

UN 38.3 检测报告

UN 38.3 Test Report

产品名称: 锂离子电池
Product Name: lithium-ion battery
产品型号: 18650
Model No.:
委托方: 深圳市旭升伟业电子科技有限公司
Client: Shenzhen Xusheng Weiye Electronic Technology Co., Ltd.

深圳市中凯检测技术有限公司
Shenzhen ZKT Technology Co., Ltd.





检测报告 Test Report

委托方/ Client.....		深圳市旭升伟业电子科技有限公司 Shenzhen Xusheng Weiye Electronic Technology Co., Ltd.	
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制造商/ Manufacturer.....		东莞倍创利电子科技有限公司 Dongguan Beichuangli electronic Technology Co., LTD	
地址/ Address.....		广东省东莞市长安镇锦厦河东二路62号1栋2-3楼 2nd to 3rd floors of Building 1, No. 62 Jinxia Hedong Second Road, Chang'an Town, Dongguan City, Guangdong Province	
测试实验室/ Testing Laboratory		深圳市中凯检测技术有限公司 Shenzhen ZKT Technology Co., Ltd.	
产品名称/Prduct name.		锂离子电池 lithium-ion battery	
商标/ Trademark.		--	
产品型号/ Model no.....		18650	
额定规格/Rating		3.7V, 2200mAh, 8.14Wh	
样品外观 / Appearance:		形状 / Shape: 近圆柱体/Almost Cylinder; 尺寸 / Size D×H: 18.5mm×66.1mm	
总页数/ Total pages.....		20页	
发行日期/ Issued data.....		2024年05月31日	
委托项目/ Test Items.....		T.1. <input checked="" type="checkbox"/> Altitude simulation 高度模拟 T.2. <input checked="" type="checkbox"/> Thermal test 温度试验 T.3. <input checked="" type="checkbox"/> Vibration 振动 T.4. <input checked="" type="checkbox"/> Shock 冲击 T.5. <input checked="" type="checkbox"/> External short circuit 外部短路 T.6. <input checked="" type="checkbox"/> Impact / <input type="checkbox"/> Crush 撞击/挤压 T.7. <input checked="" type="checkbox"/> Overcharge 过充电 T.8. <input checked="" type="checkbox"/> Forced discharge 强制放电	
检验标准/ Test standard.....		UNITED NATIONS "Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria" (ST/SG/AC.10/11/Rev.7 Amend 1 Section 38.3) 联合国《关于危险货物运输的建议书 实验和标准手册》第七版修订1第38.3节。	
检验结果/ Test result.....		合格/ Pass (检测单位盖章/Sealed)	
检测:		审核:	
Tested by:	David Yang	Tested by:	Peter Huang
批准:		批准:	
Approved by:		Approved by:	



一般说明 / General remark:

本报告出现的试验结果仅与试验样品有关。

The test results presented in this report relate only to the object tested.

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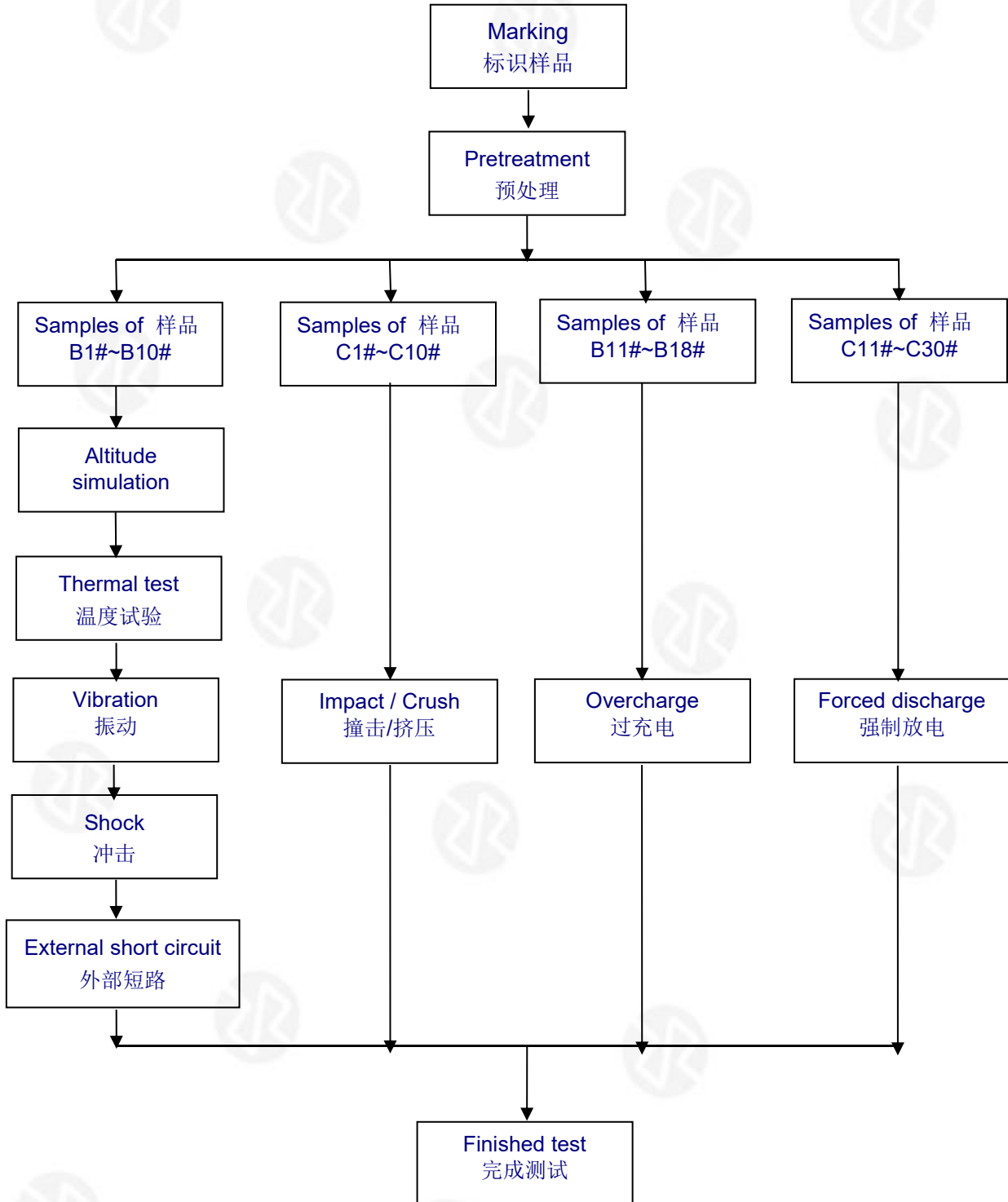
可能的试验情况判定 / Possible test case verdicts:	
— 试验情况不适用本试验产品 — Test case does not apply to the test object	N/A (or N)
— 试验样品满足要求 — Test object does meet the requirement	P (Pass)
— 试验样品不满足要求 — Test object does not meet the requirement	F (Fail)
测试/ Testing	
接收日期/ Date of receipt of test item:	2024.5.20
检测日期/ Date(s) of performance of tests	2024.5.20-2024.05.31

产品信息/ General product information:

Product name/产品名称	Li-ion Cell 锂离子电芯	lithium-ion battery 锂离子电池
Type/model/型号	18650	18650
Nominal voltage/标称电压	3.7V	3.7V
Rated capacity/额定容量	2200mAh	2200mAh
Recommended charging Voltage/推荐充电电压	4.2V	4.2V
Maximum charging Current/最大充电电流	2200mA	2200mA
Maximum discharging Current/最大放电电流	2200mA	2200mA
Discharge cut-off voltage/放电截止电压	3.0V	3.0V
Dimensions/尺寸	D×H: 18.5mm×65.4mm	D×H: 18.5mm×66.1mm
Weight/重量	39.593g	47.1g



I、Test Procedure 测试流程





II、测试方法和要求/ Test Method and Requirement

Tests T.1 to T.5 shall be conducted in sequence on the same cell or battery. Tests T.6 and T.8 shall be conducted using not otherwise tested cells. Test T.7 may be conducted using undamaged batteries previously used in tests T.1 to T.5 for purposes of testing on cycled batteries.

用相同的电芯或电池按照顺序进行试验T.1至T.5。试验T.6至T.8用没有进行其他试验的电芯。试验T7可以使用原先在试验T1至T5中使用过的未损坏的电池进行，以便测试交替充电放电的电池。

Batteries of B1#~B5#、B11#~B14# are full charged after one cycle;

Batteries of B6#~B10#、B15#~B18# are full charged after twenty-five cycles;

Cells of C1#~C5# are 50% charged after one cycle;

Cells of C6#~C10# are 50% charged after twenty-five cycles;

Cells of C11#~C20# are full discharged after one cycle;

Cells of C21#~C30# are full discharged after twenty-five cycles;

Test environment condition: ambient temperature: 15-25℃, ambient humidity: 40-70%

电池B1#~B5#、B11#~B14#为1次循环满电状态;

电池B6#~B10#、B15#~B18#为25次循环满电状态;

电芯C1#~C5#为1次循环后50%充电状态;

电芯C6#~C10#为25次循环后50%充电状态;

电芯C11#~C20#为1次循环完全放电状态;

电芯C21#~C30#为25次循环完全放电状态;

试验环境条件: 环境温度: 15-25℃, 环境湿度: 40-70%

In order to quantify the mass loss, the following procedure is provided:

$$\text{Mass loss (\%)} = (M1-M2)/M1 \times 100$$

质量损失的量化值, 可用以下公式计算:

$$\text{质量损失(\%)} = (M1-M2)/M1 \times 100$$

Where M1 is the mass before the test and M2 is the mass after the test. When mass loss does not exceed the values in Table below, it shall be considered as "no mass loss".

式中: M1是试验前的质量, M2是试验后的质量。如果质量损失不超过下表所列的数值, 应视为“无质量损失”。

Mass M of cell or battery 电芯或电池的质量	Mass loss limit 质量损失限值
M < 1g	0.5%
1g ≤ M ≤ 75g	0.2%
M > 75g	0.1%

Leakage means the visible escape of electrolyte or other material from a cell or battery or the loss of material (except battery casing, handling devices or labels) from a cell or battery such that the loss of mass exceeds the values in Table above.

渗漏系指可以看到的电解液或者其他物质从电芯或者电池中漏出, 或电芯或电池中的物质损失 (不包括电池外壳、搬运装置、或标签), 失去的质量超过上表所列的数值。

In test T.1 to T.4, cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.

在测试T.1至T.4中, 电芯和电池须满足无渗漏、无泄气、无解体、无破裂和无起火, 并且每个试验电芯或电池在试验后的开路电压不小于其在进行这一试验前电压的90%。



T.1. Altitude simulation 高度模拟

Test method 测试方法

Test cells and batteries are stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature ($20\pm 5^{\circ}\text{C}$).

试验电芯和电池被放置在压力等于或低于11.6 kPa和环境温度($20\pm 5^{\circ}\text{C}$)下存放至少6小时。

Requirement 要求

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

电芯和电池须无渗漏、无泄气、无解体、无破裂和无起火，并且每个试验电芯或电池在试验后的开路电压不小于其在进行这一试验前电压的90%。

T.2. Thermal test 温度试验

Test method 测试方法

Test cells and batteries are to be stored for at least six hours at a test temperature equal to $72\pm 2^{\circ}\text{C}$, followed by storage for at least six hours at a test temperature equal to $-40\pm 2^{\circ}\text{C}$. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated until 10 total cycles are complete, after which all test cells and batteries are to be stored for 24 hours at ambient temperature ($20\pm 5^{\circ}\text{C}$). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.

试验电芯和电池放置在试验温度等于 $72\pm 2^{\circ}\text{C}$ 的条件下存放至少6小时，接着再在试验温度等于 $-40\pm 2^{\circ}\text{C}$ 的条件下存放至少6小时。两个极端试验温度之间的最大时间间隔为30分钟。此程序重复进行，共完成10次循环，接着将所有试验电芯和电池在环境温度($20\pm 5^{\circ}\text{C}$)下存放24小时。对于大型电芯和电池，暴露于极端试验温度的时间至少应为12小时。

Requirement 要求

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

电芯和电池须无渗漏、无泄气、无解体、无破裂和无起火，并且每个试验电芯或电池在试验后的开路电压不小于其在进行这一试验前电压的90%。

T.3. Vibration 振动

Test method 测试方法

Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face.

电芯和电池紧固于振动台台面，但不得造成电芯变形，并能准确可靠地传播振动。振动应是正弦波形，对数扫描频率在7 Hz和200 Hz之间，再回到7 Hz，跨度为15分钟。这一振动过程须对三个互相垂直的电芯安装方位的每一方向重复进行12次，总共为时3小时。其中一个振动方向必须与端面垂直。

The logarithmic frequency sweep shall differ for cells and batteries with a gross mass of not more than 12 kg (cells and small batteries), and for batteries with a gross mass of more than 12 kg (large batteries).

作对数式频率扫描，对电芯和总质量不超过12千克的电池（电芯和小型电池），和对质量超过12千克的电池（大型电池）有所不同。



For cells and small batteries : from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs (approximately 50 Hz). A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz.

对电芯和小型电池：从7 Hz开始，保持1 gn的最大加速度，直到频率达到18 Hz。然后将振幅保持在0.8mm（总位移1.6mm），并增加频率直到峰值加速度达到8 gn（频率约为50 Hz）。将峰值加速度保持在8 gn直到频率增加到200 Hz。

For large batteries : from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 2 gn occurs (approximately 25 Hz). A peak acceleration of 2 gn is then maintained until the frequency is increased to 200 Hz.

对大型电池：从7 Hz开始，保持1 gn的最大加速度，直到频率达到18 Hz。然后将振幅保持在0.8mm（总位移1.6mm），并增加频率直到峰值加速度达到2 gn（频率约为25Hz）。将峰值加速度保持在2 gn直到频率增加到200 Hz。

Requirement 要求

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

电芯和电池须无渗漏、无泄气、无解体、无破裂和无起火，并且每个试验电芯或电池在试验后的开路电压不小于其在进行这一试验前电压的90%。

T.4. Shock冲击

Test method 测试方法

Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery.

试验电芯和电池用刚性支架紧固在试验装置上，支架支撑着每个试验电池的所有安装面。

Each cell shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Alternatively, large cells may be subjects to a half-sine shock of peak acceleration of 50 gn and pulse duration of 11 milliseconds.

每个电芯须经受峰值加速度150 gn和脉冲持续时间6 ms的半正弦波冲击。不过，大型电芯须经受峰值加速度50 gn和脉冲持续时间11 ms的半正弦波冲击。

Each battery shall be subjected to a half-sine shock of peak acceleration depending on the mass of the battery. The pulse duration shall be 6 milliseconds for small batteries and 11 milliseconds for large batteries. The formulas below are provided to calculate the appropriate minimum peak accelerations.

每个电池须经受半正弦波冲击，峰值加速度需要根据电池的重量来决定。小型电池的脉冲持续时间为6 ms，大型电池的脉冲持续时间为11ms。下面的公式是用来计算合适的最小峰值加速度。

Battery	Minimum peak acceleration	Pulse duration
Small batteries	150 gn or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{100850}{mass^*}\right)}$ whichever is smaller	6 ms
Large batteries	50 gn or result of formula $Acceleration(g_n) = \sqrt{\left(\frac{30000}{mass^*}\right)}$ whichever is smaller	11 ms

* Mass is expressed in kilograms.



电池	最小峰值加速度	脉冲持续时间	
小型电池	150 gn或计算结果中取最小的值 加速度 (gn) = $\sqrt{\left(\frac{100850}{mass}\right)}$	6ms	
大型电池	50 gn或计算结果中取最小的值 加速度 (gn) = $\sqrt{\left(\frac{30000}{mass}\right)}$	11 ms	

Each cell or battery shall be subjected to three shocks in the positive direction and to three shocks in the negative direction in each of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks.

每个电芯或电池须在三个互相垂直的电芯或电池安装方位的正方向经受三次冲击，接着在反方向经受三次冲击，总共经受18次冲击。

Requirement 要求

Cells and batteries meet this requirement if there is no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.

电芯和电池须无渗漏、无泄气、无解体、无破裂和无起火，并且每个试验电芯或电池在试验后的开路电压不小于其在进行这一试验前电压的90%。

T.5. External short circuit 外部短路

Test method 测试方法

The cell or battery to be tested shall be heated for a period of time necessary to reach a homogeneous stabilized temperature of 57±4°C, measured on the external case. This period of time depends on the size and design of the cell or battery and should be assessed and documented. If this assessment is not feasible, the exposure time shall be at least 6 hours for small cells and small batteries, and 12 hours for large cells and large batteries. Then the cell or battery at 57±4°C shall be subjected to one short circuit condition with a total external resistance of less than 0.1 ohm.

试验电芯或电池需要加热一段时间，以使其外壳温度均匀稳定地达到57±4°C。加热时间的长短是由电芯或电池的尺寸和设计来决定的，这个加热时间需要评估并记录。如果这个加热时间不好评估的话，对于小电芯和小电池需要在此温度下放置至少6个小时，对于大电芯和大电池至少放置12个小时。然后使电芯或电池在57±4°C下经受总外电阻小于0.1Ω的短路条件。

This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 57±4°C, or in the case of the large batteries, has decreased by half of the maximum temperature increase observed during the test and remains below that value.

短路测试持续到电芯或电池外壳温度回到57±4°C后至少持续1小时，针对大电池，外壳温度需要下降到测试过程中监控到的最大温度的一半以下。

The short circuit and cooling down phases shall be conducted at least at ambient temperature.

短路测试和冷却阶段至少应该在环境温度下进行。

Requirement 要求

Cells and batteries meet this requirement if their external temperature does not exceed 170°C and there is no disassembly, no rupture and no fire during the test and within six hours after test.

电芯和电池外壳温度不超过170°C，并且在试验过程中及试验后6小时内无解体、无破裂，无起火。



T.6. Impact / Crush 撞击/挤压

Test procedure – Impact (applicable to cylindrical cells not less than 18.0 mm in diameter)

测试步骤 – 撞击 (适用于直径大于等于18.0毫米以上的圆柱形电芯)

The test sample cell or component cell is to be placed on a flat smooth surface. A 15.8 mm \pm 0.1mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample. A 9.1 kg \pm 0.1 kg mass is to be dropped from a height of 61 \pm 2.5 cm at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface.

试样电芯或电芯组件放在平坦光滑表面上，一根316型不锈钢棒横放在试样中心，钢棒直径15.8毫米 \pm 0.1毫米，长度至少6厘米，或电芯最长端的尺度，取二者之长者。将一块9.1千克 \pm 0.1千克的重锤从61 \pm 2.5厘米高度跌落到钢棒和试样交叉处，使用一个几乎没有摩擦的、对落体重锤阻力最小的垂直轨道或管道加以控制。垂直轨道或管道用于引导落锤沿与水平支撑表面呈90度落下。

The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8 mm \pm 0.1mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.

受撞击的试样，纵轴应与平坦表面平行并与横放在试样中心的直径15.8 \pm 0.1毫米弯曲表面的纵轴垂直。每一试样只经受一次撞击。

Test procedure – Crush (applicable to prismatic, pouch, coin/button cells and cylindrical cells less than 18.0 mm in diameter)

测试步骤 – 挤压 (适用于棱柱形，袋状，硬币/纽扣电芯和圆柱形电芯直径小于18.0毫米)

A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1.5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.

将电芯或电芯组件放在两个平面之间挤压，挤压力度逐渐加大，在第一个接触点上的速度大约为1.5 cm/s。挤压持续进行，直到出现以下三种情况之一：

- (a) The applied force reaches 13 kN \pm 0.78 kN;
 - (b) The voltage of the cell drops by at least 100 mV;
 - (c) The cell is deformed by 50% or more of its original thickness.
- (a)施加的力达到13 kN \pm 0.78 kN;
- (b)电芯的电压下降至少100mV;
- (c)电芯形变达到原始厚度的50%或更多。

Once the maximum pressure has been obtained, the voltage drops by 100 mV or more, or the cell is deformed by at least 50% of its original thickness, the pressure shall be released.

一旦达到最大压力、电压下降100mV或更多，或电芯形变至少达到原始厚度的50%，即可解除压力。

A prismatic or pouch cell shall be crushed by applying the force to the widest side. A button/coin cell shall be crushed by applying the force on its flat surfaces. For cylindrical cells, the crush force shall be applied perpendicular to the longitudinal axis.

棱柱形或袋装电芯须从最宽的面施压。纽扣/硬币形电芯应从其平坦表面施压。圆柱形电芯应从与纵轴垂直的方向施压。

Each test cell or component cell is to be subjected to one crush only. The test sample shall be observed for a further 6 h. The test shall be conducted using test cells or component cells that have not previously been subjected to other tests.

每个试样电芯或电芯组件只做一次挤压试验。试样须继续观察6小时。试验须使用之前未做过其他试验的试样电芯或电芯组件进行。

Requirement 要求

Cell and component cells meet this requirement if their external temperature does not exceed 170°C and there is no disassembly and no fire during the test and within six hours after test.



电芯和电芯组件外壳温度不超过170℃，并且在试验过程中及试验后6小时内无解体，无起火。

T.7. Overcharge 过充电

Test method 测试方法

The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:

充电电流为制造商推荐的最大持续充电电流的两倍。试验的最小电压如下：

- (a) When the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.
- (b) When the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.

(a) 制造商推荐的充电电压不大于18伏时，试验的最小电压应是电池最大充电电压的两倍或22伏两者中的较小者。

(b) 制造商推荐的充电电压大于18伏时，试验的最小电压应是电池最大充电电压的1.2倍。

Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.

试验应在环境温度下进行。进行试验的时间应为24小时。□ 5

Requirement 要求

Rechargeable batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

充电电池应在试验过程中和试验后7天内无解体，无起火。

T.8. Forced discharge 强制放电

Test method 测试方法

Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.

每个电芯在环境温度下与12V直流电电源串联在起始电流等于制造商给定的最大放电电流的条件下强制放电。

The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell is forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).

试样电芯与一个适当大小的电阻负载串联以调节到规定大小的放电电流。每个电芯的放电时间（单位为h）等于电芯的额定容量除以试验初始放电电流（单位A）。

Requirement 要求

Primary or rechargeable cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.

原电芯或充电电芯应在试验过程中和试验后7天内无解体，无起火。



III、Test Data 测试数据

T.1. Altitude simulation 高度模拟

The state of cells 样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Voltage after test/Voltage pre-test 试验后电压/试验前电压(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
Full charged after one cycle 一次循环后满电状态	B1#	47.098	4.175	47.098	4.175	0.000	100.000	Pass 合格
	B2#	47.065	4.183	47.065	4.183	0.000	100.000	Pass 合格
	B3#	47.086	4.184	47.086	4.184	0.000	100.000	Pass 合格
	B4#	47.078	4.181	47.077	4.181	0.002	100.000	Pass 合格
	B5#	47.065	4.182	47.065	4.182	0.000	100.000	Pass 合格
Full charged after twenty-five cycles 25次循环后满电状态	B6#	47.036	4.181	47.036	4.181	0.000	100.000	Pass 合格
	B7#	47.056	4.193	47.056	4.193	0.000	100.000	Pass 合格
	B8#	47.054	4.179	47.054	4.179	0.000	100.000	Pass 合格
	B9#	47.045	4.187	47.045	4.186	0.000	99.976	Pass 合格
	B10#	47.043	4.186	47.043	4.186	0.000	100.000	Pass 合格

Notes 注释: Atmospheric pressure 大气压强: $1.013 \times 10^5 \text{Pa}$, Ambient temperature 环境温度: 23.7°C
After the test, there is no leakage, no venting, no disassembly, no rupture and no fire.
测试后, 电池未渗漏、未泄气、未解体、未破裂和未起火。

T.2. Thermal test 温度试验

The state of cells 样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Voltage after test/Voltage pre-test 试验后电压/试验前电压(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
Full charged after one cycle 一次循环后满电状态	B1#	47.098	4.175	47.090	4.141	0.017	99.186	Pass 合格
	B2#	47.065	4.183	47.059	4.144	0.013	99.068	Pass 合格
	B3#	47.086	4.184	47.080	4.148	0.013	99.140	Pass 合格
	B4#	47.077	4.181	47.067	4.145	0.021	99.139	Pass 合格
	B5#	47.065	4.182	47.057	4.142	0.017	99.044	Pass 合格
Full charged after twenty-five cycles 25次循环后满电状态	B6#	47.036	4.181	47.024	4.144	0.026	99.115	Pass 合格
	B7#	47.056	4.193	47.045	4.155	0.023	99.094	Pass 合格
	B8#	47.054	4.179	47.043	4.141	0.023	99.091	Pass 合格
	B9#	47.045	4.186	47.035	4.150	0.021	99.140	Pass 合格
	B10#	47.043	4.186	47.031	4.152	0.026	99.188	Pass 合格

Notes 注释: Atmospheric pressure 大气压强: $1.013 \times 10^5 \text{Pa}$, Ambient temperature 环境温度: 23.8°C
After the test, there is no leakage, no venting, no disassembly, no rupture and no fire.
测试后, 电池未渗漏、未泄气、未解体、未破裂和未起火。



T.3. Vibration 振动

The state of cells 样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Voltage after test/Voltage pre-test 试验后电压/试验前电压(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
Full charged after one cycle 一次循环后满电状态	B1#	47.090	4.141	47.090	4.141	0.000	100.000	Pass 合格
	B2#	47.059	4.144	47.059	4.143	0.000	99.976	Pass 合格
	B3#	47.080	4.148	47.080	4.148	0.000	100.000	Pass 合格
	B4#	47.067	4.145	47.067	4.145	0.000	100.000	Pass 合格
	B5#	47.057	4.142	47.057	4.142	0.000	100.000	Pass 合格
Full charged after twenty-five cycles 25次循环后满电状态	B6#	47.024	4.144	47.024	4.144	0.000	100.000	Pass 合格
	B7#	47.045	4.155	47.045	4.155	0.000	100.000	Pass 合格
	B8#	47.043	4.141	47.043	4.141	0.000	100.000	Pass 合格
	B9#	47.035	4.150	47.034	4.150	0.002	100.000	Pass 合格
	B10#	47.031	4.152	47.031	4.152	0.000	100.000	Pass 合格
Notes 注释: Atmospheric pressure 大气压强: 1.013×10^5 Pa, Ambient temperature 环境温度: 24.0°C After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. 测试后, 电池未渗漏、未泄气、未解体、未破裂和未起火。								

T.4. Shock 冲击

The state of cells 样品状态	No. 编号	Pre-test 试验前		After test 试验后		Mass loss 质量损失 (%)	Voltage after test/Voltage pre-test 试验后电压/试验前电压(%)	Status 结果
		Mass 质量 (g)	Voltage 电压 (V)	Mass 质量 (g)	Voltage 电压 (V)			
Full charged after one cycle 一次循环后满电状态	B1#	47.090	4.141	47.090	4.141	0.000	100.000	Pass 合格
	B2#	47.059	4.143	47.059	4.143	0.000	100.000	Pass 合格
	B3#	47.080	4.148	47.080	4.148	0.000	100.000	Pass 合格
	B4#	47.067	4.145	47.067	4.145	0.000	100.000	Pass 合格
	B5#	47.057	4.142	47.057	4.142	0.000	100.000	Pass 合格
Full charged after twenty-five cycles 25次循环后满电状态	B6#	47.024	4.144	47.024	4.144	0.000	100.000	Pass 合格
	B7#	47.045	4.155	47.045	4.155	0.000	100.000	Pass 合格
	B8#	47.043	4.141	47.043	4.141	0.000	100.000	Pass 合格
	B9#	47.034	4.150	47.034	4.150	0.000	100.000	Pass 合格
	B10#	47.031	4.152	47.031	4.152	0.000	100.000	Pass 合格
Notes 注释: Atmospheric pressure 大气压强: 1.013×10^5 Pa, Ambient temperature 环境温度: 23.9°C After the test, there is no leakage, no venting, no disassembly, no rupture and no fire. 测试后, 电池未渗漏、未泄气、未解体、未破裂和未起火。								



T.5. External short circuit 外部短路

The state of cells 样品状态	No. 编号	External Peak temperature(°C) 电池表面最高温度(°C)	Status 结果
Full charged after one cycle 一次循环后满电状态	B1#	58.5	Pass合格
	B2#	57.8	Pass合格
	B3#	57.6	Pass合格
	B4#	58.4	Pass合格
	B5#	58.3	Pass合格
Full charged after twenty-five cycles 25次循环后满电状态	B6#	57.9	Pass合格
	B7#	57.5	Pass合格
	B8#	58.2	Pass合格
	B9#	57.8	Pass合格
	B10#	58.7	Pass合格
Notes 注释: Atmospheric pressure 大气压强: $1.013 \times 10^5 \text{Pa}$, Ambient temperature 环境温度: 24.0°C There is no disassembly, no rupture and no fire during the test and within six hours after test. 电池在测试中和测试后6小时内未解体、未破裂, 未起火。			

T.6. Impact 撞击

The state of cells 样品状态	No. 编号	External Peak temperature(°C) 电池表面最高温度(°C)	Status 结果
50% charged after one cycle 一次循环后50%充电 状态	C1#	114.7	Pass合格
	C2#	109.6	Pass合格
	C3#	107.9	Pass合格
	C4#	110.2	Pass合格
	C5#	108.5	Pass合格
50% charged after twenty-five cycles 25次循环后50%充电 状态	C6#	110.3	Pass合格
	C7#	112.3	Pass合格
	C8#	114.4	Pass合格
	C9#	113.5	Pass合格
	C10#	111.6	Pass合格
Notes 注释: Atmospheric pressure 大气压强: $1.013 \times 10^5 \text{Pa}$, Ambient temperature 环境温度: 23.8°C There is no disassembly and no fire during the test and within six hours after test. 电芯在测试中和测试后6小时内未解体、未起火。			



T.7. Overcharge过充电

The state of cells 样品状态	No. 编号	Status 结果
Full charged after one cycle 一次循环后满电状态	B11#	Pass合格
	B12#	Pass合格
	B13#	Pass合格
	B14#	Pass合格
Full charged after twenty-five cycles 25次循环后满电状态	B15#	Pass合格
	B16#	Pass合格
	B17#	Pass合格
	B18#	Pass合格
Notes 注释: Atmospheric pressure 大气压强: $1.013 \times 10^5 \text{Pa}$, Ambient temperature 环境温度: 23.6°C There is no disassembly and no fire during the test and within seven days after the test. 电池在测试中和测试后7天内未解体, 未起火。		

T.8. Forced discharge强制放电

The state of cells 样品状态	No. 编号	Status 结果
Full discharged after one cycle 一次循环完全放电状态	C11#	Pass合格
	C12#	Pass合格
	C13#	Pass合格
	C14#	Pass合格
	C15#	Pass合格
	C16#	Pass合格
	C17#	Pass合格
	C18#	Pass合格
	C19#	Pass合格
	C20#	Pass合格
Full discharged after twenty-five cycles 25次循环完全放电状态	C21#	Pass合格
	C22#	Pass合格
	C23#	Pass合格
	C24#	Pass合格
	C25#	Pass合格
	C26#	Pass合格
	C27#	Pass合格
	C28#	Pass合格
	C29#	Pass合格
	C30#	Pass合格
Notes 注释: Atmospheric pressure 大气压强: $1.013 \times 10^5 \text{Pa}$, Ambient temperature 环境温度: 24.1°C There is no disassembly and no fire during the test and within seven days after the test. 电芯在测试中和测试后7天内未解体, 未起火。		



IV、Conclusion 结论

No. 编号	Test item 测试项目	Sample number 样品数量	Test reference 测试参考	Conclusion 结论
1	Altitude simulation 高空模拟	B1#~B10#	UN Manual of Test and Criteria, part III, subsection 38.3.4.1 UN试验和标准手册,第III部分,第 38.3.4.1节	Pass 合格
2	Thermal test 温度试验		UN Manual of Test and Criteria, part III, subsection 38.3.4.2 UN试验和标准手册,第III部分,第 38.3.4.2节	Pass 合格
3	Vibration 振动		UN Manual of Test and Criteria, part III, subsection 38.3.4.3 UN试验和标准手册,第III部分,第 38.3.4.3节	Pass 合格
4	Shock 冲击		UN Manual of Test and Criteria, part III, subsection 38.3.4.4 UN试验和标准手册,第III部分,第 38.3.4.4节	Pass 合格
5	External short circuit 外部短路		UN Manual of Test and Criteria, part III, subsection 38.3.4.5 UN试验和标准手册,第III部分,第 38.3.4.5节	Pass 合格
6	Impact/Crush 撞击/挤压	C01#~C10#	UN Manual of Test and Criteria, part III, subsection 38.3.4.6 UN试验和标准手册,第III部分,第 38.3.4.6节	Pass 合格
7	Overcharge 过度充电	B11#~B18#	UN Manual of Test and Criteria, part III, subsection 38.3.4.7 UN试验和标准手册,第III部分,第 38.3.4.7节	Pass 合格
8	Forced discharge 强制放电	C11#~C30#	UN Manual of Test and Criteria, part III, subsection 38.3.4.8 UN试验和标准手册,第III部分,第 38.3.4.8节	Pass 合格

The submitted samples were complied with the stated requirements of UN manual of test and criteria, part III, subsection 38.3

经检测，提交的测试样品均符合UN38.3的要求，测试结论为合格。



V、Main Test Apparatus主要测试仪器

Serial No. 设备编号	Name of Equipment 设备名称	Model 型号	Calibration Date /Due Date 校准日期/到期日
ZK-B012	Charge and discharge testing system 充放电测试系统	CT-4008-5V6A-S1	2023.10.19
			2024.10.18
ZK-B003	Low-pressure high-altitude simulation test chamber 低压高空模拟试验箱	GX-3020-Z	2023.10.19
			2024.10.18
ZK-B009	Constant temperature and humidity test chamber 恒温恒湿试验箱	GX-3000-1000LT	2023.10.19
			2024.10.18
ZK-B001	Vibration test instrument 振动测试仪器	EV103	2023.10.19
			2024.10.18
ZK-B002	Shock test instrument 冲击测试仪器	HSKT10	2023.10.19
			2024.10.18
ZK-B026	Battery short circuit test instrument 电池短路测试仪器	ANB62133-80	2023.10.19
			2024.10.18
ZK-B007	Impact test instrument 撞击测试仪器	GX-5066	2023.10.19
			2024.10.18
ZK-B008	Crush test instrument 挤压测试仪器	GX-5067	2023.10.19
			2024.10.18
ZK-B020	DC regulated power supply 直流稳压电源	WYG-120V60A	2023.10.19
			2024.10.18
ZK-B011	Battery anti-explosion chamber 电池防爆箱	GX-FB-200	--
			--
ZK-B019	Electronic Scale 电子秤	LQ-A3003	2023.10.19
			2024.10.18
ZK-S021	Digital Multimeter 数字万用表	15B+	2023.10.19
			2024.10.18
ZK-B024	Temperature recorder 温度记录仪	KH306AG-NUMN	2023.10.19
			2024.10.18



VI、样品图片/ Photo of The Sample

Fig. 1:

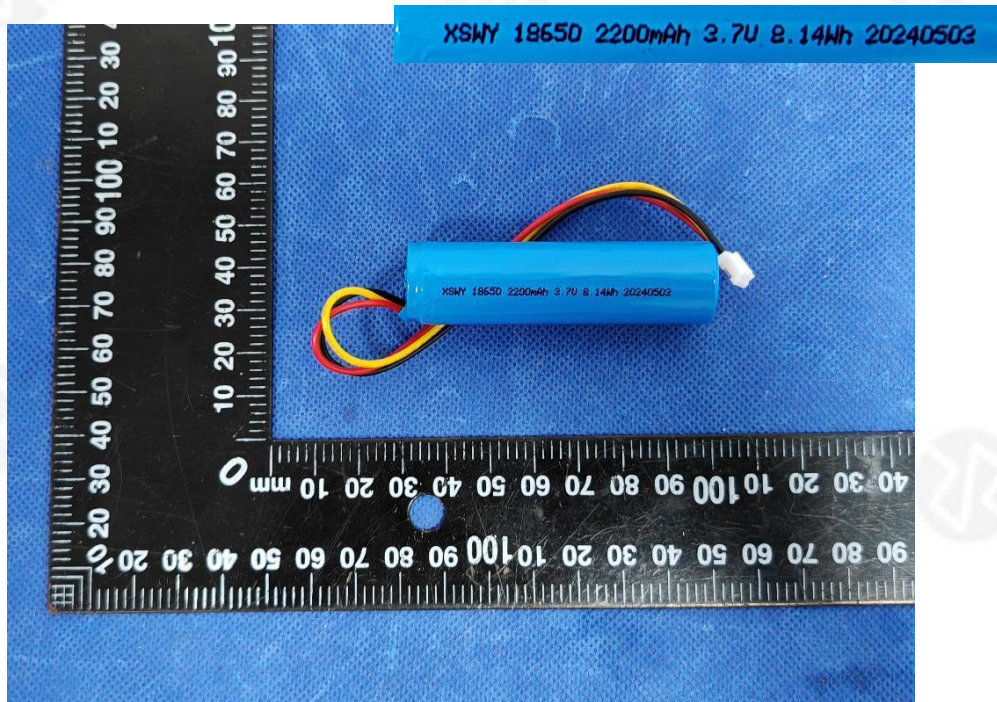


Fig. 2:

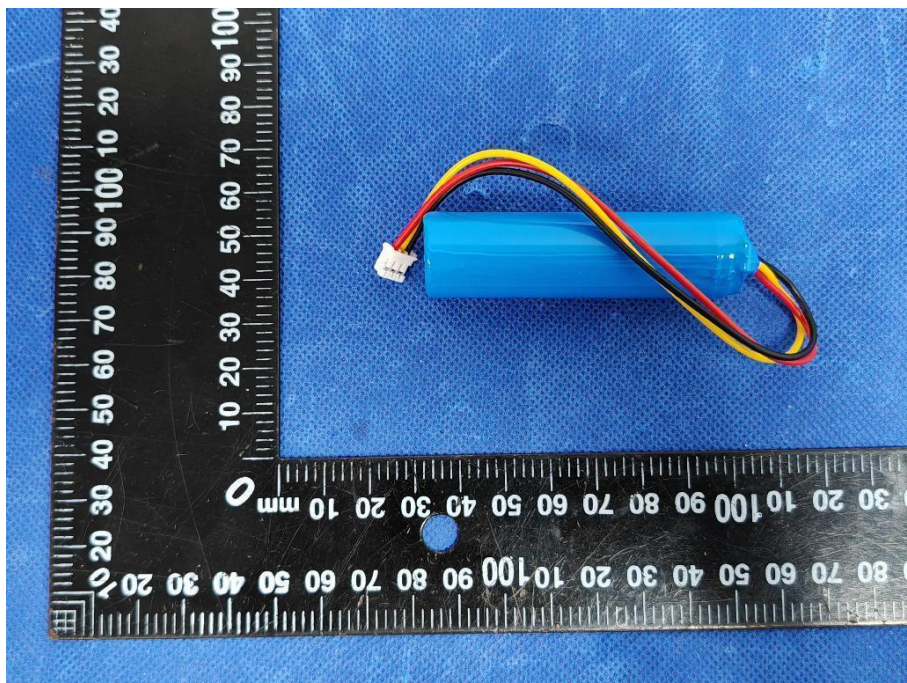




Fig. 3:

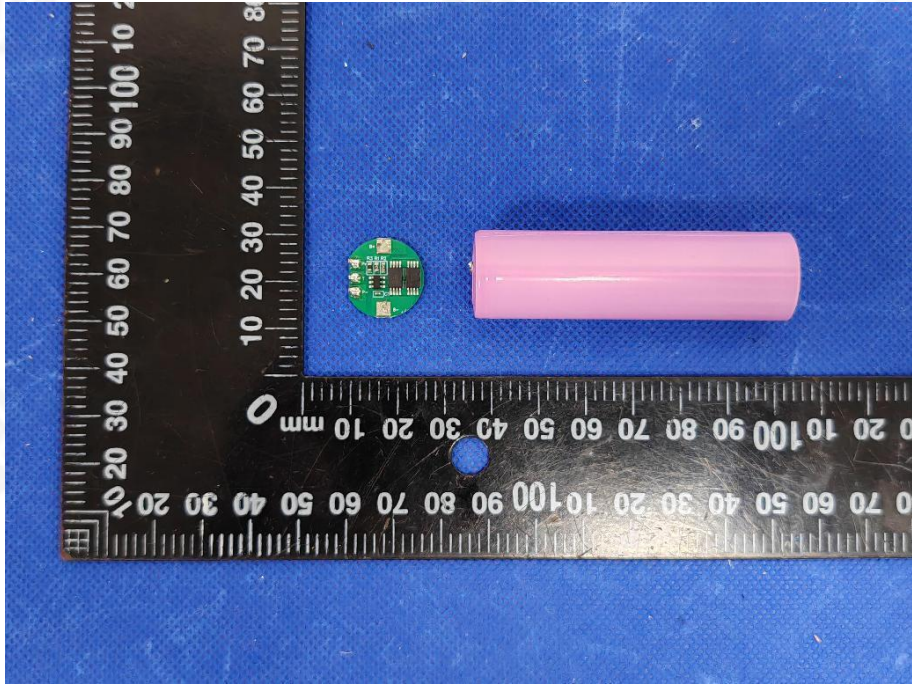


Fig. 4:

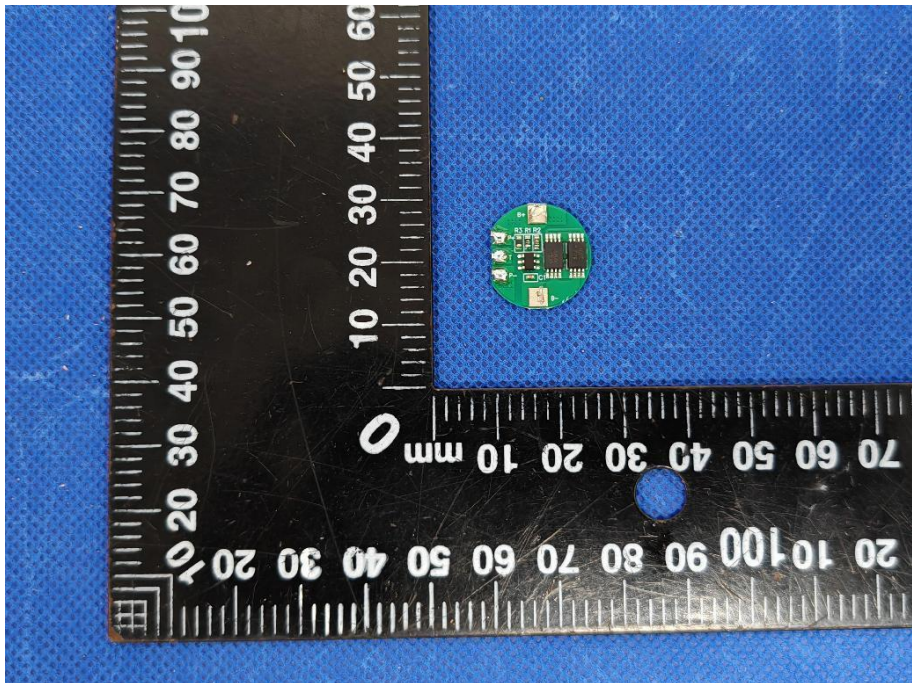




Fig. 5:

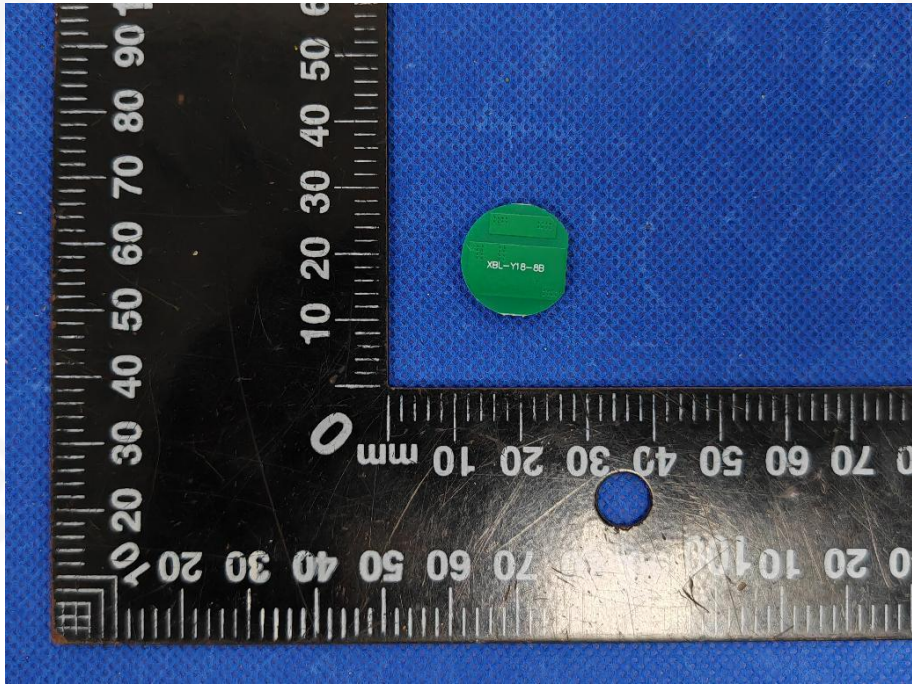
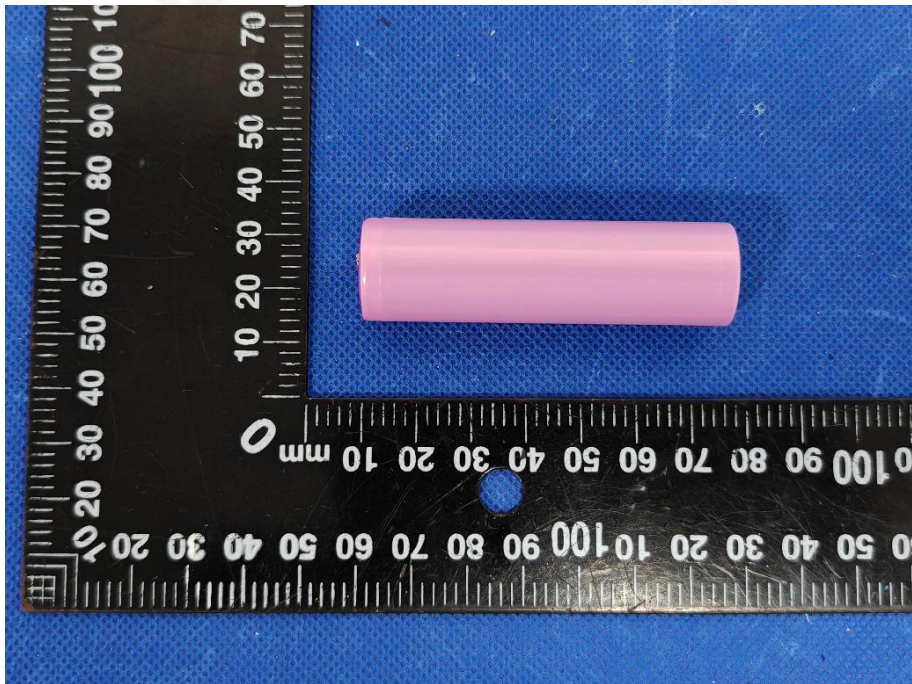


Fig. 6:





声 明 Statement

**本报告试验结果仅对受检样品有效；
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Testing Laboratory: Shenzhen ZKT Technology CO., Ltd.

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