ENERTECH	PRODUCT SPECIFICATION	Version	P3
		Revision	2.0
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Part No.	15-15410		
Product Name	SPB58253172P3 (Lithium Ion Rechargeable Cell)		

SPECIFICATION OF PRODUCT

Lithium Ion Rechargeable Cell
Part Number : 15-15410
Product Name : SPB58253172P3

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Revision History

Rev. No	Date (YY. MM. DD)	Description	Remark
1.0	19.03.17	Initial release	
2.0	20.05.13	Added Note (3), (4) in the '3. Specifcation' Added Note (2) in the '6. Characteristics'	

CONTENTS

Ⅰ. Cell Specification

1. Scope

This specification defines the characteristics of a rechargeable lithium ion rechareable cell manufactured by **Enertech International, Inc.**

2. Description and Model

2.1 Description Lithium Ion Rechargeable Cell

2.2 Part Number 15-15410

2.3 Product Name SPB58253172P3

3. Specifications

Item		Specification		Remark
3.1 Capacity	Nominal	23.0 Ah		
3.2 Energy Density	Volumetric	337 Wh/ℓ		
	Gravimetric	177 Wh/kg		
3.3 Cell Weight		≤480 g		
3.4 Nominal Voltage		3.70 V		
3.5 Operating Voltage Range	Charge(1*)	4.20 V		Cut-off : 4.2V/0.05C
	Discharge	2.70 V		Cut-off Voltage
3.6 Standard Current	Charge(CC/CV)	11.5 A		Cut-off : 4.2V/0.05C
	Discharge(CC)	11.5 A		Cut-off : 2.7V
3.7 Maximum Current (3*)	Charge	69 A		3C
	Discharge	115 A		5C
	Peak Discharge	161 A		7C, Less than 10sec
3.8 Initial Internal Resistance		<1.5mΩ		AC impedance at 1kHz
3.9 Operating Temperature	Charge	0℃ ~ 55℃		
	Discharge	-20℃ ~ 55℃		
	Recommend	25 ± 3℃		
3.10 Storage Temperature(2*)	< 1 month	-20℃ ~ 55℃		
	< 1 year	-20℃ ~ 25℃		
3.11 Storage Humidity		45 ~ 85%RH		Non-condensing
3.12 Cell Dimensions	Thickness	5.8mm	+ 0.2- 0.4	Initial full charged
	Width	253mm	± 1	
	Length	172mm	± 1	Excluding tab
	Length	192mm	± 1	Including tab

Note (1): Charging Method is CC-CV(constant voltage with limited current).
Note (2): The capacity recovery rate is more than 80%.
Note (3): Maximum Current is not for the continuous cycle condition, only check the cell performance.
Note (4): Depending on the final application requirements, the cell specification can be limitedly used by the pack design.

4. Appearance

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

5. Standard test conditions

5.1 Test sample condition

The cell used for the test shall be manufactured and delivered no later than one month before.

5.2 Environmental condition

Unless otherwise specified, all tests stated in this specification are conducted at temperature 25 ± 3° and humidity 45~ 85%(Non-condensing).

5.3 Test equipment condition

(1) Ammeter and Voltmeter

The ammeter and voltmeter should have an accuracy of the grade 0.5 or higher.

(2) Vernier caliper

The Vernier caliper should have 0.01 mm scale.

(3) Impedance meter

The impedance meter with AC 1kHz should be used.

6. Characteristics

6.1 Standard Charge

The standard charge means charging the cell with charge current 11.5A and constant voltage 4.20V at 25±3 °C for until charge current reach to 1.15A.

6.2 Standard Discharge

The standard discharge means discharging the cell with discharge current 11.5A with 2.7V cutt-off at 25±3 °C.

6.3 Standard Capacity

The standard capacity is the initial discharge capacity of the cell, which is measured with standard discharge within 1hour after the standard charge.

Standard Capacity ≥ 23.0Ah(Nominal Capacity)

6.4 Initial Internal Impedance

The Initial internal impedance of the cell measured at AC 1kHz after standard charge.

Initial internal impedance < 1.5mΩ

6.5 Charge Rate Capabilities

Charge capacity is measured after the various currents in the table below to 4.20V and constant Voltage of 4.20V until charge current reach to 1.15A at 25±3℃.

Items	Charge condition			
Current	11.5A (0.5C)	23.0A (1.0C)	46.0A (2.0C)	69.0A (3.0C)
Cut-off	1.15A(0.05C)			
Relative Capacity	100%	90%	85%	80%

Note (1): Percentage as an index of the nominal capacity is 100%.

Note (2): Charge Rate Capabilities is not for the cycle condition, only check the cell performance.

6.6 Discharge Rate Capabilities

Discharge capacity is measured with the various currents in under table and 2.7V cut-off after the standard charge at 25±3℃.

Items	Discharge condition				
Current	11.5A (0.5C)	23.0A (1.0C)	46.0A (2.0C)	69.0A (3.0C)	115.0A (5.0C)
Relative Capacity	100%	95%	92%	88%	85%

Note (1): Percentage as an index of the nominal capacity is 100%.

Note (2): Discharge Rate Capabilities is not for the cycle condition, only check the cell performance.

6.7 Temperature Dependence of Charge Capacity

Capacity comparison at each temperature, measured with discharge constant current 11.5A and 2.7V cut-off after the standard charge is as follow temperature.

Conditions are : 2 hours waiting before measuring the charge capacity

Discharge Temperature	Charge temperature		
25±3℃	0±3℃	25±3℃	55±3℃
Relative Capacity	75%	100%	100%

Note (1): Percentage as an index of the nominal capacity is 100%.

Note (2): Temperature Dependence of Charge Capacity is not for the cycle condition, only check the cell performance.

6.8 Temperature Dependence of Discharge Capacity

Capacity comparison at each temperature, measured with discharge constant current 11.5A and 2.7V cut-off with follow temperature after the standard charging at 25±3℃.

Conditions are : 2 hours waiting before measuring the discharge capacity

Charge Temperature	Discharge temperature			
25±3℃	-20±3℃	0±3℃	25±3℃	55±3℃
Relative Capacity	65%	80%	100%	100%

Note (1): Percentage as an index of the nominal capacity is 100%.

Note (2): Temperature Dependence of Discharge Capacity is not for the cycle condition, only check the cell performance.

6.9 Cycle Life

Each cycle is an interval between the charge (charge current 23.0A) with 0.05C(1.15A) cut-off and the discharge (discharge current, 23.0A) with 2.7V cut-off.

Capacity is measured at 2,000cycles.

2000th capacity ≥ 17.6Ah (80% of the Initial capacity)

6.10 Storage Characteristics

Capacity after storage for 180days at 25±3°C after standard charge, measured with standard discharge current 11.5A with 2.7V cut-off at 25±3°C

Capacity retention(after the storage) ≥ 90% of the nominal capacity

7. Shipment

The cell shall be shipped in partially charged state.

8. Warranty

Enertech International, INC. will be responsible for replacing the cell against defects or poor workmanship for 6months from the date of shipping. Any other problem caused by malfunction of the equipment or unsuitable use of the cell is not under this warranty.

The warranty set forth in proper using and handling conditions described above and excludes in the case of a defect which is not related to manufacturing of the cell.

9. Caution and prohibition

Before using and handling the cell, see carefully attached " Proper Use and Handling of Lithium Ion Rechargeable Cell".

10. Others

10.1 Storage for a long term

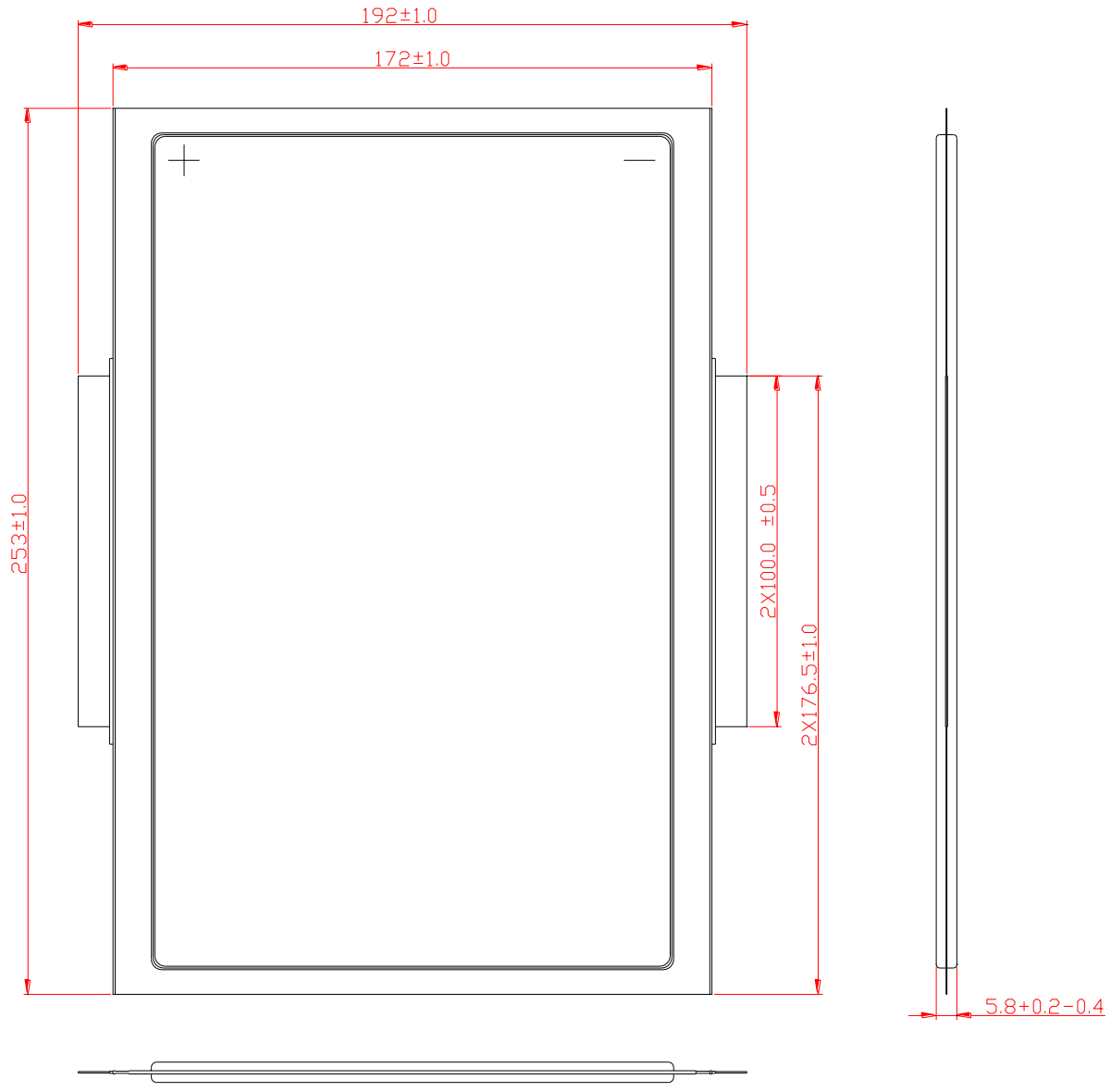
If the cell is kept for a long term (3 months or more), it is strongly recommended that the cell be preserved at dry and low temperature atmosphere.

10.2 Other

Any matters that specifications do not have should be conferred with between the both parties.

Ⅱ. Out View Drawing

(unit : mm)



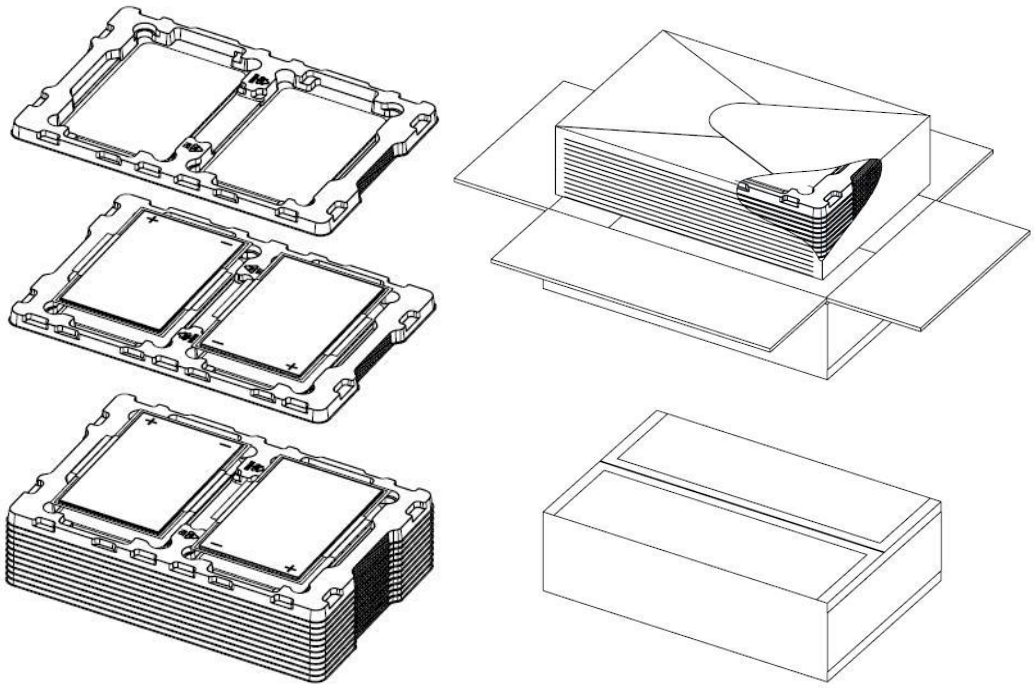
Ⅲ. Packing Specification

1. Master Packing Box

1.1 Dimension of Box : 525(W) X 350(D) X 160(H)

1.2 Packing Box Weight : less than 15.0 Kg / Box

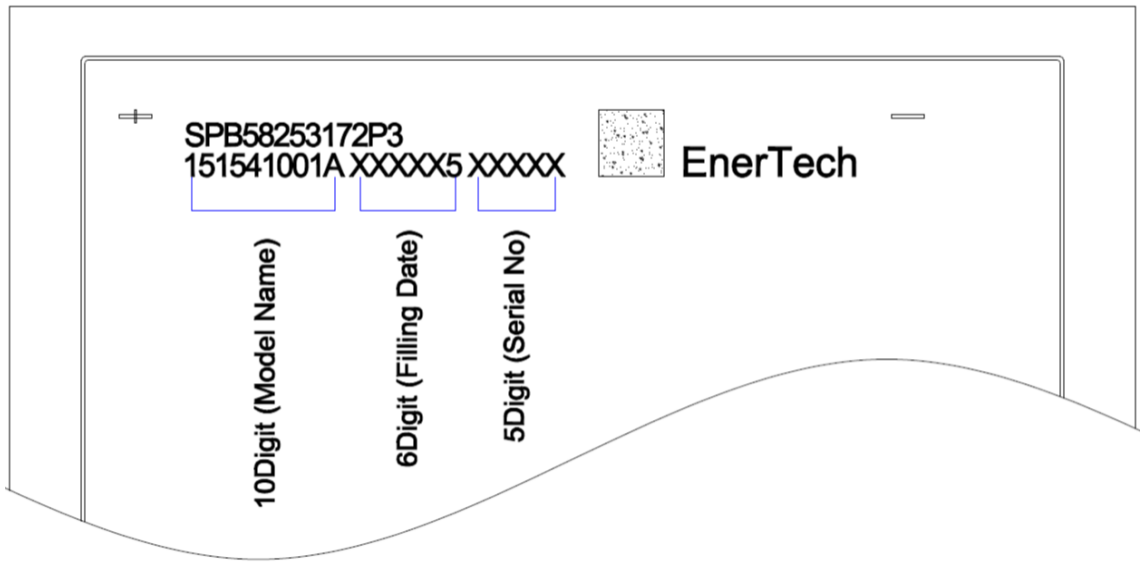
2. Packing Method



ITEM	DISCRIPTION	QTY	UNIT	Remark
1	TRAY	13	EA	
2	Cell	24	EA	
3	POLY BAG	1	EA	
4	BOX	1	EA	

Ⅳ. Lot No. Specification

Example



Explanation

1) 10Digit(Model name) : 151541001A(7Digit : Part No, 2Digit : Revision, 1Digit : Cell type)
2) 6Digit(Filling date) : 5Digit : Julian date, 1Digit : Production line
3) 5Digit (Serial No.) : 00001 ~ 99999

Ⅴ. Proper Use and Handling of Lithium Ion Rechargeable Cell

1. General

The cells supplied by Enertech International, INC. have to be handled carefully according to the specification. Here are some more to be followed.

2. Storage

The cells should be requested to be stored under the following conditions.

a. Indoor storage in a cool circumstance without direct sun light.

b. Store the cells in a dry location with low humidity and recommended temperature range is 25 ± 3°C.

c. As long-term storage can accelerate battery self-discharge and lead to the deactivation of the cells. To minimize the deactivation effect, store the cells in a temperature range of 25 ± 3°C.

d. When charging for the first time after long-term storage, the deactivation of the cells has led to the decreased capacity.

e. The cells should be used within a short period after charging because long-term storage may cause the loss of capacity by self-discharging.

f. Over-discharging may occur by self-discharge if the cells are left for a long time without any use.

g. If long-term storage is necessary, the cells should be stored at lower voltage within a range specified in the product specification, because storage at higher voltage may cause loss of characteristics.

3. Charging and discharging

a. Charging and discharge current should be used less than maximum current specified within the product specification.

b. Charging and discharge voltage should be used in the range of operating voltage specified within the product specification

c. The cells should be charged and discharged within a range of specified temperatures in the cell specification.

d. Use suitable charger with the specified voltage and current. We strongly recommend the smart battery charger. We can recommend the usage or specification of the charger manufacturing. If you want to get the information about it, please contact us.

e. Never attempt reverse charging. Charging with polarity reversed can cause a reversal in the cell polarity, causing gas pressure inside of the cell to rise, which can be led to leakage of the cell.

f. Avoid overcharging. Repeated overcharging can be led to deterioration in cell performances and over-heating occurred.

g. Charging efficiency drops at temperatures above 40°C.

4. The end of life for the cells

a. The cells can be charged and discharged repeatedly up to times specified in the produce specification with a certain level of capacity also specified in the product specification.
b. The end of life for the cells may be determined by conditions of charging, discharging, operating temperature and/or storage.

5. Protection from unexpected damaged to the cell

a. (+) and/or (-) terminals must not be connected in metal wire, necklace, chains.
b. Do not drop cells from height in order to prevent them from possible malfunction or damage.
c. Do not twist or bend cells in order to prevent possible damage.

6. For safety

a. Do not dissemble cells
b. Do not use the cell when something abnormal found such as smells, deformation, discoloration, and so on.
c. When the electrolyte leakage occurs, do not touch the liquid. When the electrolyte is coming in contact with the skin or eye, Flush immediately with fresh water and seek medical advice.
d. Soaking the cells in water is strictly prohibited, because it may cause melt of components to the damaged functions. Once watered, do not use those cells.
e. Do not have cells in the hot-temperature (60°C or more).
f. The usage by children should be supervised
g. Don't put the battery into a microwave oven, dryer, or high-pressure container.
h. Do not fold, crush and nail the cells.
i. Replace battery packs when using time of battery becomes much shorter than usual.
j. The cell should not be dismantled from the battery pack. Internal short-circuit caused by disassembly may lead to heat generation and/or venting.
k. Short-circuit results in very high current which leads to heat generation. So, an appropriate circuitry should be employed to protect accidental short-circuiting.
l. Mixing use of different types of cells, or same types but different manufacture's cell may lead to cell rupture or damage to battery pack due to the different characteristics of cell. And don't use or assemble old and new cells together.
m. Incinerating and disposing of the cell in fire are strictly prohibited, because it may cause rupture.
n. The cells and battery packs should be disposed with a discharged state to avoid heat generation by an inadvertent short-circuit. And cover terminals with proper insulating tape before disposal.
o. The cells and battery packs should be disposed according to the local environmental regulations when they are disposed.

Ⅵ. Pack assembly requirement

1. General

This document is to specify the standards and cautions to handle the large format cell manufactured by Enertech International, Inc. Please refer to the "cell specification" as to how to generally handle and use the cell. But please be aware and comply with this document when you assemble the battery pack using ETI's large format cell.

[Terminology]

A battery pack means the product composed of one or more large format cells, which are connected in series or parallel, and BMS(Battery Management System) including protection module.

2. Please comply with the "cell specification" of each large format cell for the general usage of the cells.

a. The cell should be inspected visually before battery pack assembly.
b. Do not use the cell damaged while the cell is being handled.
(Pouch-torn, strong dent, scratch on the surface, electrolyte-smell and etc.)
c. Please refer to the "Cell Specification" for the safety handling.

3. BMS should have the following functions at least.

Include protection function against over-charge, over-discharge, over-current, voltage-imbalance, Over-temperature and so on.

a. Over-charge protection:4.20V±0.02V/cell.
b. Over-discharge protection:3.00V±0.05V/cell.
c. The voltage difference of the cells should be within 100mV during pack-operation. If the difference is over 100mV, charging and discharging should not work.
d. If C-rate for continuous charging and discharging is over 1C, it should have the cooling system. If the temperature of the cells is beyond the temperature specified in the specification, charging and discharging should not work.
e. The charger should be communicated with the battery pack. Charging and discharging should be worked or not, based on the received battery's signals.

4. Refer to the following charging and discharging conditions of the cell

a. Charging mode: CC-CV mode
b. Charging Voltage: 4.2 ± 0.02V/cell
c. Max charging current: refer to the cell specification.
d. Fully charged condition: should be controlled with taper current (1/20C) and timer detection.
e. Cut-off voltage of discharging: must be over 3.0V/cell
f. Maximum discharging current: at less than specified in the cell specification

5. Cautions for battery pack assembly

a. All cells should have the same range of voltages, the difference of which should be within 20mV and all cells should be in the same Enertech production lot.
b. Secure minimum 0.3mm between cells if more than 2 cells should be stacked for the pack assembly (for swelling).
c. Remove the dust or foreign substance between cells if more than 2 cells should be stacked for the pack assembly.
d. Do not place the sharp or heat sources and high temperature components close to the cell when battery pack is designed. Otherwise, it may cause loss of characteristics.
e. The cell should not be soldered directly with leads. Otherwise, it may cause damage of component, such as separator and insulator, by heat generation.
f. The pack should equip with appropriate shock absorbers in order to minimize mechanical shock. Otherwise, it may cause shape distortion, leakage, heat generation or rupture.
g. The battery pack should be designed to be connected only to the specified charger and system.
h. A reverse connection of the cells, even in the specified battery pack, should be avoided by employing special battery design, such as special terminals. Reverse charging should be strictly prohibited.
i. Do not fold or cut the sealing or corner of the cell.
j. Check the polarity printed on the cell before battery pack assembly.
k. The cell should not be dismantled from the battery pack, Internal short-circuit caused by disassembly may lead to heat generation.