Specification Approval Sheet

Lifepo4 3.2V 2.5 Ah

Model：ANR26650M1B

Prepared by	Approved by R&D	Approved by SALES	Approved by QA
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	Signature	Date
Customer Approval		
	Company Name ：	
	Company Stamp：	

1. Scope

This document describes the Product Specification of the Lithium-iron phosphate battery supplied by BT (**Batterytalks**).

2. Model：ANR26650M1B

3. Specifications

No.	Items	Specifications
1	Nominal Voltage	3.2V
2	Nominal Capacity	2.5Ah
3	Standard Charge Current	0.2C
4	Max. Charge Current	1C
5	Continuous Discharge current	30C
6	Peak Discharge Current	60C
7	Charge Cut-off Voltage	3.9V
8	Discharge Cut-off Voltage	2.0V
9	Inner Resistance (Impedance)	(1kHz AC)≤ 6mΩ typical
10	Weight	72g
11	Dimensions	Length: 65mm Width: 26.25 mm
12	Operating Temperature	Charging: 0°C ~ 45°C Discharging: -20°C ~ 60°C (The cell surface temperature cannot exceed 70°C)
13	Storage Temperature/Humidity	Temperature: -10°C ~ +35°C Humidity:65%±20%RH (optimal store temperature of 23 ± 5°C for long term storage)
14	Cycle Life	≥2000 times (100% DOD till 80% of initial capacity at 0.2C rate, IEC Standard)

4. Cell Performance Criteria

4.1. Electrical characteristics

No.	Items	Test Method and Condition			Criteria
1	Standard Charge	Charge the cell at constant current (CC) at 0.2C and then at constant voltage (CV) at 3.65V till charge current declines to 0.05C.			N.A.
2	Rated Capacity	Capacity measured after 1 deep discharge and charge cycle: discharge at0.2C continuously till 2.0V cut-off; standard charge.			≥2500mAh
3	Cycle Life	Test condition： Temperature: 23± 5°C Charge: 0.2C CC to 3.65V, and CV to 0.05C cut off Discharge: 0.2C discharge to 2.0V Charge-Discharge cycle till 80% of rated capacity at 1C discharge of operation			≥2000 times
4	Storage Performance	Battery cell stored at 25°C with 50% SOC			
			1Month	3Month	6Month
		Capacity Retention	90%	85%	80%
		Capacity Recovery	95%	90%	85%
5	Inner Resistance (Impedance)	Internal resistance measured at AC 1KHz after 50% charge			≤6mΩ
6	Cell Voltage				3.3V ~ 3.4V

4.2. Safety Performance

No.	Items	Test Method and Condition	Criteria
1	Overcharge	Overcharge the cells at twice of the maximum charging current and twice of the maximum charge voltage for 24 hours. Observe the temperature variation during the process of the test.	No explosion No fire
2	Over Discharge	Charge:1C CC to 3.65V and CV to 0.05C cut off, Discharge the cell with 1C current for 2.5 hours.	No explosion No fire No leakage
3	Puncture Test	Charge:1C CC to 3.65V,and CV to 0.05C cut off, Standby for 1 hour, then measure OCV. Penetrate a nail vertically through the center of the cell and left for over 1h. The diameter of the nail is 2.5~3.5 mm.	No explosion No fire
4	Short test (25°C)	After the cell is standard charged to full, short the positive and negative terminals of the cell with wire resistance<30mΩ at 25°C and keep it for 4 hrs.	No explosion No fire

5	High Temperature Short test (55°C)	After the cell is standard charged to full, short the positive and negative terminals of the cell with wire resistance<30mΩ at55°C and keep it for 4 hrs.	No explosion No fire
6	Heating test (130°C)	After the cell is standard charged to full, put the cell into a heating chamber at 130°C for 10mins.	No explosion No fire

4.3. Environmental and Mechanical Test

No.	Items	Test Method and Condition	Criteria
1	Vibration Test	After standard charging the cell, vibrate it at a vibration table with frequency of 1Hz per minute between 10Hz and 55Hz, the excursion of the vibration is 1.6mm. The cell shall be vibrated for 30 minutes per axis of x, y axes.	No leakage No fire No explosion
2	Drop Test	After standard charging the cell, drop it from a height of 1.2m to concrete floor for 6 times (+/- direction on x, y axes).	No leakage No fire No explosion
3	Impact Test	After standard charging the cell, put a rod with diameter=15.8mm on the cell, and then crash the cell from a certain height (height=61.0cm) with heavy blow (weight=9.1Kg) .	No explosion No fire
4	Crush Test	After standard charging the cell, crush the cell between two flat surfaces, with a gradually increasing force till13KN. Release the cell when the force reaches the max. of 13KN. Measure the temperature.	No explosion No fire
5	Shock Test	After standard charging the cell, test it with 6 shocks/axis, 18 total, of peak acceleration of150g and pulse duration of 6 ms.	No explosion No fire No leakage

4.4. Visual inspection

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

4.5. Standard environmental test condition

Unless otherwise specified, all tests stated in this specifications are conducted under below condition:

Temperature: 23± 5°C

Humidity: 65±20% RH

5. Storage and Others

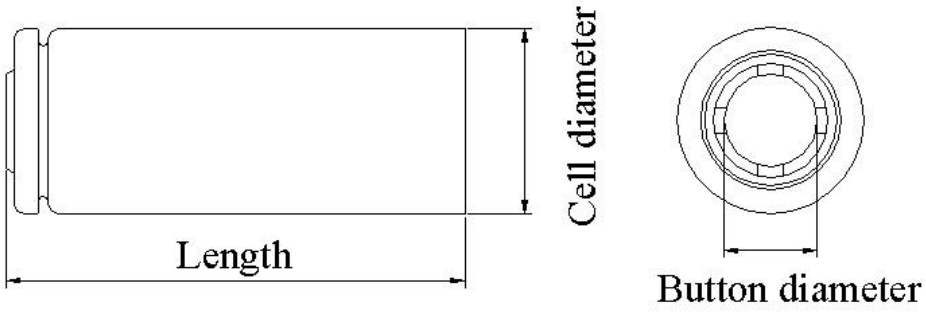
5.1. Long Time Storage

If the cell is stored for a long time, the cell's storage voltage should be3.3V ~ 3.4V and the cell is to be stored in a condition as No. 4.5.

5.2. Others

Any matters that this specification does not cover should be communicated between the customer and BT

6. Cell Drawing (unit: mm)



Cell Diameter (mm)	Cell Length (mm)
26.25	65

Handling Precautions and Guideline
For Lithium Iron Phosphate Battery

This document of 'Handling Precautions and Guideline' shall be applied to the cell manufactured by BT (**Batterytalks**).

Note (1):

It's a must for the customer to contact BT in advance when the customer uses the cells for applications or under operating conditions other than those described in this document. Additional experiments may be required to verify performance and safety under such conditions.

Note (2):

BT takes no responsibility for any accident when the cell is used under other conditions than those described in this document.

Note (3):

BT will inform, in a written form, the customer of improvement(s) regarding proper use and handling of the cell if it is necessary.

1. Charging

1.1. Charging current:

Charging current should be less than the maximum charge current specified in the Specification. Charging with higher current than recommended value may cause damage to cell electrical, mechanical and safety performance and could lead to heat generation or leakage.

1.2. Charging voltage:

Charging shall be done by voltage less than that specified in the Specification (3.65V/cell). Charging beyond 3.70V, which is the absolute maximum voltage, must be strictly prohibited. The charger shall be designed to comply with this condition. Charging at higher voltage than maximum voltage may cause damage to the cell electrical, mechanical safety performance and could lead to heat generation or leakage.

1.3. Charging temperature:

The cell shall be charged within 0°C ~ 45°C range in the Specification.

1.4. Prohibition of reverse charging:

Reverse charging is prohibited. The cell shall be connected correctly. The polarity has to be confirmed before wiring. In case of the cell is connected improperly, the cell cannot be charged. Reverse charging may cause damage to the cell which may lead to degradation of cell performance and damage the cell, which will cause heat generation or leakage.

2. Discharging

2.1. Discharging current

The cell shall be discharged at less than the maximum discharge current specified in the Specifications. Discharging at higher current than specified may result in significant reduction of capacity or over-heat.

2.2. Discharging temperature

The cell shall be discharged within -20°C ~ 60°C range specified in the Specifications.

2.3. Over-discharging

The cell may be in an over-discharged state as it self-discharges over long shelf time. Thereby, the cell must be charged periodically to keep the voltage between 3.3V and 3.4V to guard against over-discharging, which may damage the cell's overall performances. Functions to cut-off at a designated voltage and to control the recharging procedures are a must for the charger. The latter function is as follows:

The charging shall start with a trickle current (0.01C) for 15-30 minutes, i.e. pre-charging till the voltage rises to 3V, and then the stage of rapid charging follows. In case the cell voltage does not rise to 3V within the pre-charging time of 15-30 minutes, the charger shall automatically stop charging and at the same time, display the cell in abnormal state.

3. Protection Circuit Module (PCM) or Battery Manage System (BMS)

A PCM or BMS is needed to protect the cells, which usually has such functions as (1) overcharging prevention, (2) over-discharging prevention, and (3) over current prevention to maintain safety and prevent deterioration of cell performance. The over current can occur because of external short circuit.

3.1. Overcharging prohibition:

Overcharging prevention function shall stop charging when the cell reaches 3.70V.

3.2. Over-discharge prohibition:

Over-discharging prevention function shall work to avoid further drop in voltage when it touches 2.0V. It is recommended that the dissipation current of PCM shall be minimized to 0.5μA or less with the over-discharge prevention.

4. Storage

The cell shall be stored at -10°C ~ 35°C. If the cell has to be stored for a long time (Over 3 months), the environmental condition should be:

Temperature: 23 ± 5°C

Humidity: 65 ± 20%RH

The voltage for a long time storage shall be 3.3V ~ 3.4V.

5. Others

5.1. Prevention of short circuit

Enough insulation layers between wiring and the cell shall be used to maintain extra safety protection.

5.2. Prohibition of disassembly

5.2.1. Never disassemble the cell

The disassembling may generate internal short circuit in the cell, which may cause gas leakage, firing, or other problems.

5.2.2. Electrolyte is harmful

In case the electrolyte has contact with skin or eyes, flush the electrolyte away immediately with fresh water and seek medical care.

5.3. Prohibition of dumping of cell into fire

Never incinerate nor dispose the cell in fire. These may cause firing of the cells, which is very dangerous and is prohibited.

5.4. Prohibition of cell immersion into liquid such as water

The cell shall never be soaked in liquids such as water, seawater, and beverage.

5.5. Cell replacement

The cell replacement shall be done only by the supplier.

5.6. Prohibition of use of damaged cell

The cell might be damaged during shipping by shock. If any abnormal features of the cell are found such as damage or deformation of the cell housing, a smell of the electrolyte, electrolyte leakage, it shall never be used any more.

The cell with a smell of the electrolyte or leakage must be keep away from fire to avoid inflammation.