Lithium iron Phosphate Battery Specification Approval Sheet

Model: IFR26700EC-4.0Ah

Designed	Checked	Approved
Fuzhou Liang	Qin Yadong	

Customer-approval	**Signature/Date:**
	Company Name:
	Company Stamp:

GUANGDONG SUPERPACK TECHNOLOGY CO., LTD.

Add: Building 4, No. 2 of Xingye Road, Songshanhu Park, Dongguan City, Guangdong Province, 523763 P.R. China

Tel: +86-769-82260562 Fax: +86-769-82260590

Email: marketing@super-pack.com.cn Web: www.super-pack.com.cn

Amendment Records				
Edition	Description	Prepared by	Approved by	Date
A0	First Version	Fuzhou Liang	Qin Yadong	2020.03.18

GUANGDONG SUPERPACK TECHNOLOGY CO., LTD.
Add: Building 4, No. 2 of Xingye Road, Songshanhu Park, Dongguan City, Guangdong Province, 523763 P.R. China
Tel: +86-769-82260562 Fax: +86-769-82260590
Email: marketing@super-pack.com.cn Web: www.super-pack.com.cn

Content

1. Scope

This document describes the Product Specification of the Lithium-ion rechargeable cell supplied by Superpack (Guangdong Superpack Technology Co., Ltd.).

2. Definition

2.1 Rated capacity

Rated capacity: Cap=4000mAh, minimum capacity: Cap=4000mAh. Under 25±5℃, It means the capacity value of being discharged by 5-hours rate to end voltage 2.0V, which is signed Cap, the unit is mAh.

3. Model

3.1 Model and description

Model: IFR26700EC-4.0Ah

Description: Cylindrical Li-ion rechargeable cell of $LiFePO_4$

3.2 Cell dimensions

Cell physical dimensions listed in Figure 1(unit: mm)

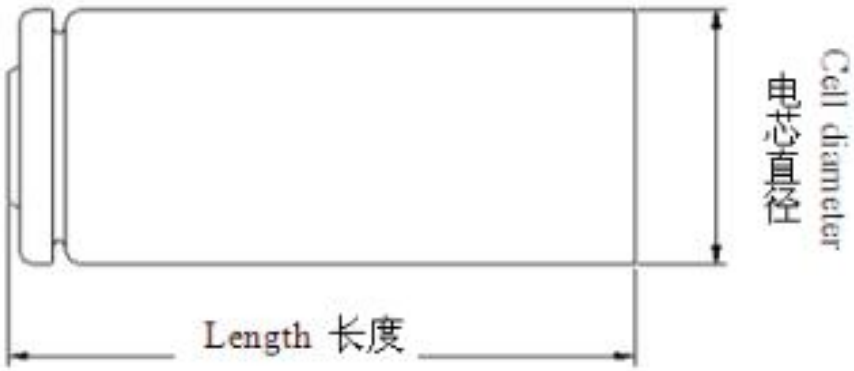


Figure 1

Cell Diameter	Cell Length
26.3±0.2	71.4±0.3

4. Characteristics

No.	Item	Specifications
1	Nominal voltage	3.2V
2	Charge cut-off voltage /Charge cut-off current	3.65V/0.02C
3	Discharge cut-off voltage	2.5V at 0~60°C
		2.0V at -20~0°C
4	Nominal capacity	4000mAh@ 0.5C
5	Standard charging current	0.3C @25°C
6	Rapid charging current	0.5C
7	Max. charge current	1.0C
8	Charging current vs operating environment temperature at 60±25%RH	≤0.2C (0°C＜T≤10°C)
		≤0.5C (10°C＜T≤20°C)
		≤1.0C (20°C＜T≤35°C)
		≤0.5C (35°C＜T≤45°C)
9	Standard discharge current	0.5C（-20°C~ +60°C）
10	Max. Discharge Current	3C (Cell surface temperature less than 60°C)
11	Max. Pulse Discharge Current(ms)	5C
12	Discharge current vs operating environment temperature at 60±25%RH	≤0.5C (-20°C＜T≤0°C)
		≤1.0C (0°C＜T≤15°C)
		≤2C (15°C＜T≤20°C)
		≤3C (20°C＜T≤35°C)
		≤1.5C (35°C＜T≤45°C)
		≤1.0C (45°C＜T≤60°C)
10	Operating Temperature	Charge： 0 to 45°C Discharge： -20 to 60°C
11	Storage temperature & humidity	Temperature：-10°C ~ +35°C Humidity：≤85%RH
12	Weight	Approx. 94g
13	Dimension	Length: 71.4±0.3 mm Diameter：26.3±0.2 mm

5. Cell Performance Criteria

4.1 Cell testing conditions

Unless otherwise specified, all tests stated according to following:

Temperature： 25±5°C

Humidity：≤85%RH

Use standard charge and standard discharge method

5.2 Requirement of the testing equipment

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

Temperature meter: The precision is ≤0.5°C

5.3 Electronic performance

No.	Item	Test Method and Condition	Standard
1	0.5C Rated Cap.	Discharging at current of 0.5C to 2.0V after standard charge at 25°C.	≥98.5% (3940mAh)
	1.0C Rated Cap.	Discharging at current of 1.0C to 2.0V after standard charge at 25°C.	≥95.0% (3800mAh)
	3.0C Rated Cap.	Discharging at current of 3.0C to 2.0V after standard charge at 25°C.	≥90.0% (3600mAh)
2	Storage retention	Store for 28 days after standard charge, then standard discharge to 2.0V measuring residual capacity at 25°C; Then standard charge/discharge 3 cycles to obtain the recoverable capacity. (the same below). Any time the capacity reaches the standard requirement, the test can be stopped.	Residual capacity ≥ 85% initial capacity; Recoverable capacity≥92% initial capacity
3	Storage recovery	Stored at 25°C for 12 months at 50%SOC. After storage cell shall be conducted standard charge/discharge for 5 cycles to obtain the recoverable capacity.	Recoverable capacity≥ initial capacity×90%
4	Discharge characteristics vs	After standard charged at 25°C temperature; Stored in the specific temperature for 6h;	-10°C ≥50%; 0°C ≥60%;

	temperature	Then discharge at the specific at 0.5C to 2.0V (discharge termination voltage is 1.6V at (-10°C)	25°C ≥100%; 55°C ≥90%;
5	Cycle life	Test condition: Temperature: 23± 5°C Charge:1C CC to 3.65V, and then CV(3.65V) to 0.05C Discharge: Constant discharge current of 1C to 2.0V ≥70% of initial discharge capacity	≥1000cycles
6	Initial impedance	AC Impedance, 1kHz, 50% SOC	＜20mΩ

5.4 Safety characteristics

No.	Item	Test Method and Condition	Criteria
1	Over charge	Standard discharged, then charge at 1C5A constant current to 1.5V termination voltage， or constant current charging after 1 h, observation 1 h.	No explosion No fire
2	Over discharge	Standard discharged, then discharge at 1C5A constant current to 90min, observation 1 h.	No explosion No fire, No leakage
3	External short circuit	Standard discharged, then discharge at 1C5A constant current to 90min, observation 1 h.	No fire, No explosion, The cell Surface temperature is less than 150 °C.
4	Heating	The cell shall be charged at standard charging condition, then heated in the chamber at 130°C for 30mins.	No explosion No fire

5.5 Reliability characteristics

No.	Item	Test Method and Condition	Criteria
1	Vibration test	The cell shall be charged at standard charging condition and vibrated for 30	No explosion

		minutes per-each of the three mutually perpendicular axes (x, y, z) with total excursion of 1.6mm, the frequency varies between 10Hz and 55Hz at 1Hz / minute.	No fire No leakage
2	Drop test	The cell shall be charged at standard charging condition, and dropped from a height of 1.5 meter to concrete floor for 6 times (+/- direction on x, y axes).	No explosion No fire No leakage
3	Impact test	The cell shall be charged at standard charging condition, and put a rod (ϕ15.8mm) on the cell, and then a heavy block (9.1Kg) crashes on the cell from a certain height (61.0cm).	No explosion No fire
4	Crush test	The cell shall be charged at standard charging condition, and place between two horizontal plates until the pressure between the two plates reaches 13KN. Measure its temperature and observe event.	No explosion No fire
5	Shock test	The cell shall be charged at standard charging condition, and shock 6 times every axis, total 18 shocks, peak acceleration is 150g/s and pulse duration is 6 mS.	No explosion No fire No leakage

6. Storage and Others

6.1 Cell storage conditions

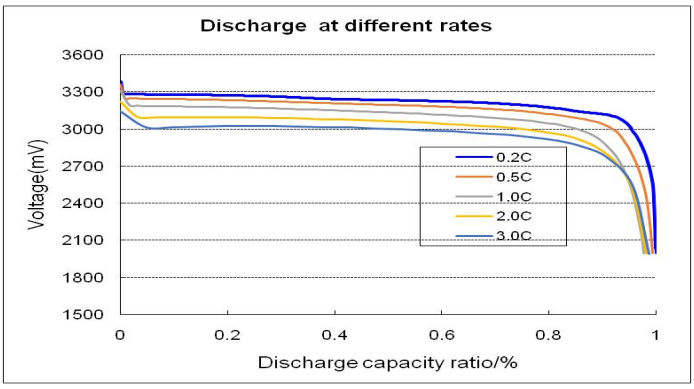
Recommend at least with 25% SOC at -10°C ~ 35°C for long storage, it is better to check the voltage each month and re-charge if the voltage lower than 3.2V.

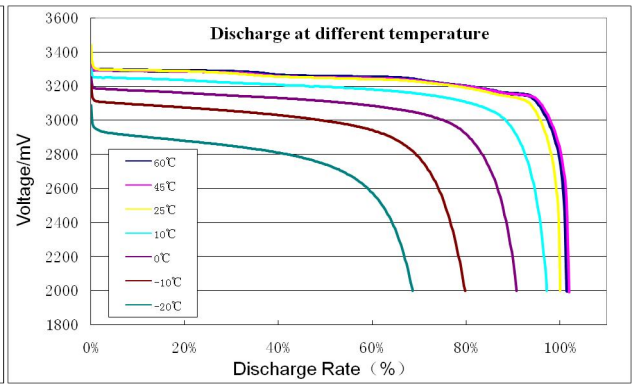
Storage humidity: ≤ 85%RH

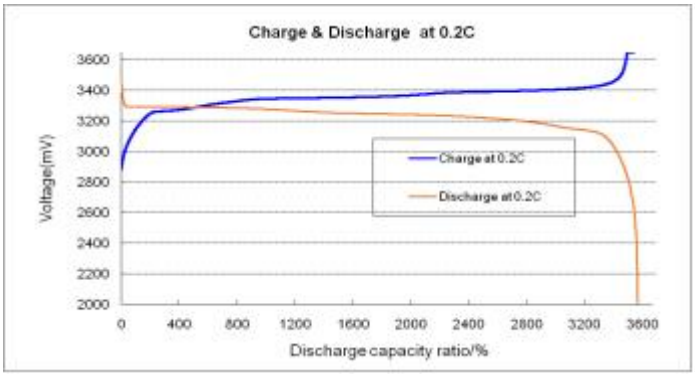
6.2 Others

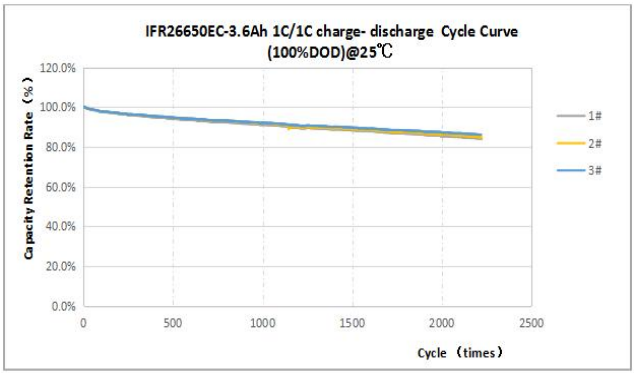
Any matters that this specification does not cover should be conferred between the customer and Superpack Technology, Co., Ltd.

6.3 Typical charge and discharge performances.









7. Handling Instructions for Lithium ion Rechargeable Cell.

7.1 Caution and Precaution.

7.1.1 Charging

a) Charging voltage must be set 3.65V/cell. Concerning charge voltage tolerance of charger, charging voltage must be set below3.65V/cell. Even if the charge could be out of order, charge voltage of charger should not be above 3.85V/cell to avoid over- charging. Cell life will be shortened by charging voltage above 3.65V.

b) Charge the cell at a constant current of 0.5C until 3.65V is attained.

c) Maintain charge voltage at 3.65V for 2.0 hours (recommended for maximum capacity).

d) No reverse charging

e) In case of cell voltage is below 2.0V, cell should be charged with per-charge that current is below 0.1C. Then cell voltage reach over 2.0V, standard charge starts. And if cell voltage never reaches to 2.0Vin specified period (timer), charger will stop charging.

f) By timer, current detection and open circuit voltage detection, charger detects full charge. When charger detect cell is full charged, charger stop charging.

7.1.2 Discharging

a) Discharge current must be below 1C /cell.

b) Discharge end voltage must be over 1.5V.

c) Do not over-discharge cell below 1V/cell.

d) Discharge temperature range should be -20 °C ~ +55°C.

7.1.3 Environmental using conditions

a) When the cell is charged.：0°C~50°C

b) When the cell is discharged.：-20°C ~ +55°C

c)Charge or discharge out of recommended range might cause the generating heat or serious damage of cell. And also, it might cause the deterioration of cell's characteristics and cycle life.

7.1.4 Storage

a)Any storage, cell should be in low humidity, no corrosive gas atmosphere area. And there is no press and condensation on the cell.

b) Recommend at least with 25% SOC at -10°C ~ 35°C for long storage, it is better to check the voltage each month and recharge if the voltage lower than 3.2V.

c) Storage humidity: ≤ 85%RH

7.1.5 Precautions on Handling Lithium Ion Cells

a) When the cells are connected in series, use same rank cells, use same lot number cells and use same charging date cells. These date show label for carton on the master carton. Further, the cell’s voltage and impedance have to be checked and matched as uses of cells. Superpack recommends match cells keep voltage within 7mV difference and impedance within 2mΩ difference at least.

b) Inspect voltage and internal impedance before using.

c) When cells are re-shipped to assembling factory, make enough attention the packing to avoid stress by shipping. Superpack recommends the same package shipped from Superpack when re-shipping. Even if after open package, when re-shipping, use the same parts and materials from Superpack for re-packing.

d) Do not use abnormal cell which has damages by shipping stress, drop, short or something else, and which gives off electrolyte odor.

e) Do not use or leave the cell under the blazing sun (or in heated car by sunshine). The cell may generate heat, , it might cause the deterioration of cell's characteristics or cycle life.

f) Do not use cell nearby the place where generates static electricity (more than 100V).

g) Please read the manual before using the cell and please reread if necessary.

h) Please read the manual of specified charger about charging method.

i) When the cell has rust, bad smell or something abnormal at first-time-using, do not use the equipment and go to bring the cell to the place which it was bought.

j) In case younger children use the cell, their parents teach how to use cells according to the manual with care.

k) Keep the cell out of the reach of younger children. And also, pay attention to cell be taken out it from the charger or equipment by little children.

l) If the skin or cloth is smeared with liquid from the cell, wash with fresh water. It may cause the skin inflammation, see a doctor immediately.

7.1.6 Cell position in equipment and charger.

To avoid degradation of cell performance by heat, a cell should set the place apart from heat generating electronic parts inside equipment and charger.

7.1.7 Precautions on Battery Pack Design.

a) Battery pack Shape, Mechanism and Material

- Do not make the shape and mechanism which easy connect to other equipment and charger.
- Do not make the terminal shape which easy cause short circuit by metal object such as necklaces, hairpins, etc. And further, have over current protection function to prevent outer short circuit.
- Do not make the terminal shape and mechanism which connect reverse to equipment.

- Do not make the shape and mechanism which static electricity and water easy go through the battery pack inside.
- Make the shape and mechanism which can inspect protection circuit function before the battery pack makes completely.
- Fix cells with mold case by rib, tape, glue etc., but do not make damage cells (especially sealing part) by rib or sharp part of mold case. In case of the battery pack is struck by hard shock or vibration, the battery pack has possibility to cause leakage, smoke, explosion.
- Weld mold case by glue. Not weld mold case by ultra-sonic welding.

b) Protection Circuit insure safety of battery

- Overcharge protection should work below 3.85V/cell by charge. Then charge current shall be shut down.
- At the voltage range 1.50~1.70V/cell, over-discharge protection should work. Then discharge current shall be shut down and consumption current is below 1μA.
- When discharge current exceed about11A, over-discharge current protection should work. Then over-discharge current shall be shut down.

c) Electric circuit

- To avoid to discharge during storage, design the low consumption current electronic circuit(e.g. Protection circuit, fuel gauge, etc) inside battery pack.

d) Cell connection

- Do not solder onto a cell in order to avoid a damage on the cell. Weld spot welding lead plate onto cell, and solder lead wire or lead plate.

7.2 Precautions and Safety Instructions.

The cell includes the flammable objects such as the organic solvent. If the handling is missed there will be possibility that the cell rupture flames or hot, or it will cause the damage to the cell and/or personal injury. Please observe the following prohibitive matters. And also, add the protection device the equipment for fear that the trouble would affect the cell by the abnormality of equipment. Please read and observe the standard cell precautions below before using utilization.

7.2.1 Don't use or expose the cell to extreme heat, flame, disposed in fire or water or get it wet. Don't modify or disassemble the cell. It will be dangerous, and may cause ignition, heating, leakage or explosion.

7.2.2 Don't short-circuit cell positive(+) and negative(-) terminals. Keep away from metal or other conductive materials. Jumbling the cells of direct contact with positive(+) and negative(-) terminals or other conductive materials may cause short-circuit. Don't reverse the positive (+) and negative (-) terminals for any reason.

7.2.3 Don't use the unspecified charger and breach charging requirement. Cell charged with unspecified condition maybe lead cell to be overcharged or abnormal chemical reaction. It causes the generating heat, smoke,rupture .

7.2.4 Don't overcharge, over-discharge, drive nail into the cell, strike it by hammer or tread it.

7.2.5 Don't give cell impact or drop, and not use the cell with conspicuous damage or deformation.

7.2.6 Don't connect cell to the plug socket or car-cigarette-plug. Don't use lithium-ion cell in mixture of different batch or use cell for other equipment.

7.2.7 Do not use or leave the cell under the blazing sun (or in heated car by sunshine), and keep cell away from little children in order to avoid troubles by Swallowing. In case of swallowing the cell, see a doctor immediately.

7.2.8 If the cell gives off an odor, generates heat, becomes discolored, or in any way appears abnormal during use, recharging or storage, immediately remove (Don't touch a abnormal cell directly) it from the device or cell charger and stop using it.

7.2.9 Do not continue to charge cell over specified time. If the cell is not finished charging over regulated time, let it stop charging. There is possibility that the cell might generate heat, smoke, rupture or flame.

7.2.10 Do not get cell into a microwave or a high-pressure container. It causes the generating heat, smoke, rapture or flame because of a sudden heat or damage of sealing condition of cell.

7.2.11 Don't solder the cell directly. Excessive heating may cause deformation of the cell components such as the gasket, which may lead to the cell swelling, leakage, explosion, or ignition.

7.2.12 Do not touch a leaked cell directly or put a leaked cell nearby fire.

7.2.13 Don't use abnormal cell which has damages by shipping stress, drop, short or something else, and which gives off electrolyte odor.

7. 3 Consultation

7.3.1 If there are problems in this specification, Superpack can consider to change specification after discussion, please contact with us.

7.3.2 For the sake of safety assurance, please discuss the equipment design, its system and protection circuit of Lithium-ion cell with Superpack in advance. And consult about the high rate current, rapid charge and special application in the same way.

GUANGDONG SUPERPACK TECHNOLOGY CO., LTD.
Add: Building 4, No. 2 of Xingye Road, Songshanhu Park, Dongguan City, Guangdong Province, 523763 P.R. China
Tel: +86-769-82260562 Fax: +86-769-82260590
Email: marketing@super-pack.com.cn Web: www.super-pack.com.cn