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EEMB CO., LTD

Li-ion Battery

Specification

Model:	LIR18650
Capacity:	2600mAh

Prepared	Checked	Approved

Customer:

Customer Approval (Customer confirmation) :

Signature	Checked	Approved

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1. Scope

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

2. Battery Cell Basic Performance

No.	Item	General Parameter	Remark
1	Nominal Capacity	2600mAh	Standard discharge (0.2C) Cut-off voltage: 3.00V
	Minimum Capacity	2550mAh	
2	Nominal Voltage	3.7V	Mean Operation Voltage
3	Voltage at end of Discharge	3.00V	Discharge Cut-off Voltage
4	Charging Voltage	4.2V	
5	Open Voltage	3.7~3.9V	
6	Load Voltage	$\geq 3.6V$	10 Ω
7	Energy	9.6Wh	
8	Internal Impedance	$\leq 150m\Omega$	AC 1KHz after 50% charge
9	Standard charge current	520mA	
10	Standard discharge current	520mA	
11	Maximum Charge Current	2600mA	Ambient temperature 0-40 $^{\circ}C$
12	Maximum Continuous Discharge Current	2600mA	Ambient temperature 0-40 $^{\circ}C$
13	Operation Temperature Range	Charge: 0~45 $^{\circ}C$	
		Discharge: -20~60 $^{\circ}C$	
14	Storage Temperature Range	Less than 1 month: -10~45 $^{\circ}C$	
		Less than 6 months: -5~35 $^{\circ}C$	
15	Weight	Approx.56g	

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3. Appearance

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

4. Battery configuration

No.	Item	Criteria	Remarks
2.1	Cell	LIR18650/2600mAh/3.7V	Li-ion
2.2	PCM	G3J+8205*2	

5. Test Conditions

5.1 Standard Test Conditions

Test should be conducted with new batteries within one week after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise specified, test and measurement shall be done under temperature of $23\pm 2^{\circ}\text{C}$ and relative humidity of 45~75%.

5.2 Measuring Instrument or Apparatus

5.2.1 Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

5.2.2 Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance more than $10\text{k}\Omega/\text{V}$

5.2.3 Ammeter

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω .

5.2.4 Impedance Meter

Impedance shall be measured by a sinusoidal alternating current method(1kHz LCR meter).

6. Battery Performance Test

6.1 Initial Performance Test

No	Items	Testing method and determinant standard
6.1.1	Charge Performance	The battery can be charged when using the original charger. The standard charge mode: under the temperature of $23\pm 2^{\circ}\text{C}$, charge the battery with the current of 0.2C until the voltage reaches up to 4.2V, then charge with constant voltage until the charge current $\leq 0.01\text{C}$, then stop charging.
6.1.2	Discharge Performance	When connecting with load, the battery can supply power. Charge the battery with standard charge mode, then rest for 0.5h, then discharge with 1C until the voltage is 3.00V, and the discharge time is required $\geq 51\text{min}$.

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6.1.3	Cycle Performance	Under the temperature of $23\pm 2^{\circ}\text{C}$., charge the battery with 0.2C, when the voltage reaches up to 4.2V charge with constant voltage until the charge current $\leq 0.01\text{C}$, then stop charging, rest for 0.5h, then discharge with 0.2C to 3.00V. Cycle with the above mode, when the continuous discharge time $< 80\%$ stop cycling. The cycle life is required ≥ 300 times.
6.1.4	Charged Storage Characteristics	Charge the battery with 0.2C, then shift to charge with constant voltage until the voltage reaches up to 4.2V, when the charge current $\leq 0.01\text{C}$ stop charging; rest under the temperature of $23\pm 2^{\circ}\text{C}$.for 28d then discharge with 0.2C to 3.00V. The discharge time is required $\geq 4.25\text{h}$.
6.1.5	Storage Characteristics	Charge the battery, which is newly manufactured shorter than 3 months, with 0.2C until the capacity reaches to 40~50%, after resting for 12 months under the temperature of $23\pm 2^{\circ}\text{C}$. and the humidity of 45 ~ 75%, then charge with 0.2C to 4.2V then shift to charge with constant voltage, after full-charge rest for 0.5h, then discharge with 0.2C to 3.00V. The discharge time is required $\geq 4\text{h}$.

6.2 Safety Test

No	Items	Test method and determinant standard
6.2.1	High Temperature Characteristics	Under the temperature of $23\pm 2^{\circ}\text{C}$, after charging the battery with 0.2C then put the battery into the constant temperature and humidity oven with $60\pm 2^{\circ}\text{C}$ for 2h, then discharge with 1C to 3.00V. The discharge time is required $\geq 51\text{min}$ and the battery should no deformation and smoking.
6.2.2	Low Temperature Characteristics	Under the temperature of $23\pm 2^{\circ}\text{C}$., after charging the battery with 0.2C, then put the battery into the constant temperature and humidity oven with $-10\pm 2^{\circ}\text{C}$ for 16~24h, then discharge with 0.2C to 3.00V. The discharge time is required $\geq 3\text{h}$ and the battery should no deformation and smoking.
6.2.3	Overcharge Protection Characteristics	After full-charging the battery with 0.2C and set 1.2 times of the nominal voltage and current as constant current and voltage supply, then load it to the battery for 8h. It is required the battery should be no leakage, deformation, smoking and explosion during the test processes.

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6.2.4	Over-discharge Protection Characteristics	Under the temperature of $23\pm 2^{\circ}\text{C}$., after discharging the battery with 0.2C to 3.00V, then connect the load with 30Ω and discharge for 24h. It is required the battery should be no leakage, fire, smoking and explosion during the test processes.
6.2.5	Short-circuit Protection Characteristics	Under the temperature of $23\pm 2^{\circ}\text{C}$., after full-charging the battery with 0.2C, then make the battery's anode and cathode short-circuit for 1h (the connecting resistance is smaller than $100\text{m}\Omega$), then cut the anode and cathode, after the battery momentary charge by 0.2C current, the voltage should come back to 3.7V, and there should be no leakage, deformation, smoking and explosion during the test processes.
6.2.6	Constant Humidity and Temperature Characteristics	Under the temperature of $23\pm 2^{\circ}\text{C}$., after charging the battery with 0.2C, then put the battery into the constant temperature and humidity oven with $40\pm 2^{\circ}\text{C}$ and 90~95% for 48h, the battery should be no obvious deformation, leakage, rust, smoking and explosion. After testing take out the battery then rest for 2h under the temperature of $23\pm 2^{\circ}\text{C}$, discharge with 0.2C to 3.00V. The discharge time is required $\geq 72\text{min}$.
6.2.7	Drop Test	Under the temperature of $23\pm 2^{\circ}\text{C}$., after full-charging the battery with 0.2C, then drop it freely from 1 meter height onto the hard board which 18~20mm thick (6 times each of X, Y, Z with positive and negative directions).The battery should be no smoking and explosion.

6.3 Standard charge

(0.2C=520mAh) Full charge condition: Constant current 0.2C, Constant voltage 4.2V for 6.5 hours in all at $23\pm 2^{\circ}\text{C}$.

6.4 Standard test condition

Test should be conducted with new batteries within one month after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise defined, test and measurement shall be done under temperature of $23\pm 2^{\circ}\text{C}$ and relative humidity of 45~75%.

6.5 Test equipment

a.Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with accuracy no less than 0.01mm.

b.Voltmeter

Class with national standard or more sensitive class with inner impedance not less than $10\text{K}\Omega/\text{V}$.

c.Ammeter

Class with national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω .

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d. Impedance Meter

Impedance shall be measured by a AC impedance method (AC 1kHz LCR meter).

6.6 Rest period

Unless otherwise defined, 30 min, rest period after charge; 30 min, rest period after discharge.

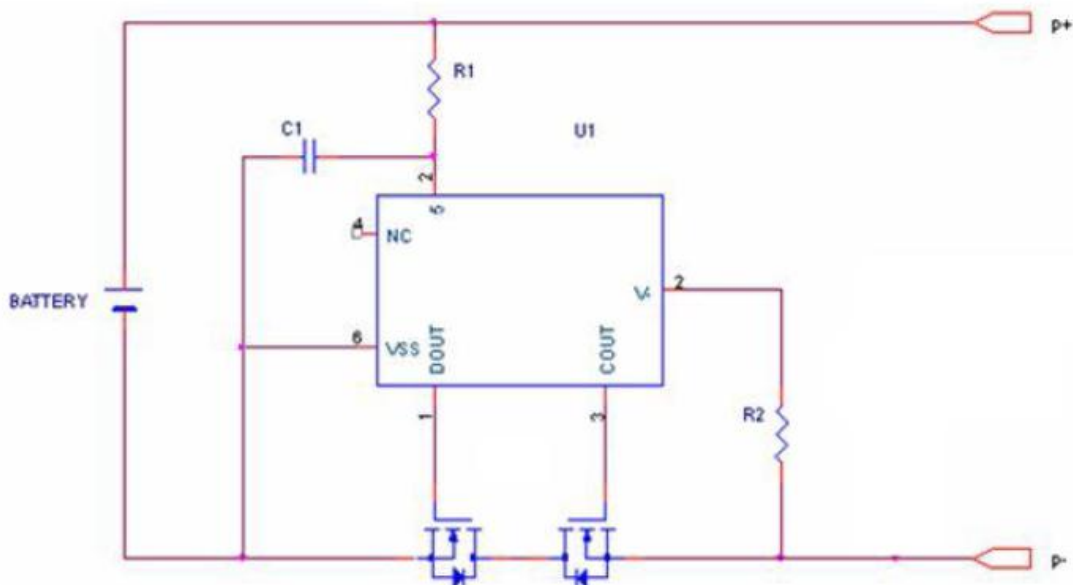
7. Battery Pack's Dimension

	<p>1. Drawing: Diameter (max) =19.5mm Height (max) =70.5mm</p>
	<p>2. Materials: Cell: LIR18650 Inside PCM</p> <p>Note: Kind in prevail</p>

8. Specification of PCM (inside)

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

8.1 Protection Circuit Diagram



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8.2 PCM Specification

NO	Item	Criteria
1	Over-charge Protection Voltage	$4.275 \pm 0.025V$
2	Over-charge detection delay time	0.96~1.4S
3	Over-charge release Voltage	$4.215 \pm 0.025V$
4	Over-discharge protection Voltage	$3.000 \pm 0.050V$
5	Over-discharge detection delay time	115~173mS
6	Over-discharge release Voltage	$3.200 \pm 0.100V$
7	Over discharge current protection current	2~6A
8	Over discharge current detection delay time	7.2~11mS
9	Short circuit protection detection delay time	220~380uS
10	Short circuit release condition	Cut off load
11	Current consumption in normal operation	$\leq 7\mu A$
12	Inner resistance	$\leq 65m\Omega$

8.3 Part List

Location	Description	part No. Specification	Size	Qty	Vendor	ROHS	Remark
U1	Protection IC	G3J	SOT-23-6	1		ROHS	
Q1	SMD MOSFET	8205	TSSOP-8	2	/	ROHS	
R1	SMD Resistance	470 Ω , $\pm 5\%$, 1/10W	0402	1	YAGEO	ROHS	
R2	SMD Resistance	2K Ω , $\pm 5\%$, 1/16W	0603	1	YAGEO	ROHS	
C1	SMD Capacitance	0.1uF, -20~+80%, 50V	0402	1	YAGEO	ROHS	

9. Warranty

One year after shipment in the standard storage condition.

10. Matters Needing Attention

Strictly observe 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 prohibit heat or throw cell into fire.
- Strictly prohibit throw and wet cell in liquid such as water、 gasoline or drink etc.
- Strictly prohibit use leave cell close to fire or inside of a car where temperature may be above 60℃. Also do not charge / discharge in such conditions.
- Strictly prohibit 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 prohibit short circuit the (+) and (-) terminals with other metals.
- Do not place Cell in a device with the (+) and (-) in the wrong way around.
- Strictly prohibit pierce Cell with a sharp object such as a needle.
- Strictly prohibit disassemble or modify the cell.
- Strictly prohibit 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 prohibit put cell into a microwave oven, dryer, or high-pressure container.
- Strictly prohibit 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 flowing water 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 prohibit reversed charging. Connect cell reverse will not charge the cell. At the same time, it will reduce the charge-discharge Performance and safety Performance; 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.

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- 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 3.6~3.9V with no use for a long time.
- Battery should be charged and discharged every 3 months at 0.2 C during long term storage, and then charge to 50-70% of the capacity for storage.
- Do not exceed these ranges of the following temperature ranges:

Charge temperature range: 0°C ~ 45°C

Discharge temperature range: -20°C ~ 60°C

Storage temperature range(up to 30 days): -20°C ~ +45°C

Storage temperature range(up to 90 days): -10°C ~ +35°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 6 months after receipt of the battery and maintain the voltage 3.6~3.9V. And store the battery in cool and dry place.