Customer/客户:_____

Li-ion Polymer Battery Pack Specification

锂离子聚合物电池组合规格书

Pack Type/组合类型：Cell+PCM+Connector Wire/电芯+保护板+插头线

Battery Model /电池型号：IE-702050-SYP-2 800mAh

Cell Capacity/电芯容量：800mAh

Customer Code/客户代码：8.4.15.424

Total Page/文件页数：15

Prepared By/Date 编 制/日 期	Checked By/Date 审 核/日 期	Approved By/Date 批 准/日 期
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2024-11-08	2024-11-08	2024-11-08

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Content

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1. Revision Records 变更履历

Product Revision Records List
产品变更履历表

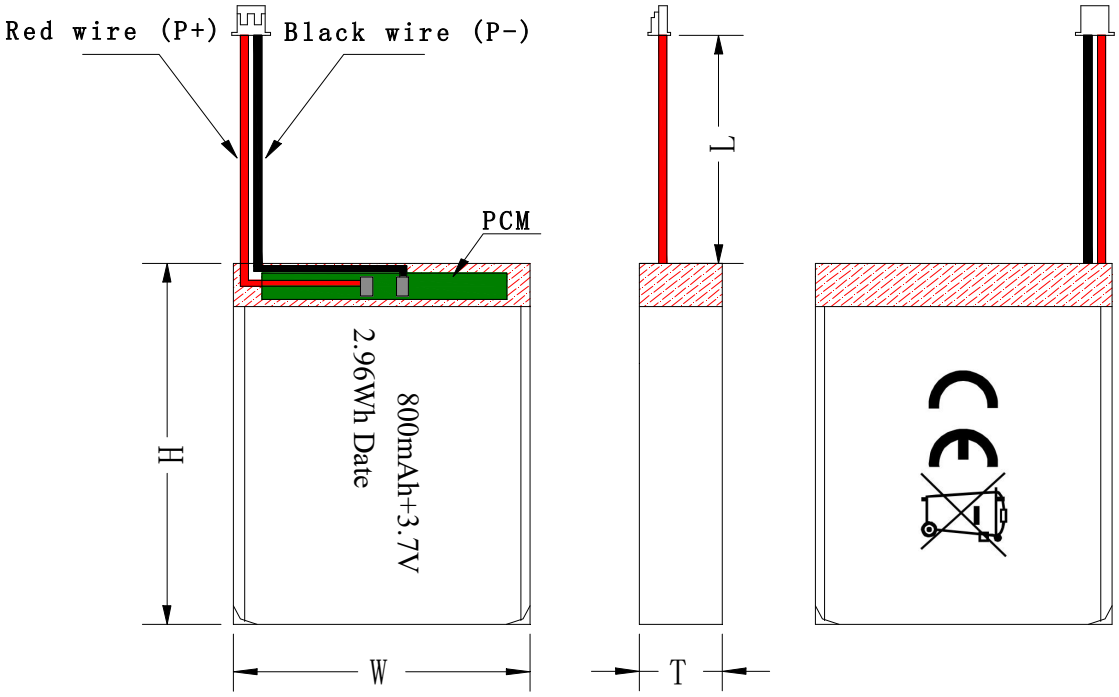
Edition 版本	Date 日期	Revision content 变更内容	Approved by 批准
A0	2024-11-08	NEW RELEASE 新发行	刘秋玲

2 .Scope 适用范围

This specification describes the basic performance, technical requirement, testing method ,warning and caution of the Li-ion Polymer rechargeable battery pack, the pack defined in this documentation is an assembly which include battery, PCM ,wire etc

Safety performance is designed according to RoHS standard and《Lithium ion cells and batteries used in portable electronic equipment-Safety requirements》GB31241-2022 compliant。

3. Initial Dimension 初始尺寸



Unit 单位（mm）

Remark 备注: Date（日期随出货日期更新） 背面喷 CE+垃圾桶标志 （标志>5*5mm）

Note: Single side edge/ double side edge / soft seal / hard sealing / protection panel PCB color green / black oil / silk screen / line layout inconsistency cannot affect the performance.

免责声明:电芯单折边/双折边及软封/硬封和保护板 PCB 颜色绿油/黑油/丝印/线路布局不一致不影响性能均可。

T (厚度) Max	7.0	W (宽度) Max	20.5	H(高度) Max	52.5
T_1 （循环后厚度）After cycle	T*1.06	L (长度)	150±3	L1 (长度)	/
Connector Wire （插头线)	JST SYP-02T-1 正向 红黑 UL3302/26# 线径 1.0mm				
PCM （保护板）	8205+DW01				

4.Specification 产品规格

NO.	Item 项目		Specifications 规格要求	
4.1	Nominal capacity 标称容量		800mAh	0.2C Discharge (0.2C 放电)
	Minimum capacity 最小容量		776mAh	0.2C Discharge (0.2C 放电)
4.2	Initial Impedance 初始内阻		≤180mΩ	
4.3	Battery Weight 电池重量		Approx(约)：16g	
4.4	Nominal voltage 标称电压 Fully charge voltage(FC) 满充电压 FC Fully discharge voltage(FD)满放电压 FD		3.7V 4.2V 3.0V	 Defined in this DOC: FC = 4.2V Defined in this DOC: FD = 3.0V
4.5	Recommended shutdown voltage 建议关机电压		≥3.0V	
4.6	Standard charging method 标准充电方法		0.5C CC （ constant current ） charge to FC, then CV(constant voltage FC)charge till charge current decline to≤0.02C 0.5C CC（恒流）充电至 FC，再 CV（恒压 FC）充电直至充电电流≤0.02C	
4.7	Max charge current 最大充电电流		0℃～15℃	0.2C
			15℃～25℃	0.5C
			25℃～45℃	1C
4.8	Max discharge current 最大放电电流		-10℃～15℃	0.2C
			15℃～60℃	1C
4.9	Charge cut-off voltage 充电截止电压		Ref. **8.1** VDET1	
4.10	Discharge cut-off Voltage 放电截止电压		Ref. **8.1** VDET2	
4.11	Storage temperature 储存温度	-20℃~60℃	≤1 month	Percentage of recoverable capacity no less than 80% of the initial capacities 恢复容量不低于初始容量的 80%
		-20℃~45℃	≤3 month	
		-20℃~25℃	≤1 year	
4.12	Recoverable capacity 恢复容量		Constant current 0.5C charge to FC, then constant voltage FC charge to current declines to 0.02C, rest for 10min，constant current 0.2C discharge to FD，rest for 10min.Repeat above steps 3 times, recording the maximum capacity. 先用 0.5 C 恒流充电至 FC，再恒压 FC 充电直至充电电流≤0.02C,搁置 10 分钟,再用 0.2C 电流放电至 FD;又搁置 10 分钟,重复以上步骤 3 次,记录容量最大值。	
4.13	Storage Humidity 储存湿度		≤75% RH	
4.14	Appearance 外观		Without distortion and leakage 无变形、电解液泄露	
4.15	Before shipment voltage 出货电压		3.8V-4.1V	
4.16	Standard testing condition 标准测试环境		Temperature(温度) ： 23±2℃ Humidity（湿度） ： ≤75%RH Atmospheric Pressure（大气压） ： 86-106 Kpa	

Remark 备注：

1. From 4.1 to 4.15, the testing condition please refer to 4.16 (standard testing condition).
   从 4.1 至 4.15 项目，测试环境遵从 4.16（标准测试环境）。
2. Operating temperature（使用温度）: charging(充电) 0℃~45℃; Discharging（放电）：-10℃~60℃.
   If the working condition is out of 4.16 , the performance will be some shift.
   如果工作环境超出 4.16 范围，性能将会有一些偏移。
3. Measuring instrument and equipment requirements 测量仪表与设备要求。

• Measure the voltage meter accuracy no less than 0.5 magnitude, resistance no less than 10KΩ/V.
测量电压的仪表准确度应不低于 0.5 级，内阻应不小于 10KΩ/V。

• Measure the current meter accuracy no less than 0.5 magnitude.
测量电流的仪表准确度应不低于 0.5 级。

• The instrument accuracy measuring time meter no less than ±0.1%.
测量时间的仪表准确度应不低于±0.1%。

• Measuring temperature meter accuracy no less than ±0.5℃.
测量温度的仪表准确度应不低于±0.5℃。

• Adjustable constant current source of constant current, in the process of charging or discharging, the current changes shall be within ±1%.
恒流源电流恒定可调，在充电或放电过程中，其电流变化应在±1%范围内。

• Constant voltage source voltage is adjustable, and its voltage range is ±0.5%.
恒压源的电压可调，其电压变化范围为±0.5%。

• Measuring instrument accuracy is not lower than 0.02 mm.
尺寸测量仪的准确度不低于 0.02mm。

• Mass tolerance of the instruments are not more than 0.1 g.
称量重量的仪器感量不高于 0.1g。

5 .General specification 常规性能

No.	Item 项目	Test Methods and Condition 测试方法和条件	Criteria 标准
5.1	0.2C Capacity 0.2C 容量	At standard testing condition，After full charge with standard charge, rest 10min, then discharging at 0.2C to voltage FD, recording the discharging time. 在标准测试环境下，标准充饱电后,搁置 10 分钟,然后用 0.2C 电流放电至 FD, 所记录放电时间。	≥300min(分钟)
5.2	Cycle Life 循环寿命	At standard testing condition，constant current 0.5C charge to FC, then constant voltage charge to current declines to 0.02C, rest 10min，constant current 0.5C discharge to FD，rest 10min. Repeat above steps till continuously discharging capacity Higher than 80% of the Initial Capacities of the Cells. 在标准测试环境下，先用 0.5 C 恒流充电至 FC，再恒压 FC 充电直至充电电流≤0.02C,搁置 10 分钟,再用 0.5C 电流放电至 FD;又搁置 10 分钟,重复以上步骤,直到放电容量是初始容量的 80%。	≥500 times(次)

6 .Capability to environment 环境性能

No.	Item 项目	Test Methods and Condition 测试方法和条件	Criteria 标准
6.1	High/low Temperature 高/低温性能	At standard testing condition， After full charge with standard charge, measure the discharging capacity with discharging current 0.2C till 3.0V cut off voltage at different temperature. (as compared with initial capacity). 在标准测试环境下，标准充饱电后, 测量电池在不同温度下用 0.2 C 电流放电至 3.0 V 所放出的容量(与初始容量作为比较)。	-10℃ ≥60% 55℃ ≥90%
6.2	Capability of keeping electricity 荷电保持能力	At standard testing condition, after being fully charged according to the standard, the battery cell is left unused for 28 days, and then discharged at 0.2C to 2.80V, recording the discharge capacity(as compared with initial capacity). 在标准测试环境下,标准充饱电后,电芯搁置 28 天,然后用 0.2C 放电至 2.80V,记录放电容量(与初始容量作为比较)。	≥80%

7. Mechanical properties and Safety Characteristic 安全性能和机械性能

No.	Item 项目	Test Methods and Condition 测试方法和条件	Criteria 标准
7.1	Over charge testing 过充测试	At standard testing condition,Charge the battery with a current of 0.5A to the voltage shown in Table 1, monitor the temperature change of the battery, and stop the experiment when the battery temperature drops by a peak of about 20% or is charged for 7 hours 在标准测试环境下,将电池放完电后，先用最大充电电流恒流充电至表 1 试验电压,然后以该电压恒压充电,电池持续充电时间到达 7h 或电池温度下降达温度最大值的 20% 时,停止实验. 充电限制电压（Ucl）／过充电试验电压（Ut） U_{cl}＜4.25V／U_{cl}+0.4 4.25V≤U_{cl}＜4.45V／4.65 U_{cl}≥4.45V／U_{cl}+0.2	No fire，no explosion 不起火，不爆炸
7.2	Over discharge testing 过放测试	At standard testing condition,discharge according to the standard discharge requirements to the termination voltage, and then discharge with an external 30 Ω load for 24 hours 在标准测试环境下, 按标准放电的要求放电至终止电压后,外接 30Ω负载放电 24 小时.	No fire，no explosion and no leakage 不起火，不爆炸，不漏液
7.3	High Temperature Short-Circuit Test 高温短路测试	After fully charging the battery, place it in an environment of 57 ℃ ± 4 ℃ until the surface temperature of the battery reaches After 57 ℃ ± 4 ℃, place for another 30 minutes and then connect the positive and negative terminals of the battery with a wire resistance of 80m Ω ± 20m Ω at this ambient temperature. Short circuit for 24 hours or the temperature drop of the battery reaches 20% of the maximum temperature value; Test termination: 将电池充满电后,放置在 57℃±4℃的环境中,待电池表面温度	No fire，no explosion 不起火，不爆炸

		达到 57℃±4℃后,再放置 30min.然后在此环境温度下用导线电阻为 80mΩ±20mΩ,连接电池正负极端,短接时间达到 24 h 或电池温度下降值达到温度最大值的 20%;试验终止	
7.4	Short-circuit testing 外部短路	At standard testing condition, connect the positive and negative poles of the battery with an 80 ± 20m Ω wire and let it stand for 24 hours 在标准测试环境下，标准充电后,将电池的正负极用一根 80±20mΩ的导线连接,放置 24 小时.	No fire， no explosion 不起火，不爆炸
7.5	Temperature cycling 温度循环	Place the fully charged battery in a controllable temperature box with a temperature of 20℃±5℃ and perform the following steps: a) Raise the temperature of the test chamber to 72℃±2℃ and maintain it for 6 hours; b) Reduce the temperature of the test chamber to -40℃±2 ℃and maintain it for 6 hours; c) Repeat steps a) to b) for a total of 10 cycles; d) At room temperature of 20. Store at 5℃ for at least 6 hours. The transition time between each two temperatures during the test shall not exceed 30 minutes, After temperature cycling, remove the battery cell and restore it to room temperature for at least 2 hours to inspect its appearance. 将充满电的电池放置在温度为 20℃±5℃可控温的箱体中进行如下步骤: a)将试验箱温度升高为 72℃±2 ℃,并保持 6 h; b)将试验箱温度降为-40℃±2℃,并保持 6 h; c)重复步骤 a)~b),共循环 10 次; d)在室温 20℃±5℃下至少保存 6h。 试验过程中每两个温度之间的转换时间不大于 30min, 温度循环后，将电芯取出并恢复至室温搁置至少 2h，检查电芯外观。	No fire，no explosion and no leakage 不起火，不爆炸，不漏液
7.6	Thermal shock 热滥用	Put the cells in the oven. The temperature of the oven is to be raised at 5±2℃ per minute to a temperature of 130±2℃ and remains 30 minutes. 将电池放进烘箱内，以 5±2℃/min 速度升高烘箱内温度至 130±2℃后,并持续 30min。	No fire，no explosion 不起火，不爆炸
7.7	Vibration Test 振动测试	At standard testing condition,After full charge with standard charge, fixed the cell to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz an 55Hz, the excursion of the vibration is 1.6mm. The cell shall be vibrated for 60 minutes per axis of X、Y、Z axes. 将标准充电后的电芯固定在振动台上，沿 X、Y、Z 三个方向各振动 60 分钟，振幅 1.6mm，振动频率为 10Hz~55Hz，每分钟变化 1Hz。	No leakage 无泄漏 No fire 不起火 No explosion 不爆炸

<table>
<tr><td>7.8</td><td>Free Drop
自由跌落</td><td>At standard testing condition,After full charge with standard charge.The Battery is to be dropped from a height of 1 meter onto Concrete slab. Free drop one time respectively from X、Y、Z positive and negative axis(six Directions).
将标准充电后的电芯从 1 米高度跌落至混凝土板上.从 X、Y、Z 正负六个方向各跌落一次。</td><td>No leakage
无泄漏
No fire
不起火
No explosion
不爆炸</td></tr>
<tr><td>7.9</td><td>Crush test
挤压测试</td><td>After fully charging the battery, place it in two planes and press it perpendicular to the direction of the electrode plate. Apply 13.0 kN ± 0.78 kN of squeezing force between the two plates at a speed of 0.1 mm/s. Once the pressure reaches its maximum value or the battery voltage drops by one-third, the squeezing test can be stopped. During the test, the battery should prevent external short circuits from occurring. For square flexible packaging batteries with a sample length of no less than 25mm, a steel half cylinder with a diameter of 25mm needs to be placed on the wide surface of the battery for extrusion. The extrusion pressure should reach the corresponding extrusion pressure for the width of the flexible packaging battery in the table before cutting off.
将电池充满电后,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 kN±0.78 kN 的挤压力,挤压电池的速度为 0.1 mm/s,一旦压力达到最大值或电池的电压下降三分之一,即可停止挤压试验。试验过程中电池应防止发生外部短路。对于样品长度不小于 25mm 的方型软包装电池,需将直径 25mm 的钢质半圆柱体置于电池宽面上进行挤压,挤压力达到表中软包装电池宽度对应挤压力后截止.（引用 GB31241-2022 标准第 7.6 条）
<table>
<tr><th colspan="3">电池挤压试验</th></tr>
<tr><td>电池类别</td><td>电池宽度mm</td><td>挤压力度N</td></tr>
<tr><td>圆柱电池</td><td>/</td><td>13,000</td></tr>
<tr><td rowspan="10">软包电池</td><td>W≤25mm, L<25mm</td><td>1,000（无金属棒）</td></tr>
<tr><td>W≤25mm, L≥25mm</td><td>1,000</td></tr>
<tr><td>＞25, ≤30</td><td>3,000</td></tr>
<tr><td>＞30, ≤40</td><td>4,000</td></tr>
<tr><td>＞40, ≤50</td><td>5,000</td></tr>
<tr><td>＞50, ≤60</td><td>6,000</td></tr>
<tr><td>＞60, ≤65</td><td>7,000</td></tr>
<tr><td>＞65, ≤70</td><td>8,000</td></tr>
<tr><td>＞70, ≤75</td><td>10,000</td></tr>
<tr><td>＞75mm</td><td>13,000</td></tr>
</table></td><td>No fire、No explode
电芯不起火、不爆炸</td></tr>
</table>

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

8. Protection Circuit 保护电路

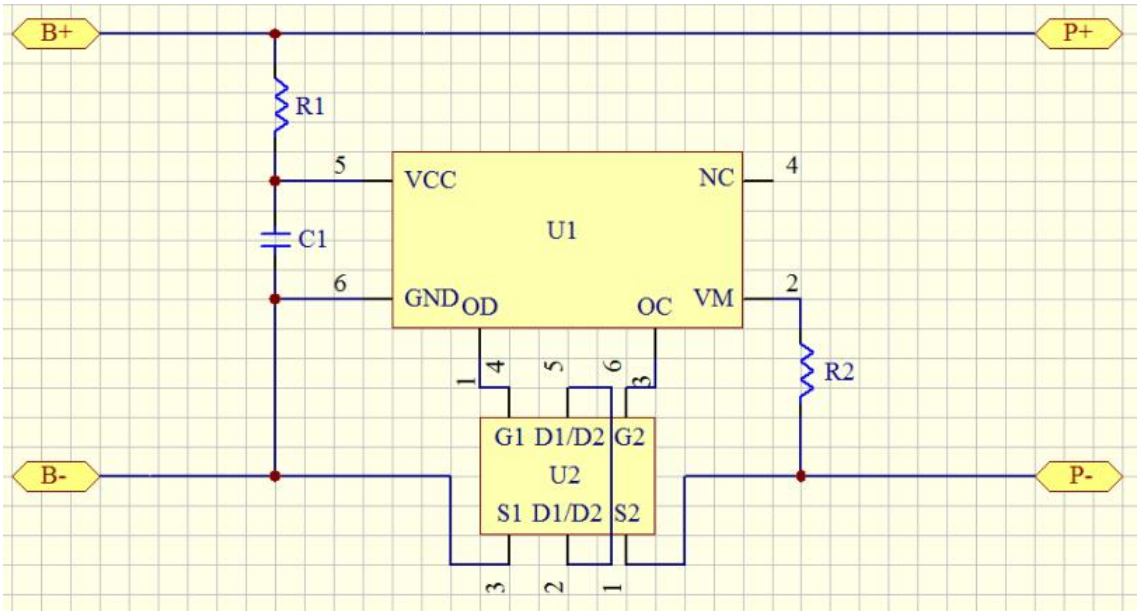
8.1 PCM Standard

Item （项目）	Symbol (符号)	Content (详细内容)	Criterion (标准)
Over charge Protection (过充保护)	VDET1	Over charge detection voltage (过充电检测电压)	4.28±0.05V
	tVDET1	Over charge detection delay time (过充电检测延迟时间)	40~200ms
	VREL1	Over charge release voltage (过充电解除电压)	4.08±0.05V
Over discharge protection (过放保护)	VDET2	Over discharge detection voltage (过放电检测电压)	2.4±0.1V
	tVDET2	Over discharge detection delay time (过放电检测延迟时间)	20~120ms
	VREL2	Over discharge release voltage (过放电解除电压)	3.0±0.1V
	IDP	Over current detection current (过电流保护电流)	2~5A
	tVDET3	Detection delay time (检测延迟时间)	3~20ms
		Release condition (保护解除条件)	Off load charging (断开负载充电)
Short protection (短路保护)		Detection condition (保护条件)	Exterior short circuit (外部电路短路)
	TSHORT	Detection delay time (检测延迟时间)	50~600uS
		Release condition (保护解除条件)	Cut short circuit (断开短路电路)
Interior resistance (内阻)	RDS	Main loop electrify resistance (主回路通态电阻)	VC=4.2V,RDS≤60mΩ
Current consumption (消耗电流)	IDD	Current consume in normal operation (工作时电路内部消耗)	4.0μA Type 6.0μA Max

8.2 BOM For PCM 保护板物料清单

NO.	Location 元件编号	Part name 元件名称	Specification 元件规格	Q'ty 数量	Remark 备注
1	U1	Protection IC	DW01	1	
2	U2	MOSFET	8205	1	
3	R1	Resistance	100Ω ±5%	1	
4	R2	Resistance	1KΩ ±5%	1	
5	C1	Capacitance	0.1μF	1	
6	PCB	Print circuit board	/	1	

8.3 Schematic diagram 原理图



9.Warnings 警告

To prevent the possibility of the pack from leaking, heating, fire .please observe the following precautions:

☆为防止电池组合可能发生的泄漏,发热,起火,请注意以下预防措施:

The soft aluminum packing foil is very easily damaged by sharp edge parts such as Ni-tabs, pins and needles .Do not strike at pack with any sharp edge parts.

☆ 电池组合外包装膜易被镍片,尖针等尖锐部件损伤,禁止用尖锐部件碰伤电池。

Do not immerse the pack in water and seawater.

☆ 严禁将电池组合浸入海水或水中。

Do not use and leave the pack near a heat source as fire or heater.

☆ 禁止将电池组合在热高温源旁,如火,加热器等使用设备。

When recharging, use the battery charger specifically for that purpose.

☆ 充电时请选用锂离子电池专用充电器。

Do not reverse the positive and negative terminals.

☆ 禁止颠倒正负极使用电池组合。

Do not connect the pack to an electrical outlet.

☆ 禁止将电池组合直接接入电源插座。

Do not discard the pack in fire or heat it.

☆ 禁止将电池组合丢入火或加热器中。

Do not short-circuit the pack by directly connecting the positive and negative terminal with metal object such as wire.

☆ 禁止用金属直接将电池组合的正负极进行短路连接。

Do not transport and store the battery together with metal objects such as necklaces, hairpins etc.

☆ 禁止将电池组合与金属如发夹、项链等一起运输或贮存。

Do not strike or throw the pack.

☆ 禁止敲击或抛掷,踩踏电池组合等。

Do not directly solder the pack or battery and pierce the battery with a nail or other sharp object.

☆ 禁止直接焊接电池组合或电芯，禁止用钉子或其它利器刺穿电池组合或电芯。

10. Cautions 注意

Do not use or leave the pack at very high temperature (for example, at strong direct sunlight or a vehicle in extremely hot conditions).Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.

△ 禁止在高温下(直热的阳光下或很热的汽车中)使用或放置电池组合,否则可能会引起电池过热,起火或功能失效,从而导致电池组合寿命减短。

Do not use it in a location where static electricity is great, otherwise, the safety devices in the pack may be damaged, which will cause hidden trouble of safety.

△ 禁止在强静电和强磁场的地方使用,否则易破坏电池组合的安全保护装置,带来不安全隐患。

If the pack leaks and the electrolyte get into the eyes, do not rub eyes, instead, rinse the eyes, with clean running water, and immediately seek medical attention. Otherwise, eye injury can result.

△ 如果电池发生泄漏,电解液进入眼睛,请不要揉擦,应用清水冲洗眼睛,并立即送医院治疗,否则会伤害眼睛。

If the pack takes off an odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use, recharging or storage, immediately remove it from the device or battery charge and stop using it.

△ 如果电池组合在使用或贮存中发出异味,发热,变色,变形,或者是在充电过程中出现任何异常现象,立即将电池从充电器或装置中移开,并停止使用。

In case the pack terminals are dirt, clean the terminals with a dry cloth before use. Otherwise power failure or charge failure may occur due to the poor connection with the instrument.

△ 如果电池组合的连接点弄脏,使用前应用干布擦净,否则可能会因接触不良而影响性能失效。

Be aware discharged battery may cause fire or smoke, tape the terminals to insulate them.

△ 废弃电池应用绝缘纸包住电池极性,以防起火，冒烟。

The pack should be stored at room temperature, charged to about 40% to 60% of capacity. In case of over-discharge, pack should be charged for one time every 3 months while storing and batteries should be discharge and charge after being stored more than a year in order to activate it and restore energy.

△电池组合应当在室温下存放，应充到 40%至 60%的电量。为防止电池过放，建议每 3 个月进行一次充电，如储存时间超过一年，建议每年进行一次充、放电以激活电池性能。

11. Notice for Design of Battery Pack 电池外壳设计注意事项

11.1 Pack toughness（外壳坚韧度）

Battery pack should have sufficient strength and the cell inside should be protected from mechanical shocks.
电池外壳应该有足够的机械强度使聚合物电池免受机械撞击。

11.2 Cell fixing（电池的固定）

The cell should be fixed to the battery pack by its large surface area. No cell movement in the battery pack should be allowed.
电池最大面积的一面应该固定在外壳上，安装后电池不能有松动。

11.3 Inside design（外壳内部设计）

No sharp edge components should be insides the pack containing the cell.
外壳内安装电池的部位不应有锋锐边。

11.4 Tab connection （极片连接）

Ultrasonic welding or spot welding is recommended for tab connection method. Battery pack should be designed that shear force are not applied to the tabs. If apply manual solder method to connect tab with PCM, below notice is very important to ensure battery performance:

- ■ The solder iron should be temperature controlled and ESD safe;
- ■ Soldering temperature should not exceed 350°C;
- ■ Soldering time should not be longer than 3s;
- ■ Soldering times should not exceed 5 times, Keep battery tab cold down before next time soldering;
- ■ Directly heat cell body is strictly prohibited, Battery may be damaged by heat above approx. 100°C

建议使用超声波或点焊焊接方法；外壳设计应使极片不受外力。

如果使用人工焊接保护板，下面的注意事项对于确保电池性能非常重要：

- ■ 焊接铬铁的温度必须可控且可防静电；
- ■ 焊接时铬铁的温度不能超过 350℃；
- ■ 焊锡时间不能超过 3 秒钟；
- ■ 焊锡次数不能超过 5 次，待极片冷却后才能进行下一次焊锡；
- ■ 严禁直接加热电芯，高于 100℃度会损害电芯。

12. Handling of Battery 电池操作注意事项

12.1 .Soft Aluminum foil（铝箔软包装）

Easily damaged by sharp edge parts such as pins and needles, Ni-tabs, comparing with metal-can-cased .
相对于金属壳的方形电池，铝箔软包装比较容易被锐利部件刺损，如针尖、镍带。

△Don't strike battery with any sharp edge parts 勿用尖锐处撞击电池。

△Trim your nail or wear glove before taking battery 剪掉指甲，或者戴手套。

△Clean worktable to make sure no any sharp particle 清理工作台，避免尖锐零部件。

12.2. Sealed edge may be damaged by heat above 100°C, bend or fold sealed edge.

封边被加热到 100°C 以上以及弯折封边都容易使封边受损。

12.3. Prohibition short circuit（禁止电池短路）

Never make short pack circuit. It generates very high current which causes heating of the cells and may cause electrolyte leakage, gassing or explosion that are very dangerous. The tabs may be easily short-circuited by putting them on conductive surface. Such outer short circuit may lead to heat generation and damage of the cell.

避免电池短路。短路会产生很高的电流而使电池发热以及电解液泄漏，产生气体或爆炸是非常危险的。极片连接在导电物体表面很容易短路，外部短路会导致发热及损害电池。

12.4.Mechanical shock（机械撞击）

△Cells have less mechanical endurance than metal-can-cased.

△Falling, hitting, bending, etc. may cause degradation of characteristics.

聚合物电池比金属壳方形电池的机械耐久性更小。

跌落、碰撞、弯曲等等都可能会降低聚合物电池的性能。