

Specification Approval Sheet

产品规格书

Battery Type: GRPA790190-25C-22.2V 22000mAh

电池型号: GRP A790190-25C-22.2V 22000mAh

Supplier 供应商	Prepared By 编制	Wuwentao	2016-2-25
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Customer Approval (客户批准)	Company Name(公司名称)
	Signature/Date(签名/日期)
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Amendment Records

(修正记录)

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Appendix

附

Customer's Checking Criterion

(customer required)

客户验收标准 (客户必填):

- By Grepow's Testing Criterion for Lithium Polymer Battery.

按格瑞普电池有限公司电池检验标准

- By Customer's Testing Request and Criterion (Customer must supply the checking criterion)

按客户要求检验 (需附验货标准)

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1. Scope 适用范围

This document describes the Product Specification of the Lithium-Polymer (LIP) rechargeable battery cell supplied by SHENZHEN GREPOW BATTERY CO.,LTD.

本规格说明书描述了深圳市格瑞普电池有限公司生产的可充电聚合物锂离子电池的产品性能指标

2. Specification 产品规格

NO.	Items	Specifications
1	Connecting mode (组合方式)	<u>6</u> S <u>1</u> P (六串一并)
2	Nominal capacity 标称容量	22000mAh @ 0.5C Discharge(放电)
3	Minimum capacity 最小容量	20482mAh @ 0.5C Discharge(放电)
4	Nominal voltage 标称电压	22.2V (cell 3.7V)
5	Open-Circuit Voltage 开路电压	24.9V (cell 4.15V)
6	PACK Voltage(As of shipment) 电池电压(出货状态)	22.8~23.4V (cell 3.8~3.9V)
7	Internal Impedance(内阻)	≤10mΩ
8	Dimensions (尺寸)	MAX (T*W*H) : 68.6*96.2*213.5 mm
9	Pack weight (电池重量)	2700 g (APPROX)
10	Standard Charge 标准充电	5.0A CC (constant current) charge to 25.2V, then CV(constant voltage 25.2V) charge till charge current decline to ≤0.05C 5.0A CC (恒流) 充电至 25.2V, 再 CV (恒压 25.2V) 充电直至充电电流≤0.05C
11	Rapid Charge 快速充电	Constant Current 10.0A, Constant Voltage 25.2V, 0.05C cut-off 持续电流: 10.0A 持续电压: 25.2V 截止电流: 0.05C
12	Charging time 充电时间	Standard Charging : 6.6 hours(Ref.) 标准充电: 6.6 小时 (参考值) Rapid charge : 3.3 hours(Ref.) 快速充电: 3.3 小时 (参考值)
13	Constant discharge current 持续放电电流	Constant current 60A end voltage 19.2V (持续电流: 60A 截止电压: 19.2V)
14	Peak discharge current 峰值放电电流	Peak current 90A, Continue time ≤3S (瞬间电流 90A, 持续时间: ≤3S)
15	High Rate Discharge 倍率放电性能	≥19.8 min Standard Charge/rest 5min discharge at 60A to 19.2V(标准充电/休息 5 分钟用 60A 放电至 19.2V)

Notice: Please do not assemble the battery privately, Parallel charging for two packs of batteries maybe lead to short circuit or ignition.

If no otherwise specified, an interval rest time is 30min between charging and discharging.

注意: 请勿私自组装电池, 将两组电池并联在一起进行充电, 此有可能造成短路或燃烧。

如果没有特别说明, 电池充放电间隔时间为 30 分钟

3. Electrical Require Electrical Requirements

3.1 PCM Electrical Characteristics @25°C (EEPROM)

Item	Min.	Typ.	Max.	Unit
Nominal Capacity	N/A	16	N/A	Ah
Nominal Voltage	16.8	22.2	25.2	V
Rated Power				
Charge Voltage	N/A	-	25.2	V
Charge Current	N/A	8	16	A

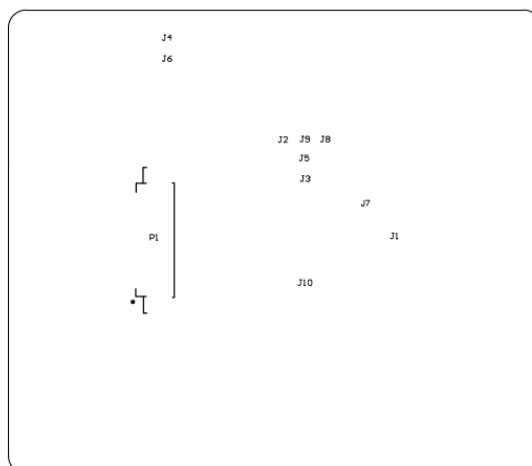
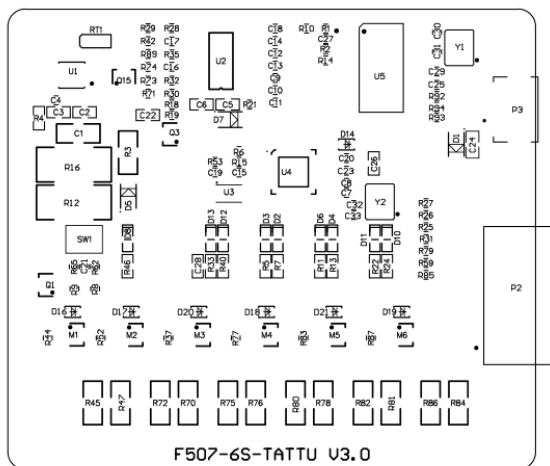
3.2 PCM Features

功能	功能描述	备注																																				
适用电芯	22000mAh TATTU 电芯																																					
按键和指示灯	包含 1 个按键, 5 个红色 LED 灯, 4 个白色 LED																																					
电量指示功能	<p>1、短按按键 1S, 查看电池电量 (白色 LED 中显示), 3S 后关闭电量显示。 2、电量指示灯状态表示见下表：</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>按键灯</th> <th>白色 LED1</th> <th>白色 LED2</th> <th>白色 LED3</th> <th>白色 LED4</th> <th>SOC</th> </tr> </thead> <tbody> <tr> <td>亮</td> <td>亮</td> <td>亮</td> <td>亮</td> <td>亮</td> <td>75%~100%</td> </tr> <tr> <td>亮</td> <td>亮</td> <td>亮</td> <td>亮</td> <td>灭</td> <td>50%~75%</td> </tr> <tr> <td>亮</td> <td>亮</td> <td>亮</td> <td>灭</td> <td>灭</td> <td>25%~50%</td> </tr> <tr> <td>亮</td> <td>亮</td> <td>灭</td> <td>灭</td> <td>灭</td> <td>8%~25%</td> </tr> <tr> <td>亮</td> <td>闪</td> <td>灭</td> <td>灭</td> <td>灭</td> <td>0%~8%</td> </tr> </tbody> </table>	按键灯	白色 LED1	白色 LED2	白色 LED3	白色 LED4	SOC	亮	亮	亮	亮	亮	75%~100%	亮	亮	亮	亮	灭	50%~75%	亮	亮	亮	灭	灭	25%~50%	亮	亮	灭	灭	灭	8%~25%	亮	闪	灭	灭	灭	0%~8%	
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一键存储功能	<p>1、长按按键超过 3S, 一键存储功能启动。 2、检测各节电芯电压, 如果电池容量低于一键存储门限电压, 则不进入一键存储功能。并报警入量不足。 3、如果电池容量高于一键存储门限电压, 则进入一键存储功能; 4、在一键存储功能启动后, 长按按键超过 3S, 强行退出一键存储功能。 5、任何非静置状态 (充放电) 都会退出一键存储; 6、进入一键存储的时候, 四个白色 LED 同时闪烁 4S; 7、退出一键存储的时候, 1 号、2 号白色 LED 和 3 号、4 号白色 LED 交替闪烁; 8、如果电池容量低于一键存储门限电压, 根据当前电量, 对应电量的白色 LED 闪烁 (比如, 电量只有 2 格, 则 1 号、2 号白色 LED 闪烁进行提示; 电量只有 1 格, 则只有 1 号白色 LED 闪); 9、在当系统处于一键存储状态的时候, 如果短按进行电量查询, LED 灯显示完电量之后, 四个白色 LED 会闪烁, 提醒系统处于一键存储状态。</p> <table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th>按键灯</th> <th>白色 LED1</th> <th>白色 LED2</th> <th>白色 LED3</th> <th>白色 LED4</th> <th>说明</th> </tr> </thead> <tbody> <tr> <td>亮</td> <td>闪</td> <td>闪</td> <td>闪</td> <td>闪</td> <td>进入一键存储</td> </tr> <tr> <td>亮</td> <td>闪</td> <td>闪</td> <td>闪</td> <td>闪</td> <td>退出一键存储</td> </tr> <tr> <td>亮</td> <td>闪</td> <td>闪</td> <td>灭</td> <td>灭</td> <td>电量不足无法进入一键存储的提示</td> </tr> </tbody> </table>	按键灯	白色 LED1	白色 LED2	白色 LED3	白色 LED4	说明	亮	闪	闪	闪	闪	进入一键存储	亮	闪	闪	闪	闪	退出一键存储	亮	闪	闪	灭	灭	电量不足无法进入一键存储的提示	1、在充放电过程中是无法进入一键存储的;												
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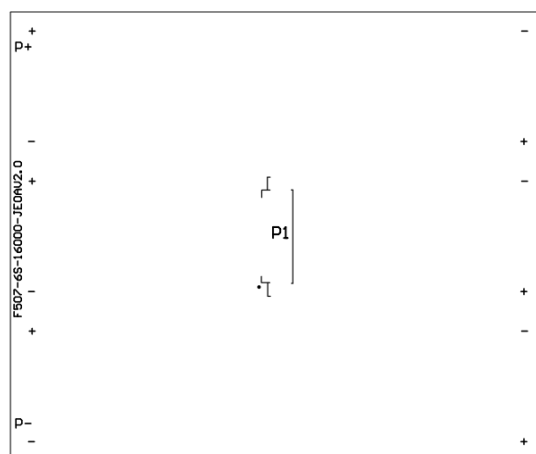
<p>静置自均衡功能</p>	<p>1、用户静置存放电池超过 1h，则判断为静置存放状态。如果电芯的一致性不好，电池组就会进入自均衡状态； 注：判断为静置存放状态的条件，在判断期间，无充电和大电流放电情况出现。</p> <p>2、任何非静置存放条件，都将导致退出静置自均衡功能。（有充电或者大电流放电情况）。</p>	<p>1、静置自均衡在充放电阶段是不会进行的；</p> <p>2、如果电芯压差过大，则不会进入均衡；</p> <p>3、该功能为被动功能，为 TATTU 自动触发；</p>												
<p>高温存储自放电功能</p>	<p>1、在高温存储状态下，开启高温存储自放电功能，直到电池适宜高温存储为止，然后结束高温自放电功能。</p> <p>2、任何非高温存储条件，都将导致退出高温存储自放电功能。（有充电或者大电流放电，持续低温情况）。</p>													
<p>电芯过压提醒功能</p>	<p>1、任何一节电芯电压超过电芯的高压安全电压，启动电芯过压提示功能。</p> <p>2、查询电量的时候，进入电芯过压保护功能后，OVERVOLLED 闪烁显示，如下所示：</p> <table border="1" data-bbox="343 1064 1165 1232"> <thead> <tr> <th>按键灯</th> <th>红色 LED1</th> <th>红色 LED2</th> <th>红色 LED3</th> <th>红色 LED4</th> <th>说明</th> </tr> </thead> <tbody> <tr> <td>亮</td> <td>亮</td> <td>亮</td> <td>亮</td> <td>闪</td> <td>OVERVOLLED</td> </tr> </tbody> </table>	按键灯	红色 LED1	红色 LED2	红色 LED3	红色 LED4	说明	亮	亮	亮	亮	闪	OVERVOLLED	<p>1、不查询电量，不会报警</p> <p>2、会首先显示电量，然后才会进行过压提醒；</p>
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<p>电芯欠压提示功能</p>	<p>1、任何一节电芯电压低于电池低压安全电压，启动电芯欠压提示功能。</p> <p>2、查询电量的时候，进入电芯欠压提示功能后，UNDERVOLLED 闪烁，如下所示：</p> <table border="1" data-bbox="343 1366 1165 1534"> <thead> <tr> <th>按键灯</th> <th>红色 LED1</th> <th>红色 LED2</th> <th>红色 LED3</th> <th>红色 LED4</th> <th>说明</th> </tr> </thead> <tbody> <tr> <td>亮</td> <td>闪</td> <td>亮</td> <td>亮</td> <td>亮</td> <td>UNDERVOLLED</td> </tr> </tbody> </table>	按键灯	红色 LED1	红色 LED2	红色 LED3	红色 LED4	说明	亮	闪	亮	亮	亮	UNDERVOLLED	<p>1、不查询电量，不会报警</p> <p>2、会首先显示电量，然后才会进行过压提醒</p>
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<p>电芯低温提醒功能</p>	<p>1、当温度低于低温安全温度，启动电芯欠温提示功能。</p> <p>2、查询电量的时候，进入电芯低温提醒功能后，UNDERTMPLED 闪烁，如下所示：</p> <table border="1" data-bbox="343 1668 1165 1836"> <thead> <tr> <th>按键灯</th> <th>红色 LED1</th> <th>红色 LED2</th> <th>红色 LED3</th> <th>红色 LED4</th> <th>说明</th> </tr> </thead> <tbody> <tr> <td>亮</td> <td>闪</td> <td>闪</td> <td>亮</td> <td>亮</td> <td>UNDERTMPLED</td> </tr> </tbody> </table>	按键灯	红色 LED1	红色 LED2	红色 LED3	红色 LED4	说明	亮	闪	闪	亮	亮	UNDERTMPLED	<p>1、不查询电量，不会报警</p> <p>2、会首先显示电量，然后才会进行过压提醒</p>
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<p>电芯过温提醒功能</p>	<p>1、当温度高于高温安全温度，启动电芯过温提示功能。</p> <p>2、查询电量的时候，进入电芯过温保护功能后，OVERTMPLED 闪烁，如下所示：</p> <table border="1" data-bbox="343 2016 1165 2139"> <thead> <tr> <th>按键灯</th> <th>红色 LED1</th> <th>红色 LED2</th> <th>红色 LED3</th> <th>红色 LED4</th> <th>说明</th> </tr> </thead> <tbody> <tr> <td>亮</td> <td>亮</td> <td>亮</td> <td>闪</td> <td>闪</td> <td>OVERTMPLED</td> </tr> </tbody> </table>	按键灯	红色 LED1	红色 LED2	红色 LED3	红色 LED4	说明	亮	亮	亮	闪	闪	OVERTMPLED	<p>1、不查询电量，不会报警</p> <p>2、会首先显示电量，然后才会进行过压提醒</p>
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<p>电芯异常提醒功能</p>	<p>1、查询电量的时候，当电芯压差过大或者电压过低，会进行异常报警；</p> <p>2、当电芯处于异常状态，红色 LED 闪烁显示 6 秒。如果是低压异常，则四个红色 LED 首先闪烁四下，然后红色 LED1 和红色 LED2 亮；如果是电芯间压差过大报异常，四个红色 LED 首先闪烁四下，然后红色 LED1 和红色 LED4 亮。如下所示；</p> <table border="1" data-bbox="347 517 1177 734"> <thead> <tr> <th>按键灯</th> <th>红色 LED1</th> <th>红色 LED2</th> <th>红色 LED3</th> <th>红色 LED4</th> <th>说明</th> </tr> </thead> <tbody> <tr> <td>亮</td> <td>闪</td> <td>闪</td> <td>闪</td> <td>闪</td> <td>四个 LED 闪</td> </tr> <tr> <td>亮</td> <td>亮</td> <td>亮</td> <td>灭</td> <td>灭</td> <td>电压电压过低</td> </tr> <tr> <td>亮</td> <td>亮</td> <td>灭</td> <td>灭</td> <td>亮</td> <td>电芯间压差过大</td> </tr> </tbody> </table>	按键灯	红色 LED1	红色 LED2	红色 LED3	红色 LED4	说明	亮	闪	闪	闪	闪	四个 LED 闪	亮	亮	亮	灭	灭	电压电压过低	亮	亮	灭	灭	亮	电芯间压差过大	<p>1、不查询电量，不会报警</p> <p>2、会首先显示电量，然后才会进行过压提醒</p>
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亮	亮	灭	灭	亮	电芯间压差过大																					
<p>存储自放电功能</p>	<p>1、当电池处于静置状态，并且处于满电状态，则判断为满电存储状态。</p> <p>2、如果电池长时间处于满电存储状态，会进入存储自放电功能，对电池进行保护；</p> <p>3、任何非满电存储条件，都将导致退出满电存储自放电功能。（有充电或者大电流放电）。</p>	<p>1、该功能为被动功能，为 TATTU 自动触发；</p>																								
<p>记录功能</p>	<p>1、每节电芯的最大电压和最低电压；</p> <p>2、电池组最大压差；</p> <p>3、充放电次数；</p> <p>4、复位的次数；</p> <p>5、最高最低温度；</p> <p>6、异常的次数；</p>	<p>1、上位机显示；</p>																								
<p>升级功能</p>	<p>1、串口升级；</p>																									

3.3 Architecture of PCBA

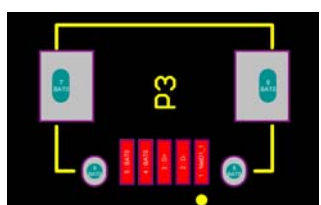
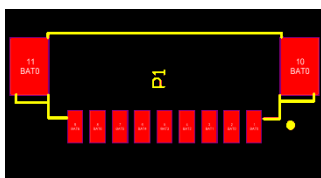


PCM Board

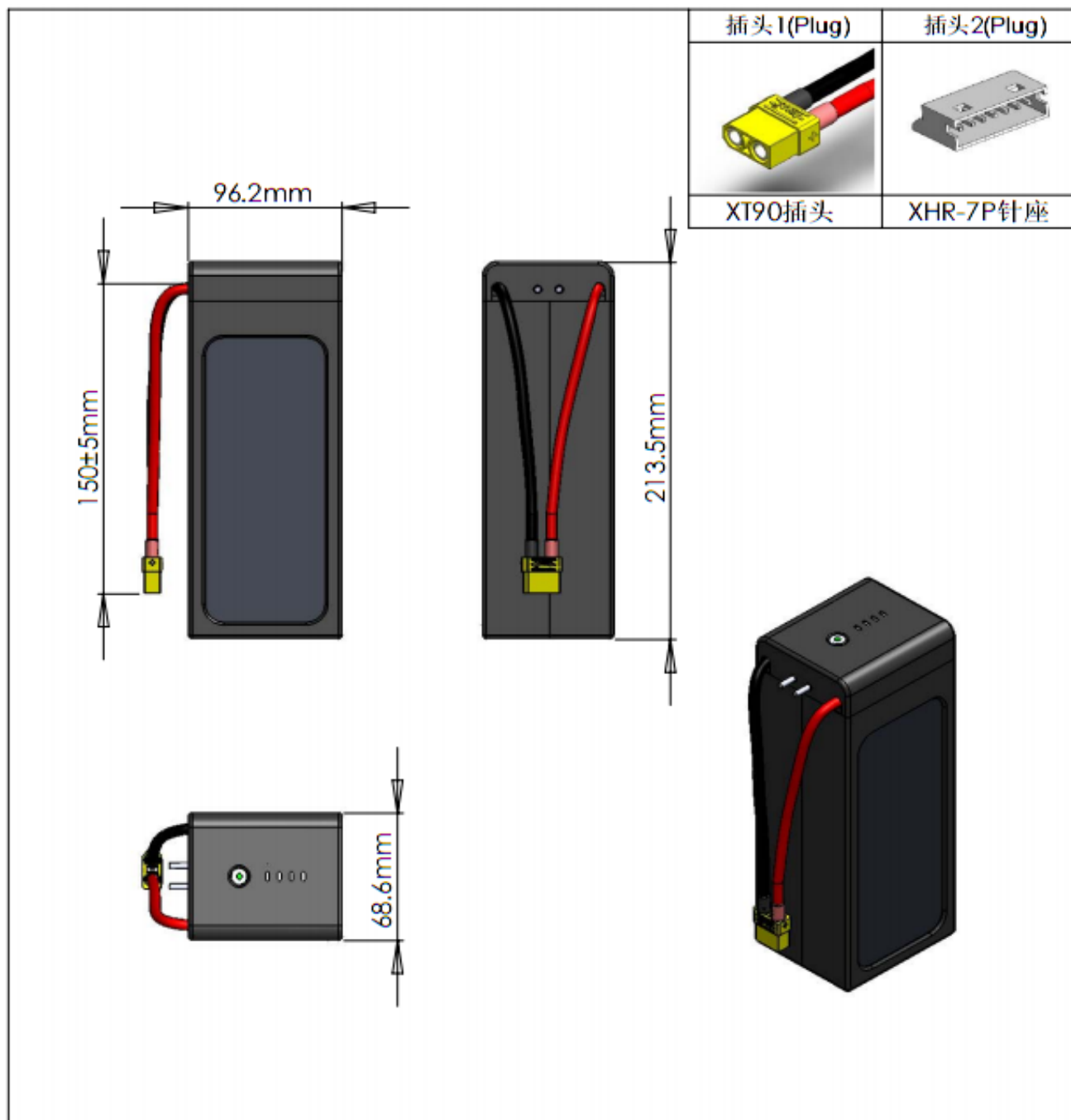


JIER Board

Port	Description
B+	Connect to Battery Positive pole
B-	Connector to Battery Negative pole
JP5 Cell Connector balance	8W9: Connected to Cell#6 positive 7: Connected to Cell#5 positive 6: Connected to Cell#4 positive 5: Connect to Cell#3 positive 4: Connect to Cell#2 positive 3: Connect to Cell#1 positive 1W2: Connect to Cell#1 negative(B-)
JP5 Communication Connector	1: Connected to +5V 2: Connect to D- 3: Connect to D+ 4W5: Connect to DGND
Usb	



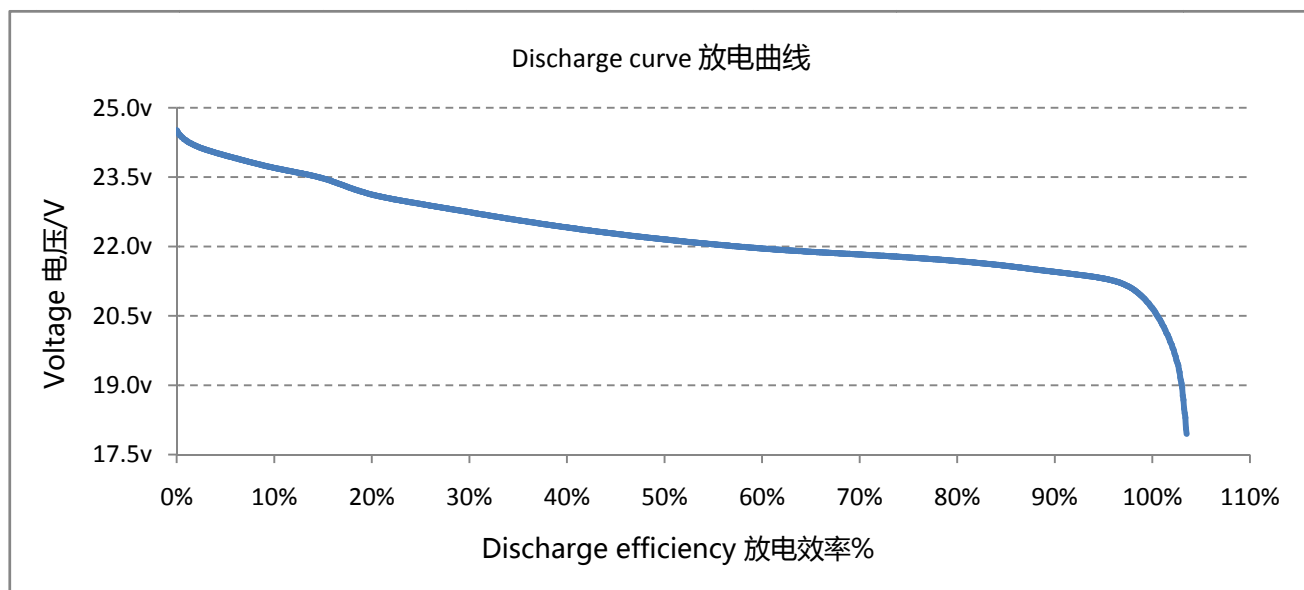
3. Pack Drawing 组装示意图



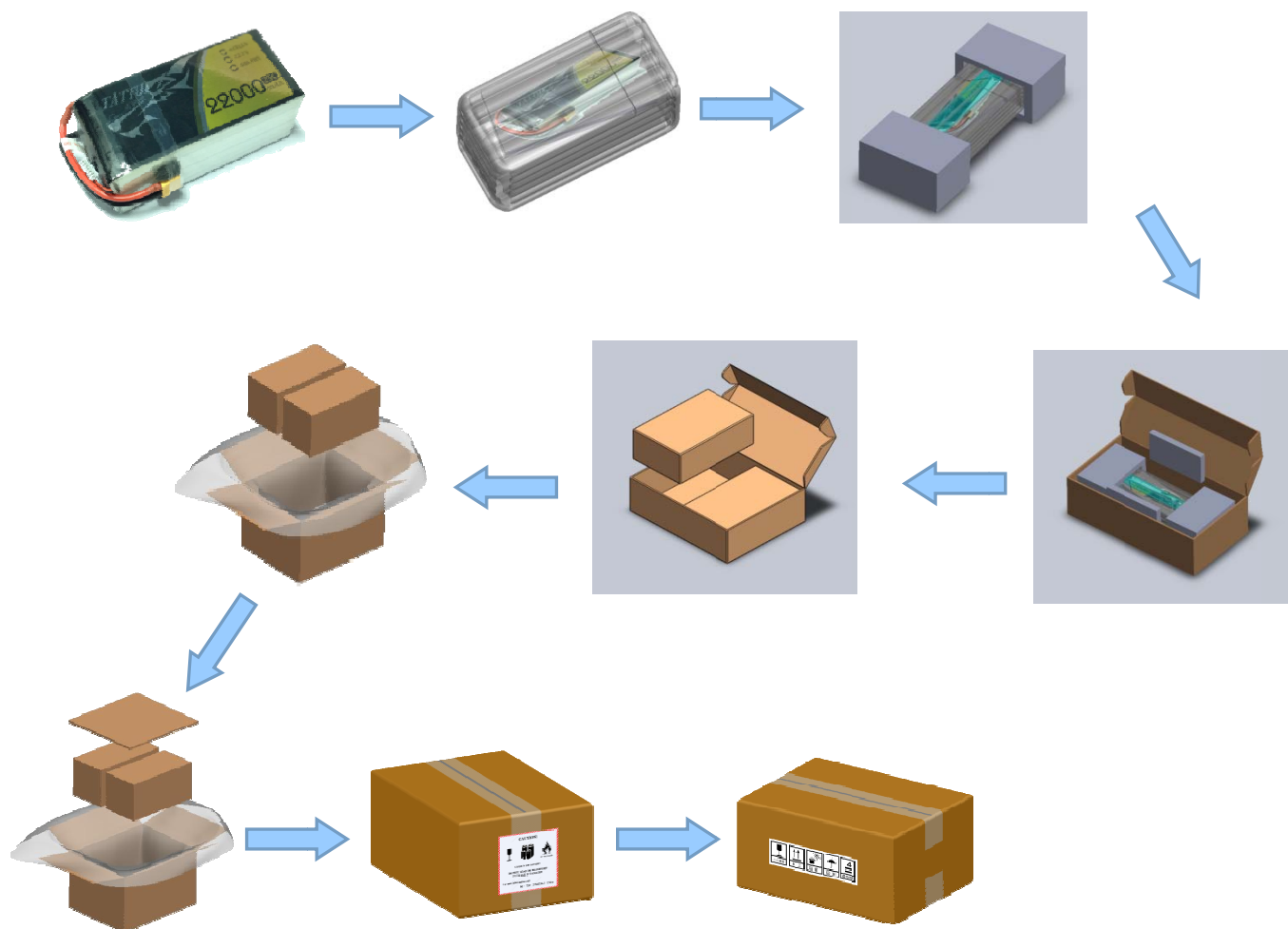
NO	名称	规格型号	用量	NO	名称	规格型号	用量
01	电芯	GRPA790190-22000mAh	6	05	直通板	FR4玻纤单面板	1
02	充电线	内置micro USB+XHR-7pin针座	1	06	保护板	6S智能保护板	1
03	放电线	黄色XT90插+8#硅胶线	1	07	胶壳	黑色磨砂纹外壳	1
04	铝片	0.4mm厚	2	08	PVC	009#黑色PVC	1

标记	处数	变更内容	成品电池图		图纸号	
			GRPA790190-6S1P		客户名称	
					比例	
			深圳市格瑞普电池有限公司 SHENZHEN GREPOW BATTERY CO.,LTD		A4	
					共 页	
					第 页	
设计		样品确认				
绘图	吴文涛	复核				
审核		批准				
版本	A	日期	2016-2-25			

4. Discharge curve 放电曲线



5. Package Schemes 包装示意



6. Performance And Test Conditions(电池性能及测试条件)

6.1 Standard test condition (标准测试条件)

Before proceed the following tests, the battery should be discharged at 60A to 19.2V cutoff. Unless otherwise stated, tests should be done within one month of delivery under the following conditions:

Ambient temperature: $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ Relative Humidity: $65 \pm 20\%$

Note Standard Charge/Discharge Conditions:

Charge: The battery will be charged to 25.2V with 5.0A from constant current to constant voltage, when the current is 0.05C, stop to charge.;

Discharge: 60A to 19.2V

在进行下列各项测试前电池应用 60A 放至 19.2V。如果没有特别规定，测试应在电池交付 1 个月内按以下各项条件进行：

环境温度： $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ 相对湿度： $65 \pm 20\%$

注意标准充放电为：

充电：以 5.0A 电流恒流充电至电池限制电压 25.2V 时,改为恒压充电,直到截止电流为 0.05C 时停止充电;

放电：以 60A 电流恒流放电至每组电池限制电压 19.2V

6.2 Visual inspection (外观检查)

There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of the cell..

不允许有任何影响电池性能的外观缺陷，诸如裂纹、裂缝、泄漏等。

6.3 Measuring Instrument or Apparatus (测量器具及设备)

6.3.1 Dimension Measuring Instrument (尺寸测量器具)

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

尺寸测量器具的精度等级应不小于 0.01 mm 。

6.3.2 Voltmeter (伏特计)

Standard class specified in the national standard or more sensitive class having inner impedance more than $10\text{k}\Omega/\text{V}$

按照国家标准指定规格等级或采用灵敏度更高的，测量电压时内阻不应小于 $10\text{k}\Omega/\text{V}$ 。

6.3.3 Ammeter (安培计)

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω .

按照国家标准指定规格等级或采用灵敏度更高的，包括电流表及电线在内的总外阻应小于 0.01Ω 。

6.3.4 Impedance Meter (电阻计)

Impedance shall be measured by a sinusoidal alternating current method (1kHz LCR meter).

内阻测试仪测量原理应为交流阻抗法 (1kHz LCR)。

6.4 Routine Inspection And Testing Of Battery Performance 电池常规性能检查及测试

NO	Items	Test Method and Condition	Criteria
1	Discharge Performance at different temperature 不同温度下放电特性	High Temperature : Storage 2hrs at 60±2℃ after standard charge,0.5C discharge at 60±2℃ 高温：标准充电后储存在 60±2℃的环境中，2 小时后用 0.5C 放电	≥95%
		Room Temperature : Storage 2hrs at 20±2℃ after standard charge,0.5C discharge at 20±2℃ 常温：标准充电后储存在 20±2℃的环境中，2 小时后用 0.5C 放电	≥100%
		Low Temperature : Storage 2hrs at -20±2℃ after standard charge,0.2 C discharge at -20±2℃ 低温：标准充电后储存在-20±2℃的环境中，2 小时后用 0.2C 放电	≥90%
2	Cycle Life 循环寿命	Test condition : Step1 :Charge: 5.0A to 25.2V , end current 0.05C Step2 : Rest :30min Step3 : Discharge: 60A to 19.2V Step4 : cycle from step1 to step 3 More than 80% first capacity at 60A discharging 测试条件： 1) 恒流恒压充电：5.0A 充电到 25.2V 限流 0.05C 2) 静置：30min 3) 恒流放电：60A 放电到 19.2V 4) 循环 1) 至 3) 工步 当以 60A 放电容量小于初始容量 80%时，所完成的循环次数定义为该电芯的循环寿命	≥150 Circle
3	Self-discharges 自放电	Standard full charge, storage at 20℃ for 28days, Standard discharge (0.5C)to test residual capacity 标准充满电后 20℃贮藏 28 天。 标准 0.5C 放电，所得容量为剩余容量	Residual capacity ≥ 85% (First Capacity) 剩余容量≥85%初始容量
		Standard charge/discharge for 2 cycles, to test recovery capacity 按标准充放电制式循环 2 次，取最大值为恢复容量	Recovery Capacity ≥ 95% (First Capacity) 恢复容量≥95%初始容量
4	High Temperature storage Characteristics 高温储存特性	60℃ 4 小时 60℃ for 4 hours	Residual capacity ≥ 95% 容量保持率≥ 95 %，

6.5 Safety Test 安全性能测试

NO	Test Items	Test Method and Condition	Criteria
1	Forced discharge (强制放电)	Battery discharge at 0.2C current with standard environment. After discharge to cut off voltage, battery connect with thermocouple and place in ventilation system. Then charge the battery up to 5V, charging current at 1C, room temperature. Charging time must over 90mins 标准环境下电池以 0.2C 放完电,然后接热电偶置于通风设备中,室温下以 1C 电流对电池进行反向充电到 5V,充电时间不低于 90min	No explosion, No fire (无起火无爆炸)
2	Crush test 挤压	Fully charge cell is to be crushed in a maximum surface. The force for the crushing is to be applied by a hydraulic ram with 32mm diameter piston. The crushing is to be continued until a pressure of 13 kN. Once the maximum pressure has been obtained it is to be released. 满电态的电芯在最大面上承受一次挤压,挤压的压力由一个直径为 32mm 活塞的液压油缸提供,挤压将持续到压力为 13 kN,一旦这个最大压力达到马上卸压;然后搁置 4h 以上	No fire and no explosion 不着火不爆炸

6.6 Ambient And Mechanical Character 环境及机械性能测试

NO	Test Items	Test Method and Condition	Criteria
1	Constant temperature and humidity 恒定湿热性能	Fully charge cell is to be placed in a chamber with a constant 40±2℃, 90%~95% relative humidity for 48 hrs. Then 0.2C discharge to turn-off voltage after take out for 2hrs. 完全充电后 将电芯放入 40±2℃ 相对湿度为 90%~95% 的恒温恒湿箱中搁置 48 小时,取出电池常温搁置 2h,再以 0.2C 放电至截止电压	No deformation ,no fire, no explosion and leakage 不变形、起火、爆炸、漏液 Discharge time ≥ 3hrs, 放电时间 ≥3 小时
2	Temperature cycling test 温度循环	Fully charge cells are to be placed in a test chamber and subjected to the following cycles: 1. Raising the chamber temperature to 75±2℃ and maintaining this temperature for 6hrs 2. Raising the chamber temperature to -40±2℃ and maintaining this temperature for 6hrs 3. Raising the chamber temperature must be within 30 min 4. repeated step 1-2 for 10 cycles 充满电的电芯放于测试箱内并承受以下循环:	No fire , no explosion and leakage 不爆炸、不起火、不漏液

		<p>1.箱内升温至 $75\pm 2^{\circ}\text{C}$, 保温 6h。 2.箱内降温至 $-40\pm 2^{\circ}\text{C}$, 保温 6h。 3.温升时间控制在 30min 内。 4.重复 1-2 步骤 10 周</p>	
3	<p>Altitude simulation Test 高空模拟</p>	<p>Fully charged, the cells are to be stored for 6 hours at an absolute pressure of 11.6 kPa and a room temperature 完全充满电后, 电池在绝对压力为11.6Kpa、室温条件下放置6小时</p>	<p>No fire, no explosion and no leakage 不爆炸、不起火、不漏液</p>
4	<p>Vibration Test 振动测试</p>	<p>After 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~ 55Hz, the excursion of the vibration is 1.6mm.The cell shall be vibrated for 30 minutes per axis of XYZ 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 30 分钟 振幅 1.6 mm 振动频率为 10Hz~55Hz, 每分钟变化为 1Hz。</p>	<p>No fire, no explosion and no leakage 不爆炸、不起火、不漏液</p>
5	<p>Drop test 自由跌落</p>	<p>After standard charge, the battery is dropping to the wood board with a thickness of 18mm to 20mm on the cement ground, the height shall be 1m measured from the lowest point of the battery to the wood board surface. Drop the cell from X, Y, Z direction (including face side and reverse side direction each) each time, then measured the open-circuit voltage after 4hrs 将标准充电后的电芯从 1.2m 高度 (最低点高度) 位置自由跌落到置于水泥地面上的 18~20 mm厚的硬木板上, 从 X、Y、Z 正负方向 (六个方向) 每个方向自由跌落 1 次, 4 小时后测开路电压</p>	<p>No fire, no explosion and no leakage, 不爆炸、不起火、不漏液</p>

Appendix

附录

Handling Precautions and Guideline

For LIP(Lithium-Ion Polymer)Rechargeable Batteries

聚合物锂离子充电电池操作指示及注意事项

Preface

This document of ' Handling Precautions and Guideline for LIP Rechargeable Batteries shall be applied to the battery cells manufactured by GREPOW.

前言

本文件“聚合物锂离子充电电池操作指示及注意事项”仅适用于深圳市格瑞普电池有限公司生产的电池。

Note(1):

The customer is requested to contact GREPOW in advance, if and when the customer needs other applications or operating conditions than those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.

声明一：

客户若需要将电池用于超出文件规定以外的设备，或在文件规定以外的使用条件下使用电池，应事先联系格瑞普，因为需要进行特定的实验测试以核实电池在该使用条件下的性能及安全性。

Note(2):

GREPOW will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.

声明二：

对于在超出文件规定以外的条件下使用电池而造成的任何意外事故，格瑞普概不负责。

Note(3):

GREPOW will inform, in a written form, the customer of improvement(s) regarding proper use and handing of the cell, if it is deemed necessary.

声明三：

如有必要，格瑞普会以书面形式告之客户有关正确操作使用电池的改进措施。

1. Charging 充电

1.1 Charging current 充电电流:

Charging current should be less than maximum charge current specified in the Product Specification. Charging with higher current than recommended value may cause damage to cell electrical, mechanical and safety performance and could lead to heat generation or leakage. 充电电流不得超过本标准书中规定的最大充电电流。使用高于推荐值电流充电将可能引起电池的充放电性能、机械性能和安全性能的问题，并可能会导致发热或泄漏。

1.2 Charging voltage 充电电压:

Charging shall be done by voltage less than that specified in the Product Specification 25.2V. Charging beyond 25.5V, which is the absolute maximum voltage, must be strictly prohibited. The charger shall be designed to comply with this condition. It is very dangerous that charging with higher voltage than maximum voltage may cause damage to the cell electrical, mechanical safety performance and could lead to heat generation or leakage.

充电电压不得超过本标准书中规定的额定电压 25.2V。25.5V 为充电电压最高极限，充电器设计应满足

此条件。

电芯电压高于额定电压值时，将可能引起电池的充放电性能、机械性能和安全性能的问题，可能会导致发热或泄漏。

1.3 Charging temperature 充电温度:

The battery shall be charged within 10°C~45°C range in the Product Specification.

电池必须在 10°C~45°C 的环境温度范围内进行充电。

1.4 Prohibition of reverse charging 禁止反向充电:

Reverse charging is prohibited. The battery shall be connected correctly. The polarity has to be confirmed before wiring, In case of the battery is connected improperly, the battery cannot be charged. Simultaneously, the reverse charging may cause damaging to the battery which may lead to degradation of battery performance and damage the battery safety, and could cause heat generation or leakage.

正确连接电池的正负极，严禁反向充电。若电池正负极接反，将无法对电池进行充电。同时，反向充电会降低电池的充放电性能、安全性，并会导致发热、泄漏。

2. Discharging 放电

2.1 Discharging current 放电电流

The battery shall be discharged at less than the maximum discharge current specified in the Product Specification.

High discharging current may reduce the discharging capacity significantly or cause over-heat. 放电电流不得超过本标准书规定的最大放电电流，大电流放电会导致电池容量剧减并导致过热。

2.2 Discharging temperature 放电温度

The battery discharge temperature is -20~60°C, 5~45°C environment suggested when discharge with large current, small current discharge suggested under <5°C or >45°C, Discharged under too low or too high temperature could lead to battery failure or other conditions.

电池放电环境温度为-20~60°C。大电流放电建议在 5~45°C 环境下进行，<5°C 或 >45°C 建议用小电流进行放电，过低或过高温大电流放电将可能导致电池失效或出现其他状况。

2.3 Over-discharging 过放电:

It should be noted that the battery would be at over-discharged state by its self-discharge characteristics in case the cell is not used for long time. In order to prevent over-discharging, the battery shall be charged periodically to maintain between 21.6V and 23.4V.

Over-discharging may causes loss of cell performance, characteristics, or battery functions.

The charger shall be equipped with a device to prevent further discharging exceeding a cut-off voyage specified in the Product Specification. Also the charger shall be equipped with a device to control the recharging procedures as follows:

The battery pack shall start with a low current (0.01C) for 15-30 minutes, i.e.-charging, before rapid charging starts. The rapid charging shall be started after the (individual) cell voltage has been reached above 3.6V within 15-30 minutes that can be determined with the use of an appropriate timer for pre-charging. In case the (individual) cell voltage does not rise to 3.6V within the pre-charging time, then the charger shall have functions to stop further charging and display the cell/pack is at abnormal state.

需要注意的是，在电池长期未使用期间，它可能会用其它自放电特性而处于某种过放电状态。为防止放电的发生，电池应定期充电，将其电压维持在 21.6V 至 23.4V 之间。

过放电会导致电池性能、电池功能的丧失。

充电器应有装置来防止电池放电至低于本标准书规定的截止电压。此外，充电器还应有装置以防止重复充电，步骤如下：

电池在快速充电之前，应先以一小电流（0.01C）预充电 15~30 分钟，以使（每个）电芯的电压达到 3.6V 以上，再进行快速充电。可用一计时器来实现该预充电步骤。如果在预充电规定时间内，（个别）电池的电压仍未升到 3.6V 以上，充电器应能够停止下一步快速充电，并显示该/电池正处于非正常状态。

3. Storage 贮存

3.1 Storage condition 储存条件

The battery shall be storied within $-10^{\circ}\text{C}\sim 45^{\circ}\text{C}$ range environmental condition.

If the battery has to be storied for a long time (Over 3 months),the environmental condition should be:

Temperature: $23\pm 5^{\circ}\text{C}$

Humidity: $65\pm 20\%\text{RH}$

The voltage for a long time storage shall be 21.6V~23.4V range. Full charged storage is prohibited

电池储存温度必须在 $-10^{\circ}\text{C}\sim 45^{\circ}\text{C}$ 的范围内。

长期存储电池（超过 3 个月）须置于温度为 $23\pm 5^{\circ}\text{C}$ 、湿度为 $65\pm 20\%\text{RH}$ 的环境中。

贮存电压为 21.6V~23.4V. 禁止满电储存

3.2 Please activate the battery once every 3 months according to the following method:

Charge at 0.2C to 4.2V, rest 5 min, then discharge with 0.2C to 3.0V/cell,rest 5 min, then charge at 0.2C to 3.9V.

请每隔 3 个月按下面方法激活电池一次:

0.2C 充电至 4.2V，休息 5 分钟，然后用 0.2C 放电至每颗电池 3.0V，休息 5 分钟，0.2C 充电 3.9V

4. Handling of Cells 电池操作注意事项

Since the battery is packed in soft package, to ensure its better performance, it's very important to carefully handle the battery

由于电池属于软包装，为保证电池的性能不受损害，必须小心对电池进行操作。

4.1 The protection of soft aluminum foil 铝箔包装材料的防护

The soft aluminum packing foil is very easily damaged by sharp edge parts such as Ni-tabs, pins and needles.

- Don't strike battery with any sharp edge parts
- Trim your nail or wear glove before taking battery
- Clean worktable to make sure no any sharp particle

铝箔包装材料易被尖锐部件损伤，诸如镍片，尖针。

- 禁止用尖锐部件碰撞电池；
- 取放电池时，请修短指甲或戴上手套；
- 应清洁工作环境，避免有尖锐物体存在

4.2 Folding edge 折边

The folding edge is form in battery process and passed all hermetic test

- Don't open or deform folding edge

折边在电池生产过程中已完成，并通过了密封测试。

- 禁止打开或破坏折边。

4.3 Mechanical shock 机械撞击

- Don't Fall, hit, bend battery body
- 禁止坠落、冲击、弯折电池。

5. Notice19Designing Battery Pack 电池外壳设计注意事项

5.1 Pack design 外壳设计

- Battery pack should have sufficient strength and battery should be protected from mechanical hock
- No Sharp edge components should be inside the pack containing the battery.
- 电池外壳应有足够的机械强度以保证其内部电芯免受机械撞击。
- 外壳内安装电芯的部位不应有锋利的边角。

6. Notice19for Assembling Battery Pack 电池与外壳组装注意事项

6.1 Cell fixing 电池的安装

- The battery should be fixed to the battery pack by its large surface area.
- No cell movement in the battery pack should be allowed.
- 应将电池的宽面安装在外壳内；
- 电池不得在壳内活动。

7. Others 其它事项

7.1 Prevention19of short circuit within a battery pack 电池短路预防

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection.

线与电芯之间需要做充分绝缘，保持电池安全

7.2 Prohibition of disassembling 严禁拆卸电池

1) Never disassemble the cells 在任何情况下不得拆卸电池

The disassembling may generate internal short circuit in the cell, which may cause gassing, firing, or other problems.

拆卸电池可能会导致内部短路，进而引起鼓气、着火及其它问题。

2) Electrolyte is harmful 电解液有害

LIP battery should not have liquid from electrolyte flowing, but in case the electrolyte come into contact with the skin, or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.

聚合物锂电池理论上不存在流动的电解液，但万一有电解液泄漏而接触到皮肤、眼睛或身体其它部位，应立即用清水冲洗电解液并就医。

7.3 Prohibition of dumping of cells into fire 严禁将电池投入火中

Never incinerate nor dispose the cells in fire. These may cause firing of the cells, which is very dangerous and is prohibited.

在任何情况下，不得燃烧电池或将电池投入火中，否则会引起电芯燃烧，这是非常危险的，应绝对禁止。

7.4 Prohibition of cells immersion into liquid such as water 严禁将电池浸入液体，如水

The cells shall never be soaked with liquids such as water, seawater drinks such as soft drinks, juices coffee or others.

不得将电池浸泡液体，如淡水、海水、饮料（果汁、咖啡等）。

7.5 Battery cells replacement 电芯的更换

The battery replacement shall be done only by either cells supplier or device supplier and never

be done by the user.

更换电芯应由电芯供应商或设备供应商完成，用户不得自行更换。

7.6 Prohibition of use of damaged cells 禁止使用已损坏的电池

The cells might be damaged during shipping by shock. If any abnormal features of the cells are found such as damages in a plastic envelop of the cell, deformation of the cell package, smelling of electrolyte, electrolyte leakage and others, the cells shall never be used any more.

The cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing.

电池在运输过程中可能因撞击等原因而损坏，若发现电池有任何异常特征，如电池塑料封边损坏，外壳破损，闻到电解液气体，电解液泄漏等，该电池不得使用。有电解液泄漏或散发电解液气味的电池应远离火源以避免着火。

7.7 Other The Chemical Reaction 其它的化学反应

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change the battery.

电池是利用化学反应产生电量，电池性能会随时间变差，即使电池长时间储存而不使用。另外，各种各样的使用方法，像充电、放电及环境温度，等等不能在本规格书规定的范围时的情形，会减小电池的期望寿命，或者会使仪器设备由于电池漏液而损坏。即使充电正确，电池长时间不能再充电，那就要更换电池了。

7.8 Note: Any other items which are not covered in this specification shall be agreed by both parties

注意：任何本产品规格书未包含的其它条款，应由双方协议确定。