Specification Approval Sheet

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

Model: **30655-0**

SPECS: **3.7V 140mAh 232535 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	2013-10-24	/	NEW RELEASE	

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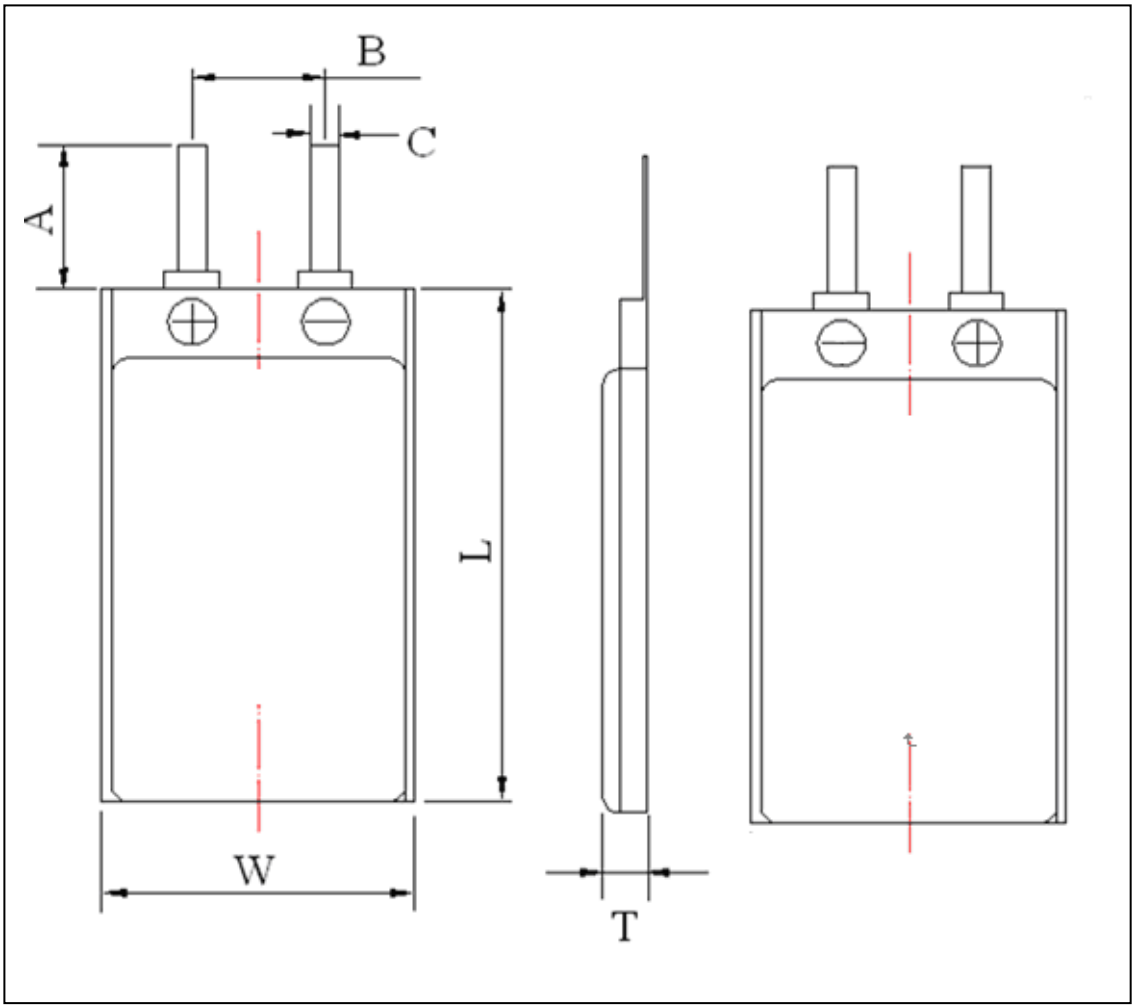
2. Scope

This specification describes the basic performance, technical requirement, testing method, warning and caution of the Li-ion Polymer rechargeable battery. The specification only applies to Tenergy Corporation.

3. Initial Dimension



Unit（mm）

T	Max:2.3	W	Max:25.0	L	Max:35.5
B	12.0±1.5	A	10.0±2.0	C	2.0±0.1

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4.Specification

NO.	Item		Specifications	
4.1	Min. capacity		140mAh 0.2C Discharge (28mA)	
4.2	Initial impedance		≤200mΩ	
4.3	Weight		Approx：3.5g	
4.4	Nominal voltage Fully charge voltage(FC) Fully discharge voltage(FD)		3.7 V 4.2 V Defined in this DOC: FC = 4.2 V 3.0 V Defined in this DOC: FD = 3.0 V	
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 hours	
4.8	Standard discharge current		Constant current 0.2C， end voltage FD	
4.9	Max. charge current	10℃～15℃	0.2C	
		15℃～25℃	0.5C	
		25℃～45℃	1.0C	
4.10	Max. discharge current	-10℃～15℃	0.2C	
		15℃～60℃	1.0C	
4.11	Discharge lower limit voltage		FD	
4.12	Charge upper limit voltage		FC	
4.13	Storage temperature	-20℃~60℃	≤1 month	Percentage of recoverable capacity no less than 80% of the initial capacities
		-20℃~45℃	≤ 3months	
		-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 and 4.14, the testing condition is following 4.17 (standard testing condition)
2. If the working condition is out of 4.17, the performance will be some shift.

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5. General Performance

No.	Item	Test Methods and Condition	Criteria
5.1	0.2C Capacity	At standard testing condition，after standard charging, rest 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 for 10min, then discharging at 1C to voltage FD, recording the discharging time.	⩾54min
5.3	Cycle Life	At standard testing condition, 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 till continuously discharging capacity higher than 80% of the initial capacity of the cell.	⩾300 times
5.4	Capability of Keeping Electricity	At standard testing condition，after standard charging, no outer loading circuit, rest the cell 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	Step1：at standard testing condition，fully charge the cells with standard charging method. Step2: rest the cells 4h at 60±2℃, then discharging at 1C to voltage FD at the same temp., recording the discharging time.	⩾54min
6.2	Discharge at low temperature	Step1：at standard testing condition，fully charge the cells with standard charging method. Step2: rest the cells 16h at -10±2℃, then discharging at 0.2C to voltage FD at the same temp., recording the discharging time.	⩾210min

7. Safe Characteristic

No.	Item	Test Methods and Condition	Criteria
7.1	Overcharge testing	At standard testing condition，charging cells with constant current 3C to voltage 4.6V, then with constant voltage 4.6V till current decline to 0A. Charging time no less than 8h.	No fire, no smoke
7.2	Over discharge	At standard testing condition，the cells be discharge to FD	No fire, no smoke, no

	testing	according to the requirements of standard discharge, then connect with external load of 30 ohm for 24 hours.	leakage.

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

8. Battery Protection

The battery shall be with the over-charging protection, over-discharging protection, and over-current protection during use. Protective circuit shall have protective functions as follows:

1）Over-charging protection

Overcharging protection stops charging if any cell of the battery pack reaches 4.25V.

2） Over-discharging protection

The Over-discharging protection monitors the voltage of any cell in the pack and works to avoid a drop in the cell voltage to 2.8V or less.

3）Over-current protection

The cell shall be discharged at less than the maximum discharge current specified in the Specification Approval Sheet. A high discharging current may reduce the discharge capacity significantly or cause overheating.

9.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.

10. 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.

11. 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.

12.Notice for Designing Battery Pack

12.1 Pack Toughness

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

12.2 Cell Fixing

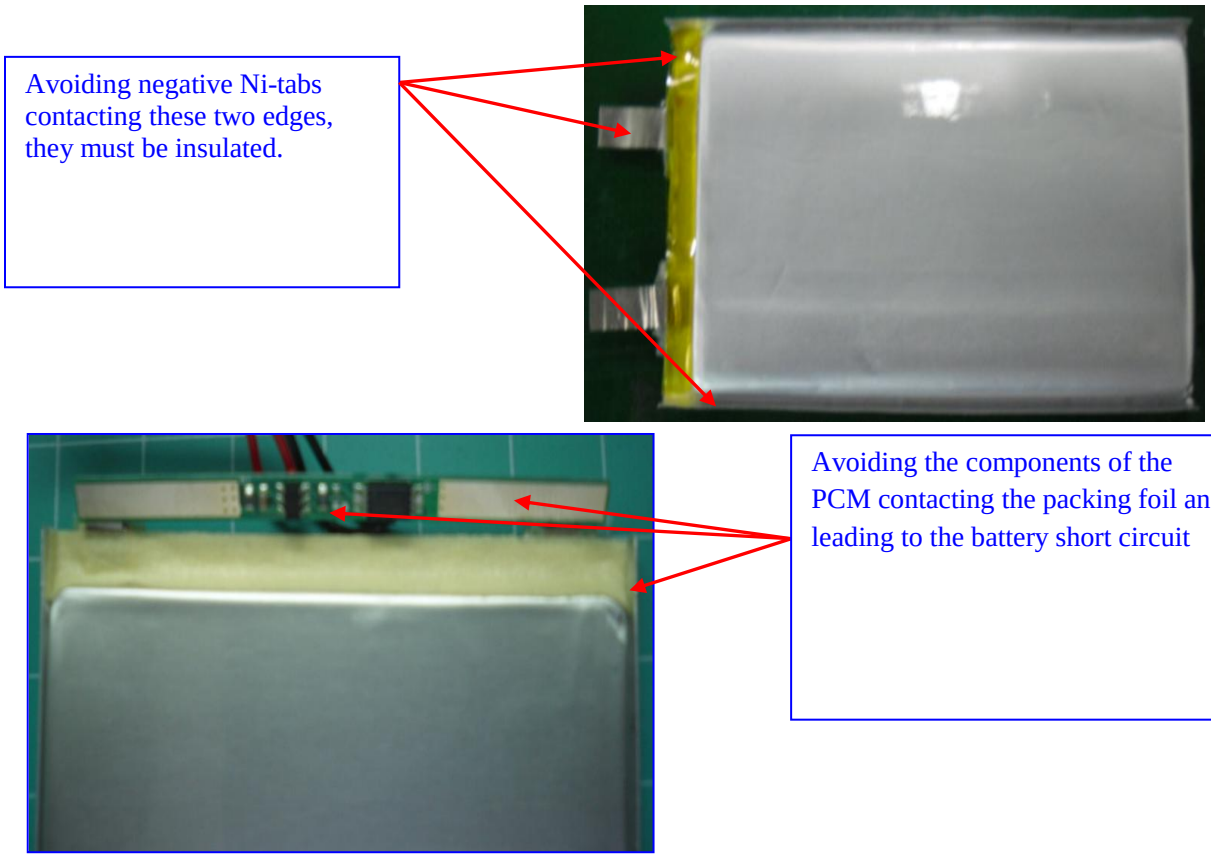
The LIP cell should be fixed to the battery pack by its large surface area.

No cell movement in the battery pack should be allowed.

12.3 Inside Design

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

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



12.5 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

13. Others

13.1The 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.

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

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

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