TINNO天珑

深圳市天珑移动技术有限公司

承　认　书

（锂电池类）

SPECIFICATION FOR　APPROVAL

物料描述　:V850 3.85V 4.9AH 聚合物锂离子电池/T/FH/新
Description:V850 3.85V4.9AH Polymer lithium ion battery/T/FH/New

物料型号
Model:　　486786

物料编码
Part No.:　　P104-BQY006-010

品牌(制造商)
BRAND:　　风华

适用机种
Application:

日期
Date:　　2023/5/10

供应商:　广东风华新能源股份有限公司
Supplier: Guangdong Fenghua New Energy Co.,Ltd.

APPROVED　BY　VENDOR			
确认 Confirmed by	校对 Checked by	审核 Audited by	批准 Approved by

文件编号：TN-WI-018　　V1.2

电话：0755-86095550 传真：0755-86095551

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变更履历 Revision History

版本 Version	变更时间 Time of changing	页码 Page	变更内容 Content of changing	审核 Audited by
V1.0	2023/4/19		新版发行	罗循武
V1.1	2023/5/11		修改 ESD 测试空气放电为“15KV”和电池规格中的“3.4V 容量保持率”参数要求	罗循武

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一、 技术规格部分 Technical Specifications

1、适用范围 Scope of application

本规格书描述电池之标称参数、电气特性、安全性能、环境适应性及其实验和判定、使用说明和安全规程、质量评定及包装、标志、贮存、运输等。适用于采用 风华 FHPV496786P 电芯,广东风华新能源股份有限公司 PACK 制成的配套电池。

The specification describes the nominal parameter, electrical characteristic, safety performance, environmental suitability and its test and judgement, direction for use, safety specification, quality evaluation, package, marking, storage and transportation of battery.This specification is applicable for the battery used cell FHPV496786P to be Packed by Guangdong Fenghua New Energy Co.,Ltd.

2、 电池规格 Battery specification

No. 序号	Content 内 容	Parameter 参 数	Notes 备 注
1	标称电压 Nominal voltage	3.85V	
2	容量 Capacity	最小值：4900mAh Minimum:4900mAh 典型值：5000mAh Typical:5000mAh	完全充电后用 0.2C 放电至截止电压的容量。 Capacity that discharges at 0.2C to cut-off voltage after being fully charged.
3	3.4V Capacity retention rate 3.4V 容量保持率	≥94%	3.4 V / 3.0 V capacity rate
4	充电电压 Charging voltage	4.4V±0.03V	
5	内 阻 Internal resistance	110 mΩ（Max）	半电态 Half charged state
6	充电方式 Charging method	恒流/恒压方式 C.C/C.V.	恒流/恒压视电池电压转换 C.C/C.V. Convert as per battery voltage
7	充电方式 Charging method	1. 标准充电 0.2C 1.Standard charge 0.2C	充电电流 980mA Charging current 980mA
		2. 快速充电 0.7C 2.quick charge 0.7C	充电电流 3430mA Charging current 3430mA
8	Time of charging 充电时间	Standard charge 标 准 充 电 — 8Hours	

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		quick charge 快 速 充 电	4.5 Hours	
9	放电截止电压 Discharging cut-off voltage	3.0V		
10	过充电保护电压 Overcharging protection voltage	4.475±0.02V		
11	过放电保护电压 Over discharging protection voltage	2.5±0.10V		
12	过电流保护 over current protection	8A～15A		
13	输出短路保护 Output short-circuit protection	保护后撤销短路负载恢复 Remove short-circuit loading recovery after being protected		
14	工作消耗电流 Operation consumption current	6uA (Max)		
15	过放保护后预充电流 Precharging current after over discharging protection	0.02C		充电电流 98mA Charging current 98mA
16	工作温度 Operation temperature	充电时 While charging	0℃～15℃	≤0.2C 恒流恒压充电至 4.4V Charge to 4.4V at ≤0.2C constant current and constant voltage
			15℃～45℃	≤0.7C 恒流恒压充电至 4.4V Charge to 4.4V at ≤0.7C constant current and constant voltage
			45℃～60℃	≤0.5C 恒流恒压充电至 4.1V Charge to 4.1V at ≤0.5C constant current and constant voltage
			>60℃	0
		放电时 While discharging	-20~60℃	
	若不按我司设定的阶梯充电方式充电，由此带来的质量风险我司不予承担。 Please charge according to the step charging mode set by our company, or we will not bear the quality risk.			

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17	贮存温度 Storage temperature	-5℃-35℃ recommend（25±5℃）	贮存时应充电至容量的40%~50% Charge to 40%-50% of capacity when being stored.
18	ID 电阻 ID resistance	100 KΩ±5%	/
19	NTC 电阻. NTC resistance	10KΩ±1% 25℃	B 值 3380
20	0V 充电功能 0V charging function	支持	/
21	循环寿命 Cycle life	500 次≥80%标称容量 500 times ≥ 80% nominal capacity	/
22	五金镀金厚度 The gold-plating thickness of hardware	/	/
23	五金镀镍厚度 nickel plating thickness of hardware	/	/
24	出货电压要求 Shipment voltage	3.90-4.00V	/
25	电池厚度（出货电压） Thickness of battery（shipment voltage）	MAX 4.96mm	不含标签 Without label
26	电池厚度（满电） Thickness of battery(fully charged)	MAX5.0mm	/
27	电池厚度（循环后） Thickness of battery(after cycle)	MAX 5.40mm	/
28	成品电池重量 The weight of battery	约 67.5g	不含标签 Without label

3、 测试要求 Test requirement

要求供应商对电池进行出厂前测试，测试项包含但不限于本标准中的关键评估项，并在规格书中附加测试结果。各项测试的测试报告需按照要求格式提供。可靠性测试必须附加测试前后的照片或测试视频。

按照本规范描述的电池测试标准，对于每一个新研发项目的首次签样认证测试和已经量产的项目电池进行周期性测试。测试报告提供时间节点请参考天珑公司的《锂离子电池认证标准》。

The Supplier shall be required to carry out ex-factory test of the battery, including but not limited to the key evaluation items in this specification, and to add the test results in the specification.The

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test reports for each test shall be provided in the required format.The reliability test must be accompanied by a photo or test video before and after the test.

According to the battery test standard described in this specification, the first approved sample certification test of each new project and project under mass production should be carried out the periodic test.

3.1 标准测试条件 Standard test condition

除非另有规定，本标准中各项试验应在试验的标准大气条件下进行：

温度：23℃±2℃

相对湿度：45％～75%

大气压力：86kPa～106kPa

Unless otherwise specified ,each test in this specification shall be carried out under the standard atmospheric conditions.

Temperature:23℃±2℃

Relative humidity:45％～75%

Atmospheric pressure:86kPa～106kPa

3.2测量仪表与设备的要求

Requirement of measuring apparatus and equipment:

测量电压的仪表准确度应不低于 0.5 级，内阻量程应不小于 10 kΩ/V。

The equipment accuracy for voltage measurement should not be less than 0.5 level, and the measuring range should not be less than 10 kΩ/V.

测量电流的仪表准确度应不低于 0.5 级。

The equipment accuracy for current measurement should not be less than 0.5 level.

测量时间用的仪表准确度应不低于±0.1%。

The equipment accuracy for time measurement should not be less than ±0.1%.

测量温度用的仪表准确度应不低于±0.5℃。

The equipment accuracy for temperature measurement should not be less than ±0.5℃.

恒流源的电流恒定可调，恒流时，其电流变化范围为±1%。

The current of constant current supply can be is constant and adjustable.The current change range should be ±1% when constant current.

恒压源的电压恒定可调，恒压时，其电压变化范围为±0.5%。

The voltage of constant voltage supply can be is constant and adjustable.The voltage change range should be ±0.5% when constant voltage.

测量尺寸用的仪器准确度应不低于 0.01mm。

The equipment accuracy for dimension measurement should not be less than0.1mm.

测量重量用的仪器准确度应不低于 0.1mg。

The equipment accuracy for weight measurement should not be less than 0.1mg.

3.3标准充电模式 Standard charge mode

标准充电：即在环境温度为23℃±2℃的条件下,先以恒定电流0.2C5A充电至4.40V（或特定值）,再以4.40V（或特定值）的恒压充电至电流小于0.02C5A.

Standard charge:Under the temperature of 23℃±2℃, charge to 4.40V(or specific value) at constant current 0.2C5A , and then charge to current less than 0.02C5A at 4.40V(or specific value) constant voltage.

3.4 快速充电模式 Quick charge mode

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快速充电：即在环境温度为23℃±2℃的条件下,先以恒定电流0.5C5A充电至4.40V（或特定值）,再以4.40V（或特定值）的恒压充电至电流小于0.02C5A.
Quick charge:Under the temperature of 23℃±2℃, charge to 4.40V(or specific value) at constant current 0.2C5A , and then charge to current less than 0.02C5A at 4.40V(or specific value) constant voltage.

3.5放电 Discharge

放电终止电压为3.0V, 标准放电电流0.2 C5A，最大恒流放电电流为1C5A.
Discharge cut-off voltage is 3.0V, standard discharge current is 0.2 C5A, and maximum discharge current at constant current is 1C5A.

4、 电性能 Electrical Characteristics

测试项目 Test Items	测试方法 Test Method	检验标准Inspection standard	抽样频率 Sampling frequency
额定容量 rated capacity	在23℃±2℃的条件下，电池按照标准充电模式充满电后搁置10分钟，以0.2C放电至3.0V Under 23℃±2℃, the battery is fully charged as per standard charge mode and rest for 10 minutes.Discharge to 3.0V at 0.2C.	放电时间不低于5h，标称容量+20mAh ≤0.2C放电容量 The discharging time should be no less than 5h,nominal capacity+20mAh ≤0.2C discharge capacity	3pcs/90d
有效放电性能 Effective discharge performance	在环境温度为23℃±2℃的条件下，电池按照标准充电模式充满电后，搁置10min,而后以0.2C5A电流放电到3.4V. Under 23℃±2℃, the battery is fully charged as per standard charge mode and rest for 10 minutes.Then discharge to 3.4V at 0.2C5A.	有效放电比（3.4V容量/3.0V容量）≥94% Effective discharge ratio (3.4V capacity / 3.0V capacity) ≥ 94%	3pcs/90d
放电性能 Discharge performance	电池按照标准充电模式充满电后，在环境温度23℃±2℃的条件下搁置10min,而后以1C5A电流(容量≥1500mAh电池，以0.5C)放电到3.0V. After the battery is fully charged as per standard charge mode, rest for 10 min under 23℃±2℃, and then discharge to 3.0V at 1C5A current(battery capacity≥1500mAh, at 0.5C).	电池放电时间≥54min.(容量≥1500mAh 电池放电时间≥110min.) Battery discharging time should be≥54min.(The discharge time of battery'capacity≥1500mAh should be≥110min).	3pcs/90d
高温放电性能 High	电池按照标准充电模式充满电后，将电池放入55℃±2 ℃的高温箱中恒温2h,然后以0.2C5A电流放电至终止电压,实验结束后,将电池取出在环境温度为23℃±2℃的条件下	放电时间≥5h，电池外观相比实验前无明显差异	3pcs/90d

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temperature discharge	搁置2h,然后目测电池外观. After the battery is fully charged as per standard charge mode, put the battery into the high temperature cabinet with the temperature of 55℃±2 ℃ and remain the temperature for 2h.Then discharge to cut-off voltage at 0.2C5A.After the test, take out the battery and place it under the environmental temperature of 23℃±2℃ for 2h, and then observe its appearance.	Discharge time≥5h;there is no obvious difference on appearance before and after the test.	
-10℃放电容量 Discharge capacity at -10℃	电池按照标准充电模式充满电后，将电池放入-10℃±2 ℃的低温箱中恒温4h,然后以0.2C5A电流放电至终止电压,实验结束后,将电池取出在环境温度为23℃±2℃的条件下搁置2h,然后目测电池外观. After the battery is fully charged as per standard charge mode, put the battery into the low temperature cabinet with the temperature of -10℃±2 ℃ and remain the temperature for 4h.Then discharge to cut-off voltage at 0.2C5A.After the test, take out the battery and place it under the environmental temperature of 23℃±2℃ for 2h, and then observe its appearance.	要求放电时间≥3.5h，电池外观相比实验前无明显差异 Discharge time≥3.5h;there is no obvious difference on appearance before and after the test.	3pcs/90d
-20℃放电 Discharge at -20℃	电池按照标准充电模式充满电后，将电池放入-20℃±2 ℃的低温箱中恒温4h，然后以0.5C5A电流放电至3.3V，实验结束后,将电池取出在环境温度为23℃±2℃的条件下搁置2h,然后目测电池外观. After the battery is fully charged as per standard charge mode, put the battery into the low temperature cabinet with the temperature of -20℃±2 ℃ and remain the temperature for 4h.Then discharge to cut-off voltage at 0.5C5A.After the test, take out the battery and place it under the environmental temperature of 23℃±2℃ for 2h, and then observe its appearance.	要求放电容量>0mAh，电池外观相比实验前无明显差异 Discharge capacity required>0mAh,there is no obvious difference on appearance before and after the test.	3pcs/90d
电池内阻 The internal resistance of battery	在23℃±2℃的条件下，测试半电态电池内阻。 Under the temperature of 23℃±2℃, test the internal resistance of battery with SOC of 50%.	容量<1800mAh,电池内阻≤130mΩ; 容量≥1800mAh,电池内阻≤110mΩ Capacity<1800mAh, the internal resistance ≤130mΩ; Capacity<1800mAh, the internal resistance ≤110mΩ	3pcs/90d

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常温荷电保持能力 charge retention under normal temperature	电池按照标准充电模式充满电后，在环境温度为23℃±2℃条件下,将电池搁置28天,再以0.2C5A电流放电至3.0V（残余容量）。再将电池按照标准充电模式充满，在环境温度为23℃±2℃下，以0.2C5 放电至3.0V（恢复容量） After the battery is fully charged as per standard charge mode, under the ambient temperature of 23℃±2℃, rest the battery for 28 days, and then discharge to 3.0V(remaining capacity) at 0.2C5A.After the battery is fully charged as per standard charge mode again, under the ambient temperature of 23℃±2℃, discharge to 3.0V(recovery capacity) at 0.2 C5.	残余容量放电时间≥4.25h；恢复容量放电时间≥4.5h，电池不膨胀，不渗露 Discharge time of remaining capacity≥4.25h;discharge time of recovery capacity≥4.5h.Battery no bulge, no leakage.	3pcs/90d
高温荷电保持能力\ charge retention under high temperature	电池按照标准充电模式充满电后，放入 45℃±2℃的烘箱中存放 7 天；从恒温箱中取出电池恢复 2 小时，然后以 0.2C 放电至终止电压 3.0V。测量电池高温前后的电压数据和电池厚度. After the battery is fully charged as per standard charge mode, put it into the oven with the temperature of 45℃±2℃ and stored for 7 days;Take out the battery from constant cabinet and recover the battery for 2h, and then discharge to cut-off voltage 3.0V at 0.2C.Test the voltage and thickness of battery before and after the test.	放电时间≥**4.5h**；厚度变化率≦5%，检查电池外观，不膨胀、不渗漏。 Discharge time≥**4.5h;** change rate of thickness≦5%, and check the appearance of battery, no bulge and no leakage.	3pcs/90d

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<table>
<tr><td>RT循环寿命
RT Cycle life</td><td>在在环境温度为 23℃±2℃时， 容量小于 4900mAh 的电池用 1C 放电至终止电压 3.0V，搁置时间：10 分钟；再以 1C 充电，限制电压 4.35V±0.05V 或 4.35V±0.05V（或特定值），截止电流 0.02C；搁置 10 分钟；再按照上述步骤进行下一个充放电循环；Under the ambient temperature of 23℃±2℃, the battery with capacity less than 4900mAh discharge to cut-off voltage 3.0V at 1C, time of resting:10 min; then charge at 1C, limit voltage 4.35V±0.05V or 4.35V±0.05V(or specific value), cut-off current 0.02C; rest 10min; carry out next cycle as per the above-mentioned procedure.
容量大于等于 4900mAh 的电池用 0.5C 放电至终止电压 3.0V，搁置 10 分钟；再以 0.5 充电，限制电压 4.35V±0.05V 或 4.35V±0.05V（或特定值），截止电流 0.02C；搁置 10 分钟；再按照上述步骤进行下一个充放电循环，循环次数和容量要求按照附表__B___类。
The battery with capacity equal to or larger than 1500 mAh is discharged to 3.0V, and rest 10min;then charge at 0.5C, limit voltage 4.35V±0.05V or 4.35V±0.05V （ or specific value), cut-off current 0.02C;rest for 10 min;carry out next cycle as per the above-mentioned procedure. The cycle time and capacity requirements according to the attached table B catalogue.</td><td>不同类别电池循环次数和容量要求按照附表，测试完成后电池（满电态）相对于测试前（出货态）厚度变化率≦8%，电池外观相比实验前无明显差异
The cycle times and capacity of different battery are required as the attached table.After the test, the change rate of thickness ≦8% compared full charge with shipment state.there is no obvious difference on appearance before and after the test.</td><td>3pcs/90d</td></tr>
<tr><td></td><td colspan="3"><table>
<tr><td>Cycle time</td><td>100 times</td><td>200 times</td><td>300 times</td><td>400 times</td><td>500 times</td><td>600 times</td></tr>
<tr><td>A catalogue</td><td>≥96%</td><td>≥93%</td><td>≥90%</td><td>≥87%</td><td>≥84%</td><td>≥80%</td></tr>
<tr><td>B catalogue</td><td>≥94%</td><td>≥90%</td><td>≥88%</td><td>≥85%</td><td>≥80%</td><td>/</td></tr>
<tr><td>C catalogue</td><td>≥93%</td><td>≥88%</td><td>≥85%</td><td>≥80%</td><td>/</td><td>/</td></tr>
</table>
备注：A 类电池循环寿命的判定以第 600 次为准，B 类电池以第 500 次为准，C 类以第 400 次为准，前面的次数和容量要求均为测试过程的参考，剩余容量百分比为相对于标称容量。
Notes: the judgement of A catalogue cycle life is based on 600 times; the judgement of B catalogue cycle life is based on 500 times;the judgement of C catalogue cycle life is based on 400 times.The former times and capacity requirements is the reference to test process; the percentage of remaining capacity is relative to nominal capacity.</td></tr>
<tr><td>45℃循环寿命（参考）
Cycle life at</td><td>将电池放入 45±2℃的高温箱中，用 0.5C 进行充放电循环，充放电限制电压分别为电池的充放电截止电压，循环 400 次</td><td>容量保持率≥80%，电池厚度变化率（满电态对出货态）≦</td><td>3pcs/90d</td></tr>
</table>

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45 ℃ (reference)	Put the battery into the high temperature cabinet with temperature of 45±2℃, and carry out charge and discharge cycle at 0.5C.The charge and discharge limit voltage are the charge and discharge cut-off voltage of battery respectively, cycle 400 times.	10%，实验前后外观无明显差异 capacity retention rate≥80%, the thickness change rate(full charge is relative to shipment state), there is no obvious difference on appearance before and after test.	
0℃低温循环（参考） Cycle under low temperature 0℃ (reference)	电池在 0±2℃条件下，用 0.5C 进行充放电，充放电限制电压分别为电池的充放电截止电压，循环 30 次 Put the battery into the high temperature cabinet with temperature of 0±2℃, and carry out charge and discharge at 0.5C.The charge and discharge limit voltage are the charge and discharge cut-off voltage of battery respectively, cycle 30 times.	容量保持率≥80%，常温恢复容量≥85%*常温标称容量，厚度变化率≦5%，内阻变化率≦50%，实验前后外观无明显差异 capacity retention rate≥80%, recovery capacity under normal temperature≥85%*nominal capacity under normal temperature,the change rate of thickness≦5%, the change rate of internal resistance≦50%.there is no obvious difference on appearance before and after test.	3pcs/90d
-10℃低温循环（参考） Cycle under low temperature -10 ℃ (reference)	电池在-10±2℃的环境下，用 0.2C 进行充放电，充放电限制电压分别为电池的充放电截止电压，循环 20 次 Put the battery into the high temperature cabinet with temperature of -10±2℃, and carry out charge and discharge at 0.2C.The charge and discharge limit voltage are the charge and discharge cut-off voltage of battery respectively, cycle 20 times.	容量保持率≥70%，测试完成后电池（满电态）相对于测试前（出货态）厚度变化率≦5%，实验前后外观无明显差异 capacity retention	3pcs/90d

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		rate≥70%, the thickness change rate of thickness(full charge is relative to shipment state) ≦ 5%, there is no obvious difference on appearance before and after test.	
低温析锂验证 Separating out lithium verification	电池置于 0℃环境下，先用 0.5C 放电至 3.0V，然后采用供应商承诺的该温度下的最大电流充电至截止电压，循环 5 次后拆解电池（0℃下充满电） Place the battery under the temperature of 0℃, discharge to 3.0V at 0.5C, and then charge to cut-off voltage at maximum current at this temperature declared by supplier.Cycle 5 times and disassemble the battery(fully charged at 0℃)	要求电池界面正常，无析锂 the interface of battery is required normal and no lithium separating out.	3pcs/180d
	电池置于 5℃环境下，按上述方法进行 5 次充放电循环后满电拆解（0℃无析锂则此项可不做） Place the battery under the temperature of 5℃, carry out 5 charge and discharge cycles as per the above-mentioned method, and then disassemble the battery at full charge(If lithium doesn't separate out at 0℃, this test can be not carried out)	要求电池界面正常，无析锂 the interface of battery is required normal and no lithium separating out.	3pcs/180d

环境性能 Environmental performance

测试项目 Test items	测试方法 Test method	检验标准 Inspection standard	抽样频率 Sampling frequency
恒定湿热性能 Constant humidity and temperature	电池标准充电后放入温度 40±2℃、相对湿度（90%~95%）的恒湿箱中搁置 48h，将电池取出在 23℃±2℃的环境温度下搁置 2 小时，检查电池外观，然后以 0.2C5 电流放电至终止电压 3.0V Put the constant humidity cabinet with the temperature 40±2 ℃ and humidity 90%~95% for 48H.And take out the battery and place under the ambient temperature of 23 ℃ ±2 ℃ for 2h, and check the appearance of battery ; then charge to cut-off voltage 3.0V at 0.2C5.	剩余容量放电时间≥4.5h，电池厚度变化率≦5%、电池不膨胀、不渗漏； Discharge time of remaining capacity ≥ 4.5h, the change rate of battery thickness ≦ 5%, no bulge, no leakage.	3pcs/90d

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ESD test	电池标准充电后，使用 8KV 对电池的每个金属接触点进行接触放电；连续进行 10 次放电，每次放电间隔时间为 1s。继续使用 15KV 对电池较薄弱的绝缘位置进行空气放电；连续进行 10 次放电，每次放电间隔时间为 1s。 Contact discharge test with 8KV to every metal contact point, continuous 10 times discharge, and the interval of each discharge is 1s.Then air discharge with 15KV to the weak insulation position,continuous 10 times discharge, and the interval of each discharge is 1s.	要求电池无异常，电性能正常 No abnormal condition happened to battery and electrical performance is normal.	3pcs/90d
低气压 Low air pressure	电池标准充电结束后，在 23℃±2℃的环境温度下，将其搁置在真空箱中，真空箱密闭后，逐渐减少其内部压力至不高于 11.6kPa，开路放置 6h（模拟海拔 15240m），然后取出电池，开路搁置 1h，观察电池状态。 After the battery is charged as per standard charge mode, the battery is placed in a vacuum box at 23±2℃. The pressure in the box is reduced not higher than 11.6KPa (simulated altitude 15240m) and kept open circuit for 6 hours, and observe the battery status.	要求电池外观无明显损伤，不膨胀、不漏液、不泄压、不破裂、不起火、不爆炸.It is required that no obvious damage on the appearance of battery, no bulge, no leakage, no pressure relief, no breakage, no fire and no explosion.	3pcs/90d
高温存储 Stored at high temperature	电池标准充电结束后，开路搁置 2h，测量厚度；在 70℃±2℃的条件下开路搁置 16h。实验结束后，取出电池，开路搁置 2h，测量厚度。然后以 0.2C 进行一次充放电，记录放电时间。After the battery is charged as per standard charge mode, rest open circuit for 2h and test its thickness.The battery is stored open circuit 16h at the temperature of 70℃±2℃ for 16hours. Take out the battery and rest at 23℃±2℃ for 2 hours,and test its thickness;and charge and discharge one time at 0.2C.Record its discharge time.	电池厚度变化率≦8%，恢复容量放电时间＞4.75h，电池外观相比实验前无明显差异 The change rate of battery thickness ≦ 8%;discharge time of remaining capacity ＞ 4.75h, and there is no obvious difference on appearance of battery before and after the test.	3pcs/90d
高温使用 Used at high temperature	电池标准充电后置于 80±2℃的高温箱内，待样品表面温度稳定后，先 0.2C 放电至 3.0V，再 0.2C 恒流恒压充电到截止电压 After the battery is charged as per standard charge mode, place the battery into the high temperature oven with the temperature of 80±2℃.When the surface temperature of samples are stable, firstly discharge to 3.0V at 0.2C, and then charge to cut-off voltage at	电池不起火、不爆炸、不漏液 no fire, no explosion, no leakage.	3pcs/90d

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	0.2C constant current and constant voltage.		
温度循环 Temperature cycle	电池按标准充电结束后，放入冷热冲击箱中，电池在 75℃±2℃中搁置 6h，然后在 30min 内将温度降至-40℃±2℃并恒温 6h，如此为 1 个循环，共循环 10 次，试验结束后在 25℃±2℃环境温度下将电池搁置 1h 进行检测 After the battery is charged as per standard charge mode, put it into thermal shock chamber.Rest the battery at 75℃±2℃ for 6h, and then in 30min, the temperature is declined to -40℃±2℃ and remains 6h, which is a cycle and totally carry out 10 cycles.After the test, inspect the battery after resting at the ambient temperature of 25℃±2℃.	要求电池应不泄露，不泄气，不破裂、不起火，不爆炸。 The battery should be no leakage, no breakage, no air relief, no fire and no explosion.	3pcs/90d
盐雾试验 Salt spray test	将电池端子放入 35℃±2℃、湿度≥85%、PH 值在 6.5～7.2 范围内的盐雾试验箱中，用 5%±1%的 NaCl 溶液盐水喷雾，持续 48h，检查镀层表面。 Put the terminals of battery into salt spray test chamber with the temperature of 35℃±2℃, humidity≥85 %, the PH value 6.5 ～ 7.2.Use Nacl solution mist spray of 5%±1%, and keep 48h, check the surface of cladding.	要求镀层无锈蚀、剥落等不良现象。 The cladding has no corroding, no peeling off.	3pcs/90d
FPC 弯折测试 FPC bending test	对聚合物内置电池的 FPC，用 1mm 的折弯半径，180 度的折弯角，单向折弯 50 次以上。 As for the FPC of built-in polymer battery, using 1 mm bend radius,180-degree bend angle bend more than 50 times single direction.	要求 FPC 无断路现象，覆盖膜无胶落，各电气节点弯折前后的阻抗差异不超过 10%。FPC is required to have no short circuit and no glue falling from the covering film.The difference of impedance of every electrical node should be not more than 10% before and after bending.	3pcs/90d
洗涤 washing	将满充后的电池固定在转动装置上，在 45±2℃，PH 11.0±0.1 的溶液中浸泡 0.5h（电池中心距液面高度为 300±10mm）；之后将电池在溶液中转动 0.5h，转速 60r/min；移除溶液，转动 10min，转速 800r/min；将电池取出在 45℃高温箱中烘烤 0.5h，	电池应不起火、不爆炸 Battery should be no fire and no explosion.	3pcs/90d

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	若样品还能充放电则用 0.2C 进行一次放电充电循环，若不能充放电则试验结束。 Fix the fully charged battery on the moving device,immerse 0.5h in the solution of PH 11.0±0.1 at 45±2℃(The height from the center of the battery to the liquid level is 300 ±10mm.); Then the battery is moved in the solution 0.5h, speed 60r/min; remove the solution, move 10 min, speed 80r/min;Take out the battery and bake in the high temperature oven with the temperature of 45℃ 0.5h.If the sample is still can be charged and discharged, charge and discharge the battery one cycle at 0.2C.Otherwise, test finishes.		
振动测试 Vibration	电池标准充电后，测量电池的电压、内阻；1h 内将电池固定在振动台上，进行振动试验，电池经受频率为10～60Hz，振幅为1.6mm，扫频速率为1oct/min的扫频振动，在 X、Y、Z 三个方向上分别扫频30min；扫频结束后，测量电池的电压、内阻、剩余容量。 After the battery is charged as per standard charge mode, test its voltage and internal resistance;Fix the battery on the vibration table within 1h and carry out vibration test.Frequency： 10～60Hz， amplitude： 1.6mm ,sweep rate: 1oct/min.Sweep X, Y, Z each direction 30 min.After the test, test battery's voltage, internal resistance and remaining capacity.	电池外观无明显损伤，不膨胀、不漏液，不泄压，不起火，不爆炸；电池内阻变化不超过 10 mΩ，电压变化不超过 0.1V No obvious damage on the appearance of battery, no bulge, no leakage, no pressure relief, no fire and no explosion.The change of internal resistance should be less than 10 mΩ, and the change of voltage should be less than 0.1V.	3pcs/90d
自由跌落 Free fall (内置式电池配合整机测试)	电池标准充电后，测试电池的内阻及电压，1h 内开始自由跌落试验， 电池从 1200mm 高处自由跌落至大理石地板或者钢板上，6 个面各着地 2 次，跌落完成电池搁置 2h 后，测试电压、内阻、将电池以 0.2C 电流放电至终止电压。内置聚合物电池该项不做要求 After the battery is charged as per standard charge mode, test its voltage and internal resistance;and carry out the test in 1h.Drop the battery from a height of 1200mm to marble floor or steel board.6 sides are dropped twice.After the test finished and rest the battery 2h, test its voltage and internal resistance, and the battery is discharged to cut-off voltage at	要求电池外观无明显破损、开裂，不膨胀、不漏液、不泄压、不起火、不爆炸；电池内阻变化不超过 10mΩ，电压变化不超过 0.1V ，放电时间≥4h No obvious damage on the appearance of battery, no bulge, no leakage, no pressure relief, no fire and no explosion.The change	3pcs/90d

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	0.2C.Built-in polymer battery is not required.	of internal resistance should be less than 10 mΩ, and the change of voltage should be less than 0.1V.	
翻滚跌落 Tumbling and fall	电池标准充电结束后，搁置 1h，测量电池的内阻、电压； 跌落高度为 0.5 米，转速为 10 转/分钟，跌落次数为 30 次。试验完成后，再测量电池组的内阻、电压。要求电池输出正常,能够充放电，然后继续翻滚跌落试验, 跌落次数不小于 100 次。 内置聚合物电池该项不做要求 After the battery is charged as per standard charge mode, rest 1h, and test its internal resistance and voltage.Drop from the height of 0.5 meter, speed 10r/min, falling 30 times.After the test, test the battery's internal resistance and voltage again.It is required that the output of batter is normal and can charge and discharge.Then continue tumbling and falling test, and falling times should be not less than 100 times.Built-in polymer battery is not required.	要求试验完成后电池功能正常，不出现电池结构件脱离现象 the function of battery is normal after the test.The parts do not peel off from battery.	3pcs/90d
机械冲击 Mechanical shock	电池固定在冲击台上，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 735m/s²，峰值加速度在 1225 m/s² 到 1715 m/s² 之间，脉冲持续时间为 6±1ms。电池每个方向进行三次加速度冲击试验 Fix the battery onto the shock table and carry out semi-sinusoidal pulse shock test.In the initial 3ms, the minimum average accelerated speed is 735m/s², the maximum accelerated speed falls in the range from 1225 m/s² to1715 m/s² .Pulse duration is 6 ± 1ms.Three acceleration shock tests are carried out in each direction of the battery	电池表面没有破损、不泄漏、不起火和不爆炸 no damage. No leakage, no fire and no explosion.	3pcs/90d
聚合物电池整体硬度测试 The overall hardness test of polymer battery	聚合物电池硬度测试：测试电池电压为出货电压，固定电池一边，固定边缘离另一边（测试边）距离为 30mm±3mm，测试头为直径 5mm 的钢制圆柱，接触面为平滑水平截面。按照图示位置对电池进行按压测试，测试速度为 5mm/min，压力设置为最大 10N,保持时间为 10S，测试完成记录电池产生的形变，每个电池只能测试两个点,按照图示测试 3 个电池 6 个点。 Hardness test of polymer battery:battery tested voltage is shipment voltage.Fix one side of the battery, and the	要求每个测试的的形变测试结果小于 2mm. The deformation test result of every test less than 2mm.	3pcs/90d

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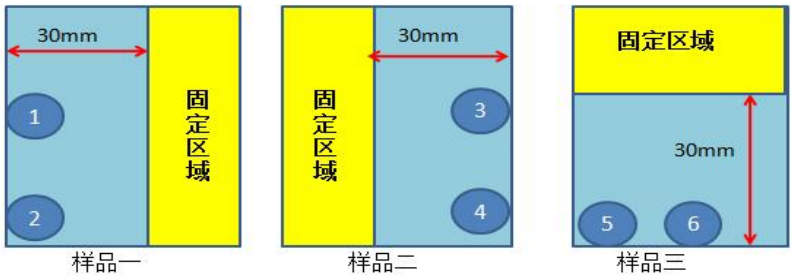
	distance from fixed side to the other side(tested side) is 30mm ± 3mm.Test pin is steel cylinder with a diameter of 5mm, and the contact side is a smooth horizontal section.Press the battery as the illustrated position, and the test speed is 5mm/min; the pressure set is maximum 10N, remain the test for 10S。Record the deformation of battery after the test。Every battery can only be tested two positions， as per illustrated figures:3 batteries, 6 positions.		
			

5、 Safety protection performance 安全保护性能

过充电保护性能 Over charge protection performance	电池标准充电结束后，用恒流恒压源持续给电池加载 7h，恒流恒压源电压设定为 2 倍的标称电压，电流设定为 2 C5A 的外接电流 After the battery is charged as per standard charge mode, the battery is continuously loaded for 7 hours with a constant current and constant pressure source.The voltage of constant current and constant voltage source is set to 2 times the nominal voltage, and the current is set to the external current of 2C5A.	直至实验结束的整个过程，电池应不爆炸,不起火，不冒烟或漏液.The battery should be no explosion, no fire and no smoke or no leakage.	3pcs/90d
过放电保护性能 Over discharge protection performance	电池在环境温度 23℃±2℃的条件下，以 0.2 C5A 放电至终止电压后，外接 30Ω负载放电，直至电池电压为零或放电时间达到 7h 截止 Under the ambient temperature of 23℃±2℃, discharge to cut-off voltage at 0.2 C5A, and discharge by externally connecting 30Ω loading until the voltage is zero or discharge time reaches 7h.	电池应不爆炸,不起火，不冒烟或漏液.no explosion, no fire and no smoke or no leakage.	3pcs/90d
短路保护 Short circuit protection	电池标准充电结束后，将正负极用 0.1Ω电阻器短路 1h，将正负极断开，电池以 1 C5A 电流瞬时充电 5s 后用电压表测量电池电压。 After the battery is charged as per standard charge mode, use resistor with 0.1Ω to make positive and negative electrode short circuit.Cut off positive and electrode.The battery is instantly charged at 1 C5A for 5s, and then test its	电池应不爆炸,不起火,不冒烟或漏液.电池电压应不低于 3.6V No explosion, no fire and no smoke or no leakage, and the	3pcs/90d

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	voltage with voltmeter.	voltage should be not less than 3.6V.	

6、 电芯安全性能 Safety performance of cell

下述试验应在有强制排风条件及防爆措施的装置内进行，在试验前所有的电芯按照要求充放电后，再进行以下试验。The following tests should be carried out in devices with forced exhaust conditions and explosion-proof measures.Before the tests, all the cells should be charged and discharged as per requirements, then carry out the following tests.

Test Items 测试项目	Test Method 测试方法	Inspection standard 检验标准	Sampling frequency 抽样频率
重物冲击 Impact （参考项）	电池放置于一平面上，并将一个直径 15.8mm±0.2mm 的钢柱置于电池中心，钢柱的纵轴平行于平面，让质量 9.1kg±0.1kg 的重物从 610mm±25mm 高度自由落到电池中心上方的钢柱上，测试完毕观察 6 小时，电池在接受冲击试验时，其纵轴要平行于平面，垂直于钢柱的纵轴，每只电池只能接受一次冲击试验，电池宽边进行重物冲击 The battery is placed on a flat, and a steel column with a diameter of 15.8mm±0.2mm is placed in the center of the battery.The longitudinal axis of the steel column is parallel to the plane.The mass with the weight of 9.1kg±0.1kg from the height of 610mm±25mm free fall on the steel column.After test finished, observe the battery for 6h.When the battery is carried out impact test, its longitudinal axis is parallel to the plane and is vertical to the longitudinal axis of the steel column.Each battery can only be carried out impact test once and on its larger side.	电池不起火,不爆炸 No fire, no explosion	3pcs/90d
热冲击 thermal shock	电池标准充电后，放于一个烘箱中加热，烘箱的温度以（5±2℃）/min 的速率上升到 130±2℃，保持 30min Charge the battery as per standard charge mode .The battery is to be placed into a drying oven. The oven temperature is raised at a rate of 5℃±2℃/min to a temperature of 130℃±2℃. The battery remains at this temperature for 30min .	电池不起火,不爆炸 No fire, no explosion	3pcs/90d
热冲击（低温充电） thermal shock(charge at low temperature)	电池置于 5℃环境下，采用该温度下供应商允许的最大电流充满电后，放于一个烘箱中加热，烘箱的温度以（5±2℃）/min 的速率上升到 130±2℃，保持 30min Place the temperature in 5℃, fully charge at the maximum current at this temperature allowed by supplier, place the battery into an oven.The oven temperature is raised at a rate of 5℃±2℃/min to a temperature of 130℃±2℃.The battery remains at this temperature	电池不起火,不爆炸 No fire, no explosion	3pcs/90d

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	for 30min .		
过充电（3C/4.8V）Overcharge	将接有热电偶的电芯置于通风橱中，连接正负极于一恒流恒压电源，调节电流至 3 C5、电压为 4.8V，然后对电芯以 3 C5 充电，直到电池电压为 4.8V，电流将到接近 0A。试验过程中监视电池温度变化，当电池温度下降到比峰值低约 10℃，停止实验 Place the cell connected with thermocouple in fume cupboard, and connect its positive and negative electrode with a constant voltage and constant current supply.Adjust its current to 3 C5, and voltage to 4.8V. And then charge the cell at 3 C5 till the voltage of battery is 4.8V and current is closed to 0A.During the test, monitor the change of battery temperature.Terminate the test when the battery temperature is declined 10℃ lower than peak value.	要求电芯不爆炸、不起火，电池的表面最高温度≤150℃ No explosion, no fire, and the highest temperature of battery surface should be ≤150℃.	3pcs/90d
高温短路 High temperature external short circuit	电池标准充电后，将接有热电偶的电芯用电阻不大于 80±20 mΩ的导线短接电池正负极，该实验在 55℃±5℃环境下进行，放电直至电池起火或爆炸或当电池的表面温度恢复至环境温度 10℃以内时，试验结束 After the battery is charged as per standard charge mode, the cell connected with thermocouple is then short-circuited by connecting the positive and negative terminals with a total external resistance less than（80±20）mΩ. The test is carried out at the temperature of 55℃±5℃ till the battery is on fire or explode or till the surface temperature of battery recover within 10℃ of ambient temperature.	电池不起火、不爆炸，外部表面温度不超过 150 ℃ No explosion, no fire, and the temperature of battery surface should be ≤150℃.	3pcs/90d
高温短路（低温充电）High temperature short circuit（charge at low temperature）	电芯置于 5℃环境下，采用该温度下供应商允许的最大电流充满电后，将接有热电偶的电芯用电阻不大于 80±20 mΩ的导线短接电池正负极，该实验在 55℃±5℃环境下进行，放电直至电池起火或爆炸或当电池的表面温度恢复至环境温度 10℃以内时，试验结束 The is placed in the environment of 5℃, charge the cell at the maximum current allowed by supplier at this temperature.The cell connected with thermocouple is then short-circuited by connecting the positive and negative terminals with a total external resistance less than（80±20）mΩ. The test is carried out at the temperature of 55℃±5℃ till the battery is on fire or explode or till the surface temperature of battery recover within 10℃ of ambient temperature.	电池不起火、不爆炸，电池的外部表面温度不超过 150℃ No explosion, no fire, and the temperature of battery surface should be ≤150℃.	3pcs/90d
针刺（参考）Nail penetration test(referenc)	电池标准充电结束后，用直径为 3.0mm 的不锈钢针，不锈钢针长度保证能刺穿，在电池的最大平面尽量靠近中心的部位将其完全刺穿，针刺速度为 80mm/s。观察电池状态，当电池的表面温度恢复至环境温度 10℃以内时，实验结束。 After the cell is charged as per standard charge, A stainless steel nail with a diameter of 3.0mm is used as penetration nail.The nail was	电池不起火、不爆炸。 No fire, no explosion	3pcs/90d

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	programmed to penetrate through the cell and penetrate through at the center of the cell.The speed of penetration is 80mm/s.Observe the cell, and the test terminates when the temperature of battery surface declines within 10℃ of ambient temperature.		
挤压 Crush	电池标准充电后，将电池置于两个平面内，垂直于极板方向进行挤压，两平板间施加 13.0±0.78KN 的挤压力，一旦压力达到最大值即可停止试验，实验过程中电池不能发生外短路。 After the battery is charged as per standard charge, place the battery between two flats and crush perpendicular to the direction of flat.Apply 13.0±0.78 KN pressing force between the two flats.Terminate the test when the force reaches maximum.The battery could not short circuit during the test.	电池不起火、不爆炸 No fire, no explosion	3pcs/90d
强制放电 Forced discharge	电芯放在 23℃±2℃的条件下，将接有热电偶的电芯以 0.2C5A 电流放电至 3.0V，再以 1C5A 电流对电池反向充电，持续 90min。 At 23℃±2℃, discharge the cell connected with thermocouple at 0.2C5A to 3.0V.And then charge the cell reversely at 1C5A and remains 90 min.Observe the status of the cell.	电池应不爆炸、不起火，外部温度不得高于 150℃ The battery should be no explosion, no fire, and the external temperature should not exceed 150℃ .	3pcs/90d
燃烧喷射 projectile test	将按标准充电模式满充的电池单体放置于燃烧喷射试验仪的钢丝网筛上；在电池上面罩上一个铝丝网，铝丝网由由八面组成，每面宽 610mm，高 305mm，铝丝直径 0.25mm，在每个方向上，每 25.4mm 有 16-18 根铝丝组成；燃料和空气流速设定到可以提供明亮蓝色火焰，该火焰可以使钢丝网发出明亮的红光，直到电池爆炸或者毁坏，或者持续加热 30min，电池未起火，未爆炸。 After the cell is fully charged as per standard charge mode, place the cell on the screen constructed by steel wire mesh.Cover a screening constructed of aluminium wire which is eight-sided.Every side is 610mm width, 305mm height and the diameter of aluminium wire is 0.25mm.Every 25.4mm is consisted of 16-18 aluminium wires each direction.The fuel and air flow rate are set to provide a bright blue flame that may cause the wire mesh to emit bright red light until the battery is exploded or destroyed, or is continuously heated for 30 minutes, the battery is not on fire, and is not exploded.	整个电池或电池的组分(粉尘状产物除外)不应穿透铝丝网 The whole battery or the component of battery(except dust-like products)should not penetrate through the aluminium wire screen.	3pcs/90d

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7、 Main BOM of battery 电池主要物料清单

物料 Material	规　格 Specification	数 量 Quantity	备注 Remarks
Cell	FHPV496786P/4920mAh	1PCS	风华/FH
PCM	F94024C（带 PTC）	1PCS	达人/广泰博 DR/GTB
海棉 Sponge	3.5*2.0*0.3mm	1 PCS	宏盛林/隆丰
海棉 Sponge	66.8*4.8*0.3mm	1PCS	宏盛林/隆丰
海棉 Sponge	56*2.0*0.3mm	1PCS	宏盛林/隆丰
黑色哑光 Mylar 防火 V0	54*18*0.05mm	1PCS	宏盛林/隆丰
黑色哑光 Mylar 防火 V0	54*17*0.05mm	1PCS	宏盛林/隆丰
黑色哑光 Mylar 防火 V0	83*12.5 缺口 2.75*1.5*0.05mm	1PCS	宏盛林/隆丰
白色 3M 胶 white 3 M glue	46*3.8*0.12mm	1PCS	宏盛林/隆丰

8.1Main BOM of cell 电芯主要物料清单

材料 Material	规格描述 Description	重量/数量 Weight/Qty	备注 Remak	厂商 Manufacturer
电芯型号 Model	FHPV496786P	1	/	风华/FH
电芯正极材料 Material of cell positive electrode	钴酸锂\ Lithium cobalt acid	≈30 g	/	杉杉/巴莫/当升
电芯负极材料 Material of cell negative electrode	石墨 graphite	≈16.0g	/	新湘乐/杉杉/贝特瑞
陶瓷隔 separator	7+1+5um	≈0.2㎡	/	W-Scope/旭然
电解质 electrolyte	六氟磷酸锂 lithium hexafluorophosphate	≈13.0g	/	杉杉/赛纬/天赐
壳体/包装膜 Case/package film	496786	≈0.03㎡	/	DNP

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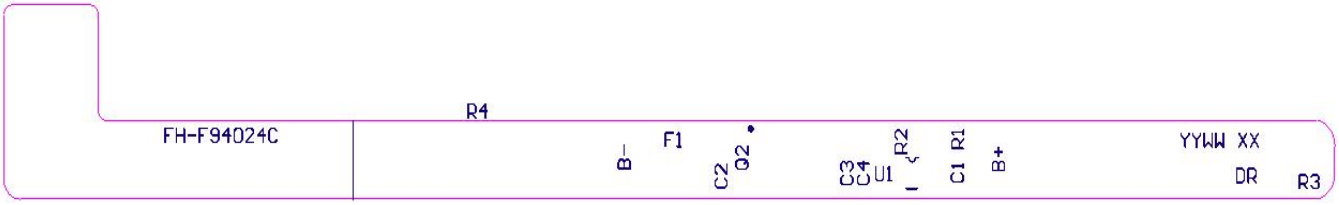
8.2Critical Component List of PCM 保护板关键物料清单

位号 No.	物料名称 Name of material	规格型号 Specification	数量 Qty	品牌 Brand
U1	Protection IC	R5487L303KM	1	理光
		MM3280JH5YRE	1	美之美
U2	MOSFET	CJAE2002/DFNWB3×3-8	1	长电
		PE5A0DZ/DFNWB3×3-8	1	尼克森
R1	电阻	0402 330Ω,±5%	1	国巨/厚声
R2	电阻	0402 1KΩ,±5%	1	国巨/厚声
C1-C4	电容	0.1uF X7R 0402 16V	4	国巨
R3	NTC	NCP15XH103F03RC	1	村田
R4	ID	0402 100KΩ,±1%	1	国巨
B+ B-	镍片	7.0*2.5*2.5*0.1mm	2	信诺通
F1	PTC	LP-USML500HF	1	维安
		SML 1210-600		神沃
J1	连接器	WP10-P002VA10	1	JAE
/	FPC	黑色，无胶压延铜	1	金鹏/爱谱生

8.3 Physical drawing of PCM 保护板实物图

8.4Layout of PCM 保护板 LAYOUT 图

顶层丝印



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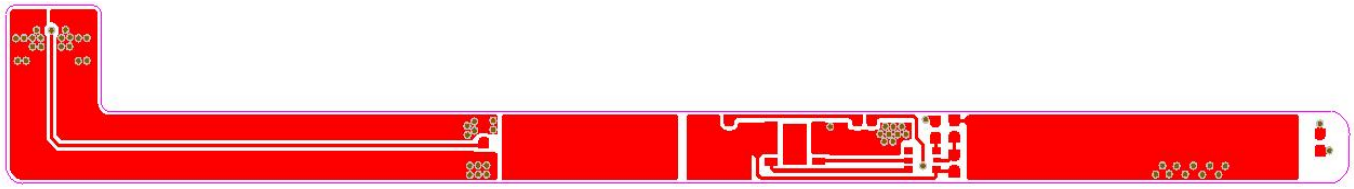
顶层布线



底层丝印

底层布线

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8.5Test Report of PCM 保护板测试报告

DAREN HIGH TECH 达人高科

SHENZHEN DARENGAOKE ELECTRONIC CO,.LTD
深圳达人高科电子有限公司

SAMPLE TEST REPORT
样品测试记录表

Insp 承办	Check 审核	Approve 批准
梁辉法	黄超	胡德东

Customer	风华	Q'TY 数量	80	Revision	V2	Inspector 品质检查		Date 日期	2020/8/15
Model 客户型号	FH-F94024C	Production	DR-MP-0618-V2	Main parts主要配置	R5487L303KM+CJAE2002	Judgement 判定结果	OK/合格	备注	
Equipment 设备	保护板测试仪 万用表 卡尺						Temperature&humidity 温湿度	28.4℃ 39%RH	

ITEM 测试项目	过充检测电压	过充释放电压	过放检测电压	过放释放电压	过流检测电流	充电过流检测电流	自耗电	内阻	ID电阻值	NTC电阻值	静电测试(接触)	静电测试(非接触)	PCB尺寸					
													过充延时	过放延时	过电流延时	长	宽	厚
Scope 范围	4.475±0.02	4.275±0.05	2.5±0.025	2.9±0.073	8-15	/	0-6	65.00	100	10	±8	±15	700-1300	14-26	8-16	88.46±0.15	9.85±0.1	0.17±0.1
Unit 单位	V	V	V	V	A	A	μA	mΩ	KΩ	KΩ	KV	KV	ms	ms	ms	mm	mm	mm
1	4.4727	4.2489	2.5005	2.911	11.446	/	2.56	45.37	100.01	9.87			986.569	19.567	11.562	88.45	9.84	0.17
2	4.4724	4.23	2.4992	2.9068	11.667	/	2.57	48.5	100.11	9.82			1006.768	19.967	11.791	88.48	9.80	0.15
3	4.4757	4.2489	2.5086	2.9175	11.622	/	2.56	48.83	100.03	9.85			1018.966	20.167	11.93	88.55	9.82	0.17
4	4.4763	4.2299	2.5017	2.9107	11.422	/	2.65	42.02	100.05	9.87			1058.967	20.968	12.394	88.5	9.84	0.15
5	4.48	4.2491	2.5025	2.9092	11.585	/	2.42	48.25	100.04	9.88			997.769	19.768	11.684	88.54	9.80	0.17
6	4.4843	4.2681	2.5027	2.9065	11.689	/	2.46	48.25	100.11	9.79			1027.368	20.367	11.992	88.48	9.78	0.17
7	4.4738	4.2461	2.4984	2.9039	11.538	/	2.49	46.41	100.10	9.83			1014.168	20.167	11.857	88.49	9.83	0.17
8	4.4832	4.249	2.5052	2.9179	11.517	/	2.7	47.18	100.01	9.89			1035.568	20.569	12.123	88.47	9.82	0.15
9	4.4756	4.2301	2.5022	2.9128	11.702	/	2.61	48.16	100.09	9.84			1022.769	20.367	11.999	88.48	9.85	0.16
10	4.477	4.2491	2.5013	2.9075	11.475	/	2.57	40.97	100.02	9.81			978.768	19.569	11.481	88.5	9.81	0.17
11	4.4843	4.2681	2.5027	2.9065	11.689	/	2.46	48.25	100.11	9.79			1027.368	20.367	11.992	88.48	9.78	0.17
12	4.4738	4.2461	2.4984	2.9039	11.538	/	2.49	46.41	100.10	9.83			1014.168	20.167	11.857	88.49	9.83	0.17
13	4.4832	4.249	2.5052	2.9179	11.517	/	2.7	47.18	100.01	9.89			1035.568	20.569	12.123	88.47	9.82	0.15
14	4.4738	4.2461	2.4984	2.9039	11.538	/	2.49	46.41	100.10	9.83			1014.168	20.167	11.857	88.49	9.83	0.17
15	4.4832	4.249	2.5052	2.9179	11.517	/	2.7	47.18	100.01	9.89			1035.568	20.569	12.123	88.47	9.82	0.15
16	4.4756	4.2301	2.5022	2.9128	11.702	/	2.61	48.16	100.09	9.84			1022.769	20.367	11.999	88.48	9.85	0.16
17	4.477	4.2491	2.5013	2.9075	11.475	/	2.57	40.97	100.02	9.81			978.768	19.569	11.481	88.5	9.81	0.17
18	4.4843	4.2681	2.5027	2.9065	11.689	/	2.46	48.25	100.11	9.79			1027.368	20.367	11.992	88.48	9.78	0.17
19	4.4724	4.23	2.4992	2.9068	11.667	/	2.57	48.5	100.11	9.82			1006.768	19.967	11.791	88.48	9.80	0.15
20	4.4833	4.247	2.5055	2.9177	11.516	/	2.7	47.18	100.01	9.89			1035.568	20.569	12.123	88.47	9.82	0.16
判定	OK	OK	OK	OK	OK	/	OK	OK	OK	OK			OK	OK	OK	OK	OK	OK

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8、 PCM Specification 保护板参数规格

No. 序 号	Items 项 目	Parameter 参 数		
		Min 最小值	Typical 典型值	Max 最大值
1	过充电保护电压 （V） Over charge protection current（V）	4.455	4.475	4.495
2	过充电恢复电压 （V） Overcharge recovery voltage（V）	4.225	4.275	4.325
3	过放电保护电压 （V） Over discharge protection voltage（V）	2.4	2.5	2.6
4	过放电恢复电压 （V） Over discharge recovery voltage（V）	2.8	2.9	3.0
5	过电流保护（A） Over current protection（A）	8	11	15
6	过电流保护电压(V) Over current protection voltage(V)	0.12	0.13	0.14
7	过充电延时时间 （ms） Over charge delay time（ms）	700	1000	1300
8	过放电延时时间 (ms) Over discharge delay time（ms）	14	20	26
9	过电流延时时间(ms) Over current delay time（ms）	8	12	16
10	NTC 电阻(KΩ) ±5%（25°C） NTC resistance(KΩ) ±5%（25°C）	9.9	10	10.1
11	工作时电路内部消耗（μA） Circuit internal consumption when operation（μA）	/	/	6
13	内 阻 （mΩ） Internal resistance（mΩ）	/	/	60

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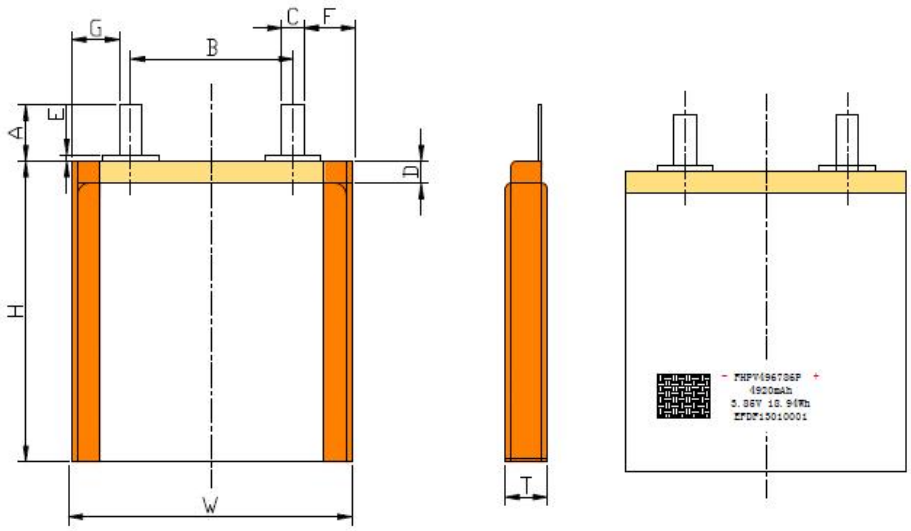
10、2D 图纸(TINNO 原图)及电芯图纸、原理图、标贴、爆炸图、包装说明图

2D drawing(original drawing from TINNO) , cell drawing, illustrative diagram, label, assembly drawing and package description figure

10.1 电芯结构图（要求按照模板提供完整信息）

Figure of cell construction(provide complete information according to template)



尺寸			
项目	规格	项目	规格
电芯厚度（T 含侧胶）	≤4.90mm	负极耳边距（F）	16.0±0.75mm
电芯宽度（W 含高温胶）	≤67.0mm	正极耳边距（G）	16.0±0.75mm
电芯高度（H）	≤86.0mm	极耳中心距（B）	31.0±1.5mm
密封胶外露（E）	0.2～2.0mm	极耳宽度（C）	6.0±0.2mm
极耳长度（A）	9.0±2.0mm	顶封宽度（D）	3.0±0.5mm

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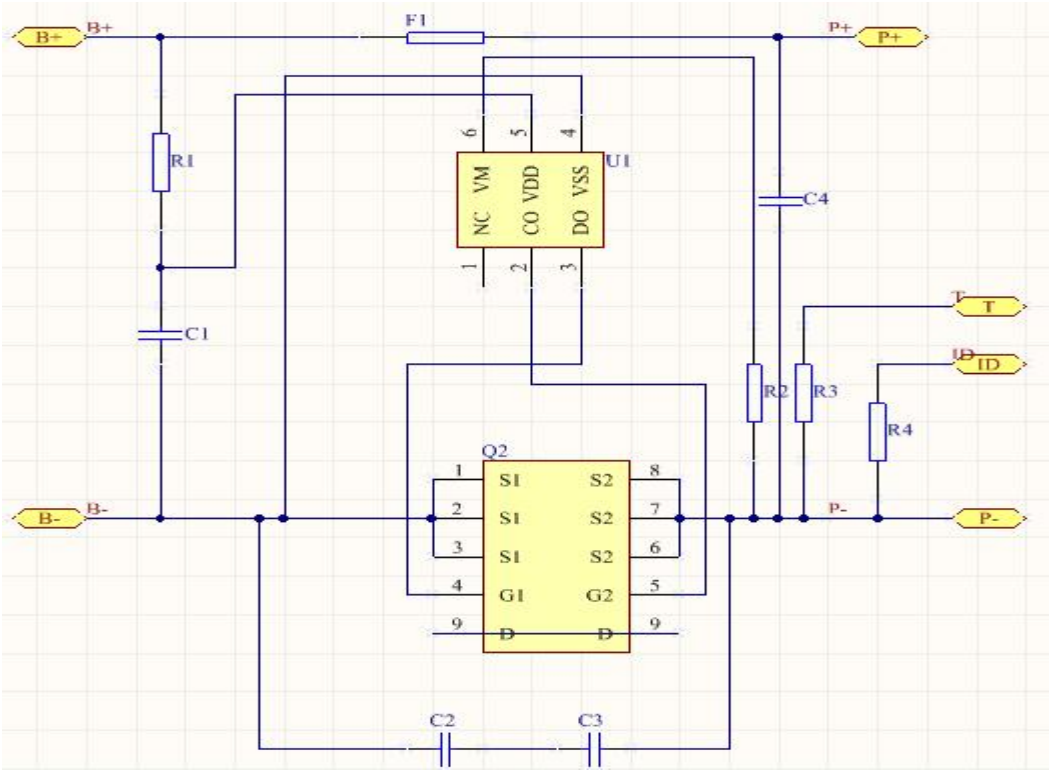
10.2 保护板原理图、layout、实物图片

Illustration diagram, layout and physical figure of PCM



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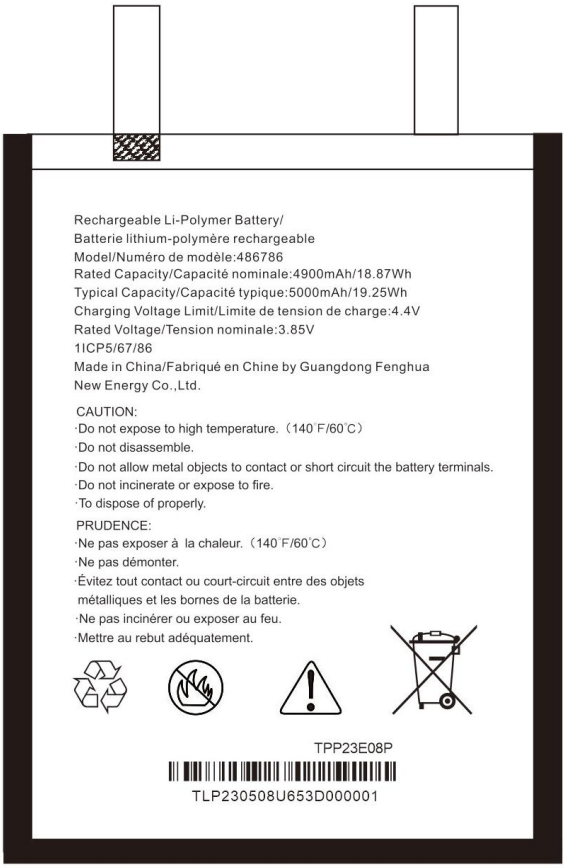
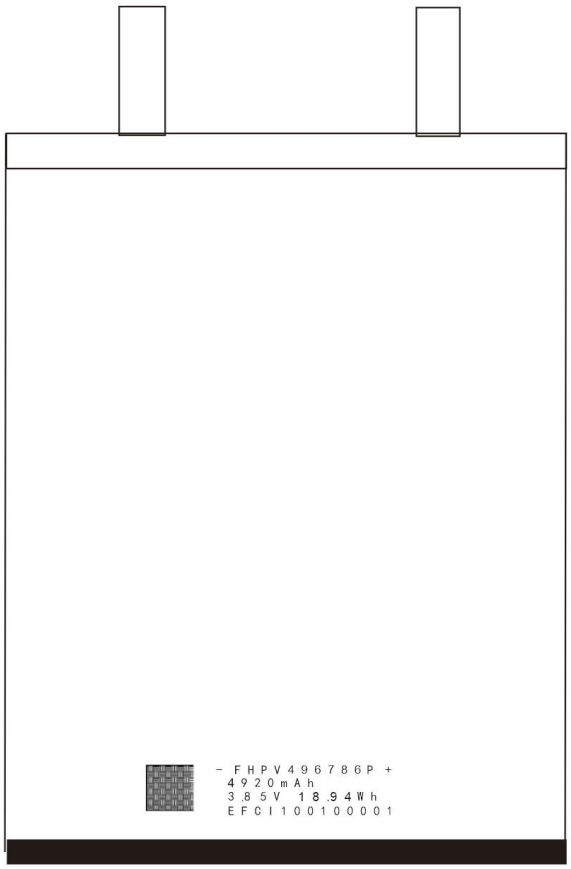
10.3 标贴刀模

Cutting die of label

正面



反面



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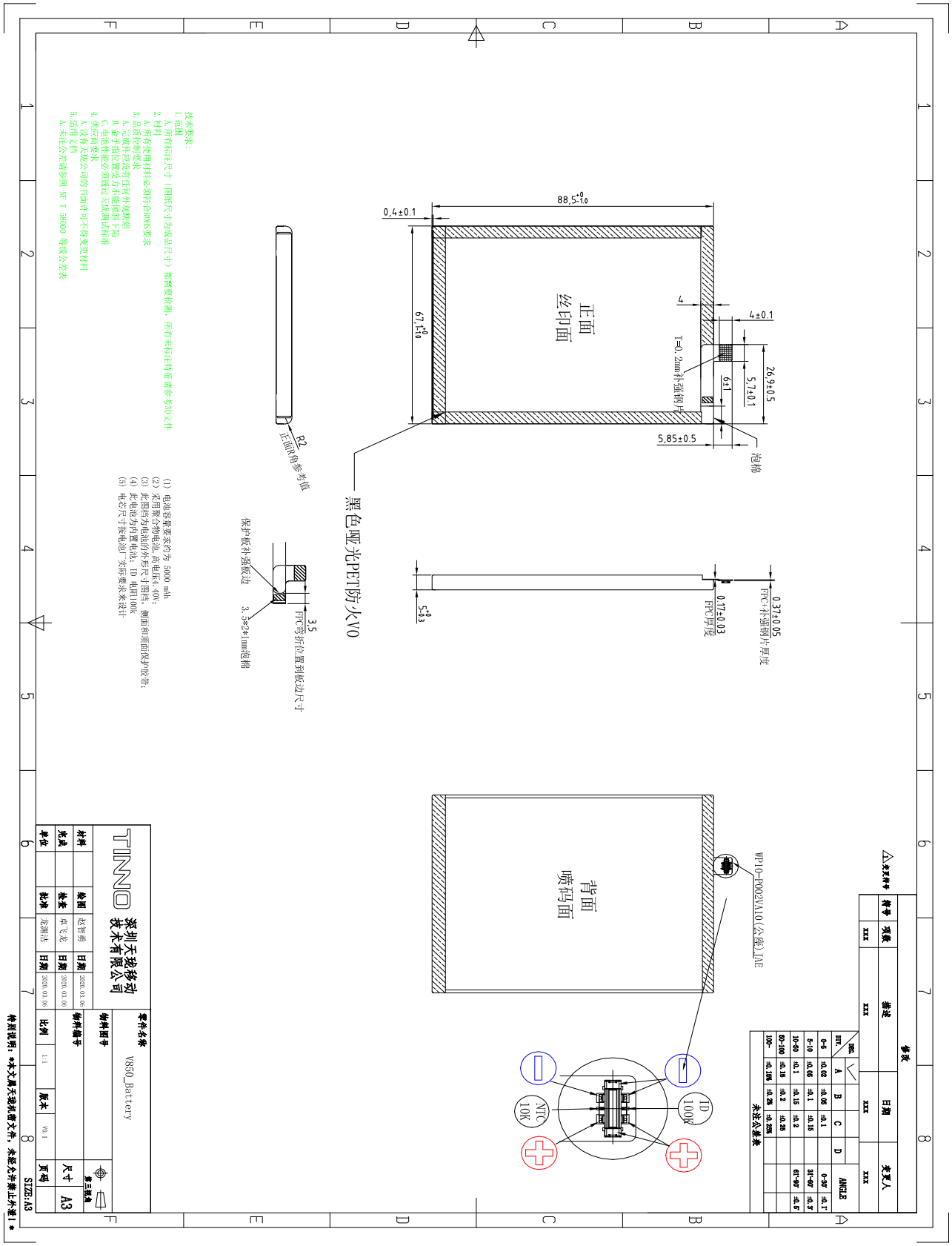
10.4 2D 图纸 2D drawing 天珑料号：P104-BQY006-010



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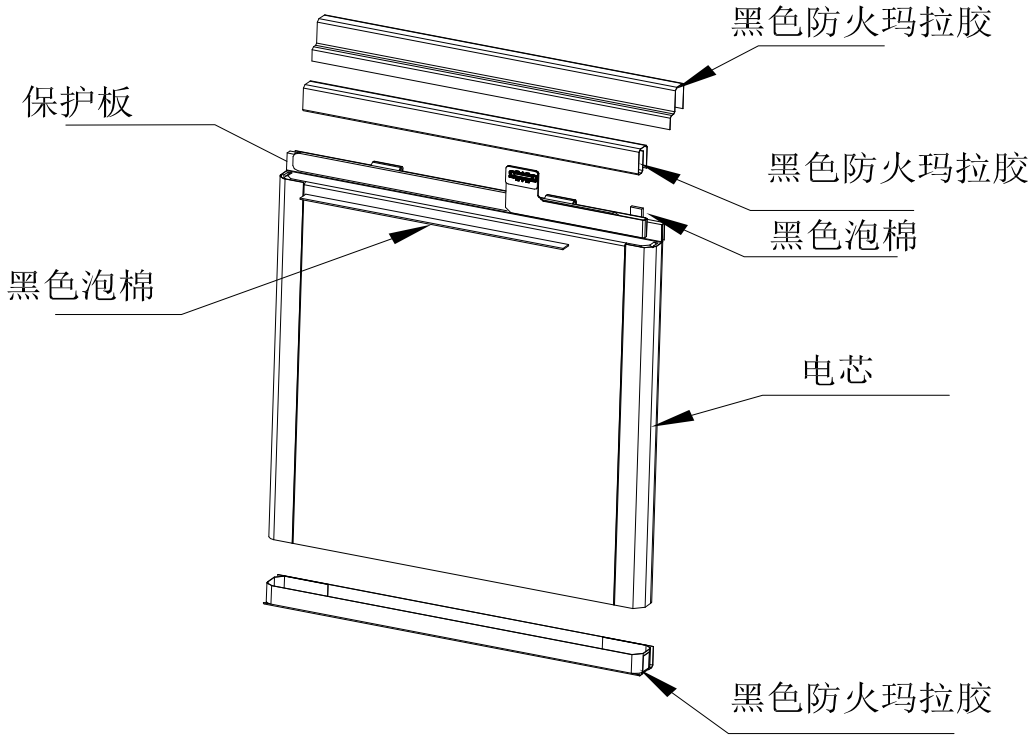
10.5 电池爆炸图 Battery assembly drawing

变更记录			
标示	变更内容	签名	日期



广东风华新能源股份有限公司				
产品型号	F94024PA-V850			
项目名称		制图		
版本	A	审核		
单位	mm	批准		
			第 1 页	共 1 页

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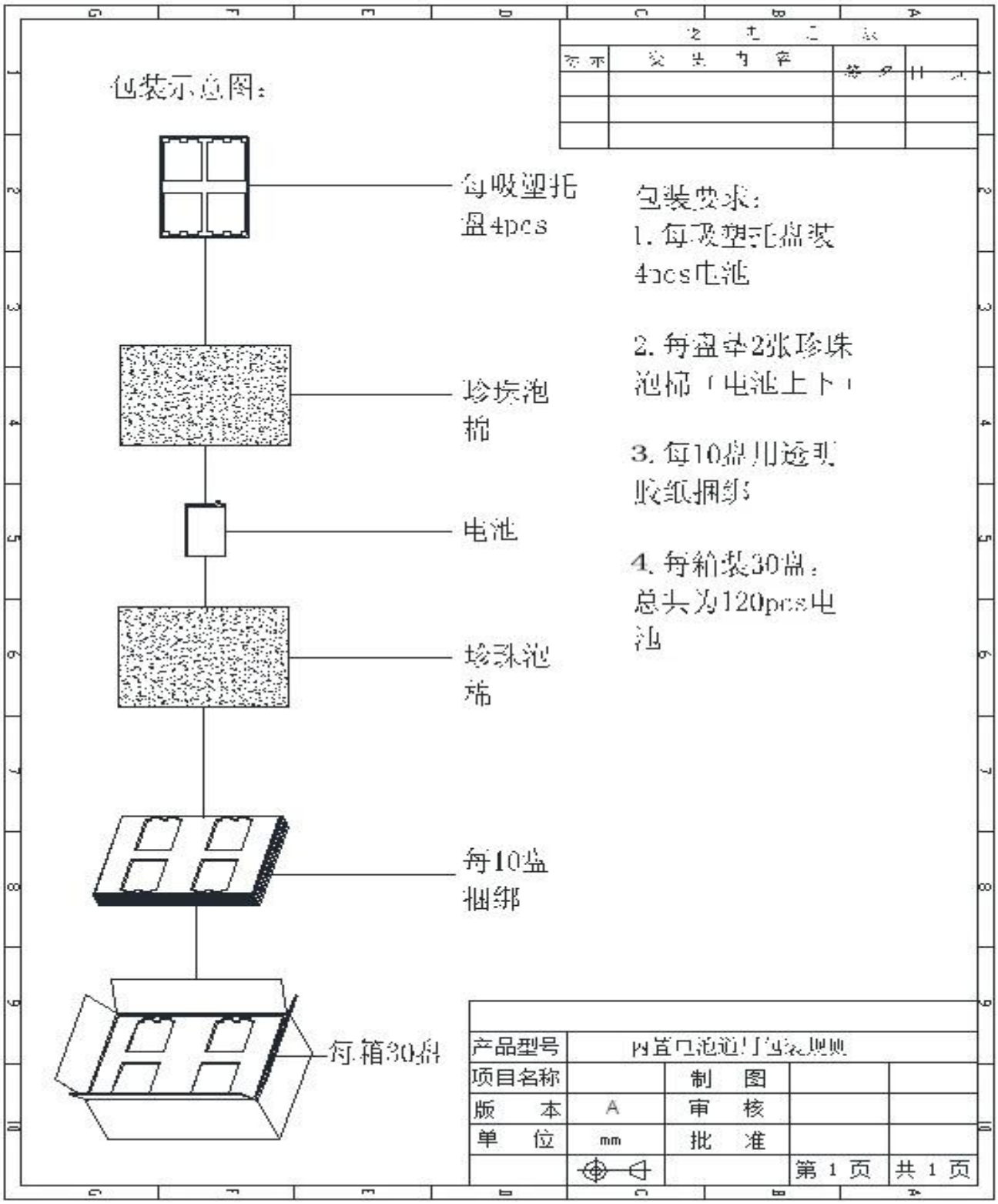
10.6 包装说明图 Package Description Drawing



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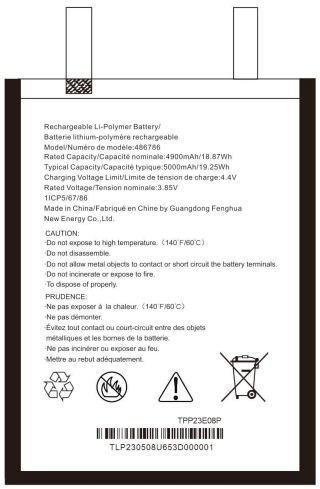
11.1 聚合物锂电池标识 marking of Al-can Lithium Polymer battery

采用喷码方式如下 ：

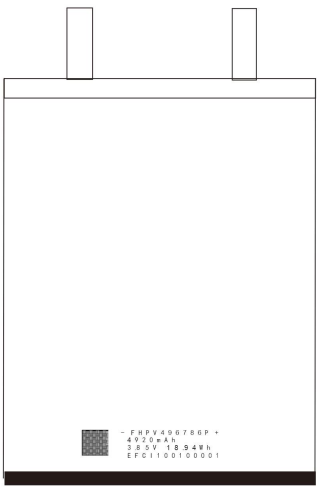
Silk-screen coding method as followed:

变 更 记 录			
序号	变更内容	签名	日期
A0	新版发行	梁文瑞	2023-5-8

正面



反面



一、对应项目号:F94044PA-U653DS-P104-BQY006-010

二、虚线不印刷

三、丝印及喷码图形需与电池居中

注:条码无需移印,
切勿出在移印钢板上

技术要求

1 丝印采用移印和喷墨技术,文字颜色为黑色;

2 电芯:FH 电芯;

3 本图为排版用图，未注事项以图形文件为准。

测试标准:

1、软包电池印刷内容耐磨往返15-20次，印刷内容允许轻微调墨和断笔，但字迹可分辨和条码可识别合格。
耐磨条件：采用橡皮擦 负重500g，30次/分钟速度。

2、软包电池印刷内容不耐醉

3、胶带附着力：用3M600粘结电芯丝印位置，用手来回抹平3次后沿90度反向迅速拉起。相同方法测试3次，每次更换新的胶带，每次测试需在同一个位置。
丝印内容允许轻微调墨和断笔，但字迹要清晰可辨。

4.测试标准只针对移印部分，不包含条码

条码规则：

TLP230508U653D000001
TL-----客户代码（固定）
P-------代表风华（固定）
23-----代表2023年取两位，变动
0508-----代表05月08日,月日各取两位，变动
U653D-------代表项目代码(固定)
000001---------6位流水号,可跳码,不可重码,变动,过日清零.

PACK码规则:TPP23E08P
T-----天珑客户
P-----表示PACK封装
P-----表示风华封装
23----2023年,变动
E----05月份,变动(1-12月用字母A-L表示)
08----08日,取两位,变动,跟条码日期一致
P------表示带PTC

电压:3.92-4.0V						FHPV496786P-4920			风华锂电池有限公司
标记	处数	区分	更改文件号	签名	年月日				
设计	梁文瑞			2019-08-01		阶段标记	数量	比例	电芯丝印
审核								1:1	
批准						共1张	第1张		
供应商									

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