Model	LF154	Specification No.	RD-EVE LF154-S13-LF	Version	A

Product Specification

Prismatic Aluminum Case Lithium-ion Battery
Model: LF154

Draft	Product Design Checked	Quality Checked	Sales Checked	Approved
Li Tingting	Cheng Cheng	Li Jiaqi	Wang Yu	Yuan Ding Tin

Customer Receiving
Company Name: Approval : Date :

September 2021
Hubei EVE Power Co., Ltd

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Customer Requirements

Customers are required to write out their requirements and communicate with EVE in advance. If the customer has some special applications or operating conditions different from those described in this document,EVE can design and manufacture the product according to the customer's special requirements.

No.	Special Requirements	Standard
1		
2		
3		
4		
5		

Customer Code:_____ Signature: _____ Date:_____

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Specification Revision History

Version	Date	Content Change	Confirm Person
A	2021/9/27	A new version is released	Li Tingting

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Term Definition

- **Products:** "Products" in this specification book refers to Hubei EVE Power Limited 154Ah rechargeable prismatic aluminum case lithium ion battery.
- **Customer:** Refers to the "Hubei EVE Dynamic Limited Company products The buyer in the Contract of Sale and Sale.
- **Environmental Temperature:** The ambient temperature where the battery is located .
- **Battery Temperature :** The temperature of the battery as measured by the temperature sensor connected to the battery.
- **Magnification:** The rated capacity value of the charge/discharge current and the battery , expressed in the word C prime. For example, the battery capacity is 154Ah when charged or When the discharge current is 51.3A, the charge or discharge rate is doubled is 1/3C.
- **State of Charge:** The ratio of the state of battery capacity measured in ampere-hours or watt-hours to rated capacity in ampere-hours or watt-hours under no load, abbreviated as SOC. For example, if the state with a capacity of 154Ah is considered to be 100% SOC, then when the capacity is 0Ah, the SOC is 0%.
- **Cycle:** The battery is charged and discharged in one cycle according to the specified charging and discharging standard. Cycles consist of short periods of normal or regenerative charging and discharging processes.In the process of charging, sometimes only normal charging without regenerative charging. Discharges can be formed by a number of partial discharges combined together.
- **Standard Charging:** The charging mode described in Section 3.5 of this data sheet.
- **Standard Discharge**: The discharge mode described in clause 3.6 of this data sheet.
- **Open Circuit Voltage:** The voltage of the battery measured when no load or circuit is connected, abbreviated as OCV.
- **Direct Current Resistance:**The ratio of the voltage change of the battery under operating conditions to the corresponding current change, abbreviated as DCR, and the test method is as described in 3.8.3.8 of this data sheet.
- **Module Group:** Lithium-ion batteries are combined in series and parallel, and a single battery monitoring and management device is installed to form an intermediate product between batteries and pack.
- **Impulse Current:** The current or voltage pulse that repeats in cycles is called pulse current, and the pulse current either appears in the same direction or alternating positive and negative directions.
- **Force of Compression：** When the module is assembled, the battery can withstand the safety boundary of the compression force.

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Unit of Measurement： See the table below

No.	Unit	Shorthand	Unit Type
1	Volt	In	Voltage Unit
2	Ampere	A	Current Units
3	Ampere-hour	Ah	Capacity Units
4	Watt-hour	Wh	Energy Units
5	Ohm	Oh	Units of Resistance
6	Milliohm	mΩ	Units of Resistance
7	Degree Celsius	℃	Temperature Unit
8	Millimetre	mm	Length Unit
9	Second	s	Time Unit
10	Hertz	Hz	Frequency Units

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1. Basic Information

1.1. Scope of Application

This product specification is suitable for prismatic aluminum case lithium-ion battery produced by Hubei EVE Power Co., Ltd. .

1.2. Product Type: Prismatic aluminum lithium ion battery

1.3. Product Name: LF154

2. Battery Specifications

2.1. Battery Basic Parameters

Project		Standard	Remark
Minimum Capacity		154.0Ah	1/3C,25°C±2°C,2.50-3.65V
Minimum Energy		496.0Wh	1/3C,25°C±2°C,2.50-3.65V
Initial Internal Resistance		≤0.5mΩ	AC，1kHz，40%SOC
Nominal Voltage		3.22V	1/3C,2.50-3.65V
Battery Weight		2755±30g	
Charge Limit Voltage (U_{max}).		3.65V	
Discharge Cut-off Voltage (U_{min}).		2.50V(>0°C)， 2.00V(-30°C≤T≤0°C)	
Fast Charging Time		40min	25°C±2°C，10-80%SOC
Cycling Performance	Fast Charging Cycle at 25°C	2000 times	Fast Charge / 1C, 2.50-3.65V, 300±20kgf clip With circulation, capacity retention rate ≥ 80%.
	Fast Charge Cycle at 45°C	1500 times	Fast Charge / 1C, 2.50-3.65V, 300±20kgf clip With circulation, capacity retention rate ≥ 80%.
Operating	Charging Temperature	-20~55°C	

Temperature	Discharge Temperature	-30~55°C	
Storage Temperature	3 Months	0~45°C	Shipment SOC Status
	1 Month	-20~45°C	
Aluminum Bar Welding Parameters	Laser Welding Penetration	≤2.5mm	
	The pole is subjected to maximum pressure	900N	The pole bears maximum vertical force and does not deform
	The pole bears maximum torque	6N·m	The pole withstands maximum twisting and does not loosen
	The pole is subjected to maximum temperature	130°C	The pole column is subjected to the maximum temperature, and the plastic pad does not deform

2.2. Product Specifications

2.2.1. Dimensions, Weight Indicators

No.	Project		Standard	Test Methods Chapter
1	Size	Width (L) (including poles).	346.4±0.5mm	3.8.1
		Width (l).	341.0±0. 5mm	
		Height (H).	110.0±0.3mm	
		Thickness (T).	33.7±0.2mm（40%SOC，300kgf Pressure Thickness	
2	Weight	Weight (with blue film, top patch).	2755±30g	3.8.2

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2.2.2. Electrical Performance Indicators

No.	Project		Standard	Test Methods chapter
1	Capacity	1/3C Capacity	≥154.0Ah	3.8.3.1
		1C Capacity	≥152.0Ah	3.8.3.2
2	Energy	1/3C Energy	≥496.0Wh	3.8.3.1
		1C Energy	≥486.0Wh	3.8.3.2
3	Discharge Performance	-20°C capacity Retention	≥70%	3.8.3.3
		0°C capacity Retention	≥85%	3.8.3.4
		25°C capacity Retention	100%	/
		55 °C capacity Retention	≥95%	3.8.3.5
4	DCR	25°C,50%SOC,1C,10sec	≤1.5mΩ	3.8.3.8
5	Circulate	Fast Charging Cycle at 25°C	2000 Times, Capacity Retention Rate ≥ 80%.	3.8.3.9
		Fast Charge Cycle at 45°C	1500 Times, Capacity Retention Rate ≥ 80%.	3.8.3.10
6	Charge Retention and Capacity Recovery	25°C, 28 Days	Capacity Retention ≥ 96%.	3.8.3.11
			Capacity Recovery Rate ≥ 98%.	
		45°C, 28 Days	Capacity Retention ≥ 93%.	3.8.3.12
			Capacity Recovery Rate ≥ 97%.	

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2.2.3. Security Performance Indicators

1	Over Discharge	No fire, no explosion	3.8.4.1
2	Over Charge	No fire, no explosion	3.8.4.2
3	External Short Circuit	No fire, no explosion	3.8.4.3
4	Heating	No fire, no explosion	3.8.4.4
5	Temperature Cycling	No fire, no explosion	3.8.4.5
6	Extrusion	No fire, no explosion	3.8.4.6

2.3. Battery Drawings

See attached Figure 5.

2.4. Appearance

The battery should be free of obvious abrasions, cracks, rust, discoloration or electrolyte leakage that have an impact on the commercial value of the battery.

3. Test Conditions

3.1.Environmental Conditions

Unless otherwise specified, the test should be at a temperature of 25°C±2°C, a relative humidity of less than 10%~90%RH, and an atmospheric pressure of 86 kPa~106 kPa in the environment. The room temperature mentioned in this data sheet refers to 25°C ±2°C.

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3.2. Measuring Equipment

The accuracy of measuring instruments and meters should meet the following requirements:

(1) Voltage measuring device: ±0.1%;

(2) Current measuring device: ±0.1%;

(3) Temperature measuring device: ±0.5°C;

(4) Dimensional measuring device: ±0.01mm ;

(5) Weight measuring device: ±0.1g.

3.3. Test Fixture Preparation

The single battery needs to be fixed with a splint (material: aluminum alloy, thickness: 12mm), and the splint needs to cover the large surface of the battery, and it is used between the splints 6 M6 bolts are fixed, and all sides of the splint need to be covered with insulating film, the thickness of the insulating film is not less than 0.1mm, and the fixture fixture is shown in the figure below:

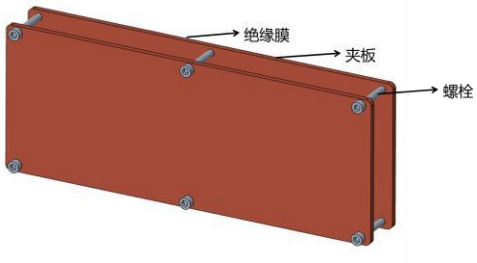

Fig. 1 Schematic diagram of the battery fixture Figure

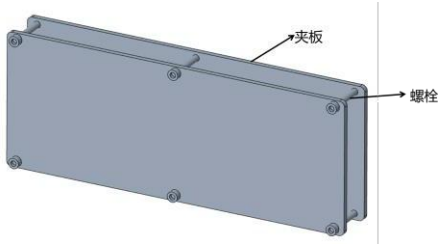

Fig.2 Battery fixture package extinct membrane diagram

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3.4. Test Fixture Installation

A battery (~40% SOC) coated with blue film (material: PET, thickness 0.11mm) and top patch (material: PC, thickness 0.3mm) is placed in the middle of the fixture for each bolt 0.35N· m of torque fixation.

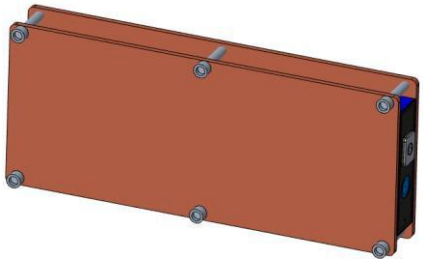

Fig. 3 Battery Hydrometry

Fig.4 Battery Axonometric Drawing

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3.5. Standard Charge Method

Standard charging is to charge the battery to 3.65V at a constant current of 51.3A at an ambient temperature of 25°C ±2°C, and then turn to constant voltage charging at 3.65V until the charging current is less than or equal to 7.7A , leave for 30min.

3.6. Standard Discharge Method

The standard discharge is that under the condition of an ambient temperature of 25°C ±2°C, the battery is discharged at a constant current of 51.3A and discharged until the voltage reaches 2.50V cut-off. Leave for 30min.

3.7. Capacity Calibration and Energy Calibration

Capacity calibration is to charge the battery according to the 3.5 standard charging method under the conditions of ambient temperature 25°C ±2°C, and then discharge according to the 3.6 standard discharge. Leave for 30min. The standard charging method and the standard discharge method are repeated 3 times, the average discharge capacity of the 3 times is 1/3C discharge capacity, and the recorded discharge capacity is the calibration capacity C0, The average discharge energy of 3 times is 1/3C discharge energy. The recorded discharge energy is the calibration energy E0.

3.8. Test Methodology

3.8.1. Size

Test equipment: caliper (width/height) flat plate thickness gauge (thickness*)

Test method:

a) Use calipers to measure battery width, height;

b) Measure the thickness of the shipped battery using a flat plate thickness gauge under test conditions: 300 sec at 1sec pressure.

*Battery thickness increases with SOC and increases with usage time, where thickness indicates the

thickness of the battery at the time of shipment (SOC ~ 4 0 at the time of shipment %）.

3.8.2. Weight

Test equipment: electronic scale;

Test method: Measure the weight of the battery using an electronic scale.

3.8.3. Electrical Properties

3.8.3.1. 1/3C Discharge Capacity and Energy

Under the condition of ambient temperature of 25°C ±2°C, the battery is fully charged according to the standard charging method (3.5), and then discharged to 2.50V at a constant current of 51.3A and set aside 30min, record the discharge capacity and discharge energy. The above charge and discharge are repeated 3 times, the average discharge capacity of 3 times is 1/3C discharge capacity C0, and the average discharge energy of 3 times is 1/3C discharge energy/E0.

3.8.3.2. 1C Discharge Capacity and Energy

Under the condition of ambient temperature of 25°C ±2°C, the battery is fully charged according to the standard charging method (3.5), and then discharged to 2.50V at a constant current of 154A and set aside 30min, record the discharge capacity and discharge energy. The above charge and discharge are repeated 3 times, the average discharge capacity of 3 times is 1C Discharge capacity C1, and the average discharge energy of 3 times is 1C discharge energy/E1.

3.8.3.3. -20°C Capacity Retention

At an ambient temperature of 25°C ±2°C, the test fixture is installed on the battery according to the method of 3.4, and then the capacity calibration (3.7 capacity calibration and energy calibration) is performed. At an ambient temperature of 25°C±2°C, the battery is fully charged according to the standard charging method (3.5), and then ± 2°C inanenvironment of -20°C2°C Leave it for 6h, discharge it to 2.00V with a constant current of 51.3A at -20°C±2 °C, and record the discharge capacity C3, discharge energy E3, C3/C0 is -20°C capacity retention rate , E3/E0 is the -20°C discharge energy ratio.

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3.8.3.4. 0°C Capacity Retention

At an ambient temperature of 25°C ±2°C, the test fixture is installed on the battery according to the method of 3.4, and then the capacity calibration (3.7 capacity calibration and energy calibration) is performed. At an ambient temperature of 25°C ±2°C, fully charge the battery according to the standard charging method (3.5), and then set aside in an environment of 0°C ±2°C 6h, discharge to 2.00V with a constant current of 51.3A in an environment of 0°C ±2°C, and record the discharge capacity C5, discharge energy E5,C5/C0 is the 0°C capacity retention rate, E5/E 0 is the 0°C discharge energy ratio.

3.8.3.5. 55 °C Capacity Retention

At an ambient temperature of 25°C ±2°C, the test fixture is installed on the battery according to the method of 3.4, and then the capacity calibration (3.7 capacity calibration and energy calibration) is performed. At an ambient temperature of 25°C±2°C, the battery is fully charged according to the standard charging method (3.5), and then set aside at 55°C ±2°C 3h, in an environment of 55°C±2°C, discharge to 2.50V with a constant current of 51.3A, record the discharge capacity C7, discharge energy E 7, C 7/C0 is the 55°C capacity retention rate, E 7/E0 is the discharge energy ratio of 55°C.

3.8.3.6. Resistance

a）At ambient temperatures of 25°C ±2°C, the shipped battery was tested at an AC 1kHz frequency.

b）At an ambient temperature of 25°C ±2°C, the battery is capacity calibrated (3.7 capacity calibration and energy calibration), and then charged according to the standard square formula (3. 5) Charge, then start with 0 The constant current discharge of 1C0 adjusts SOC to 50% and shelved for 60 m i, record the terminal voltage V1, and then discharge 10sec with a constant current of 154.0 A , record the voltage V 2 at the end of discharge, calculate DCR, DCR=(V 1-V 2) *1000/154.0 mΩ。

3.8.3.7. Fast Charging Cycle at 25°C

Upper fixture before testing: When 40% SOC at room temperature, then install the test fixture according to the method 3.4.

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Capacity test before cycle: discharge the battery to 2.50V at a constant current of 51.3A at an ambient temperature of 25°C ±2°C, sit it for 10min, and then fully charge according to the standard charging method (3.5), Then discharge according to the standard discharge method (3.6), and record the discharge capacity C0.

Cycle test: ambient temperature 25°C±2°C;

a. Charge the battery with a fast charging process (FCH) and leave it on for 30min;

b. Discharge to 2.50V at a constant current of 154 A and sit for 30min;

c. Repeat a)-b) cycles 3000 times.

Capacity test after cycle: discharge the battery to 2.50V at a constant current of 51.3A at an ambient temperature of 25°C ±2°C, sit for 30min, and then charge according to the standard (3.5 Fully charged, then discharge according to the standard discharge method (3.6), record the discharge capacity C6, capacity retention rate = C6 /C0×100 %.

3.8.3.8. Fast Charge Cycle at 45°C

Upper fixture before test: At 40% SOC at room temperature, then install the test fixture according to the method 3.4.

Capacity test before cycle: discharge the battery to 2.50V at a constant current of 51.3A at an ambient temperature of 25°C ±2°C, sit for 30min, and then fully charge according to the standard charging method (3.5), Then discharge according to the standard discharge method (3.6), and record the discharge capacity C0.

Cycle test: ambient temperature 45°C±2°C;

a. Charge the battery with a fast charging process (FCH) and leave it on for 30min;

b. Constant current discharge to 2.50V at 154A and shelving for 30min;

c. Repeat a)-b) cycles 1500 times.

Post-cycle volumetric test: The battery is set at a ambient temperature of 25°C ±2°C Discharge to 2.5V with a constant current of 51.3A and shelve Set for 10min, and then charge according to the standard square formula (3. 5) Fully charged,and then discharge according to the standard（3. 6) Discharge, record the discharge capacity C7, Capacity retention = C 7/C0×100%.

3.8.3.9. 25°C Charge Retention and Capacity Recovery

At an ambient temperature of 25°C ±2°C, the test fixture is installed according to the method 3.4,

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and then the battery is capacity calibrated (3.7 Capacity calibration and energy calibration), and then charged according to the standard method (3. 5) Charge, then leave for 28 days at ambient temperature 2 5°C ±2°C, then ambient temperature 2Under the condition of 5 °C ± 2 °C, according to the standard discharge method (3 6) Discharge (record discharge capacity C9), then follow the quasi-charging method (3 5) After charging, use the standard discharge method (3 6) Discharge (recorded discharge capacity C_{10})Capacity retention = C 9/C 0×1 0 0%, Capacity recovery rate = C_{10}/C_0×100 %.

3.8.3.10. 45°C Charge Retention and Capacity Recovery

At an ambient temperature of 25°C ±2°C, the test fixture is installed according to the method 3.4, and then the battery is capacity calibrated (3.7 Capacity calibration and energy calibration), and then charged according to the standard method (3. 5) Charge, then leave at ambient temperature 45°C±2°C for 28 days, then ambient temperature degree 25°C±2°C conditions for 6h, and then according to the standard discharge method (3 6) Discharge (record discharge capacity C11), then follow the quasi-charging method (3.5). After charging, the standard discharge method (3 6) Discharge (recorded discharge capacity C12). Capacity retention rate = C 1 1/C 0× 1 0 0%, capacity recovery rate =C_{12}/C_0×100 %.

3.8.4. Security Performance

3.8.4.1. Over Discharge

At an ambient temperature of 25°C ±2°C, fully charge the battery according to the standard charging method (2.4.3), and then install the test fixture according to method 3.4. At a safety test ambient temperature of 25±5°C, the battery was discharged at a constant current of 154.0A for 90 minutes. Observe for 1h(Refer to GB 38031-2020 Safety Requirements for Batteries for Electric Vehicles).

3.8.4.2. Over Charge

At an ambient temperature of 25°C ±2°C, fully charge the battery according to the standard charging method (2.4.3), and then install the test fixture according to method 3.4. After charging the battery to

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4.015V or 115% SOC at a constant current of 154.0A at a safety test ambient temperature of 25±5°C, charging stops. Observe for 1h. (See GB 38031-2020 Safety Requirements for Batteries for Electric Vehicles).

3.8.4.3. External Short Circuit

At an ambient temperature of 25°C ±2°C, fully charge the battery according to the standard charging method (2.4.3), and then install the test fixture according to method 3.4. At the safety test ambient temperature of 25±5°C, the positive and negative poles of the battery are short-circuited externally for 10min, and the external line resistance value should be less than 5mΩ. Observe for 1h.
(Refer to GB 38031-2020 Safety Requirements for Batteries for Electric Vehicles).

3.8.4.4. Heating (130 ° C).

At an ambient temperature of 25°C ±2°C, fully charge the battery according to the standard charging method (2.4.3), and then install the test fixture according to method 3.4. Put the battery into a temperature chamber that rises from room temperature to 130℃ ±2°C at a rate of 5°C/min, and stops heating after maintaining this temperature for 30minObserve for 1h(Refer to GB 38031-2020 Safety Requirements for Batteries for Electric Vehicles).

3.8.4.5. Temperature Cycling

At ambient temperature 25°C±2°C under the conditions, the battery is charged according to the standard method（2.4.3）Fully charge and follow 3.4 method installation testJig. Put the battery into the temperature box, which is adjusted according to the table below and the figure below, the number of cycles 5 Times.（reference GB 38031-2020 Electric vehicle Safety requirements for batteries）

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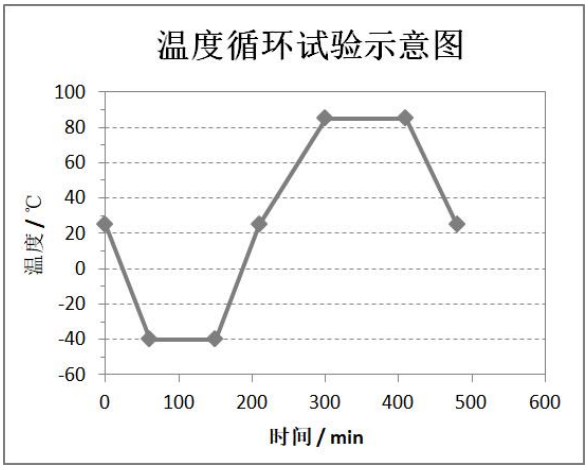
Temperature (°C).	Time Increment (min).	Cumulative Time (min).	Rate of Temperature Change (°C/min).
25	0	0	0
-40	60	60	13/12
-40	90	150	0
25	60	210	13/12
85	90	300	2/3
85	110	410	0
25	70	480	6/7



3.8.4.6. Extrusion

At an ambient temperature of 25°C ±2°C, the battery is fully charged according to the standard charging method (2.4.3). The test is carried out under the following conditions at the ambient temperature of 25±5°C

a) Extrusion direction: the battery cell is most susceptible to the same direction of extrusion in the layout of the whole vehicle;

b) Extruded plate form: semi-cylinder with a radius of 75mm, the length of the semi-cylinder (L) is greater than the size of the extruded battery cell (refer to the figure below)

c) Extrusion speed: not more than 2mm/s;

d) Extrusion degree: stop extrusion after the voltage reaches 0V or the deformation reaches 15% or the

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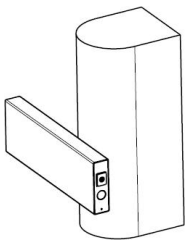
e) extrusion force reaches 100kN or 1000 times the weight of the test subject;

f) Hold for 10min. Observe for 1h(Refer to GB 38031-2020 Safety Requirements for Batteries for Electric Vehicles).



4. Charge and Discharge Parameters

4.1. Charging Mode

Parameter	Product Specifications	Condition
Standard Charging Current	1/3C	25℃±2℃
Maximum Charging Current Last	1.3C	25℃±2℃
Standard Charging Voltage	Single Battery≤ 3.85V	/
Standard Charging Mode	See 3.5	
Standard Charging Temperature	25℃±2℃	
Absolute Charging Temperature (Battery Temperature)	-20℃~65℃	Regardless of the charging mode the battery is in, charging stops as soon as the battery temperature exceeds the absolute charging temperature range
Absolute Charging Voltage	Maximum 3.85V	Regardless of the charging mode the battery is in, charging stops as soon as the battery voltage exceeds the absolute charging voltage range

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4.2. Other Charging Modes (unit: C-rate).

Battery Temperature/°C		-20	-10	0	2	5	7	10	12	15	20	25	45	48	55	60	65
SOC	0%~10%	0.02	0.02	0.05	0.2	0.4	0.4	0.8	0.8	0.8	0.8	1.3	1.0	0.7	0.5	0.2	0
SOC	10%-50%	0.02	0.02	0.05	0.2	0.4	0.4	0.6	0.6	0.6	0.6	1.3	1.0	0.7	0.5	0.2	0
SOC	50%-80%	0.02	0.02	0.05	0.2	0.2	0.2	0.4	0.4	0.4	0.4	1.0	1.0	0.7	0.5	0.2	0
SOC	80%-90%	0.02	0.02	0.05	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.5	0.5	0.5	0.3	0.2	0
SOC	90%-95%	0.02	0.02	0.05	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.1	0
SOC	95%-100%	0.02	0.02	0.05	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.2	0.1	0
SOC	100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

4.3. Discharge Mode

Parameter	Product Specifications	Condition
Standard Discharge Current	1/3C	25℃±2℃
Maximum Discharge Sustainable Current	1.3C	25℃±2℃
Discharge Cut-off Voltage	2.5V 2.0V	Temperature T>0°C Temperature T≤0°C
Standard Discharge Mode	See 3.6	
Standard Discharge Temperature	25℃±2℃	
Absolute Discharge Temperature (battery temperature)	-35℃~65℃	Regardless of the charging mode the battery is in, charging stops as soon as the battery temperature exceeds the absolute charging

		temperature range
Absolute Discharge Voltage	1.75V	Regardless of the charging mode the battery is in, charging stops as soon as the battery voltage is less than the absolute charging voltage range

4.4. Pulse Mode

4.4.1. Pulse Discharge Mode (C-rate).

60s Pulse Discharge Rate/C																				
SOC\T	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	35	40	45	50	55	60	65
100%	0.5	0.5	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	0
95%	0.5	0.5	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	0
90%	0.5	0.5	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	0
40%	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	0
30%	0.3	0.3	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	0
20%	0.2	0.2	1.0	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	0
10%	0.1	0.1	0.3	0.3	0.5	0.5	1.0	1.0	1.0	1.0	1.0	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	0
5%	0.1	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.5	0.5	0.5	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0
0%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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4.4.2. Impulse Feedback Mode (C-rate).

60s Pulse Charging Rate/C															
SOC\T	-20	-10	0	5	10	15	20	25	30	35	40	45	50	55	60	65
100%	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
95%	0.03	0.03	0.1	0.2	0.2	0.2	0.2	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.6	0
90%	0.03	0.03	0.1	0.2	0.4	0.4	0.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	0
80%	0.03	0.03	0.3	0.4	0.4	0.4	0.4	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	0
70%	0.03	0.03	0.3	0.4	0.8	0.8	0.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	0
60%	0.03	0.03	0.3	0.4	0.8	0.8	0.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	0
50%	0.03	0.03	0.3	0.4	0.8	0.8	0.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	0
40%	0.03	0.03	0.3	0.4	1.2	1.2	1.2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	0
30%	0.03	0.03	0.3	0.4	1.2	1.2	1.2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	0
20%	0.03	0.03	0.3	0.4	1.2	1.2	1.2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	0
10%	0.03	0.03	0.3	0.4	1.2	1.2	1.2	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	0
5%	0.03	0.03	0.5	0.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	0
0%	0.03	0.03	0.5	0.8	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.0	0

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5. Security Restrictions

5.1. Voltage Limit

Project	Category	Parameter	Protect Action
Charging Voltage	Charging Terminates	3.85 V	Force Stop
	Level 1 Overcharge Protection	3.70 V	Pre-alarm
	Level 2 Overcharge Protection	3.80 V	Current Reduction or Power Reduction
Discharge Voltage	Termination of Discharge	1.80 V 1.75 V	Temperature T>0 °C Forced Stop Temperature T≤0 °C Forced Stop
	Level 1 Overdischarge Protection	2.00 V 1.90 V	Temperature T>0°C Pre-alarm Temperature T≤0°C pre-alarm
	Level 2 Overdischarge Protection	1.90 V 1.80 V	Temperature T>0°C Current or Power Reduction Temperature T≤0°C Current or Power Reduction

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5.2. Temperature Limit

Project	Numeric Value	Remark
Recommended Operating Temperature Range	10°C ~45°C	The temperature range of the battery is recommended.
Maximum Operating Temperature	60°C	If the battery usage temperature exceeds the maximum operating temperature, the power needs to drop to 0.
Minimum Operating Temperature	-30°C	If the battery usage temperature exceeds the minimum operating temperature, the power needs to drop to 0.
Maximum Safety Temperature	65℃	If the battery temperature exceeds the maximum safe temperature, it will cause irreversible permanent damage to the battery, and the user shall not use it higher than the maximum safe temperature.
Minimum Safe Temperature	-35°C	If the battery use temperature exceeds the minimum safe temperature, it will cause irreversible permanent damage to the battery, and the user must not use it below the minimum safe temperature.

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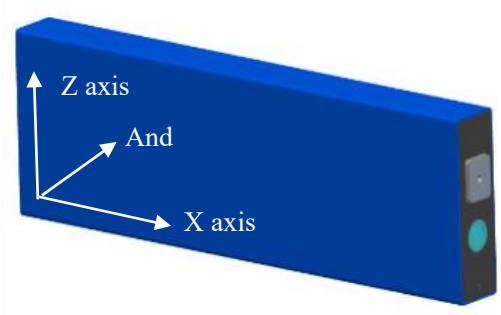
6. Module Design Parameter Recommendations

6.1. Battery Orientation



6.2. Battery Compression Force

When the module is assembled, the battery can withstand the safety boundary of the compression force. Test conditions:

-Compression area: 341.0mm×110.0mm (L×H).

-Compression speed: 0.02mm/sec

-Compression direction: Y direction

-Battery SOC: 100%.

phenomenon	Compressive force
Internal defects	30kN
Leakage	>100kN

As can be seen from the table above, the compression force of the battery must not exceed 30 kN, otherwise the battery may be damaged.

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6.3. Battery Expansion Force

6.3.1. Test Conditions:

Initial battery preload 3000N

Charge/discharge conditions:

- Charging: 51 3A constant current and constant voltage charge to 3 65V, cut-off current 7 7A （0.05C）。 Set aside 30min.

-Discharge: 51.3A constant current discharge to 2.50V. Leave for 30min.

According to the charge & discharge conditions, cycle 1500 times, and record the battery expansion force before and after the cycle.

6.3.2. Test Results:

Expansion Force	WAS	3kN
	EOL	＜ 28kN

6.4.Thermal Parameters

Test method: Reference standard: GB/T 10295-2008, ASTM E1269-2011

Average Thermal Conductivity	Thermal Conductivity (W/mK).	
	X/Z Towards	Y Towards
	18~20	1~2
Mean Heat Capacity	The Heat Capacity (kJ/kg· K))	
	0.9~1.2	

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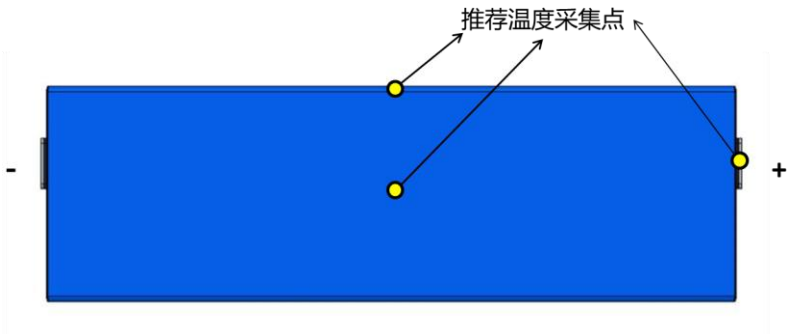
6.5. Recommended Temperature Acquisition Points (Battery Temperature Field Distribution).

When collecting the temperature on the surface of the battery, it is recommended that the temperature collection points be arranged at the positive pole column, the center of the large surface and the center of the side, as shown in the figure below.



7. Battery Operating Instructions and Precautions

7.1. Product End-of-life Management

The battery life is limited, and the customer should establish an effective tracking system to monitor and record the internal resistance and capacity of the battery during each use period. The measurement method and calculation method of internal resistance and capacity need to be discussed and agreed by both parties between the customer and Hubei EVE Power Co., Ltd. When the internal resistance of a battery in use exceeds 150% of the original internal resistance of the battery or the capacity is less than 70% of the nominal capacity (25°C), the battery should be stopped. Violation of this requirement will exempt Hubei EVE Power Co., Ltd. from the product quality assurance responsibility according to the product sales agreement and this specification.

7.2. Long-term Storage

After the battery is charged, it needs to be used as soon as possible to avoid loss of usable capacity due to self-discharge. If storage is required, the battery needs to be stored in a low SOC state. The recommended storage conditions are: 40%±10% SOC, 0~25°C, ≤60%RH.

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7.3. Transport

The shipment of the product should be carried out in boxes under no more than 40% SOC . During transportation, severe vibration, shock or extrusion, sun and rain should be avoided. It is suitable for transportation by car, train, ship, plane and other means of transportation.

7.4. Operating Instructions

- Reverse charging is prohibited. Properly connect the positive and negative poles of the battery, reverse charging is strictly prohibited.
- Overdischarge is prohibited. During normal use of the battery, in order to prevent the occurrence of overdischarge, the battery should be charged regularly to maintain the voltage at 2.50V above.
- It is strictly forbidden to immerse the battery in water, and when not in use, it should be placed in a cool and dry environment.
- It is forbidden to place the battery next to hot and high-temperature sources, such as fire, heaters, etc.
- When charging, please use a special charger for lithium-ion batteries.
- During use, it is strictly forbidden to turn the positive and negative poles of the battery upside down.
- It is forbidden to leave the battery on fire or heat the battery.
- It is forbidden to directly turn on the positive and negative electrodes of the battery with metal.
- It is forbidden to transport or store batteries with metals such as hairpins, necklaces, etc.
- It is forbidden to knock or throw, step on and bend the battery, etc.
- It is forbidden to weld the battery directly.
- It is forbidden to pierce the battery with nails or other sharp objects.
- Do not use batteries in extremely hot environments, such as direct sunlight or in a car on hot days.
- It is forbidden to use it in places with strong static electricity and strong magnetic fields.
- If the battery leaks, the electrolyte splashes on the skin or clothing, the affected area should be washed immediately with running water.
- If the battery has peculiar smell, heat, discoloration, deformation or any abnormality during use, storage and charging, it shall not be used.

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7.5. Disclaimer

If the product demand unit does not use in accordance with the provisions in this manual, causing social impact and affecting the reputation of Hubei EVE Power Co., Ltd., Hubei EVE Power Co., Ltd. will investigate the responsibility of the product demand unit. According to the degree of impact on Hubei EVE Power Co., Ltd., the product demand unit shall provide compensation to Hubei EVE Power Co., Ltd.

7.6. Other

Any matters not mentioned in this specification shall be determined through consultation between the parties.

8. Contact

Address: No. 68, Jingnan Avenue, High-tech Zone, Jingmen Economic Development Zone, Hubei Province, Hubei EVE Power Co., Ltd. Tel: 86-0724-6079699
Fax: 86-0724-6079688
Website: http://www.evejg.com

9. Drawings: LF154 Battery Drawings

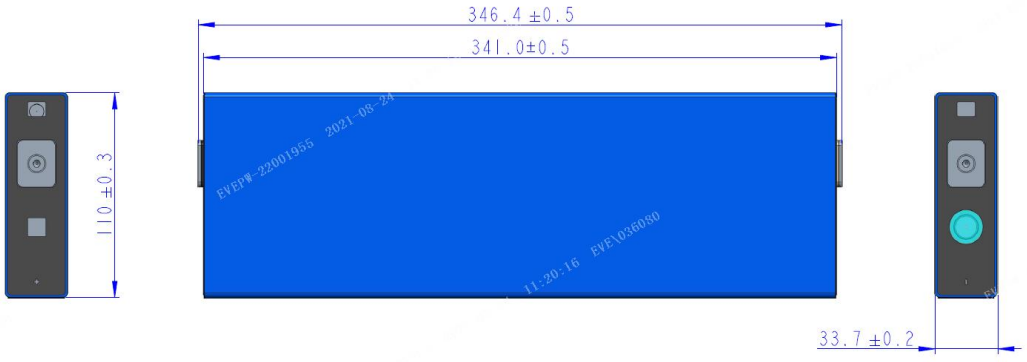

Figure 5. LF154 battery