	Akku Tronics New Energy Technology Co., Limited TEL:0086-755-85290393 FAX:0086-755-86578846	Type: ICR18650-30-3S3P-PTLC
		REV: 1.0
		Date: 2021-04-01

Specification Approval Sheet


Model : ICR18650-30-3S3P-PTLC

Type : Li-ion battery

Specification : 10.8V/9150mAh

signed by client	
Confirmed	
Checked	
Approved	

signed by manufacturer	
Prepared:	Alex Wang
Checked:	Howell Zhu
Approved:	Xueming Zhao

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1. Battery type and scope

This Specification Approval Sheet is for rechargeable Li-ion battery provided by Akku Tronics New Energy Tech. Co., Ltd.

2. Basic characteristic and components of the battery


2.1 Basic performance parameter of the battery

S/N	Details	Parameters	Remarks
1	Rated voltage	10.8V	
2	Rated capacity	9150mAh	
3	Inner resistance	$\leq 200\text{m}\Omega$	
4	Approx. Weight	Approx. 450g	

2.2 Basic performance parameter of the cell

NO.	Item	Standard	Note
1	Standard Capacity	3050mAh	discharge with 620mA (0.2C) to 2.5V
2	Minimum Capacity	2950mAh	
3	Standard Voltage	3.6 V	
4	Alternating Internal Resistance	$\leq 35\text{m}\Omega$	
5	Standard Charge	Constant current	$0.5\text{C} (1525 \text{ mA}) 10^\circ\text{C} > T \geq 0^\circ\text{C}$
		Constant voltage	4.2V
		Cut-off Current	31mA
6	Max. Charge Voltage	4.2V	
7	Rapid Charge Current	$1\text{C} (3050\text{mA}) 10^\circ\text{C} \leq T \leq 45^\circ\text{C}$	
8	Standard Discharge	Constant current	0.2C (610mA)
		Cut-off voltage	2.5V
9	Max. Discharge Current	$1\text{C} (3050\text{mA}) 60^\circ\text{C} > T \geq 45^\circ\text{C}$ $2\text{C} (6100\text{mA}) 45^\circ\text{C} > T \geq 5^\circ\text{C}$ $0.5\text{C} (1525\text{mA}) 5^\circ\text{C} > T \geq -20^\circ\text{C}$	
10	Weight	$\leq 47\text{g}$	
11	Max. Dimension	Height: $64.85 \pm 0.25\text{mm}$ Diameter: $18.35 \pm 0.15\text{mm}$	
12	Charge Temperature	$0^\circ\text{C} < T \leq 45^\circ\text{C}$	
13	Discharge Temperature	$-20^\circ\text{C} < T \leq 60^\circ\text{C}$	
14	Storage conditions	Within one month: $45^\circ\text{C} \sim 60^\circ\text{C}$, 60% RH Max	

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 Website: <http://www.akkutronics.com>

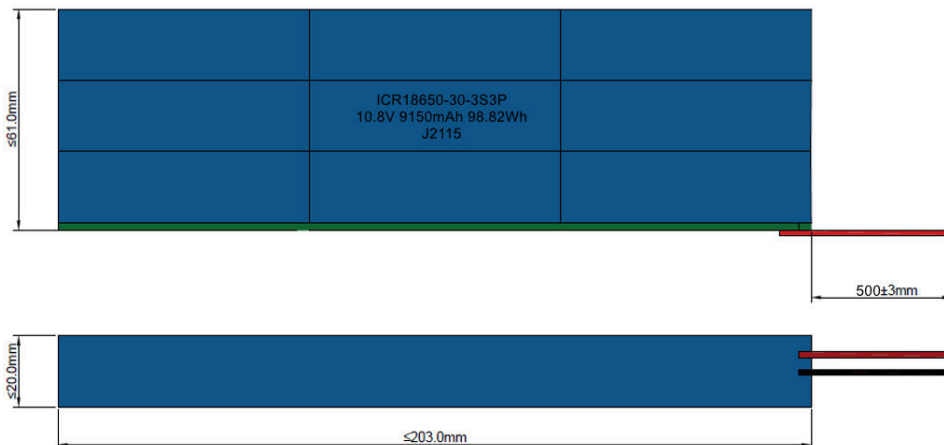
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		Within three months: 25 °C ~ 45 °C, 60% RH Max	
		Within one year: -20 °C ~ 25 °C, 60% RH Max	

2.3 Main components and parts

Materials	Model	Quantity	Related technical parameters	Manufacturer
Li-Ion battery cell	ICR18650-30	9PCS	Please refer to the battery cell specification	
Protection board	PCM 10K NTC	1PC	OCV 4.25V±0.035V/cell	
			ODV 3.0V±0.08V/cell	
			Over current: >10A	
Wire	50cm	3PCS		
Connector	JST-PH-3P	1PC		

3. Dimension of the battery



Material

1. Cell: ICR18650-30, 3050mAh (3S3P)
2. PCM
3. NTC 10KΩ
4. Wire Red UL1007 AWG22
5. Wire Black UL1007 AWG22
6. Wire Yellow UL1007 AWG22
7. Connector: JST-PH-3P
8. Shrink PVC

4. Standard Conditions for Test


All the tests need to be done within one month after the delivery date under the following conditions:

Ambient Temperature: 25±2°C; Relative Humidity: ≤75%

1	Standard Charge	Charge with constant current 0.5C (1525 mA) and Constant Voltage (CC/CV) 4.20V, cut-off at the current of 0.01C (31mA).
2	Standard Discharge	Discharge with constant current 0.2C (610mA) and cut-off at the voltage of 2.5V.

5. Characteristics

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5.1 Electrical Characteristics

NO.	Item	Test Method	Standard	
1	Nominal Voltage	The average value of working voltage during discharge with the current of 0.2C after charged under the condition of 4.1.	3.6V	
2	Discharge Capacity	Discharge with the current of 0.2C and cut-off at 2.5V after charged under the condition of 4.1	≥2950mAh	
3	Cycle Life	At the ambient temperature of 25±2°C, charge with constant current 0.5C and constant voltage (CC/CV) 4.20V, cut-off at current 31mA. Rest 10 minutes. Discharge with 0.2C and cut-off at 2.5V. Rest 20 minutes. This is a cycle life. If discharge capacity is lower than 70% of the first cycle twice in series, cycle life test is over.	≥500 Cycles (70%) With 0.5C/0.2C	
4	Temperature Dependency of Capacity	Cells shall be charged per 4.1.at 25°C±2°C and discharged per 4.2 at the following temperatures. Discharge cut-off voltage shall be 2.0 V when discharge temperature is below -10°C.	-10°C	≥70%
			0°C	≥80%
			60°C	≥90%
5	Capacity Retention at Room temperatures	Charge the cell under the condition of 4.1. Store 28 days at the ambient temperature of 25±2°C. Discharge with 0.2C to 2.5V and calculate capacity retention (compare to the standard capacity in 4.2). Charge the cell under the condition of 4.1 and discharge with 0.2C to 2.5V. Calculate capacity recovery (compare to the standard capacity in 4.2).	Retention ratio≥90% Recovery ratio≥95%	

5.2 Electrical tests


NO.	Item	Test Method	Standard
1	Short Circuit test	After fully charged under the condition of 4.1, cell is to be short-circuited by connecting the positive and negative terminals of the cell with copper wire having a maximum resistance load of 100mΩ. This test is done at room temperature and at 60 °C (different cells). Monitor the cell temperature while testing. The cell is continuously discharged until the cell case temperature has returned to be 10°C less than peak temperature.	No fire, no explosion.

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2	Over charge test	After fully discharged under the condition of 4.2, apply a 12V power supply and a 1C charge current for 1.5hrs.	No leakage, no flame, no fire, no explosion.
3	Forced-Discharge test	After fully charged under the condition of 4.1, and then cell is to be discharged by 0.2C current for 12 hours; The test is completed when the cell is to be discharged up to 250% of rate capacity or the other protective devices prevent the discharge.	No leakage, no flame, no fire, no explosion.

5.3 Mechanical tests

NO.	Item	Test Method	Standard
1	Vibration test	After fully charged under the condition of 4.1, cell shall be attached to a vibration table directly and subjected to vibration that consists of 10 Hz to 55 Hz to 10 Hz at the speed of 1Hz/min in 90~100mins. The total excursion of the vibration is 0.8mm (0.060 inches). The cell shall be vibrated in each direction along axis of the cylinder and the vertical directions of axis of the cylinder.	No leakage.
2	Crush test	After fully charged under the condition of 4.1, the cell shall be crushed between two flat surfaces. The direction of the crushing force shall be vertical to axis of the cylinder. The crushing force is to be applied by a hydraulic ram with a 32mm diameter piston. Crushing force is approximately 13 KN. Once the maximum pressure has been obtained it is to be released.	No fire, No explosion.
3	Impact test	After fully charged under the condition of 4.1, then the battery cell was placed on a flat surface so that the longitudinal axis of the battery cell shall be parallel with it. A 15.8mm diameter bar is to be placed across the center of the sample. A 9.1kg weight is to be dropped from a height of 61cm on the sample.	No flame, no fire, no explosion.
4	130°C thermal abuse test	After fully charged under the condition of 4.1, the cell is put in the oven. And then the oven temperature will be ramped at 5°C per minute to 130°C and held at 130°C. When the temperature of the cell reaches 130°C, the cell is maintained in the	When the temperature of the cell is 130°C. Cell must not fire or explosion in 60 minutes

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		130°C oven for a maximum of 60 minute or until a fire or explosion is obtained, whichever comes first. Record the time that the cell temperature reaches 130°C and the time when a fire or explosion occurs.	
5	Incineration test	After fully charged under the condition of 4.1, each test sample cell or battery is to be placed on a platform table having a 4-inch diameter hole in the center covered by a screen. The screen over the hole is to be steel wire mesh having 20 openings per inch and a wire diameter of 0.017 inch An eight-sided covered wire cage, 2 feet across and 1 foot high is covered with a metal screen is to be constructed from 0.010inch diameter wire with 16-18 wires per inch in each direction. This wire cage is placed over to the test sample. The sample is to be placed on the screen covering the hole in the center of the hole. It is to be heated until it explodes, or until it is destroyed.	When subjected to the test no part of exploding cell shall penetrate from the screen such that some or all the cell or battery protrudes through the screen

6. Caution

Please read this specification carefully before testing or using the cell since improper handling of a Li-ion cell may lead to loss of efficiency, heating, ignition, electrolyte leakage and explosion.

6.1 Caution in use:

6.1.1 Abnormal operating conditions such as overcharge (voltage > 4.25V), over discharge (voltage < 2.75V) and overcurrent charge-discharge (maximum current allowed at current temperature) cannot occur during the operation of the cell. It is strictly prohibited to use the cell in the environment which is easy to generate static electricity and poor sealing (water and dust entering).


6.1.2 More than 0.5C current charging, use in high-temperature/low-temperature environment, use in vibration environment, not match well cells and use in humid environment will reduce the cycle life of the cell.

6.1.3 The battery shall not be used in the environment of high frequency microwave and ultrasonic wave. When the battery is used in multiple S and P module, it is recommended to coat the electromagnetic insulation cover of high-voltage wire to prevent the electromagnetic wave from damaging adjacent devices and human body.

6.1.4 There should be no overlapping or contact between the positive and negative terminal wires of the battery to reduce the risk of short circuit.

6.1.5 The battery shall be designed for charging and discharging in strict accordance with the current specification to ensure the battery's cycle life and safety.

6.1.6 When the battery is assembled module for use, the cells with the same capacity, internal resistance position, same batch and same charged state shall be used. The standard of the battery should be strictly in accordance with the technical agreement. The working process of the battery module, the battery pack inside temperature difference should be less than 5°C.

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6.1.7 Do not charge the cell when cell temperature less than 0°C, please standby before charging when cell exposure at under-zero environment. Time standby as follows:

Outside Temperature	-5°C ≤ T ≤ 0°C	-10°C ≤ T ≤ -5°C	-15°C ≤ T ≤ -10°C	-20°C ≤ T ≤ -15°C
Time	2h	5h	8h	10h

6.2 Safety Caution

6.2.1 The cell should be placed away from the children.

6.2.2 When testing the cells by charging or discharging, please use professional test equipment specially designed for Li-ion batteries. Do not use ordinary constant current or constant voltage (CC/CV) power supplies. These do not protect the cell from being overcharged and over-discharged and may lead to possible loss of efficiency or danger.

6.2.3 When charging or discharging, or assembling, reversing the positive and negative terminals would lead to overcharge and over-discharge of the cell (s). This could lead to serious loss of efficiency and even explosions.

6.2.4 Do not solder the cell directly. Do not resolve the cell.

6.2.5 Do not put the cell (s) in pockets or bags with metal products, such as necklaces, hairpins, coins, screws, etc. Neither storing them without proper isolation. Do not connect the positive and negative electrodes directly with conductive materials. This could lead to a short-circuit of the cell.

6.2.6 Do not hammer, throw or trample the cell. Do not put the cell into washing machines or high-pressure containers.

6.2.7 Keep the cells away from heat sources, such as fires, heaters, etc. Do not use or store cell (s) at locations where the temperature could exceed 60°C, such as in direct sunlight. This may lead to the generation of excessive heat, ignition and loss of efficiency.

6.2.8 Do not get the cells wet or throw them into water. When not in use, place the cells in a dry environment at low temperatures.

6.2.9 When in use, testing or storing, if the cells become hot, distributing a smell, changing color, deformation or showing any other abnormalities, please stop using or testing immediately. Attempt to isolate the cell and keep it away from other cells.

6.2.10 Should electrolyte get into the eyes, do not rub the eyes. Rinse the eyes with clean water and seek medical attention if problems remain. If electrolyte gets onto the skin or clothing, wash with clean water immediately.

7. Packing


Batteries are at 50% state of charge when packed.

8. Transportation

During transportation, do not subject the cell (s) or the box (es) to violent shaking, bumps, rain or direct sunlight. Keep the cell at 50% state of charge.

9. Long-term Storage

If the battery needs to be stored for a long time, the battery's storage voltage should be 3.6 ~ 3.9 V. Also, it is recommended to charge the battery every six months.

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10. The warranty period of this product is 12 months from the date of delivery from the factory.

11. Warranty will be void if the cells are used beyond these specifications.

11. The information in this specification is subject to change without prior notice.