研发已审

Specification Approval Sheet

产品规格书

Customer Name 客户名称:	**GWS**
Customer Model 客户型号:	**CLP209291**
Customer P/N 客户料号:	**OBT0074R**
Product Model 产品编码:	**MFP-199291-001**
Product Description 产品描述:	**SB.10.199291-01/2300mAh/3.85V/ 1S1P/RoHS2.0/ GWSOC301P**

E.E 硬件制定	M.D 结构会签	Checked 审核	Approval 批准
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Customer Approved 客户承认 Stamp（盖章）	**Approved by 批准**
	Date/日期

惠州赣锋锂电科技有限公司

Huizhou Ganfeng LiEnergy Battery Technology Co.,Ltd.

AMENDMENT RECORDS
修订记录

Revision 版本	Description 说明	Originator 编写	Date 日期
A0	New release 新发行	LWY	2023-2-21
A1	更新移印图	LWY	2023-02-28

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1. Scope 适用范围

The specification shall be applied to Lithium-ion Polymer (LIP) rechargeable battery which is manufactured by Huizhou Ganfeng Lienergy Battery Technology Co., Ltd. & Dongguan Ganfeng Electronics Co., Ltd.
此产品规格书适用于惠州赣锋锂电科技有限公司的可充电聚合物锂离子电池。

2. Model 型号：

199291

3. Standard Test Conditions 标准测试条件

3.1 Environmental Conditions 环境条件

Unless otherwise specified, all tests stated in this Product Specification are conducted at below condition:
除非有其它规格说明，所有测试条件都遵循以下规格：

Temperature: 25±3℃ Humidity: 65±20% RH
温度：25±3℃ 湿度：65±20% RH

3.2 Measuring Equipment 测试设备

Voltmeter 电压表	Accuracy of the grade is above 0.5 and input impedance is higher than 10KΩ/V. 精度等级 0.5 以上，内部阻抗>10KΩ/V
Ammeter 电流表	Accuracy of the grade is above 0.5. 精度等级 0.5 以上
Slide Caliper 卡尺	External battery use of Calipers or GO-ON-GO tooling test length, with and thickness; Built-in not-removable battery use of PPG measuring length, width, thickness, length 300±30gf, width 300±30gf, thickness 600±30gf. 外置电池使用卡尺或通止规测试长，宽，厚； 内置不可拆电池使用 PPG 测量长、宽、厚，长度 300±30gf，宽度 300±30gf，厚度 600±30gf。
Impedance Meter 内阻仪	AC 1kHz should be used. 使用 AC 1kHz

Throughout this Specification, '*' annotated criteria are applicable only to fresh unused battery products within 30days from manufactured by Huizhou Ganfeng LiEnergy Battery Technology.
带“*”的规格仅适用于新鲜未使用过的电池，且从制造完成开始存储时间不超过 30 天。

4. Typical Parameters 主要参数

4.1 Cell Main Characteristics 电芯特性

Nominal Voltage 额定电压	Cell Maker 电芯制造商	Cell Model 电芯型号	Cell Minimum Capacity 电芯最小容量	Cell Nominal Capacity 电芯典型容量
3.85 V	GFL	199291	2300mAh	2350mAh

4.2 Battery Electrical Characteristics 电池特性

No.	Items 项目	Specifications 规格			
4.2.1	Charge Cut-off Voltage 充电截止电压	4.4V	0＜T≤45 ℃		
		4.1V	45＜T≤60℃		
4.2.2	Nominal Voltage 标称电压	3.85V			
4.2.3	Discharge Cut-off Voltage 放电截止电压	3.0 V			
4.2.4	* Minimal Capacity(C_{min}) * 最小容量	2300mAh @460mA discharge @R.T. 常温环境下 460mA 放电容量 2300mAh			
4.2.5	* Typical Capacity * 典型容量	2350mAh @460mA discharge @R.T. 常温环境下 460mA 放电容量 2350mAh			
4.2.6	Standard Charge 标准充电	460mA constant current charge to 4.4V, then constant voltage 4.4V charge till charge current declines to 0.02C. 460mA 恒流充电至 4.4V，然后 4.4V 恒压充电至截止电流 46mA			
4.2.7	Standard Discharge 标准放电	460mA constant current discharge to 3.0V 460mA 恒流放电至 3.0V			
4.2.8	Pre-charge Current 预充电流	Max 100mA @ 2.0~3.0V			
4.2.9	Voltage of shipment 出货电压	3.85 ~ 3.97V			
4.2.10	Initial Impedance 初始内阻	≤120mΩ	After standard charged, the battery is to be measured the initial impedance using a AC 1KHz meter at 25±3℃. 在 25±3℃环境下，将标准充电后的电池，使用交流阻抗测试仪（1KHz）测量初始内阻。		
4.2.11	Operating Current and Operating Temperature 工作电流及温度范围	Charge/Discharge 充电/放电	Temperature 温度	Current & Voltage 电流 & 电压	
		Charge 充电	0≤T≤20 ℃	460mA max CC to 4.4V，CV to 46mA	
			20＜T≤45 ℃	2300mA max CC to 4.4V，CV to 46mA	
			45＜T≤60℃	1610mA CC max to 4.1V，CV to 46mA	
		Discharge 放电	-20≤T≤0 ℃	460mA max	≥3.0V
			0＜T≤60 ℃	2300mA max	≥3.0V
4.2.12	Storage Condition (at shipping status state) 存储条件（在出货状态下）	Storage time 存储时间	Temperature 温度	Humidity 湿度	
		Within 3 months 三个月内	15℃ ~ 45℃	65±20% RH	
		Within 6 months 六个月内	15℃ ~ 35℃		
4.2.13	Weight 重量	TBD		for reference only 供参考	

5. Electrical Characteristics 电性能

No.	Items 项目	Test Method and Condition 测试方法	Criteria 标准
5.1	Full Charged Definition 充饱定义	With charging voltage 4.35V, current 0.5C continued to charge the battery, when charging current drops to 0.02C charging is terminated, shall be full charged. 以充电电压 4.35V, 电流 0.5C 对电池组持续充电，当充电电流下降至 0.02C 时充电被终止，即为充饱。	N.A
5.2	Full Discharged Definition 放空定义	Standard discharge current for continuous discharge, when the voltage drops to discharge cut-off voltage 3.0V discharge is terminated, shall be full discharged. 以标准放电电流进行持续放电，当电压降至放电截止电压 3.0V 时放电被终止，即为放空。	N.A
5.3	*Minimal Capacity *最小容量	The capacity means the discharge capacity of the battery, which is measured with discharge current of 0.2C with 3.0V cut-off voltage after the standard charge at 25±3℃. 电池放电容量，即 25±3℃环境标准充电后以 0.2C 恒流放电到 3.0V 所放出的容量。	≥2300mAh
5.4	Capacity of 3.4V 3.4V 的容量	The capacity means the discharge capacity of the battery, which is measured with discharge current of 0.2C with 3.4V cut-off voltage after the standard charge at 25±3℃. 电池放电容量，即 25±3℃环境标准充电后以 0.2C 恒流放电到 3.4 V 所放出的容量。	≥92% Cmin （根据样品数据适当调整）
5.5	Rate Discharge Capability 倍率放电性能	After standard charged, the battery is to be stored at 25±3℃ and rest for 0.5~1.0 hours, then discharge with 0.2C /0.5C/ 1.0 C to 3.0V. 将标准充电后的电池在 25±3℃环境下静置 0.5~1.0 小时，然后以 0.2C/0.5C/1C 放电至 3.0V。	0.2C ≥100% Cini 0.5C ≥95% Cini 1.0C ≥85% Cini
5.6	Cycle Life 常温循环	Test temperature: 25±3℃.Charge the battery with 0.5C current and discharge the battery with 0.5C current until cell voltage reaches 3.0V. Repeat to 400 cycles. Record the thickness and internal resistance under the first and last full charge, and record the discharge capacity after the first and last full charge. 在 25±3℃环境下，0.5C 充/0.5C 放电循环 400 周。记录首次和末次满电下厚度及内阻，记录首次和末次满电后放电容量。	Retention capacity≥80% Thickness change≤8% resistance change（reference）≤50% 容量保持率≥80% 厚度变化≤8% 内阻变化（仅参考）≤50% （满电态 VS 满电态）
5.7	Cycle Life 7℃循环	It was placed at 7±2℃ for 4h, then charged at 0.2C/discharged at 1.0C for 20 cycles. The thickness and internal resistance at the first and last full charge at 7±2℃ were recorded, and the discharge capacity after the first and last full charge at 7±2℃ was recorded.	Retention capacity≥60% Recovery capacity ≥70% at 25℃ Thickness change≤8% resistance change（reference）≤50%

		After the cycle was completed, the machine was taken out and cooled at 25±3℃ for 2h, then charged at 0.2C/discharged at 1.0C for 3 cycles. The maximum discharge capacity was set as the recovery capacity. 在 7±2℃环境静置 4h ，0.2C 充/1.0 C 放电循环 20 周。记录 7±2℃下首次和末次满电下厚度及内阻，记录 7±2℃下首次和末次满电后放电容量。循环完成后取出 25±3℃环境下冷却 2h，0.2C 充/1.0 C 放循环 3 次，取最大一次放电容量为恢复容量。	容量保持率≥60% 常温恢复容量≥70% 厚度变化≤8% 内阻变化（仅参考） ≤50% （满电态 VS 满电态）
5.8	Cycle Life 45℃循环	It was placed at 45 ± 3 ℃ for 4h, then charged at 0.5C/discharged at 0.5C for 400 cycles. The thickness and internal resistance at the first and last full charge at 45±3℃ were recorded, and the discharge capacity after the first and last full charge at 45±3℃ was recorded. After the cycle was completed, the machine was taken out and cooled at 25 ± 3 ℃ for 2h, then charged at 0.5C/discharged at 0.5C for 3 cycles. The maximum discharge capacity was set as the recovery capacity. 在 45±3℃环境静置 4h ，0.5C 充/0.5C 放电循环 400 周。记录 45±3℃下首次和末次满电下厚度及内阻，记录 45±3℃下首次和末次满电后放电容量。循环完成后取出 25±3℃环境下冷却 2h，0.5C 充/0.5C 放循环 3 次，取最大一次放电容量为恢复容量。	Retention capacity≥70% Recovery capacity ≥ 70% at 25℃ Thickness change≤8% resistance change（reference）≤50% 容量保持率≥70% 常温恢复容量≥70% 厚度变化≤8% 内阻变化（仅参考） ≤50% （满电态 VS 满电态）
5.9	Cycle Life 常温过充循环 (限制电压 +50mV)	At 25±3℃, the charging limit voltage is +50mV, 0.5C charge /0.5C discharge cycle is 400 weeks. The thickness and internal resistance under the first and last full charge were recorded, and the discharge capacity after the first and last full charge was recorded. The test is stopped when the capacity retention rate is less than 60% or the thickness expansion rate is 8%. 在 25±3℃环境下，充电限制电压+50mV，0.5C 充/0.5C 放电循环 400 周。记录首次和末次满电下厚度及内阻，记录首次和末次满电后放电容量。 容量保持率低于 60%或厚度膨胀率达到 8%，则停止测试。	Reference 仅参考
5.10	High/Low Temperature Capability 高低温放电性能	After standard charged, the battery is to be stored at 25/-20/-10/45/55/±3℃ for 4 hours, and then 0.2C constant current discharge to 3.0V at 25/-20/-10/45/55/±3℃ 将标准充电后的电池储存在 25/-20/-10/45/55/±3℃的环境中，4 小时后 0.2C 恒流放电至 3.0V。	≥100% Cini at 25℃ ≥40% Cini at -20℃ ≥70% Cini at -10℃ ≥95% Cini at 45℃ ≥90% Cini at 55℃ 25℃容量保持率 ≧100% Cini -20℃容量保持率

			≧40% Cini -10℃容量保持率 ≧70% Cini 45℃容量保持率 ≧95% Cini 55℃容量保持率 ≧90% Cini
5.11	Electrostatic Discharge (ESD) 静电放电	After standard charged, the battery is required to pass ESD test, contact discharge:±4KV, 5 times, air discharge:±8KV, 5times. Each interval of the two discharge test is 1minutes. 将标准充电后的电池每个端子进行±4kV 接触放电测试 各5 次和±8kV 空气放电测试各5 次，每两次放电测试之间间隔1分钟。	No Fire, No Explosion. Its protection function shall not fail if it is equipped with protection circuit. 不起火、不爆炸，如有保护电路其保护功能 不应失效
5.12	Retention Capability 荷电保持能力	After standard charging, 0.2C is discharged to 3.0V, which is the initial capacity .After standard charged, the battery is to be stored at 25 ± 3℃ for 28 days, then discharge with 0.2C to 3.0V at 25±3℃. Then standard charge and discharge with 0.2C to 3.0V at RT. 标准充电后 0.2C 放电到 3.0V，为初始容量。将标准充电后的电池在 25±3℃环境下存放 28 天，取出后在以 0.2C 恒流放电至 3.0 V。然后在 25±3℃下标准充电后再以 0.2C 放电至 3.0V。	≥80% Cini Recovery≥90% Cini 容量保持率≥80% Cini 容量恢复率≥90% Cini
5.13	Room temperature Storage 常温储存	1. Storage for 90 days under shipment voltage at 25±2℃ 2. Storage for 180 days under shipment voltage at 25±2℃ 1.出货状态下，在 25±2℃环境下，存储 90 天； 2.出货状态下，在 25±2℃环境下，存储 180 天.	Within 90 days, Recoverable capacity≥98% C_{min} Within 180 days, Recoverable capacity≥95% C_{min} 1.存储 90 天，容量恢复率≥98% C_{min} 2.存储 180 天，容量恢复率≥95% C_{min}
5.14	High Temperature and humidity Storage (60℃,90~95%RH) 高温高湿存储 (60℃,90~95%RH)	After standard charging, 0.2C is discharged to 3.0V, which is the initial capacity. After standard charging, the initial thickness was tested. The battery was stored at 60±3℃ and 90~95%RH for 7 days to test the hot thickness. After taking it out, it was cooled at room temperature for 2h to test the cold thickness, and at the same time, 0.2C constant discharge charge was used to 3.0V.Then discharge to 3.0V at 0.2C after standard charge at 25±3℃. 标准充电后 0.2C 放电到 3.0V，为初始容量。标准充电	Retention capacity ≥80% Cini Recovery capacity ≥90% Cini Thermal thickness change ≤15% initial thickness Cold thickness change ≤10% initial thickness 容量保持率≥80% Cini

		后测试初始厚度，电池在 60±3℃，90~95%RH 环境下存放 7 天，测试热态厚度，取出后常温冷却 2h 后测试冷态厚度，同时 0.2C 恒流放电至 3.0 V。然后在 25±3℃下标准充电后再以 0.2C 放电至 3.0V。	容量恢复率≥90% Cini 热态厚度变化≤15%初始厚度 冷态厚度变化≤10%初始厚度
5.15	High temperature Storage （85℃ 4H） 高温存储 （85℃ 4H）	After standard charging, 0.2C is discharged to 3.0V, which is the initial capacity. After standard charging, the initial thickness was tested. The battery was stored at 85±2℃ for 4 hours to test the hot thickness. After taking it out, it was cooled at room temperature for 2h to test the cold thickness, and at the same time, 0.2C constant discharge charge was used to 3.0V.Then discharge to 3.0V at 0.2C after standard charge at 25±3℃. 标准充电后 0.2C 放电到 3.0V，为初始容量。标准充电后测试初始厚度，电池 85±2℃环境下存 4h，测试热态厚度，取出后常温冷却 2h 后测试冷态厚度，同时 0.2C 恒流放电至 3.0 V。然后在 25±3℃下标准充电后再以 0.2C 放电至 3.0V。	Retention capacity ≥80% Cini Recovery capacity ≥90% Cini Thermal thickness change ≤15% initial thickness old thickness change ≤10% initial thickness 容量保持率≥80% Cini 容量恢复率≥90% Cini 热态厚度变化≤15%初始厚度 冷态厚度变化≤10%初始厚度
5.16	High temperature Storage （70℃ 48H） 高温存储 （70℃ 48H）	After standard charging, 0.2C is discharged to 3.0V, which is the initial capacity. After standard charging, the initial thickness was tested. The battery was stored at 70±3℃ for 48 hours to test the hot thickness. After taking it out, it was cooled at room temperature for 2h to test the cold thickness, and at the same time, 0.2C constant discharge charge was used to 3.0V.Then discharge to 3.0V at 0.2C after standard charge at 25±3℃. 标准充电后 0.2C 放电到 3.0V，为初始容量。标准充电后测试初始厚度，电池 70±3℃环境下存 48h，测试热态厚度，取出后常温冷却 2h 后测试冷态厚度，同时 0.2C 恒流放电至 3.0 V。然后在 25±3℃下标准充电后再以 0.2C 放电至 3.0V。	Retention capacity ≥80% Cini Recovery capacity ≥90% Cini Thermal thickness change ≤15% initial thickness old thickness change ≤10% initial thickness 容量保持率≥80% Cini 容量恢复率≥90% Cini 热态厚度变化≤15%初始厚度 冷态厚度变化≤10%初始厚度

6. Battery Safety Performance 电池安全性能

No.	Items 项目	Test Method and Condition 测试方法	Criteria 标准
6.1	Over-voltage Charge 过压充电	After standard charged, the battery is to be charged with constant current at the maximum charging current to 6.0V (or the highest voltage it may withstand choose the higher of the two), keep such voltage and charge with the constant voltage. As for the battery with protection circuit, charge till the protection circuit responses. 将标准充电后的电池继续以最大充电电流恒流充电至6.0V（或者可能承受的最高电压值，两者取较高者），并保持该电压进行恒压充电。对于移除保护电路或者没有保护电路的电池组的充电1h，对于保留保护电路的电池组充电至保护电路动作。	No Fire, No Explosion No Leakage 不起火、不爆炸、不漏液
6.2	Over-current Charge 过流充电	After standard discharged, the battery is to be charged with constant current at 1.5 times the protection current for over-current charge. As for the battery with protection circuit removed or without protection circuit, charge to the upper limit of charging voltage. As for the battery with protection circuit, charge till the protection circuit responses. 将标准放电后的电池以1.5倍的过流充电保护电流进行恒流充电。对于移除保护电路或者没有保护电路的电池组的充电至充电上限电压，对于保留保护电路的电池组充电至保护电路动作。	No Fire, No Explosion No Leakage 不起火、不爆炸、不漏液
6.3	Under-voltage Discharge 欠压放电	After standard charged, the battery is to be discharged with constant current the maximum discharge current. As for the battery with protection circuit removed or without protection circuit, discharge the battery with protection circuit removed or without protection circuit to 0.15V. As for the battery with protection circuit, discharge the battery with protection circuit constantly till the protection circuit responses. Rest it for 10 minutes after discharging, and let it fully charged again as per the test method specified in 6.1. 将标准充电后的电池以其最大放电电流恒流放电。对于移除保护电路或者没有保护电路的电池组放电至 0.15V，对于保留保护电路的电池组放电至保护电路动作。放电后静置 10 分钟， 进行标准充电。	No Fire, No Explosion No Leakage 不起火、不爆炸、不漏液
6.4	Overload 过载	After standard charged, the battery is to be discharged with constant current at 1.5 times the protection current for over-current charge. As for the battery with protection circuit removed or without protection circuit, discharge to discharging cut-off voltage. As for the battery with protection circuit, discharge till the protection circuit responses. 将标准放电后的电池以 1.5 倍的过流充电保护电流恒流放电。对于移除保护电路或者没有保护电路的电池组放电至放电截止电压，对于保留保护电路的电池组放电至保护电路动作。	No Fire, No Explosion No Leakage 不起火、不爆炸、不漏液

6.5	External Short Circuit Test 外部短路测试	After standard charged, the battery is to be short-circuited by connecting the positive and negative terminals with a total external resistance of 80 ± 20mΩ. The battery remains on test for 24 hours or until the surface temperature declines by 20% of the maximum temperature rise. 将标准充电后的电池用电阻为 80±20 mΩ 的导线连接电池的正负极使其外部短路,实验中电池能维持 24 小时或表面温度下降到最高温升值的 20%停止。	No Fire, No Explosion battery temperature not exceed 150℃ 不起火、不爆炸、电池的外部表面温度不超过 150℃。
6.6	High Temperature External Short Circuit Test 高温外部短路测试	After standard charge, the battery is to be short-circuit by connecting the positive and negative terminals of the battery with a circuit load having a resistance load of 80 ±20 mΩ at 55±3℃. The battery remains on test for 24 hours or until the surface temperature declines by 20% of the maximum temperature rise. 将标准充电后的电池在 55±3℃环境下用电阻为 80 ±20 mΩ 的导线连接电池的正负极使其外部短路，实验中电池能维持 24 小时或外部温度下降到最高温升值的 20%停止。	No Fire, No Explosion battery temperature not exceed 150℃ 不起火、不爆炸、电池的外部表面温度不超过 150℃。
6.7	Forced Discharge Test 强制放电测试	After standard discharged, the battery is to be charged in reverse with a current of 1C for 90 minutes. 将标准放电后的电池以 1C 电流反向充电 90 分钟。	No Fire, No Explosion No Leakage 不起火、不爆炸、不漏液

7. Mechanical and Environmental Test 环境

No.	Items 项目	Test Method and Condition 测试方法	Criteria 标准
7.1	Low Pressure Test 低气压测试	After standard charged, the battery is to be stored in a vacuum box at 25±3℃. Pump the vacuum to reduce the pressure to 11.6kPa (simulated altitude 15240m) and keep the pressure for 6 hours. 将标准充电后的电池放置于 25±3℃的真空箱中，抽真空将箱内压强降至 11.6kPa（模拟海拔高度 15240m），并保持 6 小时。	No Fire, No Explosion No Leakage 不起火、不爆炸、不漏液
7.2	Temperature Cycling Test 温度循环测试	After standard charged, the battery is to be stored in a temperature-controlled box at 75 ± 3 ℃ for 6 hours. Then decrease the temperature to -40 ± 3 ℃ within 30 minutes and keep this temperature for 6 hours. Then increase the temperature to 75±3℃ within 30 minutes. Repeat previous steps for 10 cycles. 将标准充电后的电池放置在 75±3℃的温控箱内保持 6 小时；然后在 30 分钟内将实验箱温度降为-40±3℃，并保持 6 小时；再次在 30 分钟内将实验箱温度升为 75±3℃；重复以上步骤循环 10 次。	No Fire, No Explosion No Leakage 不起火、不爆炸、不漏液
7.3	Free Fall Test 自由跌落测试	After standard charged, the battery is to be dropped onto the concrete board from the height of 1.0m, drop it from each surface once and altogether 6 times. 将标准充电后的电池从 1 米的高度自由跌落到水泥地板上，每个面各跌落一次，共进行六次试验。	No Fire, No Explosion 不起火、不爆炸 测试后开路电压不低于 90%的初始电压
7.4	Vibration Test 振动测试	After standard charged, the battery is to be fixed on the vibration test bench and conduct the sine vibration test. Vibrate according to a sine wave with an amplitude of 0.8mm (total maximum displacement 1.6mm) in three mutually perpendicular directions, XYZ, and the frequency is increased from 7Hz to 200Hz and then drops back to 7Hz. Each direction 12 cycles. The cycle time of vibration in each direction is 3 hours. 将标准充电后的电池固定在振动试验台上并进行正弦振动测试，在 X Y Z 三个相互垂直的方向按振幅 0.8mm（总最大位移量 1.6mm）的正弦波进行振动，频率从 7Hz 增加到 200Hz 然后再降回 7Hz。每个方向进行 12 个循环，每个方向循环时间共计 3 小时。	No Fire, No Explosion No Leakage 不起火、不爆炸、不漏液 测试后开路电压不低于 90%的初始电压，内阻增加不高于初始的 10%，厚的 5%。

7.5	Acceleration Impact Test 加速度冲击测试	After standard charge, the battery is to be fixed on the impact bench to conduct half-sine pulse impact test. Within initial 3ms, the minimum accelerated speed is 75g_n, the peak is 150±25g_n, and the pulse duration is 6±1ms. Conduct the test 3 times for each direction of the battery. 将标准充电后的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 75g_n，峰值加速度为 150±25g_n，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。	No Fire, No Explosion No Leakage 不起火、不爆炸、不漏液
7.6	Crush Test 挤压测试	After standard charged, the battery is to be crushed between two flat surfaces, And apply a pressing force of 13±0.78KN perpendicular to the board direction. Once the maximum pressure is reached, the test can be stopped. During the test, the battery must not have an external short circuit. 将标准充电后的电池置于两个平面间进行挤压，垂直于板方向施加 13±0.78KN 的挤压力，一旦达到最大压力即可停止试验。试验过程中电池不能发生外部短路。	No Fire, No Explosion 不起火、不爆炸
7.7	Constant Temperature and Humidity Test 恒定湿热测试	After standard charged, the battery is to be stored at 40±3℃ and relative humidity90~95% for 48 hours. Then rest the battery in an environment of 25±3℃ for 2 hours. 将标准充电后的电池放入 40±3℃及相对湿度为 90~95%的环境中 48 小时。然后将电池在 25±3℃环境下静置 2 小时。	No Fire, No Explosion No Leakage 不起火、不爆炸、不泄露
7.8	Thermal Abuse Test 热滥用测试	After standard charged, the battery is to be placed in the baking oven. The temperature of the oven is raised at a rate of 5±3℃/ minutes to a temperature of 130±3℃, and remains at this temperature for 30 minutes. 将标准充电后的电池放置于热箱中。热箱温度以每分钟 5±3℃的速率升至 130±3℃并保温 30 分钟。	No Fire, No Explosion 不起火、不爆炸、

8. Battery Protection Characteristics 电池保护特性

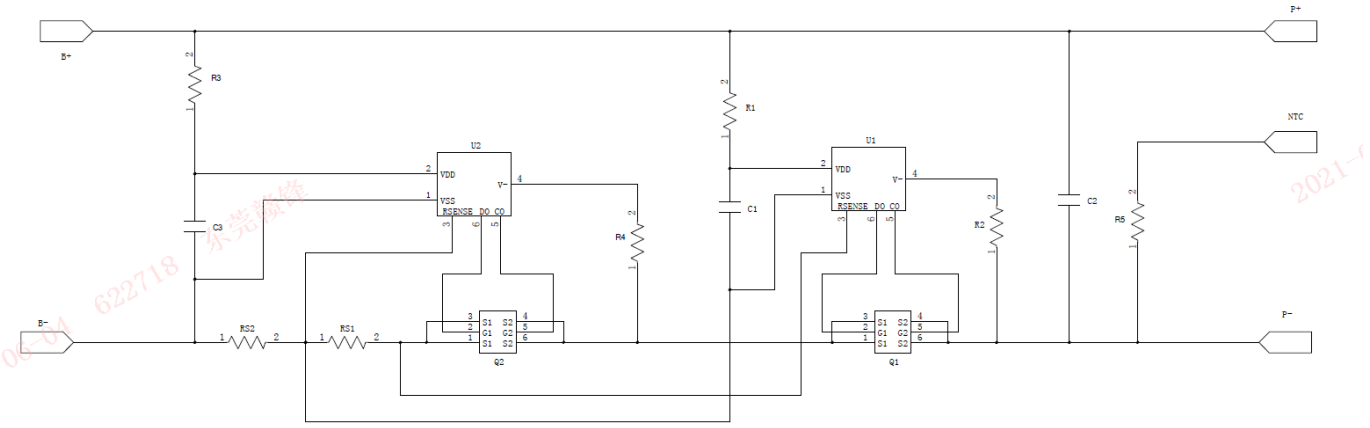
NO.	Item 项目	Symbol 符号	Content 内容	Criterion 标准
1	Over charge Protection 过充保护	VDET1′ 一次	Over charge detection voltage 过充保护电压	4.425±0.02V
		VDET1″ 二次	Over charge detection voltage 过充保护电压	4.475±0.020V
		tVDET1′ （1″） 一、二次	Over charge detection delay time 过充保护延迟时间	0.7~1.3S
		VREL1′ 一次	Over charge release voltage 过充恢复电压	4.425±0.02V
		VREL1″ 二次	Over charge release voltage 过充恢复电压	4.475±0.020V
2	Over discharge protection 过放保护	VDET2′ 一次	Over discharge detection voltage 过放保护电压	2.8±0.035V
		VDET2″ 二次	Over discharge detection voltage 过放保护电压	2.6±0.035V
		tVDET2′ （2″） 一、二次	Over discharge detection delay time 过放保护延迟时间	14~26ms
		VREL2′ 一次	Over discharge release voltage 过放恢复电压	2.8±0.035V
		VREL2″ 二次	Over discharge release voltage 过放恢复电压	2.6±0.035V
3	Over current protection 过流保护	IDP1′ 一次	Over charge detection current 充电过流保护电流	5~8.5A
		IDP1″ 二次	Over charge detection current 充电过流保护电流	8~12A
		tVDET3′ （3″） 一、二次	Detection delay time 延迟时间	11~21ms

		IDP2′ 一次	Over discharge detection current 放电过流保护电流	6~10A
		IDP2″ 二次	Over discharge detection current 放电过流保护电流	11~16A
		tVDET4′ （4″） 一、二次	Detection delay time 延迟时间	8~16ms
4	Short protection 短路保护	TSHORT1′ (1″) 一、二次	Short protection function 短路保护功能	有
5	Current consumption 工作消耗	IDD1′ (1″) 一、二次	Current consume in normal operation 工作消耗电流	≤16μA
			Current consume in sleep mode 睡眠模式消耗电流	≤0.2μA

9. PCM Key Components 保护板主要元件

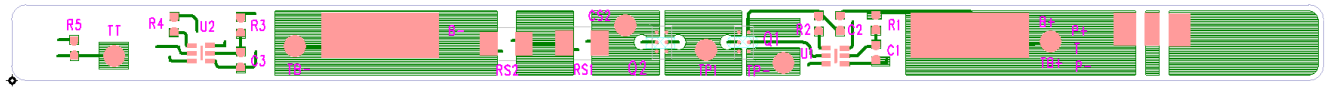
NO. 序号	Parts name 器件名称	Package 封装	Description 描述	Qty 数量	Symbol 位码	Manufacturer 品牌	Remark 备注
1	Protection IC	DFN(PLP) 1414-6	R5480K277CL	1	U1	理光	
		DFN(PLP) 1414-6	R5480K348CL	1	U2	理光	
2	N-MOSFET	CSPB2213-6	CJ6207SP	2	Q1、Q2	长电	
3	Resistor	0402	330Ω±5%	2	R1、R3	国巨	
4	Resistor	0402	1KΩ±5%	2	R2、R4	国巨	
5	THERMISTOR	0402	10K±1%NTC, B25/50=3380K±1%	1	R5	昕铭亚	
6	Resistor	1206	5mΩ ±1% SMF12M1FR005T	1	RS1	萨特	
7	Resistor	1206	3mΩ ±1% SMF12M1FR003T	1	RS2	萨特	
8	Capacitor	0402	25V,0.1uF,X7R	3	C1、C2、C3	国巨	
9	L 型镍片	/	0.1*3*3*7mm 底部铸铜	4	B+、 B-	/	
10	PCB	/	GF-0645 Rev.A	1	/	/	
11	FPC	/	GF-0645 FPC Rev.A	1	/	/	

10. Schematic Circuit Diagram 电路原理图

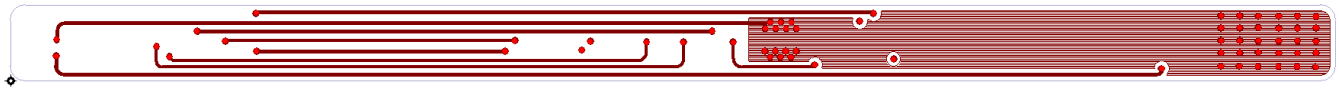


11. PCB Layout PCB 布线图

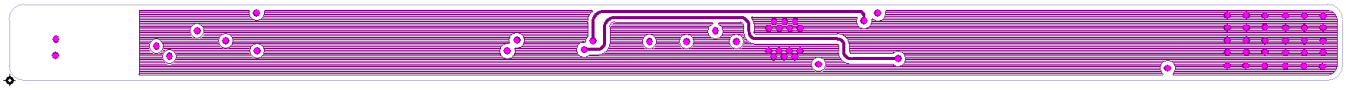
TOP Layer:



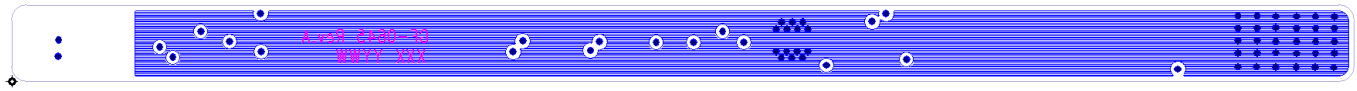
Inner layout1:



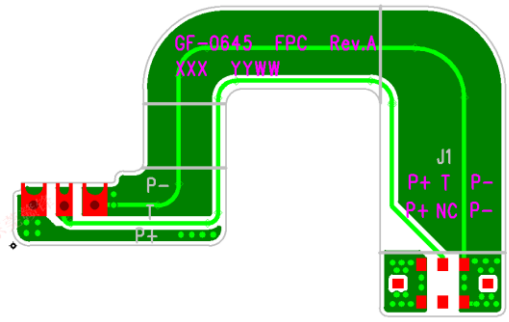
Inner layout2:



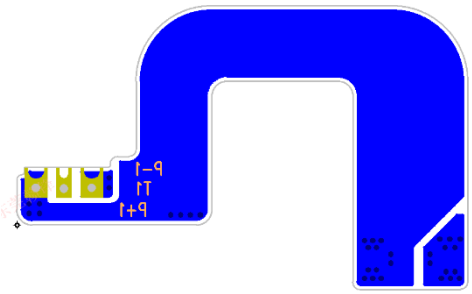
Bottom Layer:



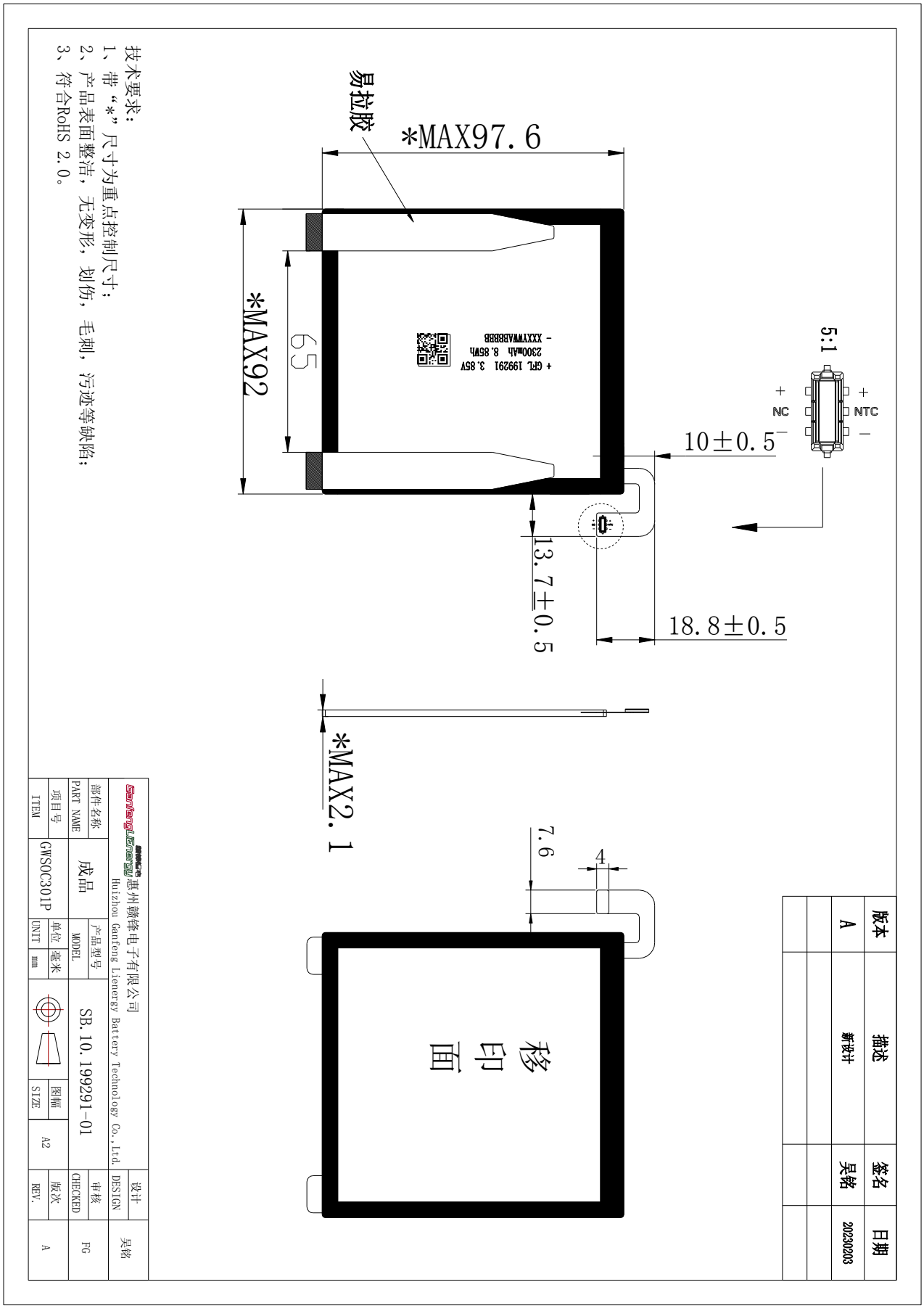
FPC TOP Layer:



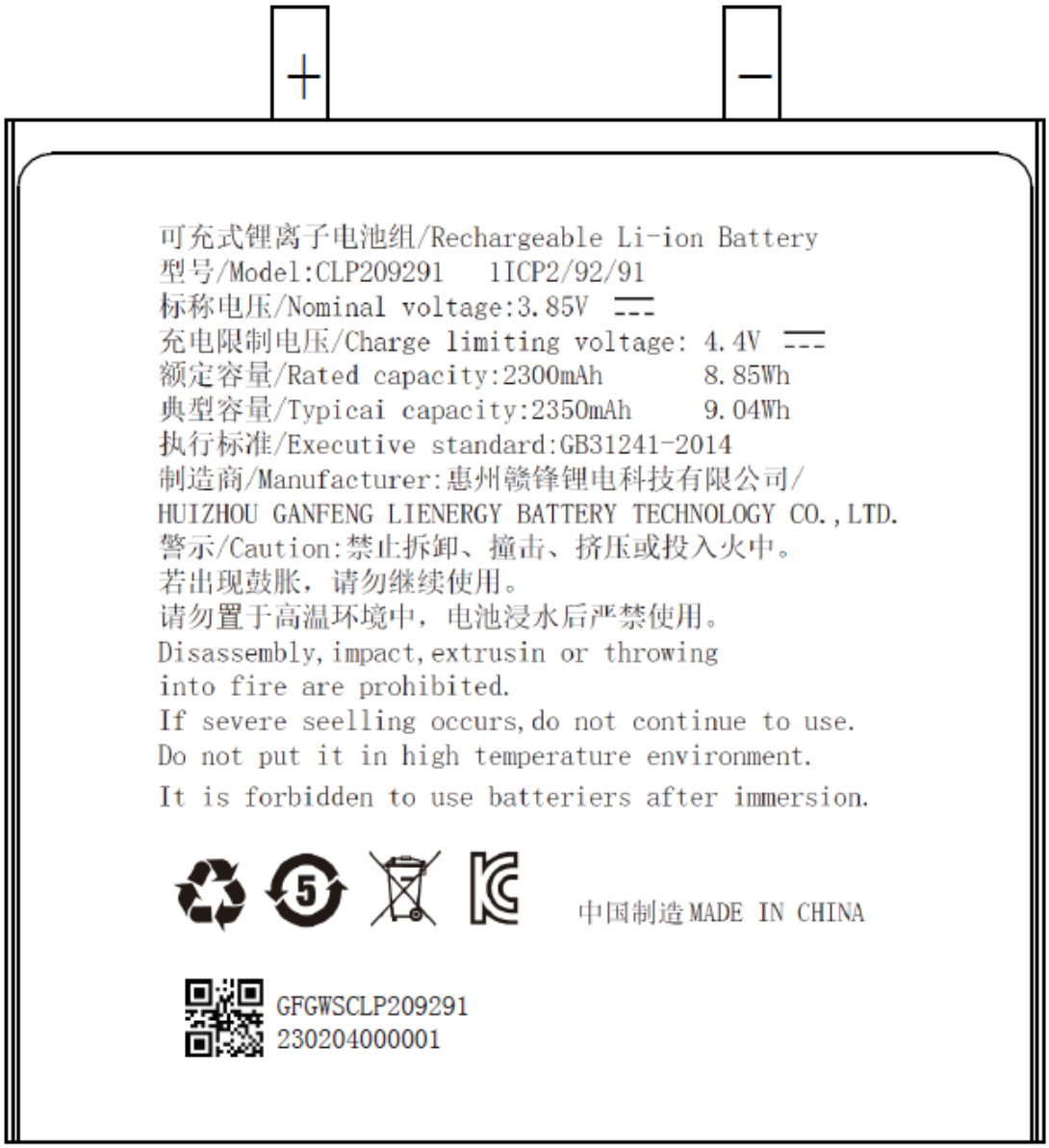
FPC Bottom Layer:



12. Battery Outline Drawing 电池外形尺寸图

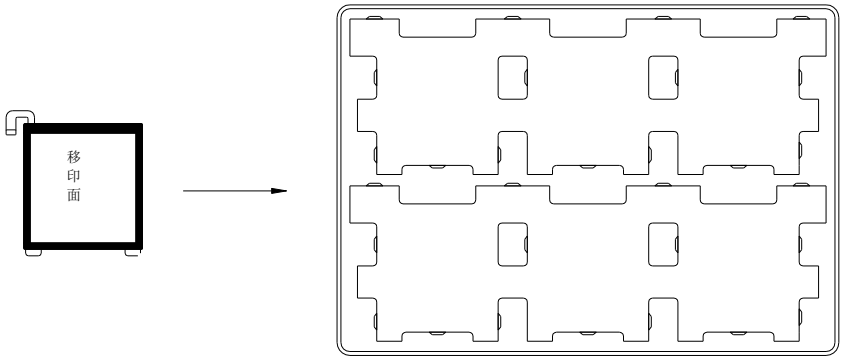


13. Label 标贴 / Printed content 印刷内容



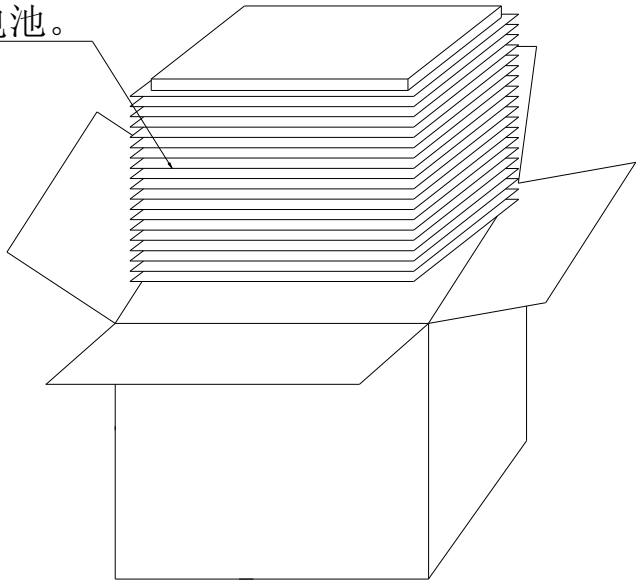
喷码规则如下：
GF:供应商代码，固定不变；
GWS:客户代码，固定不变；
CLP209291:项目代码，固定不变；
230204：年月日代码，按实际日期变更；
000001：流水号，000001-999999（6位）。

14. Packaging 包装图



每个吸塑盒放置6个成品电池

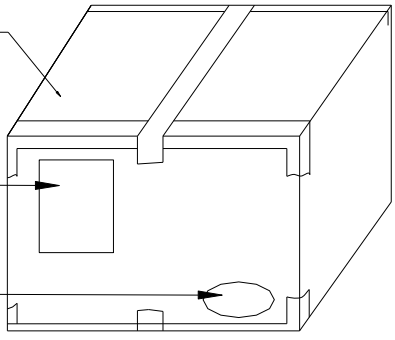
将装好电池的吸塑叠放在一起，每箱装31层，共180PCS电池。



纸箱按要求装满成品电池，再用胶带进行封装。

箱唛

环保标签



15. Battery Precautions and Safety Instructions 电池组使用注意事项及安全说明

（1） Please be sure to take to comply with the specifications and the following precautions to use with batteries, did not follow the specifications for the operation caused any accidents Huizhou Ganfeng Lienergy Battery Technology Co., Ltd. will not accept any responsibility.

（2） Guarantee to keep the battery in good repair in 12 months from the shipment.

（3） Please use 0.5C current to charge up 60% capacity after the battery placed 3 months.

（4） Before use the battery, carefully read the instruction manual and battery labels on the surface.

（5） Need to use the original battery charger, and should be placed in a dry ventilated place.

（6） Such as long-term when not in use, the battery charger to charge state half full, remove the battery from the device and separated, to avoid metal contact with the battery, causing short-circuit or damage to the phenomenon.

（7） In use or during storage, battery found there has been high fever, leakage, odor, distortion and other anomalies, please stop using it immediately and stay away from the battery.

（8） Do not short-circuit the battery positive and negative, and careful not to allow the battery to moisture, to avoid danger.

（9） In the process of using，keep away from heat, High pressure place, and do not beat, hit the battery.

（10） Battery end of life should be immediately removed from the equipment, Please properly handle security of spent batteries, do not put into fire or water.

（1） 请您务必需遵守本规格书和以下使用注意事项使用电池，对于没有按照规格书进行操作所造成的任何意外事故，惠州赣锋锂电科技有限公司将不承担任何责任。

（2） 从出厂代码日起 12 个月内保修。

（3） 电池每放置三个月,请预先以 0.5C 充电 1 次,即让电池具备 60%以上的电量。

（4） 使用电池前，请仔细阅读使用说明书和电池表面标识。

（5） 电池需使用原装充电器充电，并应放置在干燥通风场所。

（6） 如长期不使用时，请将电池充电至半满电荷状态，把电池从设备中拆除并分开放置，避免金属接触电池，造成短路或损坏现象。

（7） 在使用或储存期间，如发现电池有出现高温发热、漏液、散发异味、变形及其它异常现象时，请立即停止使用并远离电池。

（8） 切勿将电池正负极短路，并注意不可让电池受潮，以免发生危险。

（9） 使用过程中，应远离热源、高压场所，并勿摔打、撞击电池。

（10） 电池寿命终止应立刻从设备中取出,废弃电池请安全妥善处理，切勿投入火中或水中。

16. Warning, Notice and Caution 警告、注意及危险

WARNING 警告

（1） Please use special testing equipment for Li-ion battery when doing charging and discharging tests. Common CC/CV power supply etc. are forbidden, in order to avoid disabling battery functions or potential dangerous caused by over-charge and over discharge.

（2） The charger shall be equipped a full charge detection. The charger shall detect the full-charged state by a timer, current detection or open circuit voltage detection. When the charger detects the full-charge, the charger shall stop charging. Do not apply the continuous charging (trickle charging) method.

（3） Do not put the battery into a fire, or heat the battery. Keep the battery away from heat and fire. Do not store the battery in high temperature environment.

（4） Do not connect the battery reversed in positive (+) and negative (-) terminals in the charger or equipment.

（5） Do not let the battery terminals (+and-) contact a wire or any metal (like a metal necklace or a hairpin) with which it is carried or stored together. Otherwise it may cause short-circuit.

（6） Do not drive a nail in, hit with a hammer, or stamp on the battery, do not strike the battery in other ways.

（7） Do not disassemble or alter the outside structure of the batteries. Welding is not allowed to be conducted on the battery.

（8） Do not directly solder the battery terminals.

（9） Do not attempt to disassemble or modify deform the battery in any way.

（10） Do not submerge the battery in water, do not wet the battery when store the battery.

（11） Avoid to charge battery near a fire source or in direct sunlight.

（12） Don’t directly contact with the leaking battery.

（1） 对电池进行充放电测试时，请使用锂离子电池专用测试设备，严禁使用普通恒流恒压源等不能限压限流设备对电池进行充放电，以避免电池被过充过放而引起电池功能失效或发生危险；

（2） 充电器需要有监测电池充满电的装置。充电器使用通过定时，电流检测或开路电压检测电池的满电状态，当充电器检测到电池充满电时，应停止充电。电池不能用持续充电（涓流充电）方法充电；

（3） 禁止将电池扔进火里，或加热电池。远离热源和火源。禁止在高温下储存电池；

（4） 电池连接到充电器或设备时禁止将正负极反接；

（5） 禁止将电池正负极接触到与之一起携带或储存的导线或任何金属（如金属项链和发卡），可能引起短路；

（6） 禁止用钉穿刺、用锤打击或踩踏电池，禁止以其他方式敲打电池；

（7） 禁止拆卸或改变电池外部结构。禁止在电池上直接焊接；

（8） 禁止直接焊接电池端子！

（9） 禁止以任何方式分解或使电池变形；

（10） 禁止将电池放入水中，储存时禁止弄湿电池；

（11） 避免在火源附近或阳光直射下充电；

（12） 不要直接触及漏液电池。

NOTICE 注意

（1） Battery should be charged and discharged with proper charger, in compliance with correct operation contents.

（2） Children should not be allowed to play with them. Do not eat the battery.

（3） Do not use the battery with other maker's batteries, different types and/or models of batteries such as dry batteries, nickel-metal hydride batteries, or nickel-cadmium batteries, or new and old lithium batteries together.

（4） Do not charge the battery continuously for more than 12 hours. Do not leave the battery in the charger for a long time (more than 24 hours)

（5） Do not use the battery if it emits an odor and/or heat, changes color and/or shape, leaks electrolyte, or cause any other abnormality. If the battery is in use or being recharged, remove it from the device or charger immediately and discontinue use. Do not leave the battery in a charger or equipment.

（6） Do not discharge the battery continuously when it is not charged.

（7） Do not use or store the battery where is exposed to extremely hot, such as under window of a car in direct sunlight in a hot day. Otherwise, the battery may be overheated. This can also reduce battery performance and/or shorten service life.

（8） When the batteries are not be used for a long time, please store them safely so that they will stay in a half-charged state. Please wrap the batteries with non-conductive materials in order that metallic materials will not contact the batteries directly, which may result in damage to the batteries. Keep the batteries in a cool and dry place.

（1） 电池须遵循正确的操作规范，用专用充电器充放电；

（2） 避免儿童玩弄电池；禁止食用电池；

（3） 禁止与其他厂商的电池一起使用，禁止与不同种类或型号的电池如干电池、镍氢电池或镍镉电池一起使用，禁止新旧锂电池一起使用；

（4） 禁止连续充电超过 12 小时，不要把电池长时间（超过 24h）留置于充电器；

（5） 如果电池发出异味和/或发热，改变颜色和/或变形，漏液，或有其他任意异常时不得使用；如果电池正在使用或充电，应立即从用电器中或充电器上取出并停止使用；禁止将电池留在充电器或设备上；

（6） 电池未充电时禁止持续放电；

（7） 不要使用处于极热环境中的电池，如阳光直射或热天的车内。否则，电池会过热，可能着火（点燃），这样就会影响电池的性能、缩短电池的使用寿命；

（8） 长期不用时，请将电池处于适宜储存的半荷电状态储存。请用不导电材料包裹电池，以避免金属直接接触电池，造成电池损坏，将电池保存阴凉干燥处。

CAUTION 危险

（1） Follow Manufacturer’s Instruction.

（2） In case young children use the battery, instruct them on the contents of the instructions and ensure the battery is correctly used by them at all times.

（3） The battery was inspected carefully by QA before shipment to confirm with the specifications. However, in the case of any abnormality such as bad smell or heat after purchase, please bring it and communicate with us.

（4） If the battery leaks and electrolyte gets in your eyes, do not rub them. Instead, rinse them with clean running water and immediately seek medical attention. If left as is, electrolyte can cause eye injury.

（5） When the battery is abandoned, cannot be used as a common urban garbage disposal. Correct handling of the method, please refer to the local regulations of the processing of waste electronic products.

（1） 按厂家提供的方法使用；

（2） 假如儿童使用电池，应指导他们按说明书使用，确保他们一直正确使用电池；

（3） 电池出厂前都经过 QA 仔细检查。但是，万一购买后发生异味、发热等异常，请随时与我们沟通；

（4） 如果电池漏液后电解液进入眼睛，不要擦拭，应用水冲洗，立即寻求医疗救助。如不及时处理，眼睛将会受到伤害；

（5） 当电池废弃后，不能作为普通城市垃圾处理。正确的处理方法请查阅当地有关废旧电子产品处理的规定。