

Model: TB-027070180D-Fe-25Ah

SPECIFICATION



Shenzhen topband new energy Co.,Ltd

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1、General

This product specification describes the technique standards, test methods and precaution notes of prismatic type Lithium iron phosphate rechargeable cell, manufactured by Shenzhen TOPBAND New Energy Technology CO.,LTD.

2、Product specification

| No. | item | standard | remark |
|------|----------------------------------|------------|---|
| 2.1 | Nominal Capacity | 25Ah | 25±5℃, 1C discharge |
| 2.2 | Min capacity | 24.5Ah | |
| 2.3 | Internal Impedance | ≤4mΩ | |
| 2.4 | Nominal Voltage | 3.2V | |
| 2.5 | Weight | 660±20g | |
| 2.6 | Max charge Voltage | 3.65V | At CC mode |
| 2.7 | End-of-charge Current | 0.05C | At CV mode |
| 2.8 | Cut-off discharge Voltage | 2.00V | |
| 2.9 | Standard Charge Method | 1C CC/CV | 25±5℃ |
| 2.10 | Max Continuous Discharge current | 3C | Discharge Time: 18 minutes |
| 2.11 | Max pulse Discharge Current | 5C | Discharge Time: 10 seconds |
| 2.12 | Cycle Life | 2000cycles | At room temperature 25℃; 1C Continuous Discharge and 1C continouse charge current; ≥80% SOC (100% DOD) 25±5℃ |
| 2.13 | Calendar Life | 5 years | |
| 2.14 | Charging Temperature | 0~45℃ | |
| 2.15 | Discharging Temperature | -20~55℃ | |
| 2.16 | Storage Temperature | -10~30℃ | |
| 2.17 | Terminal torsion | ≤5.5N·m | Locknut is recommended |

| | | |
|------|------------|--|
| 2.18 | Appearance | Without break, scratch, distortion, contamination, leakage and so on |
|------|------------|--|

3、 Test Conditions

3.1 Standard Test Conditions

3.1 All tests stated in this Product Specification are conducted at temperature $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$ and humidity 15%~90% RH, atmospheric pressure 86kPa~106kPa.

3.2 Standard Charge Method

The "Standard Charge" means in an ambient temperature of $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$, the cell was discharged with 1C constant discharge current to cut-off voltage 2.0 V, standing 1h. Then charged it with 1C constant current to 3.65V, then charge mode turn into CV mode, until the charging current is down to 0.05C, then end of charging and standing 1h.

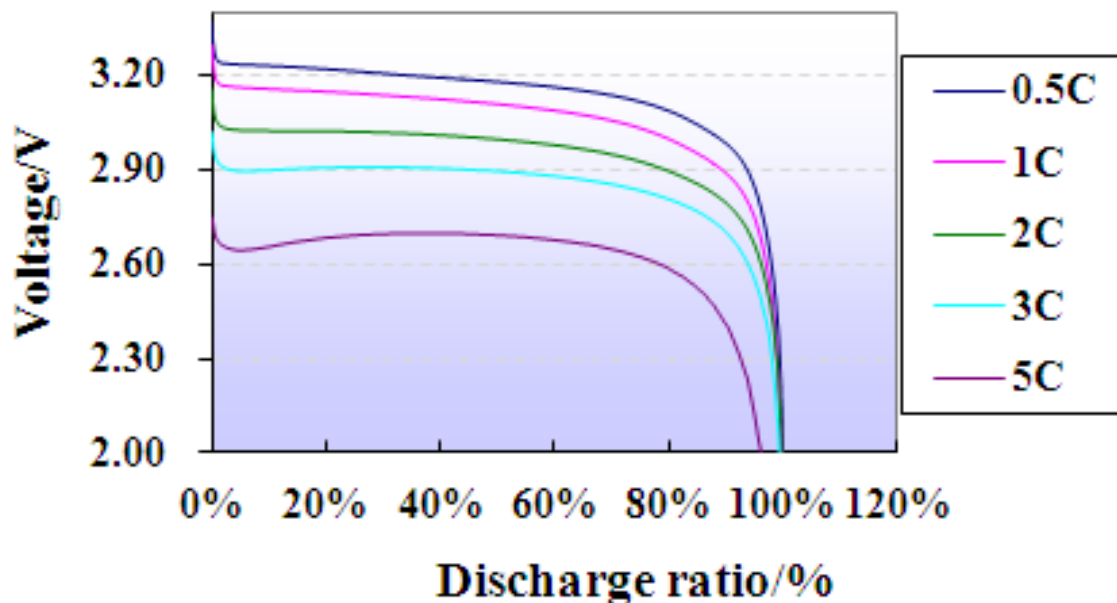
4、 Electrical Characteristics

| item | Test method | Criteria |
|--|--|--|
| 4.1 High Temperature Discharge Performance | The cell was charged in accordance with 3.2, and stored in an ambient temperature of $55^{\circ}\text{C}\pm 3^{\circ}\text{C}$ for 5h, then discharged to cut-off voltage with a constant current of 1C. After that, fetch out the cell and place it in the ambient temperature of $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$ for 4h then check its appearance. | Capacity retention at 55°C : $\geq 95\%$ |
| 4.2 Low Temperature Discharge Performance | The cell was charged in accordance with 3.2, and stored in an ambient temperature of $-20^{\circ}\text{C}\pm 3^{\circ}\text{C}$ for 24 hours, then discharged to cut-off voltage 1.8 V at a constant current of 1C. After that, fetch out the cell and place it in the ambient temperature of $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$ for 4hours, then check its appearance. | Capacity retention at -20°C : $\geq 70\%$ |
| 4.3 Rate Charge Performance in Normal Temperature | Under the ambient temperature of $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$ a. Discharged the cell with 1C constant current until the cut off voltage to 2.0V, stay for 1h. b. Charged the cells with 2C constant current until the voltage to 3.65V, stay for 1h. c. Discharged the cells with constant current until the cut off voltage 2.0V. | 2C charge capacity $\geq 80\%$ |
| 4.4 Rate Discharge Performance in Normal Temperature | The cell was charged in accordance with 3.2, then discharge to cut-off voltage 2.0V with 3C current in an ambient temperature of $25^{\circ}\text{C}\pm 5^{\circ}\text{C}$. | 3C discharge capacity $\geq 95\%$ |
| 4.5 Cycle Life ($25^{\circ}\text{C}\pm 5^{\circ}\text{C}$) | The cell was fully charged to 3.65V with 1C (cc/cv), after that stayed for 30min; Subsequently, the cell was discharged to cut-off voltage 2.0V with constant current 1C, and stayed 30 | ≥ 2000 cycles |

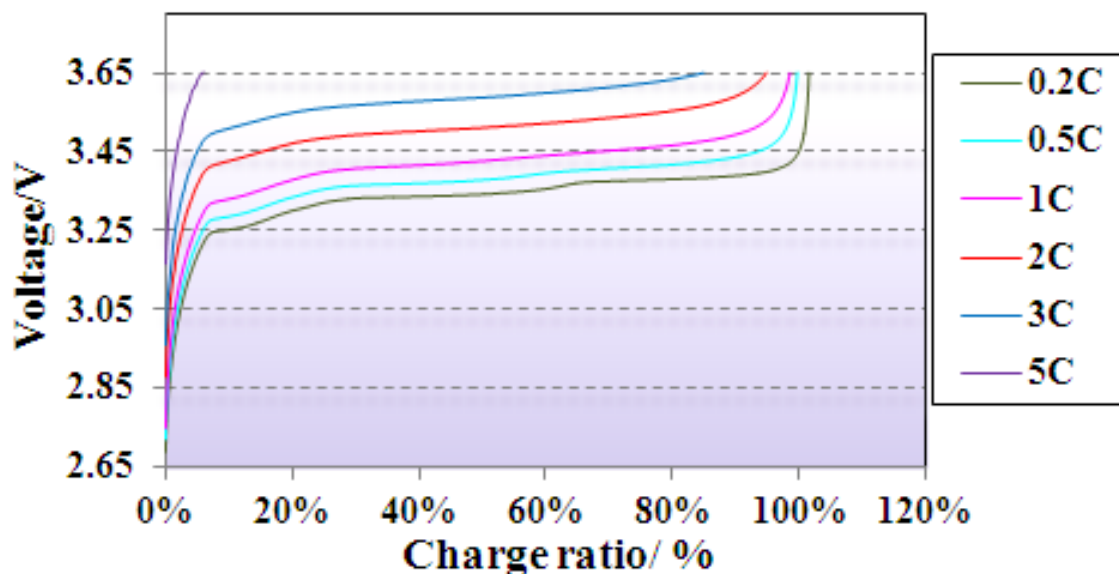
minutes; prior to next charge-discharge cycle. Record all the cycles until the retention capacity < 80%.

5. The performance test curve (for reference):

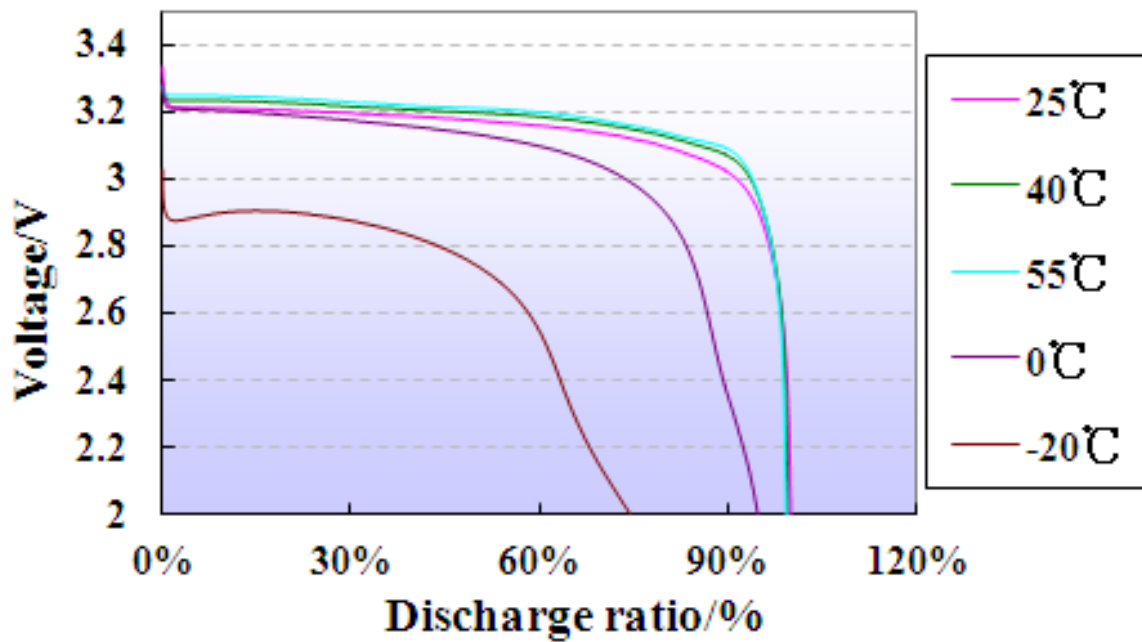
5.1. The Capacity retention at different discharge rate:



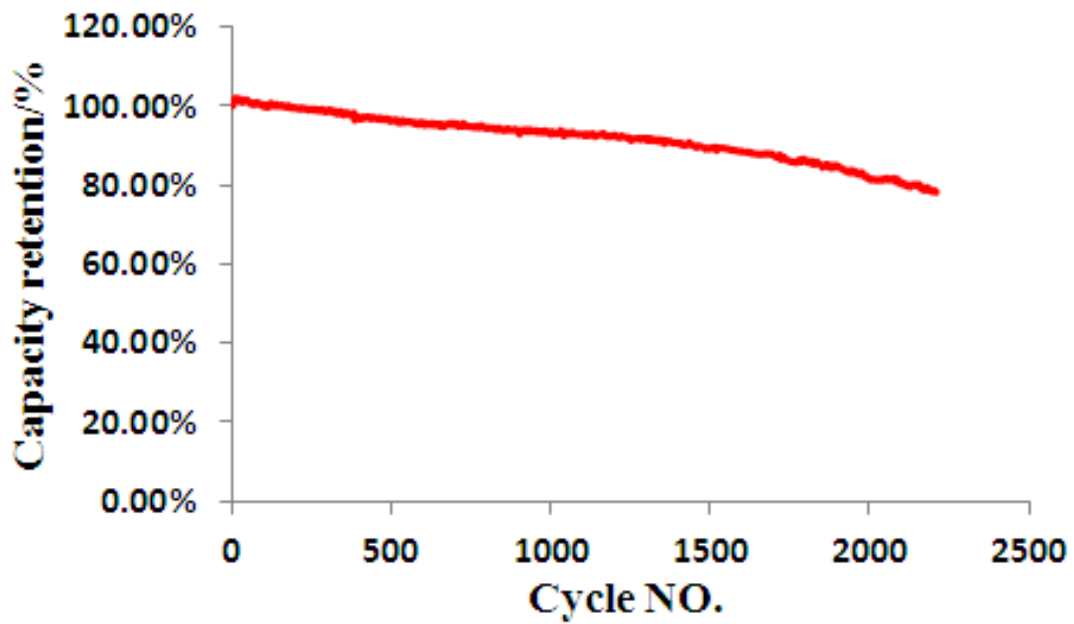
5.2. The capacity retention at different charge rate:



5.3.The discharge capacity retention at different temperature:



5.4.The capacity retention at different cycles:



6、 Environmental Characteristics

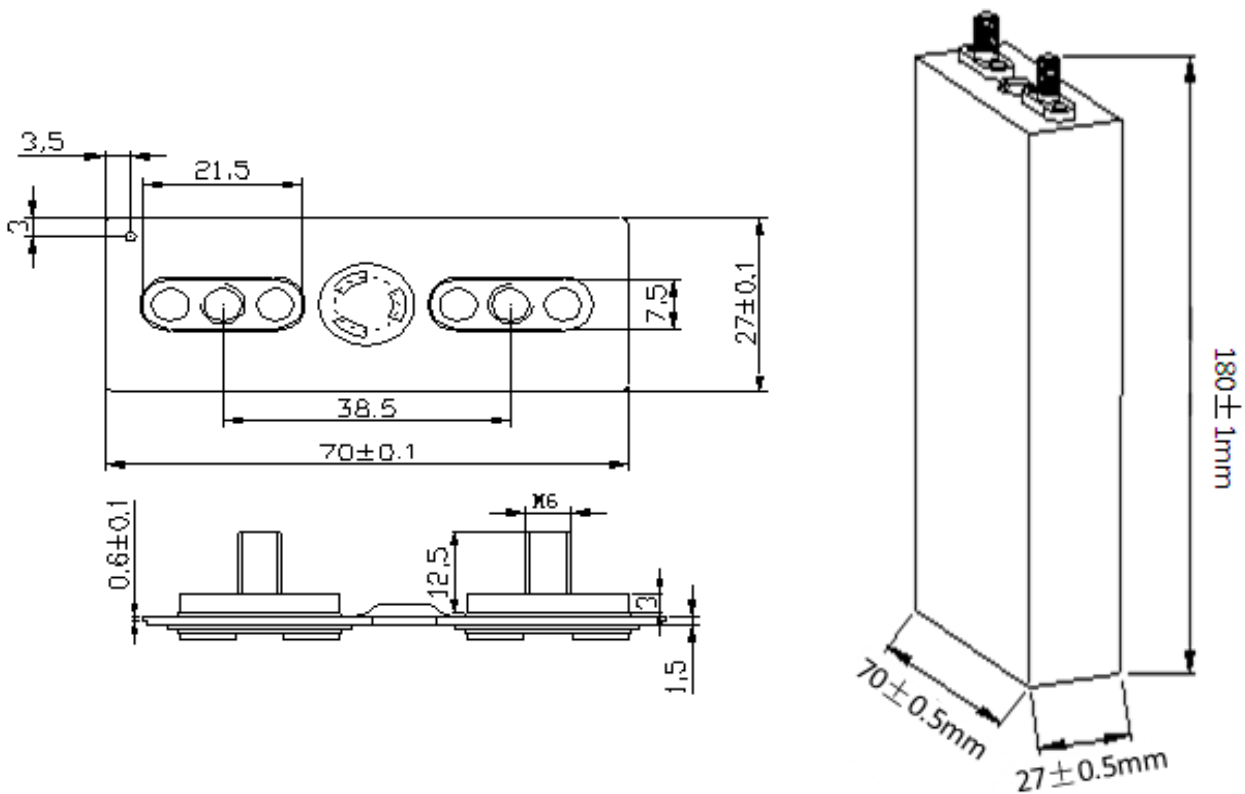
| No | Item | Test Method | Criteria | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------|------------------------|---|--|----------------------|------------------|--|----|---|---|---|-----|----|----|-------|-----|----|-----|---|----|----|-----|-------|----|----|-----|-----|----|-----|-----|---|----|----|-----|-----|--|
| 6.1 | Temperature shock test | <p>A cell is charged in accordance with 3.2, and then repeat the following procedures for 5 cycles, then check the cell's appearance.</p> <table border="1"> <thead> <tr> <th>Temperature(°C)</th> <th>Time increment (min)</th> <th>Delta time (min)</th> <th>Temperature alteration ratio (°C/Min)</th> </tr> </thead> <tbody> <tr> <td>25</td> <td>0</td> <td>0</td> <td>0</td> </tr> <tr> <td>-40</td> <td>60</td> <td>60</td> <td>13/12</td> </tr> <tr> <td>-40</td> <td>90</td> <td>150</td> <td>0</td> </tr> <tr> <td>25</td> <td>60</td> <td>210</td> <td>13/12</td> </tr> <tr> <td>85</td> <td>90</td> <td>300</td> <td>2/3</td> </tr> <tr> <td>85</td> <td>110</td> <td>410</td> <td>0</td> </tr> <tr> <td>25</td> <td>70</td> <td>480</td> <td>6/7</td> </tr> </tbody> </table> | Temperature(°C) | Time increment (min) | Delta time (min) | Temperature alteration ratio (°C/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 | No leakage, no fire, no explosion, no vent |
| Temperature(°C) | Time increment (min) | Delta time (min) | Temperature alteration ratio (°C/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 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.2 | Low-pressure Test | The cell is charged in accordance with 3.2, then stored for 6h at a vacuum of -90KPa, after that put the cell in room temperature for 6h, then check the cell's appearance. | No leakage, no fire, no explosion, no vent | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.3 | Vibration Test | <p>The cell is charged in accordance with 3.2, and then installed onto the vibration machine. Equipment parameters of frequency and amplitude are set as bellow (the frequency is to be varied at the rate of 1oct/min between 10 and 55 Hz, and repeat vibration for 30 min. The cell is tested in three mutually perpendicular directions, i.e. X,Y,Z):</p> <p>(a) frequency:10Hz~30Hz, amplitude: 0.38mm;</p> <p>(b) frequency:30Hz~55Hz amplitude: 0.19mm</p> | <p>1.No scratch, no fire, no explosion, no vent;</p> <p>2.The voltage is not less than 3.2V.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 6.4 | Shock Test | The cell is tested in accordance with 3.2, and then secured to the testing machine by means of rigid mount which supports all mounting surfaces of the cell. Each cell shall be subjected to a total of three shocks of equal magnitude. The shocks are to be applied in each of three mutually perpendicular directions. The acceleration and impulse time are as follows: acceleration of impulse peak value: 100m/s ² , shock frequency:40~80 times/min, impulse lasting time:16 min, shock times:1000±10 | <p>1.No scratch, no leakage, no fire, no explosion, no vent;</p> <p>2.the voltage is not less than 3.2V.</p> | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

7、 Safety test

All below tests are carried out on the equipment with forced ventilation and explosion-proof device. Before test, all cells are charged in accordance with 3.2, and stored 24h prior to test.

| No. | Item | Test Method | Criteria |
|-----|--------------------------------|--|-----------------------------------|
| 7.1 | Short- circuit Test | The cell was charged accordance with 3.2, after that the cell is short-circuited by connecting the positive and negative terminals with a wire for 10min, the wire has a maximum resistance load of 5mΩ., then observe for 1h. | No fire, no explosion |
| 7.2 | Overcharge Test | The cell was tested in accordance with 3.2, then 1C constant current charged till the voltage reaches 1.5 times of the specified end-off charge voltage, or the charge time reaches 1h, then stop charge, and observe for 1h. | No fire, no explosion |
| 7.3 | Over discharge test | The cell was tested in accordance with 3.2, then 1C discharge for 90min, then observe for 1h. | No fire, no explosion, no leakage |
| 7.4 | Crush Test | The cell was tested in accordance with 3.2, and then is placed on the crush machine, the axis is parallel to the crush equipment, and it is crushed between two flat surfaces till the crushing force is gradually approaching 200 kN, or voltage reaches 0V, or reaches 30% distortion, then observe for 1h. | No fire, no explosion |
| 7.5 | Impact Test | The cell was tested in accordance with 3.2, and then placed on the impact flat. A $\Phi 15.8$ mm bar is to be placed on the center of the cell. A 9.1kg weight is dropped from a height of 610mm onto the cell, the distortion is allowed. | No fire, no explosion |
| 7.6 | Stick Test | a) The cell was tested in accordance with 3.2 b) use $\phi 5$ mm $\sim\phi 8$ mm high temperature resistance steel needle, with speed of 25 \pm 5mm/s, to go through the cell from vertical direction of pole plate, the penetrate position should be close to the geometric center of plate surface, the steel needle remains in the cell; | No fire, no explosion |
| 7.7 | Heating Test(130 $^{\circ}$ C) | The cell was tested in accordance with 3.2, and then heated in a circulating air oven. The temperature of the oven is raised at a rate of 5 $^{\circ}$ C per minute to 130 $^{\circ}$ C \pm 3 $^{\circ}$ C and remain for 30 min. | No fire, no explosion |

8、Dimension



9、Shipment

The Cell shall be shipped by insulated packaging and in voltage range of 3.20~3.40 V, and 50% SOC, or in accordance with customers' requirement. The remaining capacity before charging shall depends on the storage time and conditions. To ensure the cells in a good transport environment is necessary.

10、Warranty

- 10.1. 5years warranty with 70% capacity will be subjected for this cell.(From the shipment date.)
- 10.1 This warranty is for single cells (TB-027070180D-Fe-25Ah) only, and any violation of this specification operation instruction will be out of warranty.
- 10.2 Any defective cells produced during assembly battery packs(which is over 3.2v or 25Ah) will be out of warranty.
- 10.2 Shenzhen topband new energy Co.,Ltd shall be exempt from warranty for any improper design of battery packs causing short circuit, apparent changing/damage, swell, poles broken and other abnormalities happened,
- 10.3 Shenzhen topband new energy Co.,Ltd shall not be responsible for fault occurred by handling violation of the precautions and safety instructions.

- 10.4 Shenzhen topband new energy Co.,Ltd shall not be responsible for faulty cells occurred by matching electric circuit connection, packs and charger.

11、 Precautions and Safety Instructions

Abusive use of lithium-ion rechargeable batteries would cause damage to the cell and/or personal injury. Please read the precautions and safety instructions below before using.

11.1 Standard cell precautions

- a. Do not expose the cell to extreme heat or flame.
- b. Do not short circuit, over-charge or over-discharge the cell.
- c. Do not subject the cell to strong mechanical shocks.
- d. Do not immerse the cell in water, or get it wet.
- e. Do not disassemble or modify the cell.
- f. Do not handle or store with metal objects like necklaces, coins or hairpins, etc.
- g. Do not use the cell with conspicuous damage or deformation.
- h. Do not connect cell to the plug socket.
- i. Do not touch a leaked cell directly.
- j. Do not mix the new and old Lithium-ion cell and use together.
- k. Do not expose the cell to blazing sun (or in heated car by sunshine).
- l. Keep cell away from children and pet.
- m. Do not nail into the cell, strike it by hammer or tread it.
- n. Do not impact or throw the cell.
- o. Do not direct contact the cell positive and negative electrode with aluminum case

11.2 Cell Operation Instructions

10.2.1 charging

- a. Charge the cell in a temperature range of 0°C to 45°C.
- b. Charge the cell at a constant current of 1C until 3.65V, and then at a constant voltage of 3.65V until current is 0.05C. Over 2C Charge rate is not allowed. (C : Rated Capacity of cell)
- c. Use a matched or recommend (CC/CV) lithium-ion (Li⁺) battery charger.

10.2.2 Discharging

- a. Recommended cut-off voltage is 2.0V. Recommended max continuous discharge current is 3C.
- b. For maximum performance, the cell should be discharged in a temperature range of -20°C to 55°C.

10.2.3 Storage Recommendations

- a. To protect the cell, good storage environment is necessary.
- b. In case of long period storage (more than 3 months), storage the cell at temperature range of -10°C~30°C, low humidity, no corrosive gas atmosphere.
- c. Do not press the cell.
- d. Charge and discharge every 3months is recommended, charge and discharge every 6months is obligatory.
- e. Charge and discharge steps as bellow:
in temperature of 25±5°C, 1C discharge to 2.0V, 1C CC/CV charge to 3.65V, 1C discharge to 2.0V, 1C

charge for 0.5h.

Note 1. The customer is required to contact Shenzhen topband new energy Co.,Ltd in advance, if and when the customer needs other applications or operating conditions beyond those described in this document.

Note 2. Shenzhen topband new energy Co.,Ltd shall take no responsibility for any accident when the cell is used under other conditions than those described in this specification.

12. Requirement for safety assurance

For the sake of safety assurance, please discuss with **Shenzhen topband new energy Co.,Ltd** in advance for the equipment design, cell system and protection circuit of Lithium- ion cell, high rate current, rapid charge and special applications.