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LIR18650R-25 • Li-ion cylindrical rechargeable battery

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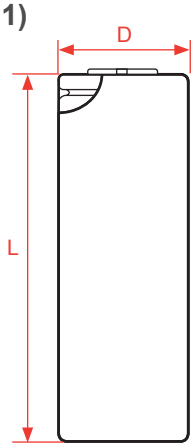
1. Scope

This product specification has been prepared to specify the Cylindrical Lithium-ion Cell.

2. Cell dimensions (fig. 1)



Item	Specification
D	Max 18.6
L	Max 65.5

units: mm

3. Cell specification

NO.	Item	Parameter
3.1	Normal capacity	2500mAh@0.2C
3.2	Minimum capacity	2400mAh@0.2C (Discharge the cell from 4.2V to 2.50V by 0.2C current)
3.3	Internal resistance	≤18mΩ(ACIR)
3.4	Normal voltage	3.7V
3.5	Charging voltage	4.2 ±0.05 V
3.6	Discharge ending voltage	2.50±0.05 V
3.7	Standard charging current	0.5C
3.8	Standard charge cut-off current	0.02C
3.9	Standard discharge current	20A
3.10	Max charge current (continuous)	2.5A (45ºC>T≥20ºC) 1.25A (20ºC>T≥10ºC) 0.5A(10ºC>T≥0ºC)
3.11	Max discharge current (continuous)	20A (60ºC>T≥20ºC) 15A (20ºC>T≥0ºC) 10A (0ºC>T≥-10ºC)
3.12	Max pulse discharge current (<1s)	30A (25±3ºC)
3.13	Cell dimension	Height: ≤65.5mm Diameter: ≤18.6mm Refer to the attached drawing 1
3.14	Weight	<47g
3.15	Max recommended charge and discharge cell body temperature	Charge: 0~ 50ºC Discharge: -20~ 70ºC
3.16	StorageTemperature	1 year: -20~25ºC 3 month: -20~ 45ºC 1 month: -20~ 60ºC
3.17	Humidity range	0~70%RH (non-condensing

4. Appearance

There shall not be such defect as deep scrath, pits, creck, rust, leakage, which may adversely affect commercial performance of the cell.

5. Technical characteristics

5.1 Cell testing conditions

Unless otherwise specified, all tests stated according to following: Temperature: 25±2.5ºC.

5.2 Requirement of the testing equipment

Voltage meter: The voltage tester internal resistance is ≥ 10 KΩ/V.

Temperature meter: The precision is ≤0.5ºC.

5.3 Electronic performance

Standardcharge

This “Standard charge” means charging the cell with constant current 0.5C and then withconstant voltage 4.2V, 0.02C cut-off at 25±3ºC.

Standard discharge capacity

The standard discharge capacity is the initial discharge capacity of the cell, which ismeasured with discharge current of 0.2C with 2.5V cut-off at 25±3ºC after the standardcharge.

Standard rated discharge capacity

The standard discharge capacity is the initial discharge capacity of the cell, which ismeasured with discharge current of 10A with 2.5V cut-off at 25±3ºC after the standard charge.

Temperature dependence of discharge capacity

Capacity comparison at each temperature, measured with discharge constant current 10A and 2.5V cut-off after the standard charge is as follows.

Discharge temperature			
-10ºC	0ºC	25ºC	60ºC
≥60%	≥80%	100%	≥95%

Note: If charge temperature and discharge temperature is not the same, the interval for temperature change is three (3) hours. Percentage as an index of the capacity at 25ºC is 100%.

Discharge rate capabilities

Discharge capacity is measured with the various currents in under table and 2.5V cut-off after the standard charge.

Discharge condition					
Current	0.5A	5A	10A	15A	20A
Relative capacity	100%	≥95%	≥95%	≥95%	≥95%

Cycle life

Each cycle is an interval between the charge (charge current 0.5C) at 25±3ºC, rest 10 minutes, and discharge (discharge current 20A) with 2.5V cut-off, then rest 45 minutes.

After 300 cycles, Capacity Retention = Cap (300th)/Cap (Av10)≥80%.

Storage characteristics

Storage for 30 days at 25±3ºC from the standard charge, measured with discharge constant current 10A with 2.5V cut-off at 25ºC.

Capacity retention (after the storage) ≥90%.

5.4 Mechanical Characteristics

NO.	Item	Criteria	Testing method
5.4.1	Vibration	There shall be no electrolyte leakage	After standard fully charge, cell shall be attached to a vibration table directly and subjected to vibration that consists of 10 Hz to 55 Hz to 10 Hz at the speed of 1Hz/min in 90~100mins.The total excursion of the vibration is 0.8mm(0.060 inches). The cell shall be vibrated in each direction along axis of the cylinder and the vertical directions of axis of the cylinder.

5.5 Safety characteristics

NO.	Item	Criteria	Testing method
5.5.1	Overcharge	No leakage, No flame, No fire, No explosion	The cell is discharged according to the standard discharge method. Apply a 1C Constant current 12V constant voltagecharge for 1.5h.
5.5.2	130ºC Hot oven Testing	No fire, No explosion	After fully charging the cellfollowing the standard charge method and put in the oven. And then the oven temperature will be ramped at 5ºC per minute to 130ºC, When the temperature of the oven reach 130ºC, the cell is maintained in the 130ºC oven for 60 minutes or until fire or explosion is obtained and Record the time that the cell temperature reaches 130ºC and the time when a fire or explosion occurs.
5.5.3	Crush testing	No fire, No explosion	After fully charging the cellfollowing the standard charge method and Put itbetween two flat surfaces for a Crush Test.The direction of the crushing force shall be vertical to axis of the cylinder.Using a pressure device which has a 32mm diameter Hydraulic piston with 13 KN Crushing force, Release the pressure immediately until the maximum is reached.
5.5.4	Over-disch arge test	No fire, No explosion	After standard charge, is to be over-discharged with 0.2C to 250%of capacity.
5.5.5	Short circuit testing	No fire, No explosion	Cell shall first be charged according to standard charge method, and then cellis to be short-circuited by connecting the positive and negative terminals of the cell with copper wire having a maximum resistance load of 50mΩ. This test is done at room temperature. Monitor the cell temperature while testing. The cell is continuously discharged until the cell case temperature has returned to be 10ºC less then peak temperature.
5.5.6	Free falling (drop)	No fire, No explosion	Each fully charged cell is dropped three times from a height of 1,0 m onto aconcrete floor. The cells are dropped so as to obtain impacts in randomorientations.

Note: All above safety tests will be conducted at 25±3ºC except where specified differently. Use proper ventilation with protective equipment.

6. Warranty

The warranty is specified in our warranties section of *Terms of Sales.* If the product is to be stored for more than three months it is necessary to perform the appropriate maintenance to ensure the good condition of the batteries. Consult our annex to the *Terms of Sales* on the recommended maintenance.

7. Activation

Please activate the battery once every three months according to the following method: Charge at a constant current and constant voltage of 0.2C to 4.2V, and cut-off 0.01C, rest ten minutes, then discharge at a constant current of 0.2C to 2.75V, and rest ten minutes, then charge at a constant current of 0.2C for three hours.

If the battery has been assembled or used, use the suitable matched charger and machines to activate.

8. Others

8.1. Storage for a long time

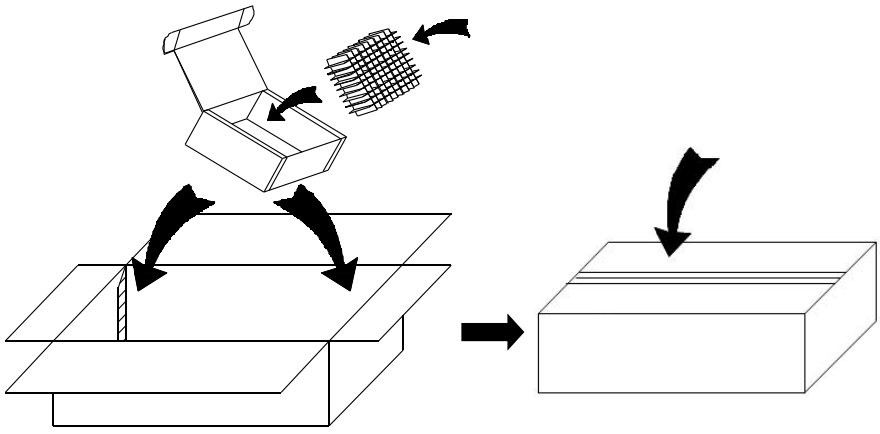
If the cell is kept for a long time (3 months or more), it is strongly recommended that the cellis preserved at dry and low temperature.

8.2. Others

Any matter not included in that specification should be discussed and confirmed by bothparties.

9. Package

100 cells per box, 2 boxes into a case, totally 200 cells.



10. Shipping

The capacity of delivery cell is approximately at 20-30% of charging.It is not guaranteed that 20-30% capacity remain when reach customer, because of self-discharge. During transportation, preventthe cell from acutely vibration, impacting, solarization, drenching.

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Proper use and handling of lithium-ion batteries

1. Charging

1.1 Charging voltage must be set 4.2V/cell. Concerning charge voltage tolerance of charger,charging voltage must be set below 4.2V/cell. Even if the charge could be out of order,charge voltage of charger should not be above 4.2V/cell to avoid over-charging. Cell life willbe shorten by charging voltage above 4.2V, leading to cell failure, serious can appear safetyproblems.

1.2 Cell must be charged with CC (constant current) - CV (constant voltage) method. Do not usethe continuous charging method.

1.3 In case of cell voltage is below 3.0V, Cell should be charged with pre-charge that current isbelow 0.1C. Then cell voltage reach over 3.0V, standard charge starts. And if cell voltagenever reaches to 3.0V in specified period (timer), charger will stop charging.

1.4 By timer, current detection and open circuit voltage detection, charger detects full charge.When charger detect cell is full charged, charger stop charging.

2. Discharging

2.1 The discharge current of a cell must be below specified in the product specification.

2.2 The discharge end voltage of a cell must be over specified in the product specification.

2.3 The cell should not be over-discharged below 2.5V.

2.4 The cell should be discharged within a range of temperatures specified in the productspecification.

3. Storage

3.1 The cell should be stored in a dry area and no corrosive gas.

3.2 No press on the cell.

3.3 Storage temperature

When stored within 1 month : -20°C ~ +60°C

When stored within 3 months: -20°C ~ +45°C

When stored within 12 months : -20ºC ~ +25°C

3.4. After the cell assembled in pack, the pack should be recharged to 40% SOC if the pack hasnever been used for one year, this will avoid the cell voltage drop too low.

4. Cycle life

4.1 Charge or discharge out of recommended range might cause the generating heat or seriousdamage of cell. And also, it might cause the deterioration of cell's characteristics and cyclelife.

4.2 Cycle life performance

The cell can be charged/ discharged repeatedly up to times with a certain level of capacityspecified in the production specification.

4.3 Cycle life may be determined by conditions of charging, discharging, operating temperatureand storage.

5. Precautions on battery pack design

5.1 Do not make the shape and mechanism which static electricity and water easy go throughthe battery pack inside.

5.2 Overcharge protection should work below 4.2V/cell by charge. Then charge current shall beshut down.

5.3 Within a voltage range of 2.75V/cell, over-discharge protection should work. Then dischargecurrent shall be shut down and consumption current is below 1μA.

5.4 When discharge current exceeds 60A, over-discharge current protection should work. Thenover discharge current shall be shut down.

5.5 To avoid discharging during storage, design the low consumption current electronic circuit(e.g. Protection circuit, fuel gauge, etc) inside battery pack.

6. Battery Pack Assembly

6.1 Prohibition of usage of damaged cell. Do not use abnormal cell which has been damaged byshipping stress, drop, short, twice spot or something else, and which gives off electrolyteodor.

6.2 The cell should be inspected visually before battery assembly.

6.3 Inspect voltage and internal impedance before using.

6.4 Do not solder onto a cell in order to avoid damage on the cell. Weld spot welding lead plateonto cell, and solder lead wire or lead plate.

6.5 The battery assembly must pay attention to anti-static, Avoid electronic componentsdamaged by electrostatic.

6.6 Battery assembly should pay attention to prevent the short circuit.

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Safety Instruction

Lithium-ion battery if use undeserved can cause cell damage and even harm the personalsafety, read it carefully beforeusing and pay attention to the prevention measures.

Should there be any additional information required by the Customer, please contact us.

Danger!

1. Electrical misusage

1.1 Use or charge the battery only in the stipulated application.

1.2 Use the correct charger for Lithium-ion batteries.

1.3 When connecting a battery pack to a charger, ensure correct polarity.

1.4 Do not reverse charge batteries.

1.5 Do not maintain secondary batteries on charge when not in use.

2. Environmental misusage

2.1 Never put a battery into water or seawater.

2.2 Don't throw the battery into the fire.

2.3 Do not use or leave the cell under the blazing sun (or in heated car by sunshine). The cellmay generate heat, smoke or flame. And also, it might cause the deterioration of cell'scharacteristics or cycle life.

2.4 Do not dismantle, open or shred cells. Batteries should be dismantled only by trainedpersonnel. Multicell battery cases should be designed so that they can be opened onlywith the aid of a tool.

2.5 Do not solder directly to batteries.

2.6 Do not subject batteries to adverse condition such as extreme temperature, deep cyclingand excessive overcharge/over discharge.

2.7 Do not short-circuit batteries. Do not store batteries haphazardly in a box or drawer wherethey may short-circuit each other or be short-circuited by conductive materials, permanentdamage to batteries may result.

2.8 Do not incinerate or mutilate batteries, may burst or release toxic material.

2.9 Do not subject batteries to mechanical shock.

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Warning!

1.1 When using a new battery or a battery to be used for the first time after long term storage,please fully charge the battery before using.

1.2 Prohibition of reverse charge

Reverse charge is prohibited. Cells shall be connected correctly. The polarity has to beconfirmed before wiring. If a cell is connected improperly, the cell cannot be charged.Simultaneously, the reverse charging may cause damage to the cell which may lead todegradation of cell performance and damage the cell safety, and could cause heatgeneration or leakage.

1.3 Do not mix our batteries with other battery brands or batteries of a different chemistry suchas alkaline and zinc carbon.

1.4 Do not mix new batteries in use with semi-used batteries, over-discharge may occur.

1.5 If find any noise, excessive temperature or leakage from a battery, please stop its use.

1.6 When the battery is hot, please do not touch it and handle it, until it has cooled down.

1.7. Do not remove the outer sleeve from a battery pack nor cut into its housing.

1.8 When find battery power down during use, please switch off the device to avoid overdischarge.

1.9. After using, if the battery is hot, before recharging it, allow it to cool in a well-ventilated placeout of direct sunlight.

1.10 Do not attempt to take batteries apart or subject them to pressure or impact. Heat may begenerated or fire may result. The alkaline electrolyte is harmful to eyes and skin, and it maydamage clothing upon contact.

1.11 Never put a battery into water or seawater.

1.12 Keep the battery away from babies and children. If swallowed, see a doctor immediately.

1.13 In the event of a cell leaking, do not allow the liquid to come into contact with the skin oreyes. If contact has been made, wash the affected area with copious amounts of water andseek medical advice.

Caution!

1.1 When not using a battery, disconnect it from the device.

1.2 Unplug a battery by holding the connector itself and not by pulling at its cord.

1.3 Used batters should be treated by authorized units.

1.4 After extended periods of storage, it may be necessary to charge and discharge thebatteries several times to obtain maximum performance.

1.5 Secondary batteries give their best performance when they are operated at normal roomtemperature.

1.6 Keep batteries clean and dry.

1.7 Wipe the battery terminals with a clean dry cloth if they become dirty.

1.8 When disposing of secondary batteries, keep batteries of different electrochemical systems separate from each other.