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Rev: A00

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Date: 2021.09.30

# Specification Approval Sheet

Model:503040AL-600mAh

Type: Li-ion Battery



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### History of specification

Date	Contents	RemarkSs
2021.09.30	First issue	A/0



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### 1 Scope

This specification is applied to Lithium Battery manufactured by AKYGA Battery

The product is ROHS compliant

### 2 Product and Model Name

2.1 Product : Aluminium Shell Lithium-ion Battery 2.2 Model Name : LPE503040AL-600mAh

### 3 Ratings

Item		Rating	Note
	Typical	600mAh	Discharge:0.2CmA
3.1 Capacity	Minimum	600mAh	
	Energy	2.22Wh	
3.2 Nominal Voltage	e	3.70V	
3.2 AC Impedano	e Resistance	≤180mΩ	(Include PCB)
3.4 Discharge Cut-o	off Voltage	3.0V	
3.5 Charge Voltage		4.20V	
3.6 Max. Charge Vo	oltage	4.20V	
3.7 Standard cha	3.7 Standard charge current		0.2CmA
3.8 Max. Charge	Current	600mA	1.0CmA
3.9 Max. discharç	ge current	600mA	1CmA
3.10 Weight		Approx :25g	
3.12 Operating	Charge	0~+45°C	
Temperature	Discharge	-10~+60℃	
3.13 Storage	less than 1 month	-10~+45°C	storage
Temperature	less than 6 months	-10~+35℃	temperature: 20-25°C , at the transportation
3.14 Shipment vol	tage	3.90-4.05V	



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#### 4 Outline Dimensions and Appearance

#### 4.1 Outline Dimensions

See attached drawing for PL503040AL(Fig.1).

This thickness will be swelling when high temperature storage or operation in high temperature.

#### 4.2 Appearance

There shall be no such defect as scratch, flaw, crack, rust, leakage, which may adversely affect.

### 5.1 Standard Test Conditions

Test should be conducted with new batteries within one month after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise defined, test and measurement shall be done under temperature of 25±2°C and relative humidity of 45~85%. The test results are not affected evidently by such conditions of temperature 15~30°C or humidity 25~85%RH.

#### 5.2 Measuring Instrument or Apparatus

### 5.2.1 Dimension Measuring Instrument

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

### 5.2.2 Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance more than 10  $\mbox{M}\Omega$ 

#### 5.2.3 Impedance Meter

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

#### 5.3 .1Standard charge current

0.2CmA=120mA

#### 5.3.2 Max. Charge Current

0.5CmA=600mA

Full charge condition: Constant current 1.0CmA to 4.2V, Constant voltage 4.2V to 0.02C in all at 25±2°C.

#### 5.4 Rest Period

Unless otherwise defined, 10min, rest period after charge, 10min, rest period after discharge.



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### 5.5 Initial Performance Test

Item	Measuring Procedure	Requirements
(1) Open-Circuit Voltage	The open-circuit voltage shall be measured within 24 hours after standard charge.	≥4.15V
(2) AC Impedance Resistance	The Impedance shall be measured in an alternating current method (1kHz LCR meter) after standard charge at 25±2°C.	≤180mΩ
(3) Minimum Capacity	The capacity on 0.2CmA discharge shall be measured after standard charge at 25±2°C(specified C5).	C5≥600mAh
(4) 0.5CmA Discharge Capacity 0.5CmA	The capacity on 0.5CmA discharge shall be measured after standard charge	Discharge Capacity ≥95%C5

### 5.6 Electrical Performance

### 5.6.1Cycle Life

Item	Measuring Procedure	Requirements
Cycle Life @25°C	Constant current 0.5C charge to 4.2V, then constant voltage charge to current declines to 0.01C, rest 10min, constant current 0.5C discharge to 2.75V, rest 10min. Repeat above steps till continuously discharging capacity Higher than 80% of the Initial Capacities of the Cells.	Cycle life ≥300

### 5.6.2Shelf Life

Item		Measuring Procedure	Requir ements
Storage Characteristics 1	1	The capacity on 0.5CmA discharge shall be measured after standard charge and then storage at 25±2°C for 30 days.	Remaining Capacity ≥85% C5



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	2	After above measured Remaining capacity, the capacity on standard discharge shall be measured after standard charge.	Recovery capacity ≥90% C5
Storage	1	The capacity on 0.5CmA discharge shall be measured after standard charge and then storage at 60±2°C for 7 days.	Remaining Capacity ≥60% C5
Characteristics 2	2	After above measured Remaining capacity, the capacity on standard discharge shall be measured after standard charge.	Recovery capacity ≥80% C5

### 5.6.3Long Time Storage Characteristics

After about half charge after a period of storage at  $25 \pm 2^{\circ}$ C for one year (365 days). The recovery available capacity is  $\geq 85\%$  C5. The capacity is determined with the capacity of the by the most of preceding three cycles.

### 5. 6. 4Plants. the self-discharge

The battery charging cross-flow 360min, voltage to 4.0 V, then will the battery in normal temperature environment, open 24h, battery off pressure aside for 10 millvolts



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### 5.7 Mechanical Performance

Item	Measuring Procedure	Requirements
Vibration test	After standard charge, the battery is to be tested as following conditions: Amplitude:0.19mm Frequency:10~55Hz(sweep:1Hz/min) Direction: X/Y/Z axis for 30min. The battery is to be tested in three mutually perpendicular to each axis.	Battery no electrolyte leakage, smoke or explosion battery voltage p 4.0 V .
Drop Test	Drop the battery in the shipment condition(full-charge)from 1m height onto 18~20 mm or thicker concrete with p-tile on it 1 times each of obverse and inverse directions at 25±2°C	No fire, no explosion, no smoking is obtained.
Constant Humidity and Temperature Characteristics	Under the temperature of 20±5°C, after charging the battery with 0.2C, then put the battery into the constant temperature and humidity oven with 55±2°C and 90~95% for 48h, the battery should be no obvious deformation, leakage, rust, smoking and explosion. After testing take out the battery then rest for 2h under the temperature of 20±5°C, discharge with 1C to 3.0V.	discharge capacity≥60% C5



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### 5.8 Safety Performance

Item	Measuring Procedure	Requirements
Short-Circuit Test	After standard charge, the battery is to be short-circuited by connecting the positive and negative terminals of the battery with copper wire having a maximum resistance load of $0.1\Omega$ .	No explosion, no fire. The temperature of the exterior cell casing shall not exceed 160°C.
Heating Test	A battery is to be heated in a gravity convection or circulating air oven. The temperature of the oven is to be raised at a rate of 5±2°C/min to a temperature of 130±2°C at which temperature the oven is to remain for 30 minutes before the test is discontinued.	No explosion, no fire.
Abnormal Charging Test	After standard charge, the battery is subjected to a charging current by connecting it to a dc-power supply. The beginning current is 3.0C, which is to be obtained by connecting a resistor of specified size and rating in series with the battery; the voltage of the dc-power supply is 4.6V. The test time is 2.5 hours.	No explosion, no fire.
Overdischarge Test	The fully discharged cell is continually discharged for 24h with the $(30 \times n) \Omega$ load at $23 \pm 2^{\circ}C$ .	No explosion, no fire.



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### **6 Electrical Characteristic**

6 Electrical Characteristic		_	
Item	Symbo	Content	Criterion
	$V_{\text{DET1}}$	Over charge detection voltage	4.28±0.05V
Over charge Protection	tV <sub>DET1</sub>	Over charge detection delay time	0.09s~1.5s
	$V_{REL1}$	Over charge release voltage	4.28±0.05V
	$V_{\text{DET2}}$	Over discharge detection voltage	3.0±0.05V
Over discharge protection	$V_{\text{DET2}}$	Over discharge release voltage	$3.0\pm0.05V$
	$tV_{DET2}$	Over discharge detection delay time	36ms∼290ms
	$I_{DP}$	charging Overcurrent Protection Current	1. 5A∼3. 0A
Over current protection	$I_{DP}$	Discharge Overcurrent Protection Current	1.5A∼3.0A
	tV <sub>DET3</sub>	Over current Detection delay time	4.5ms∼18ms
		Release condition	Cut load
		Detection condition	Exterior short circuit
Short protection	$T_{SHORT}$	Detection delay time	100us∼320us
		Release condition	Cut short circuit
Interior resistance	$R_{DS}$	Main loop electrify resistance	R <sub>DS</sub> ≤60mΩ
Current consumption	$I_{DD}$	Current consume in normal operation	7.0 μ A Max
Current consumption	$I_{DD}$	Current consume in normal operation	O. 1uA Max
Recommanded discharge current		Max. CC/CD current	0.85A
Recommanded Temperature		Working Temperature	-10°C~60°C
Short circuit protection Release		If it is with Short circuit protection Release	YES



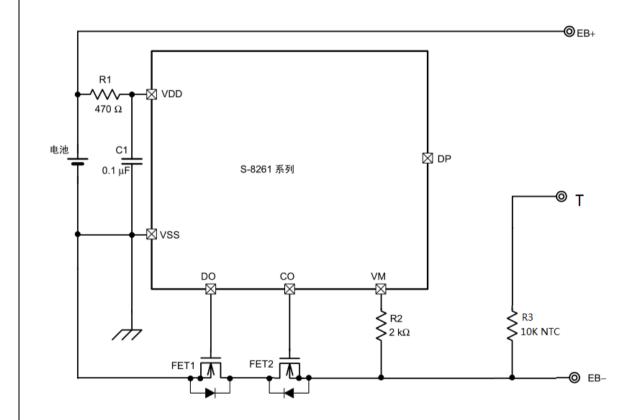
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Under voltage sleep function	If Under voltage sleep function Sleep mode will be release when charge it	YES

### 7. Application Circuit



### **8 PCM BOM LIST**

1	MOS	U2 8205A TSSOP-8	pcs	1
2	IC	U1 S8261-G3J SOT-23-6 SEIKO	pcs	1
3	Res	R1 470Ω 5% 1/16W 0603	pcs	1



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4	Res	R2 2KΩ 5% 1/16W 0603	pcs	1
5	NTC	R3 10Kntc 5% 1/16W 0603	pcs	1
6	Cap	C1 0.1UF 5% 1/16W 0603	pcs	1
7	PCB	30.0*3.8*0.6M FR4	pcs	1
8	Ni	6 * 3 * 0 . 3 m m	PCS	2

#### 9 Handling Instructions

Read and observe the following warnings and precautions to ensure correct and safe use of Li-ion batteries.

#### Danger!

Failure to observe the following precautions may result in battery leakage, overheating, explosion and/ or fire.

- Do not immerse the battery in water or allow it to get wet.
- Do not use or store the battery near sources of heat such as a fire or heater.
- Please use special chargers for Lithium ion battery.
- Do not reverse the positive (+) and negative (-) terminals.
- Do not connect the battery directly to wall outlets or car cigarette-lighter sockets.
- Do not put the battery into a fire or apply direct heat to it.
- Do not short-circuit the battery by connecting wires or other metal objects to the positive (+) and negative (-) terminals.
- Do not carry or put the battery together with necklaces, hairpins or other metal objects.
- Do not strike, throw or subject the battery near a fire or in extremely hot conditions.

### Warning!

Failure to observe the following precautions may result in battery leakage, overheating, explosion and/ or fire.

- Do not place the battery in a microwave oven or pressurized container.
- Do not use the battery in combination with primary batteries (such as dry-cell batteries) or batteries
  of different capacity, type or brand.
- Do not use the battery if it gives off an odor, generates heat, becomes ct the battery to sever physical shock.



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- Do not pierce the battery casing with a nail or other sharp object, break it open with a hammer, or step on it.
- Do not directly solder the battery terminals.
- Do not attempt to disassemble or modify the battery in any way.
- Do not recharge discolored or deformed, or appears abnormal in any way. If the battery is in use or being recharged, remove it from the device or charger immediately and discontinue use.
- Keep the batteries out of the reach of children. If a child somehow swallows a battery, seek medical attention immediately.
- If the battery leaks or emits an odor, immediately remove it from the proximity of any exposed flame. The leaking electrolyte can ignite and cause a fire or explosion.
- If the battery leaks and electrolyte gets in your eyes, do not rub them. Instead, rinse them with clean running water and immediately seek medical attention. If left as is, electrolyte can cause eye injury.

#### Caution!

Do not use or store the battery where is exposed to extremely hot, such as under window of a car in direct sunlight in a hot day. Otherwise, the battery may be overheated. This can also reduce battery performance and/or shorten service life.

Use the battery only under the following environmental conditions. Failure to do so can result in reduced performance or a shorten service life. Recharging the battery outside of these temperatures can cause the battery to overheat, explode or catch fire.

The isolated measures are needed between battery (the bare Al layer at side and top sealing) and the PCB, and also between battery and electric equipment: especially avoid the Al layer in packing foil contact to cathode or anode (including electric equipment, otherwise this can cause battery leakage or swelling.

#### Operating environment

When charging the: 0°C~45°C

When discharging the battery : -10°C $\sim$ 60°C When stored up to 30 days: -10°C $\sim$ 45°C When stored up to 90 days: -10°C $\sim$ 35°C

The voltage for a long time (6 month) storage shall be 3.7V~3.9V range.



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In cases where children use the battery, instruct them on the contents of the user's guide and keep an eye on them to ensure that the battery is being used correctly.

If the battery leaks and electrolyte gets your skin or clothing, immediately rinse the affected area with clean running water. If left as is, skin inflammation can occur.

For directions on battery installation and removal, read the instruction manual that accompanies the equipment in which the battery will be used.

If a device is not used for an extended period, the battery should be removed and stored in a cool, dry place. Otherwise, resting or reduced performance may occur.

If the terminals of the battery are dirty, wipe them clean with dry cloth before use. Otherwise, solid electrical contact may not be charged with the equipment, and this can cause power outages or charging to fail.

### 10. Shipment

Cells in the factory has filling80% of battery, the battery voltage 3.85~4.00V.

### 11. Amendment of this Specification

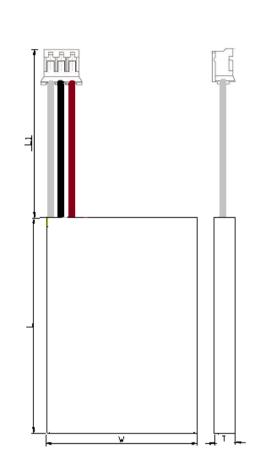
This specification is subject to change by AKYGA Battery with prior notice.



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tandard	
L≤41. 5 <b>mm</b>	
<b>₩</b> ≤33. 0 <b>mm</b>	
T≤5. 5 <b>mm</b>	
L1:60±5mm	
100726#	
HST-PHR3.0	

Connecting Wires: Red: connect to "+"; Black: connect to ground " -- ".