

Specification for Li-ion Rechargeable cylindrical battery

MODEL: 18650-1400mAh

1 Scope of application

Apply to 18650 Li-ion battery.

2 Basic Properties

	Item	Technical parameter
1	Class	Li-ion Rechargeable cylindrical battery
2	Model	18650
3	Nominal capacity	1400mAh (※6.3.1)
4	Internal resistance	$\leq 60\text{m}\Omega$ (PTC)
5	Nominal voltage	3.7V
6	Max. charging voltage	$4.20\text{V} \pm 0.03\text{V}$
7	Min. end voltage	3.00V
8	Voltage at Storage and transport	3.6V-4.0V
9	Max. constant charging current	1300mA
10	Max. constant discharging current	1400mA

11	Charging Temp Range	0°C~45°C
12	discharging Temp Range	-20°C~60°C
13	Storage Temp Range	-20°C~45°C
14	Contour size	figure 2
15	weinght	≈42g
16	Positive and negative	(+) :Cover (-) :Can
17	environmental matters	ROHS

3 Appearance

There shall be no such defects as deep scratch, crack, rust, discoloration or leakage, which may adversely affect the commercial value of the battery.

4 Important electrical properties

4.1 Cycle Life

4.1.1 ≥ 300

4.1.2 $\geq 45\text{min}$

4.1.3 No leakage

4.2 Temperature Characteristic

4.2.1 Discharge performance at -20°C: $\geq 180\text{min}$

4.2.2 Discharge performance at 0°C: $\geq 240\text{min}$

4.2.3 Discharge performance at 55°C: $\geq 51\text{min}$

4.3 Capacity retention: $\geq 255\text{min}$

4.4 Capacity recovery after storage: $\geq 34\text{min}$

5 Safety properties

5.1 Shock Test:

No leakage, no venting ,no fire, no explosion

5.2 Vibration Test:

No leakage, no venting ,no fire, no explosion

No leakage, no venting ,no fire, no explosion

5.3 Temperature Cycling Test:

No leakage, no venting ,no fire, no explosion

5.4 Altitude Simulation(low pressure) Test:

No leakage, no venting ,no fire, no explosion

5.5 Short -circuits Test:

No fire, no explosion and the exterior temperature of the battery shall not exceed 150°C

5.6 Forced-Discharge Test:

No fire, no explosion

5.7 Overcharge Test:

No fire, no explosion

5.8 Free fall Test:

No fire, no explosion

5.9 Crush Test:

No fire, no explosion

5.10 Thermal Exposure Test:

No fire, no explosion

6 Test

6.1 Standard Test Environment (Unless otherwise stated)

6.1.1 Temperature: $25 \pm 2^{\circ}\text{C}$

6.1.2 Relative humidity: 45%–75%

6.1.3 Pressure: 86KPa–106KPa

6.2 Parameter measure tolerance

6.2.1 Size: $\pm 0.1\%$

6.2.2 Current: $\pm 1\%$

6.2.3 Voltage: $\pm 1\%$

6.2.4 Internal resistance: $\pm 2\text{m}\Omega$

6.2.5 Capacity: $\pm 10\text{mAh}$

6.2.6 Temperature: $\pm 2^{\circ}\text{C}$

6.2.7 Relative humidity: $\pm 5\%$

6.2.8 Time: $\pm 1\text{min}$

6.3 Testing Method

6.3.1 Capacity

In a Condition of 6.1, Charge: charge the battery to 4.2V with Current of 1300mA, then to 20mA with Constant Voltage of 4.2V, rest for 5 min.

Discharge: discharge the battery to 3.0V with Current of 1300mA (repeat the processing 5 times, It can be ended if capacity is up to grade one time).

6.3.2 Internal resistance

Measured With internal impedance equipment at with 40%~60% charging of the battery.

6.3.3 Voltage

Measured With 20V rangeability of the multimeter or 5V rangeability of the voltage meter.

6.3.4 Current

Measured With DC 15A rangeability of the multimeter in series.

6.3.5 Temperature

Measured With digital temperature meter by the high temperature resistance down-lead.

6.3.6 Size

Measured length With digital calipers, t Measured thickness With digital micrometer.

6.3.7 Weight

Measured With 0.1g digital electronic balance

6.3.8 Appearance

eye survey

6.3.9 Cycle Life

According to 6.1 and 6.3.1, repeat this processing, When continuous three times discharging time less than 45 min, the cycles is finished

6.3.10 Temperature Characteristic

Charge according to 6.3.1, store the battery 4h under appointed temperature , and discharge the battery to 2.75V with the current of 0.2C to 2.75V

6.3.11 Capacity retention

According to 6.1 and 6.3.1, charge the battery, and store the battery on open circuit for 28 days, then discharge the battery with 0.2CA to 2.75V.

6.3.12 Capacity recovery after storage

According to 6.1 and 6.3.1 ,test the capacity of the battery,after the battery have be discharge, store it, in open circuit, in ambient temperature of $40\pm 2^{\circ}\text{C}$ for 90 days, then according to 6.1 and 6.3.1 , test the capacity of the battery.

6.3.13 Shock Test

The battery is to be secured to the testing machine by means of a rigid mount .Each battery shall be subjected to a total of two shocks of equal magnitude. The shocks are to be applied in each of mutually perpendicular directions. Each shock is to be applied in a direction perpendicular to the face of the battery. For each shock the battery is to be accelerated in such a manner that, during the initial 3ms, the minimum average acceleration is $75 g_n$ (where g_n is the local acceleration due to gravity).The peak acceleration shall be between $125 g_n$ and $175 g_n$.The waveform should be half-sine

6.3.14 Vibration Test

The battery shall be subjected to a simple harmonic motion with an amplitude of 0.8 mm [1.6 mm total maximum excursion]. The frequency is to be varied at the rate at the rate of 1 Hz per minute between 10 and 55 Hz. The battery shall be tested in two mutually perpendicular directions.

6.3.15 High temperature storage test

The battery shall be exposed to a temperature of $75^{\circ}\text{C}\pm 2^{\circ}\text{C}$ for 48 h in an oven

6.3.16 Temperature Cycling test

Raising the chamber-temperature to $70\pm 3^{\circ}\text{C}$ within 30 minutes and maintaining this temperature for 4 hours

Reducing the chamber temperature to $20\pm 3^{\circ}\text{C}$ within 30 minutes and maintaining this temperature for 2 hours.

Reducing the chamber temperature to $-40\pm 3^{\circ}\text{C}$ within 30 minutes and maintaining this temperature for 4 hours

Raising the chamber temperature to $20\pm 3^{\circ}\text{C}$ within 30 minutes

Repeating the sequence for a further 9 cycles

After the 10th cycle, storing the battery for 7 days prior to examination

6.3.17 Altitude Simulation

Samples are to be stored for 6 hours at an absolute pressure of 11.6kPa and a temperature of $20\pm 3^{\circ}\text{C}$

6.3.18 Short -circuits test

The battery shall be subjected to a short-circuit condition with a total external resistance of less than $100\text{m}\Omega$.Two separate tests shall be conducted, one in an ambient temperature of $25^{\circ}\text{C}\pm 2^{\circ}\text{C}$ and one in an ambient temperature of $60^{\circ}\text{C}\pm 2^{\circ}\text{C}$.The test shall be continued until the battery voltage falls below 0.1 V , and the battery case temperature has returned to a value within 10°C of the original ambient temperature.

6.3.19 Forced-Discharge test

The battery shall be subjected to a discharge at a constant current of 0.2C by connecting it, in series, to a power supply not less than 10V. The duration of the test shall be 12.5h. This test shall be continued even after the battery reaches 0V.

6.3.20 Overcharge test

The battery shall be discharged at a constant current of 0.2C to cut-off voltage and shall be recharged with 3C, by connecting it to a power supply of equal to 4.5V. the test time t_c should be 48 hours.

6.3.21 Free fall test

Each battery shall be dropped 6 times from 1.0 m onto a hard wood floor with 5cm height.

6.3.22 Crush test

The battery of fully charged shall be crushed between two flat hardwood blocks with a thickness of at least 12.7 mm using a crushing apparatus capable of applying a force of 13kN. The force is gradually decreased until escape form the hardwood. The battery shall be crushed with its longitudinal axis parallel or vertical to the flat surfaces of the crushing apparatus. Each battery shall be subjected to a crushing force in only one direction. Different battery shall be used for each test.

6.3.23 Thermal exposure test

The battery shall be placed in an oven. The oven temperature shall be increased at a rate of $5^{\circ}\text{C} \pm 2^{\circ}\text{C}$ per minute until the oven reaches $130^{\circ}\text{C} \pm 2^{\circ}\text{C}$. The oven shall be maintained at $130^{\circ}\text{C} \pm 2^{\circ}\text{C}$ for 15 min

7 Packing



Packing figure

Battery should be in 50% charge if it is stored for a long time.

Battery should be stored under low temperature and dry environment.

Battery should be stored away from the heat source and place where sunlight focus on.

Check the battery every 3 months when it is stored, and charge the battery to 3.9V if the voltage is below 3.5V.

8 Important Notice

8.1 Can't use directly in series connection of many batteries.

8.2 Only used on specified instrument.

- 8.3 Do not use the together with different kind of or different type of battery.
 - 8.4 Do not drop the battery into water, and do not make the battery wet.
 - 8.5 Do not short circuit the battery by metal conductor.
 - 8.6 Be sure not to use the battery by reverse anode/cathode.
 - 8.7 Do not disassemble the battery.
 - 8.8 Do not use bad scar battery.
 - 8.9 Please read the operation guidebook carefully before using the battery, because the inappropriate operation may cause overheat, catching fire , explosion or making capacity decrease.
 - 8.10 Wash yourself quickly when electrolyte infiltrating to your skin or clothes
 - 8.11 Wash your eyes by clean water quickly and go to hospital for further check, if the electrolyte infiltrate to your eyes.
 - 8.12 Take out the battery when its life time is over.
 - 8.13 Take out the battery and keep it under low temperature and low humidity when the battery is not used for a long time.
 - 8.14 Clean the battery with dry cloth before use if the connection of the battery is dirty.
- 9 Warning
- 9.1 Do not place the battery on heater, washer or high-pressure container.
 - 9.2 Do not heat the battery and drop to the fire.
 - 9.3 Stop charging if you get no result during specified time.
 - 9.4 Do not lay the battery with the necklace, coins, and other metal items together.
 - 9.5 Stop using when the battery become heat, emit smell or appear other abnormality during use, charging, or storing.
 - 9.6 Do not use battery or leave the used battery in the environment over 60°C, and do not charge and discharge under this kind of environment.
 - 9.7 Keep away from the battery which is leakage or emit abnormal smell.
 - 9.8 Keep it away from the children, avoiding being swallowed.

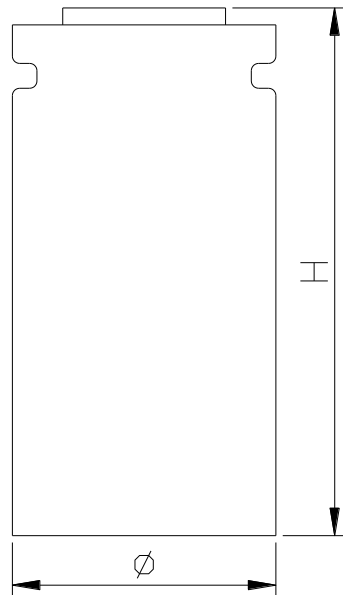


figure 2

name	Φ outside diameter	Htotal height
18650	18.00±0.05 (mm)	65.05±0.10 (mm)