

**ULTRA MAX<sup>®</sup>**

# **SPECIFICATION**

for

**Lithium Ion ( Cylindrical ) Rechargeable Battery**

**PART NO. : 18650UMX-3000**

## **ULTRA MAX BATTERIES**

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## 1. SCOPE & APPLICATION

This specification applies to the lithium ion rechargeable battery ICR 18650-30 in the form of single cell.

## 2. TYPE & MODEL

### 2.1 Type

Lithium-ion Rechargeable Battery

### Lithium Ion ( Cylindrical ) Rechargeable Battery

Single cell is ICR18650-30.

Insulation PVC tube and protection PCB are assembled upon customer's request.

## 3. SPECIFICATION

### 3.1 Cell Specification

Item	Specification	
	Standard	Test Conditions
3.1.1 Nominal Capacity	3000 mAh	Discharge current 0.2C cut off voltage 2.75 V
3.1.2 Nominal Voltage	3.70 V	
3.1.3 Discharge Cut Off Voltage	2.75 V	
3.1.4 Charge Current	0.5 C ( 1500 mA )	
3.1.5 Charge Voltage	4.20 V ( Max. 4.25 V )	
3.1.6 Charge Time	5 hours	Charge current 0.5C maximum
3.1.7 Charge Method	CC-CV ( Constant Current / Constant Voltage )	
3.1.8 Maximum Continuous Charge Current	1C ( 3000 mA )	Cell Temp. 25°C or less
3.1.9 Maximum Continuous Discharge Current	1C ( 3000 mA )	Cell Temp. 25°C or less
3.1.10 Bare Cell Weight	41.0 ± 0.5 g	Cell Only
3.1.11 Operating Temperature Range	Charge	0°C ~ + 45°C
	Discharge	- 20°C ~ + 60°C
3.1.12 Storage Temp. Range	0°C ~ + 45°C	
3.1.13 Storage Humidity Range	40 ~ 80%	

### 3.2 Accessory Specification

#### 3.2.1 Protection PCB ( double MOS version )

Location				Protection IC ( U1 )	MOSFET ( U2 )	PCB Board
	R1	R2	C1			
SPEC	SMD 470Ω±5%	SMD 2KΩ±5%	SMD 0.1μF	S8261-G2J	SME8205	φ15.8*0.6mm



## 4. DIMENSION & APPEARANCE

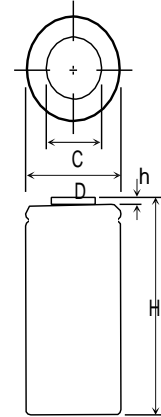
### 4.1 Assemble Dimension

Diameter (D) :  $18.5^{+0.0}_{-0.5}$  mm  
Height (H) :  $67.3^{+0.0}_{-0.5}$  mm

### Lithium Ion ( Cylindrical ) Rechargeable Battery

### 4.2 Appearance

There shall be no any defects such as remarkable scratches, leakage or deformation.



## 5. PERFORMANCE

### 5.1 Standard Test Condition

Test shall be carried out at  $23 \pm 2$  °C temperature with 25 % ~ 85 % relative humidity, unless otherwise specified.

### 5.2 Testing Instruments & Apparatus

#### 5.2.1 Dimension Measuring Instrument

Dimension shall be measured by instruments with equal or more precision scale of 0.01 mm specified by JIS B 7502 (out micro-meter) or JIS B 7503 ( dial gauge ).

#### 5.2.2 Voltmeter and Ammeter

Voltmeters and ammeters shall be equal or more precision instruments specified by JIS C 1102 ( Indication Electric Instrument level 0.5 ).

#### 5.2.3 Internal Resistance Gauge

An internal resistance shall be measured by a sine wave alternate current process ( 1 KHz ).

### 5.3 Rated Charge Condition

A maximum charging current of 0.5C and limited charging voltage of maximum 4.2 V for 5 hours.

### 5.4 Rated Discharge Condition

A constant current of 0.5C down to a 2.75 V cut-off at  $23 \pm 2$  °C.

## 5.5 Electrical Characteristic

No.	Items	Standard	Conditions	Test Methods
( 1 )	Open Circuit Voltage	3.60 V Minimum 60 mΩ Maximum		Measure the open circuit voltage at $23 \pm 2$ °C in the shipment state ( 50% discharge ).
( 2 )	Discharge Capacity	> 300 min discharge	0.2C Discharge	After charging is completed, the cell can be discharged at 0.2C for no less than 300 minutes until the voltage reaches 2.75 V.
( 3 )	Discharge Capacity	> 115 min discharge	0.5C Discharge	After charging is completed, the cell can be discharged at 0.5C for no less than 115 minutes until the voltage reaches 2.75 V.
( 4 )	High Rate Discharge Capacity	> 54 min discharge	1C Discharge	After charging is completed, the cell can be discharged at 1C for no less than 54 minutes until the voltage reaches 2.75 V.
( 5 )	Endurance	> 45 min discharge	After 300 cycle 1C Discharge	After completing 300 cycles by using 1C charge and discharge, the cell can be measured for no less than 45 minutes by using 1C discharge until the voltage reaches 2.75 V.
	In Cycle	> 34 min discharge	After 500 cycle 1C Discharge	After completing 500 cycles by using 1C charge and discharge, the cell can be measured for no less than 34 minutes by using 1C discharge until the voltage reaches 2.75 V.
ical ) Re	Discharge Capacity at - 20 °C	> 150 min discharge	0.2C Discharge at - 20 °C	After completed charging, place the cell in a room temperature of - 20°C for 1 hour. The cell can be discharged at 0.2C for no less than 150 minutes until the voltage reaches 2.75 V.
( 7 )	Discharge Capacity at - 55 °C	> 51 min discharge	1C Discharge at $55 \pm 2$ °C	After completed charging, placed the cell in a room temperature of $55 \pm 2$ °C for 1 hour. The cell can be discharged at 1C for no less than 51 minutes until the voltage reaches 2.75 V.
( 8 )	Self-Discharge Performance	> 255 min discharge	0.2C Discharge at 20 °C for 28 days	After completed charging, place the cell in a room temperature of 20°C for 28 days. After taking the cell out of a chamber, the cell can be discharged at 1C for no less than 255 minutes until the voltage reaches 2.75V.
( 9 )	Charge Recovery ( Capacity Recovery )	> 270 min discharge	Stored at 20 °C for 28 days, recharge at 0.2C	After completed charging, place the cell in a room temperature of 20°C for 28 days; recharge the battery into full capacity again, then discharge the cell using 0.2C until the voltage reaches 2.75 V. The duration report shows the cell can be discharged for no less than 270 minutes.
( 10 )	Capacity Recovery After Long Term Storage	> 210 min discharge	Stored at 40 °C for 90 days, recharge at 0.2C	The cell is taken out from a stored room temperature of 40°C for 90 days after completely discharged and place in a normal room condition for 1 hour. Recharge the cell again and then discharge at 0.2C until the voltage reaches 2.75 V. The duration report shows the cell can be discharged for no less than 210 minutes.

## 5.6 Mechanical Characteristics

No.	Items	Standard	Test Methods
( 1 )	Free Fall	No failure of appearance and more than 276 min of continue discharge	Drop the battery from a height of 1 m onto an oak board ; repeated 4 times of the examination. No visually damaged was observed. The cell can be charge and discharge at 0.2C for no less than 276 minutes.

## 5.7 Safety Characteristics

No.	Items	Standard	Conditions	Test Methods
( 1 )	Terminal Short-Circuit	No explosion no fire and no smoke	0.1Ω short-circuit for 1 hour	(+) and (-) terminals are connected with connector of around 0.1Ω after the battery is completely charged.
( 2 )	Over Voltage Charge	No explosion no fire and no smoke	7.2 V 2C for 8 hours	The cell is charged at 2C of a constant current and 7.2 V of a constant voltage for 8 hours after the battery is completely charged ( including PCB ).
( 3 )	Constant Resistance Over Discharge	No explosion no fire and no smoke	30 Ω for 24 hours	(+) and (-) terminals are connected with a soldering after the cell is completely discharged.
( 4 )	High Temperature Exposure	No explosion no fire and no smoke	100 °C for 5 hours	The cell being tested is stored in a chamber of 100 °C for 5 hours after the cell is completely charged.
( 5 )	Over Voltage Forced Discharge	No explosion no fire and no smoke	5.0 V for 2 hours	The cell is reversibly charged at a constant current of 2C and a constant voltage of 5.0 V for 2 hours after the cell is completely charged.

## 6. SAFETY CONDITIONS

The most possible danger would be due to abuse use by user or failure of the protection circuit. Abuse uses may cause a sudden rise of internal pressure which will result in explosion of the cell. The safety vent is built in the cell to reduce or prevent the damage due to explosion of the cell.

## 7. CELL CONDITION AT SHIPMENT

About 20% to 30% discharged.

## 8. HANDLING INSTRUCTIONS

### 8.1 Temperature Range

- ( 1 ) Charging : 0 °C ~ 45 °C
- ( 2 ) Discharge : - 20 °C ~ 60 °C
- ( 3 ) Storage : 0 °C ~ 45 °C

### 8.2 Charging

- ( 1 ) The lithium-ion rechargeable battery must be charged with a maximum limit of voltage and current.
- ( 2 ) Maximum limit of voltage : 4.25 V
- ( 3 ) Maximum charging current : 3000 mA
- ( 4 ) Maximum charging temperature : 45 °C
- ( 5 ) Must be completely disconnected from charger at temperature over 45 °C

## 8.3 Discharging

- ( 1 ) Maximum discharging current : 3000mA
- ( 2 ) Do not discharge below 2.40 V
- ( 3 ) Do not discharge at temperature over 60°C

## 8.4 Operation

The battery must not be connected with the charger not exclusively designed for this battery.  
The battery must not be applied for other equipments without approved protection circuit.

## Lithium Ion ( Cylindrical ) Rechargeable Battery

The battery must possess three types of protective circuits as follows :

### 8.5.1 Over-Charging Protective Circuit

The over-charging protective circuit shall operate at 4.25 volts, lower voltage is desirable.

### 8.5.2 Over-Discharging Protective Circuit

The over-discharging protective circuit shall operate at 2.4 volts, then the discharge current must decrease to less than 10 micro amperes.

### 8.5.3 Excessive Current Protective Circuit

The protective circuit must operate at charging 1.2C current or discharging at over 1.5C current.

## 9. APPLICATION PRECAUTIONS

### 9.1 Cautions

- ( 1 ) Do not heat or throw into the fire.
- ( 2 ) Do not disassemble the battery
- ( 3 ) Do not set up or leave in high temperature ( 60 °C or more ) in device.
- ( 4 ) Do not short positive(+) and negative(-) terminal with a lead.
- ( 5 ) Do not immerse in the water.
- ( 6 ) Do not give a hard shock or drop.
- ( 7 ) Do not solder lead lines to the battery in direct.

### 9.2 Charging

- ( 1 ) Charge within the limits of 0 °C to + 45 °C temperature.
- ( 2 ) Do not charge reversely.
- ( 3 ) Charge only with charger exclusively designed for this battery.

### 9.3 Discharging

- ( 1 ) Discharge with the limits of - 20 °C to + 60 °C temperature.
- ( 2 ) Do not discharge below 2.4 V.
- ( 3 ) Discharge within a designated current.
- ( 4 ) Use only as a power source for a designated device.

### 9.4 Storage

- ( 1 ) Discharge completely for the long-term storage.
- ( 2 ) Store in dry and low temperature area.
- ( 3 ) Do not store in a over 45 °C high temperature area.