

Model: Li-102945

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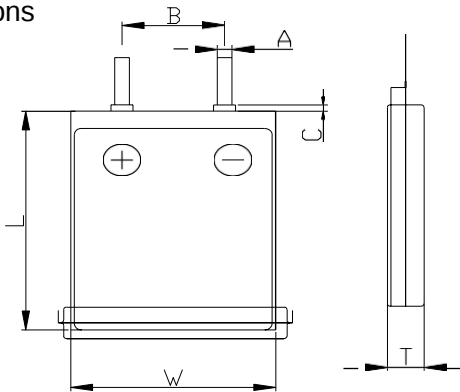
1. Scope

This document describes the Product Specification of the Lithium-Polymer rechargeable battery

2. Model: Li-Battery Model:Li-102945- 3.7V 1400mAh

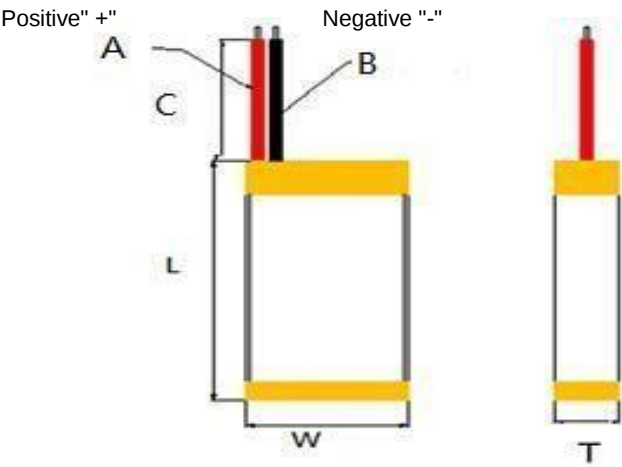
3. Dimensions

3.1 Battery Cell Dimensions



Item	Dimension (mm)
T	Max10.00
W	Max30.50
L	Max45.50
A	4.0±0.1
B	8.0±2
C	1.0±0.5

3.2 Dimensions of Battery Pack



Item	Dimension (mm)
T	Max10.00
W	Max30.50
L	Max47.00
A	Positive Side
B	Negative Side
C	50±1.0
Wire Item	24AWG wire

Note: Batteries delivered with PMC

4.0 Specifications of battery cell

NO.	Items	Specifications
1	Charge voltage	4.2V
2	Nominal voltage	3.7V
3	Nominal capacity	1400mAh (0.2C Discharge)
4	Charge current	Standard Charging: 0.2C Rapid charge: 0.5C
5	Standard Charging method	0.2C CC (constant current) charge to 4.2V, then CV (constant voltage 4.2V) charge till charge current decline to $\leq 0.02C$
6	Charging time	Standard Charging: 6.0 hours Rapid charge: 3.0 hours
7	Max.charge current	0.5C
8	Max.discharge current	1C
9	Discharge cut-off voltage	2.5V
10	Operating temperature	Charging: $0^{\circ}C \sim +45^{\circ}C$ Discharging: $-40^{\circ}C \sim +60^{\circ}C$
11	Storage temperature	$-20^{\circ}C \sim +45^{\circ}C$
12	Cell weight	Approx: 26g

5.0 Specifications of battery pack

NO.	Items	Specifications
1	Capacity	1400mAh
2	Impedance	$\leq 60m\Omega$
3	Dimension(mm)	10.0*29.5*45.5
4	Weight(g)	26
5	Max.charge current	0.5C
6	Max.charge voltage	4.2V
7	Min. discharge voltage	2.5V
8	Max.discharge current	1C

9	Charge Temperature	0°C~+45°C
10	Discharge temperature	-40°C~+60°C
11	Storage temperature	-20°C~ +45°C
12	Storage Humidity	<85%

6.0 Battery Performance Criteria

6.1 Electrical characteristics

NO.	Items	Test Method and Condition	Criteria
1	Standard Charge	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	
2	Rated Capacity	The capacity means the discharge capacity of the cell, which is measured with discharge current of 0.2C with 2.5V cut-off voltage after standard charge.	≥1400mAh
3	Discharge at High Temperature	1) Standard Charge 2) Put the cell into 55±2°C high temp oven for 4 hours and discharge at 0.2C CC to 2.5V at the high temperature.	Discharge capacity 90%
4	Discharge at Low Temperature	1) Standard Charge 2) Put the cell into -40±2°C low temp oven for 4 hours and discharge at 0.2C CC to 2.5V at the low temperature.	0.2C Discharge capacity 70%
5	Cycle Life	A battery unit shall be repeated 300 charge/discharge cycles, charged at CC-CV 0.2C to 4.20V , laying the battery 5mins, discharged at 0.2C to 2.5V end voltage. After 300 cycles, record the discharging capacity	70% of Nominal Capacity, Cycle Life≥300 times

6	Self-discharge	After the standard charging, storied the cells under the condition at 23°C for 28 days, then measured the capacity with 0.2C till 2.5V	Residual capacity: >90%
7	Initial impedance	Internal resistance measured at AC 1KHz after 50% charge	≤100 m
8	Cell Voltage	As of shipment	3.65V~3.75V
9	Temperature Characteristics	1. According to item 6.1, charge battery at 20±5°C. 2. Capacity comparison at each temperature, measured with constant discharge current 0.2 C with 2.5 V cut-off. Percentage as an index of the capacity compared with 100% at 20°C	-40°C≥70% 20°C: ≥100% 50°C: ≥80%

10	Storage Characteristics	1. According to item 5.5, charge battery at $20\pm5^{\circ}\text{C}$. 2. The battery shall be stored at $50\pm5^{\circ}\text{C}$ for 7 days and rested at room temperature for 1 hour then measured with constant discharge current 0.2C with 2.5V cut-off voltage.	Retained Capacity $\geq 85\%$
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6.2 Mechanical characteristics

NO.	Items	Test Method and Condition	Criteria
1	Vibration Test	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 and 55Hz, the excursion of the vibration is 1.6mm. The cell shall be vibrated for 30 minutes per axis of XYZ axes.	No leakage No fire
2	Drop Test	The cell is to be dropped from a height of 1 meter twice onto concrete ground.	No fire, no leakage.
3	Over-Charge Test	Charging the cell initially with constant current at 1C till voltage at 4.6V	No fire
4	Squeeze	After standard charging, put battery between two squeeze device and increase pressure gradually to 13kN and keep pressure for 1 min.	No fire, no explosion

6.3 Visual inspection

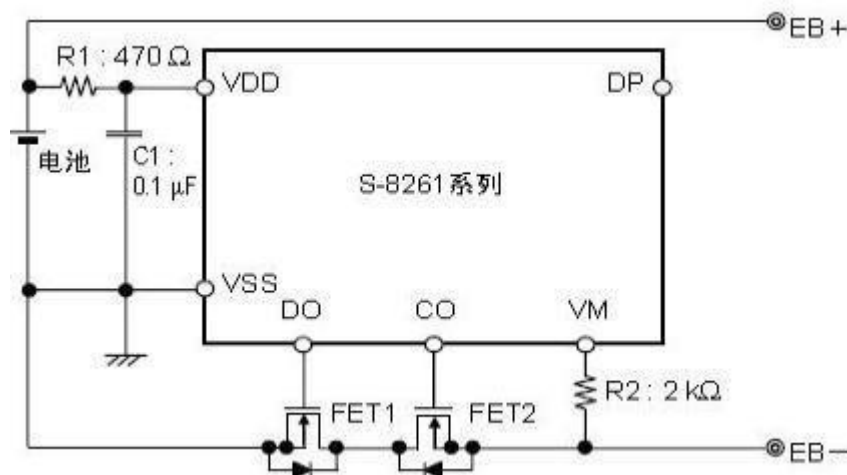
There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of the cell.

6.4 Standard environmental test condition

Unless otherwise specified, all tests stated in this Product Specification are conducted at below condition:
 Temperature: $20\pm5^{\circ}\text{C}$
 Humidity: $60\pm 15\% \text{RH}$

7 Protection Functions

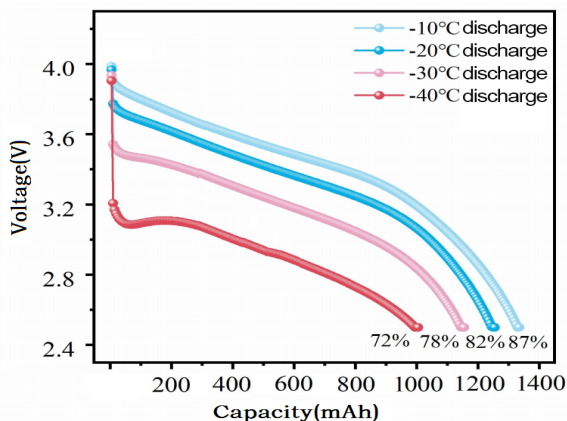
7.1 Circuit Diagram



7.2 PCM parameter

Item	Symbol	Content	Criterion
Over charge Protection	VDET1	Over charge detection voltage	4.25±0.025V
	tVDET1	Over charge detection delay time	1S~4S
	VREL1	Over charge release voltage	4.05±0.05V
Over discharge protection	VDET2	Over discharge detection voltage	2.50±0.1V
	tVDET2	Over discharge detection delay time	115mS~173mS
	VREL2	Over discharge release voltage	3.0±0.1V
		Rated discharge current	≤1400mA
Over current protection	VDET3	Over current detection voltage	0.2±0.02V
	I _{DP}	Over current protection current	10~16 A
	tVDET3	Detection delay time	7.2mS~11mS
		Release condition	Cut load
Short circuit protection		Protection condition	Exterior short circuit
		Protection Release condition	Cut short circuit
Internal resistance	R _{DS}	Main loop electrify resistance	VC=4.2V,R _{DS} ≤30mΩ
Current consumption	I _{DD}	Current consume in normal operation	≤10μA

7.3 Test for Low Temperature



Under the ordered temperature, constant charge the cell to 4.2V and then end it at 0.1A by constant voltage.

After this, remove the cell to different temperature condition (keep 2h) and discharge it to 2.5V at 1C current, record its discharge capacitance.

Appendix

Handling Precautions and Guideline Lithium-Ion Polymer Rechargeable Batteries

1. Charging

1.1 Charging current:

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.

1.2 Charging voltage

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.

1.3 Charging temperature:

The cell shall be charged within 0°C~45°C range in the Product Specification.

1.4 Prohibition of reverse charging:

Reverse charging is prohibited. The cell shall be connected correctly. The polarity has to be confirmed before wiring. In case of the cell is connected improperly, the cell cannot be charged. Simultaneously, the reverse charging may cause damaging to the cell which may lead to degradation of cell performance and damage the cell safety, and could cause heat generation or leakage.

2. Discharging

2.1 Discharging current

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.

2.2 Discharging temperature

The cell shall be discharged within -40°C~60°C range specified in the Product Specification.

2.3 Over-discharging

It should be noted that the cell would be at 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 to maintain between 3.6V and 3.9V. Over-discharging may cause loss of cell performance, characteristics, or battery functions. The charger shall be equipped with a device to prevent further discharging exceeding a cut-off voltage 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., pre-charging, before rapid charging starts. The rapid charging shall be started after the (individual) cell voltage has been reached above 2.5V within 15-30 minutes that can be determined with the use of an appropriate timer for pre-charging. In case the (individual) cell voltage does not rise to 2.5V within the pre-charging time, then the charger shall have functions to stop further charging and display the cell/pack is at abnormal state.

3. Protection Circuit Module(PCM)

The cell/battery pack shall be with a PCM that can protect cell/battery pack properly. PCM shall have functions of (1) overcharging prevention, (2) over-discharging prevention, and (3) over current prevention to maintain safety and prevent significant deterioration of cell performance. The over current can occur by external short circuit

3.1 Overcharging prohibition

Overcharging prevention function shall stop charging if any one of the cells of the battery pack reaches 4.25V.

3.2 Over-discharge prohibition

Over-discharging prevention function shall work to avoid further drop in cell voltage of 2.3V or less per cell in any cell of the battery pack. It is recommended that the dissipation current of PCM shall be minimized to 0.5uA or less with the over-discharge prevention. The protection function shall monitor each bank of the battery pack and control the current all the time.

4. Storage

The cell shall be stored within -20°C~45°C range environmental condition.

If the cell has to be stored for a long time (Over 3 months), the environmental condition should be:

Temperature: 20±5°C

Humidity: 65±20%RH

The voltage for a long time storage shall be 3.6V~3.9V range.

5. Handling of Cells

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

5.1 Soft Aluminum foil

The soft aluminum packing foil is very easily damaged by sharp edge parts such as Ni-tabs, pins and needles.

- 1) Don't strike battery with any sharp edge parts
- 2) Trim your nail or wear glove before taking battery

3) Clean worktable to make sure no any sharp particle

5.2 Sealed edge

Sealing edge is very flimsy.

Don't bend or fold sealing edge

5.3 Folding edge

The folding edge is form in battery process and passed all hermetic test

Don't open or deform folding edge

5.4 Tabs

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

Don't bend tab.

5.5 Mechanical shock

Don't Fall, hit, bend battery body

5.6 Short Circuit.

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

6 Notice Designing Battery Pack

6.1 Pack design

6.1.1 Battery pack should have sufficient strength and battery should be protected from mechanical shock

6.1.2 No Sharp edge components should be inside the pack containing the battery.

6.2 PCM design

The overcharge threshold voltage should not be exceed 4.25V

The over-discharge threshold voltage should not be lower than 2.3V

The PCM should have short protection function built inside

7. Notice for Assembling Battery Pack

7.1 Tab connection

Ultrasonic welding or spot welding is recommended to connect battery with PCM or other parts.

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

- 1) The solder iron should be temperature controlled and ESD safe
- 2) Soldering temperature should not exceed 350°C
- 3) Soldering time should not be longer than 3s
- 4) Soldering time should not exceed 5 times Keep battery tab cold down before next time soldering.
- 5) Directly heat cell body is strictly prohibited, Battery may be damaged by heat above approx.100°C

7.2 Cell fixing

- 1) The battery should be fixed to the battery pack by its large surface area.

- 2) No cell movement in the battery pack should be allowed.

8.Others

8.1 Prevention of short circuit within a battery pack.

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection.

8.2 Prohibition of disassembly

- 1) Never disassemble the cells

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

- 2) Electrolyte is harmful

Li-Polymer 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.

8.3 Prohibition of dumping of cells into fire.

Never incinerate nor dispose the cells in fire. These may cause firing of the cells, which is very dangerous and is prohibited.

8.4 Prohibition of cells immersion into liquid such as water.

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

8.5 Battery cells replacement

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

8.6 Prohibition of use of damaged cells

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 electrolyte, 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.