Product Specification

Product Name	Lithium-ion Cell
Model	JGCNR18650-2600mAh-3.6V
Made By	
Checked By	
Approved By	

Customer Approval	Company Name	
	Signature	
	Date	
	Company stamp	

Abstract

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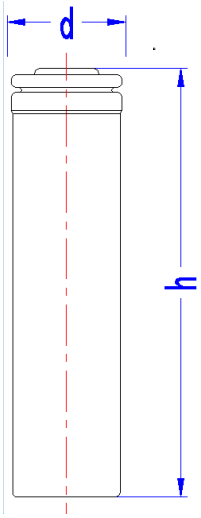
1. Application Scope

This product specification describes product performance indicators of Lithium-ion cell produced by .

2. Model

JGCNR18650-2600mAh-3.6V

3. Dimension



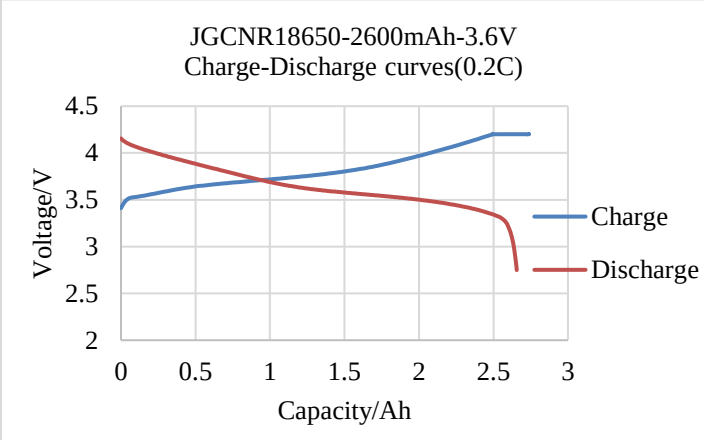
Item	Dimension including casing (mm)
h	**65.2±0.3**
d	**≤18.60**

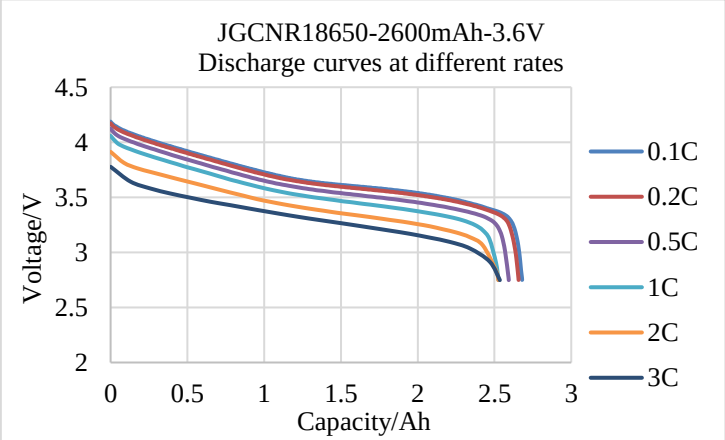
4. Major Technical Parameters

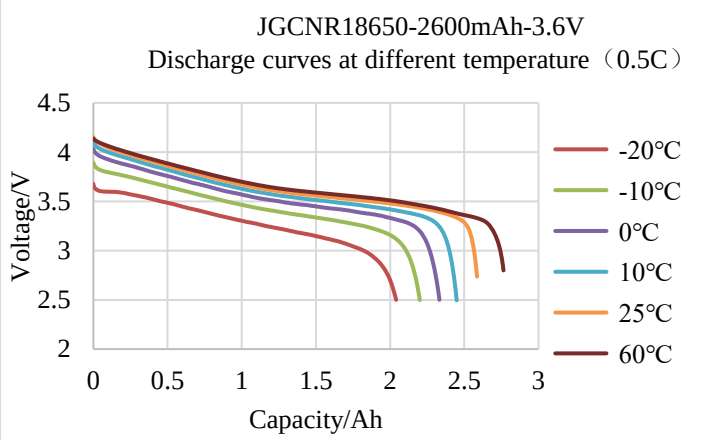
NO.	Item		Standard	Note
1	Standard Capacity		2600 mAh	0.2C,(current value of 2600 mA at 1C)
2	Minimum Capacity		2530 mAh	0.2C
3	Standard Voltage		3.6 V	
4	Alternating Internal Resistance		≤25 mΩ	AC 1kHz measurement at 25±2 ℃
5	Standard Charge	Cut-off Voltage	4.2 V	constant-current charge to 4.2 V at 0.5C, constant voltage charge to stop until 0.01C mA.
		Charge Current	1.3 A	
		Cut-off Current	26 mA	
6	Max. Charging Current		1.3 A	
7	Standard Discharge	Discharge Current	1.3 A	Constant current discharge
		Cut-off Voltage	2.75 V	
8	Fast Discharge Current		2.6 A	This current is the maximum current recommended for the combination of cells, and the specific value should be determined according to the combination structure. The maximum operating current is set at a temperature not exceeding 60 ℃.
9	Max. Continuous Discharge Current		7.8 A	Only for single cell
10	Pulse Discharge Current		10 A，5s	

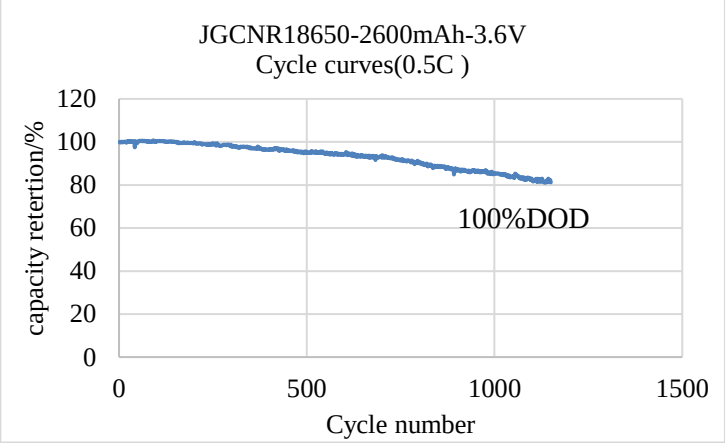
NO.	Item	Standard	Note
11	Cycle Characteristic	1000 times（100%DOD）	the residual capacity is no less than 70% of rated capacity at 0.5C rate.
		1500 times（80%DOD）	
		2000 times（50%DOD）	
12	Working Temperature	Charge：0℃～55℃	
		Discharge：-20℃～60℃	
13	Storage Temperature	-20℃～55℃	< 1 months
		-20℃～45℃	< 3 months
		-20℃～25℃	< 12 months
14	Cell Weight	Approx 45g	Including casing

5. Characteristics Curves









6. Electrical Characteristics

NO.	Item	Test Method	Standard
1	discharge capacity at normal temperature	After full charge, the experiment can be put on hold for 10 minutes; 0.2C discharge to 2.75V allows five repetitions. When the range of three consecutive experiments is less than 3% of the rated capacity, the experiment can be completed ahead of time and the maximum value of the test results can be obtained.	≥2530mAh

NO.	Item	Test Method	Standard
2	Discharge performance at different temperatures	After standard charging of normal batteries, it should be stored at least 12 hours in the constant temperature environment of - 20 ℃, - 10℃, 0℃, 10 ℃ and 25 ℃, respectively, and 5 hours of 60 ℃. Then discharge with 0.5C current to the corresponding termination voltage. When the ambient temperature is more than 15 ℃, the termination voltage is 2.75V, if less than 15 ℃, which is 2.5V.	discharge capacity /initial capacity *100% -20℃≥60%； 10℃≥85%； -10℃≥70%； 25℃≥100%. 0℃≥75%； 60℃≥99%；
3	Discharge performance at normal temperature different rate	After standard charging of normal batteries, it should be placed for 10 minutes at the prescribed ambient temperature. Then discharged to 2.75V at different rates of 0.2C, 0.5C, 1C, 2C and 3C, respectively. The capacity of batteries with different discharge rates was recorded, and the temperature rise T of batteries with different discharge rates was recorded synchronously.	discharge capacity / initial capacity *100% 0.2C：=100% T: ≤5℃ 0.5C：≥97% T: ≤10℃ 1C：≥95% T: ≤15℃ 2C：≥90% T: ≤25℃ 3C：≥85% T: ≤35℃
4	Charge retention at normal temperature	Normal batteries are charged according to the standard. They are placed in open circuit for 28 days at room temperature, and then discharged to 2.75V at 0.5C. The recovery capacity of the battery was tested according to the charging and discharging standards.	storage capacity ≥ initial capacity *90% recovery capacity ≥ initial capacity *95%
5	Charge retention and capacity recovery capability at high temperature	After standard charging, normal batteries are placed open circuit for 7 days in the environment of 55±2℃. After the storage period expires, they are placed for 5 hours at room temperature, and then discharged to 2.75V at 0.5C. The recovery capacity of the battery was tested according to the charging and discharging standards	storage capacity ≥ initial capacity *90% recovery capacity ≥ initial capacity *95%
6	Cycle characteristic	After filling up the battery, stand for 10 minutes, then charge and discharge according to 0.5C. It is counted as a cycle. The interval between each cycle should not be less than 10 minutes, and the discharge capacity should end when it is less than 70% of the rated capacity.	≥1000 times

7. Safety Characteristics

NO.	Item	Test Method	Standard
1	Overcharge	Normal batteries are charged at 1C constant current until the charging termination voltage is 1.5 times or after charging time reaches 1h, then stop charging and the appearance changes of the batteries are observed for 1h.	No explosion, No fire.
2	Over Discharge	After the standard charging of the normal batteries, use 1C constant current discharge for 90min, and observe the appearance changes of the batteries are observed for 1h.	No explosion, No fire.
3	External Short-circuit	After standard charging of normal batteries, direct short circuit positive and negative poles for 10 minutes, external line resistance should be less than 5 mΩ. When the temperature of batteries drops to 10 ℃, the test is completed and the appearance changes of batteries are observed for 1 hour.	No explosion, No fire.

NO.	Item	Test Method	Standard
4	Thermal Abuse	The initial state of the normal battery was measured. After standard charging, the battery was placed in the oven. The temperature was increased to 130±2℃ at a rate of (5±2℃)/min and kept for 30 minutes. Then the appearance of the battery was observed for one hour.	No explosion, No fire.
5	Drop	After standard charging of normal batteries, the initial state of the batteries was measured, and the test batteries were freely dropped from 1.5m height to flat cement ground, once in each direction.	No explosion, No fire.

8. Environmental Adaptability

NO.	Item	Test Method	Standard
1	Thermal Cycle	Store the cell for 48 hours at 75±2℃after standard charge, then store the cell at -20℃ for 6 hours, and at room temperature for 24 hours. Observe the batteries' appearance.	No leakage, No smoke, No fire, No explosion.
2	Static Humidity	Put the cell at 40℃±5℃ and 95%RH chamber for 48h, then get it out and store it for 2h at room temperature. Observe the appearance and discharge at 0.5C to 2.5V, then test the final capacity.	Discharge capacity after storage is more than 90% of rated capacity. No obvious outside damage, No corrosion, No smoke, No explosion
3	Vibration	Standard charge. Equip it to the vibration platform, prepare the test equipment according to following vibration frequency and relevant swing, doing frequency sweeping from X, Y, Z three directions, each from 10Hz to 55Hz for 30 minutes of recycling, rating of which is 1oct/min: A)vibration frequency:10Hz ~ 30Hz Displacement breadth (single swing): 0.38mm B)vibration frequency:30Hz ~ 55Hz Displacement breadth (single swing): 0.19mm. Observe the final state after scanning.	Residual Capacity≥90% Rated Capacity Voltage Decrease Rate ≤0.5% No obvious outside damage, No leakage, No smoke, No explosion.

9. Standard Test Environment

Unless especially specified, all tests stated in this Product Specification are conducted at below condition:
Temperature: 25±2℃
Humidity: (65±20) % RH

10. Storage and Others

10.1 Long Time Storage

The cell should be placed in a dry (humidity ≤ 85% RH) environment without corrosive gas, and the cell should not bear any pressure. And in order to ensure that the environmental control under this condition cannot make the surface of the cell appear condensate droplets, while the surface of the storage cell cannot appear moisture phenomenon. The batteries' storage voltage should be 3.6~3.75V and the cell should be charged and discharged once every three months.

10.2 Other considerations

11. Notice in Using Cell

Abuse of cell may cause accidents such as damage to cores or personal injury. So please read the following safety codes and precautions carefully before used:

- Do not immerse the cell in water or seawater, and keep the cell in a cool dry surrounding if it stands by.
- Do not use or leave the cell at high temperature as fire or heater. Otherwise, it can overheat or fire or its performance will be degenerate and its service life will be decreased.
- Do not reverse the position and negative terminals.
- Do not connect the cell electrodes to an electrical outlet.
- Do not short circuit. Otherwise it will cause serious damage of the cell.
- Do not transport or store the cell together with metal objects such as hairpins, necklaces, etc.
- Do not strike, trample, throw, fall and shock the cell.
- Do not directly solder the cell and pierce the cell with a nail or other sharp objects.
- Do not use the cell in a location where static electricity and magnetic field is great, otherwise, the safety devices may be damaged, causing hidden trouble of safety.
- Use the cell charger specifically when recharging.
- If the cell 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 cell gives off strange odor, generates heat, becomes discolored or deformed, or in any way appears abnormal during use, recharging or storage, immediately stop charging, using, and remove it from the device.
- In case the cell 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.
- Tape the discarded cell terminals to insulate them.
- Do not dissect the battery. Otherwise, the battery is no longer protected, and the cell may have potential safety hazards, such as liquid leakage, heat generation, smoke, fire, explosion, etc.

12. Disclaimer

Quality assurance does not include normal wear and tear, as well as problems caused by improper maintenance, handling and storage. Failure to follow the use and installation specified in this product specification, including but not limited to the following:

- Damage during transportation or storage.
- Problems arising from the combination of circuit, batteries and chargers.
- Incorrect battery installation or maintenance.
- Use cell or cell pack in inappropriate environments.
- Used improper or incorrect charging and discharging methods which is not included in this specification.
- Failure to comply with operational precautions.
- Bad battery cells generated in the process of assembling by the customer after shipment.
- In case of force majeure, such as lightning, storm, flood, fire, earthquake, etc.

Before using the product, please read this Product Specification carefully.

. is not responsible for any direct or indirect damage caused by the battery or battery pack caused by the product assembly or use that does not meet the requirements of this specification. The company is not responsible for the damage (personal safety) of the product, load and surrounding connectors caused by incorrect use of the product, incorrect circuit connection, or the input power supply and load function parameters used do not match the performance parameters marked in this Product Specification.. Without affecting the use of the product, if the product is upgraded without prior notice. Before ordering the products of

. reserves the right to revise the specifications and performance parameters of the product. The content is subject to change without prior notice; the final interpretation right of this information belongs to the company.

Appendix A

Suggestions for Cell Packs

1. Selecting principle of nickel strip is often applied to the design of cell packs.

Based on the working current of cell packs to make the shunt selection of nickel strip. The common nickel strip could under the current as below:

Nickel Strip Type	3*0.1	4*0.1	7*0.15	8*0.15
Normal Working Current	2A	3A	7A	8A
Maximum Continues Current	4A	5A	13A	15A

2. Relation between the cell packs design current and lead wires current breakdown, and principle of wires selection.

Based on the working current of cell packs to make the shunt selection of wires. Different wires could under the current as below:

AWG	Diameter		Cross-sectional	resistance	normal current	Max-current	AWG	Diameter		Cross-sectional	resistance	normal current	Max-current
	Metric/mm	Imperial/inch	mm^2	Ω/km	A	A		Metric/mm	Imperial/inch	mm^2	Ω/km	A	A
0000	11.68	0.46	107.22	0.17	423.2	482.6	22	0.643	0.0253	0.3247	54.3	1.280	1.460
000	10.4	0.4096	85.01	0.21	335.5	382.6	23	0.574	0.0226	0.2588	48.5	1.002	1.165
00	9.27	0.3648	67.43	0.26	266.2	303.5	24	0.511	0.0201	0.2047	89.4	0.808	0.921
0	8.25	0.3249	53.49	0.33	211.1	240.7	25	0.44	0.0179	0.1624	79.6	0.641	0.731
1	7.35	0.2893	42.41	0.42	167.4	190.9	26	0.404	0.0159	0.1281	143	0.506	0.577
2	6.54	0.2576	33.62	0.53	132.7	151.3	27	0.361	0.0142	0.1021	128	0.403	0.460
3	5.83	0.2294	26.67	0.66	105.2	120.0	28	0.32	0.0126	0.0804	227	0.318	0.362
4	5.19	0.2043	21.15	0.84	83.5	95.2	29	0.287	0.0113	0.0647	289	0.255	0.291
5	4.62	0.1819	16.77	1.06	66.2	75.5	30	0.254	0.0100	0.0507	361	0.200	0.228
6	4.11	0.0162	13.3	1.33	52.5	59.9	31	0.226	0.0089	0.0401	321	0.158	0.181
7	3.67	0.1443	10.55	1.68	41.6	47.5	32	0.203	0.0080	0.0316	583	0.128	0.146
8	3.26	0.1285	8.37	2.11	33.0	37.7	33	0.18	0.0071	0.0255	944	0.101	0.115
9	2.91	0.1144	6.63	2.67	26.2	29.8	34	0.16	0.0063	0.0201	956	0.079	0.091
10	2.59	0.1019	5.26	3.36	20.8	23.7	35	0.142	0.0056	0.0169	1200	0.063	0.072
11	2.3	0.0907	4.17	4.24	16.5	18.8	36	0.127	0.0050	0.0127	1530	0.050	0.057
12	2.05	0.0808	3.332	5.31	13.1	14.9	37	0.114	0.0045	0.0098	1377	0.041	0.046
13	1.82	0.0720	2.627	6.69	10.4	11.8	38	0.102	0.0040	0.0081	2400	0.032	0.036
14	1.63	0.0641	2.075	8.45	8.2	9.4	39	0.089	0.0035	0.0062	2100	0.025	0.028
15	1.45	0.0571	1.646	10.6	6.5	7.4	40	0.079	0.0031	0.0049	4080	0.019	0.022
16	1.29	0.0508	1.318	13.5	5.2	5.9	41	0.071	0.0028	0.004	3685	0.016	0.018
17	1.15	0.0453	1.026	16.3	4.1	4.7	42	0.064	0.0025	0.0032	6300	0.013	0.014
18	1.02	0.0403	0.8107	21.4	3.2	3.7	43	0.056	0.0022	0.0025	5544	0.010	0.011
19	0.912	0.0369	0.5667	26.9	2.6	2.9	44	0.051	0.0020	0.002	10200	0.008	0.009
20	0.813	0.032	0.5189	33.9	2.0	2.3	45	0.046	0.0018	0.0016	9180	0.006	0.007
21	0.724	0.0285	0.4116	42.7	1.6	1.9	46	0.041	0.0016	0.0013	16300	0.005	0.006

3. Voltage protection point value (for single cell) of protection board or BMS, and selecting principle of protection board.

	Over-charged Protection Voltage	Over-discharged Protection Voltage	The protection voltage point for monomer should be selected also based on the safety voltage point of cell and protection voltage point of IC.
Lithium Iron Phosphate	3.6-3.85	2.0-2.5	
Ni-Co- Mn	4.05-4.25	2.5-3.0	
Selecting principles of protection board: based on the safety needs of the cell and customers' requirements. To select the suitable protection board according to the size of cell packs.			

4. Selecting principles of chargers.

(1) Voltage should be regulated by the safest voltage of chargeable cell * n (make the Lithium iron phosphate as 3.6 V and Ni- Co- Mn as 4.2 V).

(2) Current should be limited by the safe current of chargeable cell, and the customers' specific requirements also should be considered.

(3) If above 120W, chargers with aluminium alloy cooling fin or cooling fan will be suggested.

(4) If under 60W, chargers with plastic shell will be suggested.

5. In the process of packs structure design and production, some measures and skills could be handled to avoid cell short circuit.

(1) To strengthen the positive insulation treatment of the monomer batteries, with barley paper or other high temperature resistant material.
(2) Cell in the case of size allowed, should try to use batteries of the isolation.
(3) Cell when working current is larger and can't use bracket, should strengthen the insulation of the batteries shell, for example, using paper sleeve, PVC casing.
(4) The power line shall not directly contact with the surface of the batteries, avoid cross; Must cross the line and the line between the bracket with high temperature tape or barley paper.
(5) Power line is not connected to the nickel spot welding surface as far as possible, cannot be avoided, the power line between nickel and high temperature insulation tape to stick a highland barley paper.
(6) The reasonable design of nickel welding way, minimize nickel piece of calorific value.

6. Recycling.

End-of-life lithium batteries should be recycled and disposed of in accordance with local laws. Be sure to send your used electronics, batteries, and packaging materials to a dedicated collection point.