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## ISR21700 3.6V4000MAH datasheet

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Liaoning Xinchilithium Technology Co., Ltd

Address: No.10, North 2nd Road, Dalinghe Industrial Park, Linghai City, Jinzhou, Liaoning, China

QINHUANGDAO XINCHI PHOTOELECTRICITY TECHNOLOGY CO., LTD.

Address: At The 275-KM Spot To No.102 National Road South, Funing County, Qinhuangdao City, Hebei, China

### 1. Application Scope

This product specification specifies characteristics of cylindrical lithium rechargeable battery manufactured by Qinhuangdao Xinchilithium Technology Co., LTD

### 2. Definition

#### 2.1 Rated capacity

At room temperature  $25^{\circ}\text{C} \pm 2^{\circ}\text{C}$ , It means the capacity value with a 5-hour rate discharging to end voltage 2.5 V, the unit is mAh.

#### 2.2 Standard charge method

Under  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , charge the cell to 4.2V with constant current of 0.5C, and then, charge it continuously with constant voltage of 4.2V until the charge current is less than 0.02C.

#### 2.3 Standard discharge method

Under  $25 \pm 5^{\circ}\text{C}$ , it can be discharged to 2.5V with constant current of 0.5C.

### 3. Model

3.1 Model: ISR21700-4000mAh

#### 4. Specification

| ITEM   | SPECIFICATION  |
|--|--|
| Normal capacity  | 4000 mAh (0.5C)  |
| Minimum capacity   | 3950 mAh (0.5C)  |
| Normal voltage   | 3.7 V  |
| Charge voltage   | 4.2 ±0.05 V  |
| Discharge end voltage                                      | 2.5 ±0.05 V  |
| Standard charge current                                    | 0.5C   |
| Standard discharge current                                 | 0.5C   |
| Max charge current   | 1C (T>10°C)<br>0.2C (0°C-10°C)                         |
| Max continuous discharge current                           | 3C (T>0°C)<br>1C (-10°C<T≤0°C)<br>0.5C (-20°C<T≤-10°C) |
| Surface charge and discharge batteries maximum temperature | Charge: 0°C-55°C;<br>Discharge: -20°C-60°C             |
| Working Temperature  | Charge: 10°C ~ 45°C<br>Discharge: -20°C ~ 55°C         |
| Recommended Storage temperature                            | 15°C ~ 35°C  |
| Internal resistance  | ≤20 mΩ(AC Impedance, 1000 Hz)                          |
| Cell dimension   | Height : 70.0 mm Max<br>Diameter : 21.0mm Max          |
| Weight   | ≤ 72g  |

#### 5. Technical characteristics

##### 5.1 Cell use conditions

Charge temperature: 10°C ~ 45°C

Discharge Temperature: -20°C ~ 55°C

##### 5.2 Cell testing conditions

All the tests are as follows only if any other is specially stated, :

Temperature : 25°C±5°C

Room temperature : 25°C±2°C

##### 5.3 Electric performance

| NO.   | ITEM                       | CRITERION   | TESTING METHOD   |
|-------|----------------------------|---|--|
| 5.3.1 | Discharge rate performance | A ) Discharge Performance (0.2C)<br>≥100% Rated Capacity<br>B ) Discharge Performance (0.5C)<br>≥97% Rated Capacity | The cell is charged according to standard charge method, and then, it is discharged to 2.5V using 0.2C current; after, the cell is charged according to standard charge method, and then, it is discharged to 2.5V using |

|       |  |  |  |
|-------|--|--|--|
|       |  | <p>C) Discharge Performance (1C) <math>\geq</math> 95% Rated Capacity</p> <p>D) Discharge Performance (2C) <math>\geq</math> 93% Rated Capacity</p> <p>E) Discharge Performance (3C) <math>\geq</math> 90% Rated Capacity</p>  | <p>0.5C current; The cell is charged according to standard charge method, and then, it is discharged to 2.5V using 1.0C current; At the end, the cell is charged according to standard charge method, and then, it is discharged to 2.5V using 2.0C current;</p> <p>The discharge capacities under different current shall be recorded.</p>  |
| 5.3.2 | Cycle life                                 | $\geq$ 800cycle  | The cell is charged to 4.2V using 0.5C current and then store it for 10 min. Then it is discharged to 2.5V using 1C current. Recycle it continuously till the residual capacity is less than 80% of the rated capacity.  |
| 5.3.3 | High-Low temperature discharge performance | <p>Discharge capacity/ initial capacity<math>\times</math>100%</p> <p>A)60°C<math>\geq</math>95% rated capacity</p> <p>B)0°C<math>\geq</math>80% rated capacity</p> <p>C)-10°C<math>\geq</math>70% rated capacity</p> <p>D)-20°C<math>\geq</math>60% rated capacity</p> <p>No obvious outside damage, No leakage, No smoke, No explosion</p> | Test the batteries' initial state and capacity , after standard charging, store it at 60 $\pm$ 2 °C for 3 hours, discharge at 0.2C <sub>5</sub> mA to 2.75V, then make standard charging under room temperature. Then Store it at corresponding constant temperature for 3h under 0 $\pm$ 2 °C/-10 $\pm$ 2 °C/-20 $\pm$ 2 °C in order. Then discharge the cell at 0.2C <sub>5</sub> mA to 2.5V and meanwhile make a capacity record. At last store it at room temperature for 2 hours and observe the cell appearance. |
| 5.3.4 | Storage performance                        | <p>Residual Capacity <math>\geq</math> 90 % Rated Capacity</p> <p>Recovery Capacity <math>\geq</math> 98% Rated Capacity</p> <p>Internal resistance increase rate <math>\leq</math> 30%</p>  | After standard fully charge, make standard discharge. This capacity is recorded as initial discharge current. Then the cell is fully charged according to standard charge method and stored at 25°C for 28 days. After storage, the cell is discharged according to the requirement of standard discharge method. This discharge capacity is named as the Residual capacity. And then charge and discharge the cell by 0.5C. This discharge capacity is recorded as the Recovery capacity.                             |

#### 5.4 Environmental characteristics

| NO.   | ITEM                     | CRITERION                                      | TESTING METHOD  |
|-------|--------------------------|--|---|
| 5.4.1 | Vibration                | No leakage、 No flame、 No fire、 No explosion    | 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 1.52mm. The cell shall be vibrated for 90 minutes per axis of x, y axes.   |
| 5.4.2 | Mechanical shock         | No leakage 、 No flame 、 No fire 、 No explosion | In direction X, Y, and Z intersecting one another at right-angles, apply impacts having a minimum mean acceleration of 75G in the first 3mSec and a peak acceleration that falls between 125G and 175G.   |
| 5.4.3 | Temperature Cycling Test | no leakage, no fire, no explosion              | <p>The fully charged batteries are to be placed in a test chamber and subjected to the following cycles:</p> <p>a) Raising the temperature to 75°C <math>\pm</math>2°C within 30 minutes and maintaining this temperature for 4 hours.</p> <p>b) Reducing the temperature to 20°C <math>\pm</math>2°C within 30 minutes and maintaining this temperature for 2 hours.</p> |

- c) Reducing the temperature to minus 20°C ±2°C (minus 40 ±5°F) within 30 minutes and maintaining this temperature for 4 hours.
- d) Raising the temperature to 20°C±2°C within 30 minutes.
- e) Repeating the sequence for a further 4cycles. f) After the 5th cycle, storing the batteries for 7 days prior to examination.

### 5.5 Safety characteristics

| NO.   | ITEM                 | CRITERION  | TESTING METHOD   |
|-------|----------------------|--|--|
| 5.5.1 | Overcharge test      | No flame、 No fire、 No explode  | The cell is discharged following the standard discharge method. Apply a 10V power supply and a 3C charge current for 1.5hrs.   |
| 5.5.2 | 130 °C hot oven test | When the temperature of the cell is 130°C. Cell must not fire or explode in 30 minutes | The cell is charged following the standard charge method. After charging 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 reach 130 °C , the cell is maintained in the 130 °C oven for a maximum of 30 minutes or until a fire or explosion is obtained.                            |
| 5.5.3 | Over discharge test  | No flame、 No fire、 No explode  | Cell shall first be charged according to standard charge method, 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.  |
| 5.5.4 | Crush test           | No fire、 No explode  | After charging a cell following the standard charge method, 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. |
| 5.5.5 | Short circuit test   | No fire、 No explode  | The battery to be fully charged with standard charging condition, and short the positive and negative terminals with wire resistance=100mΩ .Tests are to be conducted at 23°C ±3°C and at 55°C ±5°C.   |
| 5.5.6 | Impact test          | No flame、 No fire、 No explode  | Cell shall first be charged according to standard charge method , then the battery cell was placed on a flat surface so that the longitudinal axis of the battery cell shall be parallel with it.<br>A 7.9mm diameter bar is to be placed across the center of the sample.<br>A 9.1kg weight is to be dropped from a height of 61cm on the sample.   |

## 6. Characteristics Curves

### 7. Storage And Others

#### 7.1 Long Time Storage

If the battery should be stored under -20°C~ 45°C. If it is stored for a long time (exceed three months), the battery should be stored under temperature of 23°C ± 3°C and humidity of 65% ± 20% RH at dr and cool place. The battery should be charged and discharged each three months. The battery's storage voltage should be 3.0~3.25V and the battery which is less than 3.0V should be charged to 3.3V with 300mA~2200mA current every three month..

#### 7.2 Others

Any matters that this specification does not cover should be consulted between the customer and XINCHI.

## 8. Notice In Using Battery

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

Batteries shall be charged shall be done by voltage less than that specified in the Product Specification (4.20V/cell). Charging beyond 4.25V, which is the absolute maximum voltage, must be strictly prohibited. The charger and protection circuit of battery pack shall be designed to comply with this condition. It is very dangerous that charging with higher voltage than the maximum value and may cause damage to the cell electrical, mechanical safety performance and could lead to heat generation or leakage.

- Batteries shall be charged at 0°C-45°C environment temperature specified in the Product Specification. In case of environment temperature is lower than 10°C, batteries shall be charged with a little current (no larger than 0.5C). If the environment temperature is lower than 0°C, charge shall be prohibited.

## 9. Warning And Matters Need Attention In Using Battery.

Please pay attention to followings in case of battery will have leakage, heat or explosion.

### Warning!

- Do not immerse the battery in water or seawater, and keep the battery in a cool dry surrounding if it stands by.
- Does not use or leave the battery near a heat source as fire or heater
- Use the battery charger specifically for that purpose when recharging.
- Do not reverse the position and negative terminals.
- Do not connect the battery electrodes to an electrical outlet.
- Do not discard the battery in fire or a heater.
- Do not short-circuit the battery by directly connecting the positive and negative terminals with metal objects.
- Do not transport or store the battery together with metal objects such as hairpins, necklaces, etc.
- Do not strike, trample or throw the battery.
- Do not directly solder the battery and pierce the battery with a nail or other sharp objects.

### Becareful!

- Do not use or leave the battery at high temperature (for example, at strong direct sunlight or in a vehicle in extremely hot weather). Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased
- Do not use the battery in a location where static electricity and magnetic field is great, otherwise, the safety devices may be damaged, causing hidden trouble of safety.
- If the battery leaks and the electrolyte gets into the eyes, do not rub the eyes, instead, rinse the eyes with clean water, and immediately seek medical attention. Otherwise, it may injure eyes.
- If the battery gives off strange odor, generates heat, becomes discolored or deformed, or in any way appear abnormal during use, recharging or storage, immediately remove it from the device or battery charger and stop using it.
- In case the battery terminals are dirty, clean the terminals with a dry cloth before use. Otherwise poor performance may occur due to the poor connection with the instrument.
- Be aware of discarded batteries may cause fire or explosion; tape the battery terminals to insulate them

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