IFP29207168A-124Ah 锂离子电池

产品规格书

Product Specification of

IFP29207168A-124Ah Lithium-ion Rechargeable Cell

制　定 Formulated by		审　核 Checked by	批　准 Approved by
标准化 Standardized by		会 签 Counter Signed by	

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前　言　PREFACE

本标准为公司统一执行的企业标准。

The specification is the enterprise standard uniformly implemented by the company.

本标准的编写格式符合 GB/T 1.1-2009《标准化工作导则 第 1 部分：标准的结构和编写》的规定。

The format of this specification is in accordance with the provisions of GB/T 1.1-2009, standardization work guideline Part 1: Standards Structure and Compilation.

本标准在参照：GB/T 31484-2015《电动汽车用动力蓄电池循环寿命要求及试验方法》、GB 38031-2020 《电动汽车用动力蓄电池安全要求》、GB/T 31486-2015 《电动汽车用动力蓄电池电性能要求及试验方法》、IEC62619-2017、IEC 62660-2-2018、GB/T36276-2018、Q/GX 60013-2020《电动汽车用锂离子动力电池单体电性能测试方法》的基础上，结合我公司产品实际和试验条件，特制定《IFP29207168A-124Ah 锂离子电池产品规格书》标准，并对试验方法、判定标准内容进行了阐述，以指导 IFP29207168A-124Ah 锂离子电池产品的性能检测。

This specification refers to GB/T 31484-2015 cycle life requirements and test methods for power cell for electric vehicles, GB 38031-2020 safety requirements and test methods for power cell for electrical vehicles, GB/T 31486-2015 electrical performance requirements and test methods for power cell for electric vehicles, IEC62619-2017, IEC 62660-2-2018, GB/T36276-2018, Q/GX 60013-2020 electrical performance test method of lithium ion power cell for electrical vehicles. Combined with the actual and test conditions of our company's product, the standard of Q/GX 033-2021 product specification for IFP29207168A-124Ah Lithium ion rechargeable cell is specially formulated. The test method and criteria is revised and supplemented to guide the manufacturing and approval of IFP29207168A-124Ah Lithium ion Cell.

注：若修改，以最新发布标准为准。

Remark：If modified, please take the latest version as standard.

修订记录 Modification Record

版本号 Version Number	变更内容 Modified Contents	修订日期 Revision date	修订者 Reviser
QGX0**-2022	首次发布 1st Edition	2022.11.24	齐永成 Yongcheng Qi

1. 基本信息 Basic Information

1.1 适用范围 Scope

本产品规格书由合肥国轩高科动力能源有限公司提供给客户，描述了其锂离子二次电池的性能。

This specification sheet is provided to customers by HEFEI GOTION HIGH-TECH POWER ENERGY Co. Ltd., describing Lithium ion rechargeable cell properties.

1.2 用途 Application：EV。

1.3 产品类型 Product type：

锂离子二次电池，方形，LFP 电芯。Lithium ion rechargeable battery, Square, LFP cell.

1.4 型号名称 Model Name：IFP29207168A-124Ah。IFP29207168A-124Ah.

2. 规格 Specification

2.1 标准技术参数 Standard Technical Parameters

项目 Items	参数 Specification	条件/注释 Condition/Notes
2.1.1 标称容量 Nominal Capacity	124Ah	0.33C，2.0V-3.65V
2.1.2 标称电压 Nominal Voltage	3.2 V	
2.1.3 充放电电压范围 Charge/discharge voltage window	2.0 V～3.65 V	＞0 ℃
	1.8 V～3.65 V	≤0 ℃
2.1.4 重量 Weight	2280 g±60 g	
2.1.5 质量能量密度 Energy density	≥175 Wh/kg	0.33C
2.1.6 体积能量密度 Volumetric Energy Density	≥380 Wh/L	0.33C
2.1.7 交流内阻 AC Impedance	0.3mΩ≤R≤0.6mΩ	25℃±2℃ 新电池状态（5%±3%SOC） Fresh cell（5%±3%SOC）
2.1.8 直流内阻 DC Impedance	≤1.2 mΩ	50%SOC@3C30S，25 ℃±2 ℃

2.2 推荐充电规范 Recommended Charge specification

项目 Items	参数 Specification	条件/注释 Condition/Notes
2.2.1 常规充电（慢充）Regular Charge (Slow charge)	62 A 3.65 V 6.2 A 15 ℃≤T＜45 ℃	恒流 Constant current 恒压 Constant voltage 截止条件（终止） Cut off condition (terminating) 温度 Temperature
2.2.2 阶梯充电（快充）Step Charge	见附件 A.1 See appendix A.1	不同温度的快充策略 Fast charging strategy at different temperature

2.3 工作温度范围 Working Temperature Range

项目 Items	参数 Specification	条件/注释 Condition/Notes
2.3.1 最佳工作温度 Optimum working Temperature	10 ℃～35 ℃	
2.3.2 充电温度范围 Charge temperature range	0 ℃～55 ℃	充电电流，见附件 A.1 Charging current ,See appendix A.1
2.3.3 放电温度范围 Discharge temperature range	-30 ℃～60 ℃	电芯温度≤60 ℃ Cell temperature ≤60 ℃

3. 外观尺寸 Appearance and Dimension

3.1 外观 Appearance

电池单体外表面无明显的划痕、裂痕、生锈、变色或电解液泄漏，无影响电池单体正常使用的其它外观缺陷。

Without scratches, cracks, rust, discoloration or electrolyte leakage, no other appearance defects affecting cell normal operation

3.2 尺寸 Dimension

厚度：（29.5±0.3）mm（含外包膜厚度，（5±3）%SOC，（200±5）kgf)。

Thickness：(29.5±0.3)mm (including outer film thickness, （5±3）%SOC, （200±5）kgf)

宽度：（206.8±0.3）mm（含外包膜)。

Width：(206.8±0.3)mm (including outer film thickness)

高度：（169.58±0.5）mm（不含极柱，含外包膜和顶盖贴片）

（172.7±0.5）mm（含极柱，含外包膜和顶盖贴片）

Height：（169.58±0.5）mm（including outer film thickness and excluding terminals）

(172.7±0.5)mm（including outer film thickness and terminals）

4. 性能测试 Performance Specification

4.1 标准测试条件 Standard Testing Condition

4.1.1 单体电池充电 Single cell charging

室温下（25℃±2℃），单体电池以 40.92A 电流放电至电压为 2.0V，静置 30min，然后再以 40.92A 电流充电至电压为 3.65V 时转恒压充电，至充电电流降至 6.2A 时停止充电，充电后静置 30min。

At room temperature（25℃±2℃）, 40.92A constant current discharge to 2.0V, rest 30min, then 40.92A constant current charge to 3.65V followed by constant voltage charging until current drops down to 6.2A, rest 30min.

4.1.2 单体电池放电 Single cell discharging

室温下（25℃±2℃），单体电池以 40.92 A 电流放电至电压为 2.0V，静置 30min。

At room temperature（25℃±2℃）, 40.92 A constant current discharge to 2.0V, rest 30min.

4.2 电气特性 Electrical Properties

项目 Items	参数 Specification	条件/注释 Condition/Notes
4.2.1 初始容量 Initial Capacity	≥124 Ah	按照 4.1.1 充电，按照 4.1.2 放电 Charge and discharge as per 4.1.1 and 4.1.2

4.2.2 容量与温度的相关性 Capacity and temperature correlation	55 ℃，≥95% 初始容量 25 ℃，100% 初始容量 10 ℃，≥90% 初始容量 0 ℃，≥80% 初始容量 -20℃，≥60%初始容量 55℃, ≥95% Initial Capacity 25℃, 100% Initial Capacity 10℃, ≥90% Initial Capacity 0℃, ≥80% Initial Capacity -20℃, ≥60% Initial Capacity	25℃±2℃温度下按照 4.1.1 充电，在测试温度下静置 20h，以 1C 放电至 2.0V（0℃及以下 1.8V）。 Charge refer to 4.1.1, rest 20h at testing temperature, 1C discharge to 2.0V at testing temperature（to 1.8V at or below 0℃）.
4.2.3 SOC-OCV 表 SOC-OCV table	见附件 A.4 See appendix A.4	按照 4.1.1 充电，然后以 0.33C 放电 5% 容量（此容量为按照 4.1.2 放电至对应截止电压（[-30℃~0℃）2.0V, [0℃~10℃）2.3V, [10℃~55℃] 2.5V）对应的容量，静置 1h，重复 20 次，记录静置后的电压数据。 Charge as per 4.1.1, then discharge for 5% capacity at 0.33C（The capacity is obtained by discharging to certain cut-off voltage as per 4.1.2 （[-30℃-0℃）2.0 [0℃-10℃）2.3 [10℃-55℃] 2.5）， rest 1h, repeat 20 times, record voltage after rest.
4.2.4 不同温度和不同 SOC 放电电阻（DCR）Discharge DCR at different temperature and SOC（DCR）	见附件 A.5 See appendix A.5	按照 4.1.1 充电，然后以 0.33C 按照 4.2.2 不同温度下放电容量调整 SOC（截止电压参照 4.2.3），静置 1 h，测试 3C 放电 30 s 的 DCR。 放电电阻为开路电压与放电末端电压的差值除以电流，测试 SOC 为 95%，90%，80%，70%，60%，50%，40%，30%，20%，10%，5%。 Charge as per 4.1.1, then discharge at 0.33C to adjust SOC at different temperature as per 4.2.2, standing for 1h, measure DCR under the condition of discharge at 3C for 30s. The discharge resistance is the difference between the open circuit voltage and the discharge end voltage divided by

		the current, tested SOC is 95%,90%, 80%, 70%, 60%, 50%, 40%, 30%, 20%, 10%,5%.
4.2.5 不同温度和不同 SOC 充电电阻（DCR） Charge DCR at different temperature and SOC（DCR）	见附件 A.6 See appendix A.6	按照 4.1.1 充电，然后以 0.33C 按照 4.2.2 不同温度下放电容量调整 SOC（截止电压参照 4.2.3），静置 1 h，测试 3C 充电 10 s 的 DCR。充电电阻为充电末端电压与开路电压的差值除以电流，测试 SOC 为 5%，10%，20%，30%，40%，50%，60%，70%，80%，90%，95%。 Charge as per 4.1.1, then discharge at 0.33C to adjust SOC at different temperature as per 4.2.2, standing for 1h, measure DCR under the condition of charge at 3C for 10s, The charging resistance is difference between the charging terminal voltage and the open circuit voltage divided by the current, tested SOC at 5%，10%，20%，30%，40%，50%，60%，70%，80%，90%，95%,

4.3 最大脉冲功率（极限能力值） Maximum pulse power (limit capability value)

项目 Items	参数 Specification	条件/注释 Condition/Notes
4.3.1 不同温度和不同 SOC 脉冲放电峰值功率 Peak power pluse discharge at different temperature and SOC	见附件 A.7 See appendix A.7	按 4.2.4 测试数据计算的 DCR 和最大脉冲放电电流，计算出在不同温度规定的放电下限电压时的脉冲放电功率。 According to the DCR and the maximum pulse charging current calculated from the test data of 4.2.4, the pulse discharge power at the lowest limit voltage specified at different temperature.
4.3.2 不同温度和不同 SOC 脉冲回馈峰值功率 Peak power pluse feedback at different temperature and SOC	见附件 A.8 See appendix A.8	按 4.2.5 测试数据计算的 DCR 和最大脉冲充电电流，计算出在充电上限电压 3.65 V 时的脉冲回馈功率。 According to the DCR and the maximum pulse charging current calculated from the test data of 4.2.5, the pulse feedback power at the upper charging voltage of 3.65V was calculated.

4.4 最大允许脉冲功率（使用允许值） Maximum allowable pulse charge power（Use allowable values）

项目 Items	参数 Specification	条件/注释 Condition/Notes
4.4.1 不同温度和不同 SOC 最大允许脉冲放电功率 Maximum allowable pulse discharge power at different Temperature and SOC	见附件 A.9 See appendix A.9	依据 4.3.1 电池单体最大脉冲放电倍率能力和放电过程温度保护考虑，对电芯脉冲放电功率上限进行限定。 According to 4.3.1 maximum pulse discharge multiplier capacity of the cell and temperature protection of the discharge process, the upper limit of the pulse discharge power of the cell is limited.
4.4.2 不同温度和不同 SOC 最大允许脉冲回馈功率 Maximum allowable pulse feedback power at different Temperature and SOC	见附件 A.10 See appendix A.10	依据 4.3.2 电池单体最大脉冲充电倍率能力，结合电芯在大倍率下的脉冲充电可靠的上限电压和充电过程温度保护考虑，对电芯脉冲回馈功率上限进行限定。 According to 4.3.2 maximum pulse charging capacity of the cell, the upper limit of the feedback power of the cell is limited in consideration of the reliable upper limit voltage and temperature protection of the charging process of the cell under the high voltage.

4.5 耐久性能 Endurance performance

项目 Items	参数 Specification	条件/注释 Condition/Notes
4.5.1 室温荷电保持率 Room Temperature SOC Retention Rate	≥95%	25 ℃，100%SOC，28 d
4.5.2 室温容量恢复率 Room Temperature Capacity Recovery Rate	≥96%	
4.5.3 高温荷电保持率 High Temperature SOC Retention Rate	≥94%	55 ℃，100%SOC，7 d
4.5.4 高温容量恢复率 High Temperature Capacity Recovery Rate	≥95%	
4.5.5 高温荷电保持率 High Temperature SOC Retention Rate	≥94%	45 ℃100%SOC，28 d
4.5.6 高温荷电恢复率 High Temperature Capacity Recovery Rate	≥95%	

4.5.7 高温循环寿命 High Temperature Cycle Life	800 次 800 cycles	80%容量保持率；55 ℃，以 0.5C 电流恒流充电至终止电压 3.65 V 时转恒压充电，至充电电流降至 6.2 A 时停止充电，充电后静置 10min；0.5C 放电至 2.5V，使用企业钢板夹具约束单体蓄电池，初始夹紧力 150±50kgf。 80% capacity retention rate; 55°C, charge at 0.5C to 3.65V followed by constant voltage charging until current drops down to 6.2 A, standing for 10min；discharge to 2.5V at 0.5C under 150±50kgf preload
4.5.8 高温循环寿命 High Temperature Cycle Life	1500 次 1500 cycles	80%容量保持率；45 ℃，以 0.5C 电流恒流充电至终止电压 3.65 V 时转恒压充电，至充电电流降至 6.2 A 时停止充电，充电后静置 10min；0.5C 放电至 2.5V，使用企业钢板夹具约束单体蓄电池，初始夹紧力 150±50kgf 80% capacity retention rate; 45°C, charge at 0.5C to 3.65V followed by constant voltage charging until current drops down to 6.2A, standing for 10min；discharge to 2.5V at 0.5C under 150±50kgf preload
4.5.9 常温循环寿命 Room Temperature Cycle Life	3000 次 3000 cycles	80%容量保持率；25 ℃，以 0.5C 电流恒流充电至终止电压 3.65 V 时转恒压充电，至充电电流降至 6.2 A 时停止充电，充电后静置 30min；0.5C 放电至 2.5V，使用企业钢板夹具约束单体蓄电池，初始夹紧力 150±50kgf 80% capacity retention rate; 25°C, charge at 0.5C to 3.65V followed by constant voltage charging until current drops down to 6.2A, standing for 30min；discharge to 2.5V at 0.5C under 150±50kgf preload
4.5.10 日历寿命 Calendar Life	10 年 years	80%容量保持率；25 ℃，50%SOC 80% EOL, ,25℃，50%SOC

4.6 安全测试 Specification of Safety Test

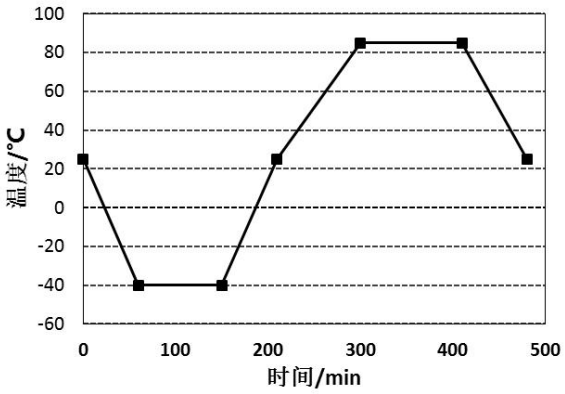
项目 Items	参数 Specification	条件/注释 Condition/Notes
4.6.1 过放电 Over discharging	不爆炸，不起火，不漏液 No explosion, no fire, no leakage	电池单体按 4.1.1 方法充电，单体蓄电池以 1 I_1 (A)电流放电 90 min，并观察 1 h。(I_1=122 A) The single cell was charged according to the method of 4.1.1, and the single cell was discharged with a current of 1 I1 (A) for 90 min and observed for 1 h (I1=122Ah)

4.6.2　过充电 Over charging	不爆炸，不起火 No explosion, no fire	电池单体按 4.1.1 方法充电，以 1 I_1 (A)电流恒流充电至电压达到企业技术条件中规定的充电终止电压（3.65 V）的 1.1 倍或 115% SOC 后停止充电，并观察 1 h。（I_1=122 A） The single cell （ The single cell is restrained by steel clamp） is charged according to the method of 4.1.1, and is charged with a constant current of 1 I1 (A) until the voltage reaches 1.1 times of the charging end voltage specified in the technical conditions of the enterprise or the charging SOC reaches 115%, and the charging is stopped, and 1 h is observed (I1=122 Ah).
4.6.3　短路 Short circuiting	不爆炸，不起火 No explosion, no fire	电池单体按 4.1.1 方法充电，将电池单体正、负极经外部短路 10 min，外部线路电阻应小于 5 mΩ，并观察 1 h。 The single cell （ The single cell is restrained by steel clamp） is charged according to the method of 4.1.1, and the cathode and anode terminals of the single cell are externally short-circuited for 10 min, and the external line resistance should be less than 5 mΩ, and observed for 1 h.
4.6.4　加热 Heating	不爆炸，不起火 No explosion, no fire	电池单体按 4.1.1 方法充电，温度箱按照 5 ℃/min 的速度由室温升至 130 ℃±2 ℃，并保持此温度 30 min 后停止加热，并观察 1 h。 The single battery（The single cell is restrained by steel clamp） is charged according to the method of 4.1.1, and the temperature box was raised from room temperature to 130 °C ± 2 °C at a rate of 5 ° C / min. After maintaining this temperature for 30 min, the heating was stopped and observed for 1 h.

4.6.5　挤　压 Crushing	不爆炸，不起火 No explosion, no fire	电池单体按 4.1.1 方法充电； 按下列条件进行试验： a)　挤压方向：垂直于电池单体极板方向施压； b)　挤压板形式：半径为 75 ㎜ 的半圆柱体，半圆柱体的长度(L)大于被挤压电池单体的尺寸； c)　挤压速度：（2±1）mm/s； d)　挤压程度：电压达到 0V 或变形量达到 15%或挤压力达到 100KN 后停止挤压，保持 10min；并观察 1h according to the method of 4.1.1; Test according to the following conditions: a) extrusion direction: apply pressure perpendicular to the battery plate; b) extruded plate form: a semi-cylindrical body with a radius of 75 mm, the length (L) of the semi-cylindrical body is larger than the size of the battery to be squeezed; c) extrusion speed: (2 ± 1) mm / s; d) degree of extrusion: after the voltage reaches 0V or the deformation amount reaches 15% or the pressing force reaches 100KN, the extrusion is stopped and kept for 10 minutes; And observe 1h.

4.6.6　温度循环 Temperature Cycle Test	不爆炸，不起火，不漏液 No explosion, no fire, no leakage	电池单体按 4.1.1 方法充电，电池单体放入温度箱中，温度箱温度按照下表进行调节，循环次数 5 次，观察 1 h。 The single cell is charged according to the method of 4.1.1. The single cell is placed in the temperature box, and the temperature of the temperature box is adjusted according to the following table. The number of cycles is 5 times and observed for 1 hour.

温度 Temp ℃	时间增量 Time increasing min	累计时间 cumulative time min	温度变化率 Temperature change rate ℃/min
25	0	0	0
-40	60	60	13/12
-40	90	150	0
25	60	210	13/12
85	90	300	2/3
85	110	410	0
25	70	480	6/7



5　使用注意事项 Notes

锂离子充电电池的使用警告。操作不当可能会造成电池发热、起火和性能劣化，务必认真阅读以下条款。

Warning for the use of lithium ion rechargeable cells. Improper handling may cause the cell to heat up, cause fire and degrade performance. Be sure to read the following terms carefully.

注意事项 Precautions

- 应用配有电池的设备时，使用前请参阅用户手册。

  When using a device equipped with a battery, refer to the user manual before use

- 包装前请检查正极和负极端子的方向。

  Check the orientation of the cathode and anode terminals before packaging

- 端子或导线与电池模块相连，注意绝缘防止短路。

  The terminal or wire is connected to the cell module, pay attention to the insulation to prevent short circuit

- 长期不用时，电池要存放于阴凉干燥处(≤35 ° C，30%～50%SOC，3 个月进行一次充放电）。
  Store the cell in a cool dry place (≤35°C，30%~50%SOC, charge and discharge once every 3 months) when not in use for a long time.

- 不要将电池放置于阳光直射处或热源。

  Do not place the cell in direct sunlight or heat source to prevent high temperature of the cell.

- 处理电池单元时请勿穿戴金属饰品（ 如戒指，手表，饰件等 ）。

  Do not wear metal accessories (such as rings, watches, accessories, etc.) when handling cell units.

- 请勿将电池放置在本文件规定的使用温度范围之外的地方。

  Do not place the cell outside the operating temperature range specified in this document.

禁止事项 Prohibited Items

- 请勿超过最大充电倍率充电。

  Do not charge more than the maximum charge rate.

- 请勿拆卸或改装电池。

  Do not disassemble or modify the Cell.

- 请勿抛掷或撞击电池。

  Do not throw or hit the battery.

- 请勿用锐器刺穿电池。（ 例如钉子，刀子，笔，电钻 ）

Do not pierce the battery with a sharp object. (eg nails, knives, pens, electric drills)

- 请勿与其它型号电池或模块单元混用。

  Do not mix with other cell or module units.

- 使用过程中请勿过度挤压电池。

  Do not over-squeeze the battery during use.

- 请勿将新、旧电池在 PACK 中同时使用。

  Do not use both new and old cell in PACK

- 请勿将电池放置于大于 60℃高温处。

  Do not place the cell at a temperature higher than 60 °C

- 不要将电池放入微波炉或高压容器中。

  Do not put the cell in a microwave or high pressure container.

- 请勿用导电材料连接正、负极端子。（ 例如金属，电线 ）

  Do not connect the positive and negative terminals with conductive materials. (eg metal, wire)

- 不允许弄湿或将电池浸入水或海水中。

  Do not allow to wet or immerse the cell in water or sea water

- 请勿以制造商书面协议之外的方式使用电池 。

  Do not use the cell in any way other than the manufacturer's written agreement.

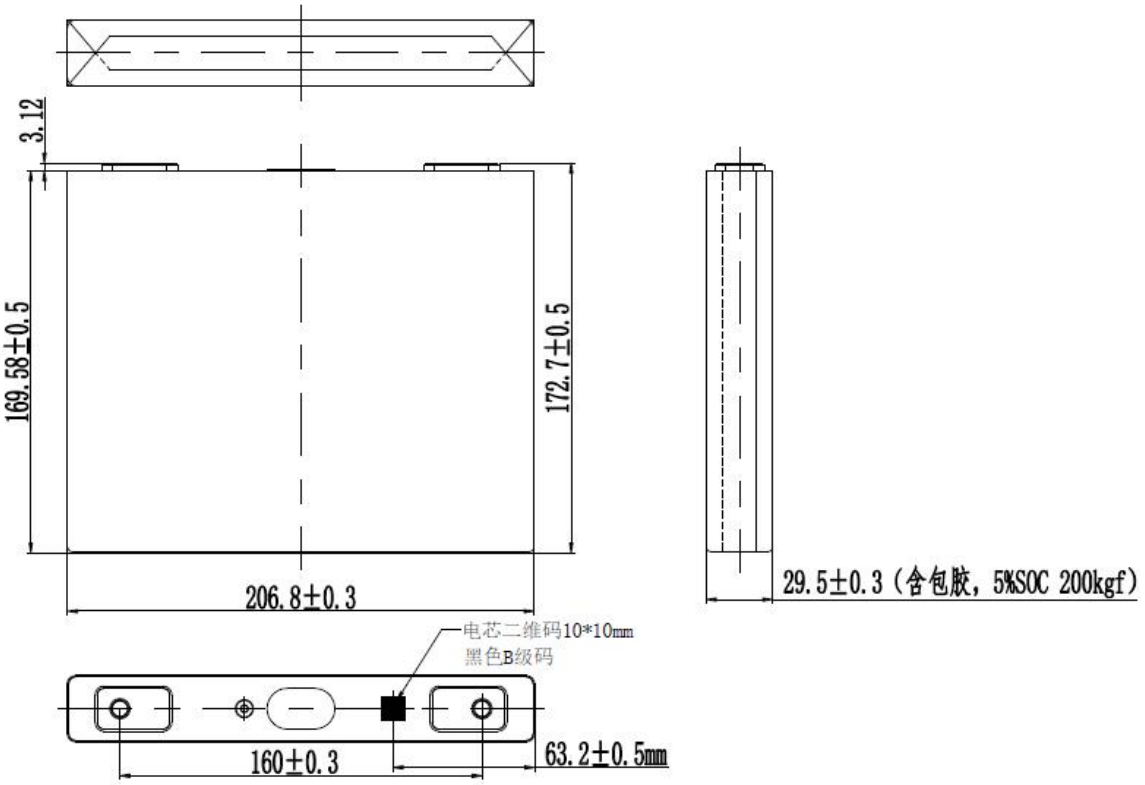
- 禁止串联电芯壳体间绝缘不良。

  Do not connect the cells in series to prevent the insulation of “Can”

- 电池在整车中的放置方向，必须保证电芯高度方向与车的行进方向垂直。

  The placement of the cell in the vehicle must ensure that the height of cell is perpendicular to the direction of the vehicle

6 外形图 Drawings



电池尺寸 Cell Dimension

注：图中尺寸单位为毫米（mm）。

Remark：The dimensions are shown in millimeters（mm）

附录 A Appendix A

A.1 阶梯充电矩阵表 Step charge Table (Step charge matrix table)

步骤 Procedure	温度 Temperature	＜0 ℃	0 ℃≤T＜5 ℃	5 ℃≤T＜10 ℃	10 ℃≤T＜15 ℃	15 ℃≤T＜25 ℃	25 ℃≤T＜45 ℃	45 ℃≤T＜50 ℃	50 ℃≤T＜55 ℃
1	充电电流（C） Charge current（C）	不允许充电 No charging	0.2	0.33	0.6	1	1	0.5	0.33
	跳转电压（V） Jumping voltage（V）	/	3.62	3.6	3.47	3.47	3.47	3.5	3.5
2	充电电流（C） Charge current（C）	/	0.10	0.20	0.45	0.5	0.5	0.25	0.20
	跳转电压（V） Jumping voltage（V）	/	3.60	3.60	3.60	3.60	3.60	3.62	3.60
3	充电电流（C） Charge current（C）	/	0.05	0.10	0.2	0.25	0.25	0.10	0.10
	跳转电压（V） Jumping voltage（V）	/	3.65	3.65	3.62	3.62	3.62	3.65	3.65
4	充电电流（C） Charge current（C）	/	/	/	0.1	0.1	0.1	/	/
	跳转电压（V） Jumping voltage（V）	/	/	/	3.65	3.65	3.65	/	/

A.2 单体电芯故障阈值 Single Cell Failure Threshold (Recommended Value)

A.2.1 单体电芯故障阈值 Single Cell Failure Threshold

项目 Items	数值 Numeric value	解释 Description	参考 Reference
单体过电压严重报警阈值 V Single cell overvoltage critical alarm threshold V	3.8	充电时过电压超过报警阈值，将影响电池的循环寿命，用户充电不允许超过此电压值 When the overvoltage exceeds the alarm threshold during charging, it will affect the cycle life of the cell. User charging is not allowed to exceed this voltage value.	必须强制断电 Power must be turned off

单体过电压一般报警阈值 V Single cell overvoltage general alarm threshold V	3.7	充电时过电压的临界值 Critical value of overvoltage during charging	超过 5 s，强制断电 Forced power must be turned off over 5s
最大工作电压 V Maximum working voltage V	3.65	正常工作的最大极限值 Maximum limit of normal operation	
单体欠压严重报警阈值 V Single cell under voltage critical alarm threshold V	[-30 ℃～0 ℃）1.8 [0 ℃～55 ℃] 2.0	放电时欠压超过报警阈值，将影响电池的循环寿命，用户放电不允许超过此电压值 When the under-voltage exceeds the alarm threshold during discharge, it will affect the cycle life of the cell. The user discharge must not exceed this voltage value	
单体欠压一般报警阈值 V Single cell under voltage general alarm threshold V	[-30 ℃～0 ℃）1.9 [0 ℃～55 ℃] 2.2	放电时欠压超过报警阈值，限功率运行 When the under voltage exceeds the alarm threshold during discharge, it will affect the cycle life of the battery. The user discharge must not exceed this voltage value.	
最小工作电压 V Minimum operating voltage V	[-30 ℃～0 ℃）2.0 [0 ℃～55 ℃] 2.3	正常工作的最小临界值 Minimum threshold for normal operation	
电池温度过高一般报警阈值 ℃ Battery temperature is too high, general alarm threshold °C	55	电池工作温度超过此温度，将会限制电池使用功率 Battery operating temperature above this temperature will limit cell power	
电池温度过高严重报警阈值 ℃ Battery temperature is too high, critical alarm threshold °C	60	电池温度超过此报警阈值，将会影响电池安全性能，用户使用时不应超过此温度 If the cell temperature exceeds this alarm threshold, it will affect the cell safety performance. The user should not exceed this temperature when using it.	

电池温度过低一般报警阈值 ℃ Cell temperature is too low, general alarm threshold °C	-20	电池工作温度低于此温度，将会限制电池使用功率 Cell operating temperature below this temperature will limit cell power	
电池温度过低严重报警阈值 ℃ Battery temperature is too low, critical alarm threshold °C	-30	电池温度低于此报警阈值，将会影响电池安全性能，用户使用时不应低于此温度 If the cell temperature is lower than this alarm threshold, it will affect the safety performance of the cell. The user should not use it below this temperature.	

A.2.2 为 Pack 设计提供的电池信息

项目 Items	符号 Symbol	数值 Numerical value	意见 Suggestions	参考 Reference
Pack 装配过程最大允许压力 Maximum allowable pressure during Pack assembly	Fmax	TBD		600kgf，5%±3%SOC
Pack 装配后电芯最终压力 Optimal pressure after Pack assembly	Fmin	TBD		150±50kgf， 5%±3%SOC

A.3 在选定条件下的循环寿命 Cycle Life at Certain Condition

A.3.1 常温循环寿命 Room Temperature Cycle Life

测试条件：Test Conditions：

充电：以 0.5 C 电流充电至电压为 3.65 V 时转恒压充电，至充电电流降至 6.2 A 时停止充电；

Charging: charge at 0.5C to 3.65V, then charging at constant voltage to cutoff current 6.2A

放电：0.5 C 放电至截止电压 2.0 V；

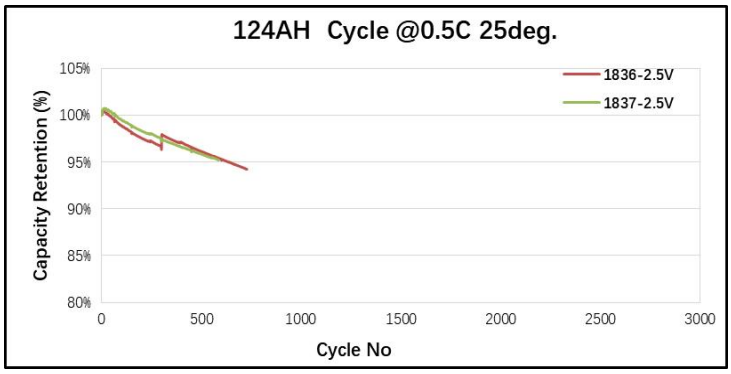
Discharge: 0.5C discharge to cut off voltage 2.0V

温度：25℃±2℃；

Temperature: 25℃±2℃

静置时间：充电/放电后静置 30 min。

Rest time: 30 min after charging/discharging



A.4 SOC-OCV 表 SOC-OCV table

T	-30 ℃	-20 ℃	-10 ℃	0 ℃	10 ℃	25 ℃	45 ℃	55 ℃
DOD	电 压 Voltage/V	电 压 Voltage/V	电 压 Voltage/V	电 压 Voltage/V	电 压 Voltage/V	电 压 Voltage/V	电 压 Voltage/V	电 压 Voltage/V
0%	3.381	3.400	3.398	3.388	3.388	3.414	3.378	3.357
5%	3.306	3.302	3.310	3.317	3.322	3.328	3.331	3.332
10%	3.293	3.299	3.309	3.316	3.322	3.327	3.331	3.332
15%	3.291	3.298	3.309	3.317	3.323	3.328	3.331	3.331
20%	3.290	3.297	3.308	3.318	3.324	3.328	3.331	3.331
25%	3.288	3.294	3.304	3.317	3.324	3.328	3.330	3.331
30%	3.287	3.291	3.298	3.311	3.322	3.328	3.330	3.330
35%	3.285	3.288	3.292	3.300	3.311	3.326	3.326	3.326
40%	3.282	3.284	3.287	3.290	3.295	3.301	3.301	3.302
45%	3.280	3.281	3.282	3.284	3.286	3.292	3.297	3.299
50%	3.277	3.279	3.279	3.282	3.285	3.290	3.296	3.298
55%	3.274	3.275	3.277	3.280	3.284	3.289	3.295	3.298
60%	3.272	3.271	3.275	3.279	3.283	3.289	3.295	3.297
65%	3.269	3.269	3.273	3.278	3.282	3.288	3.294	3.296
70%	3.267	3.266	3.270	3.275	3.277	3.284	3.278	3.274
75%	3.265	3.262	3.266	3.270	3.267	3.269	3.262	3.259
80%	3.264	3.259	3.259	3.260	3.252	3.252	3.247	3.243
85%	3.262	3.255	3.250	3.243	3.229	3.227	3.222	3.216
90%	3.259	3.251	3.237	3.223	3.210	3.200	3.206	3.206
95%	3.254	3.247	3.223	3.203	3.186	3.184	3.166	3.133
100%	3.247	3.239	3.208	3.125	2.946	2.871	2.732	2.685

A.5 不同温度和不同 SOC 的放电 DCR Discharge DCR at Different Temperature and SOC

3C 30 s 放电 Discharge DCR/mΩ								
T/SOC	-30 ℃	-20 ℃	-10 ℃	0 ℃	15 ℃	25 ℃	45 ℃	55 ℃
5%	27.33	/	/	/	/	/	1.35	1.42
10%	27.23	/	/	/	/	1.56	0.87	0.82
20%	26.98	/	/	/	1.81	1.19	0.81	0.74
30%	26.76	/	/	2.62	1.58	1.09	0.77	0.71
40%	26.47	/	/	2.42	1.45	1.04	0.75	0.71
50%	26.14	10.04	3.32	2.34	1.36	0.99	0.72	0.66
60%	25.75	8.81	3.05	2.19	1.33	0.95	0.72	0.64
70%	25.15	8.02	2.90	2.13	1.35	1.02	0.75	0.70
80%	23.49	7.55	2.80	2.06	1.31	0.99	0.73	0.67
90%	21.45	7.22	2.71	1.98	1.26	0.95	0.70	0.64
95%	20.36	7.00	2.65	1.94	1.23	0.92	0.68	0.63
注：/表示不支持 30 s，-20 ℃ 1C 测试数据，-30 ℃ 0.33 C 测试数据 Note: / indicates that test are not supported to 30 s, -20 ℃ 1C test data and -30 ℃ 0.33 C test data								

A.6 不同温度和不同 SOC 的充电 DCR Regeneration DCR at Different Temperature and SOC

3C 10 s 充电 charging DCR/mΩ				
T/SOC	15 ℃	25 ℃	45 ℃	55 ℃
5%	1.43	0.87	0.68	0.65
10%	1.47	0.85	0.64	0.59
20%	1.48	0.87	0.65	0.60
30%	1.49	0.87	0.65	0.60
40%	1.55	0.89	0.66	0.61
50%	1.61	0.92	0.69	0.64
60%	1.65	0.95	0.70	0.66
70%	1.62	0.95	0.69	0.64
80%	1.71	0.99	0.72	0.66
90%	1.87	1.04	0.79	0.72
95%	1.99	1.19	0.89	0.81
注：15 ℃ 1C 测试数据 Note: 15 ℃ 1C test data				

A.7 不同温度和不同 SOC 脉冲放电峰值功率 Peak power pulse discharge at different temperatures and SOC

3C 30 s 脉冲放电峰值功率/W Peak power pulse discharge@ 3C 30s /W								
T/SOC	-30 ℃	-20 ℃	-10 ℃	0 ℃	15 ℃	25 ℃	45 ℃	55 ℃
5%	/	/	/	/	/	/	1368.7	1187.9
10%	/	/	/	/	/	1244.3	2233.0	2378.4
20%	/	/	/	/	1155.2	1718.3	2563.6	2766.0
30%	/	/	/	1174.6	1370.2	1967.3	2796.8	3057.1

40%	/	/	/	1330.1	1500.0	2091.6	2916.4	3153.0
50%	103.2	270.0	823.7	1212.5	1601.3	2206.4	3078.2	3327.1
60%	105.0	309.5	902.7	1284.7	1666.8	2301.6	3136.0	3491.4
70%	107.7	343.6	962.8	1330.0	1697.2	2260.1	3045.3	3314.5
80%	116.2	368.7	1003.3	1378.6	1753.8	2333.0	3170.3	3452.8
90%	128.7	386.6	1038.3	1428.7	1819.0	2423.7	3312.1	3606.2
95%	136.1	398.8	1061.4	1461.5	1861.6	2485.9	3385.2	3690.2

注：/表示不支持 30 s，-20 ℃ 1C 测试数据，-30 ℃ 0.33C 测试数据

Note: / indicates that test are not supported to 30 s, -20 ℃ 1C test data and -30 ℃ 0.33 C test data

A.8 不同温度和不同 SOC 脉冲回馈峰值功率 Peak power pulse feedback at different temperatures and SOC

3C 10 s 脉冲回馈峰值功率/W Peak power pulse feedback@3C 10s /W				
T/SOC	15 ℃	25 ℃	45 ℃	55 ℃
5%	1248.9	2151.8	2803.9	2989.6
10%	1195.1	2085.8	2795.0	3025.2
20%	1025.8	1801.7	2418.8	2623.4
30%	963.5	1675.8	2239.3	2419.4
40%	927.7	1617.0	2155.4	2317.0
50%	885.9	1548.1	2066.2	2222.9
60%	803.3	1441.6	1927.5	2097.1
70%	785.1	1361.4	1871.3	2036.1
80%	744.9	1333.9	1793.0	1963.7
90%	686.1	1291.0	1641.8	1799.6
95%	650.3	1177.5	1457.9	1601.6

注：15 ℃ 1C 测试数据

Note: 15 ℃ 1C test data

A.9 不同温度和不同 SOC 最大允许脉冲放电功率/倍率 Maximum allowable pulse discharge power/rate at different temperature and SOC

30 s 最大脉冲放电功率/W Maximum allowable pulse discharge power @30s /W								
T/SOC	-30 ℃	-20 ℃	-10 ℃	0 ℃	15 ℃	25 ℃	45 ℃	55 ℃
0～10%	16.2	66.8	104.2	179.8	356.5	546.8	215.8	179.8
10～20%	32.4	167.5	138.8	357.4	441.7	903.3	359.6	287.7
20～30%	96.6	180.0	239.1	363.8	634.1	1068.7	719.2	359.6
30～40%	96.6	177.7	281.8	359.7	649.7	1084.0	719.2	359.6
40～50%	96.0	209.1	307.6	363.5	651.6	1076.0	719.2	359.6
50～60%	150.4	190.6	358.2	350.1	706.3	1068.3	719.2	359.6

60～70%	170.7	255.6	371.3	350.0	730.6	1071.2	719.2	359.6
70～80%	161.6	269.4	382.3	534.4	717.5	1090.2	719.2	359.6
80～90%	169.8	277.6	426.6	548.3	707.2	1086.8	719.2	359.6

30 s 最大脉冲放电倍率/C Maximum pulse discharge rate @30s/C								
T/SOC	-30 ℃	-20 ℃	-10 ℃	0 ℃	15 ℃	25 ℃	45 ℃	55 ℃
0～10%	0.1	0.2	0.3	0.5	1.0	1.5	0.6	0.5
10～20%	0.2	0.5	0.4	1.0	1.2	2.5	1.0	0.8
20～30%	0.3	0.5	0.7	1.0	1.8	3.0	2.0	1.0
30～40%	0.3	0.5	0.8	1.0	1.8	3.0	2.0	1.0
40～50%	0.3	0.6	0.9	1.0	1.8	3.0	2.0	1.0
50～60%	0.5	0.6	1.0	1.0	2.0	3.0	2.0	1.0
60～70%	0.5	0.8	1.1	1.0	2.0	3.0	2.0	1.0
70～80%	0.5	0.8	1.1	1.5	2.0	3.0	2.0	1.0
80～90%	0.5	0.8	1.2	1.5	2.0	3.0	2.0	1.0

注：SOC 区间范围，左区间为闭区间，右区间为开区间。
Note: SOC interval range: the left interval is closed and the right interval is open.
例如：10%~20%为 10%≤SOC＜20% For example, 10%～20% is 10% ≤ SOC ＜ 20%

A.10 不同温度和不同 SOC 最大允许脉冲回馈功率/倍率 Maximum allowable pulse feedback power/rate at different temperature and SOC

15 s 最大脉冲回馈功率/W Maximum allowable pulse charge power @15s /W				
T/SOC	15 ℃	25 ℃	45 ℃	55 ℃
0～10%	385.59	515.49	628.82	419.22
10～20%	322.88	424.66	527.78	351.73
20～30%	323.00	436.62	527.95	352.11
30～40%	273.04	438.05	496.19	354.56
40～50%	273.52	445.21	502.10	313.82
50～60%	239.42	382.97	506.93	316.04
60～70%	210.32	338.38	424.68	313.82
70～80%	210.80	339.57	435.08	246.57
80～90%	215.57	358.17	423.07	211.63

15 s 最大脉冲回馈倍率/C Maximum pulse charge rate @15s/C				
T/SOC	10 ℃	25 ℃	45 ℃	55 ℃
0～10%	0.9	1.2	1.5	1.0
10～20%	0.8	1.0	1.2	0.8
20～30%	0.7	1.0	1.2	0.8
30～40%	0.6	1.0	1.2	0.8
40～50%	0.6	1.0	1.2	0.7
50～60%	0.6	0.9	1.2	0.7

60～70%	0.5	0.8	1.0	0.7
70～80%	0.5	0.8	1.0	0.6
80～90%	0.5	0.8	1.0	0.5

注：SOC 区间范围，左区间为闭区间，右区间为开区间。例如：10%~20%为 10%≤SOC＜20%

Note: SOC interval range: the left interval is closed and the right interval is open. For example, 10% ~ 20% is 10% ≤ SOC ＜ 20%

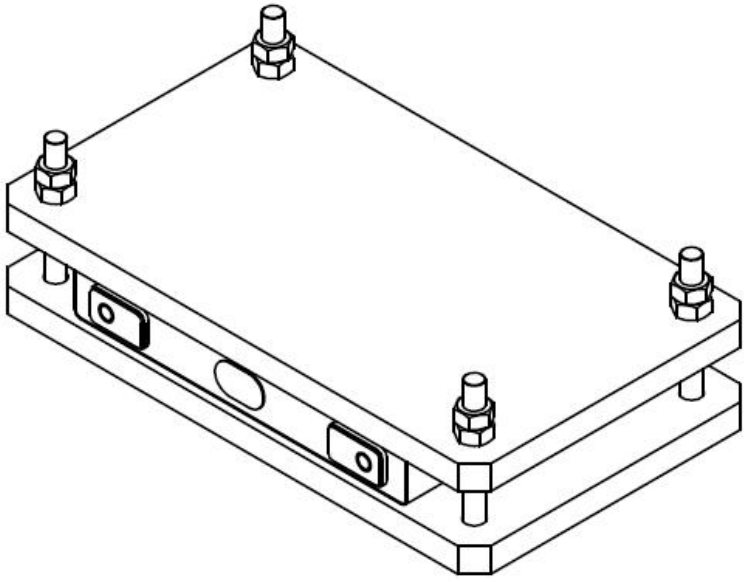
备注：脉冲回馈电流的大小应遵守下表所列的所有充电状态以及电芯温度等条件。违反脉冲回馈条件可能会造成电芯永久性的损伤导致使用寿命下降。

Remark： The high/low of the pulse feedback current must strictly comply with all charging states and cell temperature listed in the table below. Violation of pulse feedback conditions may result in permanent damage to the cell and decrease of service life.

A.11 企业钢板夹具的使用 Using of steel plate

钢制夹板（45#钢，厚度 1.5cm）：夹具需覆盖住电芯大面，并做好绝缘处理，以免接触正负极导致电芯短路，夹板之间用 4 个 M10 螺栓固定，夹具工装如下图所示：

Steel plate(45#, thickness of 1.5 cm):The plates should cover the cell, and pay attention to the insulation to prevent short circuits, the plates should to be secured with four M10 bolts, as shown below:



电芯夹具示意图 Steel plate

IFP29207168A-124Ah 锂离子电池产品环保声明
Environmental declaration of IFP29207168A-124Ah Lithium battery product

根据欧盟(EU)2015/863 指令；2006-66-EC 电池指令要求，如下表所示 镉、铅、汞、六价铬、多溴联苯(PBB)、多溴二苯醚(PBDE)及邻苯二甲酸酯(PAEs)共计 10 种物质纳入禁用物质清单。

In accordance with EU directive 2015/863, battery instruction requirements in 2006-66-EC, as shown in the following table, a total of 10 substances are included in the RSL, for example Cadmium、Lead 、Mercury、Hexavalent chromium、Polybrominated biphenyls (PBB)、Polybrominated diphenyl ethers (PBDE) and phthalate (PAEs).

A.11 十种禁用物质清单

Table A.11 List of 10 restricted substances

RoHS 禁用物质 **RoHS restricted substance**	最高限值（PPM） **The highest limit（PPM）**	说明 **Discription**
镉(Cd) Cadmium(Cd)	20	2006-66-EC 指令要求 2006-66-EC Directive Requirement
铅 (Pb) Lead (Pb)	40	2006-66-EC 指令要求 2006-66-EC Directive Requirement
汞(Hg) Mercury (Hg)	5	2006-66-EC 指令要求 2006-66-EC Directive Requirement
六价铬(Cr^{6+}) Hexavalent chromium (Cr^{6+})	1000	RoHS/中国 RoHS 2.0 RoHS/china RoHS 2.0
多溴联苯(PBB) Polybrominated biphenyls (PBB)	1000	RoHS/中国 RoHS 2.0 RoHS/china RoHS 2.0
多溴二苯醚(PBDE) Polybrominated diphenyl ethers (PBDE)	1000	RoHS/中国 RoHS 2.0 RoHS/china RoHS 2.0
邻苯二甲酸二(2-乙基已基)酯 Diphthalate (2-ethylhexyl) ester （DEHP- Di(2-ethylhexyl)Phthalate）	1000	RoHS
邻苯二甲酸丁苄酯 Benzyl butyl phthalate （BBP- Benzyl Butyl Phthalate）	1000	RoHS
邻苯二甲酸二丁酯 Dibutyl phthalate （DBP-Di-n-butyl Phtalate）	1000	RoHS
邻苯二甲酸二异丁酯 Diisobutyl phthalate （DIBP-Diiso butyl Phthalate）	1000	RoHS

从发布日期立即实施执行 Execute immediately from release date.