



GUANGZHOU MARKYN BATTERY CO., LTD.

## Specification Approval Sheet

Product Name	Li-ion Battery
Model SPEC	LFP26650C6/3300mAh/3.7V
Company Name	GMB
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Approved By	Checkup	Make

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### Specification Modification Records

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**Any copies are invalid without our company's approval**

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## 1. Scope:

This specification describes the technological parameters and testing standard for the lithium ion rechargeable cell manufactured and supplied by Guangzhou Markyn Battery Co., Ltd.

## 2. Products specified

- 1.1. Name Cylindrical Lithium Ion Rechargeable Cell
- 1.2. Type LFP26650C6-3300mAh

## 3. Caution:

- 3.1 Please read these specifications carefully before testing or using the cell as improper handling of a Li-ion cell may result in lose of efficiency, heating, ignition, electrolyte leakage or even explosion.
- 3.2 While testing the cell by charging and discharging, please use test-equipment especially designed for Li-ion cell. Do not use ordinary constant current and constant voltage (CC/CV) power supplies. These do not protect the cell from being overcharged and over-discharged, resulting in possible loss of functionality or danger.
- 3.3 When charging and discharging cells or packing them into equipment, reversing the positive and negative terminals will result in overcharging and over-discharging of the cell(s). This could lead to serious loss of efficiency and even explosions.
- 3.4 Do not solder directly on the cell. Do not resolve the cell.
- 3.5 Do not put cell(s) in pockets or bags together with metal products such as necklaces, hairpins, coins, screws, etc. Neither stores them together without proper isolation. Do not connect the positive and negative electrode directly with each other through conductive materials. This can result in a short circuit of the cell.
- 3.6 Do not beat, throw or trample the cell, do not put the cell into washing machines or high-pressure containers.
- 3.7 Keep the cell away from heat sources such as fires, heaters, etc. Do not use or store cell(s) at locations where the temperature can exceed 60such as in direct sunlight. This may lead to the generation of excessive heat, ignition and lose of efficiency.
- 3.8 Do not get cells wet or throw them into water. When not in use, place the cells in a dry environment at low temperatures.
- 3.9 While during use, testing or storing cells, cells become hot, distribute a smell, change color, deform or show any other abnormalities, please stop using or testing immediately. Attempt to isolate the cell and keep it away from other cells.
- 3.10 Should electrolyte get into the eyes, do not rub the eyes, rinse the eyes with clean water and seek medical attention if problems remain. If electrolyte gets onto the skin or clothing, wash with clean water immediately.

## 4. Basic characteristics

### 4.1 Single cell parameters

4.1 Capacity	Nominal Capacity:3300mAh Minimum Capacity:2950mAh(0.2C Discharge)
4.2 Nominal Voltage	3.2V
4.3 Internal Impedance	≤25mΩ
4.4 Discharge Cut-off Voltage	2.0V
4.5 Max Charge Voltage	3.65V
4.6 Standard Charge Current	0.5C
4.7 Max Charge Current	1.0C
4.8 Standard Discharge Current	0.5C
4.9 Max Continue Discharge Current	1.0C
4.10 Weight	88±1g
4.11 Max. Dimension	Diameter(Ø): 26.3mm Height (H): 65.8mm
4.12 Operating Temperature	Charge: 0 ~ 45°C Discharge: -10 ~ 45°C
4.13 Storage Temperature	-5 ~ 35°C

## 5. Protective Circuit Module

### 5.1 The cell/battery pack shall contain a PCM that can protect the cell/battery pack properly.

The cell/ battery shall be provided with a PCM to protect the cell/ battery properly.

PCM shall have the following functions to ensure safety and prevent deterioration of cell performance:

- (1) overcharging prevention
- (2) over-discharging prevention
- (3) over current prevention.

### 5.2 Overcharging Protection

Overcharging prevention stops charging if any cell of the battery pack reaches 4.0V.

### 5.3 Over-discharging protection

The Over-discharging protection monitors the voltage of every cell in the pack and works to avoid a drop in the cell voltage to 2.0V or less.

## 6. Standard conditions for test

All the tests need to be done within one month after the delivery date under the following conditions :

Ambient Temperature: 20 ± 5°C; Relative Humidity: 45~75%

a) Standard Charge	Constant Current and Constant Voltage (CC/CV) Current = 0.5C Final charge voltage = 3.65V Final charge Current = 0.05C
b) Standard Discharge	Constant Current (CC) Current = 0.5C End Voltage = 2.0V

## 7. Appearance

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

## 8. Characteristics

### 8.1 Electrical Performances

Items	Test procedure	Requirements
8.1.1 Nomina Voltage	The average value of the working voltage during the whole discharge process.	3.2V
8.1.2 Discharge Performance	The discharge capacity of the cell, measured with 0.66 A down to 2.0V within 1 hour after a completed charge.	≥5h
8.1.3 Capacity Retention	After 28 days storage at 20±5°C, after having been completely charged and discharged at 0.66A, discharge to 2.0V, the residual capacity is above 90%.	Capacity ≥2970mAh
8.1.4 Cycle Life	After 1000 cycles at 100% DOD. Charge and discharge at 1.65A, the residual discharge capacity is above 75% of nominal capacity.	≥1000 cycles
8.1.5 Storage	(Within 3 months after manufactured) The cells is charged with 1.65A to 40-50% capacity and stored at ambient temperature 20±5°C, 65±20%RH for 12 months. After the 12months storage period the cell is fully harged and discharged to 2.0V with 0.66A	Discharge time≥4h

### 8.2 Safety Performances

Items	Test procedure	Requirements
8.2.1 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.
8.2.2 Impact Test	The cell, placed on hard surface, receives impact from a hammer of 10Kg in free fall from 1m height.	No fire, No explosion.
8.2.3 Overcharge	After charge the cell as per standard charge mode, CC/CV charge (CC 3C and CV 10V), watch the temperature change during testing process, when the cell temperature drops to 10°C lower than the peak, end the experiment.	No fire, No explosion.

8.2.4 Thermal shock	After standard charging, heat the cell to 120±2°C at a rate of 5±2°C/min and keep it at this temperature during 10minutes.	No fire, No explosion.
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**8.3 Environmental tests**

Items	Test procedure	Requirements
8.3.5 High temperature performance	The fully charged cell is put at 55±2°C for 2 hours and then discharged to 2.0V at 1.65A.	Capacity ≥2700mAh
8.3.6 Low temperature performance	The fully charged cell is placed during 2 hours at -10±2°C and then discharge to 2.0V at 1.65A.	Capacity ≥1815mAh
8.3.7 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 fire, No explosion.
8.3.8 Drop Test	The fully charged cell is dropped from a height of 1m onto a 18~20mm hard board in X, Y and Z directions once for all axis. Then the cell is discharged at 3.3A to 2.0V followed by 3 or more cycles with the standard charge rate and a discharge at 3.3A.	No fire, No explosion.

**9.0 thers**

**9.1 Package**

when packing.Product name、 model 、 nominal voltage、 quantity、 gross weight、 date of production and corresponding impedance、 capacity should be marked outside the package box.

**9.2 Transport**

The cell should be packed in box for transport,avoid acute vibration,shock or extrusion,exposed to the sun and rain during transport.We can use car,train,ship and plane for transport.

**9.3 Storage**

The cell should be placed in a clean and dry room where the temperature is specified in 4.14 and the relative humidity is less than 75%,avoid contacting with corrosive substances,away from fire and heat resource.Besides, keep the cell in a half-charged state to prevent self-discharge

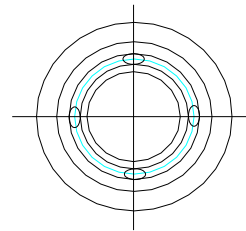
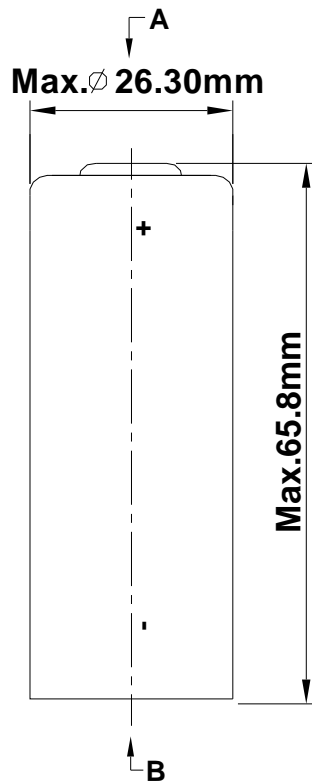
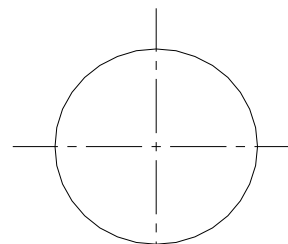
**9.4 Guarantee period is 12 months after leaving the factory.**

**9.5 we will take no responsibility for any accident when the cell is used under conditions outside of this specification**

**9.6 Any issues not covered in this specification should be discussed between the customer and us.**

**10. Drawing**

Cell Drawing (Not in scale)

**A side****B side**