



SHENZHEN TECH-POWER TOP INDUSTRY CO., LTD

Polymer Lithium ion Battery

Product Specifications

Battery Size: 425650

Number of Samples: 10PCS

Capacity: 1200mAh

Date of Sending Sample: 2009-07-22

No. of Confirmation: 911-425650-111 **Customer Code:** 62178

APPROVAL	CHECKED	DRAFT

Customer: _____

CUSTOMER APPROVAL	STAMP

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Product Specifications –TP425650-1

Revision History

Date	Description
2009-09-09	First Issue

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1. Scope :

This specification shall be applied to polymer lithium-ion battery—model number TP425650 manufactured by SHENZHEN TECH-POWER TOP INDUSTRY CO., LTD, P.R.C

2. System : Rechargeable Lithium-Ion Polymer Battery

3. Battery Model : TP425650

4. Ratings:

4.1 Min Capacity : 1200mAh(0.2C) ;

4.2 Nominal Voltage : 3.7V

4.3 Overcharge Detection Voltage : 4.28±0.025V

4.4 Max. Charging Current : 1.0C

4.5 Charging Method : constant current & constant voltage

Standard Charge(0.2C) : 0.2 C×7.5hrs

Quick Charge(1.0C) : 1.0 C×2.5hrs

4.6 Max. Discharge Current : 1.0C

4.7 Over discharge detection voltage : 3.0±0.05V

4.8 Impedance : $\leq 180\text{m}\Omega$

4.9 PACK Dimensions : (Ref. To the attached drawing)

Thickness : 4.4 mm MAX

Width : 56.5 mm MAX

Height : 51 mm MAX

4.10 Operating Temperature

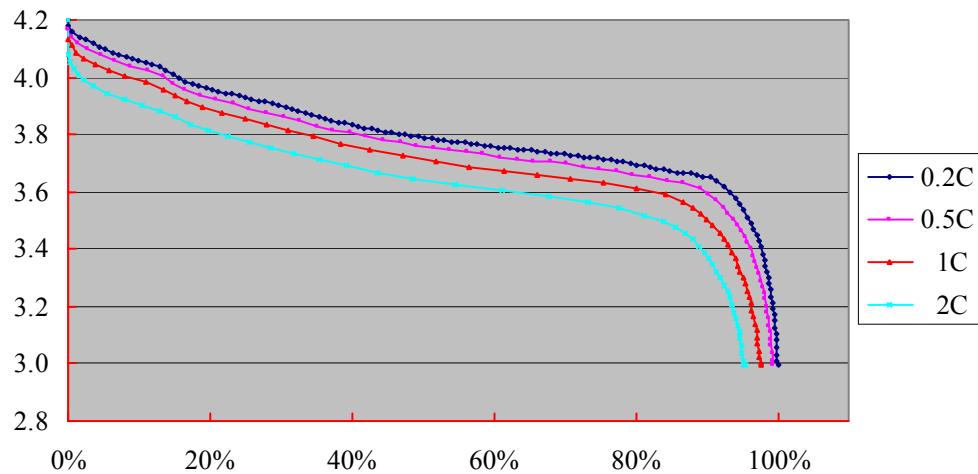
Discharge : -20°C~60°C (-40°F~140°F)

Charging : 0°C~45°C (32°F~113°F)

Storage : -20°C~45°C (-40°F~113°F)

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5. Characteristic Curves:



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6. Battery Characteristics

6.1 Electro-Chemical Characteristics

6.1.1 Discharge Characteristics

Standard: Discharge capacity/Nominal capacity×100%

- A) 0.2 C≥100%
- B) 0.5 C≥98%
- C) 1 C≥95%
- D) 2 C≥90%

The curves of charging and discharging should be smooth

Test Method: Charge the battery at 1 C under the condition of normal atmospheric pressure, f 25°C ±5°C and 45%~80% RH (unless otherwise specified, storage and charging should be conducted as this regime) , then rest for 10min and discharge at 0.2C、0.5C、1C to 3.0V respectively. Charge/discharge cycle can be conducted for 3 times before meeting the Standards (the same below) .

6.1.2 Normal Storage

Standard : Residual capacity≥Nominal capacity×85%

Recoverable capacity≥Nominal capacity×90%

OCV decrease≤3%

Impedance increase≤20%

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Test Method : Measure the initial status of the battery. Store for 30 days after Standard charged and measure the final status, then discharge at 0.5C to **3.0V** measuring residual capacity ; 1C/0.5C measure recoverable capacity. Charge/discharge cycle can be conducted for 3 times before meeting the requirement.

6.1.3 Cycle Life

Standard : Capacity \geq Nominal capacity $\times 80\%$

Test Method : Measure initial status and initial capacity, then conduct 1C/1C cycle for 300 times and measure final status. The initial discharge plateau should be no less than 40 min.

6.1.4 Long Time Storage

Standard : 0.2C discharge duration;

stored for 3 months $\geq 4.5h$;

stored for 6 months $\geq 4.25h$;

Stored for 12 months $\geq 4h$.

Test Method : Measure initial capacity . Measure the initial status of the battery after charging to **3.8±0.02V**. Measure the final status after storing for 3、6、12 months at room temperature respectively. Conduct 1C/0.2C cycle for 3 times and record the discharge duration.

6.2 Safety Characteristics

6.2.1 Overcharge

Standard : No fire\explosion; Max. temperature $< 130^{\circ}\text{C}$;

Test Method : Standard charge. Measure the initial status of the battery to make sure the battery is normal (the same below). Charge at 3 C to **4.9V**, then change to charge with constant voltage till the current less than or equal to 0.01 C. Record the process temperature and measure final status.

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6.2.2 Over Discharge

Standard : No fire\explosion

Test Method : Standard charge. Measure the initial status of the battery. Discharge at 1 C to 3.0V and then connect the positive and negative terminals with a resistor of 10Ω for 2 weeks. Observe the variation of the battery's appearance.

6.2.3 Short circuit at room temperature

Standard : No fire\explosion ; Max. Temperature< 130°C

Test Method : Standard charge. Measure the initial status of the battery. Keep the battery into a ventilation cabinet and short-circuit the positive and negative terminals directly (general resistance shall be less than or equal to $50m\Omega$). Stop the test when the temperature falls 10°C lower than the peak value. Observe the variation of the battery's appearance and temperature.

6.2.4 Short circuit at high temperature

Standard : No fire\explosion ; Max. temperature< 130°C

Test Method : Standard charge. Measure the initial status of the battery. Keep the battery into a ventilation cabinet of $60\pm2°C$ and store for 3h. Short-circuit the positive and negative terminals directly (general resistance shall be less than or equal to $50m\Omega$) at this temperature. Supervise the variation of the battery's temperature in the process of the test; stop the test when the temperature falls 10°C lower than the peak value. Observe the variation of the battery's appearance and temperature.

6.2.5 Nail Penetration

Standard : No fire\explosion

Test Method : Standard charge. Measure the initial status of the battery. Keep the battery connected with a thermocouple on a nail penetration apparatus, then penetrate through it with a 3mm diameter nail rapidly near the center of its biggest surface. Observe the variation of the battery's appearance and temperature.

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6.2.6 Impact

Standard : No fire\explosion

Test Method : Standard charge. Measure the initial status of the battery. Keep the battery connected with a thermocouple and put it on a impaction platform, place a 15.8mm diameter bar across the center of the biggest surface, then let a 9.1kg hammer fall freely onto the platform from a height of 610mm. Observe the variation of the battery's appearance.

6.2.7 Crush

Standard : No fire\explosion

Test Method : Standard charge. Measure the initial status of the battery. Keep the battery connected with a thermocouple and put it into two iron sheets (the biggest surface of the battery should be parallel to the surface of the crash platform). Apply 13KN force to crush instantly. Observe the variation of the battery's appearance.

6.2.8 Hot Oven

Standard : No fire\explosion

Test Method : Standard charge. Measure the initial status of the battery. Keep the battery connected with a thermocouple and put it into gravity convection or circulating air oven. Temperature is raised at a rate of $5^{\circ}\text{C}\pm2^{\circ}\text{C}$ per minute to a temperature of $130^{\circ}\text{C}\pm2^{\circ}\text{C}$ and remained for 10min at this temperature. Observe the variation of the battery's appearance.

6.3 Adaptation to Environment Characteristic

6.3.1 Thermal Cycle

Standard : No leakage\smoking\fire\explosion\vent

Test Method : Standard charge, then store the battery at $75\pm2^{\circ}\text{C}$ for 48h, then -20°C for 6h and room temperature for 24h. Observe the variation of the battery's appearance.

6.3.2 Static Humidity

Standard : Discharge capacity after storage/Nominal capacity $\times100\%>60\%$

Test Method : Standard charge. Put the battery into a $40^{\circ}\text{C}\pm5^{\circ}\text{C}$ and 95%RH chamber for 168h, then get it out and store it for 2h at room temperature. Observe the variation of the battery's appearance and then discharge at 1C to 3.0V measuring the final capacity.

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6.3.3 Free Drop

Standard : No leakage\smoking\fire\explosion ; Discharge duration \geq 51min

Test method : Standard charge. Measure the initial status of the battery. Measure initial status.

Then let it self fall off from a height of 1.83m (the lowest height) to a smooth concrete surface. The drop is implement totally for 10 times (6 sides and 4 arises drop respectively). Measure the final status after drop, then discharge at 1C to 3.0V measuring discharge duration.

6.3.4 High-low Temperature Discharge

Standard : No leakage\smoking\fire\explosion ; No remarkable deformation

Discharge capacity/ Nominal capacity $\times 100\%$;

A) 60 °C: \geq 95% ; C)-10 °C: \geq 70%

B) 0 °C: \geq 85% ; D)-20 °C: \geq 60%

Test Method : Standard charge. Measure the initial status of the battery. Then store it for 3h at 60 \pm 2°C and discharge at 0.5C to 3.0V, then standard charge at room temperature and store for 20h according to the requirement of 0 \pm 2°C/-10 \pm 2°C/-20 \pm 2°C and discharge at 0.5C measuring corresponding discharge capacity. Then store for 2h at room temperature. Measure final status and observe the variation of the battery's appearance.

6.3.5 Vibration

Standard : No remarkable damage\leakage\smoking\explosion

Residual capacity/ Nominal capacity \geq 95%

OCV decrease \leq 0.5%

Impedance increase \leq 20%

Test Method : Standard charge. Measure the initial status of the battery. Equip it to the vibration platform, adjust and prepare the test equipment according to following vibration frequency and relevant swing, conducting frequency sweeping from X, Y, Z three directions, each from 10Hz to 55Hz for 30 minutes of recycling, rating of which is 1oct/min :

A) vibration frequency : 10Hz~30Hz Displacement breadth (single swing) : 0.38mm

B) vibration frequency : 30Hz~55Hz

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Displacement breadth (single swing) : 0.19mm

Measure final status after sweeping and observe the variation of the battery's appearance.

Comments: the definitions of some nomenclatures of this specification

(1) 1C Standard Charge :

Charge at 1C to **4.2V** under $20^{\circ}\text{C}\pm5^{\circ}\text{C}$, then change to charge with constant voltage till the current decreases to 0.01 C.

(2) Initial Status:

Initial voltage、initial impedance and thickness of the battery.

(3) Final Status:

Final voltage、final impedance and thickness of the battery.

(4) Residual Capacity:

The first discharge capacity after being tested by the specific procedure.

(5) Standard Cycle :

After standard charge at 1C to **4.2V**, rest for 10min, then discharge at 1C to **3.0V**.

(6) Recovery Capacity:

The discharge capacity by implementing charge-discharge cycle repeatedly after being tested by the specific procedure.

(7) 1C/1C(1C/0.5C、1C/0.2C): Charge at 1C to limit charge voltage **4.2V**, then change to charge with constant voltage until the current less than or equal to 0.01 C, rest for 5min, then discharge at 1C(0.5C、0.2C) to **3.0V**.

7 Warranty Period& Product Liability

Warranty period of this product is 12 months from manufacturing code. TECH-POWER TOP INDUSTRY Co.,Ltd is not responsible for the troubles caused by mishandling of the battery which is clearly against the instructions in this specification. When TECH-POWER TOP INDUSTRY Co.,Ltd finds any new facts which require modification of this document, we will inform you.

8. Indicatuons on Battery Pack

The following warnings should be indicated on the battery packs.

- Use a specified charger.
- Do not throw the battery into fire or heat.

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- Do not short-circuit the battery terminals.
- Do not disassemble the battery.

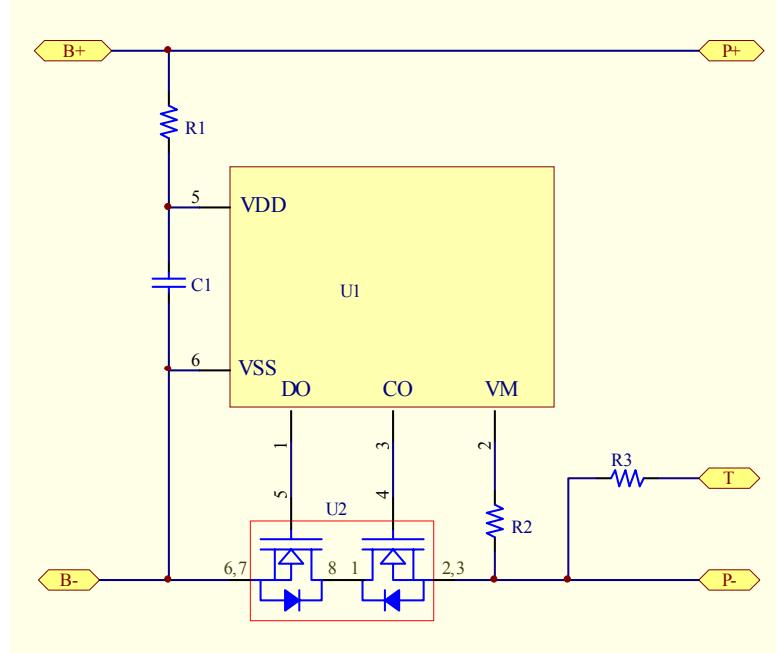
9. Warnings and Cautions in Using the Battery

To prevent the battery from leaking, heating or explosion, please observe the following precautions :

- Do not immerse the battery in water or seawater, and keep the battery in a cool and dry environment if it stands by.
- Do not use or leave the battery near a heat source as fire or heater.
- Use the Lithium-ion battery charger specifically for that purpose when recharging.
- The battery only can be soldered on the Al/Ni composite strip of the bottom.
- Do not reverse the position and negative terminals.
- Do not connect the battery to an electrical outlet.
- Do not discard the battery in fire or a heater.
- Do not short-circuit the battery by directly connecting the positive and negative terminals with metal objects.
- Do not transport or store the battery together with metal objects such as hairpins, necklaces, etc.
- Do not strike, trample or throw the battery.
- Do not directly solder the battery and pierce the battery with a nail or other sharp objects.
- Do not use or leave the battery at high temperature (for example, at strong direct sunlight or in a vehicle in extremely hot weather). Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.
- Do not use the battery in a location where static electricity and magnetic field is great, otherwise, the safety devices may be damaged, causing hidden trouble of safety.
- If the battery leaks, and the electrolyte get into the eyes, do not rub the eyes, instead, rinse the eyes with clean water, and immediately seek medical attention. Otherwise, it may injure eyes.
- If the battery gives 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 charger and stop using it.
- In case the battery terminals are dirty, clean the terminals with a dry cloth before using. Otherwise the performance may be hurt due to the poor connection with the instrument.
- Be aware discarded batteries may cause fire or explosion, tape the battery terminals to insulate them.

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10、Circuit Diagram



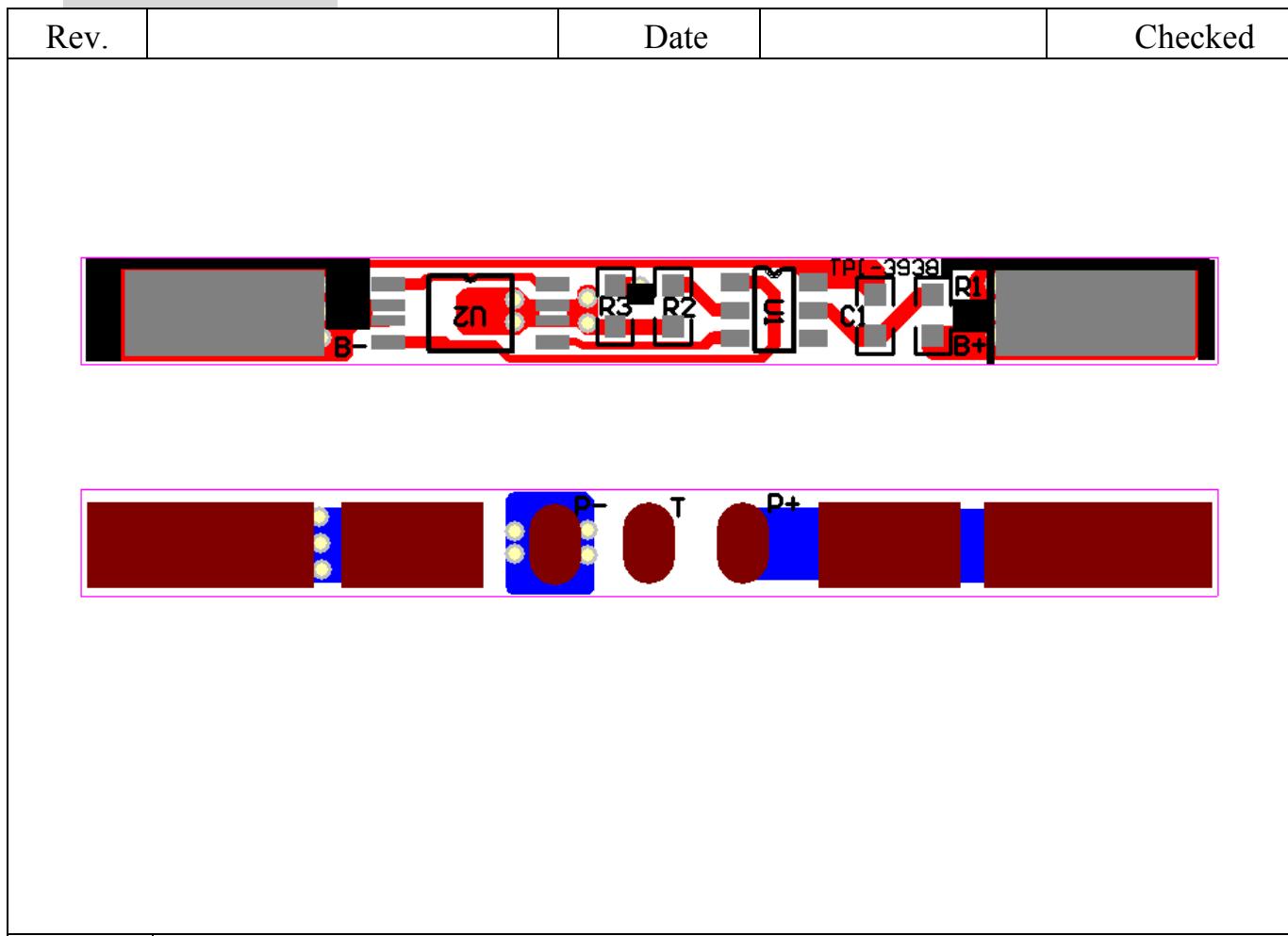
11、Parts List

No.	Item	Description				Type	Qty	Met
1	Capacitor	0.1uF	10%	25V	0603	PCS	1	C1
2	Resistor	470R	5%	1/16W	0603	PCS	1	R1
3	Resistor	2K	5%	1/16W	0603	PCS	1	R2
4	NTC	10K	5%	1/16W	0603	PCS	1	R3
5	Protection IC	G3J			SOT-23-6	PCS	1	U1
6	Power mosfet	8205			TSSOP-8	PCS	1	U2
7	PCB	TPI-3938				PCS	1	

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12 · PCB DIAGRAM



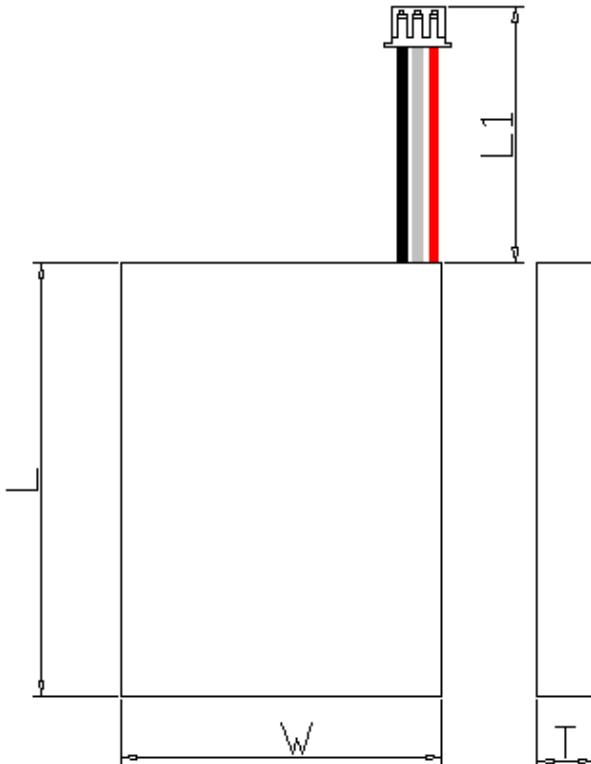
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13 · Size

Rev.	Revision note	Date	Signature	Checked																		
																						
<table border="1"><thead><tr><th>Item</th><th>Description</th><th>Dimension and specification</th></tr></thead><tbody><tr><td>T</td><td>Thickness</td><td>4.4mm(max)</td></tr><tr><td>W</td><td>Width</td><td>56.5 mm(max)</td></tr><tr><td>L</td><td>Length</td><td>51mm(max)</td></tr><tr><td>L1</td><td>Cable length</td><td>47 ± 3mm</td></tr><tr><td></td><td>Cable Spec</td><td>1571#26AWG</td></tr></tbody></table>					Item	Description	Dimension and specification	T	Thickness	4.4mm(max)	W	Width	56.5 mm(max)	L	Length	51mm(max)	L1	Cable length	47 ± 3 mm		Cable Spec	1571#26AWG
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CHECK		Cable tolerance		VER	0 · 0	TP425650	
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