Specification
For
Lithium-Ion Rechargeable Cell

TPi-Partnumber: 4LI1066

Cell Type : 21700

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Pages	13

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Contents

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1 Preface

This specification describes the type, dimension, performance, technical characteristics, warnings and cautions of the lithium ion rechargeable cell.

2 Definition

2.1 Standard charge method

Under 25 ± 2 ℃, the cell is charged to 4.20V at a constant current of 0.5C (2500 mA), and then charged constantly under the voltage of 4.20V until the current reaches 0.01C（50 mA）.

2.2 Standard discharge method

Under 25 ± 2 ℃, the cell is discharged to 2.50V at a constant current of 0.2C (1000 mA).

2.3 Nominal capacity

Nominal capacity, signed as Cap and using mAh as unit, is obtained as per standard charge followed by standard discharge.

3 Cell type and dimension

3.1 Description and model

3.2 Description: Cylindrical Li-ion rechargeable cell

Model: 21700

3.3 Cell dimension

Cell physical dimension is listed in Figure 1 (unit: mm), with tube.

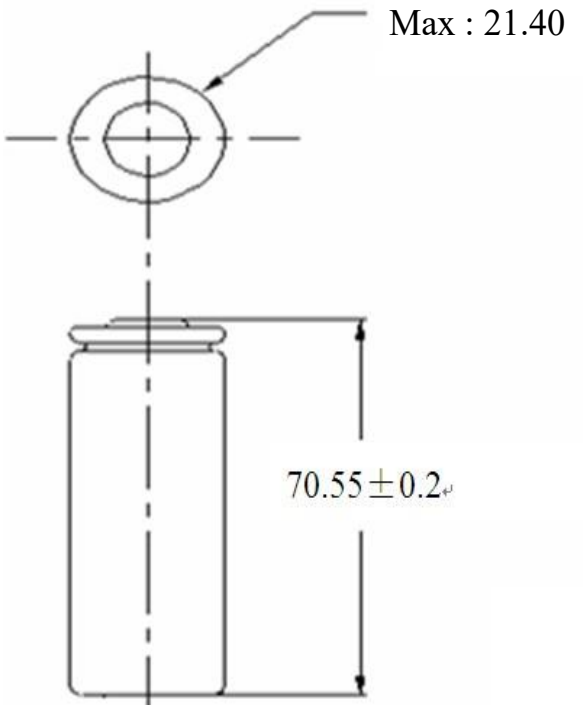

Figure 1

4 Cell characteristics

Unless otherwise specified, the cell is fresh cell and tested by standard charge and discharge.

ITEM		SPECIFICATION
Capacity	Nominal capacity	5000mAh by standard charge and discharge
	Minimum capacity	4900mAh by standard charge and discharge
Nominal voltage		3.60 V
Charge voltage		4.20 V
Discharge cut-off voltage		2.50 V
Max charge current		1C 25℃(not for cycle life)
Max discharge current		3C 25 ºC (not for cycle life)
Storage temperature		1 year: -20~25 ºC 3 months: -20~45 ºC 1 month: -20~60 ºC
Humidity range		0~60% RH (non-condensing)
Internal resistance		≤30 mΩ (AC Impedance, 1000 Hz)
Weight		≤ 72 g

5 Technical requirements

5.1 Cell operating conditions

5.2 Temperature of charge 0~45 ℃

Temperature of discharge -20~60 ℃

5.3 Cell testing conditions

Unless otherwise specified, all tests stated should be done under 25 ± 2 ℃.

5.4 Requirement of the testing equipment

The voltage measurement device: Not less than 0.5 grade

The current measurement device: not less than 0.5 grade

AC Impedance: 1000 Hz

Temperature meter: precision ≤ 0.5 ℃

Time measurement unit: ± 0.1%

The size measurement device: ± 0.1%

The quality measurement device: ± 0.1%

5.5 Electrochemical characteristics

Unless otherwise specified, the cell should be fresh cell and tested by standard charge and discharge。

NO.	ITEM	TEST METHOD AND CONDITIONS	CRITERION
5.4.1	Discharge rate capability	(1) Charge: 0.5C constant current charge to 4.20 V followed by 4.20V constant voltage charge to cut-off current ≤ 0.01C; (2) Discharge: 0.2C, 0.5C, 1C, 2C, 3C constant current discharge to cut-off voltage ≤ 2.50 V.	
5.4.2	Cycle life	(1) Charge: 0.5C constant current charge to 4.20 V followed by 4.20V constant voltage charge to cut-off current ≤ 0.05C (250 mA); (2) Discharge: 1C constant current discharge to cut-off voltage ≤ 2.75 V.	$\frac{\text{Discharge capacity of } 801^{st} \text{ cycle}}{\text{Original discharge capacity}} \geqslant 80\%$
		(1) Charge: 0.5C constant current charge to 4.15 V followed by 4.15V constant voltage charge to cut-off current ≤ 0.05C (250 mA); (2) Discharge: 1C constant current discharge to cut-off voltage ≤ 3.00 V.	$\frac{\text{Discharge capacity of } 1001^{st} \text{ cycle}}{\text{Original discharge capacity}} \geqslant 80\%$

<table>
<tr>
<td>5.4.3</td>
<td>High-low temperature discharge performance</td>
<td>(1) Charge: 0.5C constant current charge to 4.20 V followed by 4.20V constant voltage charge to cut-off current ≤ 0.01C at 25±2 ℃;
(2) Discharge: 0.2C constant current discharge to cut-off voltage ≤ 2.50 V at 25℃, 60℃, 45℃, 10℃, 0℃, -10℃, -20℃.</td>
<td>
<table>
<tr><th>Temperature</th><th>Relative Capacity</th></tr>
<tr><td>25°C</td><td>100%</td></tr>
<tr><td>60°C</td><td>≥98%</td></tr>
<tr><td>45°C</td><td>≥97%</td></tr>
<tr><td>10°C</td><td>≥90%</td></tr>
<tr><td>0°C</td><td>≥85%</td></tr>
<tr><td>-10°C</td><td>≥75%</td></tr>
<tr><td>-20°C</td><td>≥65%</td></tr>
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<tr>
<td>5.4.4</td>
<td>Storage performance at 25℃ (100% SOC)</td>
<td>(1) Charge: 0.5C constant current charge to 4.20V followed by 4.20V constant voltage charge to cut-off current ≤ 0.01C; Discharge: 0.2C constant current discharge to cut-off voltage ≤ 2.50 V, to obtain the initial capacity;
(2) Charge: 0.5C constant current charge to 4.20V followed by 4.20V constant voltage charge to cut-off current ≤ 0.01C;
(3) Stored at 25 ±2 ℃ for 28 days;
(4) Discharge: 0.2C constant current discharge to cut-off voltage ≤ 2.50V, to obtain the residual capacity;
(5) Charge: 0.5C constant current charge to 4.20V followed by 4.20V constant voltage charge to cut-off current ≤ 0.01C; Discharge: 0.2C constant current discharge to cut-off voltage ≤ 2.50V, to obtain the recovery capacity.</td>
<td>
<table>
<tr><th>Capacity</th><th>Relative Capacity</th></tr>
<tr><td>Residual capacity</td><td>≥90%</td></tr>
<tr><td>Recovery capacity</td><td>≥95%</td></tr>
<tr><td>Initial capacity</td><td>100%</td></tr>
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<tr>
<td>5.4.5</td>
<td>Storage performance at 60℃ (100% SOC)</td>
<td>(1) Charge: 0.5C constant current charge to 4.20 V followed by 4.20 V constant voltage charge to cut-off current ≤ 0.01C at 25±2 ℃; Discharge: 0.2C constant current discharge to cut-off voltage ≤ 2.50V at 25±2 ℃, to obtain the initial capacity;
(2) Charge: 0.5C constant current charge to 4.20V followed by 4.20V constant voltage charge to cut-off current ≤ 0.01C at 25±2 ℃;
(3) Stored at 60 ±2 ℃ for 28 days;
(4) Kept at 25 ±2 ℃ for 5 hours;
(5) Discharge: 0.2C constant current discharge to cut-off voltage ≤ 2.50V at 25±2 ℃, to obtain the residual capacity;
(6) Charge: 0.5C constant current charge to 4.20V followed by 4.20V constant voltage charge to cut-off current ≤ 0.01C at 25±2 ℃; Discharge: 0.2C constant current discharge to cut-off voltage ≤ 2.50V at 25±2 ℃, to obtain the recovery capacity.</td>
<td>
<table>
<tr><th>Capacity</th><th>Relative Capacity</th></tr>
<tr><td>Residual capacity</td><td>≥80%</td></tr>
<tr><td>Recovery capacity</td><td>≥90%</td></tr>
<tr><td>Initial capacity</td><td>100%</td></tr>
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5.6 Environmental characteristics and safety characteristics

NO.	ITEM	CRITERION	TESTING METHOD	STANDARD
5.5.1	Vibration	No fire, No explosion, No leakage, The maximum mass loss ≤0.1%	After standard fully charge, cell shall be attached to a vibration table directly and subjected to vibration that consists of 10 Hz to 55 Hz to 10 Hz at the speed of 1Hz/min in 90~100mins.The total excursion of the vibration is 0.8mm (0.060 inches). The cell shall be vibrated in each direction along axis of the cylinder and the vertical directions of axis of the cylinder.	UL1642
5.5.2	Drop test	No fire, no explosion	The cell is charged following the standard charge method; The cells is dropped three times from a height of 1.0 m onto a concrete floor, to obtain impacts in random orientations, at 25℃ ± 2℃;Observation of 1 h.	IEC62133
5.5.3	Overcharge test	No fire, no explosion	The cell is discharged following the standard discharge method. Apply a 8.4V power supply and a 2C charge current for 24hrs.	UN38.3
5.5.4	Forced Discharge test	No fire, no explosion	Cell shall first be discharged according to standard discharge method， then the cell is subjected to a reverse charge at 1C for 90 min at 25±2°C	IEC62133
5.5.5	130℃ hot oven test	No fire, no explosion	The cell is charged following the standard charge method. After charging the cell is put in the oven. And then the oven temperature will be ramped at 5℃ per minute to 130 ℃ and held at 130 ℃ . When the temperature of the cell reach 130 ℃, the cell is maintained in the 130℃ oven for a maximum of 30 minute or until a fire or explosion is obtained, whichever comes first.	GB31241

5.5.6	Crush test	No fire、No explode	After charging a cell following the standard charge method, the cell shall be crushed between two flat surfaces. The direction of the crushing force shall be vertical to axis of the cylinder. The crushing force is to be applied by a hydraulic ram with a 32mm diameter piston. Crushing force is approximately 13 KN. Once the maximum pressure has been obtained it is to be released.	UL1642
5.5.7	Short circuit test at room temperature	No fire、No explode	Cell shall first be charged according to standard charge method, and then cell is to be short-circuited by connecting the positive and negative terminals of the cell with copper wire having a maximum resistance load of 80±20mΩ. This test is done at room temperature. Monitor the cell temperature while testing. The cell is continuously discharged until the cell case temperature has returned to be 10℃ less then peak temperature.	UL1642
5.5.8	Short circuit test at 55℃	No fire、No explode	Cell shall first be charged according to standard charge method, and then cell is to be short-circuited by connecting the positive and negative terminals of the cell with copper wire having a maximum resistance load of 80±20mΩ. This test is done at 55 ±5℃. Monitor the cell temperature while testing. The cell is continuously discharged until the cell case temperature has returned to be 10℃ less then peak temperature.	UL1642

5.5.9	Low Pressure test	No fire, No explosion, No leakage, The maximum mass loss ≤0.1%	Cell shall first be charged according to standard charge method, and then cell is to be stored at an absolute pressure of 11.6 kPa for six hours at ambient temperature.	UL1642
Note	All above safety tests will be conducted at 25℃±2℃ except where specified differently. Use proper ventilation with protective equipment			

6 Shipment

The Cell shall be shipped in voltage range of 3.50 ~ 3.80V or in accordance with customers' requirement.

The remaining capacity before charging shall be changed depending on the storage time and conditions.

7 Storage and Shipment Requirement

Item	Conditions	Permissible time
Storage environment	-20℃~ 60℃, 60% RH Max	Less than 1 month
	-20℃~ 45℃, 60% RH Max	Less than 3 months
	-20℃~ 25℃, 60% RH Max	Less than 1 year
About long time storage: If the cell needs to be stored for a long time, the cell's storage voltage should be 3.50~ 3.80V. Also, it is recommended to charge the cell every six months.		

8 Warning and cautions in handling the lithium-ion cell

Lithium-ion rechargeable cells subjected to abuse can cause damage to the cell and/or personal injury. Please read and observe the standard cell precautions below before utilization.

Note 1. The customer is required to contact us in advance, if and when the customer needs otherapplications or operating conditions not described in this document.

Note 2. We will take no responsibility for any accident when the cell is used under other conditions not described in this document.

Warnings

To prevent the possibility of the cell from leaking, heating, explosion, please observe the following precautions: (It should be indicated especially in manual or instruction for users.)

1	Do not use and leave the cell near a heat source such as fire or heater.
2	Do not use or leave the cell under the blazing sun (or in heated car by sunshine).
3	Do not use or leave the cell at very high temperature conditions (e.g., strong direct sunlight or a vehicle in

	extremely hot conditions). Otherwise, it can overheat or catch fire or its performance will be degenerate and its service life will be decreased.
4	Do not short circuit, over-charge or over-discharge the cell.
5	Don't immerse the cell in water and seawater. Please put it in cool and dry environment if no using.
6	Don't reverse the positive and negative terminals
7	Do not disassemble or modify the cell.
8	Do not transport or store the cell together with metal objects such as necklaces, hairpins, coins, etc.
9	Make sure the cell is not with conspicuous damage or deformation.
10	Don't connect the cell to an electrical outlet directly.
11	If the cell leaks and the electrolyte splashes into the eyes, rinse the eyes with clean running water immediately for at least 15 minutes, and go to hospital for treatment if necessary.
12	Mixed use of batteries of different types is not allowed.
13	Keep the cell away from babies.
14	Do not directly solder the cell and pierce the cell with a nail or other sharp object
15	Do not strike, throw or trample the cell.
16	Use the cell charger specifically for that purpose when charging.
17	Please separate cells of different electrochemical systems from one another when disposing of secondary cells.
18	Clean the terminals with a dry cloth before use if the cell terminals are dirty. Otherwise power failure or charge failure may occur due to the poor connection with the instrument.
19	Batteries should be removed from the device or charger immediately and not used again if they are over heat, give off odor, discolor or deform, or appear abnormally in any way during use, charging and storage.

20	The cell replacement shall be done only by either cell supplier or device supplier instead of the user.
21	Please tape the terminals to insulate batteries before discarding them in case of fire and explosion.
22	Do not use cells in strong electrostatic and magnetic occasions, otherwise, it can cause safety problems easily.
23	Use of damaged cells is not permitted.
24	Make sure package designing will not cause cell damages.
25	Cell packing should be conducted strictly according to level range, any misuse of different levels should not be permitted.
26	Disassembling cells from pack or module is not permitted unless under the guidance of professional technicians.

9 The restriction of the use of hazardous substances

This model of lithium-ion cell is in accordance with our company's request of

"The hazardous substances and material management standard" or customer's requirements.

10 Modification Records

Version	Change Content	Page	PIC	Date
A/00	First version	All	Xianfeng Ai	2020-4-14
A/01	5.4.2 Cycle life：constant voltage charge to cut-off current ≤ 0.05C（250 mA） 4.Cell characteristics: weight changes to ≤ 72 g	2、4	Xianfeng Ai	2020-12-3