AML9017

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1. PREFACE

序　言

SCOPE（使用范围）

Name（名称）**:** ■ Li-ion battery（液态锂离子电池）

□ Polymer Li-ion battery（聚合物锂离子电池）

（型号）

Spec（规格）**:** 3.7/2000mAh

Edition（版本）**:** A/0

This product approval sheet has 9 pages (include the first page)

本产品承认书共 9 页（ 含首页).

This product approval sheet includes technical features, testing method, external

connection graph, packing and so on.

本产品承认书包含:技术参数,检测方式,外形尺寸图外部连接图,包装等.

Amendment on this product approval sheet content must depend on below condition:

本产品承认书所归属内容的修改必须依据以下条件:

1. Customer's request or agreement.

   客户要求或同意.

2. Safety guarantee and no influence to machine which the battery used in.

   安全保证且与电池使用机器不产生影响.

We can give mass production after the agreement of "battery approval sheet" and sample with the customer. Designed by Roofer R&D team, this approval sheet will be the basis of test.

本《产品承认书》由我司开发部编制，经由我司与客户签准《产品承认书》和样品后，方可进行产品之量产，并作为双方检测之依据。

2.Technical Features 技术参数

Item 项目	Rated performance 性　能	Note 备注
2.1 Rated Voltage 额定电压	3.7V	
2.2 Discharge Cut-off Voltage 放电终止电压	3V	
2.3 Rated Capacity 额定容量	2000mAh	0.2C Discharge 0.2C 放电
2.4 Limited Charge Voltage 充电限压	4.2VDC	
2.5 Charge Method 充电方式	CC-CV (Constant Current With Constant Voltage) 先恒流后恒压(CC-CV)	
2.6 Standard Charge Current 标准充电电流	400mA	0.2C
2.7 Quick Charge Current 快速充电电流	2000mA	1C
2.8 Max Discharge Current 最大放电电流	2000mA	1C

2.9 Initial Internal Resistance 总内阻	Charge terminal 充电端	---	AC 1kHz (AC Impedance) AC 1kHz 交流阻抗值
	Discharge terminal 放电端	≤240mΩ	
2.10 Weight Per Battery 单体电池重量		≤37.5g	Electronic scale (W/O Packing Materials) 电子秤(不含包装材料)
2.11 Battery Size 外型尺寸		L=51.5mm MAX W=34.2mm MAX H=10.2mm MAX	Calipers 卡尺
2.12.Operating Temperature 工作温度范围	Charge 充电	0˚C ～ +45˚C	Humidity 65±20% 湿度 65±20%
	Discharge 放电	-20˚C ～ +60˚C	Humidity 65±20% 湿度 65±20%
2.13 Storage Temperature 贮存温度范围	Standing Storage (less than one year 长期贮存(1 年内)	-20˚C ～ +35˚C	Humidity 65±20% 湿度 65±20%
	Notes(说明): 1. Period of storage is counted from shipping date 贮存时间以出货日期为起始点计算； 2. Test Method and standard listed as below, environment temperature (15～25)℃, CC/CV mode, 0.2C constant current charge to 4.2V, then constant voltage charge mode, cut off current 0.01C，0.2C constant current discharge, cut off voltage 3.0V，more than 5 hours discharging time. 测试方法及标准如下：环境温度(15～25)℃,CC/CV 方式,0.2C 恒流充电到 4.2V,再恒压充电方式,截止电流 0.01C 电流，0.2C 恒流放电,截止电压 3.0V，放电时间大于 5 小时。		

3.Test (测试)

3.1 Testing Environment（测试条件）:

3.1.1 Test time should be no more than one month after receive the battery
测试电池为用户收到后不超过 1 个月的产品.

3.1.2 Testing Environment(测试环境):
Humidity(温度): 15℃--25℃
Relative Humidity(相对湿度): 45%--85%
Atmospheric Pressure(大气压力): 76kPa--106kPa

3.2 Testing Instrument(测试工具):

3.2.1 Voltage meter 0.5 grade or more regulated by IEC 51/IEC 485, more than 10KΩ/V internal resistance

电压计　IEC 51/IEC 485 所规定的 0.5 级或以上，内阻大于 10KΩ/V

3.2.2 Current meter 0.5 grade or more regulated by IEC 51/IEC 485, include wire resistance less than 0.01Ω.
电流计　IEC 51/IEC 485 所规定的 0.5 级或以上，包括引线总电阻小于 0.01Ω.

3.2.3 Calipers Definition 0.02mm
卡尺　精确度 0.02mm

3.2.4 Internal Resistance Meter　AC 1KHz 4 terminal measure setting.
内阻仪　交流 1KHz 4 端子测量装置.

3.2.5 Load Resistance　Include external circuitry, allowed resistance figure error is ±5%.
负载电阻　包括外部线路,电阻值允许误差为±5%.

3.2.6 Finished Battery Product Testing Machine
成品电池测试仪

3.3 Test method and request (检测方法与要求)

Item 项 目			Test Method 检测方法	Request 要 求
1	Appearance 外观		By sight：30CM vertically 目测：垂直 30CM。	Case appearance should be smooth w/o nick, burr and other mechanical damage. Exposed metallic part should not be Oxidized. Case should not be distorted. 外壳表面应平整无划痕、毛刺及其他机械损伤,外露金属部分不应有氧化现象、胶壳不能变形。
2	Insulation Resistance 绝缘电阻		Test the external packing of battery and insulation between poles using insulation-meter 用兆欧表测量电池外包装及电极之间的绝缘度。	More than 10MΩ 大于 10MΩ
3	Nominal Capacity 标称容量	Charging 充电方式	Environment temperature (15～25) ℃, CC/CV mode, 0.2C constant current charge to 4.2V, then constant voltage charge mode, cut off current 0.01C 环境温度(15～25)℃,CC/CV 方式,0.2C 恒流充电到 4.2V,再恒压充电方式,截止电流 0.01C。	1) Discharging time: ≥5 hours. 放电时间:≥5 小时。 2) No distortion on appearance, no burst and no leak 电池外观应无变形、无爆裂、漏液。
		Discharging 放电方式	Environment temperature (15～25)℃, 0.2C constant current discharge, cut off current 3.0V 环境温度(15～25)℃,0.2C 恒流放电,截止电压 3.0V。	

4	Internal Resistance 内阻	AC testing method. In half capacity condition, using AC 1kHz testing method to measure the internal resistance figure between poles in battery connector. 交流测试法,半容量状态下,使用 AC 1kHz 检测方法,测量电池接口处正负极之间的内阻。	Charge terminal/充电端：--- Discharge terminal/放电端： ≤240mΩ
	High temperature Resistant Capability 抗高温性能	1).Use nominal capacity charging method full charge the battery,then keep 0.5h～1h. 按标称容量充电方法将电池充饱电后，搁置 0.5 小时～1 小时。 2).Put full-charged battery in 60℃±2℃ thermostat for 2h，then use 1C discharge to 3.0V 将充饱电的电池置入 60℃±2℃恒温箱中存放 2h 后，并以 1C 放电至 3.0V。	1).After test, 1C capacity should be ≥54 minutes. 实验后的 1C 容量应≥54 分钟。 2).Case appearance should not be distorted and crack. 电池外观应无变形、无爆裂。
6	Low temperature Resistant Capability 抗低温性能	1).Use nominal capacity charging method full charge the battery, then keep 0.5h～1h. 按标称容量充电方法将电池充饱电后，搁置 0.5 小时～1 小时。 2).Put full-charged battery in -20℃ ± 2℃ chest freezer for 24h，then use 0.2C discharge to 3.0V 将充饱电的电池置放在-20℃±2℃冷冻柜中 24h 后，并以 0.2C 放电至 3.0V。	1).After test, 0.2C capacity should be ≥3.5 hours。 实验后的 0.2C 容量应≥3.5 小时。 2). Case appearance should not be distorted and crack. 电池外观应无变形、无爆裂。
7	Cycle Life 循环寿命	After 400 cycles of complete charge and discharge at 1C current, and record the capacity。When the time between twice discharging less than 42 minutes, cycle life should be ending. 以 1C 的电流对电池做充放电循环，并记录容量。当连续两次放电时间小于 42 分钟时，则认为寿命终止。	Battery should not explode smoke, burn or burst. 1C charge and discharge cycle life should more than 300 times 电池不能有爆炸,冒烟,燃烧,变形等现象。1C 充放电循环寿命应≥400 次。
8	Vibration Proof Capability 抗振动性能	After standard charged, keep for 0.5h~1h,then installed onto the vibration test with clamps. Equipment parameters of frequency and amplitude are as follows(the frequency is to be varied at the rate of 1oct/min between 10Hz～55Hz, and repeat vibration for 30min. The battery is to be tested in three mutually perpendicular directions): frequency:10Hz～30Hz amplitude: 0.38mm frequency:30Hz～55Hz amplitude: 0.19mm 电池按标准充满电后，搁置 0.5～1 小时。然后将电池用夹具固定在振动台的台面上，按下面的振动频率和对应的振幅调整好实验设备。X、Y、Z 三个方向每个方向上从 10Hz～55Hz 循环扫频振动 30min，扫频速率为 1 oct/min: 振动频率：10Hz～30Hz 位移幅值（单振幅）：0.38mm 振动频率：30Hz～55Hz 位移幅值（单振幅）：0.19mm	1) Battery appearance should not be obvious nick, leak, smoke and burst. 电池外观应无明显损伤、漏液、冒烟或爆炸。 2) After test, no defect in electrical performance, and voltage≥3.7V. 实验后,电池插入相应机型接触良好，且电池端电压应≥3.7V。

9	Fall Proof Capability 抗跌落性能	After complete charge, the battery is to be drop to a armor plate(18mm～20mm thick) placed on a cement floor from a height of 1.2 meter for 14 times.(fall down by six sides and one corner). 将充满电的电池由高度 1.2 米的位置自由跌落在 18mm～20mm 厚的钢板上，一共跌落 14 次（六个面每个面跌落一次，另加跌一角，共两个循环）。	1) Battery should not be leak, smoke and burst. 电池应不漏液、不冒烟、不爆炸。 2) After test, no defect in electrical performance, and voltage≥3.7V. 实验后,电池插入相应机型接触良好，且电池端电压应≥3.7V。
11	Capacity Retention 荷电保持能力	1).In environmental temperature 20℃± 5℃ condition, Use nominal capacity charging method full charge the battery. 在环境温度 20℃±5℃条件下，按标称容量充电方法将电池充饱电。 2) Lay the battery opened circuit 28 days, then use 0.2C discharge it to cut off voltage. 将电池开路搁置 28 天,再以 0.2C 放电至终止电压。	0.2C discharging time should no less than 90%. 0.2C 放电时间应不低于 90%.
12	Constant Temperature and Humidity Proof Capability 抗恒定湿热性能	After standard charged, keep for 0.5h～1h,then Lay the battery in temperature 40±2℃ and humidity 90%～95% environmental chambers for 60 hours. Then lay the battery in environmental temperature 20±5℃condition for 2 hours. Later discharge it in 0.2C and record the capacity. 电池在标准充电后，搁置 0.5 小时～1 小时，然后将电池放入 40℃±2℃，相对湿度为 90%～95%的恒温恒湿箱中搁置 60 小时后，将电池取出在环境温度 20℃±5℃的条件下搁置 2h，以 0.2C 放电，并记录容量。	1) Battery appearance should not be obvious nick, leak, smoke and burst. 电池外观应无明显变形锈蚀、冒烟或爆炸。 2) 0.2C discharging capacity should no less than 80%. 0.2C 放电容量应≥80%。

3.4. Shipping Voltage (Inspection before shipment): ≥3.7V

出货空载电压(出货前检测): ≥3.7V

4.Protection Capability Test Method and Request

保护性能检测与要求

Item 项目		Test Method 检测方法	Request 要求
1	Overcharge Test 过充测试	Apply a 5V voltage and a 1C charge current on the battery for 10 hours. 用恒压源持续加载 10hs，恒流恒压源电压设定为 5V，电流设定为 1C 的外接电流。	Battery could not be burst, burn, leak and smoke 电池应不爆炸、不起火、不冒烟或漏液。

2	Over discharge Test 过放测试	Discharge the battery at 1C to cut off voltage，then discharge with loading 30Ω for 24hs. 以 1C 放电至终止电压后外接 30Ω 负载放电 24H。	Battery could not be burst, burn, leak and smoke 电池应不爆炸. 不起火. 不冒烟或漏液。
3	Over-current protection 过电流保护	1) The battery is fully charged to rated capacity. 按标称容量充电方法将电池充饱电。 2) Load current at 0.2A/S to cut off the output of the battery. 以 0.2A/S 的速度加载线性电流,致使电池切断输出。	Battery could not be burst, burn, leak and smoke 电池应不爆炸.不起火.不冒烟或漏液。
4	Pack Short-circuit Protection 短路保护	1) The battery is charged to rated capacity. 按标称容量充电方法将电池充饱电。 2) The battery is to be short-circuited by connecting the positive and negative terminals of the battery with thermocouple having a maximum resistance load of 0.1Ω for 1h. 将接有热电偶的电池置于通风橱中，将电池正负极用 0.1Ω 电阻器持续短路 1h。	Battery could not be burst, burn, leak and smoke After charging. 电池应不爆炸、不起火、不冒烟或漏液。 After charging，the battery can be used normally. 充电后，可正常使用。

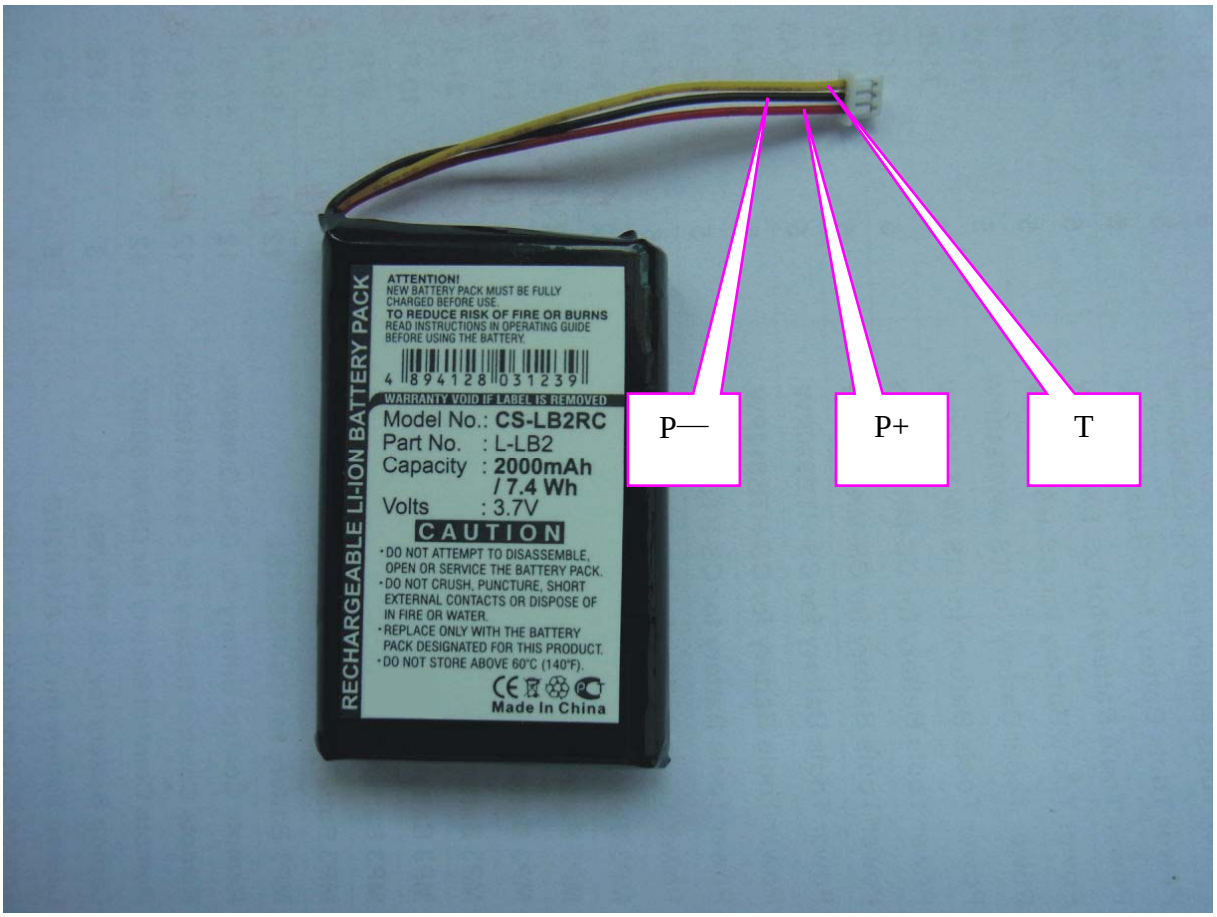
5. Cell（电芯）

1) **Chem:** Li-ion Cell
   类别： 锂离子电芯

2) **Spec:** 103450AR/3.7V/2000mAh （HF）
3) **规格：** 103450AR/3.7V/2000mAh （HF）

6. OUTLINE (外观尺寸):

L=51.5mm MAX W=34.2mm MAX H=10.2mm MAX



黑线 P-　是充放电负极　　**红线 P+ 是充放电正极**

黄线 T 是电池识别电阻=10K±1K

7. PCM Electronic Characteristic / 保护板电气参数

Over-charging voltage protection 过充电压保护	Over-discharging voltage protection 过放电压保护	Over-current protection figure 过电流保护	Short-circuit protection time 短路保护时间	Quiescent current 静态电流
4.3V±25mV	2.45V±60mV	3.5A±0.5A	≤300us	≤8uA

8. Packing / 包装

Packing method, as the customer required.
包装方法按客户要求进行包装。