

S28(B28)Specifications

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产品型号	S28 (B28)
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1. 前言

The technical specifications, test procedures, precautions for the product, and instructions for safe use described in this product specification are all for the S28 lithium ion secondary rechargeable battery provided by Gotion High-Tech Co.,Ltd through transactions. .

2. 说明

2.1 产品：软包动力电池

2.2 电芯型号： S28

3. 电芯尺寸

Thickness:13mm

Width:116mm

Length:355mm(400mm with terminals)

Weight:1.07kg±30g

Positive terminal:Aluminum

Negative terminal:Copper

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4. 电芯结构

The battery core is composed of positive electrode, negative electrode, diaphragm, electrolyte, aluminum plastic film and tabs, etc.

5. 标准

项目		标准		备注	
5.1	Capacity	$\geq 63\text{Ah}$	Ah	1C 放电容量	
5.2	AC IR	≤ 0.59	m Ω	交流 1 kHz 测量	
5.3	DC IR	≤ 0.60	m Ω	10s, 1C, 30% SOC, 25°C, BOL	
5.4	Voltage	3.20	V	电压范围: 2.5-3.65V	
5.5	Weight	1070 \pm 30g	g		
5.6	Charge cut voltage	3.65	V	超过 3.65V 禁止充电	
5.7	Discharge cut current	3.15	A	0.05C	
5.8	Discharge cut voltage	2.5	V		
5.9	Charge time	360	min	0.2C	
		90	min	1C	
5.10	Charge method	Standard charge	CC: 1/3C to 3.65V CV: V, 0.05C cut off		
		Max charge current	CC: 1C to 3.65V CV: 3.65V, 0.05C cut off		
5.11	Discharge method	Standard discharge	discharge: 63A to 2.5V		
		Continue discharge	126A		
		Peak discharge current	189A		
5.12	Cycle life	3500 times \geq 80%		25°C, 1C/1C, 100%DOD	
5.13	Operation temperature	Charge temperature	-20°C ~ -10°C	$\leq 0.11\text{C}$	0.11C 充电至 3.60V, 再 0.04C 充至 3.65V, 电芯表面温度低于 -20°C 时禁止充电
			-10°C ~ 0°C	$\leq 0.2\text{C}$	0.2C 充电至 3.58V, 接着 0.18C 充电至 3.65V, 再 0.04C 充电 3.65V;
			0°C ~ 10°C	$\leq 0.8\text{C}$	0.8C 充电至 3.55V, 再 0.33C 充电至 3.60V, 再 0.18C 充电至 3.62V, 再 0.07C 充电至 3.65V
			10°C ~ 25°C	$\leq 1.0\text{C}$	1C 恒流恒压充电 3.65V, 0.05C 截止电流;
			25°C ~ 45°C	$\leq 2.0\text{C}$	2C 充电至 3.65V;
			45°C ~ 55°C	$\leq 0.8\text{C}$	电芯表面温度高于 55°C 时禁止充电.

5.14	外观	无破裂、 电解液泄露等	
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6. Test conditions

6.1 Standard test conditions

The product test conditions on this specification are: temperature $25\pm 5^{\circ}\text{C}$, humidity 15%~85% RH, 86Kpa~106Kpa atmospheric pressure.

6.2 Test equipment and requirements

6.2.1 Dimension measuring tools

The accuracy of the measuring instrument should be greater than or equal to 0.01mm.

6.2.2 Multimeter

The accuracy of the multimeter for measuring voltage and current should not be less than 0.5, and the internal resistance should not be less than 10 MΩ when measuring voltage.

6.2.3 Internal resistance tester

The measurement principle of the internal resistance tester should be the AC impedance method (1k Hz), and the accuracy should be greater than or equal to 0.01mΩ .

6.2.4 Charge and discharge test cabinet

For the charge and discharge test cabinet, the voltage accuracy should be greater than or equal to 5mV, and the current accuracy should be greater than or equal to 0.1A.

6.3 Standard charging

"Standard charging" means that under the condition of an ambient temperature of $25\pm 2^{\circ}\text{C}$, first charge with a constant current of 1C to 3.65V, and then charge with a constant voltage of 3.65V until the current is less than 0.05C.

7. 电性能

测试项目		测试方法	检验标准		
7.1	Discharge capacity	After the battery cell is charged according to 6.2, put it aside for 10 minutes at an ambient temperature of $25\pm 2^{\circ}\text{C}$, and then discharge to the final voltage according to 1C.	放电容量 $\geq 63\text{Ah}$		
7.2	Rate	After the battery cell is charged according to 6.2, put it aside for 10 minutes at an ambient temperature of $25\pm 2^{\circ}\text{C}$, and then discharge it to the final voltage according to the different currents in the table on the right.	放电条件		
			current	1C 63A	2C 126A
			capacity	100%	$\geq 90\%$
7.2	55°C discharge performance	After the battery is charged in accordance with 6.2, put the battery in a $55\pm 2^{\circ}\text{C}$ high temperature box for 5h, and then discharge it to the final voltage with a current of 1C. After the experiment is over, take out the battery at an ambient temperature of $25\pm 2^{\circ}\text{C}$ Put it aside for 2h under the same conditions, and then visually inspect the appearance of the cell.	1. 1.Discharge capacity $\geq 95\%$ of nominal capacity 2. The appearance of the battery core has no deformation or burst		
7.3	0°C discharge performance	After the battery is charged in accordance with 6.2, put the battery in a $0\pm 2^{\circ}\text{C}$ low temperature box for 24 hours, and then discharge to 2.5 V with a current of 1C After	2. Discharge capacity $\geq 95\%$ of nominal capacity 2. The appearance of the battery core has no deformation or burst		

		the experiment, take out the battery at an ambient temperature of $25 \pm 2^{\circ}\text{C}$ Put it aside for 2h under the same conditions, and then visually inspect the appearance of the cell.	
7.4	-10 $^{\circ}\text{C}$ discharge performance	After the battery is charged in accordance with the provisions of 6.2, put the battery in a low temperature box at $-10 \pm 2^{\circ}\text{C}$ for 24h, and then discharge to 2.5V with a current of 1C. After the experiment is over, take out the battery at an ambient temperature of 25 ± 2 Leave it at $^{\circ}\text{C}$ for 2h, and then visually inspect the appearance of the cell.	3. Discharge capacity $\geq 95\%$ of nominal capacity 2. The appearance of the battery core has no deformation or burst

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测试项目		测试方法	检验标准
7.5	-20 $^{\circ}\text{C}$ discharge performance	After the battery is charged in accordance with 6.2, put the battery in a low temperature box at $-20 \pm 2^{\circ}\text{C}$ for 24h, and then discharge it to 2.1V with a current of 1C. After the experiment is over, take the battery out at an ambient temperature of 25 ± 2 Put it aside at $^{\circ}\text{C}$ for 2h, and then visually inspect the appearance of the cell.	1. Discharge capacity $\geq 70\%$ of nominal capacity; 2. The appearance of the battery core has no deformation or bursting.
7.6	Room temperature charge retention and recovery ability	The battery cell is charged according to the stipulated standard 6.2 charging method. After storing at $25 \pm 2^{\circ}\text{C}$ for 28d, the battery will be discharged to the cut-off voltage with a current of 1C. Test capacity maintenance and recovery.	Capacity retention rate: $\geq 90\%$; Capacity recovery rate: $\geq 95\%$ 。
7.7	High temperature charge retention and recovery ability	After the battery is charged in accordance with 6.2, store the battery for 7 days at an ambient temperature of $55 \pm 2^{\circ}\text{C}$, then place it at $25 \pm 2^{\circ}\text{C}$ for 5h, and then discharge it to the final voltage with a current of 1C (63A). Record keeping capacity and recovery capacity	Capacity retention rate: $\geq 90\%$; Capacity recovery rate: $\geq 95\%$
7.8	store	The battery cell is charged according to the stipulated 6.2 standard charging method and discharged at 1C current for 30min, stored at $45 \pm 2^{\circ}\text{C}$ for 28d, and then placed at $25 \pm 2^{\circ}\text{C}$ for 5h, and then charged according to the stipulated 6.2 standard charging method and discharged with 1C current to the cut-off voltage	Capacity recovery rate: $\geq 95\%$
7.9	Cycle life	The battery cell is charged to 3.65V with 1C current, 0.05C current is cut off, and discharged to 2.5V with 1C current, and the charging and discharging cycle is continuously performed 3500 times at $25 \pm 2^{\circ}\text{C}$.	Capacity retention rate: $\geq 80\%$

8. Safety, reliability, environmental adaptability

The following tests should be carried out in a device with forced exhaust conditions and explosion-proof measures. Before the test, all batteries are charged in accordance with 6.2 and left for 24 hours before performing the following tests.

测试项目		测试方法	检验标准
8.1	Over discharge	Discharge the cell at a constant current of 1C for 90 minutes and observe for 1 hour.	No fire, no explosion, no leakage
8.2	Over charge	Charge the battery cell with a constant current of 1C to 3.85V or stop charging after the charging time reaches 1h, and observe for 1h.	No fire, no explosion
8.3	Short circuit test	Short-circuit the cell with a wire less than 5mΩ at room temperature for 10 minutes.	No fire, no explosion
8.4	Drop test	The battery core falls freely from a height of 1.5m to the concrete floor, and falls once from the direction of the positive and negative terminals, and observes for 1 hour.	No fire, no explosion, no leakage
8.5	heating	Put the cell in an electric heating blast drying box, and the temperature will rise from room temperature to 130 ± 2℃ at a rate of 5℃ ± 2℃/min and keep it for 30min.	No fire, no explosion
8.6	Squeeze test	The battery core is placed between the two extrusion planes of the extrusion equipment. The extrusion plate is in the form of a semi-cylinder with a radius of 75mm. The length (L) of the semi-cylinder is greater than the size of the battery to be extruded. The extrusion speed is 5 ± 1mm. /s, end condition: the deformation reaches 30% or the voltage reaches 0V, or the extrusion force reaches 200KN.	No fire, no explosion

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测试项目		测试方法	检验标准
8.7	Sea water immersion	Immerse the battery in 3.5% NaCl solution (weight percentage, which simulates the composition of seawater at room temperature) for 2h, or until all visible reactions stop, the water depth must be sufficient to completely submerge the battery body。	不起火、不爆炸
8.8	Vibration test	After the battery cell is charged in accordance with the provisions of 6.2, let it stand for 4 Komatsu and test the voltage and internal resistance, and then clamp the fully charged sample on the vibrating machine platform, and test according to the following conditions: a) Vibration method: single vibration from top to bottom; b) Vibration frequency 10-55Hz; c) Maximum acceleration: 30m/s ² ; d) Frequency sweep cycle: 10 times; e) Vibration time 3h.	No fire, no explosion, no leakage
8.9	Low pressure	The battery cell is stored for 6 hours at an absolute pressure of 11.6kPa and a temperature of 20 ± 3℃。	No fire, no explosion, no leakage
8.10	Temperature cycle	Put the battery in a controllable temperature box, adjust the temperature according to (Table 1), and observe the temperature shock cycles for 5 times for 1 hour.	No fire, no explosion, no leakage

表 1 温度循环试验一个循环的温度和时间

温度 ℃	时间增量 min	累计时间 min	温度变化率 ℃/min
25	0	0	0
-40	60	60	13/12
-40	90	150	0
25	60	210	13/12
85	90	300	2/3
85	110	410	0
25	70	480	6/7

9. Transportation During transportation, batteries should be protected from severe vibration, impact or squeezing, and from sun and rain. It is suitable for transportation of vehicles, trains, ships and other vehicles.

10. quality assurance From the date of shipment, the warranty period of the batteries is determined by the contract. However, within this period, if the reason is not the process of SK company but the customer

- > SK company does not promise to replace the battery cell quality problems caused by the misuse of the battery.
- > SK company does not assume any responsibility for problems arising from operations in violation of safety regulations.
- > SK company does not assume any responsibility for problems arising from the use of circuits, battery packs, and chargers.
- > The defective cells produced by the customer during the cell assembly process after shipment are not included in the scope of SK's quality assurance

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11. Safety rules Misuse of lithium-ion rechargeable batteries may cause damage to the batteries and personal injury. Before using lithium ion rechargeable batteries, please read the following safety rules carefully:

Note 1. If the customer needs to operate or apply the battery cell under the conditions outside of this document, please consult SK company related matters first.

Note 2. SK company does not assume any responsibility for accidents caused by using the battery cell outside the conditions stated in this document.

11.1 Battery precautions

- a. Do not expose the battery cell to extreme heat or sparks.
- b. Do not short-circuit, overcharge or over-discharge the battery core.
- c. Do not subject the battery cell to excessive mechanical shock.

- d. Do not immerse the battery cell in sea water or water, or make it absorb moisture.
- e. Do not reverse the positive and negative poles of the battery.
- f. Do not disassemble or trim the battery core.
- g. Do not place it with metal objects such as necklaces, coins or hairpins.
- h. Do not cause obvious damage or deformation of the battery.
- i. Do not connect the battery core to the socket.
- j. Do not directly solder the batteries.
- k. Do not directly touch the leaking battery cell.
- l. Do not use batteries for other equipment.
- m. Do not mix lithium-ion batteries.
- n. Do not place the battery cell in a place exposed to direct sunlight.
- o. Keep the battery cell away from children.
- p. Do not needle, hammer or trample on the battery cell.

11.2 Instructions for use of batteries

11.2.1. Charging

a. The recommended charging temperature range of the battery cell is $0^{\circ}\text{C}\sim 45^{\circ}\text{C}$. For other temperature charging, please refer to the charging current of different temperatures in this specification.

b. Charge to 3.65 V at a constant current of $1/3C$. Do not use a charging current exceeding $2C$ (C : nominal capacity).

c. Charge at 3.65V constant voltage for less than 2 hours (maximum capacity).

* The battery must be charged using constant current and constant voltage.

* Do not continue charging beyond the standard time.

11.2.2. Discharge

a. The recommended discharge termination voltage is 2.5V, and the maximum continuous constant current discharge current is recommended to be $2C$.

b. In order to achieve better performance, the battery discharge temperature range is $-20^{\circ}\text{C}\sim 55^{\circ}\text{C}$.

11.2.3. Storage recommendations

a. Short-term storage (less than 1 month)

- Batteries should be stored in an environment with a temperature range of -20 to 45°C , low humidity and no corrosive gas.

- Don't let the battery bear any pressure.

b. Long-term storage

- If it is to be stored for a long time, the recommended voltage range is 3.60-3.95V, and the battery cells should be stored in an environment with a temperature range of $0\sim 25^{\circ}\text{C}$, low humidity and no corrosive gas.

- Don't let the battery bear any pressure.