

## 1、SCOPE

This specification governs the performance of the following ORN lithium - ion rechargeable Battery

ORN Model : 18650(2000mAh)

Size: Diameter: 18.00±0.20 mm

Height: 64.70±0.50 mm

## 2、RATINGS

Item		Standard
Nominal capacity		2000 mAh@0.2C
Minimum capacity		1950 mAh@0.2C
Nominal voltage		3.70 V
Charge ending voltage		4.20 V
Discharge ending voltage		2.75V
Max charge current		2000mA
Max discharge current		4000mA
Typical weight		48.5±0.5 g
Operating temperature range	Charge	0 °C ~ 45 °C
	Discharge	-20 °C ~ 60 °C

## 3、PERFORMANCE

### 3.1 Testing conditions

Unless otherwise specified, all tests stated according to following:

Temperature: 23±2 °C

### 3.2 Standard charge method

It can be charged to 4.2V with constant current of 0.5C, and then, charged continuously with constant voltage of 4.2V until the charged current is 0.01C.

### 3.3 Standard discharge method

It can be discharged to the voltage of 2.75 V with constant current of 0.2C.

### 3.4 Electrical performance

Item	standard	Test condition
3.4.1 Internal resistance	≤70m Ω	AC Impedance,1KHz.
3.4.2 0.2C discharge performance	Discharge time ≥300 min	The battery is charged according to standard charge method, and then, it is discharged to 2.75V using 0.2C current.
3.4.3 0.5C discharge performance	Discharge time ≥120 min	The battery is charged according to standard charge method, and then, it is discharged to 2.75V using 0.5C current.
3.4.4 1.0C discharge performance	Discharge time ≥42 min	The battery is charged according to standard charge method, and then, it is discharged to 2.75V using 1.0C current.
3.4.5 Cycle life	Cycle number ≥300 cycles	The battery is charged by 0.5C, and then it is discharged by 0.5C. The rest time after discharge is 0.5~1h in each cycle, until the discharge capacity of less than 60% C mAh, then consider the cycle to terminate.

ORN reserves the right to alter or amend the product specification without prior notice

Item	Standard	Test condition
3.4.6 Charge(Capacity) retention	Capacity retention rate $\geq 80\%$	The battery is fully charged according to standard charge method and stored at 25°C for 28 days. After storage, the battery is discharged according to the requirement of standard discharge method.
3.4.7 High temperature performance	Capacity retention rate $\geq 90\%$	The battery shall be charged following the standard charge method. And then the battery shall be stored for 2 hours at $55 \pm 2^\circ\text{C}$ followed by a discharge at 0.5C to 2.75V at this temperature.
3.4.8 Low temperature performance	Capacity retention rate $\geq 40\%$	The battery shall be charged following the standard charge method. And then the battery shall be stored for 3 hours at $-10 \pm 2^\circ\text{C}$ followed by a discharge at 0.2C to 2.75V at this temperature.

### 3.5 Safety characteristics

Item	Standard	Test condition
3.5.1 Vibration test	There shall be no electrolyte leakage	After standard fully charge, battery 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.The battery shall be vibrated in each direction along axis of the cylinder and the vertical directions of axis of the cylinder.
3.5.2 Heating test	No fire 、 No explode	The battery is charged following the standard charge method. After charging the battery 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 for 30 minutes.
3.5.3 Overcharge test	No leakage 、 No flame 、 No fire 、 No explode	The battery is discharged following the standard discharge method. Apply a 10V power supply and a 3C charge current for 1 h.
3.5.4 Nail penetration test	No fire 、 No explode	Battery shall first be charged according to standard charge method, and then battery is to be penetrated through with a nail 3mm in diameter at a speed of 40mm/sec in vertical axis across the center of electrode surface.

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Item	Standard	Test condition
3.5.5 Short-circuit test	No fire 、 No explode	Battery shall first be charged according to standard charge method, and then battery is to be short-circuited by connecting the positive and negative terminals of the battery with copper wire having a maximum resistance load of 50 m Ω . Monitor the battery temperature while testing. The battery is continuously discharged until the battery case temperature has returned to be 10 °C less than peak temperature.
3.5.6 Impact test	No flame 、 No fire 、 No explode	Battery shall first be charged according to standard charge method, then the battery was placed on a flat surface so that the longitudinal axis of the battery shall be parallel with it. A 10kg weight is to be dropped from a height of 1000mm on the sample.

#### 4、 EXTERNAL APPEARANCE

The battery shall be free from cracks, scars, breakage, rust, discoloration, leakage or deformation.

#### 5、 Cautions in handling the battery

##### 5.1 Charging Notices

The lithium-ion rechargeable battery must be charged with a charge ending voltage and charge current.

Do not reverse the positive and negative terminals.

Charge only with charge exclusively designed for this battery.

##### 5.2 Discharging Notices

Avoid discharging below 2.75V.

Discharge within a designated current.

Use only as a power source for a designated device.

##### 5.3 Operation Notices

When charging, use a battery charger specifically for that purpose.

The battery must not be applied for other equipment.

Do not beat or throw into the fire.

Do not use and leave the battery near a heat source such as fire or heater.

Do not strike, throw or trample the battery.

Do not connect the positive and negative terminal directly with metal objects.

Do not immerse the battery in water.

Do not connect the battery to an electrical outlet directly.

## 5.4 Protect circuits

The battery must possess three types of protective circuits follows:

### 5.5.1 Over-charging protective circuit

The over-charging protective circuit shall operate at 4.25 to 4.35V and cut off the charging circuit.

### 5.5.2 Over-discharging protective circuit

The over-discharging protective circuit shall operate at 2.50to 2.75V.

### 5.5.3 Over -current protective circuit

The protective circuit must operate at the working current over 3 C current and cut off the circuit.

## 6、 Storage

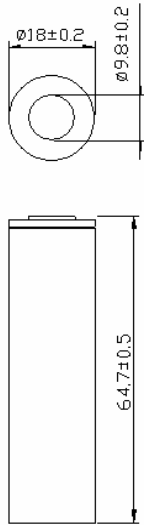
Shelf life: 1 year

Store under dry and ventilation environment.

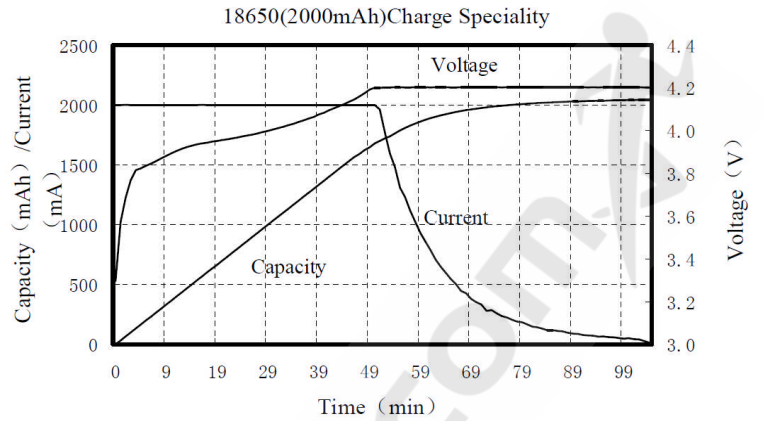
Storage temperature:	1 month	-20°C ~	45°C
	6 months	-20°C ~	35°C
	1 year	-20°C ~	25°C

### Battery Charge-discharge Curve

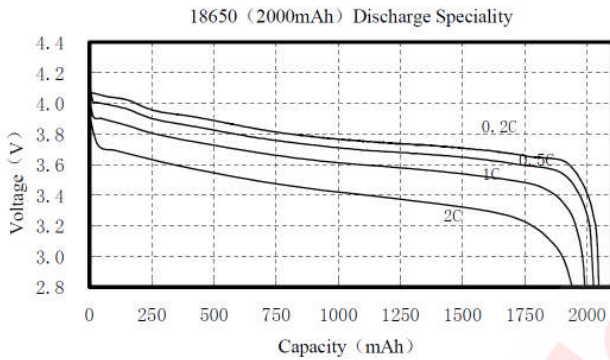
Dimensions(without Tube)



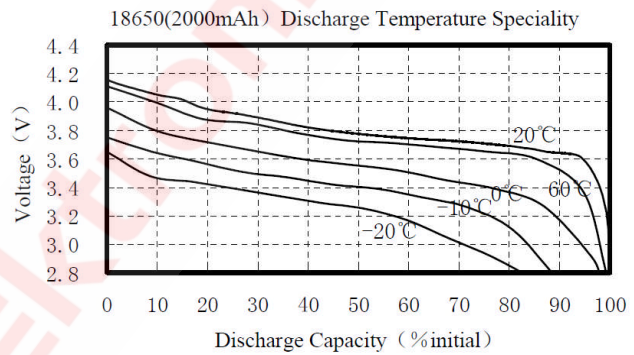
units: mm



Charge: CC/CV 1.0C, 4.2V, 20mA cut off at RT



Charge: CC/CV 1.0C, 4.2V, 20mA cut off at RT  
Discharge: CC 2.75V cut off at RT



Charge: Standard at RT  
Discharge: CC 0.2C 2.75V cut off

Note:  
CC represent constant current  
CV represent constant voltage  
RT represent room temperature