Li-ion Battery Specification

锂离子电池规格书

MODEL

型 号: NH2400 电池（单片机方案）

Nominal Capacity

标 称 容 量: 1.5V / 2400mAh

Customer

客 户:

Total Page

文件页数: 12

Registered 编制	Approved 批准

Customer Approve 客户确认		
Material code 物料编码		
Dept. 部门	Signature 签名	Date 日期
QA Dept 品质		
R&D Dept 研发		
Approved 批准		

Content

1. MODIFIED LIST

修订履历

Product Modified Record List

产品变更履历表

Revision 版本	Date 日期	Modified content 变更内容	Remarks 备注
A1	2024-8-27	初版发行	
A2	2024-9-10	电池放电截至电压由0.8V调整为0.9V; TYPE-C充电电流调整为380±50mA；并增加电池标签图示；	

2 .Scope 适用范围

This specification describes the basic performance, technical requirements, test methods, warnings and precautions of lithium-ion rechargeable batteries. This specification only applies to Dongguan Angyue Electronics Co., Ltd.The battery complies with the GB31241-2014 test standard and ROHS standard;

本标准规定了锂离子可充电池的基本性能、技术要求、测试方法及注意事项，本标准只适用于东莞市昂跃电子有限公司。电池符合 GB31241-2014 测试标准和 ROHS 标准;

3.Specification 产品规格

NO. 序号	Item 项目	Specifications 规格要求
	Cell model 电芯型号	13430-1000mAh
3.1	Typical Capacity 典型容量	2400mAh /1.5V @ 0.2C Discharge (0.2C 放电)
	Minimum capacity 最小容量	2200mAh /1.5V @ 0.2C Discharge (0.2C 放电)
3.2	Nominal voltage 标称电压	1.5V
3.3	Standard Charge 标准充电	0.4A, 5.0V (TYPE-C 端口）
3.4	Standard Discharge 标准放电	0.48A, 0.9V （电池二头）
3.5	End-of-charge Voltage 充电电压	5.0V (TYPE-C 端口）
3.6	End-of-charge Current 充电截止电流	40mA
3.7	End-of-discharge Voltage 放电截止电压	0.9 V
3.8	Standard Charging Time 标准充电时间	4.5hours（standard charge） 4.5 小时
3.9	Quick Charge Current 快速充电电流	380mA (TYPE-C 端口）
3.10	Fast discharge current 连续放电电流	1500mA （电路根据电压调整放电电流）
3.11	Max Discharge Current 最大放电电流	2000mA （电路根据电压调整放电电流）
3.12	Initial Impedance 初始内阻	Max:300mΩ
3.13	Weight 重量	Approx(约)：21.5g
3.14	Operating temperature 工作温度	Charging(充电)： 0℃~45℃ Discharging(放电)：-20℃~60℃
3.15	Storage temperature 储存温度	-5℃~30℃
3.16	Storage Humidity 储存湿度	≤75% RH
3.17	Appearance 外观	Without scratch, distortion, contamination and leakage (无划痕、变形、污迹、电解液泄露)
3.18	Standard environmental condition 标准环境	Temperature(温度) ： 25±2℃ Humidity（湿度） ： 45-75%RH Atmospheric Pressure（大气压） ： 86-106 KPA
3.19	出货电压 Shipment voltage	1.5V (电芯电压:3.60-3.90V)

3.20	Temperature Dependence of Discharge Capacity 放电容量与温度的相互关系 @ 0.2C Discharge (0.2C 放电)					
Charge temperature	Discharge temperature					
25℃	-10℃	0℃	25℃	45℃	60℃	
Relative Capacity	70%	80%	100%	95%	93%	
3.21	Rate discharge capability 不同倍率放电特性 @ 0.5C Charge (0.5C 充电)					
Charge temperature	Discharge Current					
25℃	0.2C	1.0A	1.5A	/	/	
Relative Capacity	≥100% &min	≥95% &min	≥90% &min	/	/	

4 General Performance 常规性能

No.	Item 项目	Test Methods and Condition 测试方法和条件	Criteria 标准
4.1	0.2C Capacity 0.2C 容量	After standard charging, rest battery for 10min, then discharging at 0.2C to voltage 0.9V, recording the discharging time. 标准充饱电后,搁置 10 分钟,然后用 0.2C 电流放电至 0.9V, 所记录放电时间	≥2200 mAh
4.2	Cycle Life 循环寿命	First, use a charger with TYPE-C charging cable, connect the battery, and the charging light will change from red to green. Let it stand for 10 minutes, then discharge the two ends of the battery with a current of 0.5C to 0.9V; Leave it aside for another 10 minutes and repeat the above steps until the discharge capacity is 80% of the initial capacity 先用带有 TYPE-C 充电线的充电器，连接电池，电池充电由红灯转为绿灯，搁置 10 分钟，将电池二头用 0.5C 电流放电至 0.9V；又搁置 10 分钟，重复以上步骤，直到放电容量是初始容量的 80%	≥300 times(次)
4.3	Capability of keeping electricity 荷电保持能力	20±5℃, After standard charging, rest the battery 28days, discharging at 0.2C to voltage 0.9V, recording the discharging time. 在 20±5℃状态下,标准充饱电后,电芯搁置 28 天,然后用 0.2C 放电至 0.9V,所记录放电时间.	≥80%

5 Environment Performance 环境性能

No.	Item 项目	Test Methods and Condition 测试方法和条件	Criteria 标准
5.1	Discharge at high temperature 高温放电	After standard charging, rest the cells 2h at 60±2℃, then discharging at 0.2C to voltage 0.9V, recording the discharging time. 标准充电后，在 60±2℃条件下贮存 2h，然后用 0.2C 放电至 0.9V,所记录放电时间.	≥93%
5.2	Discharge at low temperature 低温放电	After standard charging, rest the cells for 4h at -20±2℃, then discharging at 0.2C to voltage 0.9V, recording the discharging time. 标准充电后，在-20±2℃条件下贮存 4h，然后用 0.2C 放电至 0.9V,所记录放电时间.	≥60%
5.3	Thermal shock 热冲击	Put the cells in the oven. The temperature of the oven is to be raised at 5±2℃ per minute to a temperature of 130±2℃ and remains 30 minutes. 将电池放进烘箱内，以 5±2℃/min 速度升高烘箱内温度至 130±2℃后,恒温 30min.	No fire，no explosion 不起火，不爆炸
5.4	Temperature cycling 温度循环	After charged at a constant current of 0.5C The fully cells are to be placed in a test chamber and subjected to the following cycles: a) Raising the chamber temperature to 75±2℃ within 30 min and maintaining this temperature for 6h. b) Reducing the chamber temperature to minus 40±2℃ within 30 min and maintaining this temperature for 6h. c) The temperature should be changed within 30 min. d) Repeating the sequence for total 10 cycles. e) After 10 cycles, storing the cells for a minimum of 2h at room temperature, andexaminate the cell)　　电芯以 0.5C 电流充电,将电芯放置在温度为 20±5℃的温控箱体中进行如下步骤：a）将样品放入温度为 75±2℃的实验箱 中保持 6 小时；b）将实验箱温度降为-40±2℃，并保持 6 小时；c）温度转换时间不大于 30min；d）重复 a) ～b)，共循环 10 次；e）温度循环后，将电芯取出并恢复至室温搁置至少 2h，检查电芯外观。	No fire，no explosion and no leakage 不起火，不爆炸，不漏液
5.5	Shock Drop 跌落测试	Fully charge the battery according to the standard, and then drop it from 1.0 meter to the concrete floor (round drop 4 times, square 6 sides). The height of the battery above 1000mAh is 1 meter, and the height of the battery below 1000mAh is 1.5 meters.将电池按标准充满电，然后从 1.0 米跌落至水泥地板（圆形跌落 4 次，方形 6 个面）容量 1000mAh 以上电池跌落高度为 1 米,容量 1000mAh 以下电池跌落高度为 1.5 米	No fire，no explosion 不起火，不爆炸

5.6	Vibration 振动测试	Vibrated the Battery Cell in triaxial direction for 90 mins. per axis in condition of frequency 10-55 Hz (1 Hz per min.) and amplitude 1.6 mm p-p 在 X、 Y、 Z 三个垂直的方向上振动锂电池粒 90 分钟， 每个 方向的振动频率: 10-55 HZ (每分钟 1 HZ)， 振幅: 1.6 mm p-p.	No fire，no explosion and no leakage 不起火，不爆炸，不漏液

6 Safe Characteristic 安全性能

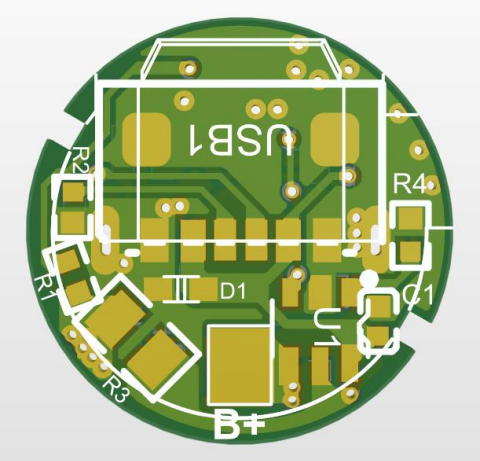
No.	Item 项目	Test Methods and Condition 测试方法和条件	Criteria 标准
6.1	Over charge testing 过充测试	At 23 ± 5 ℃, charging cells with constant current 3C to voltage 4.6V, Stop test till cells temperature 20% lower than max temperature. 在 23±5℃状态下, 电池用 3C 电流充电至 4.6V, 监视电池温度变化, 当电池温度下降一峰值低约 20% 时, 停止实验.	No fire，no explosion 不起火，不爆炸
6.2	Over discharge testing 过放测试	At 23±5℃, According to the requirements of standard charge, the cells will be discharge to cut-off voltage, then connect with external load of 30 ohm for 24 hours. 在 23±5℃状态下， 按标准放电的要求放电至终止电压后, 外接 30Ω负载放电 24 小时.	No fire，no explosion and no leakage 不起火，不爆炸，不漏液
6.3	Short-circuit testing 常温外部短路	At 20 ± 5 ℃, After standard charging, connect cells anode and cathode by wire which impedance less than 80±20mΩ, keep 24h. 在 20±5℃状态下, 标准充电后, 将电池的正负极用一根小于 80±20mΩ的导线连接, 放置 24 小时.	No fire，no explosion 不起火，不爆炸
6.4	Short-circuit testing 高温外部短路	At 60±2℃, After standard charging, connect cells anode and cathode by wire which impedance less than 80±20mΩ, keep 24h. 在 60±2℃状态下,标准充电后,将电池的正负极用一根小于 80±20mΩ的导线连接,放置 24 小时.	No fire，no explosion 不起火，不爆炸
6.5	Crush test 挤压测试	After charging a cell following the standard charge method, the cell shall be crushed between two flat surfaces. The direction of the crushing force shall be vertical to axis of the cylinder. The crushing force is to be applied by a hydraulic ram with a 32mm diameter piston. Crushing force is approximately 13 KN. Once the maximum pressure has been obtained it is to be released. 电芯按照标准充电方式充满电后，放在两个平整的表面进行挤压测试，压力器必须施加一个与圆柱电芯轴向垂直的力，平压于电芯。采用 32 mm 直径的液压活塞，所用压力为 13 KN，一旦达到最大压力值，即释放压力	No fire、 No explode 电芯不起火、不爆炸
6.6	Impact test 重物冲击测试	Cell shall first be charged according to standard charge method， then the battery cell was placed on a flat surface so that the longitudinal axis of the battery cell shall be parallel with it. A 15.8mm diameter bar is to be placed across the center of the sample. A.9.1kg weight is to be dropped from a height of 61cm on the sample. 电芯按照标准充电方式充满电后，水平放置于一个与电芯纵轴平行的平板。将一直径 Φ15.8mm 的棒放在样品中心，让重量 9.1kg 的重物从 610mm 的高度落到实验电芯上	No fire、 No explode 电芯不起火、不爆炸

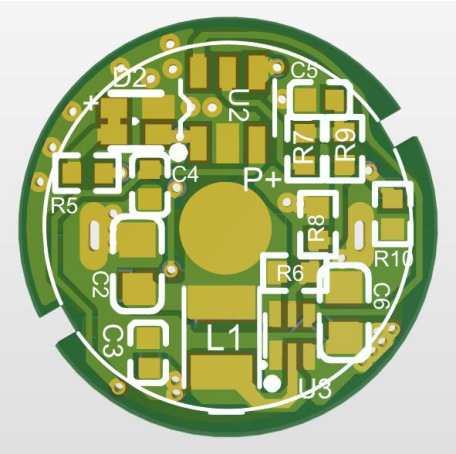
※ Above testing of safe characteristic must be with protective equipment.(安全性能测试应在有保护措施下进行)

7.1 电池参数

序号	内容	参数
1	输出电压范围	0.90~1.65V
2	输出带载能力	0~2.5A
3	无负载休眠电流	50~70uA
4	锂电池充电电压	5.0±0.2V
5	锂电池充电电流	380±50mA
6	锂电池过放电压	2.7V±50mV
7	过流保护电流	2.7A±100mA
8	短路保护	有
9	锂电池过充保护电压	4.25V±50mV
10	锂电池过放保护电压	2.7V±50mV
11	锂电池温度保护	无（充电芯片 140℃过热保护）
12	充电指示灯	充电红灯，满电绿灯
13	多节电池串联功能	支持多节串联使用
14	电路内阻	<100mΩ
15	放电均值电压	1.3V
输出电压与内部锂电池对应关系（负载电流 100mA）		
16	4.0V	1.58V
17	3.8V	1.49V
18	3.6V	1.36V
19	3.4V	1.25V
20	3.2V	1.16V
21	3.0V	1.09V
22	2.8V	1.02V
23	2.7V	低压关闭输出
输出电压与输出电流关系（电池电压 4.0V 下测试）		
24	10mA	1.60V
25	100mA	1.58V
26	500mA	1.54V
27	1000mA	1.45V
28	1500mA	1.33V
29	2000mA	1.25V
30	2500mA	1.12V

7.2 保护板正反面图片

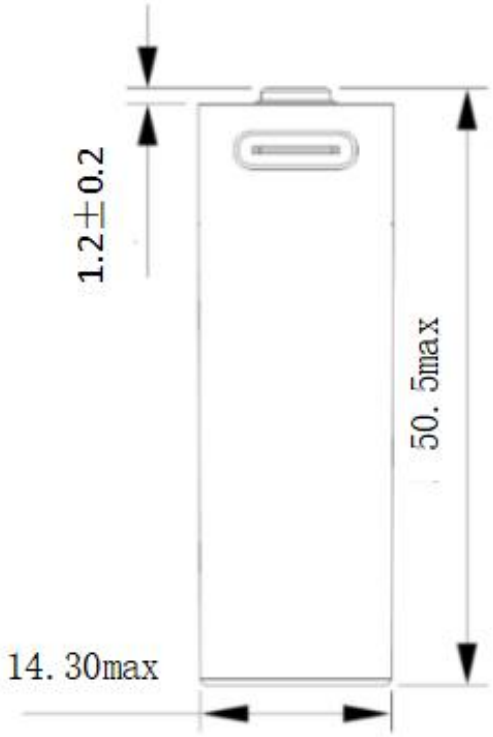




7.3 保护板 BOM 清单

序号	名称	规格	封装	丝印号	数量
1	PCB	13.5*13.5mm 0.7mm 双面 FR4			
2	贴片电阻	0.1R /±1% (0.5W)	0805_R	R3	1
3		1K /±1%	0402_R	R5	1
4		2.2K /±1%	0402_R	R4	1
5		5.1K /±1%	0402_R	R2, R10	2
6		10K /±1%	0402_R	R1	1
7		160K /±1%	0402_R	R8	1
8		220K /±1%	0402_R	R6	1
9		300K /±1%	0402_R	R7, R9	2
10	贴片电感	1uH_2520	2520	L1	1
11	贴片电容	1uF/10V/±20%/X5R	0402_C	C4, C5	2
13		4.7uF/10V/±20%/X5R	0402_C	C1, C3	2
14		22uF/10V/±20%/X5R	0603_C	C2, C6	2
15	TYPE-C-6P 母座	USB-TYPE-C-6P	Type-C_6P	USB1	1
16	双向 TVS 管	5V 双向 TVS 管	SOD-523	D1	1
17	红绿双色 LED	红绿双色 LED 1615	1615	D2	1
18	充电+锂保芯片	C6106	SOT-23-6	U1	1
19	DCDC 降压芯片	C1163	SOT-563-6	U3	1
20	MCU 主控芯片	C8121	SOT-23-6	U2	1

7.2 电池尺寸图



7.3 电池标签图

8. CAUTIONS IN USE 使用警告

To ensure proper use of the battery please read the manual carefully before using it. Handling
为了使电池安全的使用及处理请在使用前认真的阅读操作说明

- Do not expose to, dispose of the battery in fire.
- 不能把电池曝晒或丢在火中
- Do not put the battery in a charger or equipment with wrong terminals connected.
- 电池充电时不能把正负极性装反
- Avoid shorting the battery
- 避免短路电池
- Avoid excessive physical shock or vibration.
- 避免过分的物理震动和冲击电池
- Do not disassemble or deform the battery.
- 不能拆解或使电池变形
- Do not immerse in water.
- 不能将电池浸入水中
- Do not use the battery mixed with other different make, type, or model batteries.
- 不能将其它不同厂家，类型，型号的电池混合使用
- Keep out of the reach of children.
- 禁止小孩接触电池

charge and discharge 充放电

- Battery must be charged in appropriate charger only.
- 电池必须在合适的条件下充电
- Never use a modified or damaged charger.
- 决不能用故障的充电器给电池充电
- Do not leave battery in charger over 24 hours.
- 电池持续充电不能超过 24H

. storage 贮存

- Store the battery in a cool, dry and well-ventilated area.
- 电池贮藏在通风干燥的环境中

. disposal 处理

- Regulations vary for different countries. Dispose of in accordance with local regulations.
- 不同国家法规的不同，处理时根据当地的法规。

9. Battery operation instruction 电池操作说明

9.1 Charging 充电

Charging current：Cannot surpass the biggest charging current which in this specification book stipulated。
充电电流：不能超过规格书规定的最大的充电电流

Charging voltage：Does not have to surpass the highest amount which in this specification book stipulated to decide the voltage。
充电电压：不能超过规格书规定的最高的限制电压

Charge temperature：The battery must carry on the charge in the ambient temperature scope which this specification book stipulated。
充电温度：电池充电温度必须按照规格书的温度范围执行

Uses the constant electric current and the constant voltage way charge, the prohibition reverse charges. If the battery positive electrode and the cathode meet instead, can damage the battery。
先恒流后恒压方式充电，禁止颠倒的方式充电。如果电池正负极颠倒充电会带来危险。

9.2 Discharging current 放电电流

The discharging current does not have to surpass this specification book stipulation the biggest discharging current, the oversized electric current electric discharge can cause the battery capacity play to reduce and to cause the battery heat。

电池放电电流不能超过规格书规定的最大放电电流，过大的电流放电会造成电池发热和容量衰减。

9.3 discharge temperature 放电温度

The battery discharge must carry on in the ambient temperature scope which this specification book stipulated

电池放电温度必须按照规格书的温度范围执行

9.4 Over-discharges 过放电

After the short time excessively discharges charges immediately cannot affect the use, but the long time excessively discharges can cause the battery the performance, battery function losing. The battery long-term has not used, has the possibility to be able to be at because of its automatic flashover characteristic certain excessively discharges the condition, for prevented excessively discharges the occurrence, the battery should maintain the certain electric quantity。

短时间的的过放电后立即充电不影响电池的使用，但是长时间的过放电会影响到电池的功能失效，电池永久性不能适用，电池可能过放还有一个原因是自动能量的消失。预防电池过放出现的方法是电池应保持一定的电量。

9.5 Storing the Batteries 贮存电池。

The battery should store in the product specification book stipulation temperature range. If has surpasses above for six months the long time storage, suggested you should carry on additional charge to the battery。

电池贮存在规格书规定的温度范围内，如果电池贮存超过六个月，建议你开始给电池充电。

9.6 Cautions for Marking 警告标志

Please indicate Lithium-ion Battery Cell Safety Cautions, based on "Marking Guideline to ensure safety of storage batteries”, on a Battery Cell pack, packing materials, and handling manuals. It should be indicated in the manner that users can fully and easily understand.

在电池组、包装物料和使用手册上，请根据 “电池安全储存指导标志”， 标志 锂离子二次充电电池的安全注意事项，表述的 方式 应该让使用者 很容易 和 清楚理解.

ONRO's recommended Marking of Battery Cells' Caution Label:

ONRO 建议的 锂电池安全说明标志：

<table>
<tr><td rowspan="2">Danger!
危险!！</td><td>■ Rechargeable Li-ion Battery Cell:14500
■ 锂离子二次充电电池:14500
■ Do not heat Battery Cells or throw them into a fire. Do not charge, use and leave Battery Cells at places of high temperature.
■ 禁止将锂电池加热或者扔进火中，禁止在高温的地方充电、使用或者放置.
■ Do not deform, short-circuit, disassemble or modify Battery Cells.
禁止使锂电池变形，短路，禁止拆卸和改装锂电池.
■ Do not let Battery Cells be immersed in or wetted with moisture, water or sea-water.
■ 禁止将锂电池浸入淡水和海水中，或者用湿气、淡水 或 海水 淋湿.
■ Do not subject Battery Cells to strong impact or throw them around.
■ 禁止对锂电池进行强力撞击或者抛掷锂电池.</td></tr>
<tr><td>Failure to observe the above cautions may cause heat, smoke, explosion and fire.
不遵守以上警示会造成锂电池发热、冒烟、爆炸和起火.</td></tr>
</table>

10. Period of Warranty 保质期

The period of warranty is one 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 customers abuse and misuse.

电池的保质期从出货之日算起为 1 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。

11. Other The Chemical Reaction 其它化学反应

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，也会缩短电池的使用寿命，或者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，这样也需要更换电池了。

12. Storage and shipment requirement 存储及运输要求

Item 项目	Conditions 环境	Permissible time 允许时间	Maximum allowable capacity loss 允许最大容量损失
Storage environment 储存环境	-20℃~ 55℃, 60% RH Max	Less than 1 month 少于 1 个月	20%
	-20℃~ 45℃, 60% RH Max	Less than 3 months 少于 3 个月	20%
	-20℃~ 20℃, 60% RH Max	Less than 1 year 少于 1 年	20%
About long time storage: If the cell needs to be stored for a long time, the cell’s storage voltage should be 3.5 ~ 3.8 V. Also, it is recommended to charge the cell every six months. 关于长期存储： 若电池需长期存储，电池的存储电压应该为 3.5 ~ 3.8 V。同时，建议每 6 个月对电池进行充电。			

13. Note: 备注

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。