EVE Energy Co., Ltd
Product Specification

File No：LF50-73103

Version：A

Effective Date：April 29th, 2016

Product	LFP High-Capacity Battery
Model	LF50
Specification	3.2V 50Ah
Draft	
Checked	
Approved	

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Contents

History of specification

Date	Contents	Remarks
2016-4-29	First issue	A

1. Scope

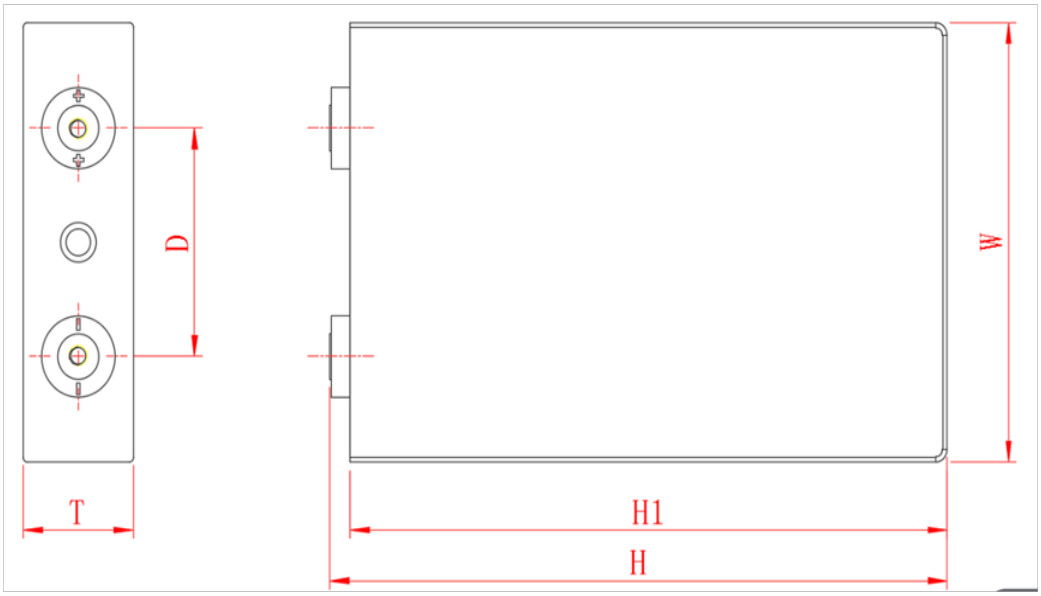
This specification is applied to LFP Battery manufactured by EVE Energy Co., Ltd.
The product can be applied to Telecommunication power supply, Storage system, etc.

2. Description and Model

2.1 Description： LFP High-Capacity Li-ion Battery with aluminum shell.

2.2 Model： LF50.

3. Drawing



Item	Parameter	Size
W	Width	135.0 ±1.0mm
T	Thickness	30.0 ±1.0mm
H	High（total include pole）	185.0 ±1.0mm
H1	High（Body）	180.0 ±1.0mm
D	Tabs Distance	67.5 ±1.0mm

Remark: The internal screw with size M6 is used in the poles. The torsion should be less than 8Nm.

4. General Technical Parameter

#	Item		Parameter	Remark
1	Typical Capacity		53 Ah	Discharge current 0.5C with 2.5V cut off. (25±3)℃
2	Minimum Capacity		50 Ah	
3	Typical Voltage		3.2V	Under 0.5CA cc-discharge
4	AC Impedance Resistance		≤1.5mΩ	50% SOC，AC 1KHz
5	Charge current（CC-CV）	Max Charge Current	1CA	0℃～45℃
		Max Impulse Current	2CA（in 30s）	
		Cut-off Voltage	3.65V	
6	Discharge	Max Discharge Current	3CA	
		Cut-off Voltage	2.5V	
7	Charging time	Standard	2.5h	Recommended value.
		Quick-charge	1.0h	
8	Recommended SOC Window		SOC：10%~90%	
9	Charging Temperature		0℃~45℃	During charge , The temperature for battery and environment should not exceed 45℃.
10	Discharging Temperature		-20℃~55℃	Battery can work at specified temperature range with capacity loss in tolerance.
11	Storage Temperature	One month	-20℃~45℃	
		One year	0℃~35℃	
12	Storage Humidity		＜70％	
13	Weight		1380g±30g	

5. Test conditions

5.1 Standard Test Conditions

Test should be conducted with new batteries within one month after shipment from our factory and the cells shall not be cycled more than five times before the test. Unless otherwise defined, test stated in this specification should be conducted at temperature of 25±3℃, humidity 45~85% and Test should be performed under atmospheric conditions with 86KPa~106KPa pressure.

5.2 Measuring Equipment

5.2.1 Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

5.2.2 Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance more than 10 MΩ

5.2.3 Impedance Meter

Impedance shall be measured by a sinusoidal alternating current method (1kHz LCR meter).

5.3 Standard Charge

The standard charge means charging the cell with charge current 0.5CA and constant voltage 3.65V at (25±3)℃, 0.05CA cutoff.

5.4 Quick Charge

The standard charge means charging the cell with charge current 1.0CA and constant voltage 3.65V at (25±3)℃, 0.05CA cutoff.

5.5 Standard Discharge

The standard charge means discharging the cell with charge current 0.5CA with 3.65V cutoff at (25±3)℃.

6. Main Performance

6.1 Electrical performance

No.	Item	Measuring Procedure	Requirements
1	Appearance	Visual inspection	Battery should be clearly marked without any defect such as breakage, leakage and oil pollution
2	Normal discharge performance	After standard charge and 1h rest, discharge to 2.5V cutoff with the current of 0.2CA, 0.5CA, 1CA respectively. Repeating 3 times, if the capacity is not qualified.	Discharge capacity/nominal capacity×100％ A）0.2CA ≥101％ B）0.5CA ≥100％ C）1CA ≥97％
3	Discharge performance at different temperatures	Standard charge at 25±3℃, and then cooling or heating to test temperature 55℃±2℃ and -20 ℃ ±2 ℃ . Discharge after the battery maintained, 5 h and 20h respectively, at test temperature with current of 0.5CA for 55℃ ±2℃ and current of 0.5CA for -20℃±2℃.	Discharge capacity/nominal capacity×100％ A)55℃≥95% （Cut off 2.5V） B)-20℃≥70% （Cut off 2.0V）
4	Charge Retention at RT	Capacity after storage for 28 days at（25±3）℃ after the standard charged, the retention is measured with discharge current 0.5CA with 2.5V cut-off at 25℃. After standard charged and 30mins rest, the recovery is measured with discharge current 0.5CA with 2.5V cut-off at 25℃.	Capacity Retention≥95％ Capacity Recovery≥97％
5	Charge Retention at High temperature	Capacity after storage for 28days at （55±2）℃ after the standard charged, the retention is measured with discharge current 0.5CA with 2.5V cut-off at 25℃. After standard charged and 30mins rest, the recovery is measured with discharge current 0.5CA with 2.5V cut-off at 25℃.	Capacity Retention≥85％ Capacity Recovery≥93％
6	cycle life	Each cycle has an interval between the standard charge and the discharge with 2.5V cut-off. Capacity after 3500 cycles.	≥80%
7	Initial Impedance	50% SOC condition，Measure the AC 1 K HZ AC impedance)	≤1.5mΩ

6.2 Safety performance

No.	Item	Measuring Procedure	Requirements
1	Over Discharge	After standard charge, discharge the battery with 1CA to cutoff 0V.	No fire、No explosion、No leakage
2	Over Charging	Charge the battery with the current of 1 CA current to 5V.	No fire、No explosion、No leakage
3	Short-Circuit Test	After standard charge, the battery is to be short-circuited with copper wire of a maximum resistance load 5mΩ for 30min.	No fire、No explosion、No leakage
4	Drop Test	After standard charge, the battery is dropped from a height of 1.5 meter twice onto concrete floor.	No fire、No explosion、No leakage
5	Heating Test	After standard charge, the battery is placed in a circulating air oven. The temperature of the oven is raised at a rate of 5±2℃/min to a temperature of 130±2℃ and then maintained 30mins.	No fire、No explosion、No leakage
6	Crush Test	After standard charge, the battery is crushed between two flat surfaces, the force with13 kN for the crushing is applied by a hydraulic ram with a 32 mm diameter piston. The crushing is continued until the pressure of 17.2 MPa is reached. The pressure is released, once the maximum pressure has been obtained.	No fire、No explosion、No leakage
7	Nail Pricking	After standard charge , Prick through the sample battery from the perpendicular direction of the battery plate with a nail having a diameter of 5mm ~ 8 mm. Steel nail remain in panels for at least 1h, until the battery cools down.	No fire、No explosion、No leakage
8	Seawater Immersion	After standard charge, a battery is fully immerged into the 3.5% NaCl solution for 2h.	No fire、No explosion、No leakage
9	Temperature cycling	After standard charge， a) batteries are placed in a test chamber with 70℃±2℃ for 12h; b) batteries are placed in a test chamber with -40℃±2℃ for 12h; Repeating the a) and b) 9 cycles, and then rest the batteries 24h under the condition of 25℃±2℃.	No fire、No explosion、No leakage

10	Low pressure Test	After standard charge, sample batteries are to be stored for 360mins at an absolute pressure of 11.6 kPa and a temperature of 25±3°C	No fire、No explosion、No leakage
11	Impact	A test sample battery is to be placed on a flat surface. A 10kg weight is dropped from a height of 1m onto sample.	No fire、No explosion、No leakage
12	Vibration	After standard charge ，The battery is to be tested in three mutually perpendicular directions. The frequency is to be varied at the rate of 1 oct /min （with 0.8mm amplitudes） between 10 and 55 Hz, and return in not less than 90 nor more than 100 min.	No fire、No explosion、No leakage

7. Transportation

Battery for shipping should be packed in boxes with the condition of half charged. The Violent vibration, impact extrusion, sun and rain should be prevented during shipping. The battery is suitable for cars, trains, ships, aircraft and other transportation vehicles.

8. Storage and other matters

8.1 Long-term storage

Batteries should be stored (more than 1 month) indoor with a dry and clean environment at 0 ℃~35 ℃. Avoiding contact with corrosive substances and staying away from fire and heat source. The battery should be charged and discharged every 6 months. The voltage for storage is between 3.20~3.31 V (30 ~ 50% SOC).

8.2 Other business

Any matters not mentioned in this specification, shall be negotiated by both parties.

9. Handling of Cells

9.1 Charging

9.1.1 Charging current

Charging current shall not exceed the maximum charging current in this specification. Otherwise it would cause the problem in charge and discharge performance, mechanical performance and safety performance.

9.1.2 Charging voltage

Charging voltage shall not exceed the maximum charging current in this specification. Otherwise it would cause the problem in charge and discharge performance, mechanical performance and safety performance.

9.1.3 Charging temperature

Batteries must be charged within the t ambient temperature range of 0 ℃~45 ℃.

9.1.4 Forbidding reverse charge

Battery should be connected correctly. It is strictly prohibited to reverse charge. Otherwise it will cause the battery scrap and produce safe hidden trouble.

9.2 Discharge

9.2.1 Discharging current

Discharge current shall not exceed the maximum charging current in this specification; Otherwise it would cause dramatically capacity loss and overheating.

9.2.2 Discharge temperature

Batteries must be discharge within the ambient temperature range of -20 ℃~55 ℃.

9.2.3 Forbidding over-discharge

Battery management system should be installed to prevent over discharge during the usage. Over discharge will cause the battery scrap and produce safety hazard. It is necessary to state that for the battery not used for a long time, it may over discharge due to the self-discharge characteristics. To prevent the occurrence of over discharge, the battery should be regularly charge and the voltage should be remained above 3.2 V.

9.3 Connection

9.3.1 Polishing the pole with abrasive paper before use, otherwise it would cause bad contact or failure.

9.3.2 It is recommended to use copper connector to connect the battery.

9.3.3 Using the specific tools, such as spanner, to connect the battery.

9.4 Announcement

Failure to observe the following precautions may result in battery leakage, overheating, explosion and/ or fire.

Warning!

1. Do not immerse the battery in water or allow it to get wet.
2. Do not strike, throw or subject the battery near a fire or in extremely hot conditions.
3. Charge with specified charge according to charging requirement
4. Do not reverse the positive (+) and negative (-) terminals.
5. Do not put the battery into a fire or apply direct heat to it.
6. Do not short-circuit the battery by connecting wires or other metal objects to the positive (+) and negative (-) terminals.
7. Do not ship or store the battery metal objects, such as necklaces, hairpins, etc.
8. Do not knock, throw, tread, bend, etc.
10. Do not directly solder the battery terminals.
11. Do not pierce the battery casing with a nail or other sharp object,

Caution!

a) Do not use or store the battery where is exposed to extremely hot, such as under window of a car in direct sunlight in a hot day. Otherwise, the battery may be overheated. This can also reduce battery performance and/or shorten service life.

a) Do not use battery in sunlight, otherwise will cause overheating, firing, or function failure, life decay;

c) If the battery leaks and electrolyte gets your skin or clothing, immediately rinse the affected area with clean running water. If left as is, skin inflammation can occur.

d) Do not use the battery if it gives off an odor, generates heat, changes color or have any problems during usage, storage and discharging.

Appendix: battery product performance curve

Fig.1 C-rate curve

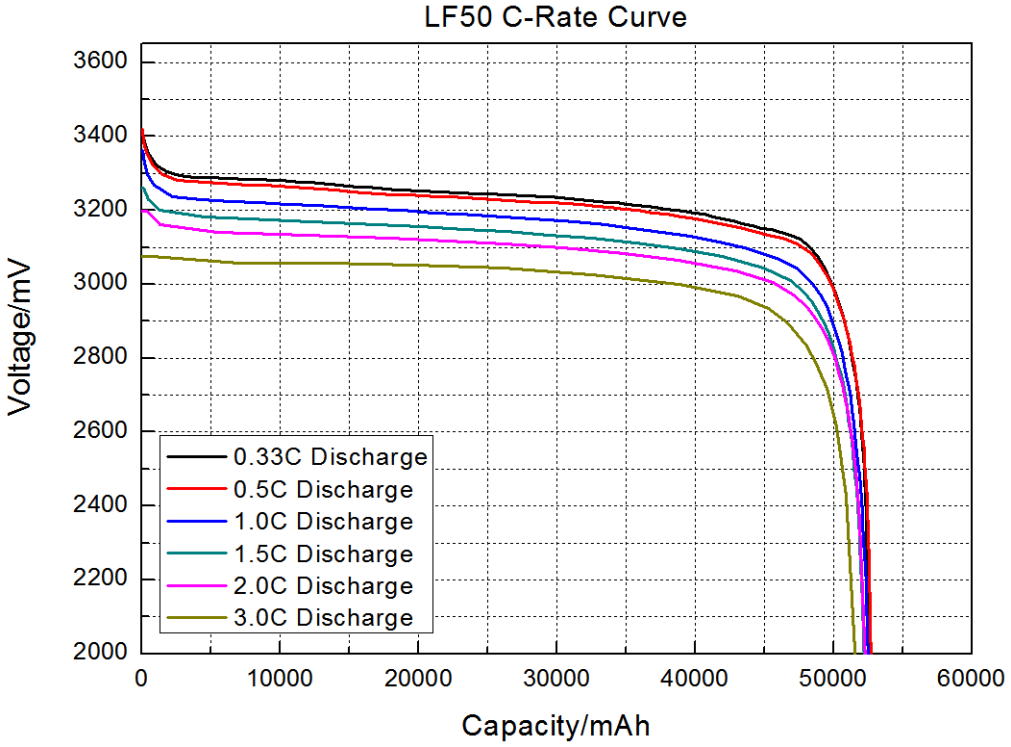


Fig.2 Different temperature discharge curve

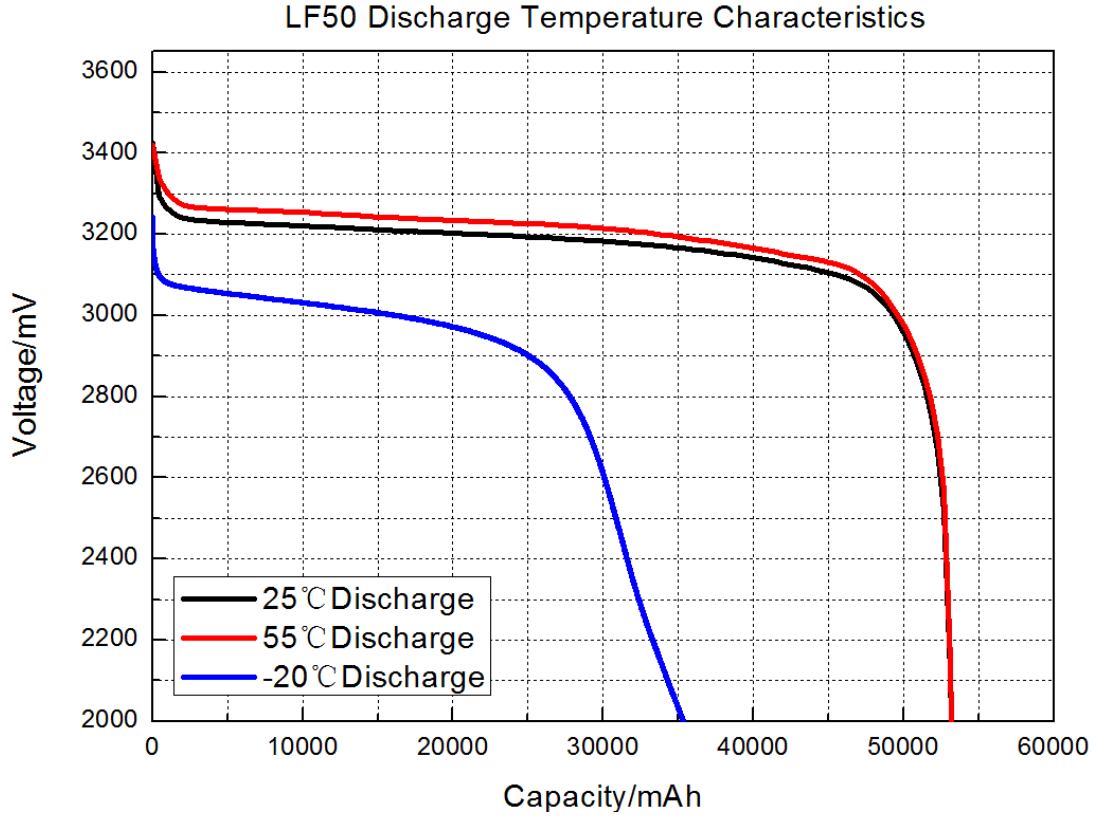


Fig.3 Cycle performance (0.5 C) curve