



YOKU ENERGY TECHNOLOGY LIMITED

Specification Approval Sheet

Product Name	Li-ion Battery
Model SPEC	ICR18650C2/4400mAh/3.7V
Company Name	Ropla
Document Number	YKJSXG1209096
Sample Number	
Document Revision	A0

Approved By	Checkup	Make

Customer Confirmation	Signature	Date
	Company Name:	

Specification Modification Records

Modification Time	Descriptions	Issued Date	Approved By
0	New release	2012-9-26	

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1. Scope:

This document is made according to customer parameter requirements, it describes the Product Specification of Chargeable Li-ion Battery produced by Yoku Energy (Zhangzhou) Co., Ltd.

2. Products specified

- 2.1. Name Cylindrical Lithium Ion Rechargeable Cell
- 2.2. Type ICR18650C2-2200mAh

3. Caution:

- 3.1 Please read these specifications carefully before testing or using the cell as improper handling of a Li-ion cell may result in loss of efficiency, heating, ignition, electrolyte leakage or even explosion.
- 3.2 While testing the cell by charging and discharging, please use test-equipment especially designed for Li-ion cell. Do not use ordinary constant current and constant voltage (CC/CV) power supplies. These do not protect the cell from being overcharged and over-discharged, resulting in possible loss of functionality or danger.
- 3.3 When charging and discharging cells or packing them into equipment, reversing the positive and negative terminals will result in overcharging and over-discharging of the cell(s). This could lead to serious loss of efficiency and even explosions.
- 3.4 Do not solder directly on the cell. Do not resolve the cell.
- 3.5 Do not put cell(s) in pockets or bags together with metal products such as necklaces, hairpins, coins, screws, etc. Neither store them together without proper isolation. Do not connect the positive and negative electrode directly with each other through conductive materials. This can result in a short circuit of the cell.
- 3.6 Do not beat, throw or trample the cell, do not put the cell into washing machines or high-pressure containers.
- 3.7 Keep the cell away from heat sources such as fires, heaters, etc. Do not use or store cell(s) at locations where the temperature can exceed 60°C such as in direct sunlight. This may lead to the generation of excessive heat, ignition and loss of efficiency.
- 3.8 Do not get cells wet or throw them into water. When not in use, place the cells in a dry environment at low temperatures.
- 3.9 While during use, testing or storing cells, cells become hot, distribute a smell, change color, deform or show any other abnormalities, please stop using or testing immediately. Attempt to isolate the cell and keep it away from other cells.
- 3.10 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.
- 3.11 Don't charge the cells and keep them in a charged state for a long time. (Display units should dismantle the battery)

4. Basic characteristics

4.1 Single cell parameters

4.1 Capacity	Nominal Capacity:2200mAh Minimum Capacity:2150mAh(0.2C Discharge)
4.2 Nominal Voltage	3.7V
4.3 Internal Impedance	≤70mΩ
4.4 Discharge Cut-off Voltage	2.75V
4.5 Max Charge Voltage	4.2±0.05V
4.6 Standard Charge Current	1.1A
4.7 Max Charge Current	2.2A
4.8 Standard Discharge Current	1.1A
4.9 Max Continue Discharge Current	2.2A
4.10 Max Pulse Discharge Current	4.4A
4.11 Weight	45.5±1g
4.12 Max. Dimension	Diameter(Ø): 18.3mm Height (H): 65.0mm
4.13 Operating Temperature	Charge: 0 ~ 45°C Discharge: -10 ~ 45°C
4.14 Storage Temperature	-5 ~ 35°C

4.2 Parameters of pile

No.	Items	Spec.	Notes
1	Rated Capacity	4400mAh(2P) Min:4300mAh	@ 0.2CmA discharging
2	Nominal Voltage	3.7V	The average value of voltage during the discharge period (with standard charge and discharge).
3	Impedance	≤150mΩ	measure two sides of the drawing line after assembling. (Red B+, Black B-)

5. Protective Circuit Module

5.1 The cell/battery pack shall contain a PCM that can protect the cell/battery pack properly.

The cell/ battery shall be provided with a PCM to protect the cell/ battery properly.

PCM shall have the following functions to ensure safety and prevent deterioration of cell performance:

- (1) overcharging prevention
- (2) over-discharging prevention
- (3) over current prevention.

5.2 Overcharging Protection

Overcharging prevention stops charging if any cell of the battery pack reaches 4.25V.

5.3 Over-discharging protection

The Over-discharging protection monitors the voltage of every cell in the pack and works to avoid a drop in the cell voltage to 2.8V or less.

6. Standard conditions for test

Unless specifically stated otherwise, tests must be done within one month of delivery and the number of charging-recharging cycles is fewer than 5. The following is test conditions:

Test conditions:

Ambient Temperature: $25^{\circ}\text{C} \pm 1^{\circ}\text{C}$ Ambient Humidity: 45~75%RH

a) Standard Charge	Constant Current and Constant Voltage (CC/CV) Current = 1.1A Final charge voltage = 4.2V Final charge Current = 0.044A
b) Standard Discharge	Constant Current (CC) Current = 1.1A End Voltage = 3.0V

7. Appearance

All surfaces must be clean, without damages, leakage and corrosion. Each product will have a product label identifying the model.

8. Characteristics

8.1 Electrical Performances

Items	Test procedure	Requirements
8.1.1 Nomina Voltage	The average value of the working voltage during the whole discharge process.	3.7V
8.1.2 Discharge Performance	The discharge capacity of the cell, measured with 1C down to 2.75V within 1 hour after a completed charge.	$\geq 51\text{min}$
8.1.3 Capacity Retention	After 28 days storage at $25 \pm 1^{\circ}\text{C}$, after having been completely charged and discharged at 0.2C, discharge to 2.75V, the residual capacity is above 90%.	Capacity $\geq 90\%$
8.1.4 Cycle Life	After 300 cycles at 100% DOD. Charge and discharge at 0.5C, the residual discharge capacity is above 75% of nominal capacity.	≥ 300 cycles
8.1.5 Storage	(Within 3 months after manufactured) The cells is charged with 0.5C to 40-50% capacity and stored at ambient temperature $25 \pm 1^{\circ}\text{C}$, $65 \pm 20\% \text{RH}$ for 12 months. After the 12months storage period the cell is fully harged and discharged to 2.75V with 0.2C	Discharge time $\geq 4\text{h}$

8.2 Safety Performances

Items	Test procedure	Requirements
8.2.1 Short Circuit	The cell is to be short-circuited by connecting the positive and negative terminals of the cell directly with copper wire with a resistance of less than 0.05Ω.	No fire, No explosion.
8.2.2 Impact Test	The cell, placed on hard surface, receives impact from a hammer of 10Kg in free fall from 1m height.	No fire, No explosion.
8.2.3 Overcharge	After charge the cell as per standard charge mode, CC/CV charge (CC 3C and CV 10V), watch the temperature change during testing process, when the cell temperature drops to 10°C lower than the peak, end the experiment.	No fire, No explosion.
8.2.4 Thermal shock	After standard charging, heat the cell to 120±2°C at a rate of 5±2°C/min and keep it at this temperature during 10minutes.	No fire, No explosion.

8.3 Environmental tests

Items	Test procedure	Requirements
8.3.5 High temperature performance	The fully charged cell is put at 55±2°C for 2 hours and then discharged to 2.75V at 0.5C.	Capacity ≥90%
8.3.6 Low temperature performance	The fully charged cell is placed during 2 hours at -10±2 °C and then discharge to 2.75V at 0.1C.	Capacity ≥55%
8.3.7 Anti-vibration	The fully charged cell is fixed on a platform and vibrated in the X , Y and Z directions for 30minutes at the speed 10ct/min Frequency: 10~30Hz, Vibration amplitude 0.38mm, Frequency: 30~55Hz, Vibration amplitude 0.19mm.	No fire, No explosion.
8.3.8 Drop Test	The fully charged cell is dropped from a height of 1m onto a 18~20mm hard board in X, Y and Z directions once for all axis. Then the cell is discharged at 1.0C to 2.75V followed by 3 or more cycles with the standard charge rate and a discharge at 1.0C.	No fire, No explosion.

9.0 thers

9.1 Package

when packing. Product name、 model 、 nominal voltage、 quantity、 gross weight、 date of production and corresponding impedance、 capacity should be marked outside the package box.

9.2 Transport

The cell should be packed in box for transport,avoid acute vibration,shock or extrusion,exposed to the sun and rain during transport.We can use car,train,ship and plane for transport.

9.3 Storage

The cell should be placed in a clean and dry room where the temperature is specified in 4.14 and the relative humidity is less than 75%,avoid contacting with corrosive substances,away from fire and heat resource.Besides, keep the cell in a half-charged state to prevent self-discharge

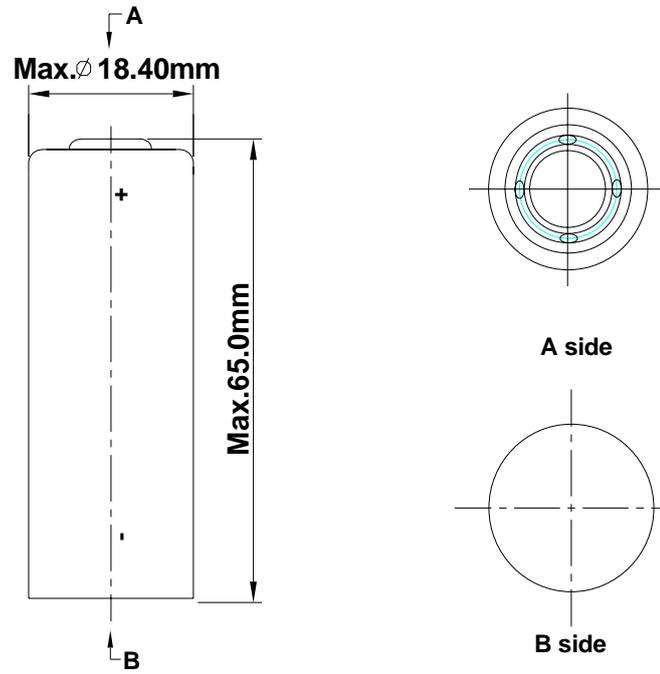
9.4 Repair period is 12 months after leaving the factory.

9.5 we will take no responsibility for any accident when the cell is used under conditions outside of this specification

9.6 Any issues not covered in this specification should be discussed between the customer and YOKU.

10. Drawing

10.1 Cell Drawing (Not in scale)



10.2 Assembly diagram (not in scale)

