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# EEMB CO., LTD

## Polymer Li-ion Battery

### Specification

<b>Model:</b>	<b>LP503870-PCM-NTC-LD/</b>
<b>Capacity:</b>	<b>1500mAh</b>

Prepared	Checked	Approved
Mike Cai	Tina Cheng	Alex Lee

Customer:

Customer Approval (Customer confirmation) :

<b>Signature</b>	<b>Checked</b>	<b>Approved</b>

Address: Room ABCD,25/F, Block A, Fortune Plaza, NO.7060 Shennan Road Shenzhen, China

Postal code: 518040

Phone: 0086-755-83022275

FAX: 0086-755-83021966

<http://www.eemb.com>

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## 1. Scope

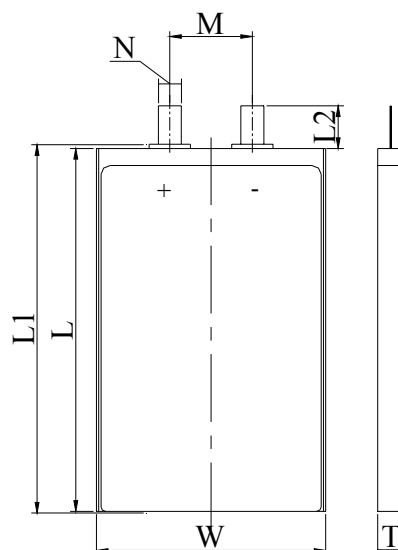
This product specification defines the requirements of the rechargeable polymer lithium-ion battery supplied to the customer by EEMB Co., Ltd.

## 2. Cell Basic Characteristics

No.	Item	Characteristics	Remark	
2.1	Model	LP503870		
2.2	Capacity	Nominal Capacity	1500 mAh	0.2C <sub>5</sub> A
		Minimum	1400 mAh	0.2C <sub>5</sub> A
2.3	Nominal Voltage	3.7 V		
2.4	Weight	Approx.30 g		
2.5	Internal Impedance	≤ 72 mΩ	AC 1KHz	
2.6	Dimension	Length	≤ 71 mm	
		Width	≤ 38.5 mm	
		Thickness	≤ 5.3 mm	
2.7	Charge	Maximum Current	1500 mA	1.0C <sub>5</sub> A (CC&CV)
		Limited Voltage	4.200±0.020 V	
		End-of Current	30 mA	
2.8	Discharge	Maximum Current	3000 mA	2.0C <sub>5</sub> A
		Cut-off Voltage	2.750±0.005 V	
2.9	Operation Temperature	Charge	0 ~ 45 °C	
		Discharge	-20 ~ +60 °C	
2.10	Storage Temperature	1 month	-20 ~ +60 °C	
		3 month	-20 ~ +45 °C	
		12 month	-20 ~ +25 °C	
2.11	Storage Relative Humidity	65±20 %		

## 3. Shape and Dimensions (Unit: mm)

Item	Specification
T	Max5.3
W	Max38.5
L	Max71
L1	Max72
L2	10±1
M	24±1
N	4±0.5



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#### 4. Appearance

It shall be free from any defects such as remarkable scratches, breaks, cracks, discoloration, leakage, or middle deformation.

#### 5. Specification

##### 5.1 Electrical Characteristics

No.	Item	Criteria	Test Instructions
5.1.1	1C <sub>5</sub> A rate discharge capacity	Discharge Time $\geq$ 57min	Full charge at 20 $\pm$ 5 $^{\circ}$ C, rest for 30 min, then discharge at the same temperature with 1.0C <sub>5</sub> A to 2.75V.
5.1.2	High temp. discharge capacity	Discharge Time $\geq$ 54min	Full charge at 20 $\pm$ 5 $^{\circ}$ C, store at 55 $\pm$ 2 $^{\circ}$ C for 2h, then discharge at the same temperature with 1.0C <sub>5</sub> A to 2.75V.
5.1.3	Low temp. discharge capacity	Discharge Time $\geq$ 4.25h	Full charge at 20 $\pm$ 5 $^{\circ}$ C, store at -10 $^{\circ}$ C $\pm$ 2 $^{\circ}$ C for 16h~24h, then discharge at the same temperature with 0.2C <sub>5</sub> A to 2.75V
5.1.4	Cycle Life	$\geq$ 300Cycles	After full charge, rest for 10 min, discharge at constant current of 0.5C <sub>5</sub> A to 2.75V. Batteries are full charge after 10 minutes. Repeat above steps till retained capacity is 80%
5.1.5	Capacity Retention	Discharge Time $\geq$ 4.5 h	After full charge, store at 20 $\pm$ 5 $^{\circ}$ C for 28 days. Then discharge with 0.2C <sub>5</sub> A to 2.75V

##### 5.2 Acclimatization Characteristics

No.	Item	Criteria	Test Instructions
5.2.1	High Temp. and High Humidity	No deformation, no rust, no fire or explosion; Discharge time $\geq$ 36min	After full charge, store at 40 $^{\circ}$ C $\pm$ 2 $^{\circ}$ C (90%~95%RH) for 48h. After test, place at 20 $^{\circ}$ C $\pm$ 5 $^{\circ}$ C for 2h and then discharge with 1C <sub>5</sub> A to end-voltage
5.2.2	Vibration	No damnification, leakage, no fire or explosion; Battery Voltage $\geq$ 3.6V	Batteries are vibrated 30 min in three mutually perpendicular directions with amplitude of 0.38mm (10~30Hz) or 0.19mm (30~55Hz) and the scanning rate of 1oct per min
5.2.3	Drop	No leakage, no fire or explosion; Discharge Time $\geq$ 51 min	Batteries are dropped onto a hard board with the thickness of 18~20mm from 1meter

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### 5.3 Safety Characteristics

No.	Item	Criteria	Test Instructions
5.3.1	Overcharge	No fire or explosion	Charged the cells at 3C <sub>5</sub> A current 20±5°C with a voltage limit of 4.8V and Current close to 0 A
5.3.2	Short-Circuit	No fire or explosion; The maximum Temperature: 150°C	Batteries are short-circuited by connecting the positive and negative terminals for 1h with a resistance load of 0.1Ω
5.3.3	Heating	No fire or explosion	Cell is heated in a circulating air oven at a rate of (5±2)°C per minute to 130±2°C, and then placed for 30 minutes at 130±2°C

Note: Unless otherwise specified, all tests stated in this specification are conducted at the following conditions:  
Temp. : 20±5°C; Relative Humidity: 25%~85%.

### 6. Specification of PCM

The specification shall be applied to Lithium polymer battery protection circuit module manufactured by EEMB CO., LTD.

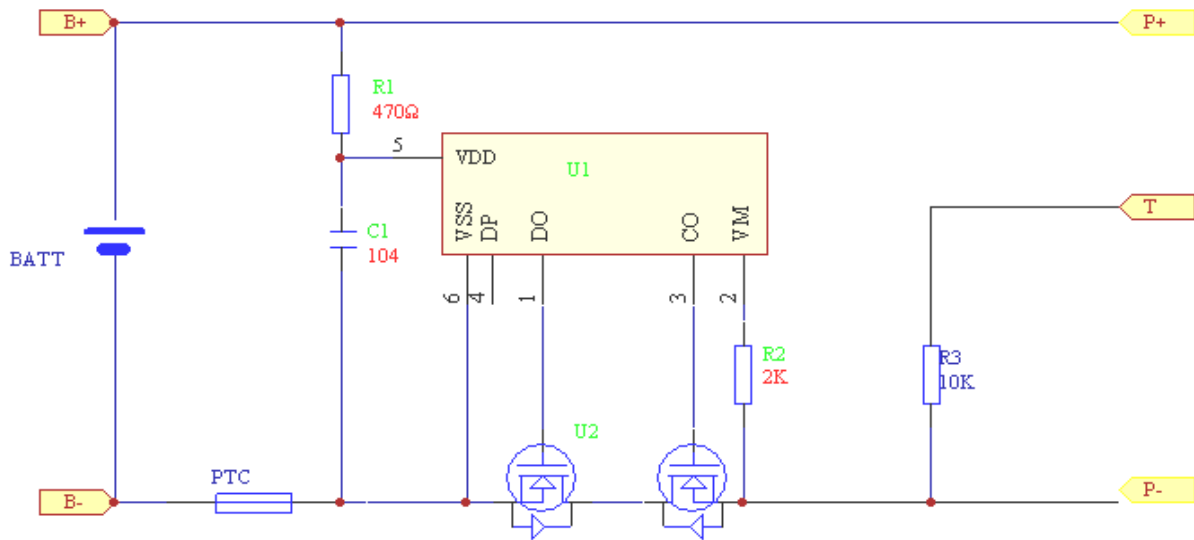
#### 6.1.0 Basic Specification(T=25°C )

Item	Symbol	Content	Criterion
Over charge Protection	V <sub>DET1</sub>	Over charge detection voltage	4.28±0.05V
	tV <sub>DET1</sub>	Over charge detection delay time	0.96S-1.40S
	V <sub>REL1</sub>	Over charge release voltage	4.175±0.025V
Over discharge protection	V <sub>DET2</sub>	Over discharge detection voltage	3.0±0.10V
	tV <sub>DET2</sub>	Over discharge detection delay time	115ms-173ms
	V <sub>REL2</sub>	Over discharge release voltage	3.5±0.050V
Over current protection	V <sub>DET3</sub>	Over current detection voltage	0.10±0.015V
	I <sub>DP</sub>	Over current detection current	2-6A
	tV <sub>DET3</sub>	Detection delay time	7.2ms-11.0ms
		Release condition	Cut load
Short protection		Detection condition	Exterior short circuit
		Release condition	Cut short circuit
Interior resistance	R <sub>DS</sub>	Main loop electrify resistance	VC=4.2V,R <sub>DS</sub> ≤70mΩ
Current consumption	I <sub>DD</sub>	Current consume in normal operation	3.0μA Type 7.0μA Max
10K NTC			

\*Note: These specs are guaranteed by design not by production tests.

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## 6.2.0 PCM Circuit Diagram



## 7. Pack's Dimension

	<p>1. Drawing:            T (max) =5.3mm            W (max) =38.5mm            H (max) =72mm            L= 35±3mm</p> <p>2. Materials:            ① cell: LP503870            ② PCM            ③ Wire: black (—) UL1571 26AWG            ④ Wire: yellow (NTC) UL1571 26AWG            ⑤ Wire: red (+) UL1571 26AWG            ⑥ Plug: :Molex51065-03</p>
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## 8. Pack's voltage and internal resistance

Voltage: 3.83~3.9V

Internal Resistance:  $\leq 300m\Omega$

## 9. Matters needing attention

Strictly observes the following needing attention. EEMB will not be responsible for any accident occurred by handling outside of the precautions in this specification.

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### **! Danger**

- Strictly prohibits heat or throw cell into fire.
- Strictly prohibits throw and wet cell in liquid such as water、 gasoline or drink etc.
- Strictly prohibits use leave cell close to fire or inside of a car where temperature may be above 60°C. Also do not charge / discharge in such conditions.
- Strictly prohibits put batteries in your pockets or a bag together with metal objects such as necklaces. Hairpins, coins, or screws. Do not store or transportation batteries with such objects.
- Strictly prohibits short circuit the (+) and (-) terminals with other metals.
- Do not place Cell in a device with the (+) and (-) in the wrong way around.
- Strictly prohibits pierce Cell with a sharp object such as a needle.
- Strictly prohibits disassemble or modify the cell.
- Strictly prohibits welding a cell directly.
- Do not use a Cell with serious scar or deformation.
- Thoroughly read the user's manual before use, inaccurate handling of lithium ion rechargeable cell may cause leakage, heat, smoke, an explosion, or fire, capacity decreasing.

### **! Warning**

- Strictly prohibits put cell into a microwave oven, dryer, or high-pressure container.
- Strictly prohibits use cell with dry cells and other primary batteries, or new and old battery or batteries of a different package, type, or brand.
- Stop charging the Cell if charging is not completed within the specified time.
- Stop using the Cell if abnormal heat, odor, discoloration, deformation or abnormal condition is detected during use, charge, or storage.
- Keep away from fire immediately when leakage or foul odor is detected.
- If liquid leaks onto your skin or clothes, wash well with fresh water immediately.
- If liquid leaking from the Cell gets into your eyes, do not rub your eyes. Wash them well with clean edible oil and go to see a doctor immediately.

### **! Caution**

- Before using the Cell, be sure to read the user's manual and cautions on handling thoroughly.
- Charging with specific charger according to product specification. Charge with CC/CV method. Strictly prohibits reversed charging. Connect cell reverse will not charge the cell. At the same time, it will reduce the charge-discharge characteristics and safety characteristics; this will lead to product heat and leakage.
- Store batteries out of reach of children so that they are not accidentally swallowed.
- If younger children use the Cell, their guardians should explain the proper handling.
- Before using the Cell, be sure to read the user's manual and cautions on handling thoroughly.
- Batteries have life cycles. If the time that the Cell powers equipment becomes much shorter than usual, the Cell life is at an end. Replace the Cell with a new same one.
- When not using Cell for an extended period, remove it from the equipment and store in a place with low humidity and low temperature.
- While the Cell pack is charged, used and stored, keep it away from objects or materials with static electric charges.
- If the terminals of the Cell become dirty, wipe with a dry clothe before using the Cell.
- Storage the cells in storage temperature range as the specifications. After full discharged, we suggest that charging to 3.7~4.0V with no using for a long time.

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- Do not exceed these ranges of the following temperature ranges:

Charge temperature range : 0°C to 45°C;

Discharge temperature range : -20°C to 60°C.

Store less than 1 month : -20°C - +60°C

Store less than 3 months : -20°C - +45°C

Store less than 1 year : -20°C - +25°C

### **! Special Notice**

Keep the cells in **50% charged state** during long period storage. We recommend to charge the battery up to 50% of the total capacity every 3 months after receipt of the battery and maintain the voltage 3.7~4.0V. And store the battery in cool and dry place.