Specification Approval Sheet

Name: **Tenergy Lithium-ion Polymer Battery**

Model: **30540-0**

SPECS: **3.7V 120mAh 282327 Lipo Cell**

Approved By	Checkup	Make

Customer Confirmation	Signature	Date
	Company Name:	
	Stamp:	

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1. **MODIFIED LIST**

Product Modified Record List

Revision	Date	Mark	Modified content	Approved by
A0	2014-02-23	/	NEW RELEASE	/

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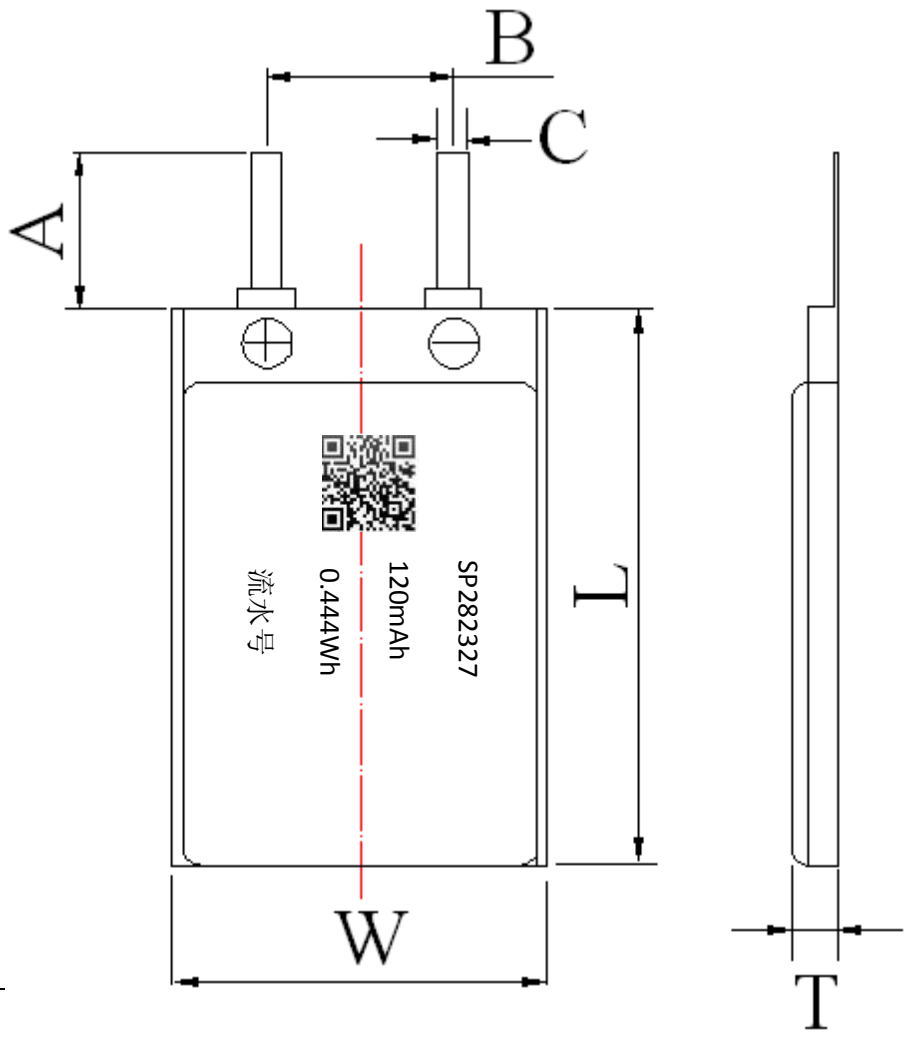
2 .Scope

This specification describes the basic performance, technical requirement, testing method, warning and caution of the Li-ion Polymer rechargeable battery pack, the pack defined in this documentation is an assembly which include battery, PCM and wire, the specification only applies to Tenergy Corporation.

3. Initial Dimension



Unit（mm）

T Max	2.8	W Max	23.8	H Max	27.5
B	9.3±2.0	A	5.0±2.0	C	2.0±0.1

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4.Specification

NO.	Item	Specifications	
4.1	Minimum capacity	120mAh 0.2C Discharge	
4.2	Initial Impedance	≤220mΩ	
4.3	Weight	Approx：2.8 g	
4.4	Nominal voltage Fully charge voltage(FC) Fully discharge voltage(FD)	3.7V 4.2V Defined in this DOC: FC = 4.2V 3.0V Defined in this DOC: FD = 3.0V	
4.5	Standard charge current	0.5 C	
4.6	Standard charging method	0.5C CC（constant current）charge to FC, then CV(constant voltage FC)charge till charge current decline to ≤0.01C	
4.7	Charging time	Standard Charging Approx 3.5 hours	
4.8	Max. charge current	0℃～15℃	0.2C
		15℃～25℃	0.5C
		25℃～45℃	1C
4.9	Max. continuous discharge current	0℃～15℃	0.2C
		15℃～60℃	1 C
4.10	Standard Discharge Current	Constant current 0.5C end voltage FD	
4.11	Charge cut-off voltage	FD	
4.12	Discharge cut-off Voltage	FC	
4.13	Storage temperature -20℃~60℃	≤1 month	Percentage of recoverable capacity no less than 80% of the initial capacities
	-20℃~45℃	≤3 month	
	-20℃~28℃	≤1 year	
4.14	Recoverable capacity	Constant current 0.5C charge to FC, then constant voltage FC charge to current declines to 0.01C, rest for 10min, constant current 0.5C discharge to FD, rest for 10min.Repeat above steps 3 times, recording the maximum capacity	
4.15	Storage Humidity	≤75% RH	
4.16	Appearance	Without distortion and leakage	
4.17	Standard testing condition	Temperature ： 23±5℃ Humidity ： ≤75%RH Atmospheric Pressure ： 86-106 Kpa	

Remark: 1.From 4.1 to 4.12, the testing condition is following 4.17 (standard testing

condition)

2.Operating temperature: charging 0℃~45℃; Discharging：-10℃~60℃

If the working condition is out of 4.17 , the performance will be some shift.

5 General Performance

No.	Item	Test Methods and Condition	Criteria
5.1	0.2C Capacity	At standard testing condition, after standard charging, rest battery for 10min, then discharging at 0.2C to voltage FD, recording the discharging time.	≥300min
5.2	1C Capacity	At standard testing condition, after standard charging, rest battery for 10min, then discharging at 1C to voltage FD, recording the discharging Capacity	≥54min
5.3	Cycle Life	At standard testing condition, constant current 0.5C charge to FC, then constant voltage charge to current declines to 0.01C, rest 10min, constant current 0.5C discharge to FD, rest 10min. Repeat above steps till continuously discharging capacity Higher than 80% of the Initial Capacities of the Cells	≥300 times
5.4	Capability of keeping electricity	At standard testing condition, After standard charging, no outer loading circuit, rest the pack 28days, discharging at 0.2C to voltage FD, recording the discharging time.	≥240min

6 Environment Performance

No.	Item	Test Methods and Condition	Criteria
6.1	Discharge at high temperature	At standard testing condition, after standard charging, rest the Cells 4h at 60±2℃, then discharging at 1C to voltage FD, recording the discharging time.	≥54min

6.2	Discharge at low temperature	At standard testing condition, after standard charging, rest the Cells 16h at -10±2℃, then discharging at 0.2C to voltage FD, recording the discharging time.	≥210min
6.3	Thermal shock	After standard charging, put the pack 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.	No fire, no smoke

7 Safe Characteristic

No.	Item	Test Methods and Condition	Criteria 标准
7.1	Overcharge testing （NO PCM）	At standard testing condition， charging cell with constant current 3C to voltage 4.6V, then with constant voltage 4.6V till current decline to 0. Stop test till cells	No smoke or fire
7.2	Over-discharge testing (NO PCM)	At standard testing condition, the pack be discharge to cut-off voltage, then connect with external load of 30 ohm for 24 hours.	No fire, no smoke, no leakage.

※ Above testing of safe characteristic must be with protective equipment.

8.Warnings

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

- The soft aluminum packing foil is very easily damaged by sharp edge parts such as Ni-tabs and needles, do not strike battery with any sharp edge parts.
- Do not immerse the battery in water and seawater
- Do not use and leave the battery near a heat source such as fire and heater
- When recharging, use the battery charger specifically for that purpose
- Do not reverse the positive and negative terminals
- Do not connect the battery to an electrical outlet
- Do not discard the battle in fire or heat it
- The battery tabs are not so stubborn especially for aluminum tab. Do not bend tab.
- Do not short-circuit the battery by directly connecting the positive and negative terminal with metal object such as wire.
- Do not transport and store the battery together with metal objects such as necklaces, hairpins etc.

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

9. Cautions

- Do not use or leave the battery 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.
- Do not use it in a location where static electricity is great, otherwise, the safety devices may be damaged and cause hidden trouble of safety.
- If the battery 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.
- 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 charge and stop using it.
- In case the battery 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.
- Be aware discharged battery may cause fire, tape the terminals to insulate them.
- The batteries should be stored at room temperature, charged to about 40% to 60% of capacity. In case of over-discharge, batteries should be charged with standard charging method for one time every 3 months while storing and batteries should be charging-discharge with standard method for one time after being stored more than a year in order to activate it and restore energy.

10. Handling of Cells

1 Soft Aluminous foil

Easily damaged by sharp edge parts such as pins and needles, Ni-tabs, comparing with metal-Can - cased LIB.

- 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

2 Sealed edge may be damaged by heat above 100°C, bend or fold sealed edge.

3 Prohibition short circuit

Never make short circuit cell. It generates very high current which causes heating of the cells, and may cause electrolyte leakage, gassing or explosion that is 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. An appropriate circuitry with PCM shall be employed to protect accidental short circuit of the battery pack.

4 .Mechanical shock

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

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

5 Handling of Tabs

The battery tabs are not so stubborn especially for aluminous tab.

Don't bend tab.

Do not bend tabs unnecessarily.

11 .Notice for Designing Battery Pack

1 Pack Toughness

Battery pack should have sufficient strength and the LIP cell inside should be protected from mechanical shocks.

2 Cell Fixing

The LIP cell should be fixed to the battery pack by its large surface area.

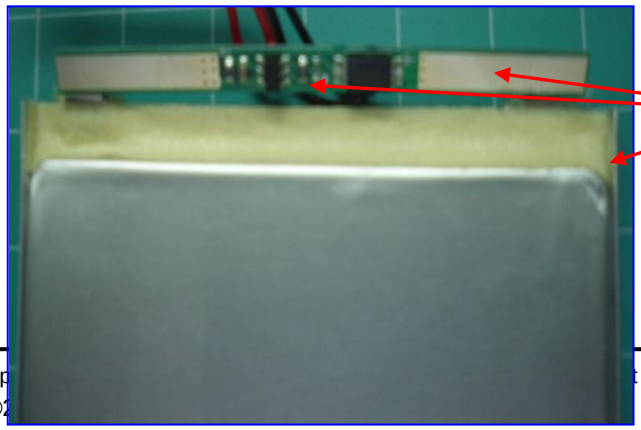
No cell movement in the battery pack should be allowed.

3 Inside Design

No sharp edge components should be insides the pack containing the LIP cell.

4 Avoid some components to contact the edge of packing foil of batteries

Avoiding negative Ni-tabs contacting these two edges, they must be insulated.



Avoiding the components of the PCM contacting the packing foil and leading to the battery short circuit

5 Tab Connection

Ultrasonic welding or spot welding is recommended for LIP tab connection method.

Battery pack should be designed that shear force are not applied to the LIP tabs.

If apply manual solder method to connect tab with PCM, below notice is very important to ensure battery performance:

- The solder iron should be temperature controlled and ESD safe;
- Soldering temperature should not exceed 370°C;
- Soldering time should not be longer than 3s;
- Soldering times should not exceed 5 times, Keep battery tab cold down before next time soldering;
- Directly heat cell body is strictly prohibited, Battery may be damaged by heat above approx. 100°C

12. Others

1The customer is requested to contact Tenergy in advance, if 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.

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

3 Tenergy will inform of the customer in a written form regarding proper use and handing of the battery, if it is deemed necessary.

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