1. SCOPE OF APPLICATION

This specification gives the technical parameters and testing standard of L-18650(2200mAh) provided by LEONE This kind of battery is suitable for notebook, interphone, portable DVD, instruments and meters, sonic equipment, aero modeling, electric tools, videcons, digital cameras.

2. KIND & TYPE

1. Kind : Rechargeable Cylindrical Lithium-ion Battery
2. Type : L-18650(2200mAh)

3. REFERENCE STANDARDS

This specification is compiled referring to technology standards of GB/T18287-2000, UL1642 and IEC61960-1:2000.

4. NOTICES

1. Please read this specification carefully before testing or using the battery, in order to avoid the battery from failure, over-heat, electrolyte leakage, set fire or explosion;
2. In charging or discharging, please apply professional testing equipment; no use of general constant current and constant voltage power which is not able to restrict current and voltage in order to avoid battery failure and dangers;
3. Please do not putthe battery with false direction of "+" " -" when charging or connecting with the equipment; otherwise the product will suffer from overcharging or over-discharging, and this will lead to battery failure or explosion.
4. Don't weld the battery directly, no opening of the battery.
5. In order to avoid short circuit, please don't put together the battery with metal stuff, such as necklaces, coins, barrettes, screws in bag or pocket, no connecting directly the "+" and"-" together with metal or other conductive materials.
6. No knocking, throwing or trampling the battery, not to mention put the battery in washing machines or high compress vessels.
7. Please keep the battery far away from heat source, such as fire, heater; do not store or use the battery under strong sunshine or high ambient temperature more than 60°C, otherwise the battery will set fire or be overheated or failure.
8. Please do not damp the battery or put it into water; please keep the battery dry and be of low temperature in storage.
9. During the period of using, testing or storage, if the battery has been found got hot, expiring abnormal odors, changed color, transformed or in other unusual states, please stop relative handling at once, isolate the battery and keep away from it.
10. If the battery leaked and the electrolyte split into your eye, don't knead you eye, flush it with clean water at once, go to see a doctor in the case of be serious; if electrolyte spattered on your skin or clothes, please flush it with clean water.

5. BASIC SPECIFICATION AND PERFORMANCE

1.	Capacity	Rated Capacity:2200mAh (0.5CA Discharge)
2.	Rated Voltage	3.7V
3.	Internal Resistant	≤ 60mΩ (with PTC)
4.	Discharge End Voltage	3.0V
5.	Charge Upper Limit Voltage	4.20±0.02V
6.	Standard Charge Current	0.5C A
7.	Fast Charge Current	1C A
8.	Standard Discharge Current	0.5CA
9.	Fast Discharge Current	1C A
10.	Discharge Current (max)	2C A
11.	Weight	45±1g
12.	Dimension(max)	Diameter(φ) : 18.3mm Height(H) : 65.0mm (see figure 1)
13.	Operational Temperature	charge : 0 ~ 45°C discharge : -20 ~ 60°C
14.	Storage Temperature	within a month : -5 ~ 35°C within six months : 0 ~ 35°C

6. TESTING CONDITIONS

Please perform under this condition:
Standard temperature: (20±5°C), standard relative humidity: (65±20%)

Standard Charge	constant current and constant voltage charge(CC/CV) constant current : 1100mA upper limit voltage : 4.20V end current : 22mA
Standard Discharge	constant voltage discharge(CC) constant current : 1100mA end voltage : 3.0V

7. Appearance

The battery should be clean and dry, no technical damages , electrolyte leakage, rustiness, and with product identification on the surface.

8. PERFORMANCE

8.1 Electrical Performance

Items	Testing Procedure	Requirements
Rated Voltage	Charge according to 6.1, then calculate the average voltage during discharge process according to 6.2	3.7V
Discharge Performance	Charge according to 6.1, then discharge within 1 hour with constant current of 0.5CA to the end voltage is 3.0V	≥120 min
	Charge according to 6.1, then discharge within 1 hour with constant current of 1.0CA to the end voltage is 3.0V	≥57min

Items	Testing Procedure	Requirements
Cycling Life	Under the ambient temperature of 20±5°C, charge with a constant current of 0.5CA to upper limit voltage, then charge with constant voltage till the current is no more than 22mA; lay the battery aside for 0.5 hour, then discharge with 0.5CA till the end voltage is 3.0V; lay the battery aside for 0.5-1 hour before next cycle; when the discharge time of the consecutive discharge is both lower than 72 minutes, the cycle life is over.	≥300 Times
Capacity Holding	Charge according to 6.1, lay the battery aside for 28 days in the ambient temperature of 20±5°C, then discharge with 0.2CA till the end voltage 3.0V appears, the capacity given out should be no less than 90% of the rated capacity.	Capacity ≥1980mAh
Storage	As for the battery life less than 3 months, charge into 40-50% of the rated capacity according to 6.1, then store for 12 months under a condition of ambient temperature of 20±5°C and 45%-85% RH; after storage, charge according to 6.1, then discharge with 0.2CA till the end voltage is 3.0V.	Discharge Time ≥4h.

8.2 SAFETY PERFORMANCE

Items	Testing Procedure	Requirements
Short Circuit	After charging according to 6.1, put a battery connected with a thermocouple into ventilation cabinet, short circuit "+" and "-"(overall resistant of the loop is no more than 50mΩ); monitor the battery temperature during the testing process, when the battery temperature is lower than the peak value for 10°C, the test is over.	No fire, no explosion. Surface temperature is lower than 150°C.
Overcharge	After charging according to 6.1, put a battery connected with a thermocouple into ventilation cabinet, connect the "+" and "-" with a constant current and constant voltage power, adjust the current to 3CA and the voltage to 10V. charge the battery till the voltage is 10V and the current is about to 0; monitor the battery temperature during the testing process, when the battery temperature is lower than the peak value for 10°C, the test is over.	No fire, no explosion
Heavy Shock	Put a battery on the shock platform, let a hammer of 10kg fall down freely from a height of 1m, shock the battery fixing in the clamp(for the position of the battery, see figure 5)	No fire, no explosion

Items	Testing Procedure	Requirements
Thermal Shock	Charge the battery according to 6.1, then put a battery into a thermal box, heat with a temperature rising speed of (5±2°C)/ min till 150±2°C,then keep this temperature constant for 10 minutes.	No fire, no explosion

8.3 ENVIRONMENT APPLICABILITY

Items	Testing Procedure	Requirements
High Temperature Performance	Charge the battery according to 6.1, lay the battery aside for 2 hours under a temperature of 55±2°C, then discharge to 2.75V with 1CA, capacity given out should be no less than 90% of the rated capacity.	Capacity ≥1980mAh
Low Temperature performance	Charge the battery according to 6.1, lay the battery aside for 16-24 hours under a temperature of -20±2°C, then discharge to 2.75V with 0.2CA, capacity given out should be no less than 90% of rated capacity.	Capacity ≥1540mAh
Vibration	Charge the battery according to 6.1, then fix the battery on the vibration platform, perform cycling sweep frequency (sweep rate is1 oct/min) vibration on X,Y,Z axis for 30min , vibration frequency: 10Hz~30Hz, displacement single swing: 0.38mm; vibration frequency: 30Hz~55Hz, displacement single swing: 0.19mm.	Battery appearance has no obvious damage, no fume, no electrolyte leakage and explosion, voltage is no less than 3.6V.
Free Fall	Charge the battery according to 6.1, then let the battery fall freely and separately along X,Y,Z axis on both directions from a height of 1m (from the lowest point to the floor) on a hard wooden floor with a thickness of 18-20mm placing on the concrete ground. Then discharge the battery with 1CA till to the voltage falls to 3.0V, and perform charge and discharge cycle for no less than 3 times (charge according to 6.1, discharge with 1CA).	No fire, no explosion. Discharge time should be no less than 51min.

9. PACKING

Battery in the package should be half-charged state. On the surface of the package, there should be with product name, type, rated voltage, number, gross, leaving factory time and corresponding internal resistant and capacity.

10. The battery should be transport in packages. Avoid strong vibration, shock or extrusion , keep away from sunshine and rain. The transport vehicle may be automobile, train, ship, airplane, etc.

11. The battery should be store in a clean, dry, ventilated room with a temperature required in 5.14 and 75%RH. Keep away from corrosive material, fire and heat source. In addition, the battery should be store in half-charging state, in order to avoid over-discharge caused by self-discharge, and this will lead to irreversible capacity loss.

12. We are irresponsible for any accident caused by handling not according to this specification.

13. We have the right to modify this specification without notifying the clients.

14. Details not be involved in this specification can be discussed between the manufacture and the clients.

FIGURE 1. DIMENSION

Ø Diameter (max)	18.3	Unit (mm)
H Height(max)	65.1	

FIGURE 2. RATE CHARGE CHARACTERISTIC

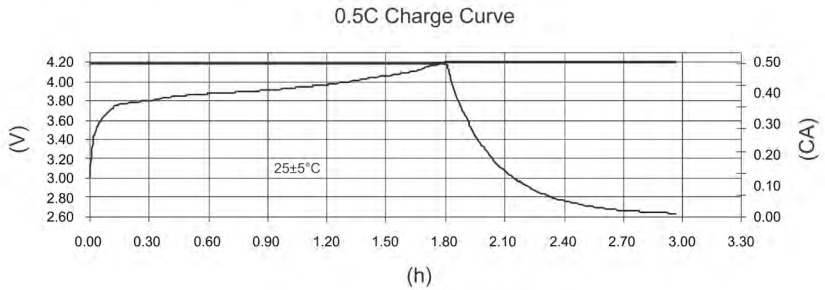

Figure a 0.5C Charge Characteristic

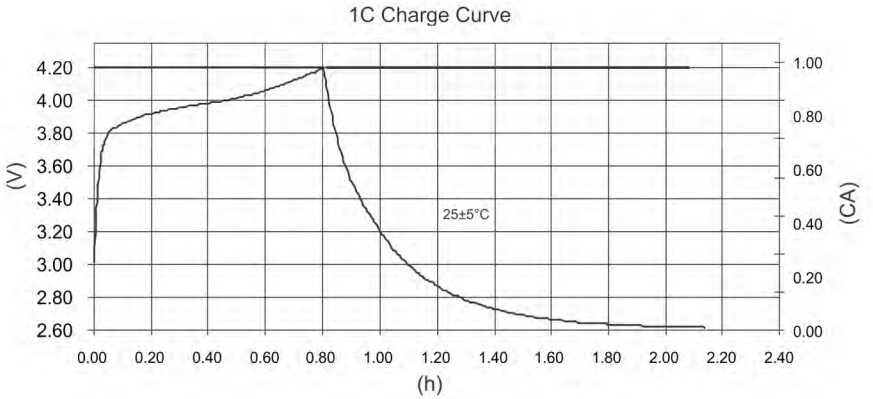

Figure b 1C Charge Characteristic

FIGURE 3. RATE DISCHARGE CHARACTERISTIC

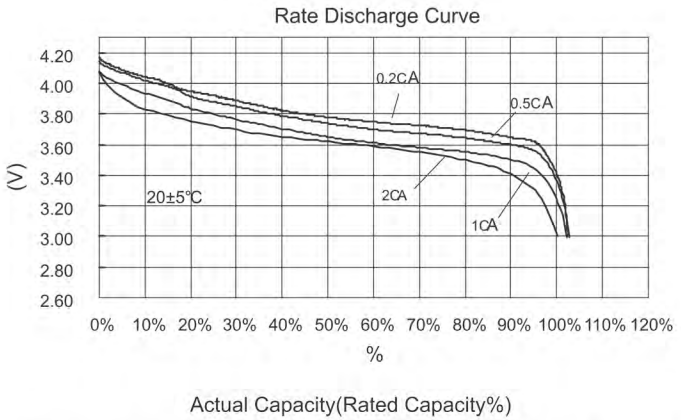

FIGURE 4. DISCHARGE CHARACTERISTIC UNDER DIFFERENT TEMPERATURE

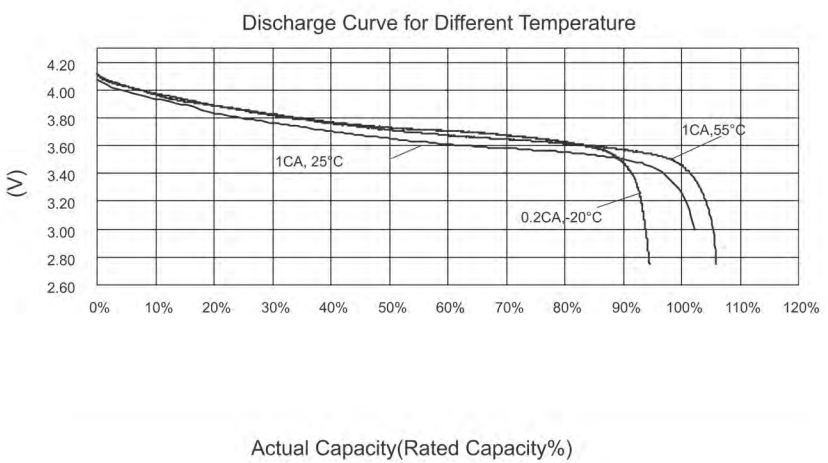

FIGURE 5. CYCLE LIFE CHARACTERISTICS

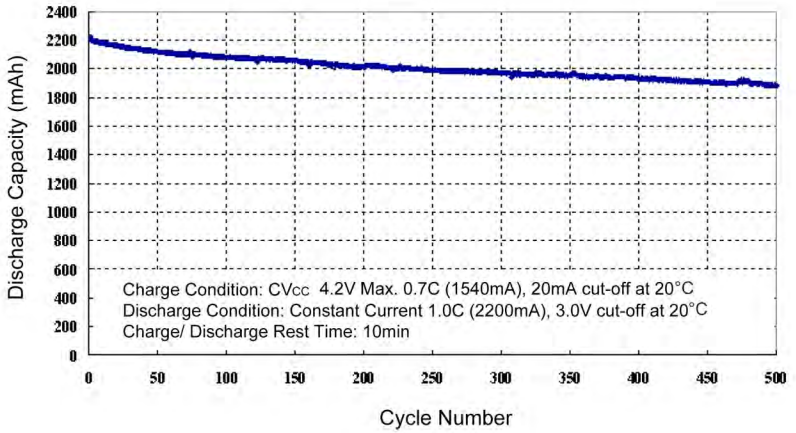
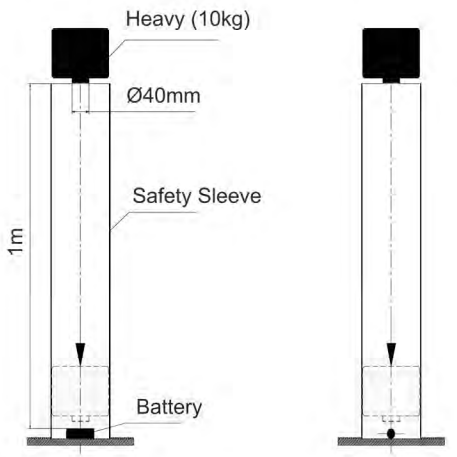
FIGURE 5.
(SKETCHING OF THE POINT SUBJECTED TO HEAVY SHOCK)