

Product Specification

Model: Lithium ion Cylindrical -1S2P



1S2P SAM 18650 6.0Ah
Lithium ion Cylindrical Battery

Amendment Record

Revision	Description	Date	Approved by
A.1	Initial Release	7-27-2015	Kevin Oh

191 Covington Drive, Bloomingdale, IL 60108
Phone: 630-295-6800 Fax: 630-295-6801
Toll Free: 877-469-4255

A. 1

1. Scope

This product specification applies to rechargeable lithium ion battery supplied by Zeus Battery Products.

2. Nominal Specifications

No.	Item	Parameter	Remark
1	Nominal Capacity	6000mAh	At standard discharge (0.2C)
2	Minimum Capacity	5750mAh	
3	Internal Impedance	≤180mΩ	
4	Max. continuous charging current	3000mA (1C)	
5	Max. continuous discharge current	3000mA (1C)	
6	Nominal Voltage	3.78V	
7	Charge Voltage	4.35V	
8	Discharge cut-off Voltage	2.75V	
9	Charge mode	CC/CV	
10	Operating Temperature	Discharge: -20 ~ 60°C Charge: 0 ~ 45°C	
11	Storage Temperature	-20~45°C	
12	Cycle Life	≥300	At standard charge/discharge
13	Pack configuration	2S1P	
14	Weight	Approx. 94g	
15	Pack Dimension	70*37.0*19.5mm Max	
16	Cell model	Li-ion 18650-3000mAh	Samsung

3. Testing condition

Temperature: $23\pm 2^{\circ}\text{C}$

Relative Humidity: 45 ~ 75%

Atmospheric pressure: 86 ~ 106kPa

3.1 Measuring Instrument and Equipment requirements

- Voltmeter accuracy should be no less than 1.0 level.
- Current meter accuracy should be no less than 1.0 level.
- Time meter accuracy should be no less than 0.1 level
- The current of Constant Current Power is adjustable and the accuracy should be no more than $\pm 1\%$ during charge/discharge.
- Dimension meter accuracy should be no less than 0.02mm and its maximum range is less than 200mm.

4. Testing methods and Requirements

4.1 Appearance and Structure

Battery pack should not have visible damage on the surface.

4.2 Discharge performance at 0.2C ($20\pm 5^{\circ}\text{C}$)

At $23\pm 2^{\circ}\text{C}$, charge the battery at 0.2C5A until the voltage reaches the charge cut-off voltage, then charge under the constant voltage, until the current is no more than 0.01C5A. After 1 minute, discharge the battery at **0.2C5A** until the voltage reaches the discharge cut-off voltage, and the discharge time is no less than **300** minutes.

4.3 Safety protection

4.3.1 Over-charge protection

At $(23\pm 2)^{\circ}\text{C}$ charge the battery at 0.2C5A until the voltage reaches the charge cut-off voltage, then charge the battery for 7 hours with the power which can supply **2C5A** current and **twice normal voltage**, and then the protection function starts. The battery has no explosion, no fire, no smoke or leakage.

4.3.2 Over-discharge protection

At(23±2°C), discharge the battery with 0.2C5A current until the voltage reaches the discharge cut-off voltage, then discharge through a **60Ω** resistor for 7 hours, and then the protection function starts. The battery has no explosion, no fire, no smoking, and no leakage.

4.3.3 Short circuit protection

At(23±2°C), charge the battery at 0.2C5A until the voltage reaches the charge cut-off voltage, then discharge through a 0.10 Ω resistor for 24 hours, and then the protection function starts, the battery has no explosion, no fire, no smoking, no leakage, and the surface temperature is no more than 150°C.

4.4 Environment Performance

4.4.1 Thermal Test

At 23±2°C, charge the battery at 0.2C5A until the voltage reaches the charge cut-off voltage, and let the battery stay at (55±2°C) for 2 hours then discharge the battery at 0.2C5A until the voltage reaches the discharge cut-off voltage, and the discharge time is no less than 300 minutes, then let the battery stay at (23±2°C) for 2 hours. There is no distortion or explosion.

4.4.2 Low Temperature

At 23±2°C, charge the battery at 0.2C5A until the voltage reaches the charge cut-off voltage, and let the battery stay at (-10±2°C) for 4 hours then discharge the battery at 0.2C5A until the voltage reaches the discharge cut-off voltage, and the discharge time is no less than 180 minutes, then let the battery stay at (23±2°C) for 2 hours. There is no distortion or explosion.

4.4.3 Humidity

At 23±2°C, charge the battery at 0.2C5A until the voltage reaches the charge cut-off voltage, and let the battery stay at (40±2)°C and 95%RH of Humidity Testing Box for 48 hours then take out it and then discharge at 0.2C5A until the voltage reaches the discharge cut-off voltage. The discharge time is no less than 180 minutes, and there is no distortion, no rust, no smoking, and no explosion.

4.4.4 Vibration

At 23±2°C, charge the battery at 0.2C5A until the voltage reaches the charge cut-off voltage, and the battery should be vibrated according to GB/T2423.10-1995 Standard with the specific conditions:

- Vibration direction: X,Y ,Z;
- Frequency sweeping time:10;
- Frequency sweeping speed: 1oct/min;
- Vibration frequency: 10HZ~55HZ movement amplitude 0.35mm

Test the voltage and inspect the appearance. The battery has no distortion, no rust, no smoking or no explosion. The voltage should be more than **7.2V** and no abnormalities during standard charge or discharge mode.

4.4.5 Cycle life

At 23±2°C, Charge the battery at **0.5C5A** until the voltage reaches the charge cut-off voltage, then charge under the constant voltage, until the current is no more than 0.01C5A; Lay aside the battery 0.5h, and then discharge the battery at **0.5C5A** until the voltage reaches the limited bottom voltage, now this is called one cycle. Rest the battery for 0.5h, next cycle should continue. When the discharge capacity is less than **80%** of rated capacity with continuous 3 times, then we think it reaches its cycle life and the cycles is no less than **300** cycles.

5. Battery BOM

No.	Part	Qty	Spec	Supplier
1	Cell	2	ICR18650-30B	Samsung
2	PCM	1	R5478N280CD+UPA1870B*1	Ricoh
3	Lead wires	2	UL1007 24#AWG, Red, Bleck	
4	PVC	1	51mm	

5.4 PCM Parameters

Item	Min	Typ	Max	Unit
Over charge detection voltage	4.40	4.425	4.450	V
Over charge release voltage	4.175	4.225	4.275	V
Over charge protection delay time	0.70	1.0	1.30	S
Over discharge protection detection voltage	2.340	2.400	2.460	V
Over discharge release voltage	2.827	2.900	2.973	V
Over discharge protection detection time	14	20	26	mS
Over current detection current	3	/	6.0	A
Over current protection detection delay time	8.0	12.0	16.0	mS
Short circuit detection	External short/ self resetting			
Short circuit detection delay time	230	300	500	μS
Resistance	0	/	60	mΩ
Current consumption	1.0	3.5	7.0	μA

* Parameters tested at 25°C

6. Pack Dimension

