Specification Approval Sheet

Model : 502535-PL

Type : Li-polymer battery

Specification : 3.7V/400mAh

signed by client	
Confirmed	
Checked	
Approved	

signed by manufacturer	
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Checked:	Howell Zhu
Approved:	Xueming Zhao

Content

1. Battery type and scope

This Specification Approval Sheet is for rechargeable Li-polymer battery.

2． Basic characteristic and components of the battery

2.1 Basic performance parameter of the battery

S/N	Details	Parameters		Remarks
1	Rated voltage	3.7V		
2	Rated capacity	400mAh		discharge with 0.2C to 2.75V after fully charge within 1h, measuring the discharge time
3	Limited charge voltage	4.2V		
4	Internal resistance	≤210mΩ		
5	charge mode	C.C/C.V.		
6	Charge time	6h		Standard charging 0.2C
7	Max Charge Current	400mA		
8	Max discharge current	Continuous: 400mA		
9	Working temperature	charging	0~45℃	
		discharging	-20~60℃	
10	Storage temperature	1 Month	-20~35℃	Charge to 40%~50% of capacity when storage
		6 months	-20~30℃	
11	Storage humidity	45% ~ 75％		relative humidity
12	Weight	Approx. 8.0g		
13	ESD ability	Touch discharge ≥ 6000V		
		Air discharge≥6500V		
14	Cycle life	500 times		Rate 0.5C, capacity≥80%

Note: If you need the battery protection parameters, please refer to PAGE 7.

2.2 Main components and parts

Materials	Model	Quantity	Related technical parameters	Manufacturer
Li-Polymer battery cell	502535	1PC	Please refer to the battery cell specification	/
Protection board	PCM	1PC	Please refer to the PCM specification	
Wire	UL1007 AWG28 Length 40mm	2PCS		

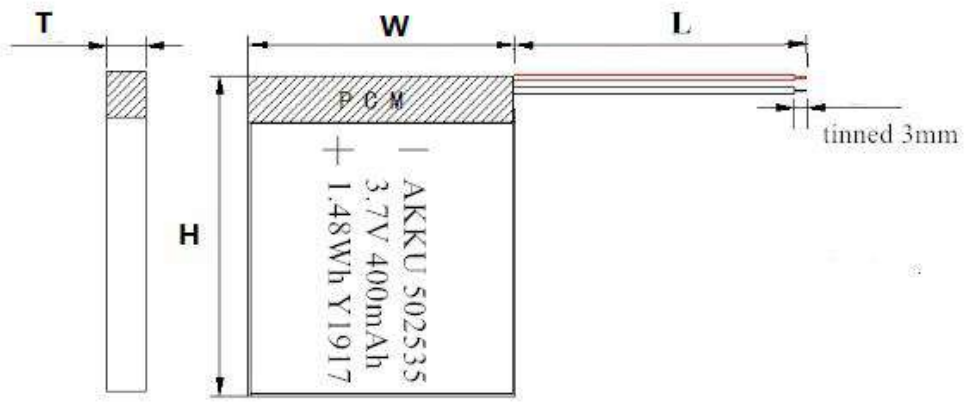
2.3 Reliable performance test

S/N	Inspection item	Standard	Testing Method
1	High temperature	No deformation, no rust, no fire or explosion; Discharge time ≥100mins with $0.5C_5A$ discharge	Place the battery in the environment of 55±2℃ for 2 hours after fully charge, then discharge with $0.5C_5A$ to cut-off voltage.
2	Low temperature	No deformation, no rust, no fire or explosion; Discharge time ≥ 3 hours with $0.2C_5A$ discharge at -20±2℃	After fully charge, place the battery in the environment of -20±2℃ for 16-24h, then discharge with $0.2C_5A$ to cut-off voltage. Then display the battery in 20±5℃ for 2 hours, observe the appearance of the battery.
		No deformation, no rust, no fire or explosion; Discharge time ≥ 3.5 hours with $0.2C_5A$ discharge at -10±2℃	After fully charge, place the battery in the environment of -10±2℃ for 16-24h, then discharge with $0.2C_5A$ to cut-off voltage. Then display the battery in 20±5℃ for 2 hours, observe the appearance of the battery.
3	Capability Retention	Discharge time ≥ 4.25h	After fully charged, store the battery at 20±5℃ for 28 days, then discharge with $0.2C_5A$ to cut-off voltage.
4	Constant humidity and heat	No deformation, no rust, no smoke or explosion. Discharge time ≥ 36 mins	After fully charge, place the battery in the environment of 40±2℃ and 90% - 95% Relative humidity for 48 hours, then place it in 20±5℃ for 2 hours, later, discharge with $1C_5A$ to cut-off voltage.

5	Vibration	No deformation, no rust, no smoke or explosion. Battery voltage ≥ 3.6V	Batteries are vibrated 30 minutes in three mutually perpendicular directions of X, Y, Z with amplitude of 0.38mm (10~55Hz) and the scanning rage of 1oct per minute.
6	Shock	No deformation, no smoke or explosion. Battery voltage ≥ 3.6V	Vibration test ended, place the battery in the directions of X.Y.Z three mutually perpendicular axis, and set pulse peak acceleration as 100m//s^2. Then shock the battery with frequency of 40 ~ 80 per minute. The duration of pulse is 16ms, Shock times: 650 ± 10.
7	Free Drop	No leakage, no smoke or explosion, but a slight deformation. Discharge time ≥ 100mins at 0.5C_5A discharge	After shock test, the batteries are dropped on the 18-20mm hardwood on the concrete floor from 650mm height as per positive and negative 6 direction of X, Y, Z. Each direction should drop one time. After test, batteries can be charged and discharged for at least three cycles.
8	Overcharge Protection	No explosion, no fire, no smoke or leakage	After fully charged, continue to charge the battery for 8 hours with C.C/C.V source. The constant voltage source sets to 2 times nominal voltage and constant current sets 2 C_5A.
9	Over discharge Protection	No explosion, no fire, no smoke or leakage.	At 20±5℃, discharge the battery discharge with 0.2C_5A to cut-off voltage. Then, continuously discharge the battery with a 30Ω load resistance for 24 hours.
10	Short-circuit Protection	No explosion, no fire, no smoke or leakage; Batteries voltage is not less than N*3.6V after instantaneous charge.	After fully charge, short-circuit positive and negative electrode with 0.1Ω for 1 hour. Cut-off positive and negative electrode, then charge the battery at 0.5C_5A instantaneously for 5S.
11	Thermal Shock	No fire, No explosion	Battery is heated in a circulating air oven at a rate of (5±2)℃ per minute to 130℃, and then placed for 30 minutes at 130℃.

12	Overcharge	No fire, No explosion	Place battery connected thermocouple in a ventilated cabinet, connect the positive and negative to CC/CV source, and adjust constant current to $3C_5A$, and constant voltage to N*10V. Charge the battery to N*10V and current to 0 A. Then monitor the changes of temperature. If the temperature of battery drops to about 10℃ lower than the max temperature, test is finished.
13	Short circuit	No fire, No explosion. The out side temperature of the battery is less than 130℃.	Place battery connected thermocouple in a ventilated cabinet, short-circuit the positive and negative, then monitor the changes of temperature. If the temperature of battery drops to about 10℃ lower than the max temperature, test is finished.
14	Nail	No fire, No explosion	Put battery in the nail test platform. then, use a diameter 8 mm steel tip to poke through into hole. Finally, use a heavy hammer to blow the battery
15	Cycle life	Cycle life ≥ 500	At 20±5℃, charge battery with 0.5 C_5A to 4.2V and then charge it with constant voltage to the current less than 20mA. Stop charge and display for 0.5~1 hour. Then discharge it with 0.5 C_5A to cut-off voltage. Display for 0.5 ~1 hour, do next charge and discharge cycle. Repeat these steps. Stop it until the continuous two cycle discharge time is less than 48 minutes.
16	Storage	When it is stored for 3 month, fully charge it, then discharge it at 0.2 C_5A, discharge time is not less than 4 hours.	The storage test of battery should be selected a battery which is less than 3 month from production date to the date of experiment. Before storage, battery capacity should be full charged 40%~50% capacity, the ambient temperature is 20℃±5℃ and relative humidity is 45%-85%. After the storage expiration of battery, battery should be charged and discharged according to fully charged and discharged.

2.4 Dimension of the battery



Dimension

T: 5.0mm
W: 25.5mm
H: 37.5mm
L: 40±3mm

Material

1. Cell: 502535 400mAh
2. PCM
3. Wire Red
   UL1007 AWG28
4. Wire Black
   UL1007 AWG28

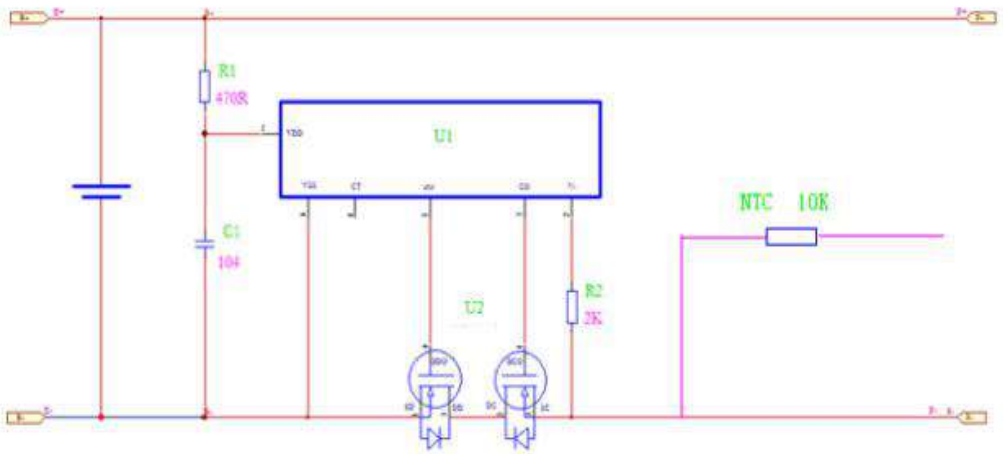
3. Specification of PCM

3.1 General electric characteristic

Items	Specification	Remarks
Over-charging Protection Voltage	4.28V±0.05V	
Over-charging Return Voltage	4.08V±0.05V	
Detection Delay Time of Over-charging Protection	120ms~160ms	
Over-discharge Protection Voltage	2.4V±0.1V	
Over-discharge Return Voltage	3.0V±0.1V	
Detection Delay Time of Over-discharging Protection	60ms~80ms	
Over-current Protection	1A	
Detection Delay Time of Over-current Protection	5ms~10.0ms	
Short circuit Protection condition	Exterior short circuit	
Detection Delay Time of short circuit Protection	0.4ms~0.6ms	
Short circuit Protection Release condition	Cut short circuit	
Internal Resistance of Proper	≤70mΩ	

Functioning		
Consume Current	3uA Type 7uA Max	

3.2 Electric schematic diagram of battery (for reference only)



4 Specification of the cell

NO.	Items	Parameters		Tolerance	Term	Remark/ condition
1	Appearance	No mechanical damage, leakage , sink ,drum and so on		/	50cm distance under 40W daylight lamp	Visual
2	Dimensions	Length	35mm	Max 36.0mm	Digital caliper	
		Width	25mm	Max 25.5mm		
		Thickness	5.0mm	Max 5.0mm		
3	Voltage	≥3.85V		/	Multimeter	VC9801
4	Capacity	≥400mAh		/	0.2C	
5	Internal resistance	≤110mΩ		/	1KHz	/

6	Consistency	Appearance quality is the same
7	**Security**	**Correspond to related safety performance**

Attentions

Danger

To prevent battery from weeping, fever, exploding, please obeys the rules as follows:
Do not immerse the battery into the water or the sea, Guard against Damp;
Do not approach the heat source, like fire or heater;
Please use the appointed charger when charging;
Do not transposition the +.- poles of the battery to charge;
Do not direct-connected the battery to alternating current power supply, or auto-ignition of the vehicle;
Do not discard the battery to the fire or hyperpyretic objects;
Do not use the conductor to lead the short circuit of the + -poles of the battery. Do not put the battery with metallic conductors to transport or store, like necklace, hairpin and so on;
Do not beat or throw the battery;
Do not impale the battery with needle or some other sharp things, do not strike it with weight;
As installed safety device in the battery, please do not resolve or change any other sections of the battery to protect the inherent safety functions.

Warnings

Do not put the battery to the microwave oven or pressure tank;
Do not use the battery with some chemical batteries (like dry battery) or different capacities and brands battery together, if the battery emits the smell, heat , changes color, be out of shape or appears any other abnormal phenomena during the charging or stored procedures, please get out the battery from the device or charger and stop using;
If can not recharge within the charging period, please not continue charging;
Put the battery to where the kids can not touch, if the kids swallow the battery, please seeing the doctor soon;
If the electrolyte of the battery into the eyes, do not rub, should wash the eyes first, then see the doctor.

Announcements

Do not put the battery under the high temperature places (like sunshine irradiation or car in the hot weather), or it will

catch fire for the heat, reduce the performance and loss the life;

To insure the safety, the battery should install the safety device, please not use when the static electricity is more than we need when produce, or the safety device will lose efficacy and lead the overheating ,fracture, exploding and catching fire;

Please use the battery in normal as follows, or it will be overheating, caught fire, reduced performance and shorten the life;

Environment condition

(Temperature) Charging: 0~+45^{0}C

Discharging: -20~+60^{0}C

Store within 30 days: -20~+400C

Store within 90 days : -20~+30^{0}C

If the kids use the battery, they should use as the operation instruction manual and guarantee that it must be use in normal at any time;

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If the battery weeps, the electrolytes stick on the skin or cloth, use the water to wash or running water to wash

To insure not install the battery wrong or wastage of the battery, please read the instruction carefully to install and dismounting;

If the battery will not be used for a long time ,please take out of the battery from the device and store in dry and shady places;

If there is sludge on the surface of the battery, please wipe up clean before using, or it will lead bad contact with the device.

! Special Notice

Keep the cells in 50% charged state during long period storage. We recommend to charge the battery up to 50% of the total capacity every 3 months after receipt of the battery and maintain the voltage 3.7V~4.1V. And store the battery in cool and dry place.