Specification
For
Lithium-ion Rechargeable Cell

Cell Type: IFR32650P-50,3.2V 5000mAh

Supplier Approved	**Prepared by**	**Checked by**	**Approved by**
Customer Approved	**Test by**	**Checked by**	**Approved by**

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1.Preface

This specification describes the type and size, performance, technical characteristics, warning and caution of the lithium ion rechargeable cell. The specification only applies to IFR32650P-50 cell supplied by Beijing Huaju New Power Technology & Development Co., Ltd.

2 .Description and model

Description: Cylindrical Li-ion rechargeable cell
Model: IFR32650P-50,3.2V,5000mAh

3.Cell specification

ITEM	SPECIFICATION
Normal capacity	5000mAh（1C)
Minimum capacity	4900mAh (1C） (Discharge the cell from 3.65V to 2.0V by 1C current)
Normal voltage	3.2V
Charging voltage	3.65 ±0.05 V
Discharge ending voltage（Cut-off）	2.0±0.05 V
Standard charging and discharge current	1C(5A)
Max charge current	2C(10A)
Max continuous discharge current	15A(3C rate)
Max pulse discharge current(long pulse)	75A(Max duration:2min)
Max pulse discharge current(short pulse)	100A(When battery temperature is below 50℃,max discharge current can last 10s)
Internal resistance	≤10 mΩ(AC Impedance, 1000 Hz),Fresh cell, 15%SOC
Weight	140.0g±0.5
Cell dimension	Height ： 67.15±0.15 mm Max 67.3 Diameter ： 32.5±0.2mm Max 32.7

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Operating temperature	Charge:-10~ 60℃ Discharge:-20~ 60℃
Storage Temperature	1 month: -20~60℃） 3 months: -20~45℃ 1 year: -20~20℃

4.Size and Appearances

4.1 Cell size

32.50±0.2mm(Max.32.7mm)

67.15±0.15mm(Max.67.3mm)

Cell physical dimension listed in Figure 1(unit: mm).

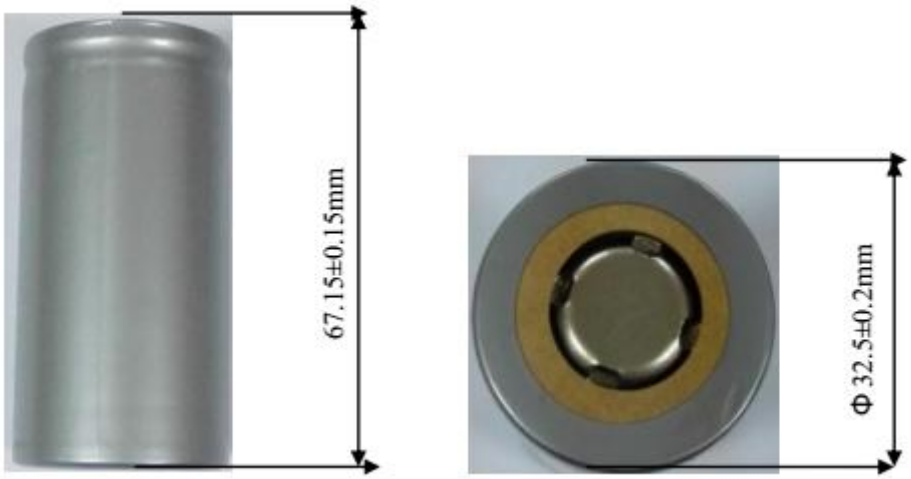

Figure 1

4.2 Cell appearances

There shall be no such defects as deep scratch,crack,rust,discoloration or leakage,which may adversely affect the commercial value of the cell.

5.Technical characteristics

5.1 Cell testing conditions

Unless otherwise specified, all tests stated according to following:

Temperature 25±2.5℃

Humidity range 45%～85%

5.2 Requirement of the testing equipment

Voltage meter: The voltage tester internal resistance is ≥ 10 KΩ/V

Temperature meter: The precision is ≤0.5℃

5.3 Electronic performance

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NO.	ITEM	TESTING METHOD				CRITERION
5.3.1	Standard charging	Under 25±2.5℃, it can be charged to 3.65V with constant current of 1C, and then, charged continuously with constant voltage of 3.65V until the charged current is 0.05C(250mA).				————
5.3.2	Standard discharge	Under 25±2.5℃, it can be discharged to the voltage of 2.0V with constant current of 1C(5A).				————
5.3.3	Absolute charging temperature	No matter what the charging model is, once temperature of the cell above the absolute charging temperature, charging should be stopped.				-10~45℃
5.3.4	Absolute charging voltage	No matter what the charging model is,including pulse charging,once voltage of the cell above the absolute charging voltage, charging should be stopped.				Max 3.8V
5.3.5	Charging current limited at different temperature					
	Cell temperature range	-10~0℃	0~5℃	5~10℃	10~45℃	45~60℃
	Max charging current allowed	0.1C(0.5A)	0.3C(1.5A)	0.5C(2.5A)	1C(5A)	1C(5A)
5.3.6	Rate discharge	Under 25±2.5℃,after 1C standard charged,rest for 10min and then discharge at 1C,3C to the discharge cut-off voltage 2.0V respectively. Charge/discharge cycle can be conducted for 3 times before meeting the Standards.				Discharge capacity/Nominal capacity*100% 1C≥100% 3C≥95%
5.3.7	Temperature discharge	Under 25±2.5℃,after 1C standard charged, rest for30min after the temperature per at the test temperature. keep the cell stay the test temperature 16～24H,then discharge at 1C to the discharge cut-off voltage 2.0V.				Discharge capacity/25℃ discharge capacity*100% -20℃≥70% 25℃≥100% 55℃≥95%
5.3.8	Normal temperature charge holding capacity	Under 25±2.5℃,tested the initial condition and initial capacity of battery. Store for 28 days after standard charged, tested the final condition of battery. Then discharge at 1C to the discharge cut-off voltage 2.0V,tested the residual capacity of battery.1C tested the recovery capacity of battery. Charge/discharge cycle can be conducted for 3 times before meeting the standards.				Residual capacity≥Nominal capacity*85% Recovery capacity≥Nominal capacity*95%

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5.3.9	Cycle Life	Under 25±2.5℃,1C charge the battery ,test for 10min,discharge at 1C to cut-off voltage. After discharging ,rest 10min,then do charge and discharge cycle more than 3000 times.	Capacity retention rate≥80%
5.3.10	Storage	Under 25±2.5℃, standard charge to the voltage of 3.65±0.02V,before discharge 1C 30 minutes, Store for 3 months, at room temperature, then 1C charging full, then discharge with 1C to 2.5V, testing the battery capacity, repeat for five times.	the discharge time of 1C Capacity ≥ 95%

5.4 Mechanical characteristics

NO.	ITEM	TESTING METHOD	CRITERION
5.4.1	Drop	Standard charge. Then let it self fall off from a height of 1m(the lowest height)to a smooth hardwood with the thick of 20mm.The drop is implemented totally for 3 times. Discharge at 1C to the cut-off voltage, then test the discharge time of the battery.。	Exterior appearance apparent stain,leakage,smoke and explosion. Discharge time≥51min.
5.4.2	Vibration	Standard charge.Install battery on the vibration table,adjust the equipment according to the following vibration and amplitude frequency.From X,Y,Z three directions in 10Hz～55Hz sweep vibration to sweep for 30mins with the sweep frequency speed rate at 1oct/min: Vibration frequency :10Hz～30Hz(single amplitude)、Displacement amplitude（single):0.38mm\Amplitude frequency:30Hz～55Hz(single amplitude)\Displacement amplitude（single):0.19mm	Exterior appearance apparent stain,leakage,smoke and explosion. Cell voltage no less than nominal voltage.

5.5 Environmental characteristics

NO.	ITEM	TESTING METHOD	CRITERION
5.5.1	Heat cycle properties	Standard charge.Put the battery into a 75±2℃ for 48h,then put it into a -20℃ for 6h,and then store it for 24h at room temperature.Observe the variation of the battery's appearance.	Exterior appearance apparent stain,leakage,smoke and explosion.
5.5.2	Static humidity	Standard charge.Put the battery into a 40±5℃ and 95%RH chamber for 168h,then get it out and store it for 2h at room temperature.Observe the variation of the battery's appearance and then discharge at 1C to the cut-off voltage.	Exterior appearance apparent stain,leakage,smoke and explosion. Discharge time no less than 36mins.

5.6 Safety characteristics

NO.	ITEM	TESTING METHOD	CRITERION

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5.6.1	Over charge test	The cell is discharged following the standard discharge method. Apply a 1.5 times standard voltage or charging 1 hours. Then observe 1hours	No flame,No fire,No explode
5.6.2	130℃ hot oven test 130℃	The cell is charged following the standard charge method. After charging the cell is put in the oven. And then the oven temperature will be ramped at 5℃ per minute to 130℃ and held at 130℃. When the temperature of the cell reach 130℃, the cell is maintained in the 130℃ oven for a maximum of 30 minutes or until a fire or explosion is obtained, whichever comes first. Record the time that the cell temperature reaches 130℃ and the time when a fire or explosion occurs.	When the temperature of the cell is 130℃. Cell must not fire or explode in 30 minutes
5.6.3	Crush test	After charging a cell following the standard charge method, the cell shall be crushed between two flat surfaces. The direction of the crushing force shall be vertical to axis of the cylinder. The crushing force is to be applied by a hydraulic ram with a 150mm diameter piston. Crushing force is approximately 200 KN. Once the maximum pressure has been obtained it is to be released.	No flame,No fire,No explode
5.6.4	Short circuit test	Cell shall first be charged according to standard charge method, and then cell is to be short-circuited by connecting the positive and negative terminals of the cell with copper wire having a maximum resistance load of less than 5 mΩ or short circuit 10minutes. This test is done at room temperature and at 60℃ (different cells). Monitor the cell temperature while testing. The cell is continuously discharged until the cell case temperature has returned to be 10℃ less then peak temperature.	No flame,No fire,No explode Highest temperature≤150℃
5.6.5	Impact test	Cell shall first be charged according to standard charge method，then the battery cell was placed on a flat surface so that the longitudinal axis of the battery cell shall be parallel with it. A 7.9mm diameter bar is to be placed across the center of the sample. A.9.1kg weight is to be dropped from a height of 61cm on the sample.	No flame,No fire,No explode

6.Handling of Cells

Prohibition short circuit

Never make short circuit cell.It generates very high current which causes heating of the cells and may cause electrolyte leakage are very dangerous.The lithium ion tabs may be easily short-circuited by putting them on conductive surface.Such outer short circuit may lead to heat generation and damage of the cell. An appropriate circuitry with PCM shall be employed to protect accidental short circuit of the battery pack.

7.Notice for Designing Battery Pack

7.1 Pack toughness

Battery pack should have sufficient strength and the lithium ion cell inside should be protected from mechanical shocks.

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7.2 Cell fixing

The lithium ion cell should be fixed to the battery pack by its large surface area.

No cell movement in the battery pack should be allowed.

7.3 Inside design

No sharp edge components should be insides the pack containing the lithium ion cell.

7.4 Tab connection

Spot welding is recommended for lithium ion tab connection method.

Battery pack should be designed that shear force are not applied to the lithium ion tabs.

If apply manual solder met hod to connect tab with PCM.below notice is very important to ensure battery performance：

The solder iron should be temperature controlled and ESD safe;

Soldering temperature should not exceed 350℃;

Soldering time should not be longer than 3s;

Soldering times should not exceed 5 times ,Keep battery tab cold down before next time solidarity ;

Directly heat cell body is strictly prohibited ,Battery may damaged by heat above approx.100℃.

7.5 For mishaps

Battery pack should be designed not to generate heat even when leakage occurs due to mishaps.

1）Isolate PCM (Protection Circuit Module) form leaked electrolyte as perfectly as perfectly as possible.

2）Avoid narrow spacing between bare circuit patterns with different voltage.(Including around connector)

3） Lithium ion battery should not have liquid from electrolyte ,but in case if leaked electrolyte as possible touch bare circuit patterns ,higher potential terminal material may dissolve and precipitate at the lower potential terminal ,and may cause short circuit ,The design of the PCM must have this covered.

8.Notice for Assembling Battery Pack

Shocks ,high temperature ,or contacts of sharp edge components should not be allowed in battery pack assembling process.

9.Others

9.1 Cell connection

1）Direct soldering of wire leads or devices to the cell is strictly prohibited.

2) Lead tabs with pre-soldering may cause damage of components ,such as separator and insulator .by heat generation.

9.2 Prevention of short circuit within a battery pack

Enough insulation layers between wiring and the cells shall be used to maintain extra safety protection. The battery pack shall be structured with no short circuit within the battery pack ,which may cause generation of smoke or firing.

9.3 Prohibition of disassembly

1）Never disassemble the cells

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

2) Electrolyte is harmful

Lithium ion battery should not have liquid from electrolyte flowing ,but in case the electrolyte come into contact with the skin ,or eyes ,physicians shall slush the electrolyte immediately with fresh water and medical advice is to be sought.

9.4 Prohibition of dumping of cells into fire

Never incinerate nor dispose the cells in fire .These may cause explosion of the cells ,which is very dangerous and is prohibition.

9.5 Battery cells replacement

The battery replacement shall be done only by either cells supplier or device supplier and never be done by the user.

9.6 Prohibition of use of damaged cells

The cells might be damaged during shipping by shock .If any abnormal features of the cells are found such as damages in a plastic envelop of the cell ,deformation of the cell package ,smelling of an electrolyte ,an electrolyte leakage and others ,the cells shall never be used any more .The cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing or explosion.

10.Period of Warranty

The period of warranty is one year from the date of shipment . Huaju guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customer abuse and misuse.

11.Storing the Batteries

The batteries should be stored at room temperature ,charged to about 30% to 50% of capacity .We recommend that batteries be charged about once per half a year to prevent over discharge.

12.Other The Chemical Reaction

Because the battery is the use of the principle of chemical reaction ,battery performance over time even if stored for a long period of time without being used . In addition ,if the various usage conditions such as charge ,ambient temperature ,etc .are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage .if the batteries cannot maintain a charge for long periods of time ,even when they are charged correctly ,this may indicate it is time to change the battery.

13.Note：

Any other items which are not covered in this specification shall be agreed by both parties.

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