



YOKU ENERGY TECHNOLOGY LIMITED

## Specification Approval Sheet

Product Name	Li-ion Battery
Model SPEC	ICR18650C2/4400mAh/11.1V
Company Name	Ropla
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Customer Confirmation	Signature	Date
	Company Name:	
	Company Stamp:	



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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 (Zhang zhou) Co., Ltd.

The temporary specification is only for the customer's reference, not regarded as the basis of the IQC and mutual confession.

### 2. Products specified

2.1 Name Cylindrical Lithium Ion Rechargeable Cell

2.2 Type ICR18650C2-2200mAh

### 3. Basic characteristics

No.	Items		Unit	Spec.	Notes
1	Nominal Voltage		V	11.1	The average value of voltage during the discharge period (with standard charge and discharge).
2	Nominal Capacity		Ah	Typ:4400mAh Min:4300mAh	@ 0.2CmA discharging
3	Standard Charge			CC/CV	Current =0.5A Final charge voltage = 12.6V Final charge Current = 0.01C
4	MAX charging voltage		V	12.6	
5	Discharge Cut-off Voltage		V	9.5	
6	Standard Charge Current		A	2.2	
7	Max Continue Discharge Current		A	4.4	
8	Weight		g	270	
9	Impedance		mΩ	≤120	measure two sides of the drawing line after assembling. (Red B+ , Black B-)
10	Assemblage Dimension		mm	198× 37.5× 18.5	(L × W × T)
11	Operating Temperature	Discharge	℃	-10℃~ +45℃	
		charge	℃	0℃~ +45℃	
12	Storage Temperature			-5 ℃~+35℃	
13	Ambient Humidity			45~75%RH	

**4. Storage**

The cells storage with 40%--50% charged in the RT (room temperature), the cell should be charge once per 6 months to avoid the cell over discharge. The customer should charge the cell for 1 hour by 0.5C for long term storage.

**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 3.0V or less.

**6. 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±1℃; Relative humidity: 45~75%

**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 Nominal Capacity	Nominal Capacity refer to the capacity of 0.2C discharge to 3.0V cut-off voltage, after charging with standard method and storing it for 0.5 hour.	2.2Ah
8.1.2 Discharge Performance	The discharge capacity of the cell, measured with 1.0C down to 3.0V within 1 hour after a completed charge.	≥51min
8.1.3 Capacity Retention	After completely charge at 0.5C, store it for 28 days at 25±1℃, and then discharge at 0.2C to 3.0V, the residual capacity is above 90%.	Capacity ≥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
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### 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
8.3.1 High temperature performance	The fully charged cell is put at 55±2°C for 2 hours and then discharged to 3.0V at 0.5C.	Capacity ≥90%
8.3.2 Low temperature performance	The fully charged cell is placed during 2 hours at -10±2°C and then discharge to 3.0V at 0.1C.	Capacity ≥55%
8.3.3 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.
8.3.4 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 2.0V followed by 3 or more cycles with the standard charge rate and a discharge at 1.0C.	No fire, No explosion.

## 9. Caution:

- 9.1 Please read these specifications carefully before testing or using the cell as improper handling of a Li-ion cell may result in lose of efficiency, heating, ignition, electrolyte leakage or even explosion.

- 9.2 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.
- 9.3 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.
- 9.4 Do not solder directly on the cell. Do not resolve the cell.
- 9.5 Do not put cell(s) in pockets or bags together with metal products such as necklaces, hairpins, coins, screws, etc. Neither stores 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.
- 9.6 Do not beat, throw or trample the cell, do not put the cell into washing machines or high-pressure containers.
- 9.7 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 such as in direct sunlight. This may lead to the generation of excessive heat, ignition and loss of efficiency.
- 9.8 Do not get cells wet or throw them into water. When not in use, place the cells in a dry environment at low temperatures.
- 9.9 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.
- 9.10 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.
- 9.11 After full charge the battery, if the discharge time is less than 60% of normal discharge time, please immediately stop using and change it or contact with the customer service personnel to repair.
- 9.12 Don't charge the cells and keep them in a charged state for a long time. ( Display units should dismantle the battery) .

## **10. Others**

### **10.1 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.

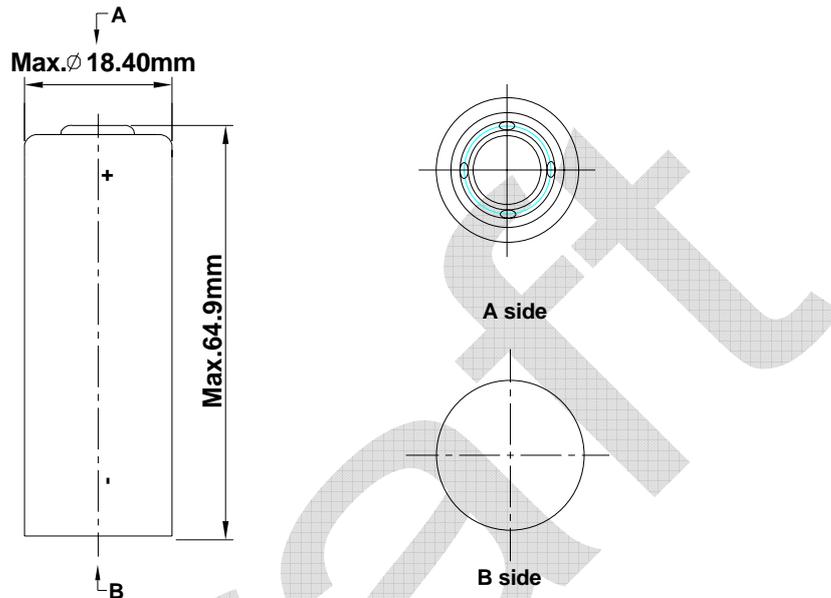
### **10.2 Transport**

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.

- 10.3 Repair period is 12 months after leaving the factory.
- 10.4 YOKU will take no responsibility for any accident when the cell is used under conditions outside of this specification
- 10.5 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)

