

## 1. Scope

This product specification has been prepared to specify the rechargeable Lithium-ion Polymer battery to be supplied to the customer by MINAMOTO BATTERY (HK) LTD.

## 2. Description and Model

2.1 Description: Lithium Ion Polymer battery

2.2 Model: **LP963448-1500**

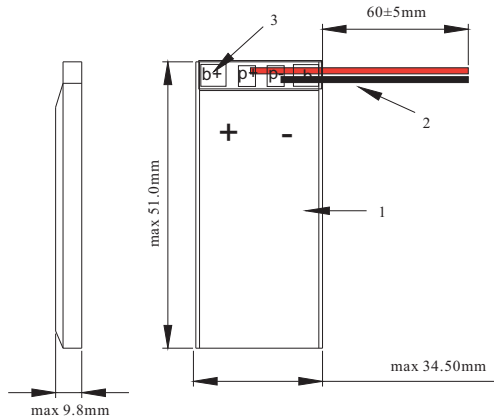
## 3. Nominal Specifications

	Item	Specification	Remark
3.1	Nominal Capacity	1500mAh	0.2C discharge
3.2	Minimum. Capacity	1470mAh	0.2C discharge
3.3	Nominal Voltage	3.7V	
3.4	Charge Voltage	4.20±0.02V	
3.5	Charge Current	Standard charge : 0.5C (750mA) Rapid charge : 1.0C (1500mA)	
3.6	Charging Time	Standard charge : 3.0 hours (Ref.) Rapid charge : 2.0 hours (Ref.)	
3.7	Max. charge current	1.0C (1500mA)	
3.8	Cont. Discharge Current	1.0C (1500mA)	
3.9	Cutoff Voltage	2.75V	
3.10	Resistance	≤100mΩ	1kHz AC Method
3.11	Weight (Approx.)	31g	
3.12	Dimensions(T.W.H.)	Thickness: 9.8mm Max. Width: 34.5mm Max. Length: 51.0mm Max.	
3.13	Operating Temperature	Charge : 0 ~ 40°C Discharge : -20 ~ 60°C	
3.14	Storage Temperature	1 year : -20~30°C 3 months : -20~35°C	

Note: Standard Charging method 0.5C (750mA) CC (constant current) charge to 4.2V, then CV(constant voltage 4.2V) charge till charge current decline to ≤0.05C ( 75mA ) .

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## 4. Outline Dimensions



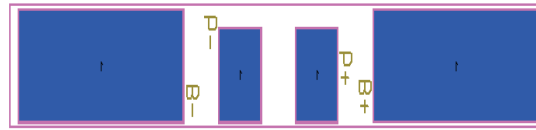
## Parts List

No.	Name	Description	Qty.
1	Cell	LP963448-1500mAh	1
2	Wire	UL1571 AWG 24#	2
3	PCM	Refer to PCM 3296-1 specification	1

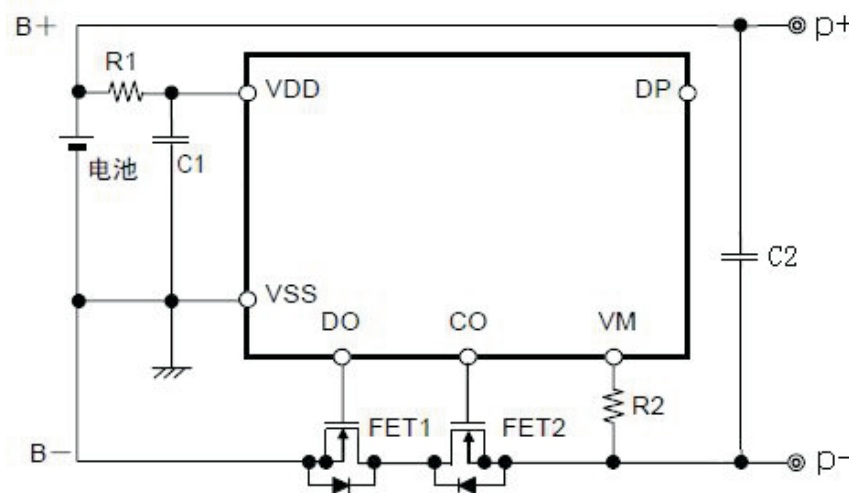
IC:	R5402N101KD	Parameter value			
Protection IC:		General temperature 25°C			
Item	Min.	Type value	Max.	Unit	
Over charge protection voltage	4.225	4.25	4.275	V	
Over charge release voltage	4.00	4.05	4.10	V	
Over discharge protection voltage	2.42	2.5	2.58	V	
Over discharge release voltage	2.9	3.0	3.1	V	
Over current detection voltage	0.185	0.2	0.215	V	
Over current protection current	6.5	8	9	A	
Over charge protection delay time	0.7	1.0	1.3	s	
Over discharge protection delay time		144	200	ms	
Over current protection delay time		16	20	ms	
Short protection delay time	230	300	500	us	
Current consumption (Operation)		3.5	7.0	μA	
Current consumption (Power down)			0.1	μA	
Impedance		24	35	mΩ	
Input voltage(B+ to B-)	-0.3		12	V	
Max continuous charge current			2	A	
Max continuous discharge current			4.5	A	
Operating temperature	-20		+55	°C	
Recommendatory storage condition	Temperature range: -5~+35°C Humidity: 0%~75%RH				
0V battery charge function	Unavailable				

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Protection of the board may offer shows



Electrical principle drawing:



## 5. Appearance

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

## 6. Standard Test Conditions

### 6.1 Environmental Conditions

Unless otherwise specified, all tests stated in this specification are conducted at temperature  $25\pm 5^{\circ}\text{C}$  and humidity  $60\pm 20\%$ .

### 6.2 Measuring Equipment

#### (1) Ammeter and Voltmeter

Standard class specified in the national standard or more sensitive class

#### (2) Slide caliper

The slide caliper should have 0.02 mm scale.

#### (3) Impedance meter

The impedance meter with AC 1 kHz should be used.

## 7. Characteristics

### 7.1 Standard Discharge Capacity

The standard discharge capacity is the initial discharge capacity of the cell, which is measured with discharge current of 300mA with 2.75V cut-off at  $25\pm 5^{\circ}\text{C}$ , within 1 hour after the standard charge.

Standard Discharge Capacity  $\geq 1470\text{mAh}$

### 7.2 Cycle Life

Each cycle is an interval between the charge at CC-CV (750mA-4.2V) for 3h and the discharge (discharge current 750mA) with 2.75V cut-off. After 300 cycles, measure capacity under the same condition in 7.1.

Capacity  $\geq 1200\text{mAh}$  (80% of the capacity at  $25^{\circ}\text{C}$ )

### 7.3 Initial internal impedance

Initial internal impedance measured at AC 1 kHz after 50% charge.

Initial internal impedance  $\leq 100\text{m}\Omega$

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7.4 Storage Characteristics

Capacity after storage for 28 days at 25°C from the standard charge, measured with discharge current 300mA with 2.75V cut-off at 25°C.

Capacity retention (after the storage) ≥ 1275mAh (85% of the capacity at 25°C)

7.5 Status of the cell as of ex-factory

The cell should be shipped in 50% charged state. In this case, OCV is not less than 3.85V.

8. Mechanical Characteristics

8.1 Drop Test

Test method: Cell (as of shipment or full charged) drop onto concrete ground from 1.0m height at a random direction 6 times.

Criteria: No fire, and no explosion.

8.2 Vibration Test

Test method: After standard charging, fixed the cell to vibration table and subjected to vibration cycling that the frequency is to be varied at the rate of 1Hz per minute between 10Hz and 55Hz, the excursion of the vibration is 1.8mm. The cell shall be vibrated for 30 minutes per axis of XYZ axes.

Criteria: No fire, and no explosion.

9. Safety

9.1 Overcharge Test

Test method: To charge the standard charged cell with 1500mA constant current until cell voltage reaches 4.6V, then be charged at constant voltage of 4.6V while tapering the charge current at 25°C for 2.5hrs.

Criteria: No fire, and no explosion.

9.2 External Short-circuit Test

Test method: To short-circuit the standard charged cell by connecting positive and negative terminal by less than 50mΩ wire.

Criteria: No fire, and no explosion.

9.3 Heating Test

Test method: After fully charged, heat up the standard charged cell at heating rate 5°C per minute up to 130°C and keep the cell in oven for 30 minutes.

Criteria: No fire, and no explosion.

10. Warranty

MINAMOTO BATTERY (HK) LTD will be responsible for replacing the cell against defects or poor workmanship for one year from the date of shipping. Any other problem caused by malfunction of the equipment or mix-use of the cell is not under this warranty.

11. Others

11.1 Storage for a long time

If the cell is kept for a long time (3 months or more), It is strongly recommended that the cell is preserved at temperature range (0-25°C), low humidity, no corrosive gas atmosphere.

11.2 Other

Any matters that this specification does not cover should be conferred between the customer and MINAMOTO.

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## Appendix

### Proper Use and Handling of Lithium Ion Polymer (LIP) battery

#### 1. General

This document has been prepared to describe the appropriate cautions and prohibitions, which the customer should take or employ when the customer uses and handles the Lithium Ion Polymer (LIP) battery to be manufactured and supplied by MINAMOTO BATTERY (HK) Ltd., in order to obtain optimum performance and safety.

#### 2. Charging

- 2.1 Charge current: Charge current should not more than the maximum charge current specified in the Product Specification (normally 0.5C-1.0C or lower). Charging with higher current may damage the cell or even lead to safety problem, e.g. overheating or leakage.
- 2.2 Charge voltage: Charge voltage shall not more than that specified in the Product Specification (4.2V/cell). 4.25V is the maximum charging voltage for each cell. Never charge the battery in series and be sure that each single cell has a separated charging circuit with a max. Charging voltage of 4.25V or the battery may be overcharged, and lead to fire or explosion. The user is fully responsible to the result of misusing the battery.
- 2.3 Charge temperature: The cell should be charged within the range of temperatures specified in the product Specification. Stop charging immediately when the surface temperature of the battery is over 50°C.
- 2.4 Reverse charging: Please make sure the polarities of cells are connected properly before charging is strictly prohibited. Reverse charging cannot charge the cells but will deteriorate their charging/discharging and safety characteristics, or even lead to fire or explosion.

#### 3. Discharging

- 3.1 Discharge current: The cell shall be discharged at the current no more than the maximum discharging current specified in the Product Specification. Over current discharging may damage the battery and cause over-heat.
- 3.2 Operation temperature: Use the battery within the temperature range specified in the Product Specification. Stop using when temperature is over 70°C.
- 3.3 Over-discharge: Over-discharge will deteriorate the cell's performance and characteristics. Do not over-discharge a battery below 2.75V/cell.

#### 4. Storage

If you intend to keep the battery for a long time (3months or longer), it is strongly recommended that the battery shall be stored under the environment with temperature 10-25°C, low humidity and without corrosive gas. The battery should be charged every six months to ensure that each cell's storage voltage is 3.6~3.9V.

#### 5. Others

- The aluminum packing foil is very soft that it will be easily left scratches. Please do not hit the cell with any sharp edge parts.
- Don't fall, hit or bend the battery. It may cause fire or explosion.
- Short circuit the battery is strictly prohibited; it may damage the battery seriously.
- Never disassemble the battery. It may cause fire.
- Never dispose of the battery in fire. It is very dangerous and strictly prohibited.
- To submerge the battery into liquid such as water is strictly prohibited.
- Avoid vibration, shock or extrude the battery. Handle carefully when moving it.

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