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EEMB CO., LTD

Lithium Iron Phosphate Battery

Specification

Model:	16LP8867220F-PCM-LD
Capacity:	10Ah

Prepared	Checked	Approved

Customer:

Customer Approval (Customer confirmation) :

Signature	Checked	Approved

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1. Scope

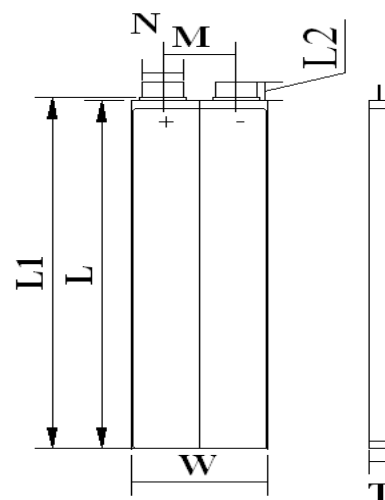
This product specification defines the requirements of the rechargeable lithium iron phosphate battery supplied to the customer by EEMB Co., Ltd.

2. Cell Basic Characteristics

No.	Item	Characteristics	Remark	
2.1	Model	LP8867220F		
2.2	Capacity	Nominal Capacity	10000 mAh	0.2C ₅ A
		Minimum	9500 mAh	0.2C ₅ A
2.3	Nominal Voltage	3.2 V		
2.4	Weight	Approx. 250 g		
2.5	Internal Impedance	≤ 15 mΩ	AC 1KHz(50%charge)	
2.6	Dimension	Length	≤ 224.0 mm	
		Width	≤ 67.5 mm	
		Thickness	≤ 9.3 mm	
2.7	Charge	Maximum Current	10000 mA	1.0C ₅ A (CC&CV)
		Limited Voltage	3.650±0.020 V	
		End-of Current	250 mA	
2.8	Discharge	Maximum Current	20000 mA	2.0C ₅ A
		Cut-off Voltage	2.00±0.005 V	
2.9	Operation Temperature	Charge	0 ~ 45 °C	
		Discharge	-10 ~ +60 °C	
2.10	Storage Temperature	1 month	-20 ~ +60 °C	
		3 month	-20 ~ +45 °C	
		12 month	-20 ~ +25 °C	
2.11	Storage Relative Humidity	65±20 %		

3. Shape and Dimensions (Unit: mm)

Item	Specification
T	Max9.3
W	Max67.50
L	Max224.0
L1	Max226.0
L2	10±1
M	36±1
N	20±0.5



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4. Appearance

It shall be free from any defects such as remarkable scratches, breaks, cracks, discoloration, leakage, or middle deformation.

5. Specification

5.1 Electrical Characteristics

No.	Item	Criteria	Test Instructions
5.1.1	1C ₅ A rate discharge capacity	Discharge Capacity ≥ Minimum Capacity	Full charge at 20±5°C, then discharge at the same temperature with 1.0C ₅ A to 2.00V.
5.1.2	High temp. discharge capacity	Discharge Time ≥ 54min	Full charge at 20±5°C, store at 55±2°C for 2h, then discharge at the same temperature with 1.0C ₅ A to 2.00V.
5.1.3	Low temp. discharge capacity	Discharge Time ≥ 3.0h	Full charge at 20±5°C, store at -10°C ± 2°C for 16h~24h, then discharge at the same temperature with 0.2C ₅ A to 2.00V
5.1.4	Cycle Life	≥ 2000 Cycles	After full charge, rest for 10 min, discharge at constant current of 0.5C ₅ A to 2.00V. Batteries are full charge after 10 minutes. Repeat above steps till retained capacity is 80%
5.1.5	Capacity Retention	Discharge Time ≥ 4.5 h	After full charge, store at 20±5°C for 28 days. Then discharge with 0.2C ₅ A to 2.00V

5.2 Acclimatization Characteristics

No.	Item	Criteria	Test Instructions
5.2.1	High Temp. and High Humidity	No deformation, no rust, no fire or explosion; Discharge time ≥ 36min	After full charge, store at 40°C ± 2°C (90%~95%RH) for 48h. After test, place at 20°C ± 5°C for 2h and then discharge with 1C ₅ A to end-voltage
5.2.2	Vibration	No damnification, leakage, no fire or explosion; Battery Voltage ≥ 3.2V	Batteries are vibrated 30 min in three mutually perpendicular directions with amplitude of 0.38mm (10~30Hz) or 0.19mm (30~55Hz) and the scanning rate of 1 oct per min
5.2.3	Drop	No leakage, no fire or explosion; Discharge Time ≥ 1 min	Batteries are dropped onto a hard board with the thickness of 18~20mm from 1meter
5.2.4	Low-pressure	No leakage, no fire or explosion	Put the batteries in a sealed vacuum and reduce internal pressure gradually to lower than 11.6 kpa. Keep for 6h

5.3 Safety Characteristics

No.	Item	Criteria	Test Instructions
5.3.1	Overcharge	No fire or explosion	Charged the cells at 3C ₅ A current 20±5℃ with a voltage limit of 4.8V and Current close to 0 A
5.3.2	Short-Circuit	No fire or explosion; The maximum Temperature: 150℃	Batteries are short-circuited by connecting the positive and negative terminals for 1h with a resistance load of 0.1Ω
5.3.3	Heating	No fire or explosion	Cell is heated in a circulating air oven at a rate of (5±2)℃ per minute to 130±2℃, and then placed for 30 minutes at 130±2℃
5.3.4	Temperature cycle	No leakage, no fire or explosion	After full charge, place the battery in the temperature control box of 20±5℃, do the following steps: (1)Put the battery into test chamber of 75℃±2℃ and keep for 6h. (2)Lower the temperature to -40±2℃ and keep for 6h (3)Temperature conversion time is no longer than 30 min (4)Repeat the above three steps for 10 cycles.

Note: Unless otherwise specified, all tests stated in this specification are conducted at the following conditions:
Temp. : 20±5℃; Relative Humidity: 25%~85%.

6. Specification of PCM

The specification shall be applied to Lithium iron phosphate battery protection circuit module manufactured by EEMB CO., LTD.

6.1.0 Basic Specification(T=25℃)

Item	Symbol	Content	Criterion
Over charge Protection	V _{DET1}	Over charge detection voltage	3.60±0.05V
	tV _{DET1}	Over charge detection delay time	5S
	V _{REL1}	Over charge release voltage	3.4±0.1V
Over discharge protection	V _{DET2}	Over discharge detection voltage	2.8±0.1V
	tV _{DET2}	Over discharge detection delay time	5S
	V _{REL2}	Over discharge release voltage	3.0±0.1V
	I _{DP}	Over current detection current	>30A
	tV _{DET3}	Detection delay time	2S
			Release condition
Short protection		Detection condition	Exterior short circuit
		Release condition	Cut short circuit
Interior resistance	R _{DS}	Main loop electrify resistance	R _{DS} ≤70mΩ
Current consumption	I _{DD}	Current consume in normal operation	100μA Type 200μA Max
Communication protocol		RS-485 or RS-232	

*Note: These specs are guaranteed by design not by production tests.

6.2.0 LED Indication Function

Table 1 LED working status

Pack Status		RUN	ALM	Power Indicator LED(green)				Introduction
		●	●	●	●	●	●	
Power off/ Dormant		Off	Off	Off	Off	Off	Off	Off/ dormant
Standby	Normal	Flashing2	Off	Off	Off	Off	Off	standby
	Low-voltage warning	Off	Flashing 1	Off	Off	Off	Off	Low-voltage warning
Charging	Normal	Normally on	Off	According to power indicated				The highest LED flashing 2
	Over-current warning	Normally on	Flashing 1	According to power indicated				The highest LED flashing 2
	Over-current protection	Off	Normally on	Off	Off	Off	Off	Over-current protection
	High low temperature warning	Normally on	Flashing 1	According to power indicated				The highest LED flashing 2
	High low temperature protection	Off	Normally on	Off	Off	Off	Off	High low temperature protection
	Overcharging warning	Normally on	Off	According to power indicated				The highest LED flashing 2
	Overcharging protection	Normally on	Off	Normally on	Normally on	Normally on	Normally on	Stop charging
Discharging	Normal	Flashing 2	Off	According to power indicated				
	Over-current warning	Flashing 2	Flashing 1	According to power indicated				
	Over-current protection	Off	Normally on	Off	Off	Off	Off	Stop discharging
	High low temperature warning	Flashing 2	Flashing 1	According to power indicated				
	High low temperature protection	Off	Off	Off	Off	Off	Off	High low temperature protection
	Overdischarging warning	Flashing 2	Flashing 1	According to power indicated				
	Overdischarging protection	Off	Off	Off	Off	Off	Off	Stop discharging
Short Circuit Protection		Off	Normally on	Off	Off	Off	Off	Short circuit protection

Note: 1、 Battery indicator shows normally which need to pass a complete discharge process.

2、 Flashing 1: LED light on for 0.5s and off for 0.5s.

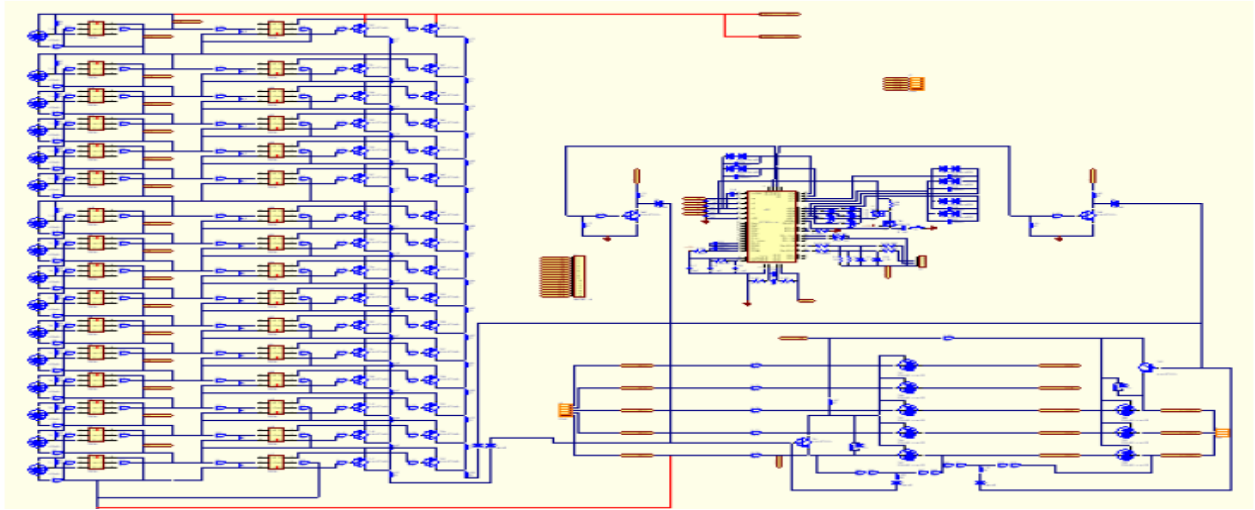
3、 Flashing 2: LED light on for 0.5s and off for 1.5s.

6.3.0 Restoration/Dormant and Awake Function

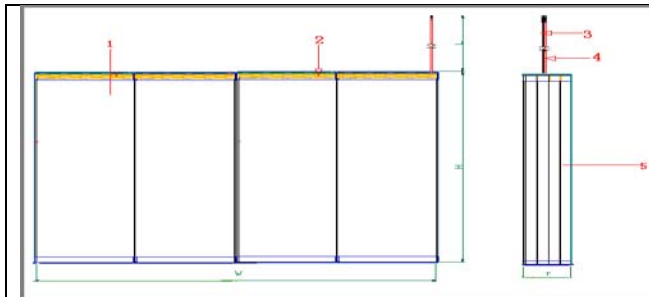
PCM design possess restoration/dormant/awake button function, long press the button(more than 3s), till all LED normally on, then loosen the button, PCM will reset and all the data of PCM will return to default. Tact the button once (<3s), PCM operation status will switch between dormant and awake.

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6.4.0 PCM Diagram (For reference)

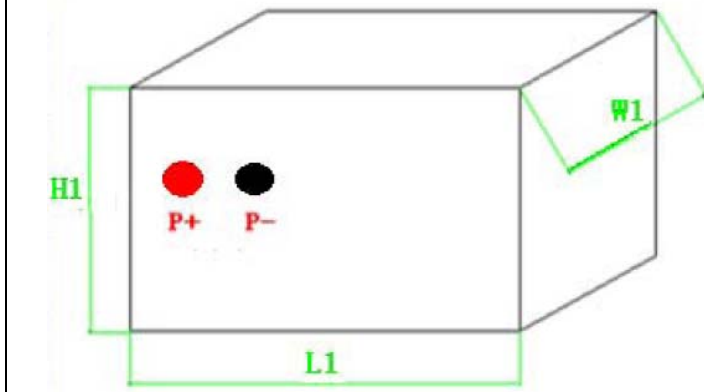


7. Pack's Dimension (For reference)



1. Drawing:
 T (max) =44.5mm
 W1 (max) =483mm
 L1 (max) =381mm

2. Materials:
 ① cell: LP8867220F
 ②PCM (with communication protocol: RS-485 or RS-232)
 ③Fuse: 30A
 ④1U case
 ⑤Connector



8. Pack's Performance

- Battery shipment voltage: 51.2V~54.4V
- Internal resistance of battery: $\leq 400\text{m}\Omega$
- Pack overcharge protection voltage range: 56.0V-60.0V
- Pack overdischarge protection voltage range: 38.4V-46.4V
- Pack Max constant charge and discharge current: 20A
- Pack Max pulse current and time: 25A/1S

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9. Shelf life

One year warranty after the date of production

10. Matters needing attention

Strictly observes the following needing attention. EEMB will not be responsible for any accident occurred by handling outside of the precautions in this specification.

! Danger

- Strictly prohibits heat or throw cell into fire.
- Strictly prohibits throw and wet cell in liquid such as water、 gasoline or drink etc.
- Strictly prohibits use leave cell close to fire or inside of a car where temperature may be above 60°C. Also do not charge / discharge in such conditions.
- Strictly prohibits put batteries in your pockets or a bag together with metal objects such as necklaces. Hairpins, coins, or screws. Do not store or transportation batteries with such objects.
- Strictly prohibits short circuit the (+) and (-) terminals with other metals.
- Do not place Cell in a device with the (+) and (-) in the wrong way around.
- Strictly prohibits pierce Cell with a sharp object such as a needle.
- Strictly prohibits disassemble or modify the cell.
- Strictly prohibits welding a cell directly.
- Do not use a Cell with serious scar or deformation.
- Thoroughly read the user's manual before use, inaccurate handling of lithium iron phosphate rechargeable cell may cause leakage, heat, smoke, an explosion, or fire, capacity decreasing.

! Warning

- Strictly prohibits put cell into a microware oven, dryer, or high-pressure container.
- Strictly prohibits use cell with dry cells and other primary batteries, or new and old battery or batteries of a different package, type, or brand.
- Stop charging the Cell if charging is not completed within the specified time.
- Stop using the Cell if abnormal heat, odor, discoloration, deformation or abnormal condition is detected during use, charge, or storage.
- Keep away from fire immediately when leakage or foul odor is detected.
- If liquid leaks onto your skin or clothes, wash well with fresh water immediately.
- If liquid leaking from the Cell gets into your eyes, do not rub your eyes. Wash them well with clean edible oil and go to see a doctor immediately.

! Caution

- Before using the Cell, be sure to read the user's manual and cautions on handling thoroughly.
- Charging with specific charger according to product specification. Charge with CC/CV method. Strictly prohibits reversed charging. Connect cell reverse will not charge the cell. At the same time, it will reduce the charge-discharge characteristics and safety characteristics; this will lead to product heat and leakage.
- Store batteries out of reach of children so that they are not accidentally swallowed.
- If younger children use the Cell, their guardians should explain the proper handling.
- Before using the Cell, be sure to read the user's manual and cautions on handling thoroughly.

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- Batteries have life cycles. If the time that the Cell powers equipment becomes much shorter than usual, the Cell life is at an end. Replace the Cell with a new same one.
- When not using Cell for an extended period, remove it from the equipment and store in a place with low humidity and low temperature.
- While the Cell pack is charged, used and stored, keep it away from objects or materials with static electric charges.
- If the terminals of the Cell become dirty, wipe with a dry clothe before using the Cell.
- Storage the cells in storage temperature range as the specifications. After full discharged, we suggest that charging to 51.2~54.4V with no using for a long time.
- Do not exceed these ranges of the following temperature ranges:
 - Charge temperature range : 0°C to 45°C;
 - Discharge temperature range : -10°C to 60°C.
 - Store less than 1 month : -20°C - +60°C
 - Store less than 3 months : -20°C - +45°C
 - Store less than 1 year : -20°C - +25°C

! Special Notice

Keep the cells in **50% charged state** during long period storage. We recommend to charge the battery up to 50% of the total capacity every 3 months after receipt of the battery and maintain the voltage 51.2~54.4V. And store the battery in cool and dry place.