

Specification For Lithium-ion Rechargeable Cell

Cell Type : PX18650 / 2900mAh



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| Version | A/05 | Pages | 11 |
| Approved | Checked | Designed | |
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1 preface

This specification describes the type, dimension, performance, technical characteristics, warnings and cautions of the lithium ion rechargeable cell. The specification only applies to N18650CL-29 cells supplied by POWER-XTRA GROUPE INTERNATIONAL LIMITED

2 Definition

2.1 Nominal capacity

The nominal capacity is obtained by discharging a cell at 1-hour rate to cut-off voltage 2.5 V under 25 ± 2 °C. The rated capacity is signed as Cap and uses mAh as unit.

2.2 Standard charge method

Under 25 ± 2 °C, the cell is charged to 4.2V at a constant current of 0.5C (1375 mA), and then charged constantly under the voltage of 4.2V until the current reaches 0.01C (28 mA) .

2.3 Standard discharge method

Under 25 ± 2 °C, the cell is discharged to 2.5V at a constant current of 1C (2750 mA).

3 Cell type and dimension

3.1 Description and model

Description: Cylindrical Li-ion rechargeable cell

Model: PX18650 / 2900mAh

3.2 Cell dimension

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

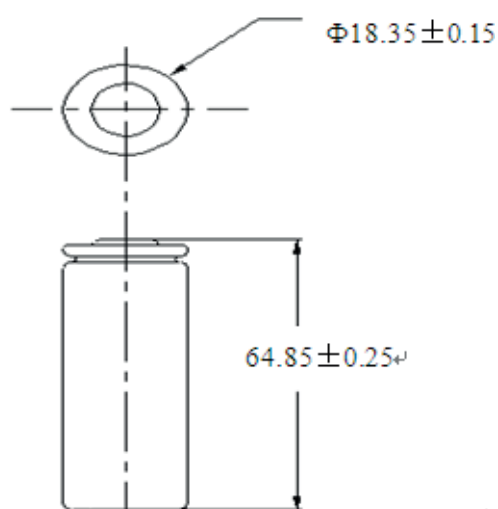


Figure 1/ 图 1

4 Cell characteristics (Unless otherwise specified, the cell is fresh cell and tested by standard charge and discharge.)

| ITEM | | SPECIFICATION |
|---------------------------|---------------------------|--|
| Capacity | Rated capacity(Minimum) | 2750 mAh @ 1 C |
| | Nominal capacity(Typical) | 2900 mAh @ 0.2 C |
| | Nominal capacity(Minimum) | 2800 mAh @ 0.2 C |
| Nominal voltage | | 3.6 V |
| Charge voltage | | 4.20 V |
| Discharge cut-off voltage | | 2.50 V |
| Energy density | | 213 Wh/Kg (1C) 225 Wh/Kg (0.2C) |
| Max charge current | | 1C (2750 mA) 25 °C (not for cycle life) |
| Max discharge current | | 3C (8250 mA) 25 °C (not for cycle life) |
| Storage temperature | | 1 year: -20~25 °C 3 months: 25~45 °C 1 month: 45~60 °C |

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| Humidity range | 0~60% RH (non-condensing) |
| Internal resistance | $\leq 35 \text{ m}\Omega$ (AC Impedance, 1000 Hz) |
| Cell dimension | Height: $64.85 \pm$ Diameter: $18.35 \pm$ |
| Weight | $\leq 48 \text{ g}$ |

5 Technical requirements

5.1 Cell usage conditions

Temperature of charge 0~45 °C

Temperature of discharge -20~60 °C

5.2 Cell testing conditions

Unless otherwise specified, all tests stated should be done under $25 \pm 2 \text{ }^\circ\text{C}$.

5.3 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 $\leq 0.5 \text{ }^\circ\text{C}$

Time measurement unit: $\pm 0.1\%$

The size measurement device: $\pm 0.1\%$

The quality measurement device: $\pm 0.1\%$

5.4 Electrochemical Characteristics (Unless otherwise specified, the cell should be fresh cell and tested by standard charge and discharge.)

| NO. | ITEM | CRITERION |
|-------|----------------|--|
| 5.4.1 | Discharge rate | Test conditions: Temperature: $25 \pm 2 \text{ }^\circ\text{C}$ |

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| | capability | <p>Charge: standard charge Discharge: CC discharge at variable values with cut-off voltage 2.5 V</p> $\frac{\text{discharge capacity at 3C}}{\text{discharge capacity at 1C}} \geq 90\% ;$ |
| 5.4.2 | | <p>Test conditions: Temperature : 25 ± 2 °C Charge: standard charge Discharge: standard discharge</p> $\frac{\text{Discharge capacity of 501th cycle}}{\text{Original discharge capacity}} \geq 90\% \text{ or}$ $\frac{\text{Discharge capacity of 1001th cycle}}{\text{Original discharge capacity}} \geq 80\%$ |
| 5.4.3 | High-Low temperature discharge performance | <p>Test conditions: Charge: standard charge Discharge: CC discharge at 1C (2750 mA) under various temperatures with cut-off voltage 2.5V (2.0 V at -20 °C)</p> $\frac{\text{discharge capacity at } -20 \text{ }^{\circ}\text{C}}{\text{discharge capacity at } 25 \text{ }^{\circ}\text{C}} \geq 70\%$ $\frac{\text{discharge capacity at } 60 \text{ }^{\circ}\text{C}}{\text{discharge capacity at } 25 \text{ }^{\circ}\text{C}} \geq 90\%$ |
| 5.4.4 | Storage performance | <p>5.4.4.1 RT Storage Performance (100% SOC) Test conditions: Charge: standard charge Stored at 25 °C for 28 days Discharge: standard discharge</p> $\frac{\text{Residual capacity after 28days storage}}{\text{Original discharge capacity}} \geq 85\%$ $\frac{\text{Recovery capacity after 28days storage}}{\text{Original discharge capacity}} \geq 90\%$ <p>5.4.4.2 High Temperature Storage Performance (100% SOC) Test conditions: Charge: standard charge</p> |

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| | | <p>Stored at 60 °C for 7 days Discharge: standard discharge after kept for 5 h at RT</p> <p>$\frac{\text{Residual capacity after 7days storage}}{\text{Original discharge capacity}} \geq 85\%$</p> <p>$\frac{\text{Recovery capacity after 7days storage}}{\text{Original discharge capacity}} \geq 90\%$</p> <p>5.4.4.3 High Temperature Storage Performance(50% SOC) Test conditions: Charge: standard charge Discharge: CC discharge at 1C (2750 mA) for 30 min Stored at 45 °C for 28 days Charge: standard charge after kept for 5 h at RT Discharge: standard discharge</p> <p>$\frac{\text{Recovery capacity after 28days storage}}{\text{Original discharge capacity}} \geq 90\%$</p> |
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5.5 Environmental characteristics and safety characteristics

| NO. | ITEM | CRITERION | TESTING METHOD |
|-------|----------------------|--|---|
| 5.5.1 | Overcharge test | No leak, no flame, no fire, no explosion | After fully charged according to the standard charge method, the cell is charged at 1C till the ending conditions: the cell voltage reaches 1.5 times of the cut-off voltage of standard charge or the 1C charge time reaches 60 min. The cell is observed for 1 h afterwards. |
| 5.5.2 | 130 °C hot oven test | No fire, no explosion | After fully charged according to the standard charge method, the cell is put in a oven at a heating speed of 5 °C per minute until the temperatures of both the cell and the oven reach 130 °C. The cell shall be maintained at 130 °C for 30 min or until a fire or explosion is obtained. |

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| 5.5.3 | Crush test | No fire, no explosion | After fully charged according to the standard charge method, the cell is crushed with a half cylinder, of which the radius is 75 mm and which is longer than the cell. The direction of the crushing force shall be vertical to axis of the cylinder. When the cell voltage reaches 0 V or the deformation extent reaches 30% or the crushing force reaches 200 kN, the test is stopped, and the cell is observed for 1 h. |
| 5.5.4 | Short circuit test | No fire, no explosion | After fully charged according to the standard charge method, the cell is short-circuited by connecting the positive and negative terminals with a copper wire for 10 min. The wire resistance shall be less than 5 mΩ. The cell is observed for 1 h after test. |
| 5.5.5 | Over discharge test | No fire, no explosion, no leak | After fully charged according to the standard charge method, the cell is discharged at 1 C for 90 min and then observed for 1 h. |
| 5.5.6 | Drop test | No fire, no explosion, no leak | After fully charged according to the standard charge method, the cell is dropped with both ends from a height of 1.5 m onto the cement floor. Afterwards, the cell is observed for 1 h. |
| 5.5.7 | Seawater immersion | No fire, no explosion, no leak | After fully charged according to the standard charge method, the cell is immersed in sea water (3.5wt% of NaCl) for 2 h. Afterwards, the cell is observed for 1 h. |

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| 5.5.8 | Thermal cycling | No fire, no explosion, no leak | <p>After fully charged according to the standard charge method, the cell is put in an oven. Then</p> <ol style="list-style-type: none"> 1. Decrease the chamber temperature from RT to -40 °C within 60 min and keep the cell under -40 °C for 90 min. 2. Raise the chamber temperature from -40 °C to 25 °C within 60 min. 3. Raise the chamber temperature from 25 °C to 85 °C within 90 min and keep the cell under 85 °C for 110 min. 4. Decrease the chamber temperature from 85 °C to 25 °C within 70 min. 5. Repeat the sequence for a further 4 cycles. <p>Afterwards, the cell is observed for 1 h.</p> |
| 5.5.9 | Low pressure | No fire, no explosion, no leak | <p>After fully charged according to the standard charge method, the cell is put at the pressure of 11.6 kPa for 6 h. Afterwards, the cell is observed for 1 h.</p> |
| Note | <p>Unless otherwise specified, all safety tests above shall be conducted in ventilated environment at 25 ± 2 °C and under protective equipment.</p> | | |

6 Package picture



Small box

big box

pallet

(100pcs cells in a small box, 2 small boxes in a big box)

7 Shipment

The Cell shall be shipped in voltage range of 3.6 ~ 3.9 V or in accordance with customers' requirement. The remaining capacity before charging shall be changed depending on the storage time and conditions.

8 Warranty

The Warranty period of cell is made according to business contract. However, even though the problem occurs within this period, PX won't replace a new cell for free as long as the problem is not due to the failure of PX manufacturing process or is due to customers' abuse or misuse.

PX will not be responsible for the trouble caused by handling in violation of cautions in instructions.

PX will not be responsible for the trouble caused by matching electric circuit, cell pack and charger.

PX will not be responsible for any defect of cells caused during assembling after acceptance.

9 Storage and Shipment Requirement

| Item | | Requirement |
|--|--------------------------------|----------------------------|
| Storage environment | Short period less than 1 month | 45 °C ~ 60 °C, 60% RH Max |
| | Long period less than 3 month | 25 °C ~ 45 °C, 60% RH Max |
| | Recommend storage | -20 °C ~ 25 °C, 60% RH Max |
| Long time storage : If the cell is stored for a long time, the cell's storage voltage should be 3.6~3.9 V. Also, it is recommended to charge the cell every six months. | | |

10 Warning and cautions in handling the lithium-ion cell

Lithium-ion rechargeable batteries 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 BAK in advance, if and when the customer needs other applications or operating conditions not described in this document.

Note 2. PX 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 battery from leaking, heating, explosion, please observe the following precautions:
(It should be indicated especially in manual or instruction for users.)

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| 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 battery 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 battery 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 battery 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 battery away from babies. |
| 14 | Do not directly solder the battery and pierce the battery with a nail or other sharp object |
| 15 | Do not strike, throw or trample the battery. |
| 16 | Use the battery charger specifically for that purpose when charging. |

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| 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 battery 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 battery 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 battery damages. |
| 25 | Battery 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. |

11 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.

12 Contact information

www.power-xtra.com

13 Version change record

| Version | Change Content | Page | PIC | Date |
|---------|--|--------------------|-----|------------|
| A/00 | | | | 2016-06-13 |
| A/01 | 3 months : -20~45 °C 1 month : -20~60 °C 0~90% RH 0~60% RH | P2, P8 | | 2017-3-29 |
| A/02 | 206Wh/Kg 213Wh/Kg ≤49g ≤48g 65.0 65.1 | P2 P3 P2, P3 | | 2017-8-4 |
| A/03 | 65.1Max 64.85±0.25; 18.50Max 18.35±0.15 | P2, P3 | | 2017-8-16 |
| A/04 | 225 Wh/Kg (0.2C) | P2 | | 2017-9-28 |
| A/05 | | P7 P8 | | 2018-5-11 |
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