Li-ion Battery Pack Specification

锂离子电池组合规格书

Pack Type 组合类型：	Cell（2S2P）+PCM+Housing （2S2P）电芯+保护板+胶壳
Cell Model 电芯型号:	14500-800
Pack Model 产品型号：	ID984
Pack Capacity(mAh) 组合容量(mAh)：	1520
Customer Code 客户代码:	LZ121
Total Page 文件页数：	15

Registered 编制	Checked 审核	Approved 批准
包银波/刘升	江宜建/严威	郭玉杰
2017-12-01	2017-12-01	2017-12-01

Customer Approve 客户确认		
Dept. 部门	Signature 签名	Date 日期
QA Dept 品质		
R&D Dept 研发		
Approved 批准		

Content 目录

1.Modified List 修订履历

Product Modified Record List

产品变更履历表

Revision 版本	Date 日期	Mark 标记	Modified content 变更内容	Approved by 批 准
A0	2017-11-27	/	New Release 新版本	/
A1	2017-12-01	/	Update the maximum overcurrent value and BOM 更新最大过流值和BOM	/

2 .Scope 适用范围

This specification describes the basic performance, technical requirement, testing method ,warning and caution of the Li-ion rechargeable battery pack, the pack defined in this documentation is an assembly which include battery, PCM and wire, the specification only applies to the li-ion battery produced by Icon energy system (Shen zhen) Co.,Ltd.

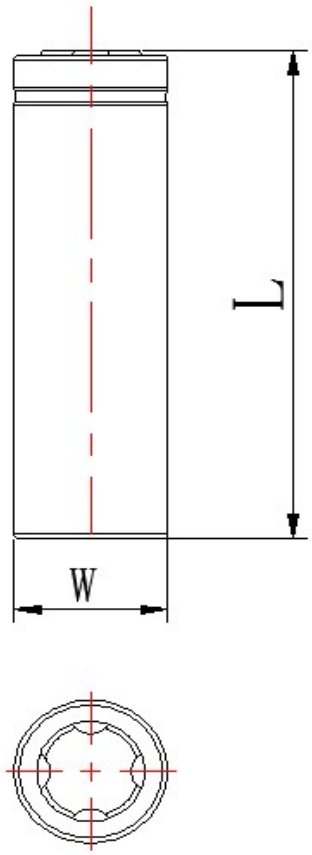
本标准规定了锂离子可充电池的基本性能、技术要求、测试方法及注意事项，电池组合定义的是包括电芯，保护板和连接线的组合，本标准只适用于博科能源系统（深圳）有限公司所生产的锂离子电池。

3. Battery Safety certificate 电池认证

The Battery shall meet the following standards: 电池需要满足以下测试标准

UL1642 UL2054 UN38.3

4.Cell Specification 电芯规格



Unit 单位（mm）

Model（型号）	14500-800	W（宽度）	14.1±0.2	L（高度）	48.5±0.5

5.Specification 产品规格

NO.	Item 项目		Specifications 规格要求	
5.1	Typical capacity 典型容量		1600mAh 0.2C Discharge (0.2C 放电)	
	Min capacity 最小容量		1520mAh 0.2C Discharge (0.2C 放电)	
5.2	Initial Impedance 初始内阻		≤180mΩ	
5.3	Weight 重量		Approx(约)：TBD	
5.4	Nominal voltage 标称电压 Fully charge voltage(FC) 满充电压 FC Fully discharge voltage(FD)满放电压 FD		7.40V 8.40 V Defined in this DOC: FC =8.40V * 6.0±0.2V Defined in this DOC: FD =6.0±0.2V* *为建议使用参数，与实际保护参数有别.	
5.5	Standard charge current 标准充电电流		0.5C	
5.6	Standard charging method 标准充电方法		0.5C CC（constant current）charge to FC, then CV(constant voltage FC)charge till charge current decline to ≤0.01C 0.5C CC（恒流）充电至 FC，再 CV（恒压 FC）充电直至充电电流≤0.01C	
5.7	Charging time 充电时间		Standard Charging (标准充电) Approx 3.5 hours 大约 3.5 小时	
5.8	Charge current 充电电流	0℃～15℃	0.2C	
		15℃～25℃	0.5C	
		25℃～45℃	1C(1.6A)	
5.9	Max. discharge current 最大放电电流	-20℃～60℃	电流：1.6A (MAX)，持续电流。	
	Instant max.discharge current 瞬间（脉冲）最大放电电流		4.8A/20S Instant discharge current 瞬间放电电流	
5.10	Standard Discharge Current 标准放电电流		Current 0.2C end voltage FD 电流：0.2C 截止电压：FD	
	Continuous discharge current 可持续放电电流		≤1.6A Long time working current 长时间工作电流	
5.11	Battery voltage of shipment 电池出货电压		7.50V～7.58V（空运） 7.60V～7.80V（海运） Voltage of shipment（IES）	
5.12	Battery capacity of shipment 电池出货电量		SOC：20%~30%（空运） SOC：40%~70%（海运）Capacity of shipment（IES）	
5.13	Charge cut-off voltage 充电截止电压		8.4V（机器可能存在浮充，建议实际充电电压调整为 8.2V）	
5.14	Discharge cut-off Voltage 放电截止电压		6V	
5.15	Storage temperature 储存温度	-20℃~60℃	≤1 month	Percentage of recoverable capacity no less than 80% of the initial capacities 恢复容量不低于初始容量的 80%
		-20℃~45℃	≤3 month	
		-20℃~30℃	≤1 year	
5.16	Recoverable capacity 恢复容量		Constant current 0.5C charge to FC, then constant voltage FC charge to current declines to 0.01C, rest for 10min，constant current 0.2C discharge to FD，rest for 10min.Repeat above steps 3 times, recording the maximum capacity 先用 0.5C 恒流充电至 FC，再恒压 FC 充电直至充电电流≤0.01C,搁置 10 分钟,再用 0.2C 电流放电至 FD;又搁置 10 分钟,重复以上步骤 3 次,记录容量最大值.	
5.17	Storage Humidity 储存湿度		≤75% RH	
5.18	Appearance 外观		Without distortion and leakage 无变形、电解液泄露	

5.19	Standard testing condition 标准测试环境	Temperature(温度) Humidity（湿度） Atmospheric Pressure（大气压）	：23±5℃ ：≤75%RH ：86-106 Kpa

Remark: 1.From 5.1 to 5.14, the testing condition is following 5.19 (standard testing condition)
从 5.1 至 5.14 项目，测试环境遵从 5.19（标准测试环境）
2.Operating temperature（使用温度）: charging(充电) 0℃~45℃; Discharging（放电）：-20℃~60℃
If the working condition is out of 5.19 , the performance will be some shift.
如果工作环境超出 5.19 范围，性能将会有一些偏移。

6 General Performance 常规性能

Item 项 目			Test Method 检测方法	Request 要 求
6.1	Appearance 外观		By sight：30CM vertically 目测：垂直 30CM。	Case appearance should be smooth w/o nick, burr and other mechanical damage. Exposed metallic part should not be Oxidized. Case should not be distorted. 外壳表面应平整无划痕、毛刺及其他机械损伤,外露金属部分不应有氧化现象、胶壳不能变形。
6.2	Nominal Capacity 标称容量	Charging 充电方式	Environment temperature 23±5℃, CC/CV mode, 0.5C constant current charge to FC, then constant voltage charge mode, cut off current 0.01C 环境温度 23±5℃,CC/CV 方式,0.5C 恒流充电到 FC,再恒压充电方式,截止电流 0.01C。	1) Discharging time: ≥300 minutes. 放电时间:≥300 分钟。 2) No distortion on appearance, no burst and no leak 电池外观应无变形、无爆裂、漏液。
		Discharging 放电方式	Environment temperature 23±5℃,0.2C constant current discharge, cut off current FD. 温度 23±5℃,0.2C 恒流放电,截止电压 FD.	
6.3	储存性能 Storage performance		1). In environmental temperature 23±5℃ condition, Use nominal capacity charging method full charge the battery. 在环境温度 23±5℃条件下，按标称容量充电方法将电池充饱电。 2). Lay the battery opened circuit 28 days, then use 0.2C discharge it to cut off voltage..将电池开路搁置 28 天,再以 0.2C 放电至终止电压。	0.2C discharging time should be ≥270min 0.2C 放电时间应不低于 270 分钟。
6.4	Cycle Life 循环寿命		At standard testing condition, constant current 0.5C charge to FC, then constant voltage FC charge to current declines to 0.01C, rest for	≥300times(次)

		10min, constant current 0.2Cdischarge to FD,rest for 10min. Repeat above steps till continuously discharging capacity higher than 80% of the initial capacity of the cell. 在标准测试环境下，先用 0.5C 恒流充电至 FC，再恒压 FC 充电直至充电电流≤0.01C，搁置 10 分钟，再用 0.2C 电流放电至 FD；搁置 10 分钟，重复以上步骤，直到放电容量是初始容量的 80%.	
6.5	Vibration Capability 振动性能	After standard charge, Set the vibration testing machine on 10~55HZ，test three direction, I=90%, T=30min. Record the discharging capacity after test. 电池满充后，将振动仪设置在扫频 10~55HZ，三方向测试；I=90%；T=30min 实验后记录电池的放电容量.	1) After test, 1C capacity should be no less than 90% of it before test Internal resistance discrepancy should be no more than 3mΩ. 实验后的 1C 容量≥实验前 90%，内阻相差不超过 3mΩ。 2) Battery appearance should not be obvious nick, leak, smoke and burst. 电池外观应无明显损伤、漏液、冒烟或爆炸
6.6	Drop Test 跌落测试(只适用于带胶壳类产品)	Hang the battery in one meter high in the air. Let the cells fall down by six sides (Anode and Cathode side，crosswise sides）1 time each，all together 6 times. 将电池悬空在 1 米高处，将电池自由跌落 6 面(正负极面，横向面)各 1 次，共 6 次。	Battery appearance should not be obvious nick and breakage, leak, smoke and burst.电池外观应无明显损伤及破裂、电池应不漏液、不冒烟、不爆炸。

7 Environment Performance 环境性能

No.	Item 项目	Test Methods and Condition 测试方法和条件	Criteria 标准
7.1	Discharge at high temperature 高温放电	At standard testing condition，after standard charging, rest the Cells 3h at 55±2℃, then discharging at 0.2C to voltage FD, recording the discharging time. 在标准测试环境下，标准充电后，在 55±2℃条件下贮存 3h，然后用 0. 2C 放电至 FD, 所记录放电时间.	1).After test,0.2C capacity should be ≥285minutes. 实验后的 0.2C 容量应≥285 分钟。 2).Case appearance should not be distorted and crack. 电池外观应无变形、无爆裂。

7.2	Discharge at low temperature 低温放电	At standard testing condition，after standard charging, rest the Cells 3h at -10±2℃, then discharging at 0.2C to voltage FD, recording the discharging time. 在标准测试环境下，标准充电后，在-10±2℃条件下贮存 3h，然后用 0.2C 放电至截止电压,所记录放电时间.	1).After test, 0.2C capacity should be ≥210minutes. 实验后 0.2C 容量应≥210 分钟。 2). Case appearance should not be distorted and crack. 电池外观应无变形、无爆裂。
7.3	Thermal shock 热冲击	Step1：at standard testing condition，fully charge the cells with standard charging method. Step2: put the cells in the oven, the temperature of the oven is to be raised at 5±2℃ per minute to a temperature of 130±2℃ and remains 10 minutes. 第一步：在标准测试环境下，按标准充电方式满充电芯. 第二步：将电池放进烘箱内，以5±2℃/min速度升高烘箱内温度至130±2℃后，恒温10min.	No fire, no smoke 不起火,不冒烟

8 Safe Characteristic 安全性能

Item 项目		Test Method 检测方法	Request 要求
8.1	Overcharge Test 过充测试	Apply 10V battery voltage and a 0.5C charge current on the battery for 8hs. 用恒压源持续加载 8hs，恒流恒压源电压设定为 10V，电流设定为 0.5C 的外接电流。	Battery could not be burst, burn, leak and smoke 电池应不爆炸、不起火、不冒烟或漏液。
8.2	Over discharge Test 过放测试	Discharge the battery at 0.5C to cut off voltage，then discharge with loading 30Ω*2for 24hs. 以 0.5C 放电至终止电压后外接 30Ω*2 负载放电 24H。	Battery could not be burst, burn, leak and smoke 电池应不爆炸. 不起火. 不冒烟或漏液。
8.3	Pack Short-circuit Protection 短路保护	1) The battery is charged to rated capacity. 按标称容量充电方法将电池充饱电。 2) The battery is to be short-circuited by connecting the positive and negative terminals of the battery with thermocouple having a maximum resistance load of 0.1Ω for 1h. 将接有热电偶的电池置于通风橱中，将电池正负极用 0.1Ω电阻器持续短路 1h。	Battery could not be burst, burn, leak and smoke After charging. 电池应不爆炸、不起火、不冒烟或漏液。 After charging，the battery can be used normally. 充电后，可正常使用。

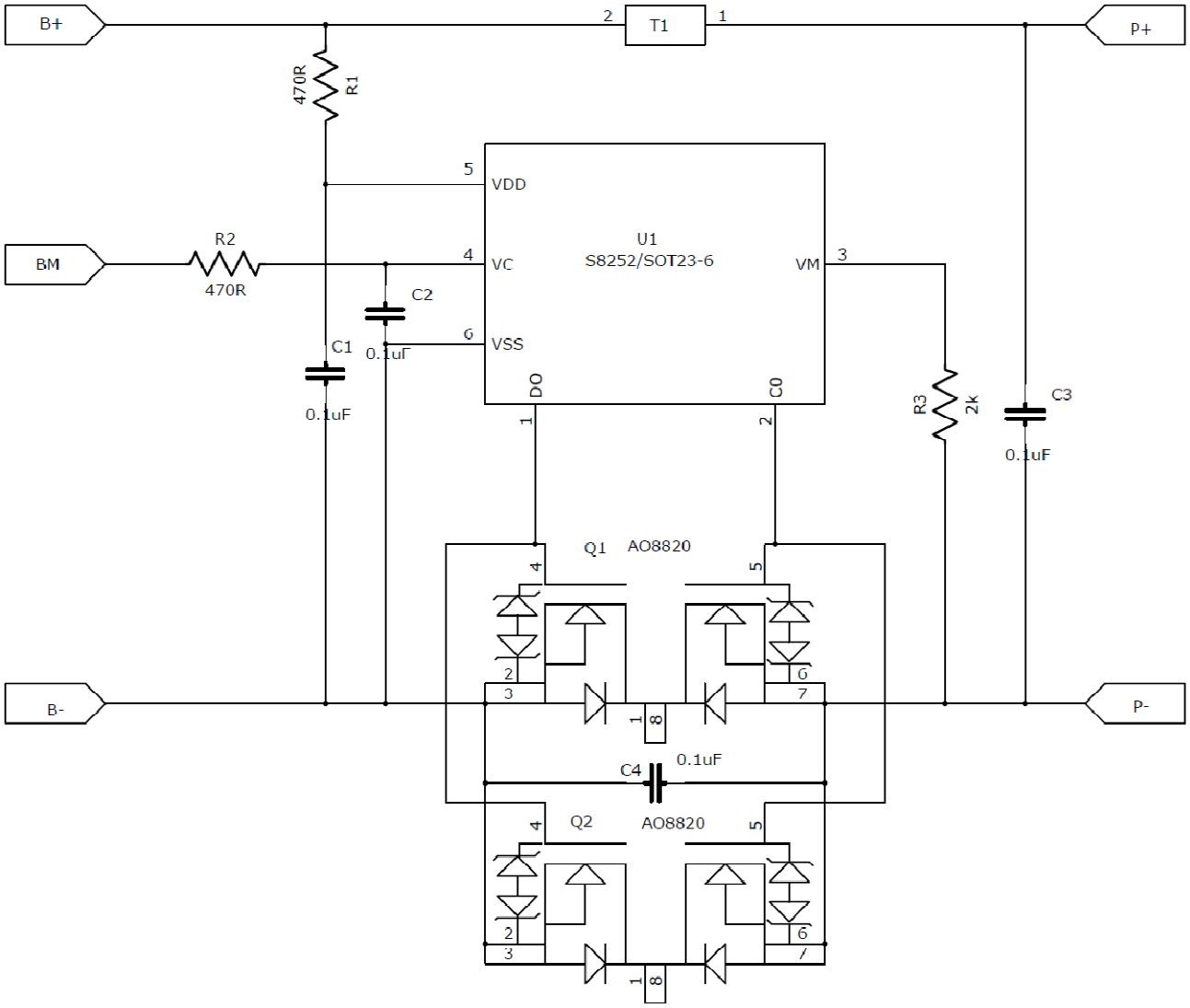
※ Above testing of safe characteristic must be with protective equipment.(安全性能测试应在有保护措施下进行)

9. Protection circuit(保护电路)

9.1 PCM Standard（保护板标准）

Battery Link 电池组组合方式		2S2P				
Absolute Maximum Rating						
Input Charging Voltage 充电电压			8.4		±1%	V
Input Charging Current 充电电流			≤1.6			A
Output Discharging Voltage 放电电压			6.0			V
Instant max. output Discharging Current 瞬间最大放电电流		≤4.8A/20S（此值为初步确定值，后续成品实物实测后可能再做调整）				
MAX. Output Discharging Current （最大输出电流） (0℃～40℃)		1.6A 持续放电				--
Continuous discharge current 长时间可持续放电电流		≤1.6				A
Ambient Condition	Operating Temperature 工作温度	0	25	40		℃
	Humidity (No Water-Drop) 工作湿度	0%		75%		RH
Protection Parameters (for Individual Cell).						
Over-Charge Voltage Protection (OVP) 过充保护电压			4.250		±25mV	V
Over-Charge Voltage Protection Release (OVPR) 过充恢复电压			4.050		±30mV	
Over-Discharge Voltage Protection (UVP) 过放保护电压			3.00		±100mV	V
Over-Discharge Voltage Protection Release (UVPR)过放恢复电压			3.20（充电恢复）		±100mV	V
Over-Current Discharge Protection (OCDP)放电过流保护			5	7.5	10	A
Over-Current Discharge Protection Release 放电过流保护恢复方式		断开负载				
Short circuit protection Release 短路保护恢复方式		断开负载				
Idle mode 静态模式		≤10				uA
Shutdown mode 掉电模式		≤1				uA

9.2. Schematic 原理图



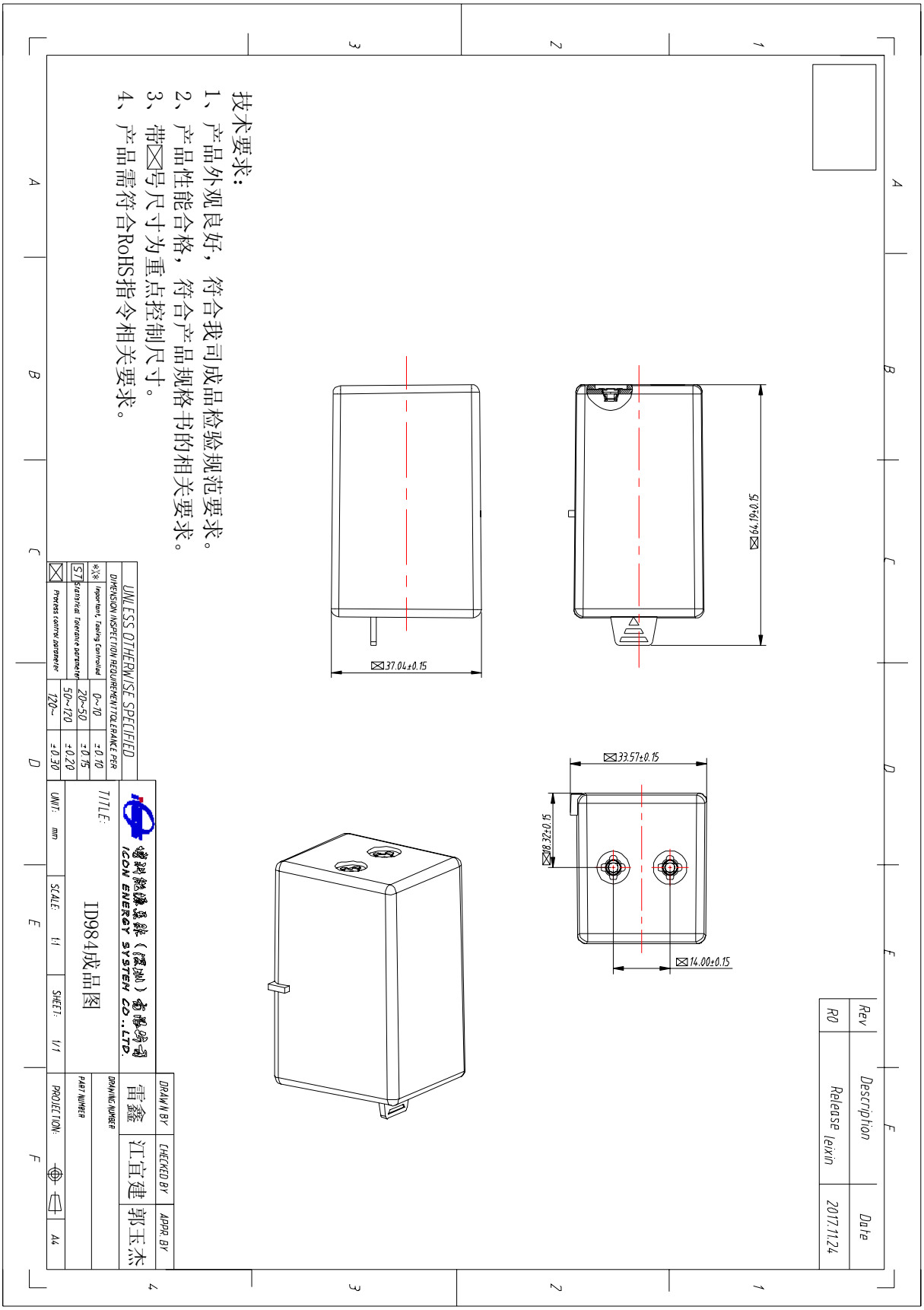
9.3 Bill of PCM

器件名称	位号	器件型号	封装	数量	品牌
Protection IC	U1	S-8252AYY	SOT-26	1	精工
MOSFET	Q1 Q2	AO8820（主选） AO8814（备选）	TSSOP-8	2	AOS
电阻	R1,R2	470R Ohm±5%	0603	2	
电阻	R3	2K Ohm±5%	0603	1	
电容	C1, C2, C3,C4, C5	C105/50V ±20%	0603	4	
温度开关	T1	SEKI ST-22 J6 70C		1	SEKI

10、Main Parts List 电池主要零部件：

NO	Item	Model	Specification	Remakes	vendor
1	Cell	14500-800	800mAh	4PCS	惠州豪鹏
2	PCM	FR4	Over Voltage Protect:4.250±0.025V Over Discharge Protect: 3.0±0.1V	1PCS	
3	Holder	ABS765A		1PCS	
4	Housing	PC+ABS CX7240		1Set	

11.2D Drawing　2D 图



12.Label 标签

TBD

13.Packing 包装

TBD

14.Warnings 警告

Load circuit may cause voltage and current, and the voltage or current may add to pack, the voltage or current must be controlled as lower than RWV and RWI, larger voltage or current may damage the PCM of pack.

☆负载可能产生电压和电流,该电压和电流会反加在电池组合（含 PCM）上，该电压和电流不能超过保护板自身反向耐压耐流值，过高电压或电流会损坏电池组合中的保护板。

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

☆为防止电池组合可能发生的泄漏,发热,起火,请注意以下预防措施:

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

☆ 电池组合外包装膜易被镍片,尖针等尖锐部件损伤,禁止用尖锐部件碰伤电池.

Do not immerse the pack in water and seawater

☆ 严禁将电池组合浸入海水或水中.

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

☆ 禁止将电池组合在热高温源旁,如火,加热器等使用设备.

When recharging, use the battery charger specifically for that purpose

☆ 充电时请选用锂离子电池专用充电器.

Do not reverse the position and negative terminals

☆ 禁止颠倒正负极使用电池组合

Do not connect the pack to an electrical outlet

☆ 禁止将电池组合直接接入电源插座

Do not discard the pack in fire or heat it

☆ 禁止将电池组合丢入火或加热器中

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

☆ 禁止用金属直接将电池组合的正负极进行短路连接.

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

☆ 禁止将电池组合与金属,如发夹,项链等一起运输或贮存.

Do not strike or throw the pack.

☆ 禁止敲击或抛掷,踩踏电池组合等.

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

☆ 禁止直接焊接电池组合或电芯，禁止用钉子或其它利器刺穿电池组合或电芯.

15. Cautions 注意

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

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

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

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

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

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

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

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

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

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

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

△ 废弃之电池应用绝缘纸包住电极,以防起火, 冒烟.

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

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

3 Prohibition short circuit（禁止电池短路）

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

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

4 .Mechanical shock（机械撞击）

△LIP cells have less mechanical endurance than metal-can-cased LIB.

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

聚合物电池比金属壳方形电池的机械耐久性更小。
跌落、碰撞、弯曲等等都可能会降低聚合物电池的性能。

16 Period of Warranty 保质期

The period of warranty is one year from the date of shipment. Iconergy guarantees to give a replacement in case of battery with defects proven due to manufacturing process instead of the customer abuse and misuse.

电池的保质期从出货之日算起为一年。如果证明电池的缺陷是在我们公司制造过程中造成的而不是客户滥用或错误使用造成，本公司负责退换电池。

17. Others 其它事项

1.The customer is requested to contact Icon energy 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.

客户若需要将电池用于超出文件规定以外的应用，或在文件规定以外的使用条件下使用电池，应事先联系博科能源系统，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。

2. Icon energy will take no responsibility for any accident when the battery is used under other conditions than those described in this Document.

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，博科能源系统概不负责。

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

如有必要，博科能源系统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。

4. Any matters that this specification does not cover should be conferred between the customer and Icon energy

任何本说明书中未提及的事项，须经双方协商确定。