深圳特威新能源有限公司

SHENZHEN TOPWAY NEWENERGY CO.LTD

□品□□书□

Specification For Approval

客户名称（Customer Name）： Nicolai Electronics

□池型号 （Model）： TW104050-2500mAh

Prepared制定	Checked核	Approved核准
	岑振	

Custom approval (客户承)

Comment（注）：

Customer's signature/ Date(客户章/日期)：

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Revision History

(修)

Revision	Description	Date	Originator	Approval
A	New release	2025-08-07		

Content

目

1. Scope

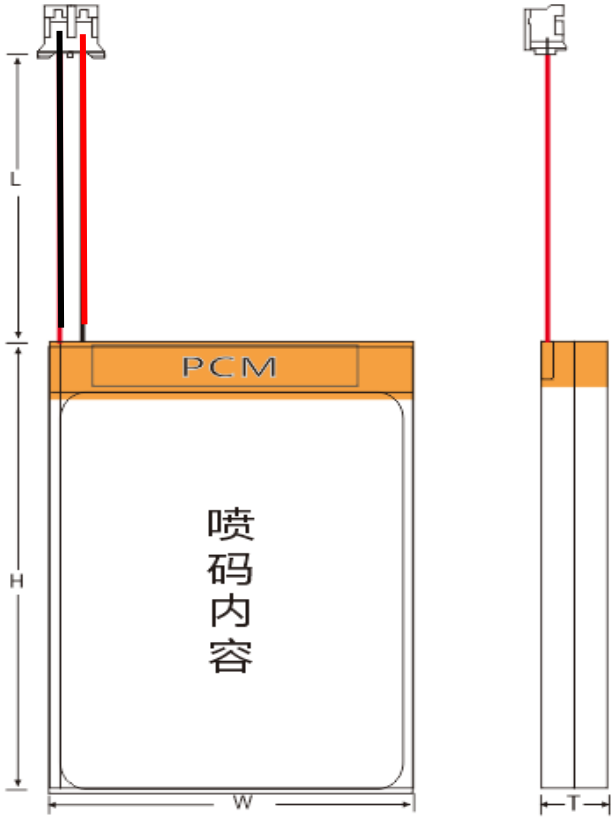
This document describes the Product Specification of the Lithium-ion Polymer (LIP) rechargeable battery supplied by Shenzhen Topway new energy Co,ltd

适用范

本格明书描述了深圳特威新能源有限公司生的可充聚合物离子池的品性能指.

2. Battery Dimensional Drawing (all unit in mm, not in scale)

外形尺寸 (位：mm;未按比例)



Items	Description	Dimension and Spec	Connect wires: Wire spec: UL1007 24AGW Red wire: connect to"+" Black wire: connect to"-" Connector: PH2.0-2P 反向
T	Thickness 厚度	10.2mm(Max)	
W	Width 度	40.0±0.5mm	
H	Length 度	51.5±0.5mm	
L1	Wire length 度	100.0±3.0 mm(∅1.4)	

3. Specifications of single battery

池技格

No.	Items	Specifications
3.1	Charge voltage 充	4.2V
3.2	Overcharge protection voltage 充保	4.28V±0.025V
3.3	Nominal voltage □ □	3.70V
3.4	Nominal capacity 称容量	2500mAh @0.2C Discharge(□□)
3.5	Charge current 充流	Standard charge: 0.2C □□ □ □□ 0.2C Rapid charge 0.5C □ □ □ □ 0.5C
3.6	Charging time 充	Standard charge: 6.0-7.0 hours (Ref.) □准充□□ 6.0-7.0 □ (参考) Rapid charge 3.0-4.0 hours (Ref.) 快速充： 3.0-4.0 小(参考)
3.7	Max. discharge current □ □ □ □	1.0C
3.8	Discharge cut-off voltage 放截止	3.0V
3.9	Operating temperature 工作温度	Charging: 0°C ~ 45°C 充： 0°C ~ 45°C Discharging: -10°C ~ 60°C 放： -10°C ~ 60°C
3.10	Storage temperature 存温度 Storage humidity 存湿度	Cless than 1 month□ -10°C ~ +45° □ □ □ □ □ □ -10°C ~ +45° Cless than 3 month□ -10°C ~ +35° □ □ □ □ □ □ -10°C ~ +35° 45% --75%RH

3.1.2 Test parameters 测试条件

Unless otherwise specified, all tests stated according to following:

除非有特殊明，所有的条件要求如下：

Temperature 温度： 25±3℃

Humidity 湿度：45～75%RH

Use standard charge and standard discharge method □ □ □ □ □ □ □ □ □

4.Performance Criteria

性能□□测试□

4.1 Electrical characteristics 充放性能

NO.	Items	Test Method and Condition	Criteria
4.1.1	Standard Charge 准充	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 0.5C□□□□4.2V，再恒 4.2V 充直至充流□□ ≤0.02C	
4.1.2	standard discharge 准放	After the battery charging standard, with 0.2 C to terminate the current discharge voltage of 3.0V. 池准充后 ,以 0.2C 的流放至止 3.0V.	
4.1.3	Cycle Life 循寿命	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 条件： 充：0.5C 充到 4.2V 放：0.2C 放到3.0V 当放容量降至初始容量的 80%，所完成的循次数定池的循寿命	≥300□
4.1.4	Storage Characteristics 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. 准充后，在 No.5.1 条件下存 30 天，再以 0.2C 放至3.0V 所放出的容量。	Residual capacity >90% □□□>90%
4.1.5	Initial impedance of battery 池初始内阻	Internal resistance measured at AC 1KHz after 50% charge 半充状下，量其 AC 1KHz 下的交流阻抗	≤180mΩ
4.1.6	battery Voltage 池	As of shipment. 出状	3.80V~4.05V

4.2 Mechanical characteristics 机械特性

No.	Items	Test Method and Condition	Criteria
4.2.1	Vibration Test 振测	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. 将准充后的池固定在振台上，沿 X、Y、Z 三个方向各振分，振幅 1.6mm，振率 10Hz~55Hz，每分化 1Hz。	No leakage 无泄漏 No fire 不起火
4.2.2	Drop Test 跌落测	The cell is to be dropped twice from a height of 1 meter onto concrete ground. 将准充后的池从 1□ □ □ □ □ □ □ □ □ □ □ 2□	No explosion, no fire, no leakage. 不爆炸、不起火、 不泄漏

4.3 Environmental specification 境适性能

No.	Items	Test Method and Condition	Criteria
4.3.1	Long Time Storage 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. 测量池的初始容量□ □池 □ □□ 3.85±0.03V后，测量池存前的初始状，分别温存 3个月、6个月后，测量池的最状,然后0.5C/0.2C循3次池的放。	Storage 3 months of battery≥4.25h； Storage 6 months of battery≥4h； 存3个月的池≥4.25h； 存6个月的池≥4h
4.3.2	Static Humidity 恒定湿性能	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. 池准充后，置于温度40±2℃，相湿度90-95%的恒温恒湿箱中，置16h后，取出池置2h，察池的外化并以0.2C放至止3.0V□	Discharge capacity ≥70% No remarkable deformation \ smoking \ leakage \ explosion 剩余容量≥70% 池外无明形、不冒烟、不爆炸
4.3.3	Discharge Characteristics under Different Temperature 不同温度下的放性能	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. 测量池的初容量和初始状□ □□□□ □□ □ □□ □□ 60±2℃条件下恒□□□2h、以0.2C放至3.0V，然后在室温条件下准充，□□ 按照60±2℃/0±2 ℃/-10±2 ℃的序在相的恒温条件下置2h，以0.2C测量池□的止容量，最后在室温状下置2h测量池的最□□ □□ □□ □□ □ □□ □□	Discharge capacity / Nominal capacity *100% A)60 ℃≥95%； B)25℃≥100%； B)0℃≥85%； C)-10 ℃≥60%；

4.4 Safety Specification（cell）安全性能(池)

No.	Items	Test Method and Condition	Criteria
4.4.1	Overcharge Test 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. 池 准放"后，用2□ □ □ □ □ □ □ □ □ 4.6 V，然后恒充小	No explode, No fire 无爆炸，无起火
4.4	2 Over discharge Test 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 □池按□准充模式充后，□ □ 以 0.5C 放至止后，外接 30Ω 放 7h.	No explode, No fire 无爆炸，无起火
4.4.3	External Short - Circuiting Test 测试	After cells are charged on right way , discharging the battery cell directly with 100mΩ resistance for one hour. 池 准充"以后，用阻100 mΩ将正极两端直接接1小	No explode, No fire 无爆炸，无起火
4.4.4	Heating Test 高温	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 池室温"准充"以后，然后放入 5ºC/分的循烘炉，在130ºC保持10分后停止。	No explode, No fire 无爆炸，无起火
4.4.5	Impact Test 机械冲	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 池 准充"以后，池放在平板上，用直径15.8mm的棒放在池中部，重物从610mm高落下作用在棒上行冲	No explode, No fire 无爆炸，无起火

4.5.Visual inspection

外

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

不允许有影响性能的外观缺陷，如划痕、裂、气、泄漏等。□ □□ □□ □ □ □ □ □ □ 响

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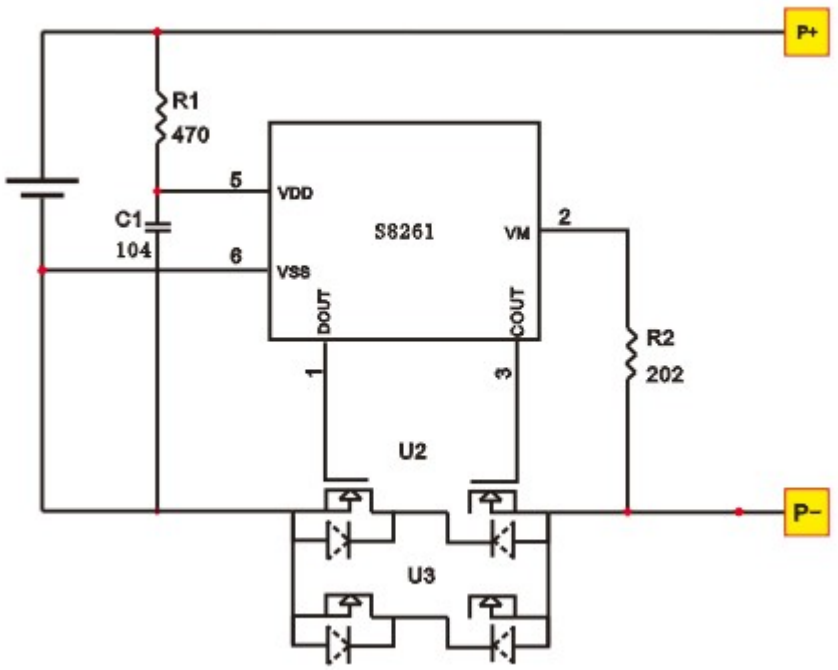
4.6. Protection Functions
保功能

4.6.1 Electrical characteristics 气特性

No	目/Item	条件/Condition	格/Specification
4.6.2.1	充 Overcharge	保 /Detection voltage	4.28V±0.025V
4.6.2.2		Release voltage	4.08V±0.05V
4.6.2.3		保延 /Detection delay time	960ms～1400ms
4.6.2.4	放 Over discharge	保/Detection voltage	3.00V±0.05V
4.6.2.5		恢复/ Release voltage	3.00±0.10V
4.6.2.6		保延 / Detection delay time	115～173ms
4.6.2.7	放流 Over discharge current	放流保流/Over current	3.0～5.0A
4.6.6.0		放流保延/delay time	7.2～11ms
4.6.2.9	短路保 Short detection	短路保延/ Short detection delay time	320～540μs
4.6.2.10		恢复条件/Release Conditions	断开 /Cut off load
4.6.2.11	 Normal current consumption	工作状下自耗 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 路板原理



4.6.3 PCM BOM /保板物料清

No.	器件号 Location	描述 Description	格/part No. Specification	□ □ □ □ Pack type	□ □ Qty	厂商/注 Maker/Remark
1	U1	片保 IC Protection IC	S8261ABJ-G3J	SOT-23-6	1	Sieko
2	U2	片 MSOFET SMD MOSFET	8205A	TSSOP-8	2	DP
3	R1	片阻 SMD Resistance	470Ω, ±5%	0603	1	YAGEO
4	R2	片阻 SMD Resistance	2.0KΩ, ±5%	0603	1	YAGEO
5	C1	片容 SMD Capacitance	0.1μF/-20%+80%	0603	1	YAGEO
6	PCB	双，油，	30.0*3.6*0.6mm	FR4	1	FR4 GREEN OIL

5. Storage 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

期存

期存的池（超 3 个月）置于干燥、凉爽。

存 3.60～3.95V

且存境要求: 温度：0-28°C; 湿度： 60 ±15% RH。

6. Period of warranty 保期

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.

保期从出之日起一年。如果是池本身的缺陷而不是用用造成的量，本公司确保更。

7.Others 其它事

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

任何本格中未提及的事，双方商确定□ □□ □ □ 书

Appendix

附

Handling Precautions and Guideline

For LIP (Lithium-Ion Polymer) Rechargeable Batteries

聚合物离子充池操作指示及注意事

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"聚合物离子充池操作指示及注意事"适用于深圳特威新能源有限公司生的池。

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：

客户若需要将池用于超出文件定以外的，或在文件定以外的使用条件下使用池，事先系特威，因需要行特定的以核池在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.

□ □ □ □

于在超出文件定以外的条件下使用池而造成的任何意外事故，特威概不。

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，特威会以面形式告知客有关正确操作使用池的改措施。

1. Charging 充

1.1 Charging current 充流:

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.

充流不得超本准中定的最大充流。使用高于推荐流充将可能引起池的充放性能、机械性能和安全性能的，并可能会致或泄漏。

1.2 Charging voltage 充:

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.

充不得超本准书中定的定（4.2V/池）。4.25V □充最高极限，充器的足此条件。□□ □ □ □ □□池禹□□ □ □定□□□□，将可能引起池的充放性能、机械性能和安全性能的，可能会致或泄漏。

2. Discharging □□

2.1 Discharging current 放流

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.

放流不得超本准书定的最大放流，大流放会致池容量并致。

2.2 Over-discharging 放 ：

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，在池期未使用期，它可能会用其自放特性而于某种放状。防止放的生，池定期充(境温度是 25~35℃，每 90 天行至 3.85V)，将其持在 3.6□ 3.9V 之。放会致池性能、池功能的失。充器有装置来防止池放至低于本准定的截止。此外，充器有装置以防止重复充，步如下：

池在快速充之前，先以一小流（0.01C）充 15~30 分，以使（每个）池的达到 3.0V 以上，再行快速充。可用一器来充步。如果在充定内，（个 别）池的仍未升到 3.0V 以上，充器能停止下一步快速充，并示池/池正于非正常状。

***5.* Handling of Cells** *池操作注意事*

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

由于池属于包装，保池的性能不受害，必小心池行操作。

5.1 Soft Aluminum foil 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

箔包装材料易被尖部件，如片，尖。

- 禁止用尖部件碰撞池；
- 取放池，修短指甲或戴上手套；
- □□□□□□□□□□□□□□□

5.2 Top sealed edge 封

Sealing edge is very flimsy.

- Don't bend or fold sealing edge

□封非常容易受到害□□。

- 禁止弯折封。

5.3 Mechanical shock 机械撞

- Don't Fall, hit, bend battery body.
- 禁止落、冲、弯折池。

5.4 Short 短路

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

任何候禁止短路池，它会致池重坏。

6 Others 其它事

6.1 Prohibition of dis-assembly 禁拆卸池

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

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

□□□池可能会致内部短路，□而引起鼓气、着火及其它。□ □□□

2) Electrolyte is harmful 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.

聚合物池理上不存在流的解液，但万一有解液泄漏而接触到皮肤、眼睛或身体其它部位，立即用清水冲洗解液并就医。

6.2 Prohibition of dumping of cells into fire 禁将池投入火中

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，不得燃池或将池投入火中，否会引起池燃，是非常危的，禁止。

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

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

不得将池浸泡液体，如淡水、海水、料（果汁、咖啡等）。

6.4 Battery cells replacement 池的更

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

更池由池供商或供商完成，用不得自行更。

6.5 Prohibition of use of damaged cells 禁止使用已坏的池

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.

池在程中可能因撞等因而坏，若池有任何异常特征，如池塑料封坏，外壳破，到解液气体，解液泄漏等，池不得使用。有解液泄漏或到异常味道的池离火源以避免着火。