

Document Name	Document No.	Date	Page
LIP18650 Specification	ZJQM-RD-SPC-H0552	2019-5-4	1/9

EEMB BATTERY

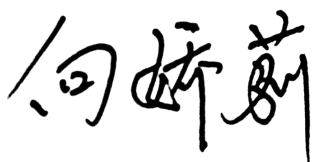
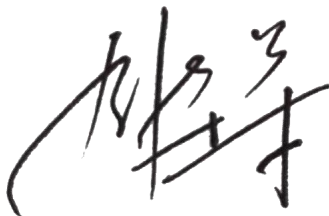
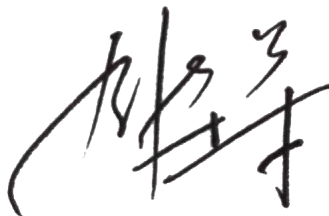
Lithium Iron Phosphate Battery

Specification

磷酸铁锂电池

产品规格书

Model 型号:	LIP18650
Capacity 容量:	1400mAh

Prepared 编制	Checked 审核	Approved 批准
		

Customer 客户名称:

Customer Approval (Customer confirmation) 客户确认:

Address: 6/F, Block 110, Jindi Industrial Zone, Sha Tou Street, Futian District, Shenzhen, China

Postal code: 518048

Phone: +86-755-83022275

FAX: +86-755-83021966

<https://www.eemb.com>

Document Name	Document No.	Date	Page
LIP18650 Specification	ZJQM-RD-SPC-H0552	2019-5-4	2/9

Catalog

Chapter	Content	Page
0	Catalog.....	2
1	Scope.....	3
2	Battery Cell Basic Characteristics.....	3
2.1	Model.....	3
2.2	Capacity.....	3
2.3	Nominal Voltage.....	3
2.4	Weight.....	3
2.5	Internal Impedance.....	3
2.6	Dimension.....	3
2.7	Charge.....	3
2.8	Discharge.....	3
2.9	Operation Temperature.....	3
2.10	Storage Temperature.....	3
2.11	Storage Relative Humidity.....	3
3	Battery Cell Shape and Dimensions.....	4
4	Appearance.....	4
5	Battery Cell Specification.....	4
5.1	Electrical Characteristics.....	4
5.1.1	1C ₅ A rate discharge capacity.....	4
5.1.2	High temp. discharge capacity.....	4
5.1.3	Low temp. discharge capacity.....	4
5.1.4	Cycle Life.....	5
5.1.5	Capacity Retention.....	5
5.2	Acclimatization Characteristics.....	5
5.2.1	High Temp. and High Humidity.....	5
5.2.2	Vibration.....	5
5.2.3	Drop.....	5
5.2.4	Low-pressure.....	5
5.3	Safety Characteristics.....	6
5.3.1	Overcharge.....	6
5.3.2	Short-Circuit.....	6
5.3.3	Heating.....	6
5.3.4	Temperature cycle.....	6
6	Battery Pack's Shipping Standard.....	6
7	Warranty.....	7
8	Matters Needing Attention.....	7~9

Document Name	Document No.	Date	Page
LIP18650 Specification	ZJQM-RD-SPC-H0552	2019-5-4	3/9

1. Scope 适用范围

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

本产品规格书适用于 EEMB 提供的磷酸铁锂电池。

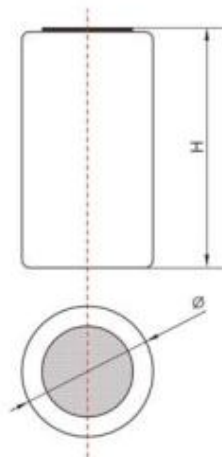
2. Battery Cell Basic Characteristics 电芯产品基本特性

No.	Item 项目	Characteristics 性能指标	Remark 备注	
2.1	Model 型号	LIP18650		
2.2	Nominal Capacity 标称容量	1400 mAh	0.5C ₅ A	
2.3	Nominal Voltage 额定电压	3.2 V		
2.4	Weight 重量	41 g		
2.5	Internal Impedance 内阻	≤ 60 mΩ	AC 1KHz(50% charge)	
2.6	Dimension 外形尺寸	Height 高	65.5 mm	
		Diameter 直径	18.5 mm	
2.7	Charge 充电	Maximum Current 最大充电电流	1400 mA	1C ₅ A (CC&CV)
		Limited Voltage 充电上限电压	3.65 V	
		End-of Current 充电截至电流	14 mA	
		Standard 标准	0.5C ₅ A × 7.5hrs	
		Rapid 快速	1C ₅ A × 2.5hrs.	
2.8	Discharge 放电	Maximum Pulse Current 最大脉冲放电电流	2800 mA	2.0C ₅ A
		Cut-off Voltage 放电终止电压	2.000 ± 0.005 V	
2.9	Operation Temperature 工作温度	Charge 充电温度	0 ~ 45 °C	
		Discharge 放电温度	-20 ~ +60 °C	
2.10	Storage Temperature 贮存温度	-20 ~ +45 °C		
2.11	Storage Relative Humidity 贮存湿度	65 ± 20 %		

3. Battery Cell Shape and Dimensions (Unit: mm)

产品外形及尺寸 (单位: mm)

Item 项目	Specification 规格
Diameter (Φ) 直径	≤18.5
Height (H) 高度	≤65.5



4. Appearance 外观

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

电池表面无划伤、裂纹、脏点、锈蚀、变形、变色、漏液等缺陷，中间无翘起。

5. Battery Cell Specification 电池性能测试规范

5.1 Electrical Characteristics 电学性能

No 序号	Items 项目	Criteria 标准	Test Method and Condition 测试方法
5.1.1	Discharge Performance at Normal Temperature 常温放电性能	0.2C ₅ A	≥ 100%
		0.5C ₅ A	≥ 98%
		1C ₅ A	≥ 95%
		2C ₅ A	≥ 90%
In standard atmospheric pressure, ambient temperature of 25±2°C, relative humidity of 45%~80%, standard charge with 0.5C, rest for 10min, discharge with different currents to 2.0V. Recycled three times, when once reach standard, namely to meet the standard requirements. 在标准大气压下，环境温度为 25±2°C，相对湿度为 45%~80%，标准充电为 0.5C，静置 10min，不同电流放电至 2.0V。循环三次，一旦达到标准，即满足标准要求。			
5.1.2	Charge Retention 充电保持	Residual capacity ≥ nominal capacity * 85% Recovery capacity ≥ nominal capacity * 90% Open-circuit voltage decreasing rate ≤ 3%	Measure the initial state and initial capacity of the battery, battery charging standards, open place for 30 days, measuring battery final state; In 0.5C ₅ A discharge to 2.0V, measuring the residual capacity of battery; 0.5C/0.5C electrical measurement Pool recovery capacity. Recycled three times, when once reach standard, namely

Document Name	Document No.	Date	Page
LIP18650 Specification	ZJQM-RD-SPC-H0552	2019-5-4	5/9

		<p>Internal resistance increasing rate $\leq 20\%$ 剩余容量 \geq 标称容量 * 85% 恢复容量 \geq 标称容量 * 90% 开路电压下降率 $\leq 3\%$ 内阻增加率 $\leq 20\%$</p>	<p>to meet the standard requirements. 测量电池的初始状态和初始容量，电池标准充电，放置于开放位置 30 天，测量电池最终状态；在 0.5C₅A 放电至 2.0V，测量电池的剩余容量；0.5C / 0.5C 电测量池恢复容量。循环三次，一旦达到标准，即满足标准要求。</p>						
5.1.3	Cycle Life 循环寿命	<p>Capacity \geq Nominal capacity * 80% 容量 \geq 标称容量 * 80%</p>	<p>Measuring battery's initial state and initial capacity. Measuring the final state after cycle 2000 times at 0.5C / 0.5C. 测量电池的初始状态和初始容量。在 0.5C / 0.5C 下循环 2000 次后测量最终状态。</p>						
5.1.4	Storage Performance (0.2C discharge) 储存性能 (0.2C 放电)	<table border="1"> <tbody> <tr> <td>3 months</td> <td>$\geq 4.5h$</td> </tr> <tr> <td>6 months</td> <td>$\geq 4.25h$</td> </tr> <tr> <td>12 months</td> <td>$\geq 4h$</td> </tr> </tbody> </table>	3 months	$\geq 4.5h$	6 months	$\geq 4.25h$	12 months	$\geq 4h$	<p>After full charge to $3.0 \pm 0.02V$, measure battery's initial status, respectively store for 3 months, 6 months and 12 months, measuring the final state of the battery; then cycle 3 times at 0.5C / 0.2C, record the discharge time of battery. 充满电至 $3.0 \pm 0.02V$ 后，测量电池的初始状态，分别存放 3 个月，6 个月和 12 个月，测量电池的最终状态；然后在 0.5C / 0.2C 循环 3 次，记录电池的放电时间。</p>
3 months	$\geq 4.5h$								
6 months	$\geq 4.25h$								
12 months	$\geq 4h$								

5.2 Acclimatization Characteristics 环境适应性能

No 序号	Items 项目	Criteria 标准	Test Method and Condition 测试方法
5.2.1	Thermal Cycling Performance 热循环性能	<p>Batteries don't smoke, no fire, no explosion. 电池不冒烟，不起火，不爆炸。</p>	<p>After standard charge, rest for 48h at $75 \pm 2^\circ C$, then rest for 6h at $-20^\circ C$, last rest for 24h at room temperature; watch battery appearance change. 标准充电后，在 $75 \pm 2^\circ C$ 下静置 48h，然后在 $-20^\circ C$ 下静置 6h，在室温下静置 24h；看电池外观变化。</p>
5.2.2	A Constant Humid Performance 持续潮湿表现	<p>Residual capacity / nominal capacity $\times 100\% > 60\%$. No deformation, no rust, no smoke, vent is not open, no explosion. 剩余容量/标称容量 $\times 100\% > 60\%$. 不变形，不生锈，不冒烟，泄防槽不打开，不爆炸。</p>	<p>After standard charge, place the cell in a $40 \pm 5^\circ C$ and RH 95% constant temperature and humidity box for 168h, take out and aside 2h, discharge at 1C₅A to 2.0V. 标准充电后，将电池置于 $40 \pm 5^\circ C$ 和 RH 95% 恒温恒湿箱中 168h，取出并放置 2h，在 1C₅A 放电至 2.0V。</p>
5.2.3	Drop	<p>Discharge Time $\geq 51min$. No leakage, no</p>	<p>After standard charge, measuring the initial state. The cell drop onto a hard board with the thickness of 20mm from 1m</p>

Document Name	Document No.	Date	Page
LIP18650 Specification	ZJQM-RD-SPC-H0552	2019-5-4	6/9

	跌落	explosion, no fire. 放电时间 ≥ 51 min。不 泄漏, 不爆炸, 不起 火。	in six directions, test the final state of the cell; then discharge at $1C_5A$ to 2.0V, test discharge time. 标准充电后, 测量初始状态。将电芯从六个方向上的 1m 处落到厚度为 20mm 的硬板上, 测试电芯的最终状态; 然后在 $1C_5A$ 放电至 2.0V, 测试放电时间。								
5.2.4	Discharge Performance under Different Temperatures 不同温度下的放 电性能	<table border="1"> <tbody> <tr> <td>60°C</td> <td>$\geq 95\%$</td> </tr> <tr> <td>0°C</td> <td>$\geq 85\%$</td> </tr> <tr> <td>-10°C</td> <td>$\geq 70\%$</td> </tr> <tr> <td>-15°C</td> <td>$\geq 60\%$</td> </tr> </tbody> </table>	60°C	$\geq 95\%$	0°C	$\geq 85\%$	-10°C	$\geq 70\%$	-15°C	$\geq 60\%$	<p>Measuring cell initial capacity and initial state. After standard charge, rest for 3h at $60 \pm 2^\circ C$, $0.5C_5A$ discharge to 2.75V. Then after standard charge at room temperature, respectively rest for 20h at $0 \pm 2^\circ C$, $-10 \pm 2^\circ C$ and $-10 \pm 2^\circ C$, $0.5C_5A$ discharge to 2.0V and measuring final capacity. Finally put aside at room temperature for 2h, measuring the final state of the battery and observe the battery appearance change.</p> <p>测量电芯初始容量和初始状态。标准充电后, 在 $60 \pm 2^\circ C$ 下静置 3h, $0.5C_5A$ 放电至 2.0V。然后在室温下标准充电 后, 分别在 $0 \pm 2^\circ C$, $-10 \pm 2^\circ C$ 和 $-10 \pm 2^\circ C$ 下放置 20h, $0.5C_5A$ 放电至 2.75V 并测量最终容量。最后在室温下放置 2 小时, 测量电池的最终状态并观察电池外观的变化。</p>
60°C	$\geq 95\%$										
0°C	$\geq 85\%$										
-10°C	$\geq 70\%$										
-15°C	$\geq 60\%$										
5.2.5	Vibration 震动	<p>Residual capacity \geq nominal capacity * 95%;</p> <p>Voltage decay rate \leq 0.5%;</p> <p>Internal resistance increasing rate \leq 20%;</p> <p>No obvious damage, no smoke, no explosion. 剩余容量\geq标称容量* 95%;</p> <p>电压衰减率$\leq 0.5\%$;</p> <p>内阻增加率$\leq 20\%$;</p> <p>没有明显的损坏, 不 冒烟, 不爆炸。</p>	<p>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.</p> <p>电池在三个相互垂直的方向上振动 30 分钟, 振幅为 0.38mm (10~30Hz) 或 0.19mm (30~55Hz), 扫描速率 为每分钟 1oct。</p>								

5.3 Safety Characteristics 安全性能

No 序号	Items 项目	Criteria 标准	Test Method and Condition 测试方法
5.3.1	Overcharge 过充	No explosion or fire. Max. temperature $< 130^\circ C$.	After standard charge, charging with $1C_5A$ to 4.8V; then CV charging with $0.01C_5A$, observe the temperature and the appearance of the cell.

Document Name	Document No.	Date	Page
LIP18650 Specification	ZJQM-RD-SPC-H0552	2019-5-4	7/9

		不爆炸或着火。最大温度 $<130^{\circ}\text{C}$ 。	标准充电后, 用 $1\text{C}_5\text{A}$ 充电至 4.8V ; 然后用 $0.01\text{C}_5\text{A CV}$ 充电, 观察温度和电池的外观。
5.3.2	Over Discharge	No fire or explosion. 不爆炸或着火。	After standard charge, discharge with $1\text{C}_5\text{A}$ to 2.0V , then connect the cathode with 10Ω resistance, rest for 14 days. Measuring the final state of the cell. 标准充电后, 用 $1\text{C}_5\text{A}$ 放电至 2.0V , 然后用 10Ω 电阻连接正极, 静置 14 天。测量电芯的最终状态。
5.3.3	Short-circuit 短路	No explosion or fire. Max. temperature $<130^{\circ}\text{C}$. 不爆炸或着火。最大温度 $<130^{\circ}\text{C}$ 。	After standard charge, place the battery with thermocouple into a fume hood, and short-circuit by connecting the positive and negative terminals (resistance load of $50\text{m}\Omega$), end the test when the battery temperature drops to about 10°C lower than peak value. 标准充电后, 将带热电偶的电池放入通风橱, 并通过连接正负极端子 (电阻负载为 $50\text{m}\Omega$) 进行短路, 当电池温度降至峰值以下约 10°C 时结束测试。
5.3.4	Impact 重击	No fire or explosion. 不爆炸或着火。	After full charge, test the initial state of battery, place it on the flat and connect to the thermocouple, put a bar with 15.8mm diameter to the middle of the cell, a 9.1kg weight drop from 610mm height to the table, watch battery appearance and temperature changes. 充满电后, 测试电池的初始状态, 将其放在平板上并连接到热电偶上, 在电芯中间放一个直径为 15.8mm 的棒, 从 610mm 的高度到, 9.1kg 的重量跌落到桌面上, 观察电池外观和温度变化。
5.3.5	Compression 压缩	No explosion or fire. Max. temperature $<130^{\circ}\text{C}$. 不爆炸或着火。最大温度 $<130^{\circ}\text{C}$ 。	After full charge, test the initial state of cell, place it on the flat and connect to the thermocouple, placed it between two iron flat mould, quickly compress the battery with 13KN . Observe the temperature of the cell and appearance change. 充满电后, 测试电芯的初始状态, 将其放在平板上并连接热电偶, 将其置于两个铁平模具之间, 用 13KN 快速压缩电池。观察电芯温度和外观变化。
5.3.6	Thermal Shock	No fire or explosion. 不爆炸或着火。	Cell is heated in a circulating air oven at a rate of $(5\pm 2)^{\circ}\text{C}$ per minute to $130\pm 2^{\circ}\text{C}$, and then placed for 10min at $130\pm 2^{\circ}\text{C}$, observe appearance change of the cell. 将电芯在循环空气烘箱中以 $(5\pm 2)^{\circ}\text{C}/\text{分钟}$ 的速率加热至 $130\pm 2^{\circ}\text{C}$, 然后在 $130\pm 2^{\circ}\text{C}$ 下放置 10 分钟, 观察电芯的外观变化。

6. Battery Shipping Standard 电池出货标准

Voltage: $3.2\text{V}\sim 3.4\text{V}$

电池出货电压: $3.2\text{V}\sim 3.4\text{V}$

Document Name	Document No.	Date	Page
LIP18650 Specification	ZJQM-RD-SPC-H0552	2019-5-4	8/9

7. Warranty 保质期

6 months warranty for sample battery after date of production. One year warranty for finished battery after the date of production.

样品电池保质期为（出厂之日起）半年；产品电池保质期为（出厂之日起）1年。

8. Matters Needing Attention 注意事项

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

您必须严格遵守下述电池使用注意事项。对于没有按照以下注意事项所造成的任何意外事故，EEMB 不负担任何责任。

! Danger 危险

- Strictly prohibits heat or throw cell into fire. 严禁把将电池投进火中或进行加热
- Strictly prohibits throw and wet cell in liquid such as water、gasoline or drink etc.
严禁把电池投入液体中，如水、汽油、饮料等，也不要把电池弄湿。
- 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.
禁止在火源附近或温度超过 60°C 的轿车中使用或遗留电池，也不要这些环境中进行充放电。
- 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.
禁止把电池同项链、发夹、硬币或螺钉等金属品一起放在兜中或包中，也不要把电池同上述物品一起储存或运输。
- Strictly prohibits short circuit the (+) and (-) terminals with other metals.
禁止使用金属导体短路电池的正负极。
- Do not place Cell in a device with the (+) and (-) in the wrong way around.
在装入设备时注意电池的正负极不要反装。
- Strictly prohibits pierce Cell with a sharp object such as a needle.
禁止使用锐利的物品刺穿电池。
- Strictly prohibits disassemble or modify the cell.
禁止对电池进行分解。
- Strictly prohibits welding a cell directly.
禁止直接对电池进行焊接。
- Do not use a Cell with serious scar or deformation.
禁止使用已经损坏的电池。
- Thoroughly read the user's manual before use, inaccurate handling of lithium iron phosphate rechargeable cell may cause leakage, heat, smoke, an explosion, or fire, capacity decreasing.
在使用之前请详细阅读操作说明书，不适当的操作可能引起电池变热、着火、爆炸、毁坏或电池容量的衰减。

Document Name	Document No.	Date	Page
LIP18650 Specification	ZJQM-RD-SPC-H0552	2019-5-4	9/9

! Warning 警告

- Strictly prohibits put cell into a microware oven, dryer, or high-pressure container.
禁止把电池放加热器皿、洗衣机或高压容器中。
- 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.
禁止把电池同干电池或其它原电池或者新旧电池一起使用，也不要同不同包装、不同型号或不同品牌的电池一起使用。
- Stop charging the Cell if charging is not completed within the specified time.
如果在规定的充电时间内充电没有结束，停止充电。
- Stop using the Cell if abnormal heat, odor, discoloration, deformation or abnormal condition is detected during use, charge, or storage.
在使用、充电或储存期间如发现电池有变热、散发气味、变色、变形或其它反常之处停止使用。
- Keep away from fire immediately when leakage or foul odor is detected.
当发现电池漏液或散发出难闻的气味时立即远离。
- If liquid leaks onto your skin or clothes, wash well with fresh water immediately.
如果电解液渗漏到您的皮肤或衣服上，立刻用大量清水冲洗。
- 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.
如果电解液渗出并进入您的眼睛里，不要揉擦您的眼睛，立刻用食用油清洗眼睛并就医。

! Caution 注意

- Before using the Cell, be sure to read the user's manual and cautions on handling thoroughly.
在使用电池之前，应详细阅读操作指南并对使用中的注意事项有足够深刻的理解。
- Charging with specific charger according to product specification. Charge with CC/CV method. Strictly prohibits revered 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.
充电时请使用指定的充电器并按照本规格书的要求进行充电。采用恒流恒压方式充电，禁止反向充电。若电池正负极接反，将无法对电芯进行充电；同时，反向充电会降低电芯的充放电性能和安全性，并会导致发热和泄漏。
充电时请使用指定的充电器并按照本规格书的要求进行充电。采用恒流恒压方式充电，禁止反向充电。若电池正负极接反，将无法对电芯进行充电；同时，反向充电会降低电芯的充放电性能和安全性，并会导致发热和泄漏。
- Store batteries out of reach of children so that they are not accidentally swallowed.
把电池放到小孩够不到的地方以免吞服。
- If younger children use the Cell, their guardians should explain the proper handling.
小孩使用电池时，监护人应详细解释操作方法。
- Before using the Cell, be sure to read the user's manual and cautions on handling thoroughly.
在将电池装入设备或从设备中取出之前详细阅读设备操作手册。
- 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.
电池具有使用寿命，如果使用电池的设备的工作时间比平常少的多，请更换新电池。
- When not using Cell for an extended period, remove it from the equipment and store in a place with low humidity and low temperature.
当长期不用时，要将电池从设备中取出并放在低温低湿的环境中保存。

Document Name	Document No.	Date	Page
LIP18650 Specification	ZJQM-RD-SPC-H0552	2019-5-4	10/9

- While the Cell pack is charged, used and stored, keep it away from objects or materials with static electric charges.
电池应在远离静电的场所进行充电、使用和储存。
- If the terminals of the Cell become dirty, wipe with a dry clothe before using the Cell.
如果电池的接线端变脏，在使用之前用干布擦净。
- Storage the cells in storage temperature range as the specifications. After full discharged, we suggest that charging to 3.2~3.4V.with no using for a long time.
电芯应贮存在产品规格书规定的温度范围内，电芯放电放完后，如果长期不使用，建议充电至 3.2~3.4V 贮存。
- 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.
- 电池在长期贮存过程中，必须每 3 个月 0.2C 进行充放电一次，然后充电至 50~70%的容量进行贮存。
- Do not exceed these ranges of the following temperature ranges:
电池在使用和贮存时的温度不能超出下面的要求：

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

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

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

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

Store less than 1 year 贮存 12 个月 : -20°C - +25°C

! Special Notice 特别注意

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 3.2~3.4V. And store the battery in cool and dry place.

电池在长时间储存的过程中保持带电量为 50%。我们建议每 3 个月充电至 **50%**以上容量，保持电压在 3.2~3.4V。将电池存储在阴凉干燥的地方。

EEMB reserves the final explanation. Please use battery strictly according to specification. EEMB will not be responsible for any inappropriate operation. EEMB keeps the right to change product specifications without previous notice. If any question, please consult with the manufacturer

EEMB 保留最终解释权。请严格按照规范使用电池。EEMB 对任何不当操作将不负责。EEMB 保留修改产品规格书不另行通知的权利。如有任何问题, 请咨询制造商。