



Li-ion Cylindrical Battery Specification

锂离子圆柱电池说明书

MODEL

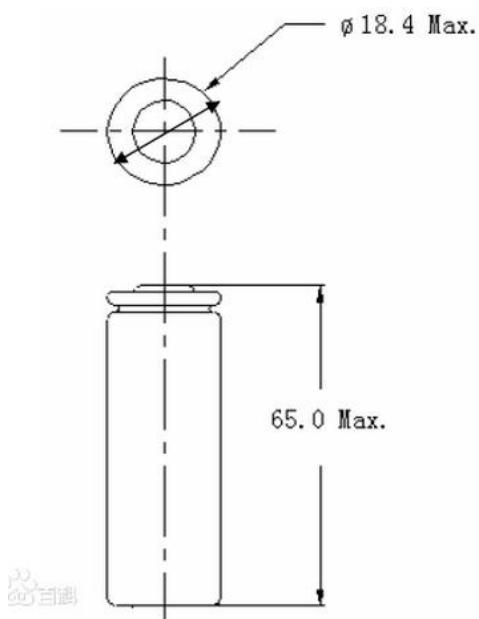
型 号: IMR18650

Nominal Capacity

标 称 容 量: 3000mAh

.Products assembly drawing and size refers to picture 1

产品组装图及尺寸请参阅图



Specification 产品规格

NO. 序号	Item 项目	Specifications 规格要求
1	Typical Capacity 典型容量	3000mAh @ 1C Discharge (1C 放电)
	Minimum capacity 最小容量	3000mAh @ 1C Discharge (1C 放电)



2	Nominal voltage	标称电压	3.7V
3	Standard Charge	标准充电	CCCV,1.50A, 4.20V±0.05V,150mA cut-off
4	Standard Discharge	标准放电	40A
5	End-of-charge Voltage	充电截止电压	4.20V±0.05V
6	End-of-charge Current	充电截止电流	Standard charge: 1500mA Rapid charge : 3600mA
7	End-of-discharge Voltage	放电截止电压	4.2 V
8	Charging Time	充电时间	Standard charge : 3hours Rapid charge : 2.5hours
9	Quick Charge Current	快速充电电流	3000mA (1.0C5rate) 1C 充电
10	Quick Discharge Current	快速放电电流	3000mA(ambient temperature 25℃)
11	Max Discharge Current	最大放电电流	6000mA(ambient temperature 25℃)
12	Initial Impedance	初始内阻	Max:100mΩ
13	Weight	重量	Approx(约): 47.0g±2g
14	Operating temperature	工作温度	Charging(充电): 0℃~45℃ Discharging(放电): -20℃~60℃
15	Storage temperature	储存温度	1.5year -20~25℃ 3 months -20~45℃ 1 month -20~60℃
16	Storage Humidity	储存湿度	≤75% RH
17	Appearance	外观	Without scratch, distortion, contamination and leakage (无划痕、变形、污迹、电解液泄露)
18	Standard environmental condition 标准环境		Temperature(温度) : 25±5℃ Humidity (湿度) : 65-20%RH Atmospheric Pressure (大气压) : 86-106 KPA
19	T Note (1): If the cell is kept as ex-factory status (50% of charge), the capacity recovery rate is more than 80%.		

2. Appearance

There shall be no such defects as scratch, rust, discoloration, leakage which **may adversely affect commercial value of the cell.**

3. Characteristics

3.1 Standard Charge

This "Standard Charge" means charging the cell with charge current 1500mA and constant voltage 4.2V at 25℃ for 3hours.



3.2 Standard Discharge Capacity

The standard discharge capacity is the initial discharge capacity of the cell, which is measured with discharge current of 750mA with 2.75V cut-off at 25°C within 1hour after the standard charge.

Standard Discharge Capacity $\geq$ 3000mAh

3.3 Initial internal impedance

Initial internal impedance measured at AC 1kHz after rated charge.

Initial internal impedance $\leq$ 100m Ω

3.4 Temperature Dependence of Discharge Capacity

Capacity comparison at each temperature, measured with discharge constant current 750mA and 2.75V cut-off after the standard charge is as follows.

Charge Temperature	Discharge temperature			
25°C	-10°C	0°C	25°C	40°C
Relative Capacity	50%	80%	100%	80%

Note: If charge temperature and discharge temperature is not the same, the interval for temperature change is 3 hours.

Percentage as an index of the capacity at 25°C(=2950mAh) is 100%.

3.5 Temperature Dependence of Charge Capacity

Capacity comparison at each temperature, measured with discharge constant current 750mA and 2.75V cut-off after the standard charge is as follows.

	Discharge temperature			
	0°C	25°C	45°C	25°C
Relative.Capacity	80%	100%	80%	

Note: If charge temperature and discharge temperature is not the same, the interval for temperature change is 3 hours.

Percentage as an index of the capacity at 25°C(=2950mAh) is 100%.

3.6 Charge Rate Capabilities



Discharge capacity is measured with constant current 750mA and 2.75V cut-off after the cell is charged with 4.2V as follows

Current	0.2C (750mA)	0.5C (1500mA)	1.0C (3000mA)	2.0C (6000mA)
Cut-off	7h or 0.05C	2.5h or 0.05C	2.5h or 0.05C	2.5h or 0.05C
Relative Capacity	100%	95%	90%	80%

Note: Percentage as an index of the capacity at 25°C(=2950mAh) is 100%.

3.7 Discharge Rate Capabilities

Discharge capacity is measured with the various currents in under table and 2.75V cut-off after the standard charge.

Current	0.2C (750mA)	0.5C (1500mA)	1.0C (3000mA)	2.0C (6000mA)
Relative Capacity	100%	95%	90%	80%

Note: Percentage as an index of the capacity at 25°C(=2550mAh) is 100%.

3.8 Cycle Life

Each cycle is an interval between the charge (charge current 1500mA) with 2.5h or 0.05C cut-off and the discharge (discharge current 1500mA) with 2.75V cut-off. Capacity after 299cycles and plus 1 day, measured under the same condition in 7.2

Capacity $\geq$ 2100mAh(70% of the capacity at 25°C)

3.9 Storage Characteristics

Capacity after storage for 30days at 25°C from the standard charge,

measured with discharge current 1500mA with 2.75V cut-off at 25°C.

Capacity retention(after the storage) $\geq$ 2400mAh (80% of the capacity at 25°C)

3.10 Status of the cell as of ex-factory

The cell should be shipped in 50% charged state. In this case, OCV is from 3.65V to



3.85V.

4. Mechanical Characteristics

4.1 Drop Test

Test method: Cell(as of shipment or full charged) drop onto the oak-board

(thickness: $\geq 30\text{mm}$) from 1.5m height at a random direction 6 times.

Criteria: No leakage

4.2 Vibration Test

Test method: Cell(as of shipment) is vibrated along 2 mutually perpendicular axes with total excursion of 1.6mm and with frequency cycling between 10Hz and 55Hz by 1Hz/min.

Criteria: No leakage

5. Safety

5.1 Overcharge Test

Test method: To charge the standard charged cell with 12V and 2.6A at 25°C

for 2.5 hours.

Criteria: No fire, and no explosion.

5.2 External Short-circuit Test

Test method: To short-circuit the standard charged cell by connecting positive and negative terminal by less than $50\text{m}\Omega$ wire for 3hours.

Criteria: No fire, and no explosion.

5.3 Reverse Charge Test

Test method: To charge the standard charged cell with charge current 2.6A

By -12V for 2.5 hours.

Criteria: No fire, and no explosion.

5.4 Heating Test

Test method: To heat up the standard charged cell at heating rate 5°C per minute up to

130°C and keep the cell in oven for 60 minutes.

Criteria: No fire, and no explosion.

6. Others

6.1 Storage for a long time

If the cell is kept for a long time(3months or more), It is strongly recommended that the cell is preserved at dry and low-temperature.

6.2 Other

Any matters that specifications does not have, should be conferred with between the both parties.



6.3 PTC Specification

Item	PTC Specification (in the Cell)			
	Hold Current	Resistance	Power Dissipation	Resistance After Trip
Spec.	2.7A	9~18mΩ	Max. 2.5W	Max. 33mΩ

Proper Use and Handling of Lithium Ion Cells

See before using lithium-ion cell

Supplied by

Shenzhen IMR Technology Co., Ltd

1. General

This document has been prepared to describe the appropriate cautions and prohibitions, which the customer should take or employ when the customer uses and handles the lithium ion cell to be manufactured

2. Charging

2.1 Charging current

Charging current should be less than maximum charge current specified in the product specification.

2.2 Charging voltage

Charging should be done by voltage less than that specified in the product specification.

2.3 Charging time

Continuous charging under appropriate voltage does not cause any loss of characteristics. However, the charge timer is recommended to be installed from a safety consideration, which shuts off further charging at time specified in the product specification.

2.4 Charging temperature

The cell should be charged within a range of specified temperatures in the product specification.

2.5 Reverse charging

The cell should be connected, confirming that its poles are correctly aligned.

Inverse charging should be strictly prohibited. If the cell is connected, improperly, it may be damaged.

3. Discharging

3.1 Discharging

3.1.1 The cell should be discharged at less than maximum discharge current specified in the product specification.

3.2 Discharging temperature

3.2.1 The cell should be discharged within a range of temperatures specified in the product specification.



3.2.2 Otherwise, it may cause loss of characteristics.

3.3 Over-discharging

3.3.1 The system should equip with a device to prevent further discharging exceeding discharging cut-off voltage specified in the product specification.(over-discharging)

3.3.2 Over-discharging may cause loss of performance, characteristics, of battery function.

3.3.3 Over-discharging may occur by self-discharge if the battery is left for a very long time without any use.

3.3.4 The charger should equip with a device to detect cell voltage and to determine recharging procedures.

4. Storage

4.1 Storage conditions

4.1.1 The cell should be stored within a range of temperatures specified in the product specification.

4.1.2 Otherwise, it may cause loss of characteristics, leakage and/or rust.

4.2 Long-term storage

4.2.1 The cell should be used within a short period after charging because long-term storage may cause loss of capacity by self-discharging.

4.2.2. If long-term storage is necessary, the cell should be stored at lower voltage within a range specified in the product specification, because storage at higher voltage may cause loss of characteristics.

5. Cycle life

5.1 Cycle life performance

5.1.1 The cell can be charged/discharged repeatedly up to times specified in the produce specification with a certain level of capacity also specified in the product specification.

5.1.2 Cycle life may be determined by conditions of charging, discharging, operating temperature and/or storage.

6. Design of System

6.1 Connection between the cell and the battery

6.1.1 The cell should not be soldered directly with leads. Namely, the cell should be welded with leads on its terminal and then be soldered with wire or leads to soldered lead.

6.1.2 Otherwise, it may cause damage of component, such as separator and insulator, by heat generation.

6.2 Positioning the battery in the System

6.2.1 The battery should be positioned as possible as far from heat sources and high temperature components.

6.2.2 Otherwise, it may cause loss of characteristics.



6.3 Mechanical shock protection of the battery

6.3.1 The battery should equip with appropriate shock absorbers in order to minimize shock.

6.3.2 Otherwise, it may cause shape distortion, leakage, heat generation and/or rupture.

6.4 Short-circuit protection of the cell

6.4.1 The cell equips with an insulating sleeve to protect short-circuit which may occur during transportation, battery assembly and /or system operation.

6.4.2 If the cell sleeve is damaged by some cause such as outside impact, it may cause short-circuit with some wiring inside the battery.

6.5 Connection between the battery and charger/system

6.5.1 The battery should be designed to be connected only to the specified charger and system.

6.5.2 A reverse connection of the battery, even in the specified system, should be avoided by employing special battery design such as a special terminals.

7. Battery Pack Assembly

7.1 Prohibition of usage of damaged cell

7.1.1 The cell should be inspected visually before battery assembly.

7.1.2 The cell should not be used if sleeve-damage, can-distorsion and/or electrolyte-smell is detected.

7.2 Terminals handling

7.2.1 Excessive force on the negative terminal should be avoided when external lead is welded.

7.3 Transportation

7.3.1 If the cell is necessary to transported to order place, such as the battery manufacturer, careful precautions should be taken to avoid damage of cell.

8. Others

8.1 Disassembly

8.1.1 The cell should not be dismantled from the battery pack.

8.1.2 Internal short-circuit caused by disassembly may lead to heat generation and/or venting.

8.1.3 When the electrolyte is coming in contact with the skin or eyes, flush immediately with fresh water and seek medical advice.

8.2 Short-circuiting

8.2.1 Short-circuit results in very high current which leads to heat generation.

8.2.3 An appropriate circuitry should be employed to protect accidental



short-circuiting.

8.3 Incineration

8.3.1 Incinerating and disposing of the cell in fire are strictly prohibited, because it may cause rupture.

8.4 Immersion

8.4.1 Soaking the cell in water is strictly prohibited, because it may cause melt of components to damaged to functions.

8.5 Mixing use

8.5.1 Different types of cell, or same types but different manufacturer's cell may lead to cell rupture or damage to system due to the different characteristics of cell.

8.6 Battery exchange

8.6.1 Although the cell contains no environmentally hazardous component, such as lead or cadmium. the battery should be disposed according to the local regulations when it is disposed.

8.6.2 The cell should be disposed with a discharged state to avoid heat generation by an inadvertent short-circuit.

8.7 Caution - The Battery used in this device may present a risk of fire or chemical burn if mistreated. Do not disassemble, heat above 100°C or incinerate. Replace battery with Samsung SDI battery only. Use of another battery may present a risk of fire or explosion. Dispose of used battery promptly. Keep away from children. Do not disassemble and do not dispose of in fire.

8.8 Warning – Attached

Handling Precaution and Prohibitions of Lithium Ion & Lithium Ion Polymer Rechargeable Cells and Batteries

Inaccurate handling of lithium ion and lithium ion polymer rechargeable battery may cause leakage, heat,

smoke, an explosion, or fire.

This could cause deterioration of performance or failure. Please be sure to follow instructions carefully.

1.1 Storage

Store the battery at low temperature (below 20°C is recommended), low humidity, no dust and no corrosive gas atmosphere.

1.2 Safety precaution and prohibitions

To assure product safety, describe the following precautions in the instruction manual of the application.

[Danger!]

■ Electrical misuse

Use dedicated charger.



Use or charge the battery only in the dedicated application.

Don't charge the battery by an electric outlet directly or a cigarette lighter charger.

Don't charge the battery reversely.

■ Environmental misuseage

Don't leave the battery near the fire or a heated source.

Don't throw the battery into the fire.

Don't leave, charge or use the battery in a car or similar place where inside of temperature may be over 60°C.

Don't immerse, throw, wet the battery in water / seawater.

■ others

Don't fold the battery cased with laminated film such as pouch and Polymer.

Don't store the battery in a pocket or a bag together with metallic objects such as keys, necklaces, hairpins, coins, or screws.

Don't short circuit (+) and (-) terminals with metallic object intentionally.

Don't pierce the battery with a sharp object such as a needle, screw drivers.

Don't heat partial area of the battery with heated objects such as soldering iron.

Don't hit with heavy objects such as a hammer, weight.

Don't step on the battery and throw or drop the battery on the hard floor to avoid mechanical shock.

Don't disassemble the battery or modify the battery design including electric circuit.

Don't solder on the battery directly.

Don't use seriously scared or deformed battery.

Don't put the battery into a microwave oven, dryer ,or high-pressure container.

Don't use or assemble the battery with other makers' batteries, different types and/or models of batteries such as dry batteries, nickel-metal hydride batteries, or nickel-cadmium batteries.

Don't use or assemble old and new batteries together.

[Warning!]

Stop charging the battery if charging isn't completed within the specified time.

Stop using the battery if the battery becomes abnormally hot, order, discoloration, deformation, or abnormal conditions is detected during use, charge, or storage.

Keep away from fire immediately when leakage or foul odors are detected. If liquid leaks onto your skin or cloths, wash well with fresh water immediately.

If liquid leaking from the battery gets into your eyes, don't rub your eyes and wash them with clean water and go to see a doctor immediately.

If the terminals of the battery become dirty, wipe with a dry cloth before using the battery.

The battery can be used within the following temperature ranges. Don't exceed these ranges.



Charge temperature ranges : 0°C ~ 45°C

Discharge Temperature ranges : -20°C ~ 60°C

Store the battery at temperature below 60°C

Cover terminals with proper insulating tape before disposal.

improperly, it may be damaged. Unless otherwise specified, all tests stated in this specification

CAUTIONS IN USE 使用警告

To ensure proper use of the battery please read the manual carefully before using it. Handling
为了使电池安全的使用及处理请在使用前认真的阅读操作说明

- Do not expose to, dispose of the battery in fire.
- 不能把电池曝晒或丢在火中
- Do not put the battery in a charger or equipment with wrong terminals connected.
- 电池充电时不能把正负极性装反
- Avoid shorting the battery
- 避免短路电池
- Avoid excessive physical shock or vibration.
- 避免过分的物理震动和冲击电池
- Do not disassemble or deform the battery.
- 不能拆解或使电池变形
- Do not immerse in water.
- 不能将电池浸入水中
- Do not use the battery mixed with other different make, type, or model batteries.
- 不能将其它不同厂家, 类型, 型号的电池混合使用
- Keep out of the reach of children.
- 禁止小孩接触电池

charge and discharge 充放电

- Battery must be charged in appropriate charger only.
- 电池必须在合适的条件下充电
- Never use a modified or damaged charger.
- 决不能用故障的充电器给电池充电
- Do not leave battery in charger over 24 hours.
- 电池持续充电不能超过 24H

. storage 贮存

- Store the battery in a cool, dry and well-ventilated area.
- 电池贮藏在通风干燥的环境中

. disposal 处理

- Regulations vary for different countries. Dispose of in accordance with local regulations.
- 不同国家法规的不同, 处理时根据当地的法规。



Battery operation instruction 电池操作说明

1 Charging 充电

Charging current: Cannot surpass the biggest charging current which in this specification book stipulated.

充电电流：不能超过规格书规定的最大的充电电流

Charging voltage: Does not have to surpass the highest amount which in this specification book stipulated to decide the voltage.

充电电压：不能超过规格书规定的最高的限制电压

Charge temperature: The battery must carry on the charge in the ambient temperature scope which this specification book stipulated.

充电温度：电池充电温度必须按照规格书的温度范围执行

Uses the constant electric current and the constant voltage way charge, the prohibition reverse charges. If the battery positive electrode and the cathode meet instead, can damage the battery.

先恒流后恒压方式充电，禁止颠倒的方式充电。如果电池正负极颠倒充电会带来危险。

2 Discharging current 放电电流

The discharging current does not have to surpass this specification book stipulation the biggest discharging current, the oversized electric current electric discharge can cause the battery capacity play to reduce and to cause the battery heat.

电池放电电流不能超过规格书规定的最大放电电流，过大的电流放电会造成电池发热和容量衰减。

3 discharge temperature 放电温度

The battery discharge must carry on in the ambient temperature scope which this specification book stipulated

电池放电温度必须按照规格书的温度范围执行

4 Over-discharges 过放电

After the short time excessively discharges charges immediately cannot affect the use, but the long time excessively discharges can cause the battery the performance, battery function losing. The battery long-term has not used, has the possibility to be able to be at because of its automatic flashover characteristic certain excessively discharges the condition, for prevented excessively discharges the occurrence, the battery should maintain the certain electric quantity.

短时间的过充过放不影响电池的使用，但是长时间的过放电会影响到电池的功能失效，电池永久性不能适用，电池可能过放还有一个原因是自动能量的消失。预防电池过放的出现方法是电池应保持一定的电量。

9.5 Storing the Batteries 贮存电池。

The battery should store in the product specification book stipulation temperature range. If has surpasses above for six months the long time storage, suggested you should carry on additional charge to the battery.

电池贮存在规格书规定的温度范围内，如果电池贮存超过六个月，建议你开始给电池充电。

5. Period of Warranty 保质期

The period of warranty is one year from the date of shipment. guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customers abuse and misuse.

电池的保质期从出货之日算起为 1 年。如果证明电池的缺陷是在制造过程中形成的而不是由于用户滥用及错误使用造成，本公司负责退换电池。



6. Other The Chemical Reaction 其它化学反应

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change the battery.

由于电池是利用化学反应的原理，所以随时间的增加电池的性能会降低，即使是存放很长一段时间而不使用。如果使用条件如充电、放电及周围环境温度等情形不在指定的使用范围内，也会缩短电池的使用寿命，或者产生漏液导致设备损坏。如果电池长周期不能充电，即使充电方法正确，这样需要更换电池了。

7.Note: 备注

Any other items which are not covered in this specification shall be agreed by both parties.

本说明书未包括事项应由双方协议确定。