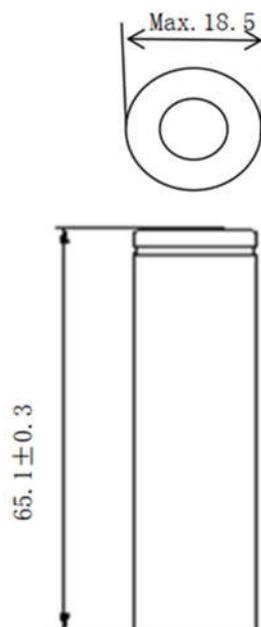


	Lithium-ion Battery	
	Model	Specifications
	ISR18650-2200	ISR 2200mAh 10c Grade A

Product Specifications:

No.	Items	Specifications
1	Limited Charge Voltage	4.2
2	Nominal Voltage	3.7V
3	Rated Capacity	2200mAh
4	Standard Charging Current	1100mA
	Rapid Charging Current	2200mA
5	Max. Continuous Charge Current	4.4A
6	Max. Continuous Charge Current	22 A cycle, 25A continuous, 30A 2s
7	Discharge Cut-off Voltage	2.75V
8	Operating Temperature (Cell Surface Temperature)	Charging : 0°C~50°C (Recommended recharge release < 45°C)
		Discharging: -20°C~80°C (Recommended recharge release < 70°C)
9	Storage Temperature	1 month: 30°C~60°C, 3 months: 30°C~45°C 1 year: 20°C~25°C
10	Cell Weight	Approx. 44.5 gms
11	AC Impedance	≤20 mΩ
12	Cell Dimension	Height: 65.1 mm ± 0.3 mm Diameter: ≤18.5mm

Cell Dimension:



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Standard Test Conditions:

Unless otherwise specified, all tests stated in this datasheet are conducted at below conditions:
 Temperature: 23°C±2°C, Relative Humidity: 65%±20%, Atmospheric Pressure: 86kPa~106kPa

Electrical characteristics:

No.	Items	Test Methods and conditions	Criteria
1	Standard Charging Method	Charging the cell with constant current at 1100mA and then with constant voltage at 4.2V till charge current declines to ≤ 44mA	Limited Charge Voltage = 4.2V Charge Current = 1100mA
2	Rapid Charging Method	Charging the cell with constant current at 2200mA and then with constant voltage at 4.2V till charge current declines to ≤ 110mA	Limited Charge Voltage = 4.2V Charge Current = 2200mA
3	AC Impedance	Prior to charging, the cell shall be discharged at a constant current to 1100mA down to the cutoff discharge voltage 2.75V. The cell should be stored at the temperature of 23°C±2°C from 1h to 4h. Internal resistance is measured at AC 1KHz±0.1KHz.	≤20mΩ
4	Capacity	(1) Prior to charging the cell shall be discharged at a constant current of 440 mA down to cutoff voltage 2.75V, rest for 10 minutes. (2) The capacity means the discharge capacity of the cell, which is measured with discharge current of 440mA to 2.75V cut-off voltage after standard charge and rest step from 0.5h to 1h. The above experiment repeat 3 times, until the discharge capacity meet the requirement for one time, then the test can be stopped.	≥2000mAh
5	High Rate Discharge Performance	(1) Prior to charging the cell shall be discharged at a constant current of 1100 mA down to cutoff voltage 2.75V, rest for 10 minutes. (2) Discharge with the current of 10C, after standard charge and rest from 0.5h to 1h, and record the discharge capacity.	≥96% Rated Capacity
6	Cycle Life	Charge: The cell shall be charged in accordance with rapid charge method, rest for 30 minutes. Discharge: 10C discharge to 2.75V, one cycle is finished, then rest for 30 minutes. Then	≥300cycles

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		repeat above steps, when capacity is less than 80% of rated capacity two times in a row, test is end.	
7	Self-discharge	Voltage difference after corresponding days rest at 23±2°C	10 days ≤ 0.05V 30 days ≤ 0.08V 90 days ≤ 0.15V
8	Low Temperature Performance	(1) Firstly, discharge to 2.75V with the current of 1100mA. (2) The cell shall be charged in accordance with the standard charging method. (3) The cell shall be stored in the temperature of -20°C±2°C from 16h to 24h. (4) Discharge at the constant current of 400mA down to the cutoff discharge voltage 2.5V	Discharge capacity ≥ 70% Rated capacity

Cell Safety Tests:

No.	Items	Test Methods & Conditions	Criteria
1	Overcharge Test	Firstly, discharge to 2.75V with the current of 440mA. The charge at constant current of 4C to 10V until the cell explode or fire of the surface temperature of the cell stabled (the changes of temperature less than 10°C during 30 minutes). Once the cell meets one of the three conditions, the test can be stopped	No Fire, No Explosion.
2	Low Pressure Test	The full charged cells are to be stored for at least 6h at a vacuum environment with pressure of less than 11.6kPa, and temperature of 23°C±2°C	No Fire, No Explosion. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.
3	Heating Test	The cells are fully charged with standard charging method and put into oven with nature air or cycled air convected, heat cell by velocity of 5°C/min ± 2°C/min to 130°C± 2°C and maintain for 30 minutes	No Fire, No Explosion.



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4	Temperature Cycling Test	<p>The fully charged cells are placed in a test chamber and subjected to the following cycles:</p> <p>a) Raising the temperature to $75^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and maintaining this temperature for at least 6 hours. b) Reducing the temperature to $-40^{\circ}\text{C} \pm 2^{\circ}\text{C}$ within 30 minutes and maintaining this temperature for at least 6 hours. c) Repeating the sequence for a further 9 cycles. d) After the 10th cycle, storing the cells for 24 hours prior examination, in the temperature of $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$.</p>	<p>No Fire, No Explosion. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.</p>
5	Short Test	<p>The full charged cells are placed in a test chamber and subjected to the following cycles: short the positive and negative terminals with the wire resistance of $80\text{m}\Omega \pm 20\text{m}\Omega$. Tests are to be conducted at $23^{\circ}\text{C} \pm 2^{\circ}\text{C}$, keep 24h or surface temperature decline to 20% of max temperature, test is end.</p>	<p>No Fire, No Explosion. The surface temperature of samples shall not exceed 150°C.</p>
6	Forced Discharge Test	<p>The cell is discharged with standard discharging method. Inverse charge current=2.2A time\geq90 minutes</p>	<p>No Fire, No Explosion.</p>

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Mechanical Tests:

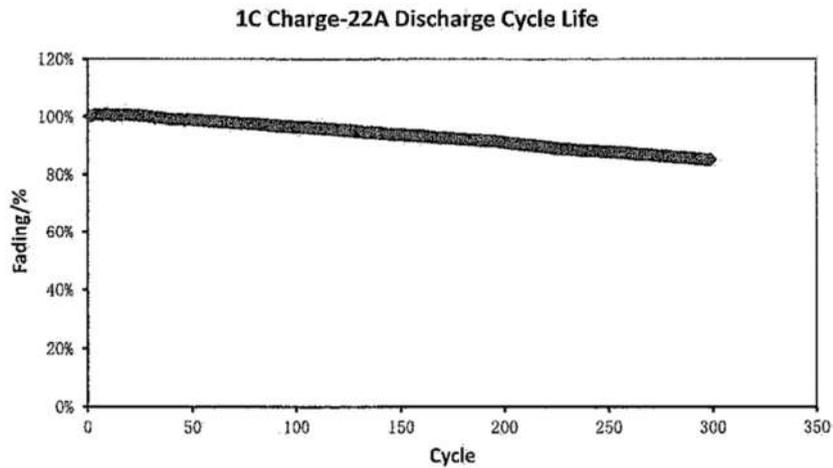
No.	Items	Test Methods & Condition	Criteria
1	Vibration Test	After standard charging, fixed the cell on the vibration table and subjected to vibration cycling that frequency is 250 Hz, the amplitude of the vibration is ± 0.1 mm. The cell shall be vibrated for 8h, and rest 30 minutes after every hour.	No Fire, No Explosion. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.
2	Shock Test	The full charged cell is fixed on shock table. Each cell shall be subjected to a half sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Each cell shall be subjected to three shocks in positive direction followed by three shocks in negative direction of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.	No Fire, No Explosion. The open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure.
3	Impact Test	After standard charge, the cell is placed on a flat surface. A 15.8mm diameter bar is placed across the center of the cell. The weight of 9.1 kg is dropped from a height of 610mm onto the cell	No Fire, No Explosion.
4	Crush Test	A cell is crushed between two flat surfaces. The applied force is 13 kN \pm 1kN by hydrocylinder. Once the maximum pressure has been obtained or voltage decrease to 1/3 of nominal voltage sharply or 10% of deformation has occurred compared to the initial dimension, the force is released.	No Fire, No Explosion.
5	Free Drop Test	The fully charged cell drops on the concrete ground from 1m height, total 3 times, to obtain the shock of random directions. After the test, the cell shall rest for a minimum one hour and then a visual inspection shall be performed.	No Fire, No Explosion.

Visual Inspection:

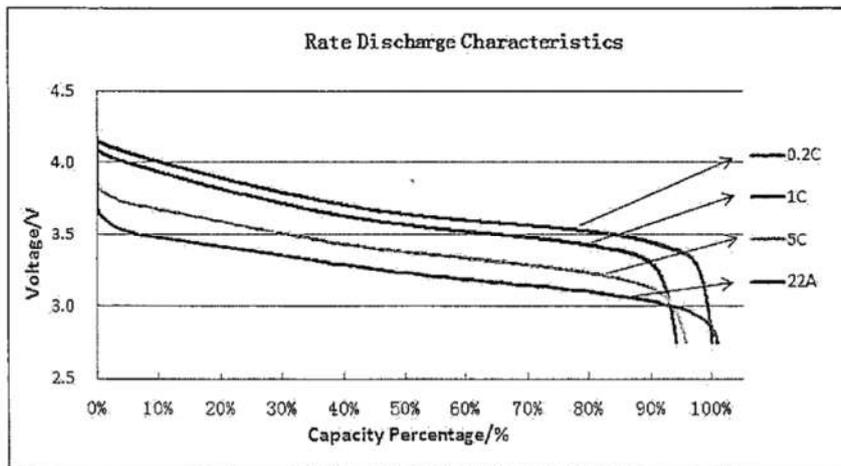
There shall be no such defect as scratch, flaw, crack and leakage which may adversely affect commercial value of the cell.

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Cycle Life:



Rate Discharge Characteristics:





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Discharge Characteristics at different temperature:

