

CTC Battery, Inc.

Lithium Iron Phosphate Battery Specification

Model: 12.8 V 19.8 Ah

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Rev 01

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Revision Control

This section describes the change made to each revision of this document.

Revision	Change	Prepared By	Approved By	Date
Rev 01	Initial design release	Qidong Wang		7/09/12

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1. Scope

This specification is applied to the LiFePO4 battery pack in this Specification and manufactured by CTC Battery, Inc.

2. Model

Item Code	Cell	Assembly	Voltage	Capacity
LFP128198	IFR18650EC 3.3 Ah	4S6P	12.8V	19.8 Ah

3. Dimension and Weight

No.	Item	General Parameter	Remarks
3.1	Pack Dimension	High: 166mm	
		Width: 76mm	
		Length: 181mm	
3.2	Weight	Approx: 2.75kg	

4. Product Specification

No.	Item	General Parameter	Remarks
1	Rated Capacity	19.8Ah	0.2C standard charge / discharge
2	Nominal Voltage	12.8 V	3.2V / Cell
3	Discharge Cut-off Voltage	10.0 V	
4	Charging Cut-off Voltage	14.6 V	
4	Cycle Life	Capacity greater than 80% of the initial pack capacity	800 cycles
			Charge: CC at 0.2C to 14.6V, then CV until current reaches 0.05C
			Rest: 30 min.
			Discharge: 0.2C to 10.0V
			Temperature: $20 \pm 5^{\circ}\text{C}$
9	Standard Charge	0.2C constant current (CC) charge to 14.6V, then constant voltage (CV) charge at 14.6V until charge current decline to $\leq 0.05\text{C}$	Charge time : Approx 6h
10	Standard Discharge	Constant current at 0.2C rate	
		Cut-off voltage 10.0V	
11	Maximum Continuous Charge Current	40 A	
12	Maximum Continuous Discharge Current	40 A	Maximum Discharge Current 100A 30S
13	Operation Temperature Range	Charge: 0°C to 45°C	
		Discharge: -10°C to 60°C	
14	Storage Temperature Range	Less than 1 year : 0°C to 25°C	
		Less than 3 months:- 5°C to 35°C	

5. Cell Safety Features

No.	Items	Inspection Method and Procedure
1	Cell and Package	UN Manual of Test and Criteria Section (5th) 38.3
2	Transportation - Air	IATA Dangerous Goods Regulations (IATA DGR) (53rd)
3	Transportation - Ocean	IMO International Maritime Dangerous Good Code
4	Transportation - Ground	GB12268 -2005 List of Dangerous Goods

No.	Test Item	Standard Requirement	Criteria
1	Altitude Simulation	UN Manual of Test and Criteria Section (5th) 38.3 Test T.1	No mass loss, no leakage, no venting, no disassembly, no rupture and no fire and the open circuit voltage of each cell or battery after testing is not less than 90% of its voltage immediately prior to the procedure.
2	Thermal Test	UN Manual of Test and Criteria Section (5th) 38.3 Test T.2	Same as above
3	Vibration	UN Manual of Test and Criteria Section (5th) 38.3 Test T.3	Same as above
4	Shock	UN Manual of Test and Criteria Section (5th) 38.3 Test T.4	Same as above
5	External Short Circuit	UN Manual of Test and Criteria Section (5th) 38.3 Test T.5	The external temperature does not exceed 170°C, no disassembly, no rupture and no fire within six hours of this test.
6	Impact	UN Manual of Test and Criteria Section (5th) 38.3 Test T.6	The external temperature does not exceed 170°C, no disassembly, no fire within six hours of this test.
7	Forced Discharge	UN Manual of Test and Criteria Section (5th) 38.3 Test T.8	No disassembly, no fire within 7 days of this test.
8	Other	1.2 M Drop Test	The tested package is capable of withstanding a 1.2 M drop test in any orientation without damage the cells or batteries contained therein, without shifting the contents so as to allow battery to battery or cell to cell contact and without release the contents.
Test Environment and Condition		Ambient temperature: 20°C ~ 21°C; ambient humidity: /%	

6. Protection

When Li-ion rechargeable battery is used over the permitted voltage or current, electrolyte may disassemble. This case will affect safety performance of Li-ion rechargeable battery.

No.	Item	Test Condition	Criteria
1	Voltage	Charging voltage	DC: 3.65V / cell
2	Current	Low current consumption for single cell	$\leq 150 \mu\text{A}$
		Maximal continuous discharging current	40 A
3	Cell Balance	Balance start point voltage	
		Balance current	
4	Over Charge Protection (cell)	Over charge detection voltage	$3.9 \pm 0.025\text{V}$
		Over charge detection delay time	0.8 to 1.5S
		Over charge release voltage	$3.8 \pm 0.05\text{V}$
5	Over Discharge Protection (cell)	Over discharge detection voltage	$2.0 \pm 0.05\text{V}$
		Over discharge detection delay time	90~200mS
		Over discharge release voltage	$2.3 \pm 0.05\text{V}$
6	Over Current Protection	Over current detection voltage	100mV
		Over current detection current	$160 \pm 15\text{A}$
		Detection delay time	7-20ms
		Release condition	Disconnect the load
7	Short Protection	Detection condition	Exterior short circuit
		Detection delay time	300-600us

7. Performance and Testing Conditions

7.1 Standard Test Conditions

Test should be conducted with new batteries within one week after shipment from our factory and the batteries shall not be cycled more than five times before the test. Unless otherwise specified, test and measurement shall be done under temperature of $20 \pm 5^{\circ}\text{C}$ and relative humidity of 45~85%. If it is judged that the test results are not affected by such conditions, the tests may be conducted at temperature $15 \sim 30^{\circ}\text{C}$ and humidity 25~85%RH.

7.2 Measuring Instrument or Apparatus

7.2.1 Dimension Measuring Instrument

7.2.2 Voltmeter (Standard class specified in the national standard or more sensitive class having inner impedance more than $10\text{k}\Omega/\text{V}$)

7.2.3 Ammeter

Standard class specified in the national standard or more sensitive class. Total external resistance including ammeter and wire is less than 0.01Ω .

7.2.4 Impedance Meter

Impedance shall be measured by a sinusoidal alternating current method (1kHz LCR meter).

7.3 Standard Charge/Discharge

7.3.1 Standard Charge : 0.2C

Charging shall consist of charging at a 0.2C constant current rate until the battery reaches 14.6V. The battery shall then be charged at constant voltage of 14.6V volts while tapering the charge current. Charging shall be terminated when the charging current has tapered to $0.05\text{C}_5\text{A}$. Charge time: Approx 6 hour, the battery shall demonstrate no permanent degradation when charged between 0°C and 45°C .

7.3.2 Standard Discharge: 0.2C.

Battery shall be discharged at a constant current of 0.2C to 10.0V @
-10°C to 60°C

If no otherwise specified, the rest time between charging and
discharging is 30 minutes.

7.4 Appearance

There shall be no such defect as crack, rust, leakage, which may adversely affect
commercial value of battery.

8. Handling of Battery

8.1 Prohibition Short Circuit

Never short circuit battery. It generates very high current which causes heating of the battery and may cause electrolyte leakage, gassing or explosion that is very dangerous.

The poles may be easily short-circuited by putting them on conductive surface.

Such outer short circuit may lead to heat generation and damage of the battery.

An appropriate circuitry with PCM shall be employed to protect accidental short circuit of the battery pack.

8.2 Mechanical Shock

Falling, hitting, bending, etc. may cause degradation of battery characteristics.

9. Others

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 internally, which may cause generation of smoke or firing.

10. Warranty

The period of warranty is 12 months from the date of shipment. CTC guarantees to give a replacement in case of battery with defects proven due to manufacturing process instead of the customer abuse and misuse.

11. Storing the Battery

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 Chemical Reaction

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, 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. Photo



14. Warning: Risk of Fire, Explosion or Burn.

- 14.1 Do not short circuit the (+) and (-) terminals with any metals.
- 14.2 Do not immerse, throw and wet battery in water.
- 14.3 Do not heat above 60°C or throw battery into fire.
- 14.4 Do not disassemble, crush or modify the battery.
- 14.5 Do not put battery into a microwave oven, dryer, or high-pressure container.
- 14.6 Do not use battery with dry batteries and other primary batteries, or batteries of a different type, brand or package.
- 14.7 Stop using the battery if abnormal heat, odor, deformation, or abnormal condition is detected.
- 14.8 Stop charging the battery if charging is not completed within the specified time.

15. Caution

- 15.1 Do not charge or discharge the battery outside of its stated operating temperature range. Reduce charging limits for lower operating temperature.
- 15.2 Do not connect more than one module in series. This battery is designed for direct replacement of lead acid battery.
- 15.3 Do not expose the battery to heat in excess of 60°C during operation, 60°C in storage; do not incinerate or expose to open flames.
- 15.4 Remove the battery from equipment immediately when its life cycle has expired.
- 15.5 Do not incinerate or dispose the battery, recycle the battery to your nearest recycling center as per the appropriate local regulations.

