Product Specifications ：

IFP28148115A-52Ah Lithium ion Rechargeable Cell

Formulated by		Checked by	Approved by
Standardized by		**Counter Signed by**	**Standardized by**

CONTENS

Preface

The format of this specifications is in accordance with the provisions of GB/T 1.1-2009, standardization work guideline Part 1: Standards Structure and Compilation.

On the basis of the reference of GB/T 31484-2015 < Cycle Life Requirements and Test Methods for Power Cell for Electric Vehicles >, GB/T 31485-2015 < Safety Requirements and Test Methods for Power Cell for Electrical Vehicles >, GB/T 31486-2015<Electrical Performance Requirements and Test Methods for Power Cell for Electric Vehicles>， Q/GX 003-2016<Technical Specification for Lithium Ion Power Cell for Electrical Vehicles>. With the combination of the actual and testing conditions of our company, the standard of Q/GX 030-2019 <Product Specification for IFP28148115A-52Ah Lithium Ion Rechargeable Cell>. The testing method and criterions are revised and supplemented to guide the manufacture and acceptance of the IFP28148115A-52Ah Lithium ion Cell.

Remark：If modified, please take the latest version as standard.

Modification Record

Version Number	Description of Changes	Revision date	Reviser
Q/GX 030-2019	1st Edition	2019.08.19	Ke Wang
Q/GX 030-2019	(1) Update of Cell Dimension Tolerance (2) Update of Cell Capacity (3) Update of Charge Matrix Table	2021.01.29	Zhaodong Wang

Note: Modified details were reflected in text

1. Basic Information

1.1 Scope

This specification sheet is provided to customers by HEFEI GUOXUAN HIGH-TECH POWER ENERGY Co. Ltd., describing Lithium ion rechargeable cell properties.

1.2 Application: Electric Vehicles and Energy Storage

1.3 Product type: Lithium ion rechargeable battery

1.4 Model Name: IFP28148115A-52Ah

2. Specification

2.1 Standard Technical Parameters

Items	Condition/Notes	Specification
2.1.1 Capacity	1C	52Ah
2.1.2 Nominal Voltage	0.33C	3.2V
2.1.3 Charge/discharge voltage window	＞0℃	2.0～3.65V
	≤0℃	1.8～3.65V
2.1.4 Weight	/	966g±30g
2.1.5 weight Energy density	0.33C/0.33C	175Wh/kg
2.1.6 volume Energy density	0.33C/0.33C	350Wh/L
2.1.7 AC Impedance	25℃±2℃	0.5mΩ≤R≤0.8mΩ
2.1.8 DC Impedance	50%SOC，25℃±2℃	≤2.5mΩ

2.2 Recommended Charge specification

Item	Condition/Notes	Specification
2.2.1 Regular Charge (Slow charge)	Constant current Constant voltage Cut off condition(terminating) Temperature	26A 3.65V 2.6A 10℃≤T＜45℃
2.2.2 Step Charge	Fast charging strategy at different temperature	See appendix A.1

2.3 Working Temperature Range

Item	Condition/Notes	Specification
2.3.1 Optimum working Temperature		10～35℃
2.3.2 Charge temperature range	Charging current, see appendix A.1	-20～55℃
2.3.3 Discharge temperature range	The highest cell temperature≤60℃	-30～60℃

3. Appearance and Dimension

3.1 Appearance

Without scratches, cracks, rust, discoloration or electrolyte leakage, no other appearance defects affecting cell normal operation

3.2 Dimension

Thickness：28.2±0.5mm（including outer film thickness, 5%SOC, 10kgf）
Width：148±0.5mm（including outer film thickness, 1/3-1/2 of Can）
Height：118.6±0.5mm（including terminals）

4. Performance Specification

4.1 Standard testing condition

4.1.1 Single cell charging

At room temperature（25℃±2℃）,discharge at 52A to 2.0V,standing for 30min,then charge at 52A to 3.65V by constant voltage charging until current drops down to2.6A,standing for 30min.

4.1.2 Single cell discharging

At room temperature（25℃±2℃）,discharge at 52A to 2.0V,standing for 30min.

4.2 Electrical Properties

Items	Condition	Specification
4.2.1 Initial Capacity	Charge and discharge as per 4.1.1 and 4.1.2	≥52Ah
4.2.2 Capacity and temperature correlation	At 25℃±2℃,charge as per 4.1.1, discharge at 1C to 2.0V at testing temperature（to 1.8V at or below 0℃）.	55℃,≥100% Initial Capacity 25℃, 100% Initial Capacity 0℃, ≥85%Initial Capacity -10℃,≥75%Initial Capacity -20℃,≥70%Initial Capacity -30℃,≥55%Initial Capacity
4.2.3 SOC-OCV Table	Charge as per 4.1.1, then discharge for 5% capacity at 1C（The capacity is obtained by discharging to certain cut-off voltage as per 4.1.2 （[-30℃-0℃）2.0 [0℃-10℃）2.3 [10℃-55℃] 2.5）, standing for 1h, repeat 20 times, record voltage after standing.	See appendix A.4

4.2.4 Discharge DCR at different temperature and SOC	1. Charge the lithium ion cell as per section 4.1.1 2. Discharge at 1C to adjust SOC at different temperature as per 4.1.2. 3. standing for 1h. 4. Measure the DCR under the condition of discharge at 3C for 30s, stand for 40s, charge at 2.25C for 15s or the condition of discharge at 5C for 10s, stand for 40s, charge at 3.75C for 10s. 5. The discharge resistance is the difference between the open circuit voltage and the discharge end voltage divided by the current, tested SOC is 95%, 90%, 80%, 70%, 60%, 50%, 40%, 30%, 20%, 10%, 5%; 6. The charging resistance is difference between the charging terminal voltage and the open circuit voltage divided by the current, tested SOC at 5%, 10%, 20%, 30%, 40%, 50%, 60%, 70%, 80%, 90%, 95%.	See appendix A.5
4.2.5 Charge DCR at different temperature and SOC		See appendix A.6

4.3 Maxium plus power（Ultimate capacity value）

Item	Parameter	Condition
4.3.1 Peak power plus discharge at different temperature and SOC	See appendix A.7	According to the DCR and the maximum pulse charging current calculated from the test data of 4.2.4, the pulse discharge power at the lowest limit voltage specified at different temperature.
4.3.2 Peak power plus feedback at different temperature and SOC	See appendix A.8	According to the DCR and the maximum pulse charging current calculated from the test data of 4.2.5, the pulse feedback power at the upper charging voltage of 3.65v was calculated.

4.4 Maximum allowable pulse charge power（Use allowable values）

Item	Parameter	Condition

4.4.1 Maximum allowable pulse discharge power at different Temperature and SOC	See appendix A.9	According to 4.3.1 maximum pulse discharge multiplier capacity of the cell and temperature protection of the discharge process, the upper limit of the pulse discharge power of the cell is limited.
4.4.2 Maximum allowable pulse feedback power at different Temperature and SOC	See appendix A.10	According to 4.3.2 maximum pulse charging capacity of the cell, the upper limit of the feedback power of the cell is limited in consideration of the reliable upper limit voltage and temperature protection of the charging process of the cell under the high voltage.

4.5 Durability Performance

Items	Specifications	Remarks
4.5.1 Room Temperature SOC Retention Rate	≥95%	25℃,100%SOC,28 days
4.5.2 Room Temperature Capacity Recovery Rate	≥96%	
4.5.3 High Temperature SOC Retention Rate	≥94%	55℃, 100%SOC， 7 days
4.5.4 High Temperature Capacity Recovery Rate	≥95%	
4.5.5 Storage Capacity Recovery Rate	＞94%	45℃, 50%SOC, 28 days
4.5.6 High Temperature Cycle Life	800 times	80% capacity retention rate; 55°C, according to charging method in 4.1.1; 1C discharge to 2.5V
4.5.6 High Temperature Cycle Life	1000 times	80% capacity retention rate; 45°C, according to charging method in 2.2.2; 1C discharge to 2.5V
4.5.7 Room Temperature Cycle Life	2000 times	80% capacity retention rate; 25°C, according to the 25 degree charging method in 2.2.2; 1C discharge to 2.5V
4.5.9 Calendar Life	8 years	80% capacity retention rate, 25℃, 50%SOC

4.6 Specification of Safety Test

Items	Specifications	Remarks

4.6.1 Over discharging	The single cell was charged according to the method of 4.1.1, and the single cell was discharged with a current of 1 I1 (A) for 90 min and observed for 1 h.	No explosion, no fire, no leakage
4.6.2 Over charging	The single cell is charged according to the method of 4.1.1, and is charged with a constant current of 1 I1 (A) until the voltage reaches 1.5 times of the charging end voltage specified in the technical conditions of the enterprise or the charging time reaches 1 h, and the charging is stopped, and 1 h is observed.	No explosion, no fire
4.6.3 Short circuiting	The single cell is charged according to the method of 4.1.1, and the cathode and anode terminals of the single cell are externally short-circuited for 10 min, and the external line resistance should be less than 5 mΩ, and observed for 1 h.	No explosion, no fire
4.6.4 Drop test	The single battery is charged according to the method of 4.1.1. The positive and negative terminals of the single battery are freely dropped from the height of 1.5 m onto the concrete floor and observed for 1 h.	No explosion, no fire, no leakage
4.6.5 Heating	The single battery was charged according to the method of 4.1.1, and the temperature box was raised from room temperature to 130℃ ± 2℃ at a rate of 5℃ / min. After maintaining this temperature for 30 min, the heating was stopped and observed for 1 h.	No explosion, no fire
4.6.6 Nail Penetration	The single cell is charged according to the method of 4.1.1, and the high temperature resistant steel needle with a diameter of 5mm~8mm is used to penetrate from the direction perpendicular to the battery plate at a speed of (25±5) mm/s, and the penetration position should be close to the surface. In the geometric center, the steel needle stays in the battery and is observed for 1 h.	No explosion, no fire

<table>
<tr><td>4.6.7 Crushing</td><td>The single cell is charged according to the method of 4.1.1;
Test according to the following conditions:
a) extrusion direction: apply pressure perpendicular to the battery plate;
b) extruded plate form: a semi-cylindrical body with a radius of 75 mm, the length (L) of the semi-cylindrical body is larger than the size of the battery to be squeezed;
c) extrusion speed: (2 ± 1) mm / s;
d) degree of extrusion: after the voltage reaches 0V or the deformation amount reaches 15% or the pressing force reaches 100KN, the extrusion is stopped and kept for 10 minutes;
And observe 1h.</td><td>No explosion, no fire</td></tr>
<tr><td>4.6.8 Seawater Soak Test</td><td>The single cell is charged according to the method of 4.1.1, and the single cell is immersed in a 3.5% NaCl solution (mass fraction, simulating seawater composition under normal temperature) for 2 hours, and the water depth should not completely pass through the single cell.</td><td>No explosion, no fire</td></tr>
<tr><td>4.6.9 Temperature Cycle Test</td><td>The single cell is charged according to the method of 4.1.1. The single cell is placed in the temperature box, and the temperature of the temperature box is adjusted according to the following table. The number of cycles is 5 times and observed for 1 hour.
<table>
<tr><th>Temp ℃</th><th>Time increasing min</th><th>cumulative time min</th><th>Temperature change rate ℃/min</th></tr>
<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>
</table></td><td>No explosion, no fire, no leakage</td></tr>
<tr><td>4.6.10 Low Pressure Test</td><td>The single cell is charged according to the method of 4.1.1, the single cell is placed in the low pressure box, the air pressure in the test chamber is adjusted to 11.6KPa, the temperature is room temperature, and it is allowed to stand for 6h, and observed for 1h.</td><td>No explosion, no fire, no leakage</td></tr>
</table>

5. Notes

Warning for the use of lithium ion rechargeable cells. Improper handling may cause the cell to heat up, cause fire and degrade performance. Be sure to read the following terms carefully.

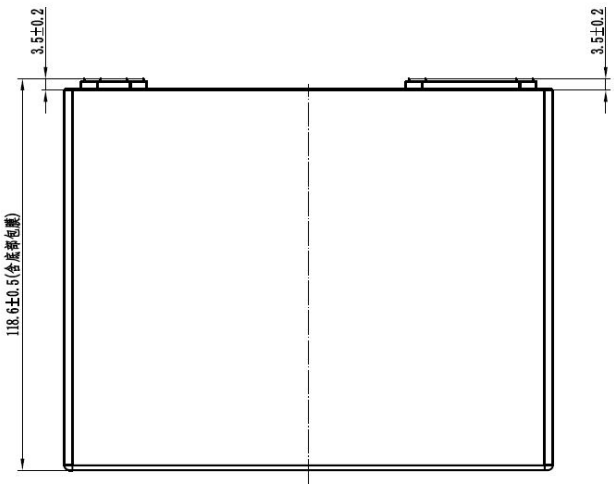
Precautions

- When using a device equipped with a battery, refer to the user manual before use.
- Check the orientation of the cathode and anode terminals before packaging.
- The terminal or wire is connected to the cell module, pay attention to the insulation to prevent short circuit.
- Store the cell in a cool dry place (≤35℃， 30%~50%SOC, charge and discharge once every 3 months) when not in use for a long time.
- Do not place the cell in direct sunlight or heat source to prevent high temperature of the cell.
- Do not wear metal accessories (such as rings, watches, accessories, etc.) when handling cell units..
- Do not place the cell outside the operating temperature range specified in this document.

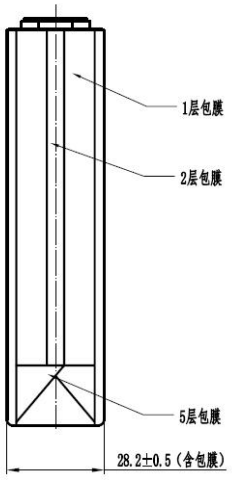
Prohibited Items

- Do not charge more than the maximum charge rate.
- Do not disassemble or modify the Cell.
- Do not throw or hit the battery.
- Do not pierce the battery with a sharp object. (eg nails, knives, pens, electric drills)
- Do not mix with other cell or module units.
- Do not over-squeeze the battery during use.
- Do not use both new and old cell in PACK.
- Do not place the cell at a temperature higher than 60 °C.
- Do not put the cell in a microwave or high pressure container.
- Do not connect the positive and negative terminals with conductive materials. (eg metal, wire)
- Do not allow to wet or immerse the cell in water or sea water.
- Do not use the cell in any way other than the manufacturer's written agreement.
- Do not connect the cells in series to prevent the insulation of can.
- The placement of the cell in the vehicle must ensure that the height of cell is perpendicular to the direction of the vehicle.

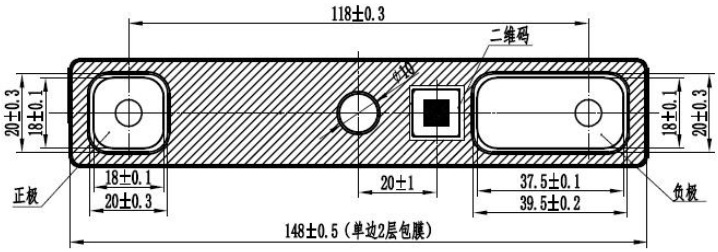
6. Drawings



Over Cell Dimension



Thickness of Cell



Dimension of Cover Plate

Remark：The dimensions are shown in millimeters（mm）.

Appendix

A.1 Step charge Table (Step charge matrix table)

A.1.1 Step charge Table（0 ℃≤T＜55 ℃）

步骤	温度	0 ℃≤T＜5 ℃	5 ℃≤T＜10 ℃	10 ℃≤T＜15 ℃	15 ℃≤T＜20 ℃	20 ℃≤T＜45 ℃	45 ℃≤T＜50 ℃	50 ℃≤T＜55 ℃
1	Charge current (C)	0.3	0.33	0.5	0.8	1	0.5	0.33
	Jumping voltage (V)	3.55	3.5	3.5	3.5	3.5	3.5	3.6
2	Charge current (C)	0.2	0.33	0.5	0.5	0.5	0.25	0.25
	Jumping voltage (V)	3.6	3.6	3.6	3.6	3.6	3.62	3.62
3	Charge current (C)	0.15	0.25	0.25	0.25	0.25	0.1	0.1
	Jumping voltage (V)	3.62	3.62	3.62	3.62	3.62	3.65	3.65
4	Charge current (C)	0.1	0.1	0.1	0.1	0.1		
	Cutoff voltage (V)	3.65	3.65	3.65	3.65	3.65		

A.1.2 Step charge Table（T＜0℃）

步骤	温度	-20 ℃≤T＜-15 ℃	-15 ℃≤T＜-10 ℃	-10 ℃≤T＜-5 ℃	-5 ℃≤T＜0 ℃
1	Charge current (C)	0.05	0.1	0.15	0.2
	Jumping SOC	20%	20%	20%	20%
2	Charge current (C)	0.02	0.05	0.1	0.15
	Jumping SOC	50%	50%	50%	50%
3	Charge current (C)	0.01	0.02	0.05	0.1
	Jumping SOC	80%	80%	80%	60%
4	Charge current (C)	/	/	0.02	0.05
	Cutoff SOC/Cutoff voltage (V)	/	/	90%	3.65

A.2 Single Cell failure Threshold (Recommended Value)

A.2.1 Single Cell Failure Threshold (BMS)

Cell Model	Numeric value	Description	Reference
Single cell overvoltage critical alarm threshold V	3.8	When the overvoltage exceeds the alarm threshold during charging, it will affect the cycle life of the cell. User charging is not allowed to exceed this voltage value.	Power must be turned off
Single cell overvoltage general alarm threshold V	3.7	Critical value of overvoltage during charging	Power must be turned off over 5s
Maximum working voltage V	3.65	Maximum limit of normal operation	
Single under voltage critical alarm threshold V	[-30℃-0℃）1.8 [0℃-55℃） 2.0	When the under-voltage exceeds the alarm threshold during discharge, it will affect the cycle life of the cell. The user discharge must not exceed this voltage value	
Single under voltage general alarm threshold V	[-30℃-0℃）1.9 [0℃-55℃） 2.2	When the under voltage exceeds the alarm threshold during discharge, it will affect the cycle life of the battery. The user discharge must not exceed this voltage value.	
Minimum operating voltage V	[-30℃-0℃）2.0 [0℃-55℃） 2.3	Minimum threshold for normal operation	
Battery temperature is too high, general alarm threshold °C	55	Battery operating temperature above this temperature will limit cell power	
Battery temperature is too high, critical alarm threshold °C	60	If the cell temperature exceeds this alarm threshold, it will affect the cell safety performance. The user should not exceed this temperature when using it.	
Cell temperature is too low, general alarm threshold °C	-20	Cell operating temperature below this temperature will limit cell power	

Battery temperature is too low, critical alarm threshold °C	-30	If the cell temperature is lower than this alarm threshold, it will affect the safety performance of the cell. The user should not use it below this temperature.	

A.2.2 Cell Information for Pack Design

Cell Model	Symbol	Numerical value （5%SOC）	Suggestions	Reference
Maximum allowable pressure	Fmax	TBD		250kgf，5%SOC
Minimum required pressure	Fmin	TBD		20kgf，5%SOC

A.3 Cycle Life at Certain Condition

A.3.1 Room Temperature Cycle Life

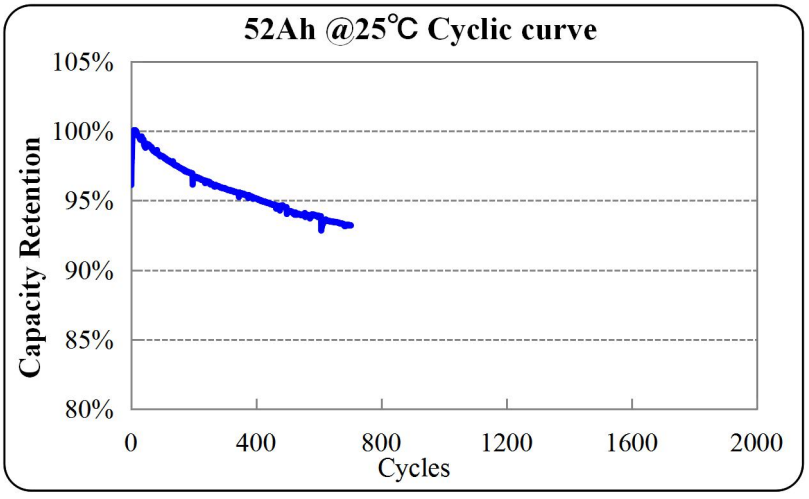
Test Conditions

Charging: step constant current charging 1C-3.51V, 0.5C-3.60V, 0.25C-3.62V, 0.1C-3.65V

Discharge: 1C discharge to cutoff voltage 2.0V

Temperature: 25℃

Rest time: 30 min after charging/discharging



A.4 SOC-OCV table

T	-10℃	0℃	10℃	15℃	25℃	35℃	45℃
DOD	Voltage/V	Voltage/V	Voltage/V	Voltage/V	Voltage/V	Voltage/V	Voltage/V
0%	3.361	3.335	3.340	3.352	3.375	3.354	3.334
5%	3.320	3.319	3.325	3.326	3.329	3.330	3.331
10%	3.309	3.318	3.324	3.325	3.328	3.329	3.331
15%	3.309	3.318	3.324	3.325	3.328	3.329	3.331
20%	3.309	3.318	3.324	3.325	3.328	3.329	3.331
25%	3.309	3.318	3.324	3.325	3.328	3.329	3.331
30%	3.304	3.314	3.323	3.324	3.327	3.329	3.330
35%	3.293	3.304	3.316	3.319	3.324	3.325	3.327
40%	3.292	3.293	3.298	3.302	3.310	3.306	3.301
45%	3.285	3.285	3.288	3.290	3.294	3.295	3.297
50%	3.280	3.282	3.285	3.287	3.290	3.293	3.296
55%	3.277	3.280	3.284	3.285	3.289	3.292	3.295
60%	3.276	3.279	3.283	3.285	3.288	3.291	3.294
65%	3.274	3.279	3.282	3.284	3.288	3.290	3.293
70%	3.273	3.277	3.280	3.281	3.284	3.280	3.277
75%	3.272	3.273	3.272	3.272	3.272	3.267	3.261
80%	3.270	3.264	3.258	3.256	3.253	3.248	3.242
85%	3.266	3.250	3.236	3.234	3.230	3.223	3.217
90%	3.259	3.230	3.215	3.213	3.210	3.205	3.201
95%	3.246	3.209	3.188	3.186	3.180	3.149	3.117
100%	3.227	3.175	3.072	3.024	2.928	2.830	2.732

A.5 Regeneration DCR at Different Temperature and SOC

Discharge @3C 30s , DCR/mΩ								
T/SOC	-30℃	-20℃	-10℃	0℃	10℃	25℃	45℃	55℃
10%	/	/	/	10.32	4.81	2.94	1.73	1.61
20%	/	/	/	6.83	3.79	2.35	1.55	1.41
30%	/	16.71	9.46	5.31	3.35	2.13	1.49	1.33
40%	/	14.20	7.40	4.59	3.13	1.98	1.42	1.29
50%	17.82	12.46	6.38	4.24	2.98	1.88	1.33	1.20
60%	16.72	10.99	5.85	4.05	2.92	1.93	1.40	1.25
70%	15.09	10.11	5.56	3.97	2.94	1.89	1.38	1.23
80%	13.97	9.61	5.41	3.91	2.87	1.81	1.32	1.18
90%	13.29	9.32	5.29	3.81	2.79	1.72	1.25	1.11
Note: / indicates that 30s, -30 °C 2C test data, -20 ° C 2C test data are not supported								

A.6 Regeneration DCR at Different Temperature and SOC

charge @2.25C 15s , DCR/mΩ				
T/SOC	10℃	25℃	45℃	55℃
10%	2.98	1.91	1.37	1.26
20%	2.92	1.85	1.34	1.20
30%	2.87	1.82	1.29	1.15
40%	2.84	1.77	1.25	1.14
50%	2.80	1.72	1.22	1.08
60%	2.80	1.75	1.22	1.08
70%	2.80	1.74	1.26	1.13
80%	2.77	1.72	1.22	1.08
90%	2.71	1.63	1.15	1.01

A.7 Peak power pulse discharge at different temperatures and SOC

Peak power pulse discharge @30s /W								
T/SOC	-30℃	-20℃	-10℃	0℃	10℃	25℃	45℃	55℃
10%	/	/	/	166.6	358.5	577.4	979.3	1050.1
20%	/	/	/	259.7	471.5	754.5	1131.2	1244.2
30%	/	105.8	188.4	337.5	536.2	847.1	1215.2	1348.9
40%	/	125.1	241.5	391.3	575.6	911.9	1278.8	1406.9
50%	117.1	143.2	281.3	424.4	606.2	963.9	1363.3	1513.8
60%	124.7	162.9	308.4	447.4	626.8	959.7	1323.3	1485.0
70%	138.3	178.0	326.5	462.1	630.4	985.2	1350.9	1513.8
80%	150.2	188.3	338.4	471.2	646.1	1028.3	1414.2	1585.1
90%	158.4	194.8	346.2	482.4	663.7	1078.4	1489.7	1677.3
Note: / indicates that 30s, -30 °C 2C test data, -20 ° C 2C test data are not supported								

A.8 Peak power pulse feedback at different temperatures and SOC

Peak power pulse feedback@15s /W				
T/SOC	10℃	25℃	45℃	55℃
10%	440.3	665.2	898.5	975.3
20%	399.7	618.9	839.8	935.1
30%	388.4	585.6	795.4	885.3
40%	384.3	586.1	795.1	857.7
50%	382.5	590.8	791.9	875.8
60%	374.2	563.3	773.1	862.3
70%	368.6	554.1	729.4	799.7
80%	366.1	548.7	728.5	810.4
90%	366.1	564.7	758.3	850.5

A.9 Maximum allowable pulse discharge power/rate at different temperature and SOC

Maximum allowable pulse discharge power @30s /W								
T/SOC	-30℃	-20℃	-10℃	0℃	10℃	25℃	45℃	55℃
0%~10%	6.8	14.0	43.7	75.4	149.5	244.6	301.6	150.8
10%~20%	6.8	28.1	58.2	119.9	216.1	348.5	301.6	150.8
20%~30%	13.5	75.5	114.6	167.8	265.9	418.3	301.6	150.8
30%~40%	13.5	89.4	147.7	196.1	287.6	454.6	301.6	150.8
40%~50%	80.5	102.3	172.0	213.4	303.6	481.3	301.6	150.8
50%~60%	88.3	119.9	195.3	234.9	325.8	492.8	301.6	150.8
60%~70%	100.2	134.0	212.3	249.5	337.0	524.1	301.6	150.8
70%~80%	108.4	141.2	218.6	254.0	346.0	548.6	301.6	150.8
80%~90%	113.9	145.5	223.6	260.6	355.9	577.3	301.6	150.8

Remark： For SOC is the range of interval, the left interval is the closed interval, and the right interval is the open interval. For example： 10%~20% is 10%≤SOC＜20%

Maximum pulse discharge rate @30s /C								
T/SOC	-30℃	-20℃	-10℃	0℃	10℃	25℃	45℃	55℃
0%~10%	0.1	0.1	0.3	0.5	1.0	1.6	2.0	1.0
10%~20%	0.1	0.2	0.4	0.8	1.4	2.3	2.0	1.0
20%~30%	0.1	0.5	0.8	1.1	1.8	2.8	2.0	1.0
30%~40%	0.1	0.6	1.0	1.3	1.9	3.0	2.0	1.0
40%~50%	0.6	0.7	1.2	1.4	2.0	3.2	2.0	1.0
50%~60%	0.7	0.9	1.3	1.6	2.2	3.3	2.0	1.0
60%~70%	0.7	1.0	1.5	1.7	2.2	3.5	2.0	1.0
70%~80%	0.8	1.0	1.5	1.7	2.3	3.6	2.0	1.0
80%~90%	0.8	1.0	1.5	1.7	2.4	3.8	2.0	1.0

Remark： For SOC is the range of interval, the left interval is the closed interval, and the right interval is the open interval. For example： 10%~20% is 10%≤SOC＜20%

A.10 Maximum allowable pulse feedback power/rate at different temperature and SOC

Maximum pulse feedback power@15s /W				
T/SOC	10℃	25℃	45℃	55℃
0%~10%	161.7	252.2	351.6	175.8
10%~20%	135.4	213.7	295.1	147.5
20%~30%	116.1	183.1	258.3	129.2
30%~40%	114.5	183.7	260.1	130.1
40%~50%	114.7	186.7	263.2	131.6
50%~60%	100.4	160.6	230.3	115.2
60%~70%	88.2	141.9	195.9	98.0
70%~80%	88.4	142.4	200.7	100.4
80%~90%	90.4	150.2	212.9	106.5

Remark： For SOC is the range of interval, the left interval is the closed interval, and the right interval is the open interval. For example: 10%~20% is 10%≤SOC＜20%

Maximum pulse feedback rate@15s /C				
T/SOC	10℃	25℃	45℃	55℃
0%~10%	0.9	1.4	2.0	1.0
10%~20%	0.8	1.2	1.6	0.8
20%~30%	0.6	1.0	1.4	0.7
30%~40%	0.6	1.0	1.5	0.7
40%~50%	0.6	1.0	1.5	0.7
50%~60%	0.6	0.9	1.3	0.6
60%~70%	0.5	0.8	1.1	0.5
70%~80%	0.5	0.8	1.1	0.6
80%~90%	0.5	0.8	1.2	0.6

Remark： For SOC is the range of interval, the left interval is the closed interval, and the right interval is the open interval. For example:10%~20% is 10%≤SOC＜20%.

Remark： The high/low of the pulse feedback current must strictly comply with all charging states and cell temperature listed in the table below. Violation of pulse feedback conditions may result in permanent damage to the cell and decrease of service life.

Environmental declaration of IFP28148115A-52Ah Lithium battery product

In accordance with EU directive 2015/863, battery instruction requirements in 2006-66-EC，as shown in the following table, a total of 10 substances are included in the RSL, for example Cadmium、Lead 、Mercury、Hexavalent chromium、Polybrominated biphenyls (PBB)、Polybrominated diphenyl ethers (PBDE) and phthalate (PAEs).

Table A.11 List of 10 restricted substances

RoHS restricted substance	The highest limit （PPM）	Discription
Cadmium(Cd)	20	2006-66-EC Directive Requirement
Lead (Pb)	40	2006-66-EC Directive Requirement
Mercury (Hg)	5	2006-66-EC Directive Requirement
Hexavalent chromium (Cr^{6+})	1000	RoHS 1.0 limited substance
Polybrominated biphenyls (PBB)	1000	RoHS 1.0 limited substance
Polybrominated diphenyl ethers (PBDE)	1000	RoHS 1.0 limited substance
Diphthalate (2-ethylhexyl) ester （DEHP- Di(2-ethylhexyl)Phthalate）	1000	Added restricted substances in RoHS 2.0
Benzyl butyl phthalate （BBP- Benzyl Butyl Phthalate）	1000	Added New restricted substances of RoHS 2.0
Dibutyl phthalate （DBP-Di-n-butyl Phtalate）	1000	Added New restricted substances in RoHS 2.0
Diisobutyl phthalate （DIBP-Diiso butyl Phthalate）	1000	Added New restricted substances in RoHS 2.0

Execute immediately from release date.