TEST REPORT
EN IEC 62619
Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for secondary lithium cells and batteries, for use in industrial applications

Report Number. .....:	TSZ24KU024A02-01
Date of issue .....:	2024-11-13
Total number of pages.....:	26 Pages
Applicant's name.....:	Chengdu Greenfaith New Energy Technology Co., Ltd.
Address .....:	Room 4008, Building 3, 88 Jitai 5th Road, High-Tech Zone, Pilot Free Trade Zone, Chengdu, Sichuan, P.R.China
Test specification:	
Standard .....:	EN IEC 62619:2022

General disclaimer:

The test results presented in this report relate only to the object tested.

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Test item description .....:	LiFePO4 Battery(Li-ion)
Trade Mark(s).....:	LVFU
Manufacturer.....:	Same as applicant
Model/Type reference .....:	LFF51280
Ratings .....:	51.2V, 280Ah, 14.34kWh

Testing Laboratory:	Shenzhen Tiansu Calibration and Testing Co., Ltd.	
Testing location/ address ..... :	No.2, Jinlong Avenue, Longgang District, Shenzhen, Guangdong, China	
Tested by (name, function, signature) ..... :	Leon Gong /Test engineer	Leon Gong
Reviewed by (name, function, signature) .. :	Dick Ye /Reviewer	Dick Ye
Approved by (name, function, signature) .. :	Duan Jiangtao /Technical director	Duan Jiangtao

SHENZHEN TIANSU CALIBRATION AND TESTING CO.,LTD. Report Seal

List of Attachments (including a total number of pages in each attachment): N/A	
Summary of testing:	
Tests performed (name of test and test clause): 7.2.3 Drop test (cell or cell block, and battery system) 8.2.2 Overcharge control of voltage (battery system) 8.2.3 Overcharge control of current (battery system) 8.2.4 Overheating control (battery system) Cell (Model: LF280K) were CB approved according to lEC 62619:2022, Certificate No.: JPTUV-147819, Report No.: CN23O0C7 001	**Testing location:** Shenzhen Tiansu Calibration and Testing Co., Ltd. No.2, Jinlong Avenue, Longgang District, Shenzhen, Guangdong, China
The product fulfils the requirements of IEC 62619:2022.	

Copy of marking plate:

The artwork below may be only a draft.

LVFU	
Product name	LiFePO4 Battery(Li-ion)
Model	LFF51280
IFpP/73/174/208/[16S]M/-10+50/90	
Parameter	Nominal Voltage:51.2Vd.c.
	Rated Capacity: 280Ah
	Rated Energy: 14.34kWh
positive /negative electrode	Red/ black
Recommended Charge	CC/CV 200A of 57.6V, Cutoff
	current 14A
Date of manufacture	241017
Code	LC241017F600001
注意事项（WARNING）:	
B100	
2.Wait at least 5 minutes after power off before proceeding.	
3. Must be grounded before operation	
4.disposal of batteries should follow local regulations.	



Test item particulars.....:	
Classification of installation and use.....:	To be defined in final product
Supply Connection.....:	DC connector
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object does not meet the requirement.....:	F (Fail)
Testing.....:	
Date of receipt of test item .....:	2024-10-28
Date (s) of performance of tests.....:	2024-11-01 to 2024-11-09

General remarks:

"(See Enclosure #)" refers to additional information appended to the report.

"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Name and address of factory (ies) .....: Same as applicant

General product information and other remarks:

The battery of model LFF51280 is composed of sixteen lithium-ion cells (16S1P), and equipped with overcharge, overdischarge, overcurrent, and short circuit protection circuits.

	Cell	Battery
Model	LF280K	LFF51280
Rated capacity(Ah)	280	280
Nominal voltage(V)	3.2	51.2
Recommended Charge Current(A)	140	140
Maximum Charge Current(A)	280	200
Recommended Discharge Current(A)	140	140
Maximum Discharge Current(A)	280	200
Maximum Charge Voltage(V)	3.65	57.6
End-of-discharge Voltage(V)	2.5	43.2
Charge temperature Range(°C)	0~65	0~55
Discharge temperature Range(°C)	-20~65	-20~60
Nominal mass(kg)	5.42±0.3	139.5±3
External dimensions(mm)	72±0.5*207±0.5*173.7±0.5	541±1.2*316±1.2*882±1.2

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
4	**PARAMETER MEASUREMENT TOLERANCES**		P
	Parameter measurement tolerances		P

5	**GENERAL SAFETY CONSIDERATIONS**		P
5.1	**General**		P
	Cells and batteries are safe under conditions of both intended use and reasonably foreseeable misuse... :	Clause 6, Clause 7, 8.1, and 8.2. See also table 5.1 for Critical components information	P
	Reduce the risk of injuries from moving parts		P
5.2	**Insulation and wiring**		P
	Voltage, current, altitude, and humidity requirements		P
	Adequate clearances and creepage distances between connectors and live parts at different voltages or between live parts and non-current-carrying accessible parts		P
	Protect from hazardous live parts, including during installation		P
	The mechanical integrity of internal connections		P
5.3	**Venting**		P
	Pressure relief function		P
	Encapsulation used to support cells within an outer casing		P
5.4	**Temperature/voltage/current management**		P
	The design prevents abnormal temperature-rise		P
	Voltage, current, and temperature limits of the cells		P
	Specifications and charging instructions for equipment manufacturers		P
5.5	**Terminal contacts of the battery pack and/or battery system**		P
	Polarity marking(s)		P
	Polarity marking not provided for keyed external connector		N/A
	Capability to carry the maximum anticipated current		P
	External terminal contact surfaces		P
	Terminal contacts are arranged to minimize the risk of short circuits		P
5.6	**Assembly of cells, modules, or battery packs into battery systems**		P
5.6.1	General		P
	Independent control and protection method(s)		P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	Recommendations of cell operating limits, mounting advice, storage conditions and other design recommendations by the cell manufacturer		P
	Batteries designed for the selective discharge of a portion of their series connected cells		N/A
	Protective circuit component(s) and consideration to the end-device application		P
5.6.2	Battery system design		P
	The voltage control function		P
	Maximum charging/discharging current of the cell are not exceeded		P
5.7	**Operating region of lithium cells and battery systems for safe use**		P
	The cell operating region..... :	See Page 4.	P
	Designation of battery system to comply with the cell operating region		P
5.8	**System lock (or system lock function)**		N/A
	Non-resettable function to stop battery operation		N/A
	Manual with procedure for resetting of battery operation		N/A
	Emergency battery final discharge		N/A
5.9	**Quality plan**		P
	Manufacturing quality plan (for example: ISO9001, etc.) prepared and implemented..... :	The manufacturer supplies a self-declaration document.	P
	The process capabilities and the process controls		P
6	**TYPE TEST CONDITIONS**		P
6.1	**General**		P
6.2	**Test items**		P
	Cells or batteries that are not more than six months old (See Table 1 of IEC 62619)		P
	Capacity confirmation of the cells or batteries		P
	Default ambient temperature of test, 25 °C ± 5 °C		P
7	**SPECIFIC REQUIREMENTS AND TESTS**		P
7.1	**Charging procedure for test purposes**		P
	The battery discharged to a specified final voltage prior to charging		P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	The cells or batteries charged using the method specified by the manufacturer..... :	Battery Pack: 140A CC (Constant current) charge to 57.6V, then CV (constant voltage 57.6V) charge till charge current decline to 14A	P
7.2	**Reasonably foreseeable misuse**		P
7.2.1	External short-circuit test (cell or cell block)	Cell evaluated only.	N/A
	Short circuit with total resistance of 30 m ± 10 m at 25 °C ± 5 °C		N/A
	Results: no fire, no explosion		N/A
7.2.2	Impact test (cell or cell block)	Cell evaluated only.	N/A
	Cylindrical cell, longitudinal axis impact		N/A
	Prismatic cell, longitudinal axis and lateral axis impact		N/A
	Results: no fire, no explosion.		N/A
7.2.3	Drop test (cell or cell block, and battery system)		P
7.2.3.1	General		N/A
7.2.3.2	Whole drop test (cell or cell block, and battery system)	Cell evaluated only.	P
	Description of the Test Unit..... :		—
	Mass of the test unit (kg)..... :		—
	Height of drop (m)..... :		—
	Results: no fire, no explosion		N/A
7.2.3.3	Edge and corner drop test (cell or cell block, and battery system)		P
	Description of the Test Unit..... :	Battery Pack	—
	Mass of the test unit (kg)..... :	140.280	—
	Height of drop (m)..... :	0.025	—
	Results: no fire, no explosion		P
7.2.4	Thermal abuse test (cell or cell block)	Cell evaluated only.	N/A
	Results: no fire, no explosion		N/A
7.2.5	Overcharge test (cell or cell block)	Cell evaluated only.	N/A
	For those battery systems that are provided with only a single protection for the charging voltage control		—
	Results: no fire, no explosion..... :		N/A
7.2.6	Forced discharge test (cell or cell block)	Cell evaluated only.	N/A
	Cells connected in series in the battery system ..... :		N/A
	Redundant or single protection for discharge voltage control provided in battery system ..... :		N/A

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	Target Voltage ..... :		N/A
	Maximum discharge current of the cell, Im..... :		N/A
	Discharge current for forced discharge, 1.0 It ..... :		N/A
	Discharging time, t = (1 It / Im) x 90 (min.) ..... :		N/A
	Results: no fire, no explosion..... :		N/A
7.3	**Considerations for internal short-circuit – Design evaluation**		N/A
7.3.1	General		N/A
7.3.2	Internal short-circuit test (cell)	Cell evaluated only.	N/A
	Samples preparation procedure: In accordance with Clause A.5 and A.6 of IEC 62133-2:2017		N/A
	Tested per 7.3.2 b) in an ambient temperature of 25 °C ± 5 °C.		N/A
	The appearance of the short-circuit location recorded by photograph or other means .....:		—
	The pressing was stopped - When a voltage drop of 50 mV was detected; or		N/A
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) was reached		N/A
	Results: no fire..... :		N/A
7.3.3	Propagation test (battery system)		N/A
	Method to create a thermal runaway in one cell ... :		N/A
	Results: No external fire from the battery system, no battery case rupture ..... :		N/A

8	**BATTERY SYSTEM SAFETY (CONSIDERING FUNCTIONAL SAFETY)**		P
8.1	**General requirements**		N/A
	Functional safety analysis for critical controls		N/A
	Conduct of a process hazard analysis for both the cell manufacturing process and the battery system manufacturing process		N/A
	Conduct of risk assessment and mitigation of the battery system		N/A
8.2	**Battery management system (or battery management unit)**		P
8.2.1	Requirements for the BMS		P
	The safety integrity level (SIL) target of the BMS		N/A
	The charge control evaluated by tests in clauses 8.2.2 to 8.2.4		P
8.2.2	Overcharge control of voltage (battery system)		P

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	The exceeded charging voltage applied to the whole battery system		P
	The exceeded charging voltage applied to only a part of the battery system, such as the cell(s) ..... :		N/A
	Results: no fire, no explosion ..... :	See Table 8.2.2.	P
	The BMS terminated the charging before exceeding the upper limit charging voltage		P
8.2.3	Overcharge control of current (battery system)		P
	Results: no fire, no explosion ..... :	See Table 8.2.3	P
	The BMS detected the overcharging current and controlled the charging to a level below the maximum charging current		P
8.2.4	Overheating control (battery system)		P
	The cooling system, if provided, was disconnected		N/A
	Elevated temperature for charging, 5 °C above maximum operating temperature ..... :	60°C	P
	Results: no fire, no explosion ..... :	See Table 8.2.4	P
	The BMS detected the overheat temperature and terminated charging		P
	The battery system operated as designed during test		P

9	**EMC**		N/A
	Battery system fulfil EMC requirements of the end-device application ..... :		N/A

10	**INFORMATION FOR SAFETY**		N/A
	The cell manufacturer provides information about current, voltage and temperature limits of their products		N/A
	The battery system manufacturer provides information regarding how to mitigate hazards to equipment manufacturers or end-users.		N/A

11	**MARKING AND DESIGNATION (REFER TO CLAUSE 5 OF IEC 62620)**		P
	The marking items shown in Table 1 in IEC 62620 indicated on the cell, battery system or instruction manual.		P
	Cell or battery system has clear and durable markings		P
	Cell designation		N/A

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
	Battery designation		P
	Battery structure formulation		P

12	**PACKAGING AND TRANSPORT**		N/A
	Refer to Annex D		N/A

ANNEX A	**OPERATING REGION OF CELLS FOR SAFE USE**		P
A.1	General		P
A.2	Charging conditions for safe use		P
A.3	Consideration on charging voltage		P
A.4	Consideration on temperature		P
A.5	High temperature range		P
A.6	Low temperature range		P
A.7	Discharging conditions for safe use		P
A.8	Example of operating region		P

ANNEX B	**PROCEDURE OF 7.3.3 PROPAGATION TEST BY LASER IRRADIATION**		N/A
B.1	**General**		N/A
B.2	**Test conditions**		N/A
B.2.1	Cell test (preliminary test)		N/A
	The cell fully charged according to the manufacturer recommended conditions ..... :		—
	Laser irradiation point on the cell ..... :		—
	Output power of laser irradiation..... :		—
	Tested in an ambient temperature of 25 °C ± 5 °C		N/A
	Repeat of cell test for 3 times		N/A
B.2.2	Battery system test (main test)		N/A
	The battery system fully charged according to the manufacturer recommended conditions ..... :		—
	Target cell to be laser irradiated ..... :		—
	The irradiation point on the target cell same or similar as that on the cell test		
	Output power of laser irradiation..... :		—
	Tested in an ambient temperature of 25 °C ± 5 °C		N/A

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict
ANNEX C	**PROCEDURE OF 7.3.3 PROPAGATION TEST BY METHODS OTHER THAN LASER**		N/A
C.1	General		N/A
C.2	Test conditions:		N/A
	– The battery fully charged according to the manufacturer recommended conditions ..... :		—
	– Target cell forced into thermal runaway ..... :		—
	– A specially prepared sample (e.g. a heater or a hole for nail penetration provided) used for ease of testing..... :		—
C.3	Method used for initiating the thermal runaway. 1) Heater (Heater, Burner, Laser, Inductive heating 2) Overcharge 3) Nail penetration of the cell 4) Combination of above methods 5) Other methods..... :		—

ANNEX D	**PACKAGING AND TRANSPORT**		N/A
	The materials and pack design chosen in a way as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants		N/A
	Regulations concerning international transport of secondary lithium batteries		N/A

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

5.1	TABLE: Critical components information				N/A
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Cell	EVE Power Co., Ltd.	LF280K	3.2V, 280Ah, 896wh	IEC 62619: 2022	Ref. Certif. No. JPTUV-147819 Report No.: CN23O0C7 001
Supplementary information: Some of the above information cannot be reflected due to customer trade secrets					

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

7.2.1	TABLE: External short-circuit test (cell or cell block)				N/A
Sample No.	**Ambient (at 25°C ± 5°C)**	**OCV at start of test (V dc)**	**Resistance of Circuit (mΩ)**	**Maximum Case Temperature Rise ΔT (°C)**	**Results**
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--

Supplementary information:

A – No fire or Explosion
B – Fire
C – Explosion
D – The test was completed after 6 h
E – The test was completed after the cell casing cooled to 20% of the maximum temperature rise
F – Other (Please explain):___

7.2.5	TABLE: Overcharge test (cell or cell block)					N/A
Sample No.	**OCV at start of test (V dc)**	**OCV at end of test (V dc)**	**Measured Maximum Charging Current (A)**	**Measured Maximum Charging Voltage (V dc)**	**Max. Cell Case Temperature, (°C)**	**Results**
--	--	--	--	--	--	--
--	--	--	--	--	--	--
--	--	--	--	--	--	--

Supplementary information:

Results:
A – No fire or Explosion
B – Fire
C – Explosion
D – Test concluded when temperature reached a steady state condition
E – Test concluded when temperature returned to ambient
F – Other (Please explain): _____

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

7.2.6	TABLE: Forced discharge test (cell or cell block)				N/A
Sample No.	**OCV before applying reverse charge, (V dc)**	**Target Voltage (V dc)**	**Measured Reverse Charge Current It, (A)**	**Total Time for Reversed Charge Application (min)**	**Results**
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--

Supplementary information:

Results:
A – No fire or Explosion
B – Fire
C – Explosion
D – Other (Please explain): ___

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.2	TABLE: Internal short-circuit test (cell)			N/A
Sample No.	**OCV at start of test, (V dc)**	**Particle location [1)]**	**Maximum applied pressure, (N)**	**Results**
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--
--	--	--	--	--

Supplementary information:

Identify one of the following**:**

1: Nickel particle inserted between positive and negative (active material) coated area.

2: Nickel particle inserted between positive aluminium foil and negative active material coated area.

Results:

A – No fire or explosion
B – Fire
C – Explosion
D – Test concluded when 50 mV voltage drop occurred prior to reaching force limit
E – Test concluded when 400 N pressure was reached and 50 mV voltage drop was not achieved
F – Test was concluded when fire or explosion occurred
G – Other (Please explain): __

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.3	TABLE: Propagation test (battery system)				N/A
Sample No.	**OCV of Battery System Before Test, (V dc)**	**OCV of Target Cell Before Test, (V dc)**	**Maximum Cell Case Temperature, (°C)**	**Maximum DUT Enclosure Temperature, (°C)**	**Results**
--	--	--	--	--	--
--	--	--	--	--	--
--	--	--	--	--	--

Method of cell failure [1)]	**Location of target cell**	**Area for fire protection (m^2)**
--	--	--
--	--	--
--	--	--

Supplementary information:

1) Cell can be failed through laser exposure, applied heat, overcharge, nail penetration or combinations of these failures or other acceptable methods. See supporting documentation for details on cell failure method

2) If the battery system has no outer covering, the manufacturer is required to specify the area for fire protection.

Results:
A – No fire external to DUT enclosure or area for fire protection or no battery case rupture
B – Fire external to DUT enclosure or area for fire protection
C – Explosion
D – Battery case rupture
E – Other (Please explain): __

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

8.2.2	TABLE: Overcharge control of voltage (battery system)				P
Sample No.	**OCV at start of test for Cell/Cell Blocks, (V dc)**	**Maximum Charging Current, (A)**	**Max. Charging Voltage, (V dc)**	**Max. Voltage of Cell/Cell Blocks, (V dc)**	**Results**
B01#	Min 2.975	200	57.537	3.630	A, D, F

	Charge Voltage Applied Battery System: 1)	
	Whole	**Part**
	64.24V	--

Supplementary information:

The exceeded voltage can be applied to only a part of the system such as the cell(s) in the battery system per Figure 6 of IEC 62619, if it is difficult to do it in using the whole battery system.

Results:
A – No Fire or Explosion
B – Fire
C – Explosion
D – The voltage of the measured cells or cell blocks did not exceed the upper limit charging voltage
E – The voltage of the measured cells or cell blocks did exceed the upper limit charging voltage
F – All function of battery system did operate as intended during the test.
G – All function of battery system did not operate as intended during the test.
H – Other (Please explain): ___

8.2.3	TABLE: Overcharge control of current (battery system)			P
Sample No.	**OCV at start of test, (V dc)**	**Max. Charging Current, (A)**	**Max. Charging Voltage, (V dc)**	**Results**
B01#	48.278	240	52.085	A, D, F

Supplementary information:

Results:
A – No fire or Explosion
B – Fire
C – Explosion
D – Overcurrent sensing function of BMU did operate and then charging stopped
E – Overcurrent sensing function of BMU did not operate and then charging stopped
F – All function of battery system did operate as intended during the test.
G – All function of battery system did not operate as intended during the test.
H – Other (Please explain): ____

IEC 62619			
Clause	Requirement + Test	Result - Remark	Verdict

8.2.4	TABLE: Overheating control (battery system)		P
Model No.	**OCV at start(SOC 50%) of test, V dc**	**Maximum Charging Current, A**	**Maximum Charging Voltage, V dc**
B01#	53.394	140	55.371
Maximum Specified Temperature of Battery System, °C		**Maximum Measured Cell Case Temperature, °C**	**Results**
55		58.0	A, D, F

Supplementary information:

Results:
A – No fire or Explosion
B – Fire
C – Explosion
D – Temperature sensing function of BMU did operate and then charging stopped
E – Temperature sensing function of BMU did not operate and then charging stopped
F – All function of battery system did operate as intended during the test.
G – All function of battery system did not operate as intended during the test.
H – Other (Please explain): ____

Circuit Diagram

Peoduct protective cicuit module

The circuit shematic and layout and BMS. infoemation cannot be reflected due to customer’s business secrets

Product Photo

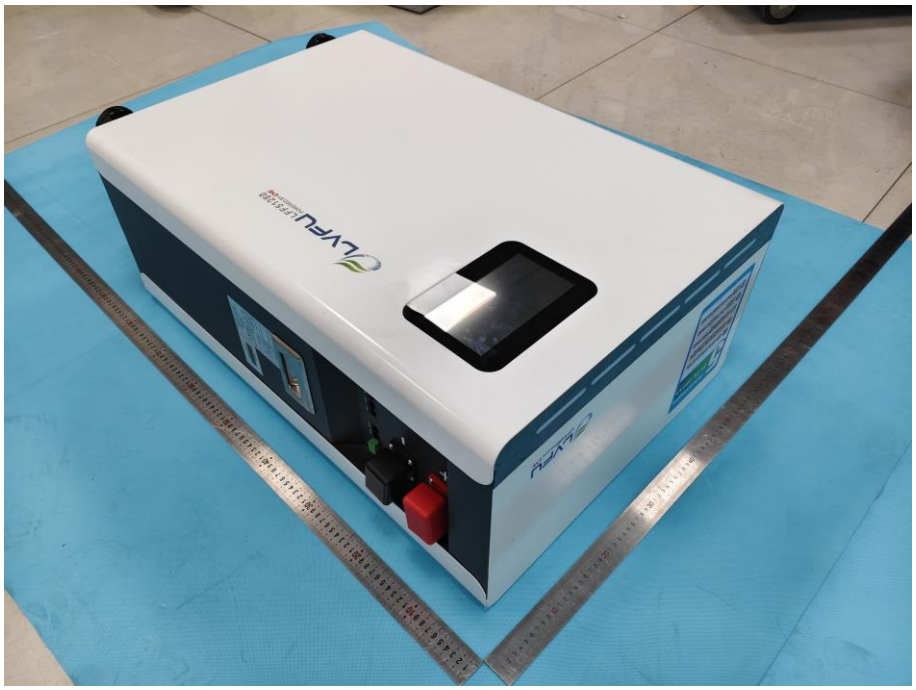


Figure 1 Front view of battery Pack



Figure 2 Back view of battery Pack



Figure 3 Internal view of battery Pack

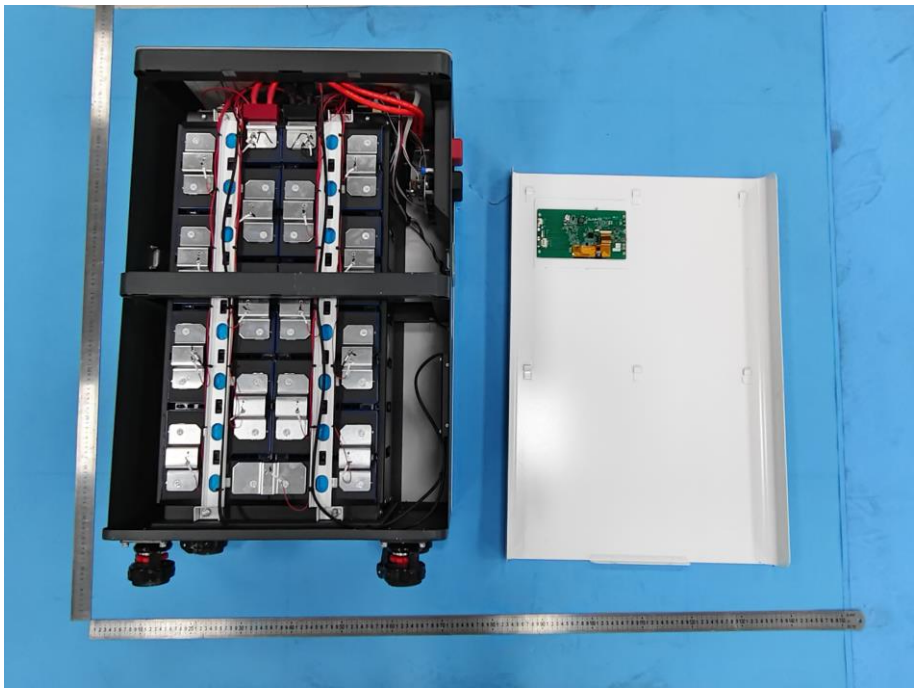


Figure 4 Internal view of battery Pack

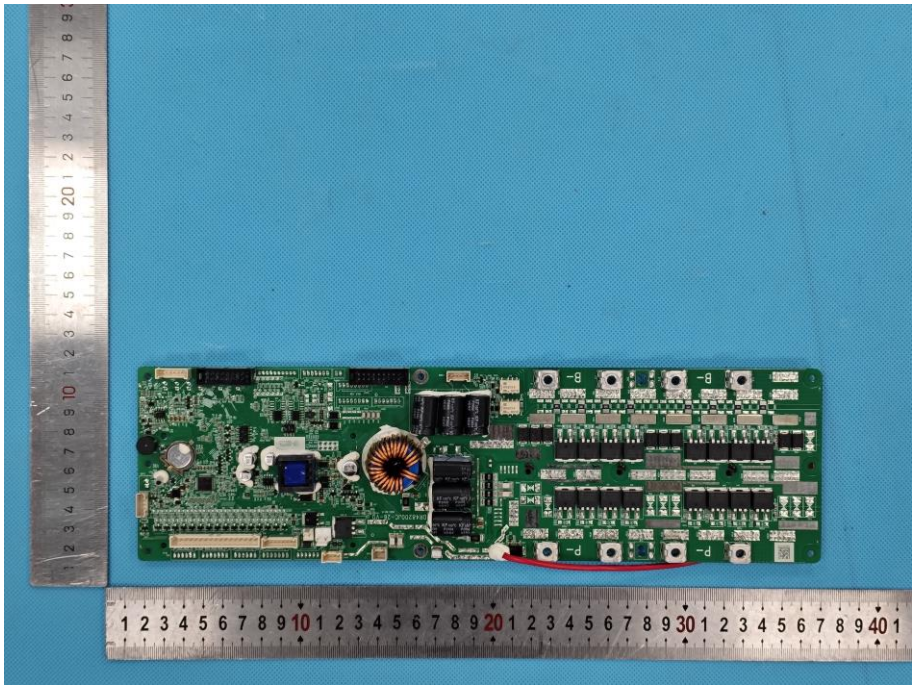


Figure 5 Front view of PCB

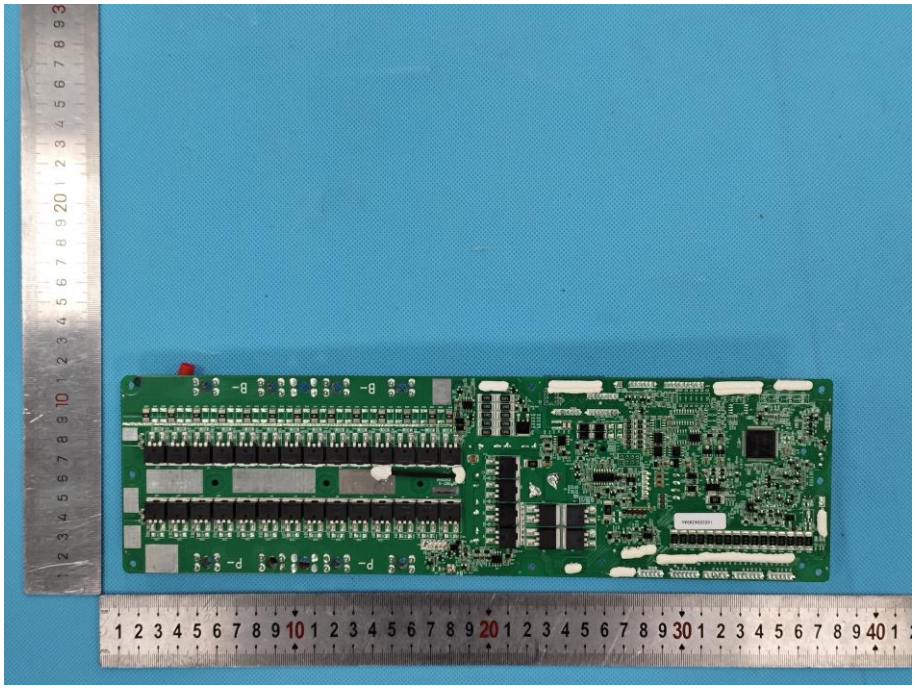


Figure 6 Back view of PCB

Product Photo

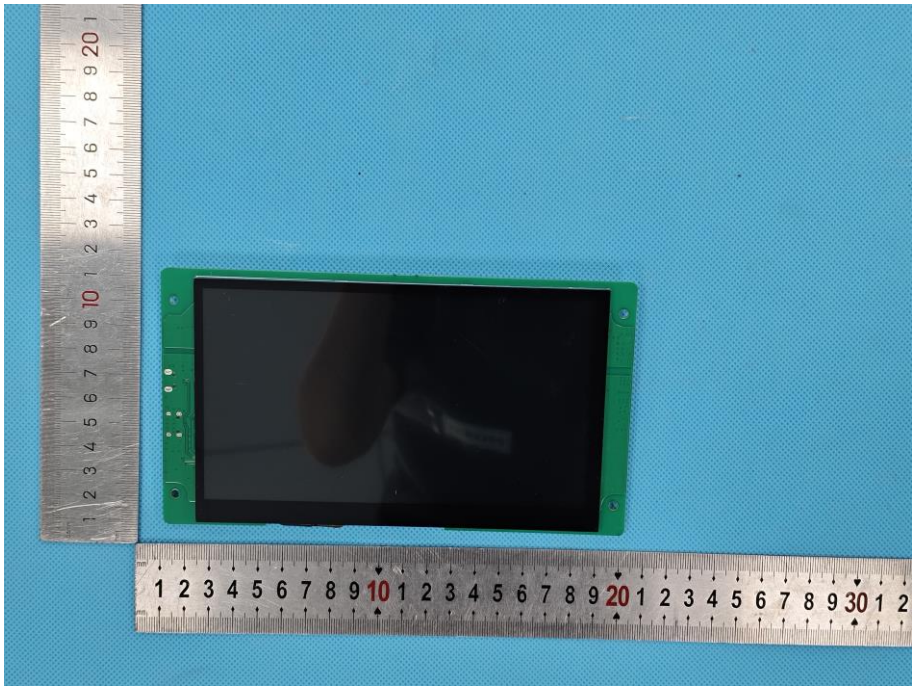


Figure 7 Front view of Display screen

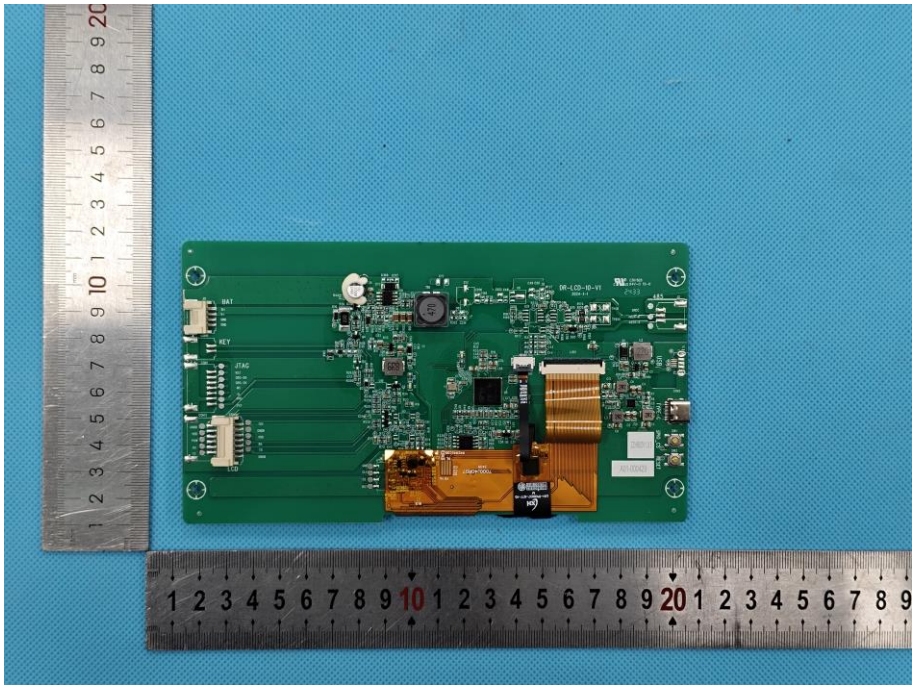


Figure 8 Back view of Display screen

Product Photo

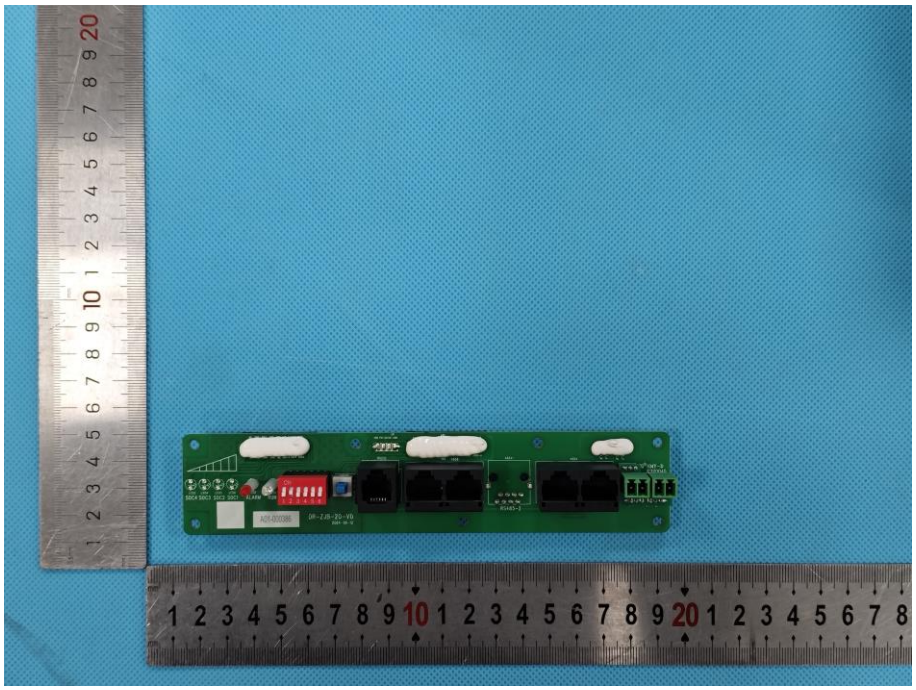


Figure 9 Front view of PCB

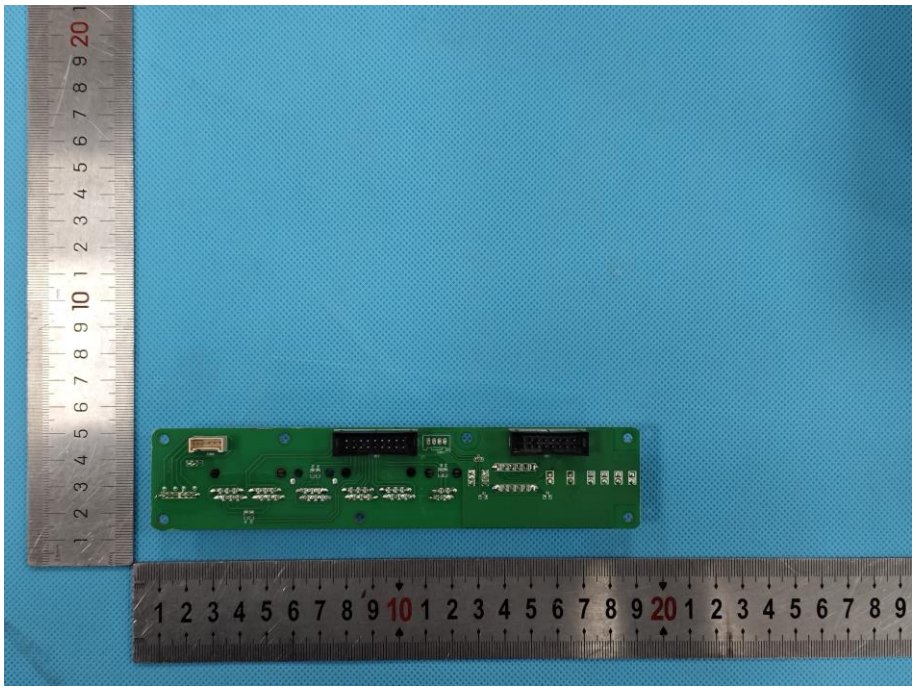


Figure 10 Back view of PCB

Product Photo

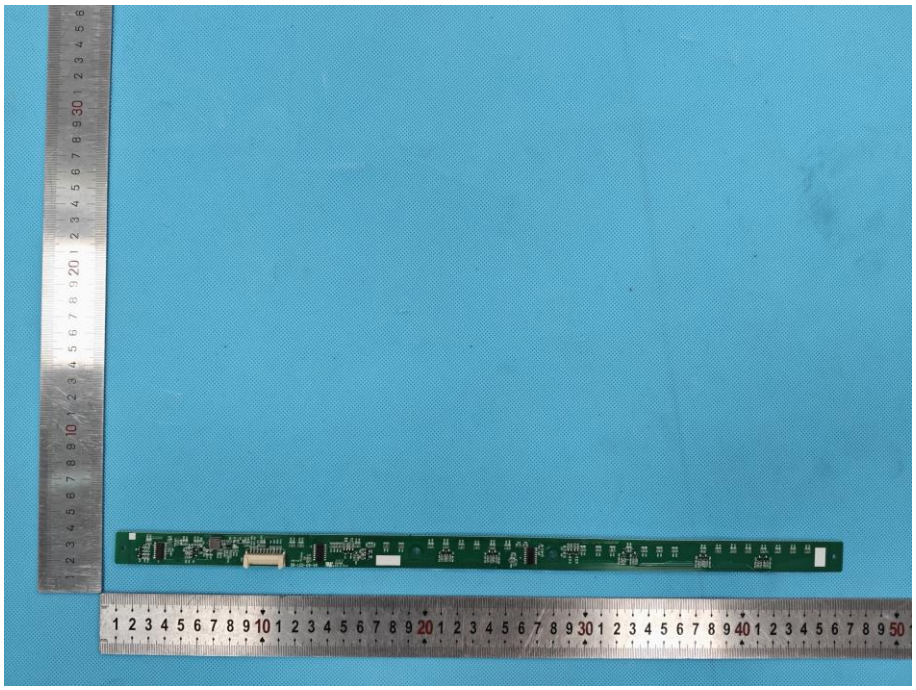


Figure 11 Front view of PCB

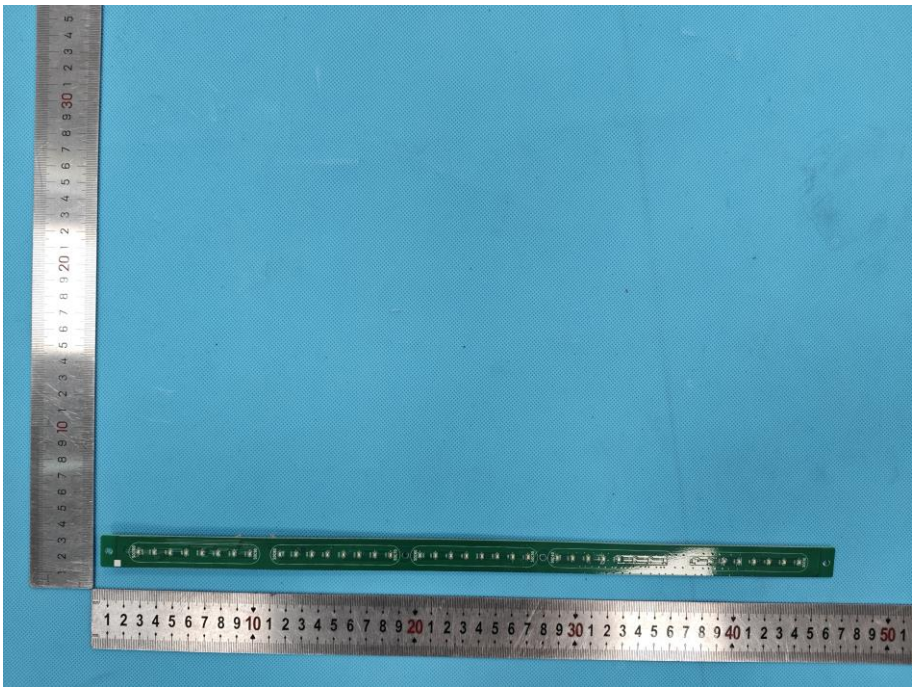


Figure 12 Back view of PCB

Product Photo

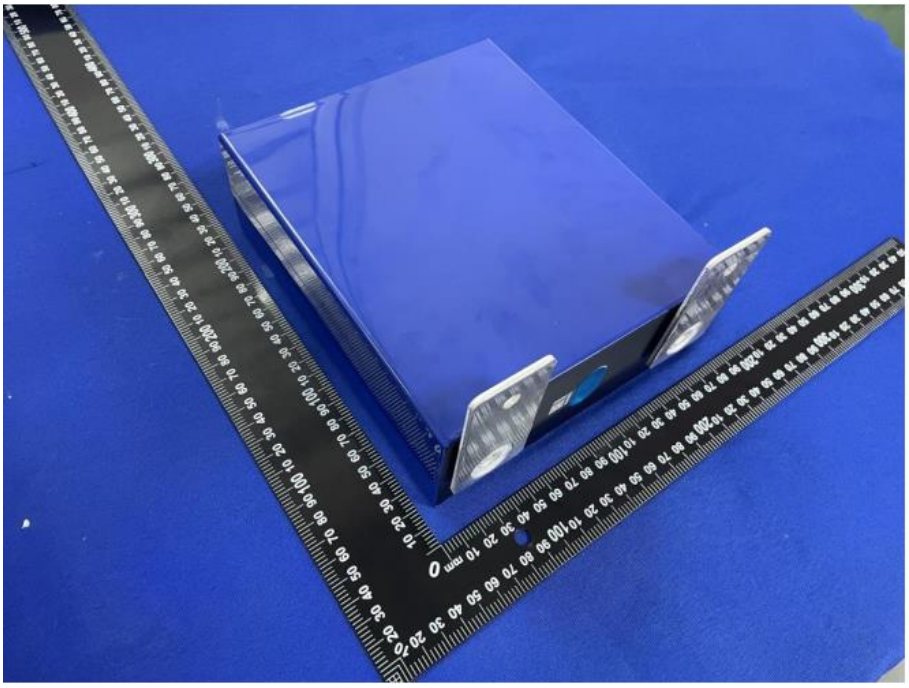


Figure 13 Front view of cell

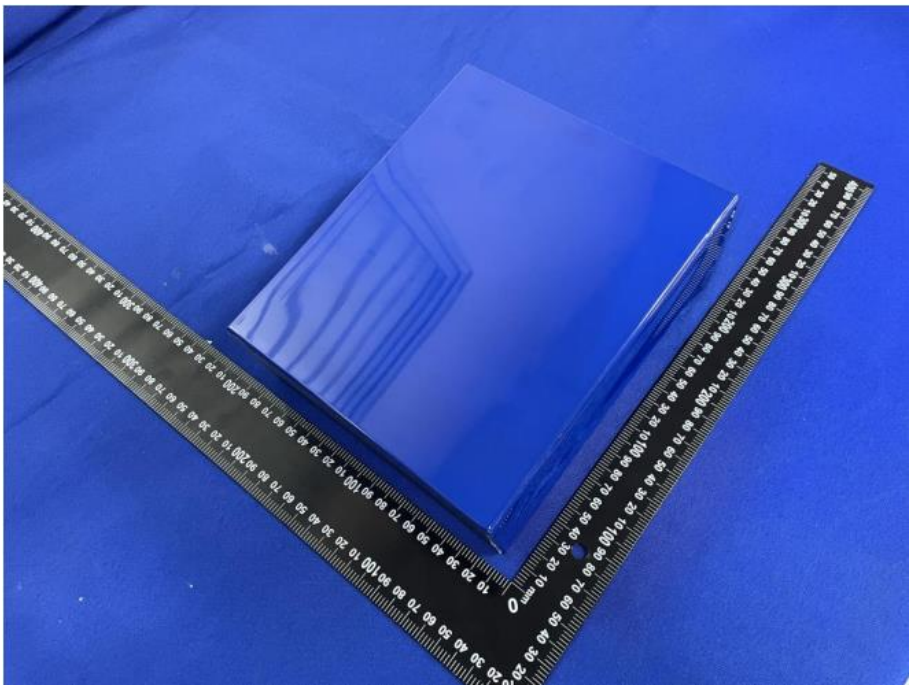


Figure 14 Back view of cell