Specification Approval Sheet

Model ICR18650-26J-26M-2S4P

Specification Approval sheet

1. Scope

The specification shall be applied to Li-ion battery pack of WJP18650-2s4p 10400mah,which is manufactured by Akyga Battery

The product is ROHS compliant

2. Specification

NO	Items	Criteria	Remarks
2.1	Typical Capacity	10400mAh	0.2C
	Minimum Capacity	10200mAh	
2.2	Energ	76.96wh	
2.3	Nominal Voltage	7.4 V	
2.4	Open Circuit Voltage	3.6V-3.95V	
2.5	Internal Impedance PCB）	≤180mΩ	AC 1KHz after standard charge
2.6	Charge voltage	4.2V	
2.7	Standard charge current	5200mA	0.5C
2.8	Max. charge current	10400mA	1.0C
2.9	Standard discharge current	20800mA	2.0C
2.10	Max. discharge current	40000mA	
2.11	Discharge cut-off voltage	2.75V	
2.12	Operating Temperature	0~15℃ (0.2C) 15~25℃ (0.5C) 25~45℃ (1C)	Charging
		-20~+60℃	Discharging
2.13	Storage Temperature	-20℃~+60℃	Less than 1 month
		-20℃~+45℃	Less than 6 months

3.Battery configuration

NO	Item	Criteria	Remarks
3.1	Cell	ICR18650-26J-2600mah	4 2S4P
3.2	PCM	WNB-T421-B	
3.3		UL1007 10 AWG	L=150mm

4.Battery Performance Criteria

4.1 Appearance

There shall be no such defect as scratch, bur and other mechanical scratch, and the connector should be no rust dirt. The structure and dimensions see attached drawing of the battery.

4.2 Measurement Apparatus

(1) Dimension Measuring Instrument

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

(2)Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance not less than 10 KΩ/V

(3) Ammeter

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

(4) Impedance Meter

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

4.3 standard Test Condition

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 20±5℃ and relative humidity of 45~85%.

4.4 Standard Charge

0.5C=5200mA Full charge condition: Constant current 0.5C, Constant voltage4.2 for 5~8 hours in all at20±5℃.

0.5C=5200mA 4.2V(CC-CV)

4.5 Common Performance

No	Items/	Testing method and determinant standard
1	Charge Performance	The battery can be charged when using the original charger. The standard charge mode :under the temperature of 20±5℃,charge the battery with the current of 0.2C until the voltage reaches up to 4.2V,then charge with constant oltage until the charge current ≤ 0.01C，then stop charging.
2	Discharge Performance	When connecting with load, the battery can supply power. Charge the battery with standard charge mode, then rest for 0.5h, then discharge with 1C until the voltage is 3.0V, and the discharge time is required ≥54min.
3	Cycle Performance	Under the temperature of 20±5℃,charge the battery with 0.5C/0.2C, when the voltage reaches up to4.2V charge with constant voltage until the charge current ≤ 20mA，then stop charging, then rest for 0.5h, then discharge with 0.5C to 3.0V. Cycle with the above mode, the test shall be terminated when Discharging Capacity ＜80% of Initial Capacity in three consecutive cycles. The cycle life is required ≥300 times.
4	Charged Storage Characteristics	Charge the battery with 0.2C, then shift to charge with constant voltage until the voltage reaches up to4.2V, when the charge current ≤0.01C stop charging; rest under the temperature of 20±5℃ for 28d then discharge with 0.2C to 3.0V. The discharge time is required ≥4.25h.

5	Storage Characteristics	Charge the battery ,which is new manufactured shorter than 3 months, with 1C/0.2C until the capacity reaches to 40~50%, after resting for 12 months under the temperature of 20±5℃ and the humidity of 45～75%,then charge with 0.2C to 4.2V then shift to charge with constant voltage, after full-charge rest for 0.5h,then discharge with 0.2C to3.0V. The discharge time is required

4.6 Safety Performance

No	Items/	Testing method and determinant standard /
1	High Temperature Characteristics	Under the temperature of 20±5℃, after charging the battery with 1C/0.2C, then put the battery into the constant temperature and humidity oven with 55±2℃ for 2h,then discharge with 1C to 3.0V. The discharge time is required ≥54min and the battery should no deformation and smoking.
2	Low Temperature Characteristics	Under the temperature of 20±5℃, after charging the battery with 1C/0.2C, then put the battery into the constant temperature and humidity oven with -10±2℃ for 16~24h,then discharge with 0.2C to3.0V. The discharge time is required ≥3.5hand the battery should no deformation and smoking.
3	Overcharge Protection Characteristics	After full-charging the battery with 0.2C and set the constant current and voltage supplier with 2times of the nominal voltage and current, then load it to the battery for 8h. It is required the battery should be no leakage, deformation, smoking and explosion during the test processes.
4	Over-discharge Protection Characteristics	Under the temperature of 20±5℃,after discharging the battery with 0.2C to3.0V, then connect the load with 30Ω then discharge for 24h. It is required the battery should be no leakage, in fire, smoking and explosion during the test processes

5	Short-circuit Protection Characteristics	Under the temperature of 20±5℃,after full-charging the battery with 0.2C, then make the battery's anode and cathode short-circuit for 1h(the connecting resistance is smaller than 100mΩ),then cut the anode and cathode, After the battery momentary charge by 1C current，the voltage should come back to 3.6V,and there should be no leakage, deformation, smoking and explosion during the test processes.
6	Constant Humidity and Temperature Characteristics	Under the temperature of 20±5℃, after charging the battery with 0.2C, then put the battery into the constant temperature and humidity oven with 55 ± 2 ℃ 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℃, discharge with 1C to 3.0V. The discharge time is required ≥36min.
7	Free fall test	The battery to be fully charged in accordance with standard charge condition, then drop the battery three times from a height of 1,0 m onto a concrete floor. The batteries are dropped so as to obtain impacts in random orientations. No Fire,
8	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 and 55Hz, the excursion of the vibration is 1.6mm. The cell shall be vibrated for 30 minutes per axis of XYZ axes. No explosion ,No leakage, No fire

9	Thermal exposure test	Each fully charged cell, stabilized at room temperature, is placed in a circulating air-convection oven. The oven temperature is raised at a rate of 5 °C/min ± 2 °C/min to a temperature of 130 °C ± 2 °C. The cell remains at this temperature for 10 min before the test is discontinued. No explosion, No fire

4.7 Rest Period

Unless otherwise defined, 30min,rest period after charge,30min,rest period after discharge.

5. Storage and Others

5.1 Long Time Storage

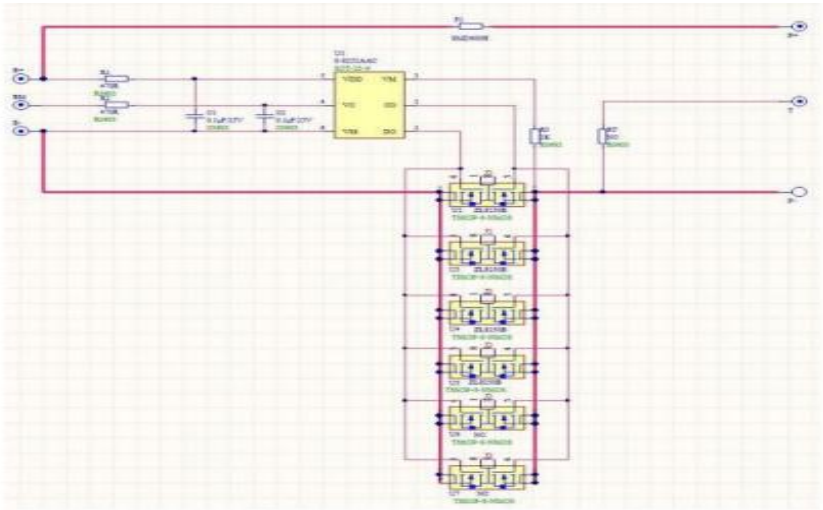
If stored for a long time(exceed three months), the cell should be stored in drying and cooling place. The cell's storage voltage should be3.7~3.9V and the cell isto be stored in a condition as appendix No. 4

5.2 Others

Any matters that this specification does not cover should be conferred between the customer and superpower

6.Protection Circuit

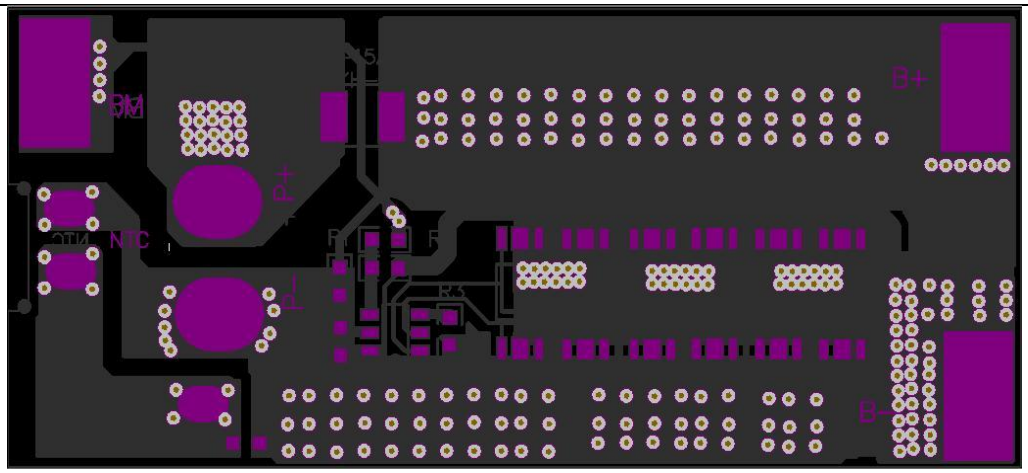
6.1 Circuit Diagram



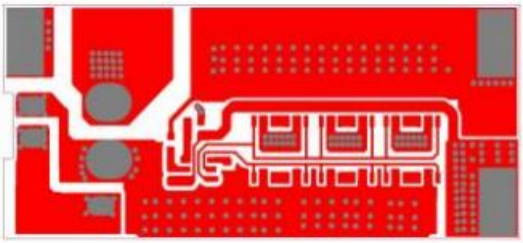
6.2 PCM parameter

IC: / Protection IC:	S-8252B	parameter value			
		General temperature 25℃			
item		Min.	Type value	Max.	Unit
Over charge protection voltage		4.255	4.28	4.305	V
Over charge release voltage		4.03	4.08	4.13	V
Over discharge protection voltage		2.8	2.9	3.0	V
Over discharge release voltage		2.9	3.0	3.1	V
Over current detection voltage		0.18	0.2	0.22	V
Over current protection current		8	10	12	A
Over charge protection delay time		0.5	1.0	1.5	s
Over discharge protection delay time		38	128	256	ms
Over current protection delay time		2.4	8	16	ms
Short protection delay time		84	280	560	us
Current consumption (Operation)			4.5	20	uA
Current consumption (Power down)				0.1	uA
Impedance			12	50	mΩ
Input voltage(B+ to B-)		-0.3		12	V
Max continuous charge current				6	A
Max continuous discharge current				6	A
Operating temperature		-20		+55	℃
Recommendatory storage condition		Temperature range: -5~+35℃ Humidity: 0%~75%RH			
0V battery charge function		Unavailable			

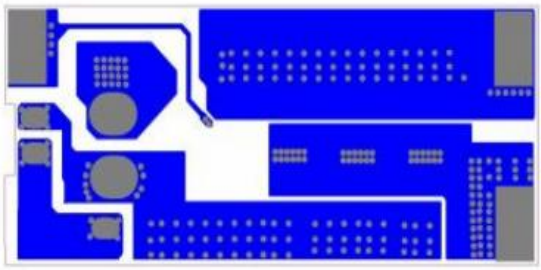
6.3 PCB



TOP SILKSCREEN



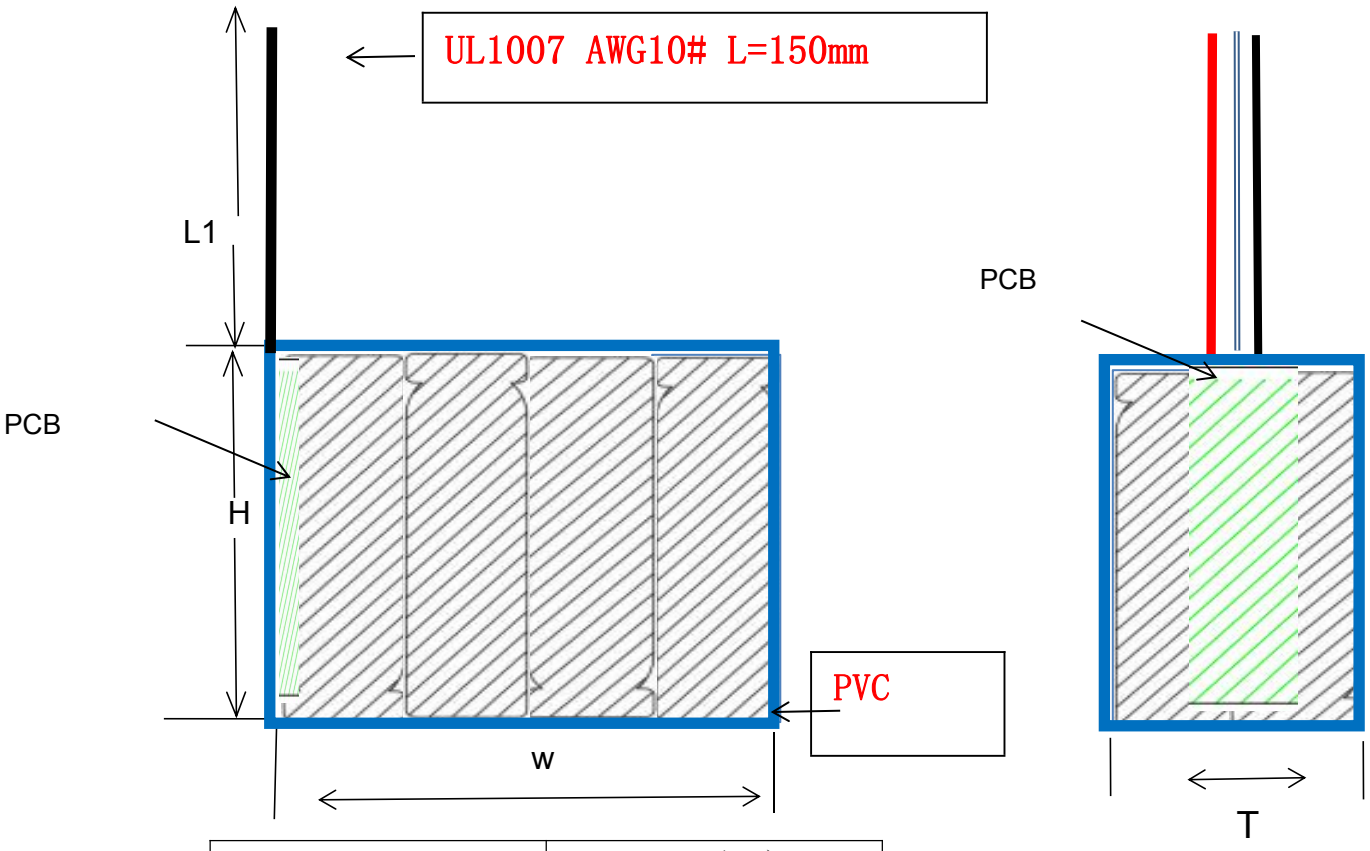
BOTTOM SILKSCREEN



7． PCM Parts list PCM

物料名称	品 牌	型号/规格	封装	元件编号	数量
贴片电容	KYOCERA	100NF 50V X7R 10%	0603	C1	2
贴片电阻	KYOCERA	RC0603J 470RG1 470R	0603	R1 R2	2
贴片电阻	KYOCERA	RC0603JR-072KL 2K	0603	R3	1
贴片保护IC	TEW	S-8252B	SOT23-6	U1	1
贴片MOSFET	FNK	8205A	TSSOP8	U3 U4 U5 U7	4
镍片	YKS	7*3.5*0.3mm	/	B+ B- BM	3
镍片	YKS	3*4*0.3mm	/	F1	
PCB	YMS	T421-B	55*24*1mm	/	1

8. Assembly Drawing&Lable



ITEM	(mm)
H	Max. 72.0±1.0
T	Max. 38.0±1.0
L1	150±5.0
W	Max. 75.0±1.0

Appendix

Handling Precautions and Guideline
For LIP (Lithium-Ion Polymer) Rechargeable Batteries

Preface

This document of 'Handling Precautions and Guideline LIP Rechargeable Batteries' shall be applied to the battery cells manufactured by Akyga Battery

Note (1)

The customer is requested to contact Akyga Battery in advance, if and when the customer needs other applications or operating conditions than those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.

Note (2)

Akyga Battery will take no responsibility for any accident when the cell is used under other conditions than those described in this Document

Note (3)

Akyga Battery will inform, in a written form, the customer of improvement(s) regarding proper use and handling of the cell, if it is deemed necessary.

1 Charging

1.1 Charging current

Charging current should be less than maximum charge current specified in the Product Specification. Charging with higher current than recommended value may cause damage to cell electrical， mechanical, and safety performance and could lead to heat generation or leakage.

1.2 Charging voltage

Charging shall be done by voltage less than that specified in the Product Specification 4.2V/cell). Charging beyond 4.30V, which is the absolute maximum voltage, must be strictly prohibited. The charger shall be designed to comply with this condition.

It is very dangerous that charging with higher voltage than maximum voltage may cause damage to the cell electrical, mechanical safety performance and could lead to heat generation or leakage.

1.3 Charging temperature

The cellshall be charged within 0℃~45 ℃ range in the Product Specification.

1.4 Prohibition of reverse charging

Reverse charging is prohibited. The cell shall be connected correctly. The polarity has to be confirmed before wiring. In case of the cell is connected improperly, the cell cannot be charged. Simultaneously, the reverse charging may cause damaging to the cell which may lead to degradation of cell performance and damage the cell safety, and could cause heat generation or leakage.

2 Discharging

2.1 Discharging current

The cell shall be discharged at less than the maximum discharge current specified in the Product Specification. High discharging current may reduce the discharging capacity significantly or cause over-heat.

2.2 Discharging temperature

The cellshall be discharged within -20℃~60 ℃ range specified in the Product Specification.

2.3 Over-discharging

It should be noted that the cell would be at an over-discharged state by its self-discharge characteristics in case the cell is not used for long time. In order to prevent over-discharging, the cell shall be charged periodically to maintain between3.7V and3.9V.

Over-discharging may causes loss of cell performance, characteristics, or battery functions

The charger shall be equipped with a device to prevent further discharging exceeding a cut-off voyage specified in the Product Specification. Also the charger shall be equipped with a device to control the recharging procedures as follows: The cell battery pack shall start with a low current (0.01C) for 15 - 30 minutes, i.e. pre-charging, before rapid charging starts. The rapid charging shall be started after the （individual）cell voltage has been reached above 3V within 15 - 30 minutes that can be determined with the use of an appropriate timer for pre-charging. In case the (individual) cell voltage does not rise to3V within the pre-charging time, then the charger shall have functions to stop further charging and display the cell/pack is at abnormal state.

3.Protection Circuit Module

The cell/battery pack shall be with a PCM that can protect cell/battery pack properly. PCM shall have functions of (1) overcharging prevention, (2) over-discharging prevention, (3) over current prevention to maintain safety and Prevent significant deterioration of cell performance. The over current can occur by external short circuit

3.1 overcharging protection:

Overcharging protection function shall stop charging if any one of the cells of the battery pack reaches 4 25±0 025V；

3.2 over-discharging protection:

Over-discharging prevention function shall work to avoid further drop in cell voltage of 2.75.0±0.05V
Or less per cell in any cell of the battery pack. It is recommended that the dissipation current of PCM
Shall be minimized to 0.5uA or less with the over-discharging prevention,the protection function shall monitor each bank of the battery pack and control the current all the time

4. Storage

The cellshall be storied within -10℃~ 45℃ range environmental condition.

If the cell has to be storied for a long time (Over 3 months), the environmental condition should be:
Temperature: 23±5℃
Humidity: 65±20%RH

The voltage for a long time storage shall be3.7V~3.9V range.

5. **Handling Instructions**

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

Danger!

— 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.

Do not use any chargers other than those recommended.

— 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 pierce the battery casing with a nail or other sharp object, break it open with a hammer, or step on it.

— Do not strike, throw or subject the battery to sever physical shock.

— Do not directly solder the battery terminals.

— Do not attempt to disassemble or modify the battery in anyway.

— 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 offan odor, generates heat, becomes 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.

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.

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.

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.

Operating environment:

When charging the battery: 0℃~45℃

When discharging the battery: -20℃~60℃

When stored up to 30 days: -20℃~45℃

When stored up to 360 days: -10℃~25℃

6.Amendment of this Specification

This specification is subject to change with prior notice.