Lithium-ion Battery
DATA SHEET

Battery Model : LIR18650

Prepared	Authorized	Approved
Jun,Wong	Wei , Lau	Ji de, Wong

Manufacturer: EEMB Co., Ltd.
Website: http://eemb.com

This Specification describes the requirements of the lithium ion rechargeable battery supplied by EEMB Co., Ltd.

1. Basic Characteristics

1.1	Capacity（25±5℃）	Nominal Capacity： 2200mAh (1.1A Discharge) Minimum Capacity： 2150mAh (1.1A Discharge)
1.2	Nominal Voltage	3.6V
1.3	Internal Impedance	≤ 70mΩ
1.4	Discharge Cut-off Voltage	3.0V
1.5	Max Charge Voltage	4.20±0.05V
1.6	Standard Charge Current	1.1A
1.7	Rapid Charge Current	2.2A
1.8	Standard Discharge Current	1.1A
1.9	Constant Discharge Current	5.0A
2.0	Max Pulse Discharge Current	11.0A
2.1	Weight	44.0±1g
2.2	Max. Dimension	Diameter(O): 18.4mm Height (H): 65.2mm
2.3	Operating Temperature	Charge: 0 ~ 45℃ Discharge: -20 ~ 60℃
2.4	Storage Temperature	During 1 month: -5 ~ 35℃ During 6 months: 0 ~ 35℃

2. Standard Conditions for Test

All the tests need to be done within onemonth after the delivery date under the following conditions : Ambient Temperature:25±5℃; Relative Huimdity:65±20%

Standard Charge	Constant Current and Constant Voltage (CC/CV) Current = 1.1A Final charge voltage = 4.2V Final charge Current = 0.044A
Standard Discharge	Constant Current (CC) Current = 1.1A End Voltage = 3.0V

3. Appearance

All surfaces must be clean, without damages, leakage and corrosion. Each product will have a product label identifying the model.

4. Characteristics

4.1Electrical Performance

Items	Test procedure	Requirements
Nominal Voltage	The average value of the working voltage during the whole discharge process.	3.6V
Discharge Performance	The discharge capacity of the cell, measured with 1.1A down to 3.0V within 1 hour after a completed charge.	≥114min
Capacity Retention	After 28 days storage at 25±5℃, after having been completely charged and discharged at 0.44A, discharge to 2.75V, the residual capacity is above 85%	Capacity≥1870mAh
Cycle Life	After 300 cycles at 100% DOD. Charge at 2.2A,and discharge at 5.0A, the residual discharge capacity is above 80% of nominal capacity	≥250 cycles
Storage	(Within 3 months after manufactured) The cells is charged with1.1A to 40-50% capacity and stored at ambient temperature 25±5℃, 65±20%RH for 12 months. After the 12 months storage period the cell is fully charged and discharged to 3.0V with 0.44A	Discharge time≥4h

4.2 Safety Performances

Items	Test procedure	Requirements
Short Circuit	The cell is to be short-circuited by connecting the positive and negative terminals of the cell directly with copper wire with a resistance of less than 0.05Ω	No fire no explosion
Impact Test	A test sample battery is to be placed on a flat surface. A 5/8 inch (15.8mm) diameter bar is to be placed across the center of the sample. A 20 pound (9.1kg) weight is to be dropped from a height of 24 ±1 inch (610±25mm) onto the sample.	No fire no explosion
Overcharge (3C/10V)	The cell is connected with a thermocouple and put in a fume hood. The positive and negative terminals are connected to a	No fire, no explosion

	DC power supply set at 6.6A and 10V until the cell reaches 10V and the current drops to approximately 0A. Monitor the temperature of cell. When the temperature of the cell is approximately 10℃ less than the peak value, the test is completed.	
Thermal Shock	After standard charging, heat the cell to 150±2℃ at a rate of 5±2℃ /min and keep it at this temperature during 10 minutes.	No fire, no explosion

4.3 Environmental Tests

Items	Test procedure	Requirements
High temperature performance	The fully charged cell is put at 55±2℃ for 2 hours and then discharged to 2.75V at 2.2A.	Capacity≥1870mAh
Low temperature performance	The fully charged cell is placed during 16-24 hours at -20±2℃ and then discharge to 2.75V at 0.44A.	Capacity≥1320mAh
Anti-vibration	The fully charged cell is fixed on a platform and vibrated in the X , Y and Z directions for 30minutes at the speed 10ct/min Frequency: 10~30Hz, Vibration amplitude 0.38mm. Frequency: 30~55Hz, Vibration amplitude 0.19mm	No deformation should be visible.Not leak, smoke and/or explode. Voltage should be not less than 3.6V.
Drop Test	The fully charged cell is dropped from a height of 1m onto a 15~20mm hard board in X, Y and Z directions once for all axis. Then the cell is discharged at 2.2A to 3.0V followed by 3 or more cycles with the standard charge rate and a discharge at 2.2A	No fire, no explosion. Discharge Time≥51min

5. Packing

Cells are at a half-charged state when packed. The packing box surface will contain the following: name, type, nominal voltage, quantity, gross weight, date, capacity and impedance.

6. Transportation

During transport, do not subject the cell(s) or the box (es) to violent shaking, bumps, rain and direct sunlight. Keep the cell(s) at a half-charged state.

7. Long-term Storage

The cell should be used within a short period after charging because long-term storagemay cause loss of capacity by self-discharging. If the cell is kept for a long time(3months or more), It is strongly recommended that the cell isstored at dry and low-temperature and Keep the cell(s) at a half-charged state. the cell should be shipped in 50% charged state. In this case, OCV is from 3.65V to 3.85V. Our shipping voltage is 3.75-3.80v . because storage at higher voltage may cause loss of characteristics.

- over a period of 1 month: -5 ~ 35℃, relative humidity: ≤75%.
- over a period of 6 months: -20~ 25℃, relative humidity: ≤75%.

8. Changes of Specifications

The information in this specification is subject to change without prior notice.

9. For Reference Only

The information contained in this document is for reference only and should not be used as a basis for product guarantee or warranty. For applications other than those described here, please consult your nearest CHAM Sales Office or Distributors.

10. Pack Quality Requirement for safety and quality

10.1 The battery pack's consumption current.

- Sleep Mode : Under 250uA.
- Shut Down Mode : Under 10uA / Under 3.0V.

Under 1uA / Under 2.5V.

10.2 Operating Charging Voltage of a cell.

- Normal operating voltage of a cell is 4.20V
- Max operating voltage of a cell is 4.25V.

10.3 Pre-charging function

- Pre-charge function should be implemented to prevent abnormal high rate charging after deep discharge.
- Pre-charging condition Operation : Under 3.0V

-Charging current : Under 150mA/Cell.(Continuous)

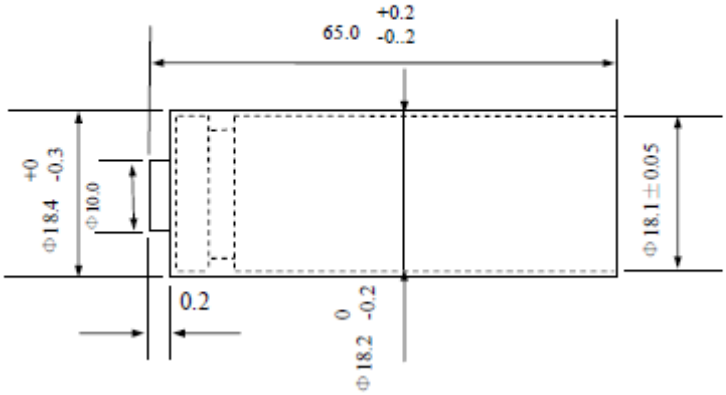
-Pre-charge stop (Normal Charge Start) : All cells reach 3.0V

10.4. Cell voltage monitoring system.

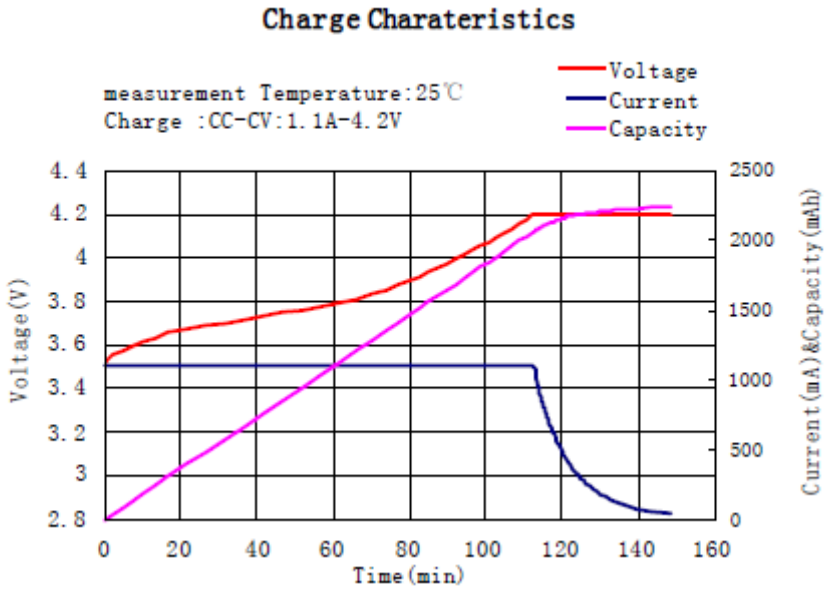
- The system (Charger or Pack) should equip a device to monitor each Cell voltage and to stop charging if a cell imbalance happened.

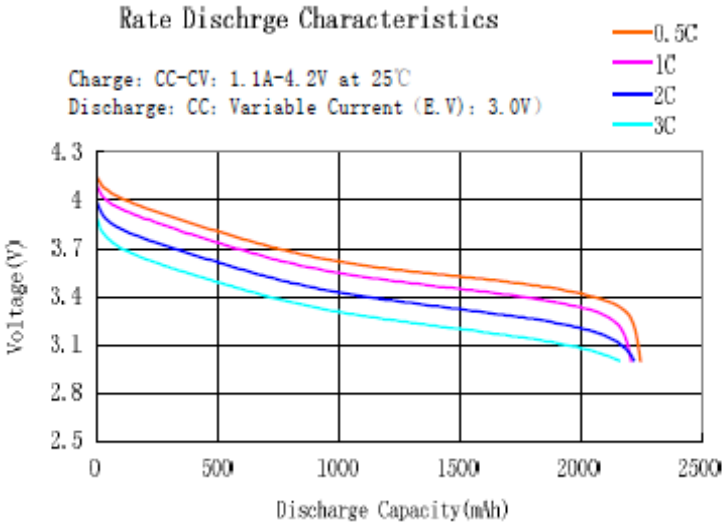
11. Appendix

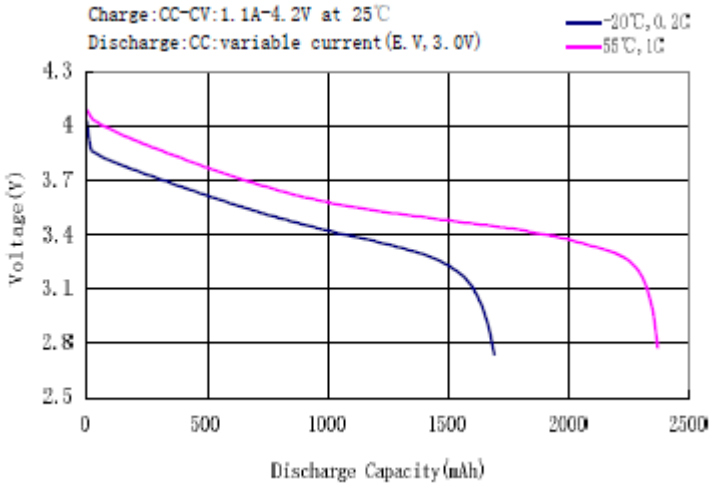
External Dimensions (mm)

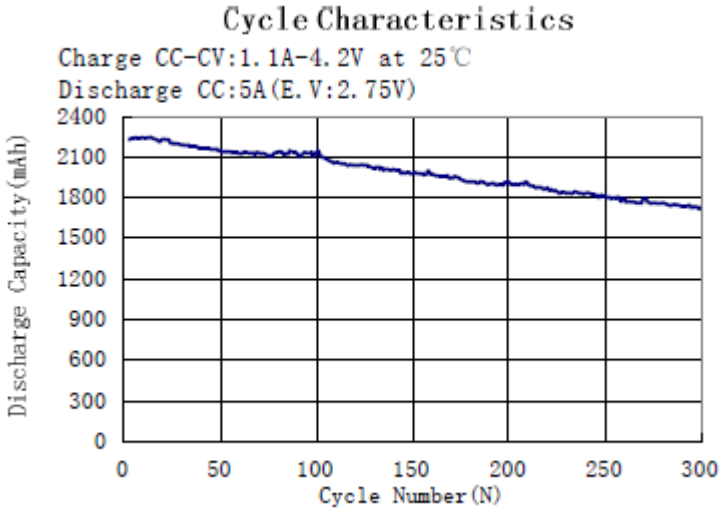


12. Performance




Rate Dischrge Characteristics
Charge: CC-CV: 1.1A-4.2V at 25℃
Discharge: CC: Variable Current (E.V): 3.0V)
0.5C
1C
2C
3C
Voltage(V)
4.3
4
3.7
3.4
3.1
2.8
2.5
0
500
1000
1500
2000
2500
Discharge Capacity(mAh)


Charge:CC-CV:1.1A-4.2V at 25℃
Discharge:CC:variable current(E.V,3.0V)
-20℃,0.2C
55℃,1C
Voltage(V)
4.3
4
3.7
3.4
3.1
2.8
2.5
0
500
1000
1500
2000
2500
Discharge Capacity(mAh)


Cycle Characteristics
Charge CC-CV:1.1A-4.2V at 25℃
Discharge CC:5A(E.V:2.75V)
Discharge Capacity(mAh)
2400
2100
1800
1500
1200
900
600
300
0
0
50
100
150
200
250
300
Cycle Number(N)

13. Protection

When Li-ion rechargeable battery is used over the permitted voltage or current, electrolyte may disassemble, and this case will affect safety performance of Li-ion rechargeable battery. So protection circuit module were used in order to prevent overcharge, over discharge and over current.
The parameters of protection circuit module as follows:

Overcharge Protection Voltage :	4.25V±25mV
Over-discharge Protection Voltage :	2.50V±80mV
Over-current Protection Voltage:	3.0A

WARNINGS!

1) Do not immerse the battery in water or seawater, and keep the battery in a cool dry surrounding if it stands by.
2) Do not use or leave the battery near a heat source as fire or heater
3) When recharging, use the battery charger specifically for that purpose
4) Do not reverse the position (+) and negative (-) terminals
5) Do not connect the battery to an electrical outlet
6) Do not discard the battery in fire or heat it
7) Do not short-circuit the battery by directly connecting the positive (+) and negative (-) terminal with metal objects such as wire.
8) Do not transport or store the battery together with metal objects such as necklaces, hairpins etc.
9) Do not strike or throw the battery
10) Do not directly solder the battery and pierce the battery with a nail or other sharp object.

CAUTIONS!

1) Do not use or leave the battery at very 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.
2) Do not use it in a location where static electricity is great, otherwise, the safety devices may be damaged, causing hidden trouble of safety.
3) 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, it may injure eyes or cause a loss of sight.
4) 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.
5) 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.
6) Be aware discarded batteries may cause fire, tape the battery terminals to insulate them.

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.