对于任何细节和问题，请告诉我们
For any details and enquiry, please contact VDL；Tel:0755-29961201,Fax:0755-29961203

VDL SPECIFICATIONAPPROVAL SHEET

VDL 产品承认书

Customer Name 客户代码: 0710

Customer Product Model 客户产品型号:

Product Model 产品型号: 503035

Product Capacity 产品容量: 500mAh/3.7V

Product Code产品编码:

Assembly Plant Code 组装厂编码:

Terminal Code 终端编码:

Prepared by 制作	Checked by 审核	Approved by 批准
李龙珠	刘圣军	陈远松

Approved by customer 客户承认 (Stamp) （盖章）	Tested by 测试	Checked by 审核	Approved by 批准

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Revision History
版本履历表

Revision 版本	Description 内容描述	Modify 修改人	Approval 审批人	Date 日期
A/0	First Issue 新版发行	李龙珠	刘圣军	2022-04-15
A/1	1. 更新成品重量， 2. 更新出货电压，	李龙珠	刘圣军	2022-06-21

Contents 目录

1. Scope 概述

The specification shall be applied to Lithium-ion Polymer rechargeable battery pack manufactured by **VDL Electronics Co., LTD**. It is the basis for product design, production and inspection. Its purpose is to let the customer know the quality standard and the instruction.

本产品承认书描述 VDL 电子有限公司设计制造的可充电聚合物锂电池，它是产品设计、生产和检验的依据。其作用是让客户了解产品的质量标准及正确使用方法。

Reference standard 参考标准：

GB/T 31241-2013 中华人民共和国国家标准《蜂窝电话用锂离子电池总规范》

IEC/EN61960 欧盟锂电池标准

UL1642 美国锂电池安全标准

2.Product basic information 产品基本信息：

No.	Items 项 目	Parameter 参 数
1	Battery model电池型号	503035
2	Design scheme保护电路设计方案	S-8261DAA+DP8205
3	Minimal capacity最小容量	500mAh（0.2C Standard discharge 0.2C标准放电）
4	Typical capacity典型容量	515mAh（0.2C Standard discharge 0.2C标准放电）
5	Nominal voltage标称电压	3.7V
6	Shipment voltage出货电压	3.8-3.9V（50%-70%）
7	Charge ending voltage充电限制电压	4.2V
8	Discharge ending voltage放电终止电压	3.0V
9	Over current protection过电流保护	1.0~3.5A
10	Short circuit protection短路保护功能	Yes 有
11	AC Impedance内阻	≤200mΩ (详见9.4项 / Detail in 9.4)
12	Battery Weight电池组重量	9.9±0.5g
13	Max discharge current最大放电电流	1C（连续放电模式For continuous Discharge mode）
14	Max charge current最大充电电流	2C（连续充电模式For continuous charge mode）
15	循环寿命	500次充放电循环后，电池能恢复80%的初始容量
16	电芯锂含量	0.25g
17	材料体系	LCO+石墨
18	能量密度	403wh/L
19	PS等级	PS2

3．Battery protection characteristics 电池保护特性(Ta=25℃)

No.	Items 项 目	Parameter 参 数	condition 条件
1	Overcharge protection detection voltage 过充保护检测电压	4.280±0.050V	Battery voltage is greater than the protection voltage, and the delay time to reach, then the state of the battery into overcharge protection. 电池电压大于过充保护电压，且延时时间达到，则电池进入过充电保护状态。
2	Overcharge release voltage 过充保护恢复电压	4.080±0.050V	
3	Overcharge protection delay time 过充保护延迟时间	1000~1600mS	
4	Over discharge protection detection voltage 过放保护检测电压	3.000±0.050V	Battery voltage is less than the protection voltage, and the delay time to reach, then the state of the battery into over discharge protection. 电池电压小于过放保护电压，且延时时间达到，则电池进入过放电保护状态。
5	Over discharge release voltage 过放保护恢复电压	3.000±0.050V	
6	Over discharge protection delay time 过放保护延迟时间	115~175mS	
7	Overcurrent discharge protection current 放电过流保护电流	1.0~3.5A	Battery discharge current is greater than the protection current, and the delay time to reach, then the state of the battery into overcurrent protection 电池放电电流大于过流保护，且延时时间达到，则电池进入放电过流保护状态。
8	Overcurrent protection delay time 放电过流保护延时时间	6-10mS	
9	Current consumption (Operation) of PCM 保护板的正常状态下静态电流	≤6μA	VDD= 3.9V
10	Load resistance of PCM 保护板的空载内阻	≤70mΩ	VDD= 3.9V
11	0V charge function 0V 充电功能	Available 允许	
12	Charge overcurrent protection current 充电过流保护电流	2~8.3A	If shall stop charging for an excessive charge current at Over Current Protection current lasts for delay time 电池充电电流大于充电过流保护电流，且延时时间达到，则电池进入充电过流保护状态。
13	Charge overcurrent delay time 充电过流延迟时间	6~20ms	

4．Condition adapting characteristics 环境适应性（n=1）

No.	Items 项目	Test Method 测试方法	Criteria 标准
1	High/low Temperature 高/低温性能	After the cell fully charged at 23℃±2℃, measure the discharging capacity with discharging current 0.2C till 3.0 (V) cut off voltage at different temperature. (as compared with initial capacity) 在 23℃±2℃条件下满充电后 ,测量电池在不同温度下用 0.2 C_5A 电流放电至 3.0 (V)所放出的容量（与初始容量作为比较）。	在-10℃时 ≥70% At -10℃: ≥70% 在 55℃时 ≥95% At 55℃:≥95%
2	Invariableness humid and hot 恒定湿热	After putting the cell in the invariableness humid and hot box of 40℃±2℃ and relative humidity of 90～95% for 48 hours. Discharge the cell to 3.0*n(V) cut-off voltage at 0.2C current. 将电池放入 40℃±2℃及相对湿度为 90～95%的恒温恒湿箱中 48 小时后，再以 0.2C 电流放电至 3.0*n(V)。	No leakage, no fire, no explosion. The discharging time ≥3h. 无泄漏，无起火，无爆炸。放电时间≥3h。
3	Vibration 振动	The fully charged cell is vibrated from 90 to 100 minutes at three mutually perpendicular planes with excursion of 0.8mm, and change the frequency from 10 to 55 HZ with 1Hz/min speed. 满充电后的电池在三个相互垂直的方向按振幅 0.8mm 的谐振形式进行振动, 频率在10-55HZ以1Hz/min的速率变化，往复振动 90 至 100min.	No leakage, no fire, no explosion. 电池无漏液,无冒烟，无起火，无爆炸
4	Free fall 自由跌落	a) after the core is charged according to the test method specified in the specification, the headphone built-in core is m 1.8 drop height, the headphone box built-in core is free to drop on the concrete slab according to the drop height of 1.5 m; b) the cylindrical core and button type core are dropped once each section, the cylindrical surface is dropped twice, and a total of 4 drop tests are carried out; each side of the square type core is dropped once ,6 drop tests are carried out a)将电芯按照规格书规定的试验方法充满电后，耳机内置电芯按 1.8m 的跌落高度，耳机盒内置电芯按照 1.5m 的跌落高度，自由落体跌落于混凝土板上; b)圆柱形和纽扣型电芯两个断面各跌落一次，圆柱面跌落两次，共进行 4 次跌落试验；方型电芯每个面各跌落一次，共进行 6 次跌落试验	No fire, no explosion. 电池无冒烟，无起火，无爆炸
5	Acceleration impact 加速度冲击	the core is fixed on the impact table after being charged according to the test method specified in the specification, and the half-sine pulse impact experiment is carried out. in the initial 3 ms, the minimum average acceleration is 75 gn, the peak acceleration is 150 gn±25 gn.. pulse duration 6	No fire, no explosion. 电池无冒烟，无起火，无爆炸

		ms±1 ms. three acceleration impact tests in each direction of the core. The impact test of cylindrical core is carried out according to its axial direction and radial direction, and the impact test of square type and soft packing core is carried out in turn according to three vertical directions.电芯按照规格书规定的试验方法充满电后,固定在冲击台上,进行半正弦脉冲冲击实验,在最初的 3ms 内,最小平均加速度为 75gn,峰值加速度为 150gn± 25gn。,脉冲持续时间为 6ms± 1ms。电芯每个方向进行三次加速度冲击试验。圆柱型电芯按照其轴向和径向两个方向进行冲击试验,方型和软包装电芯按照三个相互垂直的方向依次进行冲击试验。	
6	**Heat abuse** **热滥用**	When the core is charged according to the test method specified in the specification, then the battery is placed in the test box. The temperature is heated at (5℃±2℃)/ min temperature rise rate. When the temperature in the box reaches 130℃±2℃, the temperature is constant and lasts 30 min.. 将电芯按照规格书规定的试验方法充满电后，再将电池放于试验箱中，温度以（5℃±2℃）/min 的温升速率进行升温，当箱内温度达到 130℃±2℃后恒温，并持续 30min。	No fire, no explosion. 电池无起火，无爆炸
7	**Combustion jet** **燃烧喷射**	After the electric core is charged according to the test method specified in the specification. for the test tooling If there is a slide of the core during the test, a single wire can be used to fix the core sample on the wire net; if there is no such situation, the core can not be bundled. heating the core with a flame, stop heating when the following three cases occur: a) the battery explodes; b) the battery is completely burned; c) the battery is continuously heated for 30 min, and the battery is not on fire or exploded.将电芯按照规格书规定的试验方法充满电后,再将电芯放置在试验工装的钢丝网上。如果试验过程中出现电芯滑落的情况时,可用单根金属丝把电芯样品固定在钢丝网上;如果无此类情况发生,则不可以捆绑电芯。用火焰加热电芯，当出现以下三种情况时停止加热：a）电池爆炸；b）电池完全燃烧；c）持续加热 30min，量电池未起火、未爆炸。	After testing, the components of the core (except dust-like products) or the whole core shall not penetrate through the aluminum mesh. 试验后,组成电芯的部件(粉尘状产物除外)或电芯整体不得穿透铝网。

5．Safety performance 安全性能（n=1）

No.	Items 项目	Test Method 测试方法	Criteria 标准
1	Forced discharge 强制放电	Discharge the cell to the cut-off voltage with 0.2C current and then reverse charge the cell for more than 90 mins with 1C current.电池先以 0.2C 放电至终止电压，再以 1C 电流，对电池进行反向充电，90min 以上	No fire, no explosion 无起火，无爆炸
2	Overcharge 过充电	After discharged with 0.2C to the cut-off voltage, charge the cell with 1.0C/4.6V for 7.0hrs. 0.2C 放电至截止电压后，电池用 1C /4.6V 恒流恒压充电 7.0h	No explosion, no fire 无起火、无爆炸
3	Low pressure 低气压	Put the fully charged cell in a vacuum chamber at ambient temperature 20~25℃ for 6 hrs. The vacuum environment pressure is set to be less than 11.6kPa, simulating an altitude of 15240m. 电池放在一个模拟真空的空间放置 6 小时，环境温度为 20~25℃，真空环境压力≤11.6kpa，模拟 15240m 高空低压环境	No leakage, no fire, no explosion 无泄漏，不起火，不爆炸
4	Short test 短路测试	Short circuit the fully charged cell by connecting the positive and negative terminals with resistance load 80±20 mΩ at room temperature 20~25℃. The cell remains on test for 24 hrs or until the surface temperature declines by 20 % of the maximum temperature rise, whichever is the sooner. 在室温 20~25℃下，把充满电电池的正负极用 80±20 mΩ 的负载连接起来，使电池外部短路。结束条件：测试时间 24 小时或者表面温度下降到最高温度的 20%。	No fire, no explosion. The temperature of the cell surface not exceeds 150℃. 无起火，无爆炸 电池表面温度不超过 150 ℃。
5	Soak test 浸泡测试	Put the fully charged cell into pure water, soaked for 24 hours. 把满充电的电池放进清水中浸泡 24 小时	No broken, no fire 无破裂，无起火

6	Crush test 挤压测试	A fully charged cell is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram or similar force mechanism. The flat surfaces are to be brought in contact with the cell and the crushing is to be continued until an applied force of 13 ±1kN is reached. Once the maximum force has been obtained it is to be released. 满充电池，放置在两块平面金属板间，持续施压 13±1kN 的压力，直到液压油缸施加的压力达到 13KN（17.2Mpa）时停止。	No fire, no explosion 无起火，无爆炸
7	Shock test 撞击测试	The cell is to be secured to the testing machine by means of a rigid mount which supports all mounting surfaces of the cell. Each cell shall be subjected to a total of three shocks of equal magnitude. The shocks are to be applied in each of three mutually perpendicular directions unless it has only two axes of symmetry in which case only two directions shall be tested. Each shock is to be applied in a direction normal to the face of the cell. For each shock the cell is to be accelerated in such a manner that during the initial 3ms the minimum average acceleration is 75 g (where g is the local acceleration due to gravity). The peak acceleration shall be between 125 and 175g. 在环境温度下，将电池分别按三个轴向固定在测试台面上，每个面经受等量的冲击，每一次冲击前 3ms 内平均加速度最少达到 75g(g 为重力加速度），峰值加速度达 125g 至 175g。	No leakage, no fire, no explosion 无泄漏，不起火，不爆炸
8	High Temperature Discharge 高温放电	Under ambient temperature, charge according to the standard, charge the battery to full charge, put the core into the high temperature box of 55℃±2℃ at constant temperature 2 h, then discharge to the termination voltage with 0.2 C constant current. 在环境温度下，按照标准充电，将电池充满电，将电芯放入55℃±2℃的高温箱中恒温2h，然后以0.2C恒流放电至终止电压。	Discharge time not less than 5 h 放电时间应不低于 5h
9	Low temperature discharge 低温放电	Under ambient temperature, charge according to the standard, put the core into the low temperature box of -20℃±2℃ for 4 h at constant temperature, and discharge to the termination voltage with 0.2 C constant current under the ambient condition of -20 and 2℃. 在环境温度下，按照标准充电，将电芯放入-20℃±2℃的低温箱中恒温4h后，在-20℃±2℃的环境条件下以0.2C恒流放电至终止电压。	discharge capacity shall not be less than 60% rated capacity 放电容量应不低于 60%的额定容量
10	Rate of discharge 倍率放电	Under ambient temperature, charge according to standard, stop charging, hold 0.5 h~1 h, at 23℃±2℃ ambient temperature, discharge to termination voltage according to 1 maximum rate current 在环境温度下，按照标准充电，停止充电后,搁置0.5h～1h，在23℃±2℃的环境温度下，按照1C最大倍率电流放电至终止电压。	The discharge time ≥ 51min 放电时间≥51min

11	Temperature rise test 温升试验	Discharge temperature rise test: fill the electric core according to the method specified in the specification, put the electric core into the high temperature box of 37℃±2℃ at constant temperature for 4 h, discharge the electric core at constant current to the discharge termination voltage specified by the manufacturer, and record the surface temperature change of the electric core Recharge temperature rise test: the core that completes the discharge temperature rise test is placed in the high temperature box of 37℃±2℃ and the constant temperature is shelved 0.5 h, to discharge the maximum charging current as specified by the manufacturer to the charging limit voltage specified by the manufacturer, and the surface temperature change of the core is recorded 放电温升试验：按照规格书规定的方法给电芯充满电，将电芯放入37℃±2℃的高温箱中恒温4h后，以制造商规定的最大放电电流恒流放电至制造商规定的放电终止电压，记录电芯的表面温度变化 充电温升试验：完成放电温升试验的电芯放入37℃±2℃的高温箱中恒温搁置0.5h，以制造商规定的最大充电电流恒流放电至制造商规定的充电限制电压，记录电芯的表面温度变化	The maximum surface temperature of the battery during the temperature rise test is not higher than the upper limit of the charge and discharge surface temperature of the core specified in the specification 温升试验过程中电池的表面最高温度不高于规格书中规定的电芯充放电表面温度的上限
12	Charge retention and recovery capacity at room temperature 室温荷电保持能力及恢复容量	Standard charging system: the core is first discharged to the termination voltage at an ambient temperature of 23℃±2℃ at 0.2 ItA, then charged to the charging limit voltage at 0.2 ItA, and transferred to the limiting voltage constant voltage charge until the charging current is equal to 0.02 ItA, that is, the core is charged. holding capacity: the full electric core is discharged to ℃ termination voltage at 0.2 ItA at 23℃±2 ambient temperature after 28 days of open circuit shelving at 20 and 5 ambient temperatures. recovery capacity: after 28 days of open circuit shelving at 20℃±5℃ ambient temperature, the full electric core is discharged to the termination voltage at an ambient temperature of 0.2 ItA at 23 and 2, after the core is charged according to the standard charging system, it is discharged to the termination voltage at an ambient temperature of 0.2 ItA at 23℃±2.标准充电制式：电芯首先在23℃±2℃的环境温度下以0.2ItA进行放电至终止电压，然后以0.2ItA充电至充电限制电压，转以限制电压恒压充电直至充电电流等于0.02ItA，即为电芯充满电。 保持容量：满电电芯在20℃±5℃环境温度下开路搁置28天后，在23℃±2℃环境温度下以0.2ItA放电至终止电压。 恢复容量：满电电芯在20℃±5℃环境温度下开路搁置28天后，在23℃±2℃环境温度下以0.2ItA放电至终止电压，然后电芯按照标准充电制式充满电后，在23℃±2℃环境温度下以0.2ItA放电至终止电压。	Maintain capacity requirement not less than 85% of initial capacity; No less than 90% of 90% of initial capacity 保持容量要求不低于初始容量的 85%； 恢复容量要求不低于初始容量的 90%

13	High temperature charged capacity and recovery capacity 高温荷电保持能力及恢复容量	a) charge the core according to the method specified in the specification, measure the ratio and record the thickness or diameter of the geometric center of the wide surface of the core, and then store 7 d; under ambient conditions of temperature 60℃±2℃. The thickness or diameter of the geometric center of the wide surface h, the core b) be measured and recorded under the condition of 23℃±2℃. The discharge capacity of the c) core is recorded C 0.2 current constant current discharge to the discharge termination voltage specified in the specification a)按照规格书规定的方法给电芯充满电，量取比记录电芯宽面几何中心的厚度或直径，然后在温度60℃±2℃的环境条件下存储7d； b)在23℃±2℃的环境条件下搁置4h，量取并记录电芯宽面几何中心的厚度或直径； c)电芯以0.2C电流恒流放电至认定的规格书规定的放电终止电压，记录放电容量	After the test, the core should not expand. No leakage, no smoke, no fire, no explosion, no thickness expansion rate greater than 10%; capacity retention rate not less than 85% of initial capacity, capacity recovery rate not less than 90% of initial capacity 试验后，电芯应不膨胀。不漏液、不冒烟、不起火、不爆炸、厚度膨胀率不大于 10%；容量保持率不低于初始容量的 85%，容量恢复率不低于初始容量的 90%
14	Storage capacity retention and recovery capacity at room temperature 室温存储容量保持能力及 恢复容量(仓储条件)	the core is filled with 40%~60% capacity before storage, and then stored for 28 days (D) in an environment where the ambient temperature is 20℃±5℃ and the relative humidity is 45% and 75%. then after charging as specified, discharge to the termination voltage at a temperature of 0.2 ItA at 23℃±2℃. 电芯储存前给电芯充入40%～60%的容量，然后在环境温度20℃±5℃，相对湿度45%～75%的环境中储存28天（D)。然后再按规定充电后，在23℃±2℃的温度环境下以0.2ItA放电至终止电压。	
15	Storage capacity retention and recovery capacity at room temperature 室温存储容量保持能力及 恢复容量(仓储条件)	the core is filled with 40%~60% capacity before storage, and then stored for 28 days (D) in an environment where the ambient temperature is 20℃±5℃ and the relative humidity is 45% and 75%. then after charging as specified, discharge to the termination voltage at a temperature of 0.2 ItA at 23℃±2℃. 电芯储存前给电芯充入40%～60%的容量，然后在环境温度20℃±5℃，相对湿度45%～75%的环境中储存28天（D)。然后再按规定充电后，在23℃±2℃的温度环境下以0.2ItA放电至终止电压。	
16	Storage performance 储存性能	The core is filled with 40%~45% capacity before storage, and then stored in an environment of 20℃±5℃ ambient temperature ,45% relative humidity ~75% for 12 months. then charged again and discharged to the termination	Charge and discharge test can be cycle 5 times, discharge time should not be less than

		voltage at a temperature of 0.2 C ℃±2℃. 电芯储存前给电芯充入40%～45%的容量，然后在环境温度20℃±5℃，相对湿度45%～75%的环境中储存12个月。然后再充满电后，在23℃±2℃的温度环境下以0.2C放电至终止电压。	4 h 充放电试验可以循环 5 次，放电时间应不低于 4h
17	External short circuit at high temperature 高温外部短路	When the core is charged according to the test method specified in the specification, it is placed in an environment of 55℃±5℃, and then 30 min. after the surface temperature of the core reaches 55 and 5℃. Then wire the positive and negative extremes of the core and make sure that the total external resistance is 80 mΩ+20 mΩ.. the temperature change of the core is monitored during the test. when one of the following two conditions occurs, the test terminates: a) the core temperature drops to 20% below the peak value; b) the short connection time reaches 24 hours. 将电芯按照规格书规定的试验方法充满电后,放置在55℃ ±5℃的环境中,待电芯表面温度达到55℃ ±5℃后,再放置30min。然后用导线连接电芯正负极端,并确保全部外部电阻为80mΩ 士20mΩ 。试验过程中监测电芯温度变化。，当出现以下两种情况之一时，试验终止：a)电芯温度下降到比峰值低20%；b）短接时间达到24小时。	Core should not fire and explosion, the outer surface temperature of the core should not be higher than 150℃ 电芯应不起火和不爆炸，电芯的外表面温度不得高于 150℃
18	Temperature cycle 温度循环	When the core is charged according to the method specified in the specification, the core is placed in a temperature control box with a temperature of 20±5℃. a) put the sample into an experimental box with a temperature of 75℃±2℃ to hold 6 h). b.reduce the temperature of the experimental box to -40℃±2℃ and keep 6 temperature conversion times not greater than 30 min;c) again raise the temperature of the experimental box to 75℃±2℃, temperature conversion times not greater than 30 min;d) repeat step a)(℃±) for a total of 10 cycles. 将电芯按照规格书规定的方法充满电后，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6h；b) 将实验箱温度降为-40℃±2℃，并保持6h，温度转换时间不大于30min；c)再次将实验箱温度升为75℃±2℃，温度转换时间不大于30min；d) 重复步骤a)~c)，共循环10次。	No leakage, no fire, no explosion 无泄漏，不起火，不爆炸

6. Testing requirements 测试要求

6.1 Battery test environment 电池试验环境（无特别注明时，试验环境应符合此项要求）

Temperature 温度：25℃±3℃

Relative humidity 相对湿度： 45～85% RH

Atmospheric pressure 大气压力： 86～106 kPa

6.2 Measuring instrumentation requirements 测量仪表要求

Voltage instrumentation requirements: Measuring the voltage meter accuracy no less than 0.5 magnitude 电压仪表要求：测量电压的仪表的精确度不低于 0.5 级

Current instrumentation requirements: Measuring the current meter accuracy no less than 0.5 magnitude 电流仪表要求：测量电流的仪表精确度不低于 0.5 级

Time instrumentation requirements: Measuring the time meter accuracy no less than 0.1%
时间仪表要求：测量时间的仪表精确度不低于 0.1%

Temperature instrumentation requirements: Measuring the temperature meter accuracy no less than 0.5 ℃ 温度仪表要求：测量温度的仪表准确度不低于 0.5℃

Impedance instrumentation requirements: Measuring impedance should by sinusoidal alternating (1 KHZ) test 内阻仪表要求：测量内阻应由正弦交变(1KHZ)进行测试

7．Operation temperature and humidity range 运行温湿度范围

7.1 Charging temperature and the Current requirements 充电环境温度及电流要求:

Temperature 温度	Max charge current 允许最大充电电流	Maximum relative humidity 最大相对湿度
0℃≤T≤15℃	0.2C（截止电压4.2V）	90%
15℃＜T≤45℃	2.0C（截止电压4.2V）	90%

7.2 Discharge temperature 放电环境温度:

-20℃ ～ +60℃，Maximum relative humidity：90%

-20℃ ～ +60℃，最大相对湿度：90%

8．Storage temperature and humidity range(At 50% SOC)存储温湿度范围(在 50% SOC 条件下)

8.1 Environmental conditions 存放条件；

Unless otherwise specified，Cells shall to be tested within one month after shipment and not be cycled (charge/discharge) over one time before the test. All tests shall be performed at 23±2℃ and humidity of 65±20% RH.

The lithium iron cell impedance would increase in whole storage process, while the capacity would decrease, cell would be charged in 9.1.1 and discharged in 9.1.2

除非另有规定，电池应在装运后一个月内进行测试，且在测试前一段时间内不得循环(充放电)。所有试验均在23±2℃、65±20% RH湿度下进行。锂电池在整个存储过程中阻抗会增大，容量会减小，电池在9.1.1条件下进行充电，在9.1.2条件下进行放电。

Storage Temperature	23℃	23℃	23℃	23℃	60℃	60℃
Storage Duration	1 Year	1 Year	90 Days	90 Days	1 Week	1 Week
Storage Charge State	As received	100%	As received	100%	As received	100%
Recovered Capacity	90%	80%	95%	90%	85%	80%
Recovered Impedance @100% Charge State	150%	150%	120%	150%	150%	160%

9．Electrical Characteristics 电气特性

9.1 Battery standard charge/discharge 电池组标准充/放电

9.1.1 standard charge 标准充电

At 25℃±3℃ conditions, CC 0.5C/CV 4.2V, when charging current drops to 0.02Ccharging is terminated, The charging time limited 4hrs.

在25℃±3℃条件下，以0.5C恒电流，4.2V恒电压充电至电流降到0.02C截止，限时4小时。

9.1.2 Standard Discharge标准放电

Standard discharge current 0.2Cfor continuous discharge, when the voltage drops to discharge cut-off voltage 3.0V discharge is terminated, shall be full discharged.

以标准放电电流 0.2C 进行持续放电，当电压降至放电截止电压 3.0V 时放电被终止，即为放空。

9.2 Maximum charge current 最大充电电流

At 25℃±3℃ conditions, CC 2.0C/CV 4.2V, when charging current drops to 0.02Ccharging is terminated, The charging time limited 2h.

在25℃±3℃条件下，以2.0C恒电流，4.2V恒压，充电至电流降到0.02C截止，限时2小时。

9.3Maximum discharge current 最大放电电流

At 23℃±2℃ condition, discharge the cell with 1C.

在23℃±2℃条件下，以1C对电池进行放电。

9.4 Initial impedance 初始内阻

At25℃±3℃ ambient temperature, after standard charged battery pack, AC impedance tester(1KHz) measuring the initial impedance should be≤200mΩ.

在 25℃±3℃环境温度下，经过标准充电的电池，使用交流阻抗测试仪（1KHz）测量初始内阻应≤200mΩ.

9.5 Initial capacity 初始容量

The initial capacity is for standard charge to full, in 1 hour, the capacity measured at 25℃±3℃ conditions with discharge current of 0.2C till 3.0V cut-off voltage.

The initial capacity≥500mAh.

电池初始容量为电池以标准充电方式满充，1 小时内，在 25℃±3℃条件下以 0.2C 电流放电至 3.0V 截止所放出的容量，初始容量≥500mAh.

9.6 Retention Capability 荷电保持能力

After full charging, storing the battery 28 days with20±5°C condition, and then discharge with discharge current of 0.2C till 3.0V cut-off voltage, discharge time should be≥255min

电池满充电后，在 20±5℃的环境条件下存放 28 天，然后以 0.2C 电流连续放电至 3.0V 终止电压，放电时间≥255min

9.7 Cycle life 循环寿命

Battery cycle life is tested at 25℃±3℃. For each cycle test, battery is charged using 0.5C constant current until battery voltage meet 4.2V. Then, battery is charged by constant voltage until battery charging current drop to 0.1C. After that, battery is discharged by 0.5C constant current until battery voltage drop to 3V. Repeat until each 50th cycle.

At each 50 cycle, battery capacity will be tested. The test condition is that the battery is charged using 0.2C constant current until the battery voltage meet 4.2V. Then, battery is charged by constant voltage until the charging current drop to 0.02C. After that, battery is discharged by 0.2C constant current until battery voltage drop to 3V.

If the discharge time is more than or equal to 4hours (80% of initial battery capacity), battery need to repeat above 50cycles charge/discharge test. If not, cycle life test is completed.

Cycle life should be 500cycles or above.

电池在温度 25℃±3℃条件下循环测试，以 0.5C 恒流充电到电压 4.2V，然后恒压充电到截止电流 0.1C。再以 0.5C 恒流放电到 3.0V，为 1 个循环周期。这样重复 50 次。

每 50 次做一次容量检测。以 0.2C 恒流充电到 4.2V 然后恒压充电到截止电流 0.02C。再以 0.2C 恒流放电到 3.0V。如果放电时间大于等于 4 小时（80%初始容量），电池必须再重复 50 次充放电测试。否则，循环寿命测试结束。循环寿命应该大于等于 500 次。

9.8 Shipments battery capacity 电池出货容量

Shipments battery capacity is 50%-70%.

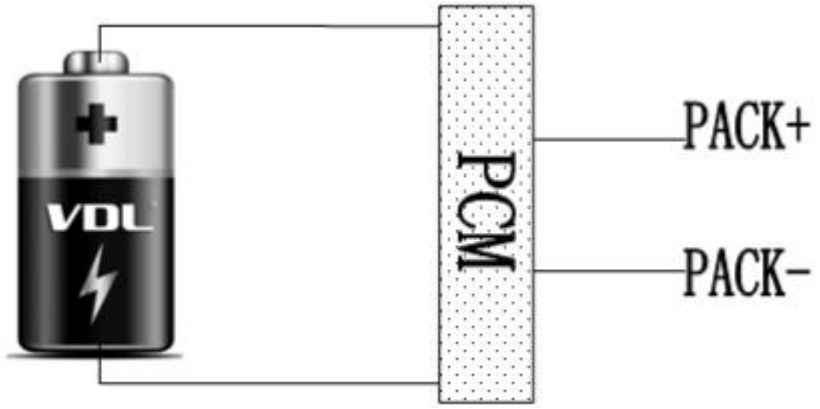
电池的出货容量为50%-70%.

9.9 Agency approvals 承认机构

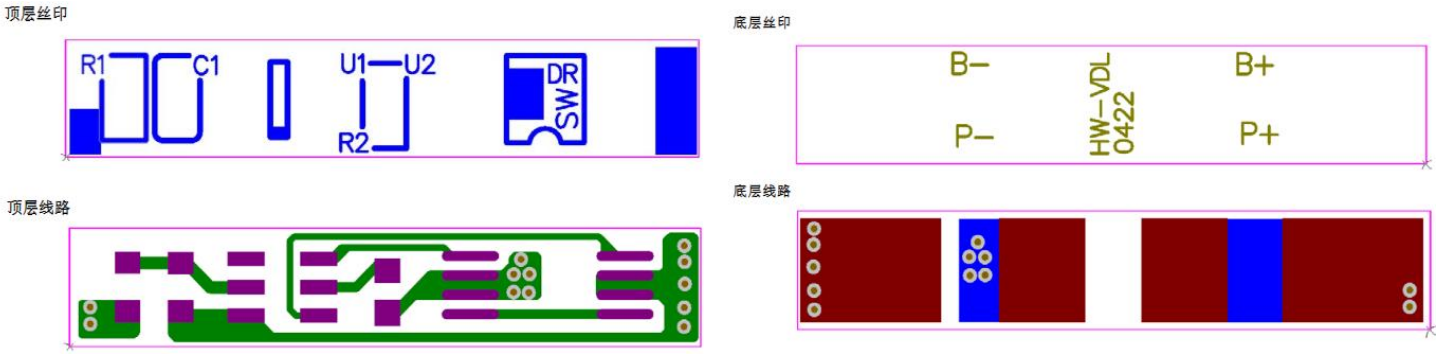
VDL battery safety performance is designed according to UL1642 standard and CE Directive requirement, the product' s safety performance is conforming to UL1642 standard and CE Directive requirement.

VDL 电池的安全性能是根据 UL1642 标准和 CE 指令要求制定.产品的安全特性与 UL1642 标准和 CE 指令要的要求是一致的.

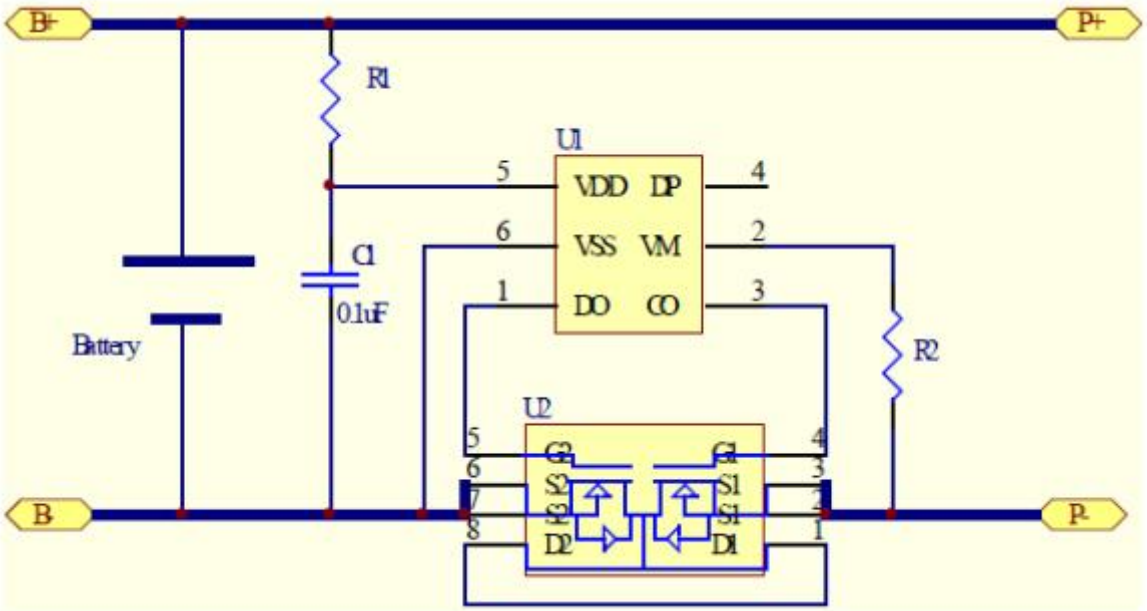
10．Battery structure diagram 电池架构图(Sketch map 示意图）



11．PCB Layout PCB 布线图



12．Schematic circuit diagram 电路原理图

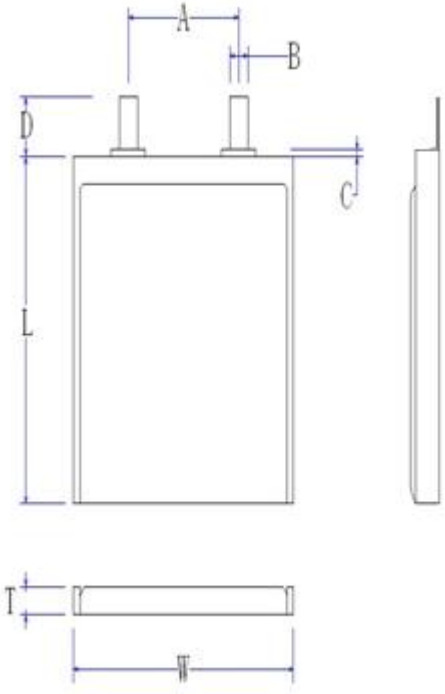


13.Cell 电芯

13.1 Cell Performance parameters 电芯性能参数

编号	项目		规格	备注
1	Initial impedance 初始内阻		≤100mΩ	1kHz AC Impedance 交流阻抗 AC 1kHz
2	Nominal voltage 标称电压		3.7V	/
3	Dimensions 外形尺寸	T	5.0mm Max	Thickness 厚度(受 300gf 力测量)
		W	30.0mm Max	Width 宽度(受 300gf 力测量)
		L	33mm Max	Cell length(not include Tab sealant) 电芯长度(不含极耳胶)(受 300gf 力测量)
		A	18.0±2 mm	Tab center distance极耳中心距
		B	3.0±0.2 mm	Tab width 极耳宽度
		C	0.5~2.0 mm	Tab exposed size 极耳胶外露尺寸

13.2 Cell outline drawing 电芯外形尺寸(Not In Scale 未按比例)



13.3 Spray Content 电池喷码：

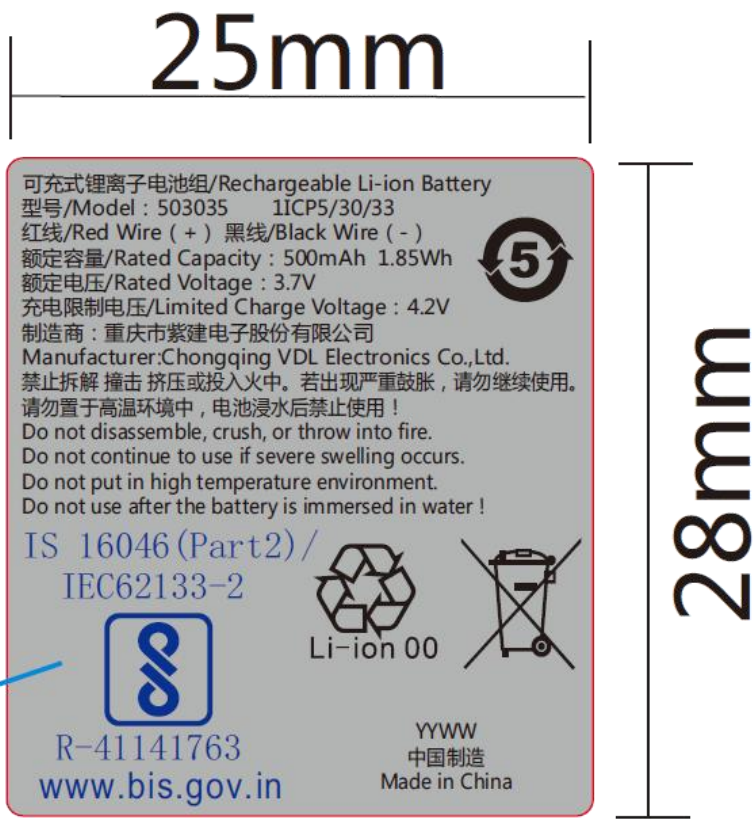
正面喷码：

- VDL 503035 3.7V
+500mAh 1.85Wh XXXXXX

Remark：XXXXXX-YYMMDD，日期

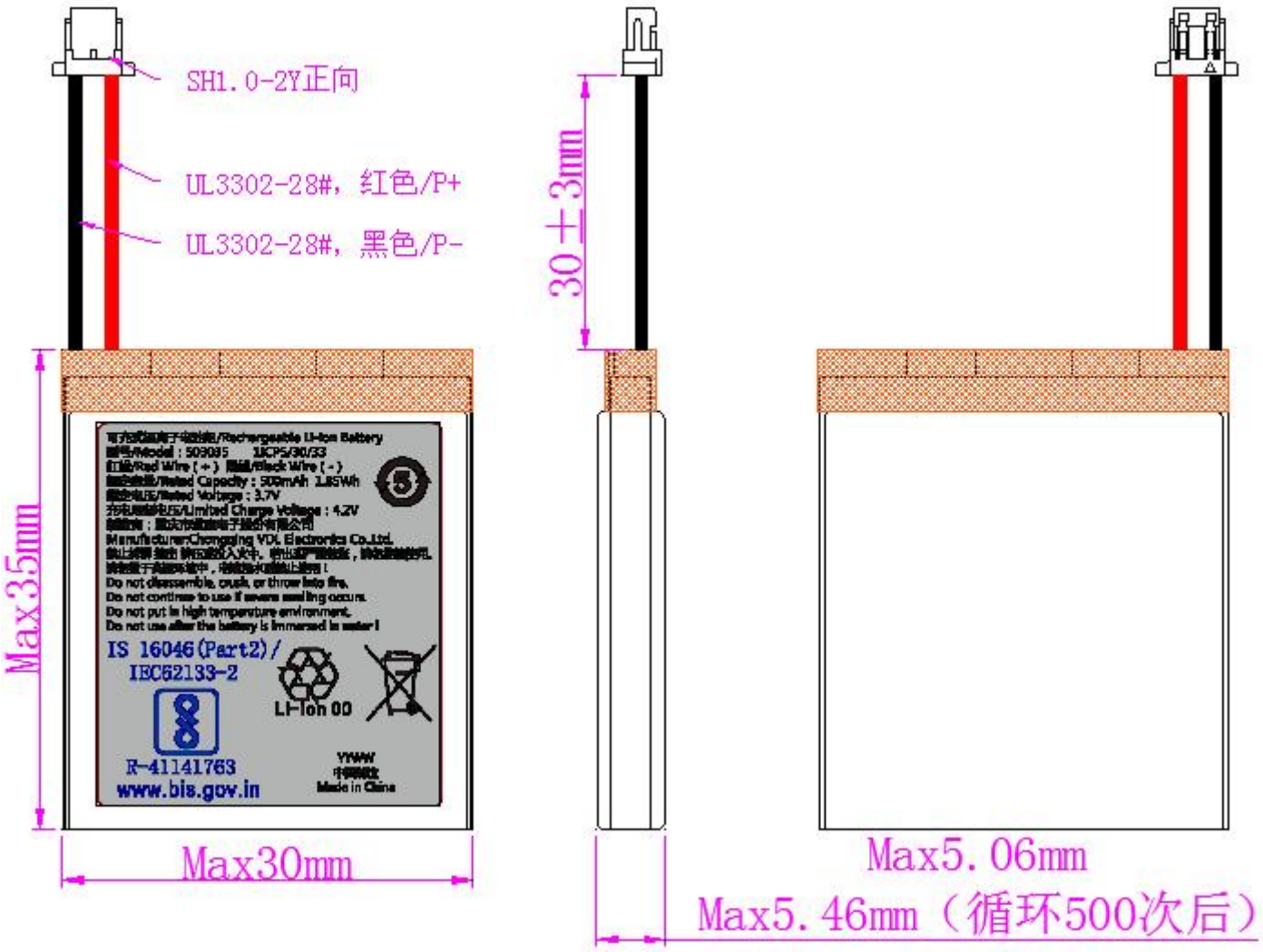
注：标签红色外框为刀模线，实际没有
蓝色BIS认证标志为预留位，需认证后才印刷

正面贴标签：



14．Battery Outline Drawing 电池组外形尺寸

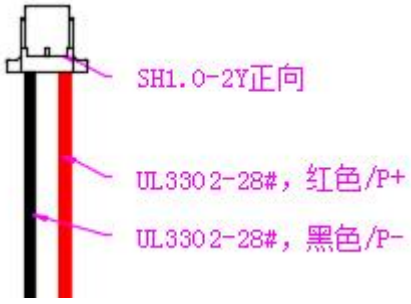
14.1Battery Outline Drawing 电池组外形尺寸(Not In Scale 未按比例)



14.2 Battery size parameters 电池组尺寸参数

Wiring method 出线方式	正极出线
Remark 备注	1、Solder welding of protective plate 保护板锡焊； 2、 Protect circuit components facing inside， 保护电路元器件朝内； 3、 Measure with 300gf force.用 300gf 力测量尺寸。

15． Terminal wire 端子线



16. BOM 1(Bill of materials)电池物料清单

NO. (项次)	Material Name (零件名称)	Specification(规格型号)	Qty (用量)
1	Cell 电芯	503033Q-500mAh	1
2	Protection board 保护板	S-8261DAA+8205	1
3	端子线	SH1.0-2Y 正向，UL3302-28#红黑	1
4	Brown Tape 茶色高温胶	0.05*25*25mm	1
5	Brown Tape 茶色高温胶	0.05*5*80mm	1
6	标签	0.06*25*28mm，消银龙+哑膜	1

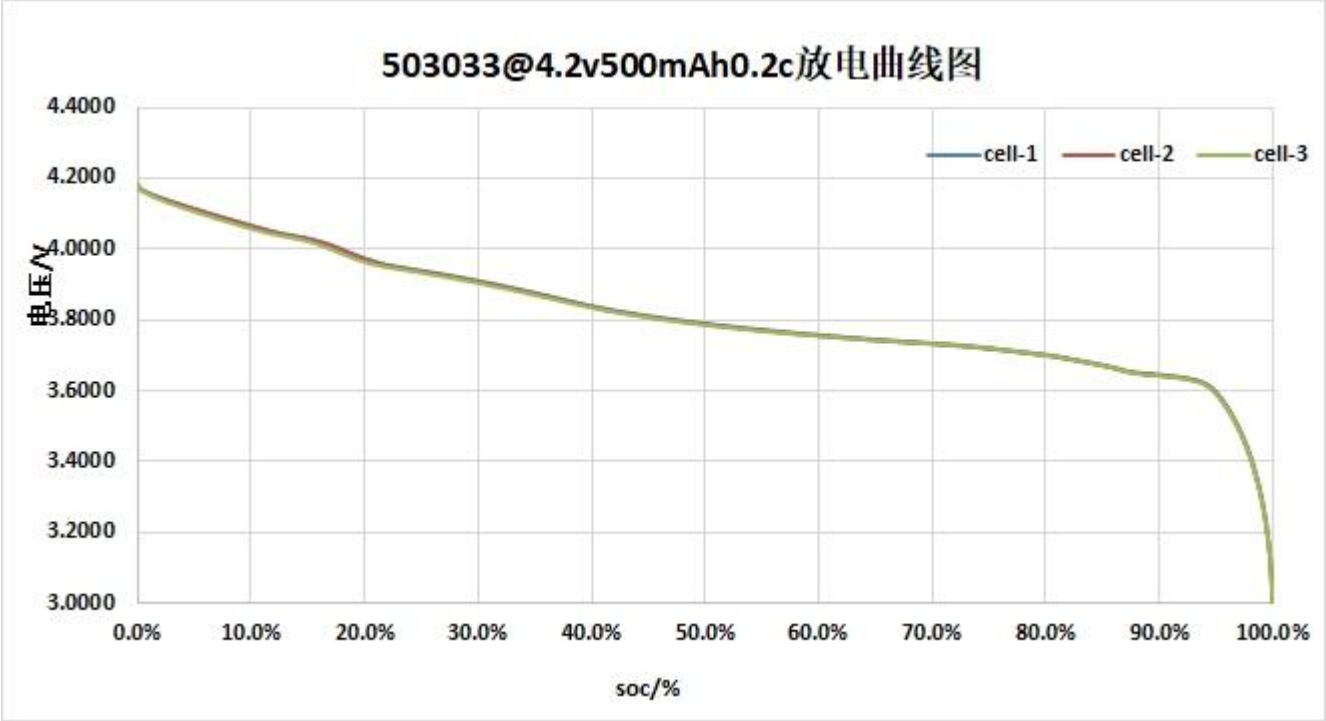
PCM BOM 2

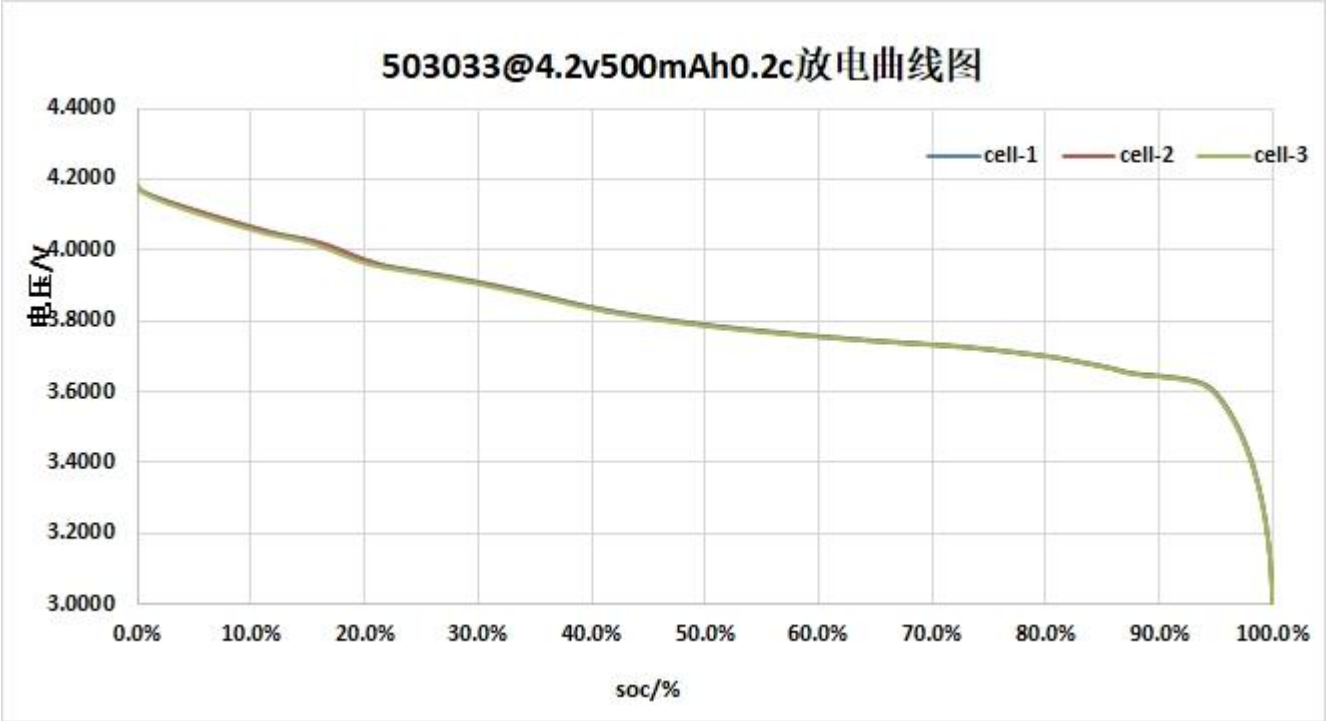
Material Name (零件名称)	Specification (规格型号)	Position (零件位置)	Qty (用量)
PCBA	VDL0422	/	1
PCB	PCB，0.6*3.9*22mm	/	1
IC	S-8261DAA， SOT-23-6	U1	1
MOSFET	DP8205A，TSSOP-8	U2	1
贴片电阻 Chip resistor	300Ω±5%, 0402	R1	1
贴片电阻 Chip resistor	470Ω±5%, 0402	R2	1
贴片电容 Chip capacitors	0.1μF/-20%~+80%/16V	C1	1

Note：The battery of materials should be consistent with the requirements of the RoHS

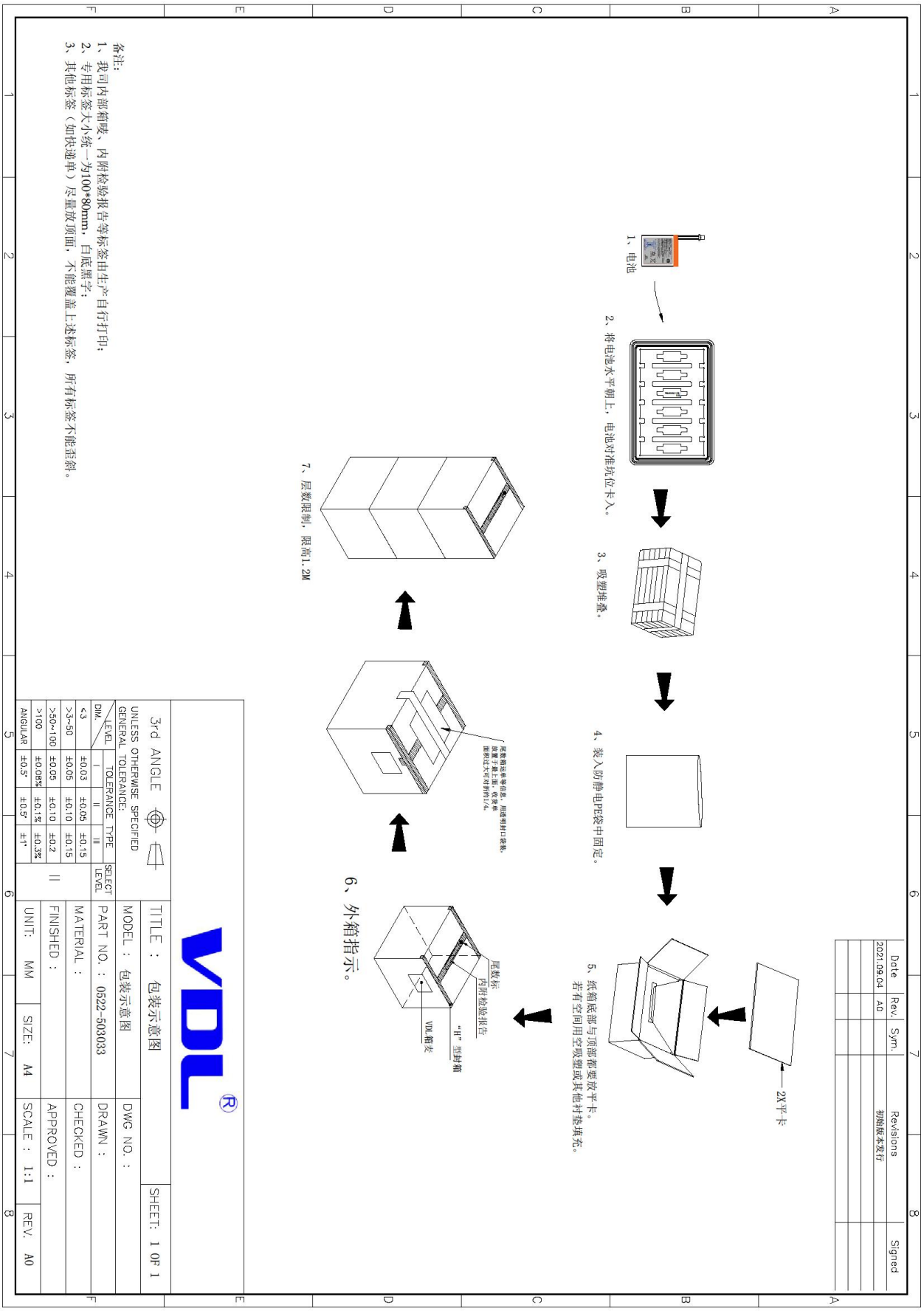
注：电池组所使用的材料应符合RoHS的要求.

OCV/SOC曲线


503033@4.2v500mAh0.2c放电曲线图
cell-1
cell-2
cell-3
电压/V
4.4000
4.2000
4.0000
3.8000
3.6000
3.4000
3.2000
3.0000
0.0%
10.0%
20.0%
30.0%
40.0%
50.0%
60.0%
70.0%
80.0%
90.0%
100.0%
soc/%


503033@4.2v500mAh0.2c放电曲线图
cell-1
cell-2
cell-3
电压/V
4.4000
4.2000
4.0000
3.8000
3.6000
3.4000
3.2000
3.0000
0.0%
10.0%
20.0%
30.0%
40.0%
50.0%
60.0%
70.0%
80.0%
90.0%
100.0%
soc/%

包装示意图


1、电池
2、将电池水平朝上，电池对准坑位卡入。
3、吸塑堆叠。
4、装入防静电PE袋中固定。
5、纸箱底部与顶部都要放平卡。
若有空间用空吸塑或其他衬垫填充。
2X平卡
6、外箱指示。
尾数标
内附检验报告
"H"型封箱
VDL箱麦
7、层数限制，限高1.2M
备注：
1、我司内部箱唛、内附检验报告等标签由生产自行打印；
2、专用标签大小统一为100*80mm，白底黑字；
3、其他标签（如快递单）尽量放顶面，不能覆盖上述标签，所有标签不能歪斜。
Date
Rev.
Sym.
Revisions
Signed
2021.09.04
A0
初版版本发行
3rd ANGLE
UNLESS OTHERWISE SPECIFIED
GENERAL TOLERANCE:
TOLERANCE TYPE
SELECT LEVEL
TITLE： 包装示意图
SHEET: 1 OF 1
MODEL： 包装示意图
DWG NO.：
PART NO.： 0522-503033
DRAWN：
MATERIAL：
CHECKED：
FINISHED：
APPROVED：
UNIT: MM
SIZE: A4
SCALE： 1:1
REV. A0

17．Battery Precautions and Safety Instructions 电池组使用注意事项及安全说明

Please be sure to comply with the specifications and the following precautions to use with batteries. For any accident caused by operation not following the specifications, VDL Electronics Co., Ltd will not take any responsibility

请您务必需遵守本规格书和以下使用注意事项使用电池，对于没有按照规格书进行操作所造成的任何意外事故，VDL 电子有限公司将不承担任何责任.

- Warranty period is 12 months after shipment date.
  从出厂代码日起 12 个月内保修.
- When the battery is stored for 3 months, it should be charged with 0.5C current to 50% SOC.
  电池每放置三个月,请预先以 0.5C 充电 1 次,即让电池具备 50%以上的电量.
- Before using the battery, carefully read the instruction manual and battery labels on the surface.
  使用电池前，请仔细阅读使用说明书和电池表面标识.
- Please use the original battery charger. The battery should be placed in a dry and ventilated place.
  电池需使用原装充电器充电，并应放置在干燥通风场所.
- If the battery is not used for a long time, please charge the battery to 50% SOC status. Remove the battery from the device and place it separately, to avoid the short-circuit and damage caused by contacting metal.
  如长期不使用时，请将电池充电至半满电荷状态，把电池从设备中拆除并分开放置，避免金属接触电池，造成短路或损坏现象.
- When using or during storage, if the battery is hot, with leakage, odor, distortion or other anomalies, please stop using it immediately and stay away from the battery.
  在使用或储存期间，如发现电池有出现高温发热、漏液、散发异味、变形及其它异常现象时，请立即停止使用并远离电池.
- Do not short-circuit the battery positive and negative terminals. Do not damp the battery to avoid any danger.
  切勿将电池正负极短路，并注意不可让电池受潮，以免发生危险.
- Please keep the battery away from heat, high voltage place. Please do not beat or hit the battery.
  使用过程中，应远离热源、高压场所，并勿摔打、撞击电池.
- Remove the battery immediately from the device when the battery life ends. Please dispose the waste battery properly. Do not put it into fire or water.
  电池寿命终止应立刻从设备中取出,废弃电池请安全妥善处理，切勿投入火中或水中.
- Keep small cells and batteries which are considered swallowable out of the reach of children.
  将电池远离孩童不能得到的地方，以避免孩童噬咬或吞咽电池
- Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion.In case of ingestion of a cell or battery, seek medical assistance promptly.
  如果吞咽了电池，应迅速送医院处理，吞咽有可能导致烧伤、软组织穿孔和死亡，摄入后 2 小时内可能发生严重烧伤
- In case of ingestion of a cell or battery, seek medical assistance promptly.
  如果摄入电芯或电池，应立即寻求医疗援助。

18．Customer Inquiry

客户要求

Model 型号：503035/500mAh

1.If the customer approves the specification and samples, please sign the specification back to VDL within 1 week. It is invalid when expires.

如果客户认可本承认书和样品，请于 7 天内回签本承认书给 VDL 电子有限公司，过期视为无效。

2. If the customer requires more explanation or the operating conditions are different from the specification content, please write down your information and contact VDL Electronics Co., Ltd in advance. VDL Electronics Co., Ltd could design and build products according to your special request.

如果客户需要其他方面的说明或工作条件与规格书内容不一致,请客户提前和 VDL 电子有限公司联系. VDL 电子有限公司将按照贵公司特殊要求设计和开发产品.特殊要求标准:

项目 / 序号	Special Request 特殊要求	Criteria 标准
1		
2		
3		
4		
5		
6		

Company Name : Signature : Date:

公司名称: 签名: 日期: