

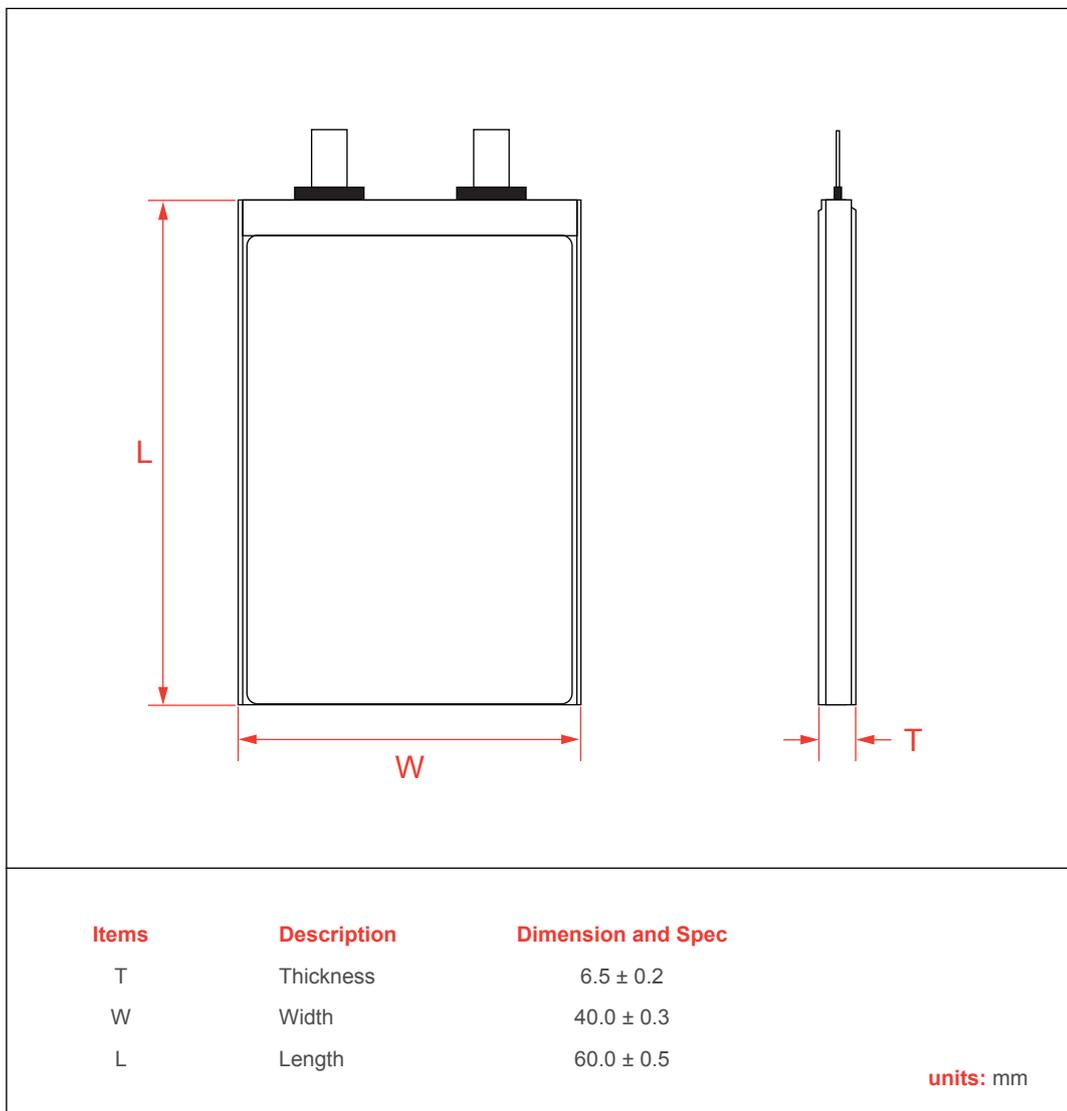


LP654060 • Polymer Lithium-ion battery

1. Scope

This specification is applied to the reference battery in this specification.

2. Structure drawing



3. Product specification (Table 1)

No.	Item	General Parameter	Remark
1	Rated capacity	2000mAh	Standard discharge 0.2C ₅ A after standard charge.
2	Nominal voltage	3.7V	
3	Battery limit voltage	4.2V	
4	Internal impedance	≤80mΩ	Internal resistance measured at AC 1KHz after 50% charge. The measure must uses the new batteries that within one week after shipment and cycles less than 5 times.
5	Standard charge	Constant current 0.2C ₅ A Constant voltage 4.2V 0.01 C ₅ A cut-off	Charge time : Approx 3.0h
6	Standard discharge	Constant current 0.2C ₅ A end voltage 2.75V	Discharge time : Approx 2.0h
7	Fast charge	Constant current 0.5C ₅ A Constant voltage 4.2V 0.01 C ₅ A cut-off	Charge time : Approx 2.0h
8	Maximum charge current	0.5C ₅ A	1A
9	Maximum continuous discharge current	0.5C ₅ A	1A
10	Operation temperature range	Charge: 0~45°C	60±25%R.H. Bare cell
		Discharge: -20~50°C	
11	Storage Temperature	Less than 1 months: -20~50°C	60±15%R.H. at the shipment state
		Less than 6 months: -20~30°C	
		Charge quantity 50%~60%	
12	Weight	About 35g.	

4. Performance and test conditions

4.1 Standard test conditions

Test should be conducted with new batteries within one week after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise specified, test and measurement shall be done under temperature of $20\pm 5^{\circ}\text{C}$ and relative humidity of 45~75%. If it is judged that the test results are not affected by such conditions, the tests may be conducted at temperature 15~30°C and humidity 25~75%RH.

4.2 Measuring instrument or apparatus

Dimension measuring instrument

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance more than 10k Ω /V

Ammeter

Standard class specified GB/T18287-2000 in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01 Ω .

Impedance meter

Impedance shall be measured by a sinusoidal alternating current method (1kHz LCR meter).

4.3 Standard charge/discharge

Standard charging: the test process and standards are as follows:

0.2C₅A: Charging shall consist of charging at a 0.2C₅A constant current rate until the cell reaches 4.2V.

The cell shall then be charged at constant voltage of 4.2V volts while tapering the charge current. Charging shall be terminated when the charging current has tapered to 0.02C₅A. Charge time: Approx 7h. The cell shall demonstrate no permanent degradation when charged between 0°C and 45°C.

Standard discharge

0.2C₅A: Cells shall be discharged at a constant current of 0.2C₅A to 2.75 volts @20 \pm 5°C

If no otherwise specified, the rest time between Charge and Discharge amount to 30min.

4.4 Appearance

There shall be no such defect as flaw, crack, rust, leakage, which may adversely affect commercial value of battery.

4.5 Initial performance test (Table 2)

Item	Test method and condition	Requirements
Cell voltage	As of shipment	3.8V~4V
Open-circuit voltage	The open-circuit voltage shall be measured within 24 hours after standard charge.	≥4V
Internal impedance	Internal resistance measured at AC 1KHz after 50% charge.	≤80mΩ
Minimal rated capacity	The capacity on 0.2C ₅ A discharge till the voltage tapered to 2.75V shall be measured after rested for 30min then finish standard charge.	≥1900mAh

4.6 Temperature dependence of discharge capacity

Cells shall be charged per 3.3.1 and discharged. Except to be discharged at temperatures per Table 3. Cells shall be stored for 3 hours at the test temperature prior to discharging and then shall be discharged at the test temperature. The capacity of a cell at each temperature shall be compared to the capacity achieved at 23°C and the percentage shall be calculated. Each cell shall meet or exceed the requirements of Table 3.

Table 3

Discharge Temperature	-20°C	-10°C	0°C	23°C	50°C
Discharge Capacity (0.2C ₅ A)	50%	80%	90%	100%	90%

4.7 Cycle life and leakage-proof (Table 4)

No.	Item	Criteria	Test condition
1	Cycle Life 0.2C ₅ A	Higher than 70% of the initial capacities of the cells	Carry out 300cycle Charging/Discharging in the below condition. <ul style="list-style-type: none"> • Charge: Standard Charge, per 4.3.1 • Discharge: Standard discharge, per 4.3.2 • Rest time between charge/discharge: 30min. • Temperature: 20±5°C

5. Mechanical characteristics and safety test

Table 5 - Mechanical characteristics

No.	Items	Test Method and Condition	Criteria
1	Vibration test	After standard charging, fixed the cell to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz an 55Hz, the excursion of the vibration is 1.6mm. The cell shall be vibrated for 30 minutes per axis of XYZ axes.	No leakage No fire
2	Drop test	The cell is to be dropped from a height of 1 meter twice onto concrete ground.	No explosion, No fire, no leakage.
3	Collisions	After the vibration test, according to X.Y.Z each battery average three vertical pulse peak acceleration, the setting for the 100m/s ² , every minute, 40 ~ 80 collision frequency, pulse duration 16ms collision frequency ± 10 thousand.	No explosion, No fire, no leakage.

Table 6

No.	Items	Battery condition	Test Method	Requirements
9	High temperature performance	Fresh, fully charged	After charging will a battery into 55 \pm 2°C In the case of high temperature 2h Batteries in 55 \pm 2°C 0.5C ₅ A discharge current to the termination voltage, discharge time should not below 108min, battery will in environmental temperature 20 \pm 5°C place 2h.	No explosion, No fire
10	Low temperature performance	Fresh, fully charged	After charging, will be a battery into -20 \pm 2°C degrees Celsius in the box, then 16h constant 24h ~ 0.2 C ₅ A with discharge current to the termination voltage, discharge time should not below 3h. After the experiment, the battery will in environmental temperature of 20 \pm 5°C condition 2h aside	No deformation and burst
11	Charged	Fresh, fully charged	A full battery, at ambient temperature 20 \pm 5°C under the conditions of the battery will be open to 28d aside, 0.2 C ₅ A to terminate discharge current voltage.	the discharge time not below 4.0h
12	Constant damp performance	Fresh, fully charged	Standard after the battery, will a battery into 40 \pm 2°C, relative humidity 90~95% at constant temperature and humidity box after 48h battery will in environmental temperature 20 \pm 5°C Aside 2h, 0.5 C ₅ A to terminate discharge current voltage.	No obvious deformation, hands rust, smoke, explosion, discharge time not less than 72 min

6. Handling of cells

6.1 Prohibition short circuit

Never make short circuit cell. It generates very high current which causes heating of the cells and may cause electrolyte leakage , gassing or explosion that are very dangerous. The LI tabs may be easily short-circuited by putting them on conductive surface. Such outershort circuit may lead to heat generation and damage of the cell. An appropriate circuitry with PCB shall be employed to protect accidental short circuit of the battery pack.

6.2 Mechanical shock

Falling, hitting, bending, etc. may cause degradation of LI characteristics.

7. Notice for designing battery pack

7.1 Pack toughness

Battery pack should have sufficient strength and the LI cell inside should be protected from mechanical shocks.

7.2 Cell fixing

The LI cell should be fixed to the battery pack by its large surface area. No cell movement in the battery pack should be allowed.

7.3 Inside design

No sharp edge components should be insides the pack containing the LI cell.

8. Notice for assembling battery pack

Shocks, high temperatur e, or contacts of sharp edge components should not be allowed in battery pack assembling process.

9. Others

9.1 Prevention of short circuit within a battery pack

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection. The battery pack shall be structured with no short circuit within the battery pack, which may cause generation of smoke or firing.

9.2 Prohibition of disassembly

1. Never disassemble the cells

The disassembling may generate internal short circuit in the cell, which may cause gassing, firing, explosion, or other problems.

2. Electrolyte is harmful

LI battery should not have liquid from electrolyte flowing, but in case the electrolyte come into contact with the skin, or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.

9.3 Prohibition of dumping of cells into fire

Never incinerate nor dispose the cells in fire. These may cause explosion of the cells, which is very dangerous and is prohibited.

9.4 Prohibition of cells immersion into liquid such as water

The cells shall never be soaked with liquids such as water, seawater, drinks such as soft drinks, juices, coffee or others.

9.5 Prohibition of use of damaged cells

The cells might be damaged during shipping by shock. If any abnormal features of the cells are found such as damages in a plastic envelop of the cell, deformation of the cell package, smelling of an electrolyte, an electrolyte leakage and others, the cells shall never be used any more. The cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing or explosion.

10. Storing the batteries

The batteries should be stored at room temperature, charged to about 30% to 50% of capacity.

We recommend that batteries be charged about once per half 3 months to prevent over discharge.

11. Other the chemical reaction

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.

12. 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.

13. Note

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