深圳特威新能源有限公司

SHENZHEN TOPWAY NEWENERGY CO.LTD

产品规格书

Specification For Approval

客户名称（Customer Name）：_____

电池型号 （Model）： TW704060-2000mAh

Prepared制定	Checked审核	Approved核准
	岑振华	

Custom approval (客户承认)
Comment（备注）： Customer’s signature/ Date(客户签章/日期) : _____

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Revision History

(修订记录)

Revision	Description	Date	Originator	Approval
A	New release	2023-06-09		

Content

目录

1. Scope

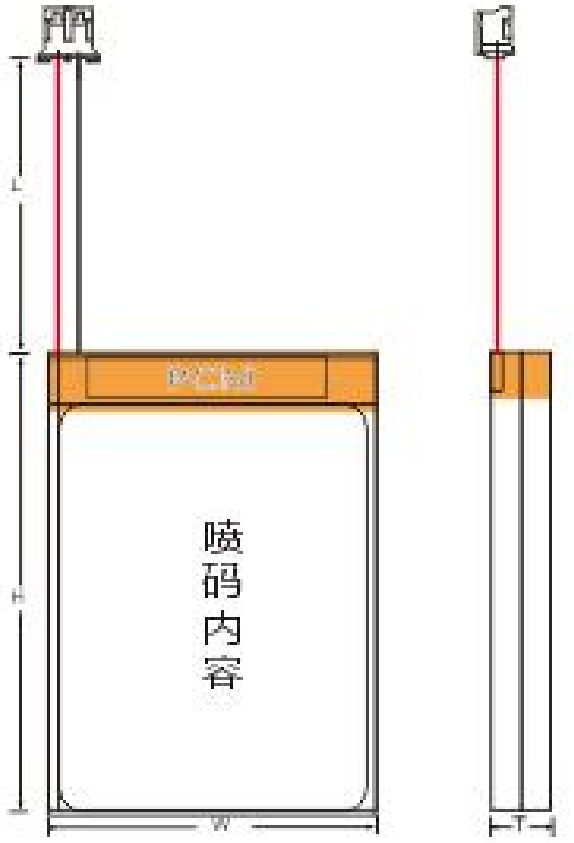
This document describes the Product Specification of the Lithium-ion Polymer (LIP) rechargeable battery supplied by Shenzhen Topway new energy Co,ltd

适用范围

本规格说明书描述了深圳特威新能源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. Battery Dimensional Drawing (all unit in mm, not in scale)

外形尺寸图 (单位：mm;未按比例)



Items	Description	Dimension and Spec	
T	Thickness 厚度	7.2mm(Max)	Connect wires: Wire spec: UL1571 26AGW Red wire: connect to”+” Black wire: connect to”-” Connector: JST-ZR-2P positive polarity
W	Width 宽度	40.0±0.5mm	
H	Length 长度	61.5±0.5mm	
L1	Wire length 导线长度	50.0±3.0 mm	

3. Specifications of single battery

电池技术规格

No.	Items	Specifications
3.1	Charge voltage 充电电压	4.2V
3.2	Overcharge protection voltage 过充保护电压	4.28V±0.025V
3.3	Nominal voltage 标称电压	3.70V
3.4	Nominal capacity 标称容量	2000mAh @0.2C Discharge(放电)
3.5	Charge current 充电电流	Standard charge: 0.2C 标准充电： 0.2C Rapid charge 0.5C 快速充电： 0.5C
3.6	Charging time 充电时间	Standard charge: 6.0-7.0 hours (Ref.) 标准充电： 6.0-7.0 小时(参考值) Rapid charge 3.0-4.0 hours (Ref.) 快速充电： 3.0-4.0 小时(参考值)
3.7	Max. discharge current 最大放电电流	1.0C
3.8	Discharge cut-off voltage 放电截止电压	3.0±0.1V
3.9	Operating temperature 工作温度	Charging: 0°C ~ 45°C 充电： 0°C ~ 45°C Discharging: -10°C ~ 60°C 放电： -10°C ~ 60°C
3.10	Storage temperature 储存温度 Storage humidity 储存湿度	Cless than 1 month：-10°C ~ +45° 一个月以内： -10°C ~ +45° Cless than 3 month：-10°C ~ +35° 三个月以内： -10°C ~ +35° 45% --75%RH

3.1.2 Test parameters 测试条件

Unless otherwise specified, all tests stated according to following:

除非有特殊说明，所有测试的条件要求如下：

Temperature 温度： 25±3℃

Humidity 湿度：45～75%RH

Use standard charge and standard discharge method 使用标准充电与标准放电方式

4.Performance Criteria

性能检查及测试

4.1 Electrical characteristics 充放电性能

NO.	Items	Test Method and Condition	Criteria
4.1.1	Standard Charge 标准充电	Charging the cell initially with constant current at 0.2C and then with constant voltage at 4.2V till charge current declines to 0.02C 先用 0.2C 恒流充电至 4.2V，再恒压 4.2V 充电直至充电电流≤0.02C	
4.1.2	standard discharge 标准放电	After the battery charging standard, with 0.2 C to terminate the current discharge voltage of 3.0V. 电池标准充电后,以 0.2C 的电流放电至终止电压 3.0V.	
4.1.3	Cycle Life 循环寿命	Test condition： Charge:0.2C to 4.2V Discharge:0.2C to3.0V 80% or more of 1st cycle capacity at 0.2C discharge of Operation 测试条件： 充电：0.2C 充电到 4.2V 放电：0.2C 放电到 3.0V 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池的循环寿命	≥300 次
4.1.4	Storage Characteristics 储存特性	After the standard charging, store the cells under the condition as No.5. 1 for 30 days, then discharging battery with 0.2C till 3. 0V, which is discharged whole capacity. 标准充电后，在 No.5. 1 条件下贮存 30 天，再以 0.2C 放电至 3. 0V 所放出的容量。	Residual capacity >90% 剩余容量>90%
4.1.5	Initial impedance of battery 电池初始内阻	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	≤180mΩ
4.1.6	battery Voltage 电池电压	As of shipment. 出货状态	3.80V~4.00V

4.2 Mechanical characteristics 机械特性

No.	Items	Test Method and Condition	Criteria
4.2.1	Vibration Test 振动测试	After standard charging, 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. 将标准充电后的电池固定在振动台上，沿 X、Y、Z 三个方向各振动 30 分钟，振幅 1.6mm，振动频率为 10Hz~55Hz，每分钟变化 1Hz。	No leakage 无泄漏 No fire 不起火
4.2.2	Drop Test 跌落测试	The cell is to be dropped twice from a height of 1 meter onto concrete ground. 将标准充电后的电池从 1 米高度跌落至混凝土地面 2 次	No explosion, no fire, no leakage. 不爆炸、不起火、不泄漏

4.3 Environmental specification 环境适应性能

No.	Items	Test Method and Condition	Criteria
4.3.1	Long Time Storage 贮存性能	Charged to the voltage of 3.85±0.03V, before storage, measured the initial condition and initial capacity of battery. Store for 3 months, 6 months at room temperature, measured the final condition of battery. Then conduct 0.2C /0.2C cycle for 3 times to record the discharge time of the battery. 测量电池的初始容量，电池充电至3.85±0.03V后，测量电池存储前的初始状态，分别室温贮存3个月、6个月后，测量电池的最终状态,然后0.2C/0.2C循环3次记录电池的放电时间。	Storage 3 months of battery≥4.25h； Storage 6 months of battery≥4h； 贮存3个月的电池≥4.25h； 贮存6个月的电池≥4h
4.3.2	Static Humidity 恒定湿热性能	After standard charge. Put the battery into a 40℃±2℃ and 90-95％RH chamber for 16h, then set aside 2h at room temperature. Observe the variation of the battery's appearance and then discharge with 0.2C to the cut-off voltage. 电池标准充电后，置于温度为40±2℃，相对湿度为90-95％的恒温恒湿箱中，搁置16h后，取出电池搁置2h，观察电池的外观变化并以0.2C放电至终止电压3.0V。	Discharge capacity ≥70% No remarkable deformation \ smoking \ leakage \ explosion 剩余容量≥70% 电池外观无明显变形、不冒烟、不爆炸
4.3.3	Discharge Characteristics under Different Temperature 不同温度下的放电性能	Tested the initial status and initial capacity of battery. After standard charge. Put the battery into a 60℃±2℃for 2h, discharge with 0.2C current to the cut-off voltage 3.0V, then standard charge at room temperature. In turn put the battery into 60℃±2℃/0±2 ℃/-10℃±2℃ for 2h, discharge at 0.2C to the cut-off voltage, then test the final capacity of the battery, and then store it for 2h at room temperature. Observe the variation of the battery's appearance. 测量电池的初始容量和初始状态，电池标准充电后，在60±2℃条件下恒温搁置2h、以0.2C放电至3.0V，然后在室温条件下标准充电， 按照60±2 ℃/0±2 ℃/-10±2 ℃的顺序在相应的恒温条件下搁置2h，以0.2C测量电池对应的终止容量，最后在室温状态下搁置2h测量电池的最终状态，观察电池外观变化。	Discharge capacity / Nominal capacity *100％ A)60 ℃时≥95%； B)25℃时≥100％； B)0℃时≥80％； C)-10 ℃时≥60%；

4.4 Safety Specification（cell）安全性能(电池)

No.	Items	Test Method and Condition	Criteria
4.4.1	Overcharge Test 过充测试	After“standard discharging”, then charging the battery with constant current as 2 times as standard max charging current until battery voltage is 4.6 V, eventually, charging battery with constant voltage for 7 hours. 电池“标准放电“后，用2倍最大充电电流恒流充到4.6 V，然后恒压充电7小时	No explode, No fire 无爆炸，无起火
4.4.2	Over discharge Test 过放测试	After discharged to the cut-off voltage， the battery shall be subjected to a short-circuit condition with a load resistance 30Ω for 7 hours 电池按标准充电模式充电后，以0.2C放电至终止电压后，外接30Ω负载放电 7h.	No explode, No fire 无爆炸，无起火
4.4.3	External Short - Circuiting Test 短路测试	After cells are charged on right way , discharging the battery cell directly with 100mΩ resistance for one hour. 电池“标准充电“以后，用阻值100 mΩ电线将正负极两端直接连接1小时	No explode, No fire 无爆炸，无起火
4.4.4	Heating Test 高温测试	After cells are charged by standard charging way under room temperature，then heated in a circulating air oven at a rate of 5ºC per minute to 130ºC. At 130ºC,oven is to remain for 10 minutes before test is discontinued 电池室温“标准充电“以后，然后放入升温速率是5ºC/分钟的循环风烘炉，在130ºC保持10分钟后停止。	No explode, No fire 无爆炸，无起火
4.4.5	Impact Test 机械冲击测试	After cells are charged by standard charging way, are impacted with their longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8mm diameter bar . The weight from 610 mm high impact on the round rods 电池“标准充电“以后，电池放在平板上，用直径15.8mm的棒放在电池中部，重物从610mm高处落下作用在圆棒上进行冲击	No explode, No fire 无爆炸，无起火

4.5.Visual inspection

外观检查

There shall be no such defect as scratch, flaw, crack, swelling 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、胀气，泄漏等。

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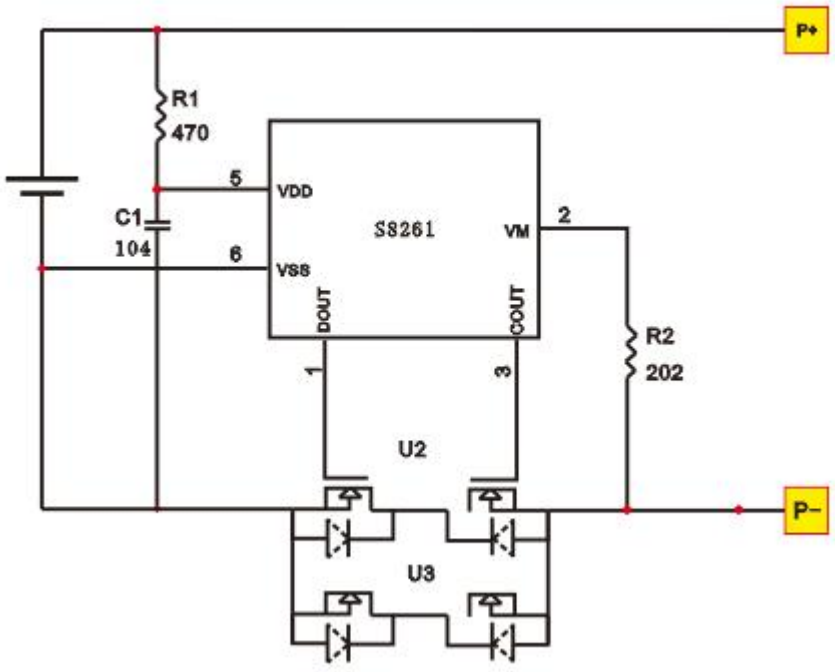
4.6. Protection Functions
保护功能

4.6.1 Electrical characteristics 电气特性

No	项目/Item	条件/Condition	规格/Specification
4.6.2.1	过充电 Overcharge	保护电压/Detection voltage	4.28V±0.025V
4.6.2.2		恢复电压/Release voltage	4.08V±0.05V
4.6.2.3		保护延时时间/Detection delay time	960ms～1400ms
4.6.2.4	过放电 Over discharge	保护电压/Detection voltage	3.00V±0.05V
4.6.2.5		恢复电压/ Release voltage	3.00±0.10V
4.6.2.6		保护延时时间/ Detection delay time	115～173ms
4.6.2.7	放电过流 Over discharge current	放电过流保护电流/Over current	1.2～3.0A
4.6.6.0		放电过流保护延时/delay time	7.2～11ms
4.6.2.9	短路保护 Short detection	短路保护延时/ Short detection delay time	320～540μs
4.6.2.10		恢复条件/Release Conditions	断开负载/Cut off load
4.6.2.11	自耗电 Normal current consumption	工作状态下自耗电 Normal current consumption of PCM	2.0～6.0uA
4.6.2.12	内阻/IR resistance	PCM 内阻/ IR of PCM	≤60 mΩ

4.6.2 Application Circuit 线路板原理图



4.6.3 PCM BOM /保护板物料清单

No.	器件编号 Location	描述 Description	规格/part No. Specification	封装形式 Pack type	数量 Qty	厂商/备注 Maker/Remark
1	U1	贴片保护 IC Protection IC	S8261ABJ-G3J	SOT-23-6	1	Sieko
2	U2	贴片 MSOFET SMD MOSFET	8205A	TSSOP-8	2	DP
3	R1	贴片电阻 SMD Resistance	470Ω，±5%	0603	1	YAGEO
4	R2	贴片电阻 SMD Resistance	2.0KΩ，±5%	0603	1	YAGEO
5	C1	贴片电容 SMD Capacitance	0.1μF/-20%+80%	0603	1	YAGEO
6	PCB	双层，绿油，喷锡	30.0*3.6*0.6mm	FR4	1	FR4 GREEN OIL

5. Storage 贮存

5.1 Long Time Storage

If the Cell is stored for a long time, the cell's storage voltage should be 3.6~3.9V and the cell is to be stored in a condition as Temperature : 0-28°C; Humidity: 60 ± 15% RH

长期贮存

长期贮存的电池（超过 3 个月）须置于干燥、凉爽处。

贮存电压为 3.60～3.95V

且贮存环境要求: 温度：0-28°C; 湿度： 60 ±15% RH。

6. Period of warranty 保质期

The period of warranty is a year from the date of shipment.The battery can be replaced due to quality problem of battery instead of the customer's abuse and misuse.

保质期从出货之日起一年。如果是电池本身的缺陷而不是用户错用滥用造成的质量问题，本公司确保更换。

7.Others 其它事项

No matters what this specification does not cover should be conferred between the customer and Topway.

任何本规格书中未提及的事项，须经双方协商确定.

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 LIP Rechargeable Batteries shall be applied to the battery cells manufactured by Topway

前言

本文件“聚合物锂离子充电电池操作指示及注意事项”仅适用于深圳特威新能源有限公司生产的电池。

Note (1):

The customer is requested to contact Topway 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，应事先联系特威，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):

Topway 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，特威概不负责。

Note (3):

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

声明三：

如有必要，特威会以书面形式告知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 (4.2V/cell). Charging beyond 4.25V, 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（4.2V/电池）。4.25V 为充电电压最高极限，充电器的设计应满足此条件。电池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。

2. Discharging 放电

2.1 Discharging current 放电电流

The cell 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 Over-discharging 过放电:

It should be noted that the cell would be at an 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 cell shall be charged periodically（charging to 3.85V per 90 days at 25~35℃） to maintain between3.6V and 3.9V. 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 cell battery pack shall start with a low current (0.01C) for 15 - 30 minutes, i.e. precharge, before rapid charging starts. The rapid charging shall be started after the （individual）cell voltage has been reached above 3.0V within 15 - 30 minutes that can be determined with the use of an appropriate timer for pre-charge. In case the (individual) cell voltage does not rise to 3.0V within the pre-charge 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，它可能会用其自放电特性而处于某种过放电状态。为防止过放电的发生，电池应定期充电(环境温度是 25~35℃，每 90 天进行补电至 3.85V)，将其电压维持在 3.6 至 3.9V 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）电池的电压达到 3.0V 以上，再进行快速充电。可用一记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 3.0V 以上，充电器应能够停止下一步快速充电，并显示该电池/电池正处于非正常状态。

5. 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。

5.1 Soft Aluminum foil 铝箔包装材料

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

5.2 Top sealed edge 顶封边

Sealing edge is very flimsy.

● Don't bend or fold sealing edge

顶封边非常容易受到损害。

● 禁止弯折顶封边。

5.3 Mechanical shock 机械撞击

● Don't Fall, hit, bend battery body.

● 禁止坠落、冲击、弯折电池。

5.4 Short 短路

Short terminals of battery is strictly prohibited, it may damage battery.

任何时候禁止短路电池，它会导致电池严重损坏。

6 Others 其它事项

6.1 Prohibition of dis-assembly 严禁拆卸电池

1) Never disassemble the cells 在任何情况下不得拆解电池

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。

6.2 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，否则会引起电池燃烧，这是非常危险的，应绝对禁止。

6.3 Prohibition of cells immersion into liquid such as water 严禁将电池浸入液体中，如水中。

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）。

6.4 Battery cells replacement 电池的更换

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

更换电池应由电池供应商或设备供应商完成，用户不得自行更换。

6.5 Prohibition of use of damaged cells 禁止使用已经损坏的电池

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 an electrolyte, an 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。

有电解液泄漏或闻到异常味道的电池应远离火源以避免着火。