typ.})	1640mAh	在室温 23±2℃下标准充电后，0.2C 放电至截止电压 3.0V 0.2C Discharge cut-off Voltage 3.0V after standard charge at 23±2℃
	最小容量 (C _{min.})	1558mAh	
2、标称容量 Nominal capacity		1600mAh	
3、标称电压 Nominal voltage		3.70V	
4、开路电压 Shipments of Open-circuit voltage		3.70V-3.90V	自发货之日起一个月内，室温下测量电芯电压 Test the cell voltage within 1 month since the delivery day at 23±2℃
5、内阻 Internal impedance		≤5mΩ	室温下，AC 1kHz测试电芯内阻 AC 1kHz at 23±2℃
6、充电截止电压 Charge cut-off voltage		4.2V	
7、标准充电电流 Standard charge current		800mA	0.5C
8、最大充电电流 Max. charge current		1600mA	1C
9、标准放电电流 Standard discharge current		800mA	0.5C
10、最大持续放电电流 Max.continuous discharge current		64000mA	40C
11、最大瞬间放电电流 Max.burst discharge current		80000mA	50C (≤5S)
12、放电截止电压 Discharge cut-off voltage		3.0V	
13、电芯尺寸 Cell size		(7.1±0.3) * (33.5±1) * (76±1) mm	
14、电芯重量 Cell weight		≤38g	
15、工作环境温度 Operating environment temperature		10℃~+45℃	充电 Charging
		-10℃~+60℃	放电 Discharging

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3、测试方法及条件

Testing method

3.1 标准测试条件

Standard test conditions

被测试电芯须为本公司出厂时间不超过一个月的电芯，且电芯未进行过五次以上充放电循环。除其它特殊要求外，本产品规格书规定的测试条件为：温度 $23\pm 2^{\circ}\text{C}$ ，相对湿度 $45\%\sim 65\%\text{RH}$ ，大气压 $86\text{kPa}\sim 106\text{kPa}$ 。

The cell for test must be new produced no more than 1 month and charge-discharged less than 5 cycles. Unless otherwise specified, all tests stated in this Specification shall be conducted at the temperature of $23\pm 2^{\circ}\text{C}$ and the relative humidity of $45\%\sim 65\%\text{RH}$, and atmospheric pressure is $86\text{kPa}\sim 106\text{kPa}$.

3.2 测试设备要求

Measuring Equipments

- (1) 测量尺寸的仪器精度应大于等于 0.01mm 。
- (2) 万用表测量电压及电流的准确度应不低于 0.5 级，测量电压时内阻不应小于 $10\text{k}\Omega/\text{V}$ 。
- (3) 内阻测试仪测量原理应为交流阻抗法 (AC 1kHz LCR)。
- (4) 电芯测试系统的电流精度应为 $\pm 0.1\%$ 以上，恒压精度 $\pm 0.5\%$ ，计时精度不低于 $\pm 0.1\%$ 。
- (5) 测量温度的仪表准确度应不低于 $\pm 0.5^{\circ}\text{C}$ 。
- (1) Slide caliper should have an accuracy of the grade 0.01mm or higher.
- (2) The multimeter should have an accuracy of the grade 0.5 or higher. The impedance when testing voltage should be more than $10\text{K}\Omega/\text{V}$.
- (3) The impedance meter with AC 1 kHz should be used.
- (4) For the cell testing system, the accuracy of current should be more than $\pm 0.1\%$, the accuracy of voltage should be more than $\pm 0.5\%$ and the accuracy of time should be more than $\pm 0.1\%$.
- (5) The thermometer should be have an accuracy of the grade 0.5°C or higher.

3.3 标准充电 Standard Charge

0.5C 恒流恒压充电至 4.2V ，截止电流为 0.02C 。

0.5C CC-CV 4.2V , Cut-off current is 0.02C 。

3.4 标准放电 Standard Discharge

0.5C 恒流放电至截止电压 3V 。

0.5C constant current Discharge cut-off voltage 3V 。

3.5 搁置时间

Rest Time

如无特殊要求，电芯充放电间隔 30min 。

Unless otherwise specified, between cell charging and discharging, there is a 30min interval.

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4、产品性能（以下测试方法及要求可以根据不同客户及项目要求做调整）		
Performance		
4.1、电性能测试		
Electricity Characteristics		
项目 Item	测试方法 Testing method	要求 Requieiment
1. 开路电压 Open-circuit voltage	标准充电后，24 小时内测量开路电压 Measure the open-circuit voltage of the cell within 24 hours after the Standard Charge	$\geq 4.10V$
2. AC 内阻 AC Internal Impedance	充半电后，在 $23\pm 2^{\circ}C$ 采用交流法测量内阻（通过电芯正负极耳测试） After half charge, measure the resistance with the overall cathode and anode tab at AC1 KHz , $23\pm 2^{\circ}C$	电芯内阻 $\leq 5 m\Omega$ AC Internal Impedance of the Cell $\leq 5 m\Omega$
3. 容量 Capacity	标准充电后，搁置30min，在 $23\pm 2^{\circ}C$ 温度 0.2C 放电至3.0V Discharge the cell at a constant current of 0.2C to 3.0V after standard charge and rest 30min at $23\pm 2^{\circ}C$	放电容量 Discharge Capacity $\geq 100\%C_{min}$.
4. 倍率放电特性 C-rate discharge Characteristics	标准充电后，用最大连续放电电流 40C 进行恒流放电到 3V 截止 Discharge the cell at a constant current of 40 C to 3V after Standard Charge	放电容量 Discharge Capacity $\geq 90\% C_{min}$.
5. 放电温度特性 Temperature Dependence of the Discharg Characteristics	电芯在 $23\pm 2^{\circ}C$ 标准充电后，在 30 分钟内冷却或加热到测试温度。放电前电芯在此温度下保持 2 小时，然后 1C 放电至 3V 截止，做完一个温度实验后，电芯在室温 $23\pm 2^{\circ}C$ 下放置 2h 然后进行充电 Heat or cool the cell to the testing temperature within 30min and rest for 2 hours after standard charge at $23\pm 2^{\circ}C$, then discharge at 1C to 3V cut-off. When a test finished, charge the cell after rested 2 hours at room temperature ($23\pm 2^{\circ}C$)	-10℃ $\geq 60\%$
		25℃ $\geq 100\%$
		60℃ $\geq 95\%$
6. 循环性能 Cycle Life characteristics	标准充电后，搁置 30min，0.5C 放电至 3V，搁置 30min，重复上述步骤进行循环，直至电芯放电容量连续 3 次 $\leq 80\%$ ，测试温度 $23\pm 2^{\circ}C$ Measure capacity under the cycle conditions described below, until the discharge capacity $\leq 80\%$ for three times. Cycle conditions: Standard Charge , rest for 30min; Discharge at 0.5C to 3V cut-off. Testing temperature is $23\pm 2^{\circ}C$	循环次数 ≥ 300 次 Cycle Life ≥ 300 cycles 放电容量 Discharge Capacity $\geq 80\%C_{min}$.

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4.2 储存特性

Storage Characteristics

项目 Item	测试方法 Testing method	要求 Requirement
常温贮存 General Temperature Storage Characteristics	1 标准充电后电芯在23±2℃的环境中贮存28天，测试0.5C放电容量（保持容量） Store the cell, which is charged at standard charge condition, for 28 days at 23±2℃. Measure the remaining capacity of the cell at 0.5C discharge	容量保持 ≥85% C_{min} . Remaining Capacity≥85% C_{min}
	2 1C循环3次，测试恢复容量（3周循环的最大放电容量） Charge and discharge at 1C for 3 cycles. Measure the recovery capacity (the max. discharge capacity for three cycles)	容量恢复 ≥90% C_{min} . Recovery Capacity≥90% C_{min}
高温贮存 High Temperature Storage Characteristics	1 标准充电后电芯在60±2℃的环境中贮存7天，测试1C放电容量（保持容量） Store the cell, which is charged at standard charge condition, for 7 days at 60±2℃. Measure the remaining capacity of the cell at 1C discharge	容量保持 ≥60% C_{min} . Remaining Capacity≥60% C_{min}
	2 1C循环3次，测试恢复容量（3周循环的最大放电容量） Charge and discharge at 1C for 3 cycles. Measure the recovery capacity (The max. discharge capacity for three cycles)	容量恢复 ≥80% C_{min} . Recovery Capacity≥80% C_{min}
长期贮存性能 Long-ter Storage Characteristics	贮存前给电芯充入50%的容量，然后开路搁置365天，在23±2℃的环境条件下1C循环3次，测试恢复容量（3周循环的最大放电容量） Store the cell at 23±2℃ for 365 days after charging the cell with 50% capacity, then charge and discharge the cell at 1C, at 23±2℃ for 3 cycles. Measure the recovery capacity (The Max. discharge capacity for three cycles)	容量恢复 ≥85% C_{min} . Recovery Capacity≥85% C_{min}

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4.3 安全特性

Safely Performance

项目 Item	测试方法 Testing method	要求 Requirement
恒定湿热性能 Constant humidity and temperature test	标准充电后，将电芯放入 $40\pm 2^{\circ}\text{C}$ ，相对湿度为 90%~95% 的恒温恒湿箱中搁置 48h，取出电芯在环境温度 $23\pm 2^{\circ}\text{C}$ 条件下，搁置 2h，若外观无明显变化则以 1C 放电至 3V。 Put the cell into an oven of constant humidity(90%~95%) and constant temperature($40\pm 2^{\circ}\text{C}$), rest for 48 hours, take it out and rest for 2 hours at $23\pm 2^{\circ}\text{C}$, then discharge at 1C to 3V cut-off.	放电容量 $\geq 80\%C_{\min}$. Discharge Capacity $\geq 80\%C_{\min}$.
振动 Vibration test	标准充电后，电池在以下条件下测试： 振幅：0.8mm（双振幅：1.6mm） 振动频率：10~55Hz(扫频:1Hz/min) 方向：X、Y、Z 三个互相垂直方向往复振动 90~100min After standard charge, the battery is to be tested as following conditions: Amplitude:0.8mm（Double amplitude：1.6mm） Frequency:10~55Hz(sweep:1Hz/min) Direction: X/Y/Z axis for 90~100min. The battery is to be tested in three mutually perpendicular to each axis.	不漏液，不起火,不爆炸 No leak, no fire, no explosion
跌落测试 Drop test	标准充电后，电池按 1m 的跌落高度自由落体跌落于混凝土板上，X,Y,Z 方向上各一次，共计 3 次 After standard charging, the battery falls freely on the concrete floor from the height of 1m, X, Y, Z each time, 3 times in total.	不起火,不爆炸 No fire, No explosion
短路测试 Short circuit test	电芯标准充电后，然后采用阻值 $80\pm 20\text{m}\Omega$ 的铜导线将电池的正极和负极连接短路，当电池温度下降到比峰值低20%或者短接时间达到24h，结束测试 After the standard discharge of the cell, then Uses the resistance value to $80 + 20 \text{ m}\Omega$ copper wires connect the positive and negative of the battery short circuit, when the battery temperature down to about 20% lower than the peak or a short time at 24 h, the test is finished.	不起火,不爆炸, No fire, no explosion

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过充测试 Overcharge Test	电芯标准放电后，先用3C充电电流充电至4.6V，试验过程中监测电池温度变化，当出现以下两种情况之一时，结束测试。 a) 电池持续充电时间达到7h; b) 电池温度下降到比峰值低20%。 After the standard discharge of the cell, the cell is firstly charged to 4.6V with 3C charging current. During the test, the temperature change of the battery is monitored. When one of the following two situations occurs, the test is finished. A) the continuous charging time of the battery reaches 7h; B) the battery temperature drops to 20% below the peak value.	不起火,不爆炸, No fire, no explosion
强制放电 Forced-Discharge Test	电芯标准放电后，以1C电流反向充电90min After standard discharge of the cell, reverse charge with 1C current for 90min	不起火,不爆炸, No fire, no explosion

5、储存及运输要求（以下测试方法及要求可以根据不同客户及项目要求做调整）
Storage and Shipment Requirement

项目 Item	要求 Requirement	备注 Remark
1、贮存温度 Storage temperature	≤ 1month: -20℃~45℃ ≤ 3 month: -20~30℃ ≤ 1 Year: 25±3℃	运输时推荐贮存温度为 23±2℃ The best temperature in shipment is 23±2℃
2、湿度 Humidity	≤75%RH	/
3、荷电量 State of Charge (SOC)	30%-70%	电压 3.70-3.90V Voltage 3.70-3.90V

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警告!

不仔细阅读下述事项可能导致电芯泄露、爆炸或起火

- ◆ 不能把电芯进入水中，长时间不用时把电芯放在阴凉和干燥的地方保存。
- ◆ 禁止与一次电芯（如干电芯）或不同容量、型号、品种电芯组合使用。
- ◆ 电芯应放在小孩接触不到的地方，如果小孩不小心吞咽电芯应立即寻求医疗救济助。
- ◆ 不能在产热源的附近使用或存放电芯，比如火源或加热炉。
- ◆ 充电时必需使用符合规格的充电器。
- ◆ 请勿将正负板接反。
- ◆ 请勿将电芯直接连接到墙上插座或车载点烟式插座上。
- ◆ 请勿将电芯投入火中或给电芯加热。
- ◆ 禁止用导线或其它金属物体将电芯正负极短路。
- ◆ 禁止将电芯与项链、发夹或其它金属物体一起运输或贮存。
- ◆ 禁止撞击、投掷电芯，使电芯受到硬物撞击。
- ◆ 禁止直接焊接电芯端子。
- ◆ 禁止用钉子或其它尖锐物体刺穿电芯壳体，禁止锤击或脚踏电芯。
- ◆ 禁止以任何方式分解电芯。
- ◆ 过放电会导致电池功能的丧失，并破坏电池的内部结构；当电池因未使用自放电至单节电压低于 3V 时，这样的电池需报废不能再进行充电使用，如继续使用会有胀气及起火的风险。

WARNINGS!

The cell will fire, explode or leak if not strictly observing this item described below.

- ◆ Do not immerse the cell in water or seawater, and keep the cell in a cool dry environment during stands by period.
- ◆ Do not mix using the cell with one-off cell (such as dry cell) or different performance together.
- ◆ Keep all batteries out of the reach of little children. Consult a doctor immediately if a cell is swallowed.
- ◆ Do not use or leave the cell near a heat source such as fire or heater.
- ◆ When re-charging , use the cell charger specifically for that purpose.
- ◆ Do not reverse the positive (+) and negative (-) terminals.
- ◆ Do not connect the cell to an electrical outlet.
- ◆ Do not dispose the cell in fire or heat.
- ◆ Do not short-circuit the cell by directly connecting the positive (+) and negative (-) terminals with metal objects such as wire.
- ◆ Do not transport or store the cell together with metal objects such as necklaces, hairpins etc.
- ◆ Do not strike or throw the cell against hard surface.
- ◆ Do not directly solder the cell .
- ◆ Do not pierce the cell with a nail or other sharp object.
- ◆ Never disassembling the cell in any way.
- ◆ Overdischarge will lead to the loss of the battery function and damage the internal structure of the battery. When the battery with a single cell voltage less than 3V by self-discharge due to unused , the battery must be scrapped and can not be used anymore, continued use will have risk of gassing and fire.

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注 意!

- ◆ 不要在极热环境中使用或者储存电芯，如阳光直射或热天的车内。否则，电芯会过热，可能着火（点燃），这样就会影响电芯的性能、缩短电芯的使用寿命。
- ◆ 不要在强静电场所使用电芯，否则电子保护装置可能会受到损坏导致危险事故。
- ◆ 如果电芯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。
- ◆ 如果电芯发出异味、发热、变形、变色或出现其它任何异常现象时不得使用；如果电芯正在使用或充电，应立即从用电器中或充电器上取出并停止使用。
- ◆ 如果电芯的端子变脏，使用前用干布擦干净。否则电芯会接触不良，从而引起能量损耗或无法充电。
- ◆ 随意丢弃电芯可能会导致火灾，处理电芯前需要把电芯 100%放电并用绝缘胶带把电芯的输出端进行绝缘。

CAUTIONS!

- ◆ Do not use or leave the cell at very high temperature (for example, at strong direct sunlight or in a vehicle in extremely hot weather). Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be shortened.
- ◆ Do not use it in a location where static electricity is rich, otherwise, the safety devices may be damaged, causing a harmful situation.
- ◆ In case the electrolyte getting into the eyes due to the leakage of cell, do not rub the eyes! Rinse the eyes with clean running water, and seek medical attention immediately. Otherwise, it may injure eyes or cause a loss of sight.
- ◆ If the cell gives off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use, recharging or storage, immediately remove it from the device or cell charger and place it in a contained vessel such as a metal box.
- ◆ In case the cell terminals are contaminated, clean the terminals with a dry cloth before use. Otherwise power failure or charge failure may occur due to the poor connection between the cell and the electronic circuitry of the instrument.
- ◆ Be aware discarded batteries may cause fire, 100%discharged the cell and tape the cell terminals to insulate them before disposal.

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Fig.1 Dimensional Drawing of 743476-40C-1600mAh

