Specification Approval Sheet
产品规格确认书

Model: 16Ah-12S

型号 : 16Ah-12S

Customer Approval **客户承认**	Signature 签名	Date 日期
	Company name 公司名称:	
	Company Stamp 公司印章:	

Herewin Approved	Signature 签名	Date 日期
Prepared 制订	JHJ	20170722
Checked 审核		
Approved 批准		

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Content

目录

1.Scope 适用范围

This document describes the Product Specification of the Lithium-Polymer (LIP) rechargeable battery supplied by HereWin Technology Corporation Limited).

本规格说明书描述了深圳市海盈科技有限公司（以下简称海盈）生产的可充电聚合物锂离子电池的产品性能指标

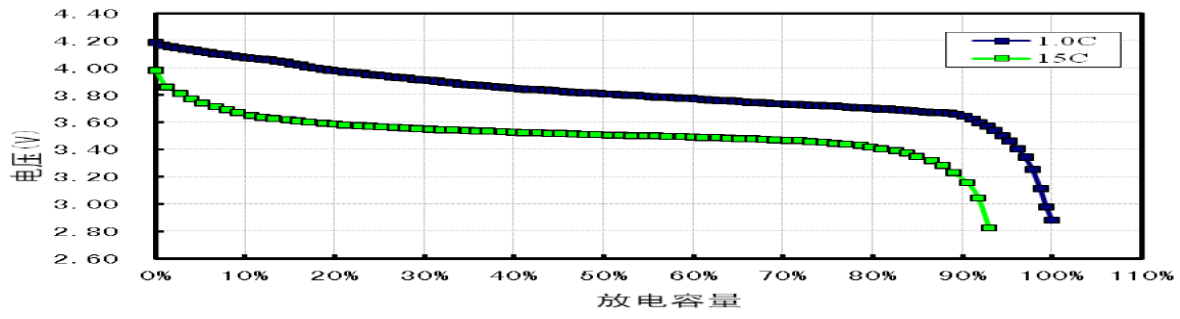
2.Cell Model:HYP1174170S

电芯型号：HYP1174170S

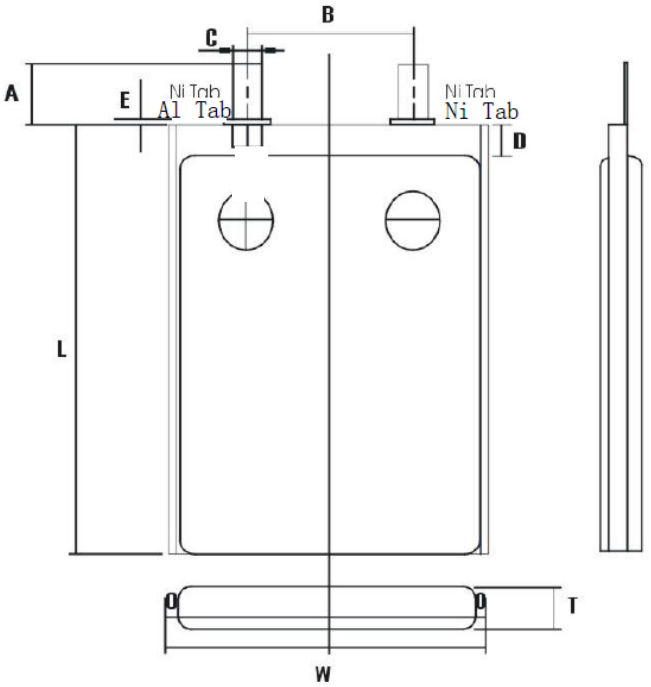
3.Cell Specification 电芯规格

NO.	Items	Specifications	
1	Charge cut-off voltage 充电截止电压	4.2V	
2	Nominal cut-off voltage 标称电压	3.7V	
3	Discharge cut-off voltage 放电截止电压	3.0V	
4	Rated Capacity 标称容量	16000mAh @ 0.5C Discharge(放电)	
5	Minimal Capacity 最小容量	15900mAh @ 0.5C Discharge(放电)	
6	Standard Charging method 标准充电方法	0.5C CC（constant current）charge to 4.2V,then CV(constant voltage 4.2V)charge till charge current decline to ≤0.02C 0.5C CC（恒流）充电至 4.2V，再 CV（恒压 4.2V）充电直至充电电流≤0.02C	
7	Max. charge current 最大充电电流	2.0C （充电温度 0℃~40℃）	
8	Max. discharge current 最大放电电流	240.0A（continuous current 持续电流） 480.0A（Instantaneous discharge 瞬间电流）	
9	10C Mid Point Voltage(V) 10C 中值电压（V）	≥3.52V	
10	Operating temperature 工作温度	Charging 充电： 0℃~40℃ Discharging 放电： 0℃~40℃	
11	Cell Weight 电池重量	Approx 约：323g	
12	Storage Temp. (at shipping status: approx. 50% capacity of fully charged state) 储存温度（在运输状态：约完全充电状态的 30-50%容量）	1 month: -20~40℃ 3 month: -20~35℃ 1 year: -20~25℃	The battery should cycle once in three month. 电池应 3 个月循环一次

4. Rate discharge curve 倍率放电曲线

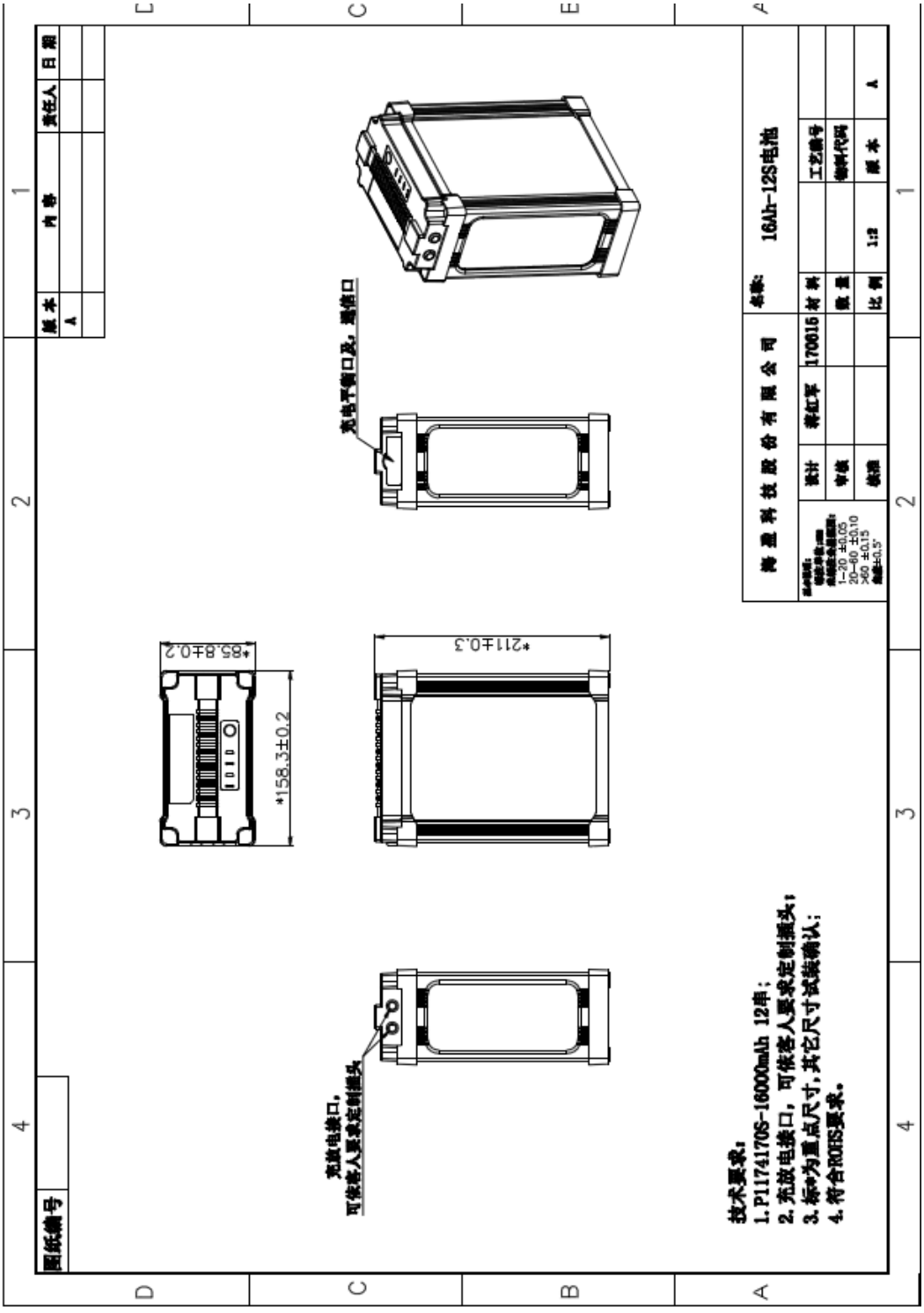


5 Drawing (all unit in mm, not in scale)
外形尺寸（单位：mm;未按比例）

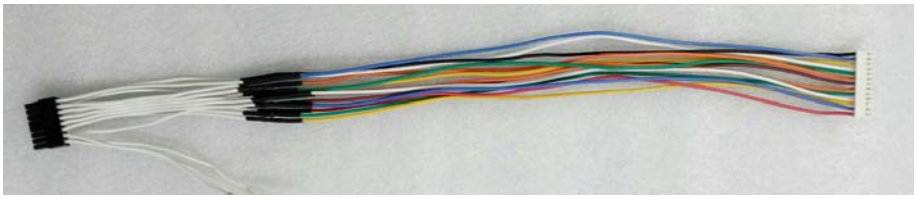


Items	Description	Dimension and Spec
T	Thickness 电芯厚度	≤11.3±0.4mm
W	Width 电芯宽度	≤72.5±1mm
L	Length 电芯长度	≤170.5±1mm
A	Tab length Tab 长度	12.0±1.0mm
B	Distance between 2 tabs Tab 间距	40.0±2.0mm
C	Tab width Tab 宽度	20.0±0.5mm
D	Top sealing Width 顶封宽度	6.0±0.5mm
E	Sealant Length Sealant 长度	1.5mm for ref.
F	Tab Thickness 极耳厚度	0.2±0.01mm

6 电池组尺寸/Battery size



USB port can connect computer and read battery data .



Charge connector

XT90 Amass Plug

AS150 Plug

XT150 Plug

AS150/XT150/XT90 plug is optional .
Capacity can choose 16000mah 44.4v and 12000mah 44.4v

7.Specification/产品规格

NO.	Items	Specifications	
7.1	Charge cut-off voltage 充电截止电压	50.4V	
7.2	Nominal cut-off voltage 标称电压	44.4V	
7.3	Discharge cut-off voltage 放电截止电压	36.0V	
7.4	Nominal Capacity 标称容量	16000mAh @ 0.5C Discharge(放电)	
7.5	Minimal Capacity 最小容量	15500mAh @ 0.5C Discharge(放电)	
7.6	Standard Charging method 标准充电方法	at 23±5℃, 0.5C CC（constant current）charge to 50.4V,then CV(constant voltage 50.4V)charge till charge current decline to ≤0.02C 在 23±5℃条件下，0.5C CC（恒流）充电至 50.4V，再 CV（恒压 50.4V）充电直至充电电流≤0.02C	
7.7	Max charge current 最大充电电流	2.0C(建议 1.0C 充电)	
7.8	discharge current 放电电流	常规放电(无保护功能)：持续 80A（由 AS150 插头和线材决定，电芯可达到 160A） Normal discharge（none with protection function）：80A(common)	
		瞬间放电(无过放保护)：100A（由 AS150 插头和线材决定，电芯可达到 320A） ignition wire（no over discharge protection）：100A	
7.9	Operating temperature 工作温度	Charging： 10℃~45℃ 充电： 10℃~45℃ Discharging：-10℃~50℃ 放电： -10℃~50℃	
7.10	Initial impedance 初始内阻(成品)	Internal resistance measured at AC 1KHz after 50% charge半充状态下，测量其AC 1KHz下的交流阻抗 ≤36mΩ	
7.11	电池重量/weight	约Approx 4360g	
7.12	Storage temperature(at shipping status: approx. 50% capacity of fully charged state) 储存温度（在运输状态：约完全充电状态的 50%容量）	1 month: -20~40℃ 3 month: -10~35℃ 1 year: 0~30℃	The battery should be charged in 3 month，keep its charge state in about 50% 电池应 3 个月充电 1 次，保持电量在 50%以上

8.Battery PACK Performance Criteria/ 电池性能检查及测试

NO.	Items	Test Method and Condition	Criteria
8.1	Capacity 容量	According to the charge by 7.6 methods, 0.5C and 36.0V discharge cut-off voltage of the discharge capacity. 按用 7.6 方法充电后，0.5C 放电至 36.0V 截止电压所放出的容量。	≥16000mAh
8.2	Cycle Life 循环寿命	Test condition： Charge:1.0C to 50.4V Discharge:80A to 42.0V 80% or more of 1st cycle capacity at 0.5C discharge of Operation 测试条件： 充电：1.0C 充电到 50.4V 放电：80A 放电到 42.0V 当放电容量降至初始容量的 80%时，所完成的循环次数定义为该电芯的循环寿命	≥150 times（容量保持率需达到初始容量 80%以上）
8.3	Self-discharge 自放电	According to the charge by 7.6 methods, storied the cells under the condition 23±5℃ for 30 days, then measured the capacity with 0.5C till 36.0V 按用 7.6 方法充电后，在 23±5℃条件下贮存 30 天，再以 0.5C 放电至 36.0V 所放出的容量。	Residual capacity >90% 剩余容量>90%
8.4	Battery Voltage 成品电压	As of shipment. 出货状态	≥45.6V
8.5	Temperature Characteristics 温度特性	1. According to the charge by 7.6 methods. 2. Capacity comparison at each temperature, measured with constant discharge current 0.2C with 36.0V cut-off. Percentage as an index of the capacity compared with 100% at 23℃ 1. 用 7.6 方法充电后， 2. 在不同温度条件下，用 0.2C 的电流恒流放电至截止电压 36.0V。以 23℃时放电容量为基准计算百分比。	-10℃容量保持率 ≥70% 0℃容量保持率≥80% 60℃容量保持率≥95%

9. Mechanical characteristics 机械特性

NO.	Items	Test Method and Condition	Criteria
9.1	Vibration Test 振动测试	According to the charge by 7.6 methods, fixed the products 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 30 minutes per axis of XYZ axes. 用 7.6 方法充电后，将产品固定在振动台上，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。	No fire, no leakage. 无起火、无泄漏
9.2	Drop Test 跌落测试	Charged with the 7.6 methods, the product from a height of 1 meters down to fall to the thickness of the hard board with thickness of 20mm, X, Y, Z from the positive and negative direction (six directions) in each direction, free fall 1. 用 7.6 方法充电后，将产品从 1 米高度跌落至跌落到厚度为 20mm 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。	No fire, no leakage. 无起火、无泄漏
9.3	过放 Over discharge	Charged with the 7.6 methods, the product discharge at 1C to 0V. 用7.6方法充电后，将产品以1C放电至0V。	No fire, no leakage. 无起火、无泄漏

10．充电说明/Instruction of charge

充电电流和充电电压不得超出本规格书中所规定的最大值

充电器的设计应满足本规格书的要求

使用超出本规格书要求的电流和电压范围可能引起电芯充放电性能、机械性能和安全性能的问题。

The current of charge and discharge should not exceed the maximum current in the specification.

The design of charger should meet the specification.

It may cause the quality problem of batteries charge and discharge performance, mechanical performance and safety performance problems when current and voltage range beyond the requirements of this specification.

11. 产品使用时警告事项及注意事项/The use of the product warnings and precautions

11.1 Prevention□of short circuit within a battery pack

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

电池组的短路预防

电池引线及单体电池间必须要有足够的绝缘层以保证电池组不短路。

11.2 Prohibition of disassembly

严禁拆卸电芯

1）Never disassemble the cells

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

在任何情况下不得拆卸电芯

拆卸电芯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

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.

电解液有害

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。

11.3 Prohibition of dumping of cells into fire

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

严禁将电芯投入火中

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

11.4 Prohibition of cells immersion into liquid such as water

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

严禁将电芯浸入液体 ，如水

不得将电芯浸泡液体，如淡水、海水、饮料（果汁、咖啡等）。

11.5 Battery cells replacement

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

电芯的更换

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。

11.6 Prohibition of use of damaged cells

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.

禁止使用已损坏的电芯

电芯在运输过程中可能因撞击等原因而损坏，若发现电芯有任何异常特征，如电芯塑料封边损坏，外壳破损，闻到电解液气体，电解液泄漏等，该电芯不得使用。

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。

12. Storage/贮存

The battery shall be storied within -20℃~40℃ range environmental condition.

If the battery has to be storied for a long time (More than once every three months must fill the electricity),the environmental condition should be:

Temperature: 23±5℃

Humidity: 65±20%RH

The voltage for a long time storage shall be 43.2V~46.8V range.

电池组储存温度必须在-20℃~40℃的范围内。

长期存储电池组（超过三个月必须补电一次）须置于温度为 23±5℃、湿度为 65±20%RH 的环境中。

建议贮存电压为 43.2V~46.8V 电池组储存温度必须在-20℃~40℃的范围内。

附　　页

电池详细功能说明
Battery detail function description

电池功能说明 battery function description

1.电量指示 Battery Indicator

电池具备 4 格 LED 电量指示，通过按键操作可以查看当前电池电量。

The battery has 4 cell LED power indication, You can check the current battery power by pressing the button.

操作方法：电池在关机状态下，短按按键一次，LED 指示电池当前电量，2 秒后电量指示灯熄灭；电池在开机状态下，LED 指示电量 3 分钟（非充放电状态）后进入关机状态。

Operation method: When the battery is off, press the button once, and the LED indicates the current of the battery. After 2 seconds, the battery indicator goes out; When the battery is on power, the LED indicates that the power is 3 minutes (non charge discharge status) and then goes into the shutdown state.

电量指示灯 battery Indicator light				
LED1	**LED2**	**LED3**	**LED4**	**当前电池电量 Current battery power**
●	●	●	●	**88% ～ 100%**
●	●	●	⊙	**76% ～ 87%**
●	●	●	○	**63% ～ 75%**
●	●	⊙	○	**51% ～ 62%**
●	●	○	○	**38%～ 50%**
●	⊙	○	○	**26%～ 37%**
●	○	○	○	**13%～ 25%**
⊙	○	○	○	**0% ～ 12%**

说明 Explain：

“●”代表 LED 灯常量 stands for LED lamp constants；

“⊙”代表 LED 灯闪烁 Stands for LED light flashing；

“○”代表 LED 灯熄灭 stands for The LED lamp goes off

2.充电均衡功能 Charging equalization function

电池充电过程中，自动均衡内部各单元电芯电压。

During battery charging, the core voltage of each unit is automatically balanced.

开启条件：（1）充电状态；（2）单节电芯电压均大于 3.65V；（3）最大压差大于 20mV；（同时满足以上条件，电池开启均衡功能）

Open condition : 1) charging state; (2) single cell voltage is more than 3.65V; (3) maximum pressure difference is more than 20mV; (at the same time satisfy the above conditions, the battery open equalization function)

关闭条件：（1）充电状态，最大单体压差小于 10mV；（2）退出充电状态；（任一条件满足终止）

Close condition : (1) charging state, the maximum single cell pressure difference is less than 10mV; (2) withdraw from the charging state; (any condition meets the termination)

3.充电电量指示 charging power indication

电池充电状态下，进行充电电量指示。 Charge battery indication when battery is charged.

充电电量指示灯 Charging indicator				
LED1	LED2	LED3	LED4	当前电池电量 Current battery power
⊙	○	○	○	0% ～ 12.5%
●	○	○	○	12.5% ～ 25%
●	⊙	○	○	25% ～ 37.5%
●	●	○	○	37.5% ～ 50%
●	●	⊙	○	50% ～ 62.5%
●	●	●	○	62.5% ～ 75%
●	●	●	⊙	75% ～ 87.5%
●	●	●	●	87.5% ～ 100%
○	○	○	○	Full-charge

说明：“●”代表 LED 灯常量； “⊙”代表 LED 灯闪烁； “○”代表 LED 灯熄灭

Explain：“●” stands for LED lamp constants； “⊙”Stands for LED light flashing； “○”stands for The LED lamp goes off

4.充电报警功能 charging alarm function

充电超压报警：充电过程中，当检测到任一单体电压超过 4.25V，蜂鸣器滴滴报警，LED2 闪； 电压均低于 4.15V 报警解除，LED 正常指示电量；报警时可进行手动关机，停止报警；开机后，电压高于 4.15V，继续报警，直到电压小于 4.15V 解除报警。

Charging overpressure alarm: the charging process, when the detection of any single voltage drops over 4.25V, buzzer alarm, LED2 flash; The voltage is lower than 4.15V, the alarm is relieved, the LED is normal to indicate the quantity of electricity. When the alarm is available, the manual shutdown is completed and the alarm is stopped; After starting up, the voltage is higher than 4.15V, continue to alarm, lift the alarm until the voltage is less than 4.15V.

充电超温报警：充电时，当检测到电池温度高于 75℃时，蜂鸣器滴滴报警，LED1 和 LED2 同时闪；充电中， 温度低于 65℃或者停止充电，报警自动解除，LED 正常指示电量。

Charging over temperature alarm: when charging, when the detected battery temperature is higher than 75 degrees, the

buzzer drops alarm, LED1 and LED2 flash at the same time. When charging, the temperature is lower than 65 degrees or stop charging, the alarm will be automatically lifted and the LED will indicate the normal quantity of electricity.

充电过流报警：充电时，检测到充电电流大于 20A 时，蜂鸣器滴滴报警 10S 后停止，同时 LED3 闪，提示充电过流；蜂鸣器报警 10S 后，直到充电电流小于 10A，LED 报警指示解除。

Charging over-current alarm: when charging, when the charging current is more than 20A, the buzzer drops alarm, stops after 10S, and LED3 flashes at the same time, indicating charging over-current; After the buzzer alarm 10S, until the charging current is less than 10A, LED alarm indication is relieved.

5.存储自放电功能 storage self discharge function

当电池长期不使用时，会自动放电到安全存储电压，保证电池储存安全。

When the battery is not used for a long time, it will automatically discharge to the safe storage voltage, and ensure the storage safety of batteries.

开启条件：（1）关机未使用时间＞7 天；（2）单体电压均大于 3.90V（以上条件同时满足开启）

Opening condition: (1) shut down, unused time > 7 days; (2) single body voltage is all greater than 3.90V (above condition meet to open at the same time)

结束条件：（1）最小单体电压≤3.85V；（2）触发按键；（3）进行充放电操作；（任一条件满足即结束）

Close condition : (1) the minimum single cell voltage is ≤3.85V ; (2) the trigger button; (3) charging and discharging operation; (any conditions to meet and can end)

自放电指示：电池上白色指示灯闪烁表示电池处于自放电状态。

Self discharge indication: the white indicator light flashes on the battery, indicating that The battery is in a state of spontaneous discharge condition .

6.电池通讯功能 battery communication function

开机状态，可以通过电池的通讯 USB 接口获得电池的实时电池信息，包括电池组整体电压、电池单体电压、电压容量百分比、电池温度、电流、循环次数、电池状态信息等。

The boot state, can obtain real-time information communication through the USB battery interface, including battery pack whole voltage, single cell voltage, voltage-capacity percentage, battery temperature, current, life cycles, battery status information etc..

7.电池数据记录功能 battery data record function

电池能够进行使用寿命内的数据信息记录，数据信息包括单体电压，电流，温度等；通过 USB 接口可以获取历史数据记录。

The battery can record the data information in the service life, and the data information includes battery cell voltage, current, temperature and so on. The data record can be obtained through the USB interface.

8.电池寿命显示功能 battery life display function

通过 LED 电量指示灯显示电池寿命。

Display battery life through the LED power indicator.

操作方法：开机状态，长按按键约 5S，4 个 LED 闪 3 次后指示电量 2S，全灭 1S 后 LED 显示电池当前寿命。

Operating method: boot state, press the button about 5S, 4 LED flashing 3 times, indicating the amount of electricity 2S, all out of 1S, LED shows the current life of the battery.

电池寿命指示灯 Battery life indicator				
LED1	**LED2**	**LED3**	**LED4**	**电池寿命 battery life**
●	●	●	●	**90% ～ 100%**
●	●	●	⊙	**80% ～ 90%**
●	●	●	○	**70% ～ 80%**
●	●	⊙	○	**60% ～ 70%**
●	●	○	○	**50% ～ 60%**
●	⊙	○	○	**40% ～ 50%**
●	○	○	○	**30% ～ 40%**
⊙	○	○	○	**20% ～ 30%**
○	○	○	○	**Lower than 20%**

说明：“●”代表 LED 灯常量； “⊙”代表 LED 灯闪烁； “○”代表 LED 灯熄灭

Explain：“●” stands for LED lamp constants； “⊙”Stands for LED light flashing； “○”stands for The LED lamp goes off

9.自动关机功能 automatic shutdown function

电池开机未使用时（未进行充放电），3 分钟后可以自动关机。

When the battery is turned on and unused (without charging and discharging), it can be automatically switched off after 3 minutes.

10.自动唤醒功能 Auto wakeup function

电池关机状态下，进行充电或放电时，电池能够自动开机指示电量。

When the battery is closed, the battery can switch on automatically indicate battery power when charging or discharging.

11.手动开关机 Manual switch machine

电池开机：在电池关机状态下，先短按按键一次，LED 显示当前电池电量，在灯没有熄灭状态下，再长按按键 2 秒以上，电量指示灯依次全亮，随后 LED 指示当前剩余电量，电池进入开机状态。

Battery boot : in the off state, the first short press the button once, the LED shows the current battery, the lamp is not extinguished state, then press the button for 2 seconds or more, electric power indicator were lit, then LED indicates the current battery remaining power into the boot state.

电池关机：电池处于开机状态下，短按按键一次，LED 灯全闪，再长按按键 2 秒以上，LED 指示灯依次全灭，电池进入关机状态。

Battery shutdown: the battery is in the boot state, press the button once, LED lights all flash, and then press the button for more than 2 seconds, LED indicator lights out in turn, the battery into the shutdown state.

12.提醒充电功能 Remind charging function

开启条件：电池关机后，当检测到任一单体电压低于 3.7V 时，橙色 LED 指示灯闪烁，提示电池需要进行充电至存储电压（建议存储单体电压 3.80—3.90V）；

Open the battery condition: after the shutdown, when the detection of any single cell voltage lower than 3.7V, the orange LED flashing lights, battery charging voltage to the storage needs (recommended storage single voltage 3.80 ~3.90V)

结束条件：报警提示过程中，当单体电压均高于 3.72V 时，报警自动解除；当电池最低单体电压降到 3.5V 时，报警提示关闭，保存电池电量，防止电池过放。

End condition: alarm process, when the single cell voltage was higher than 3.72V, Automatic alarm release ; the lowest single voltage drops to 3.5V, alarm off, save battery power, avoid over -discharge.

13.电池状态指示 Battery status indicator

短按按键查看电量或电池开机后，当检测到电芯压差过大或者电压过低时，红色 LED 指示灯常亮进行报警提醒；

Press the button to check the power or the battery is switched on. When the voltage difference between the cell is too large or the voltage is too low, the red LED indicator is always on the alarm;

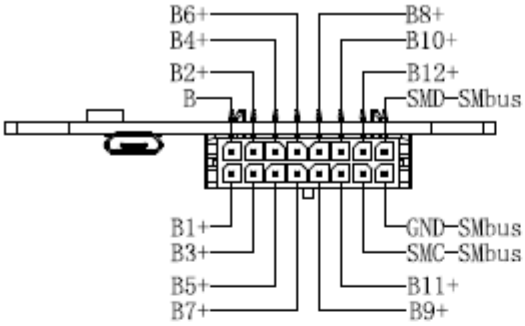
电池压差大条件：单节电压均大于 3.85V，压差大于 200mV；

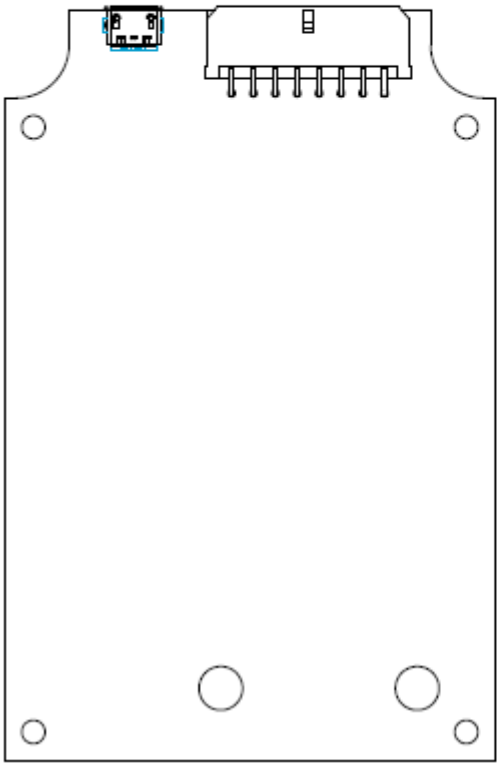
Battery pressure differential condition: single cell voltage is more than 3.85V, pressure difference is more than 200mV

电池电压过低条件：最低单体电压小于 2.8V。

Battery voltage is too low: minimum single cell voltage is less than 2.8V.

14. 平衡充电端口定义 charge connector interface definition





各接口定义如下：
1、B-电池组负极；
2、B1+第一节电池正极；
3、B2+第二节电池正极；
4、B3+第大三节电池正极；
5、B4+第四节电池正极；
6、B5+第五节电池正极；
7、B6+第六节电池正极；
8、B4+第七节电池正极；
9、B8+第八节电池正极；
10、B9+第九节电池正极；
11、B10+第十节电池正极；
12、B11+第十一节电池正极；
13、B12+第十二节电池正极；
14、SMC-SMbus SMbus通讯的时钟引脚SMC；
15、SMD-SMbus SMbus通讯的时钟引脚SMD；
16、GND-SMbus SMbus通讯的时钟引脚GND；