

Lithium ion battery specification

Model: TB_2770145AE_20Ah_LFP

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Version	A0		

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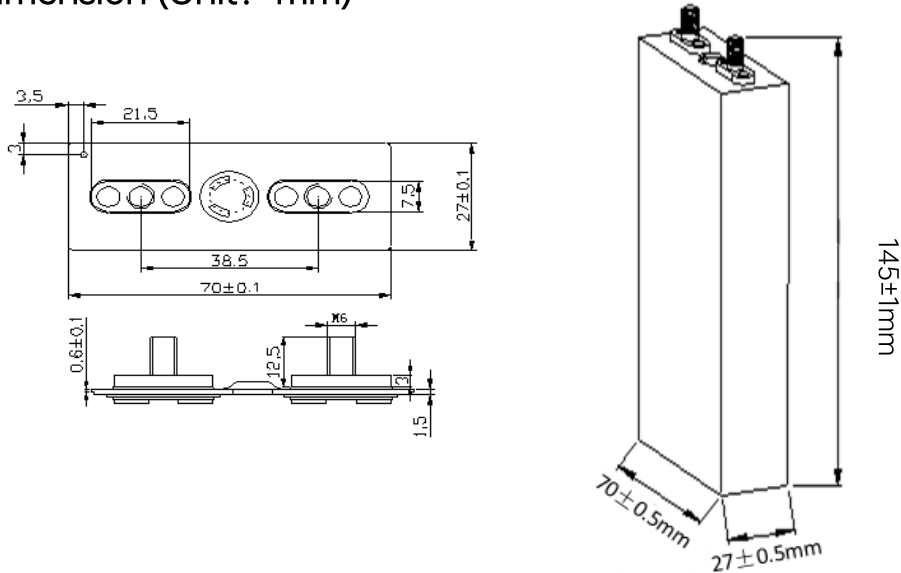
Website: www.topband.com.cn

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1、 General

This product specification describes the technique standards, test methods and precaution notes of prismatic type(Lithium ion) LiFePO_4 rechargeable cell, manufactured by Shenzhen Topband Battery Co.,Ltd.

2、 Dimension (Unit: mm)



3、 Product specification

No.	Item	Standard	Remark
3.1	Nominal capacity	20.0Ah	25±2°C, 0.5C
3.2	Min capacity	19.5Ah	
3.3	Internal impedance	≤4mΩ	25±2°C, AC 1000Hz
3.4	Nominal voltage	3.2V	
3.5	Weight	520±20g	
3.6	Voltage range	3.65 ~ 2.00V	
3.7	Recommended charge current	≤0.5C	
3.8	Recommended discharge current	≤1C	
3.9	Max continuous charge current	2C	25±5°C, SOC<80%
3.10	Max continuous discharge current	3C	25±5°C, SOC > 20%
3.11	Max pulse discharge current	5C	25±5°C, 10s, SOC≥20%
3.12	Cycle life	2500 cycles (1C, 100%DOD)	25±2°C, capacity retention≥80%
		5000 cycles (0.5C, 100%DOD)	
		7500 cycles (0.5C, 80%DOD)	
3.13	Charging temperature	0 ~ 45°C	Stop charging once the temperature of the cell exceeds the temperature

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			range
3.14	Discharging temperature	-20 ~ 55°C	Stop discharging once the temperature of the cell exceeds the temperature range
3.15	Storage temperature	-10 ~ 30°C	
3.16	Terminal torsion	≤5.5N·m	
3.17	Appearance	No break,scratch,distortion,contamination,leakage.	

4、 Test Conditions

4.1 Standard Test Conditions

4.1.1 All tests defined in this Product Specification are conducted at temperature 25±2°C, humidity 15% ~ 90%RH, atmospheric pressure 86 ~ 106kPa.

4.1.2 Unless there are other special instructions, all performance was tested with unused cells within 1 month after production date.

4.2 Standard Charge Method

The "Standard Charge" means in an ambient temperature of 25±2 °C, the cell was discharged with 0.5C constant current to cut-off voltage 2.0V, standing 1 hour. Then charged it with 0.5C constant current to 3.65V, then change into constant voltage charge mode, until the charging current down to 0.05C, then stop charging and standing 1h.

5、 Electrical Characteristics

No.	Item	Test method	Criteria
5.1	High Temperature Discharge Performance	The cell was charged in accordance with 4.2, and stored in an ambient temperature of 55±2°C for 5h, then discharged to 2.0V with 1C constant current. After that, then place the cell in the ambient temperature of 25±2°C for 4h then check its appearance.	1. Capacity retention ≥95% 2. No deformation, No crack.
5.2	Low Temperature Discharge Performance	The cell was charged in accordance with 4.2, and stored in an ambient temperature of -20±2°C for 20h, then discharged to 1.8V with 1C constant current. After that, place it in the ambient temperature of 25±2 °C for 4h, then check its appearance.	1. Capacity retention ≥60% 2. No deformation, No crack.
5.3	Rate Charge Performance in Normal Temperature	Under the ambient temperature of 25±2°C a. Discharged to 2.0V with 1C constant current, stay for 1h. b. Charged to 3.65V with 2C constant current, stay for 1h. c. Discharged to 2.0V with 1C constant current.	Capacity retention ≥80%

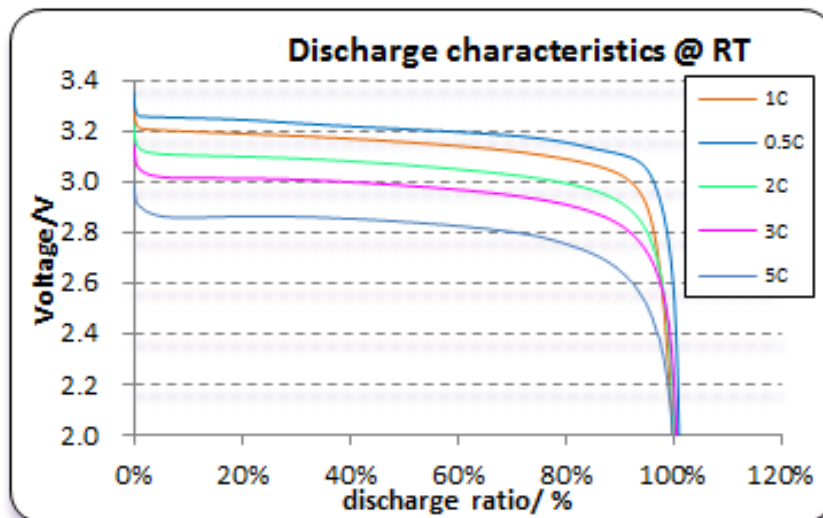
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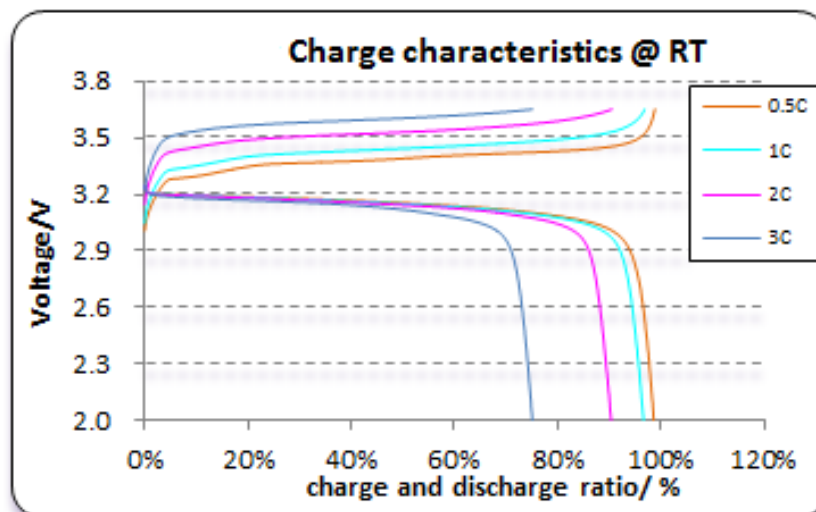
5.4	Rate Discharge Performance in Normal Temperature	The cell was charged in accordance with 4.2, then discharge to 2.0V with 3C current in an ambient temperature of $25\pm 2^{\circ}\text{C}$.	Capacity retention $\geq 90\%$
5.5	Charge Retention	The cell was charged in accordance with 4.2, and stored in an ambient temperature of $25\pm 2^{\circ}\text{C}$ for 28 days, and then discharged to 2.0V with 1C constant current.	Capacity retention $\geq 85\%$ Capacity recovery $\geq 90\%$
5.6	Cycle Life ($25\pm 2^{\circ}\text{C}$)	The cell was charged to 3.65V with 1C CC/CV cut off 0.05C, stayed for 30min; Subsequently, the cell was discharged to 2.0V with constant current 1C, and stayed for 30min; Prior to next charge-discharge cycle. Record all the cycles until the retention capacity $< 80\%$.	≥ 2500 cycles

6、The performance test curve(for reference)

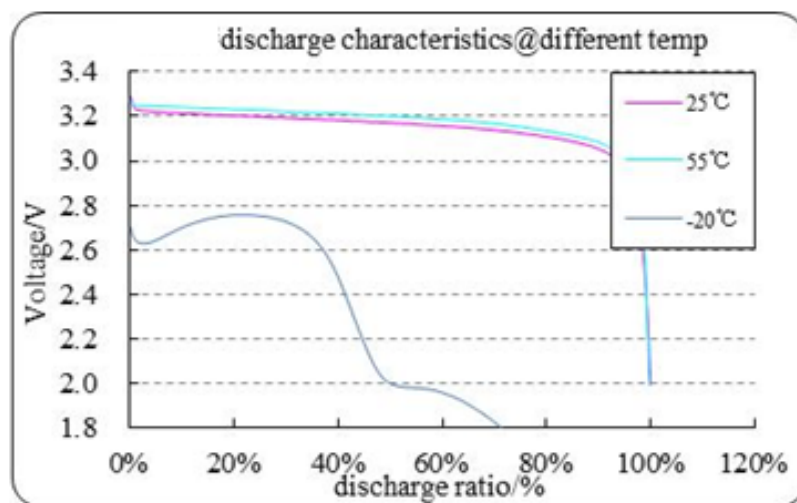
The capacity retention at different discharge rate



The capacity retention at different charge rate



The discharge capacity retention at different temperature



7、 Environmental Characteristics

No.	Item	Test Method	Criteria																																
7.1	Temperature cycle	<p>The cell was charged in accordance with 4.2, 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
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7.2	Low-pressure Test	<p>The cell was charged in accordance with 4.2, 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.</p>	No leakage, no fire, no explosion, no vent																																
7.3	Vibration Test	<p>The cell was charged in accordance with 4.2, and then installed onto the vibration machine. Equipment parameters of frequency and amplitude are set as below (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): (a) frequency: 10Hz~30Hz, amplitude: 0.38mm;</p>	1.No scratch, no fire, no explosion, no vent; 2.The voltage is not less than 3.2V.																																

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		(b) frequency:30Hz~55Hz amplitude: 0.19mm;	
7.4	Mechanical shock	The cell was tested in accordance with 4.2,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.	1.No scratch, no leakage, no fire, no explosion, no vent; 2.the voltage is not less than 3.2V.

8、 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 4.2, and stored 24h prior to test.

No.	Item	Test Method	Criteria
8.1	Short- circuit Test	The cell was charged accordance with 4.2, 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
8.2	Overcharge Test	The cell was tested in accordance with 4.2, 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
8.3	Over discharge Test	The cell was tested in accordance with 4.2, then 1C discharge for 90min, then observe for 1h.	No fire, no explosion, no leakage
8.4	Crush Test	The cell was tested in accordance with 4.2, and then compress two of the largest surface areas of the cell, the compressive force is put by a hydraulic piston with a diameter of 32 mm. The compression is continued until the pressure reaches 17.2 MPa, the pressure reaches 13 kN, and the pressure is released when the maximum pressure is reached.	No fire, no explosion

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8.5	Impact Test	The cell was tested in accordance with 4.2, and then placed on the impact flat. A $\Phi 15.8\text{mm}$ 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
8.6	Nail Test	a) The cell was tested in accordance with 4.2 b) use $\phi 5\text{mm} \sim \phi 8\text{mm}$ high temperature resistance steel needle, with speed of $25 \pm 5\text{mm/s}$, 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
8.7	Heating Test(130°C)	The cell was tested in accordance with 4.2, and then heated in a circulating air oven. The temperature of the oven is raised at a rate of 5°C per minute to $130 \pm 2^\circ\text{C}$ and remain for 30 min.	No fire, no explosion

9、Shipment

The Cell shall be shipped by insulated packaging at SOC in accordance with customers' requirement. The remaining capacity before charging shall depend on the storage time and conditions. To ensure the cells in a good transport environment is necessary.

10、Warranty

10.1 In this specification, quality assurance protocol is the main quality assurance protocol if it conflicts with the quality assurance protocol.

10.2 If customers due to abuse or misuse, Shenzhen Topband Battery Co., Ltd will not be free replacement.

10.3 Shenzhen Topband Battery Co., Ltd will not undertake any responsibility for breach of safety operation problems.

10.4 Shenzhen Topband Battery Co., Ltd shall be exempt from warranty for fault cells come from by matching electric circuit connection, other battery packs and charger.

10.5 It's out of guarantee service by Shenzhen Topband Battery Co., Ltd after customer assemble the cell (if the cell is bad in the process of assembly).

10.6 This specification was developed after consultation between the parties. For projects not included in this specification, Shenzhen Topband Battery Co., Ltd. does not undertake quality assurance.

11、Precautions and Safety Instructions

Abusive use of (lithium-ion) LiFePO_4 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.

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- 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

11.2.1 charging

- a. Charge the cell in a temperature range of 0°C to 45°C.
- b. Charge the cell at a constant current of 0.5C 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.

11.2.2 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 0°C to 35°C.

11.2.3 Storage Recommendations

- a. In case of long period storage (more than 3 months), storage the cell at temperature range of -10~+30°C, low humidity, no corrosive gas atmosphere.
- b. Charge and discharge the every 3months is recommended, charge and discharge the cell every 6months is obligatory. Charge and discharge steps as bellow:
In temperature of 25±2°C, 0.5C discharge to 2.0V, stay for 30min, 0.5C CC/CV charge to 3.65V cutoff 0.05C, stay for 30min, 0.5C discharge to 2.0V, stay for 30min, 0.5C charge to about 30%SOC.
- c. To protect the cell, good storage environment is necessary.

Note 1. The customer is required to contact Shenzhen Topband Battery 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 Battery 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 safety assurance, please discuss with Shenzhen Topband Battery Co.,Ltd in advance for your equipment design, the circuit protection of battery/cells, high rate discharge, rapid charge and other aspects of special application.