



Title: Prismatic Li-ion Rechargeable Battery	Number: PC046067-H-03B04
Model: <i>Powercard 046067-H</i>	Date: 2003-02-04      Rev: A-2

**SPECIFICATIONS OF POWERCELL LI-ION BATTERY**

**MODEL: PC 046067-H**

**APPLICATION:**

Accepted by :

Date:

*Korea PowerCell Inc.*

Prepared by :

Approved by :

Date:



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## Product Specifications 3(10)

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### 1. Preface

This Product Specification describes the requirements of Rechargeable Lithium-ion Battery ("Cell") to be supplied to \_\_\_\_\_ by **Korea Powercell Inc.**

### 2. Description and Model

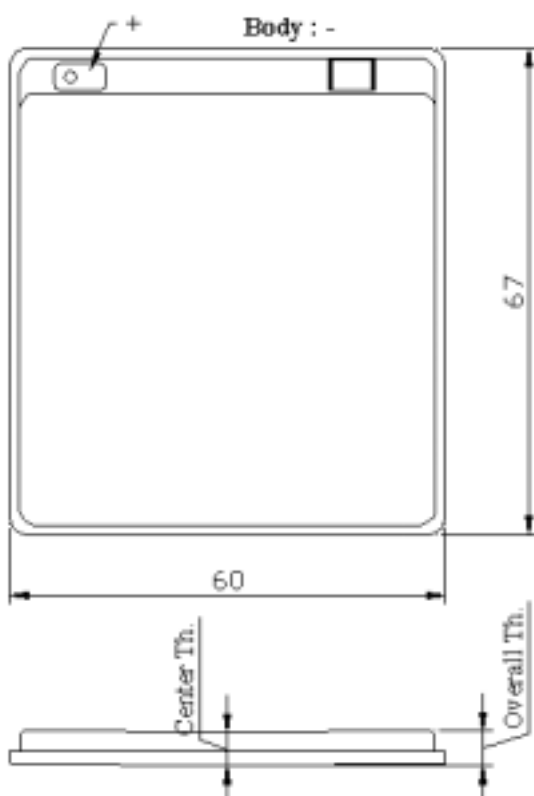
2.1 Description	<b>Lithium-ion Rechargeable Battery</b>
2.2 Model (Type)	<b>PC046067 (<i>Powercard</i>) -H</b>

### 3. Nominal Specification

Item	Specification	Remark
3.1 Nominal Capacity	1800 mAh( min.)	0.2C rate, 3.0V cut-off
3.2 Nominal Voltage	3.7 V	From 4.20 V to 3.00V
3.3 Charging Method	CC/CV	Constant Current / Constant Voltage
3.4 Charging Current (Std.)	0.5CA (0.9A)	End Current : 50 mA (0 ~ 45 )
3.5 Charging Voltage	4.2 ± 0.03 V	0 ~ 45
3.6 Charging Time (Std.)	4.0 hours	
3.7 Discharge Current (Std.)	0.5CA (0.9A)	- 20 ~ 60
3.8 Discharge Current (Max)	1CA (1.8A)	- 20 ~ 60
3.9 Discharge Cut-off Voltage	3.0 V	
3.10 Initial Internal Impedance	Less than 50 m	AC Impedance 1kHz
3.11 Cell Weight	approx. 51g	
3.12 Storage Temperature Range	-20 ~ 35	

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#### 4. Dimension Drawing of PC 046067 (unit : mm)



Center thickness:  $4.6 \pm 0.1$  mm

Overall thickness:  $4.8 \pm 0.2$  mm

#### 5. Standard Test Conditions

Unless otherwise specified, all tests stated in this Product Specification are conducted at temperature  $25 \pm 3$  and humidity  $65 \pm 20\%$  RH.



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## 6. Electrical Characteristics

### 6.1 Standard Charge and Discharge

The "Standard Charge" means charging the Cell with initial charge current 900mA (0.5C) and with a constant voltage 4.20V ( $\pm 0.03$  V) at 25 °C for 3.0 hours or with 50mA end-current.

The "Standard Discharge" means discharging the Cell with initial discharge current 900mA (0.5C) and with 3.0V cut-off voltage at 25 °C.

### 6.2 Capacity

The initial capacity is the initial discharge capacity of the Cell, which is measured with discharge current 360mA (0.2C) with 3.0V cut-off at 25 °C within 1 hour after the Standard Charge.

Norminal Capacity 1800 mAh

( Initial Capacity 1850mAh )

### 6.3 Cycle Life

Each cycle has each phase of charge current 900 mA and discharge 900 mA current with 3.0V cut-off at 25 °C.

Capacity after 300 cycles, measured under the same conditions stated in 6.2(0.2C).

Capacity 1440 mAh (80%)

### 6.4 Initial Internal Impedance

Internal resistance measured at 1KHz after Standard Charge.

Initial Internal Impedance 50 mΩ (Typically 30mΩ )

### 6.5 Temperature Dependency of Discharge Capacity

Relative capacity at each temperature, measured with constant discharge current 360mAh with 2.75V cut-off after the Standard Charge shown below.

Charge Temp.	Discharge Temp.			
25	-20	-10	25	60
	> 50 %	>70%	100 %	>95%(*1)



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Note(\*1) : Generally, more than 100%

## 6.6 Discharge Characteristics on Load (C-Rate)

Relative capacity at each load, measured with constant discharge current 0.2C, 0.5C, 1.0C, 1.5C with 3.00V cut-off after Standard Charge shown below.

Charge Current	Discharge Current			
Standard Charge	0.2 CA	0.5 CA	1 CA	1.5 CA
	360 mA	900 mA	1800 mA	2700 mA
	100 %	>96 %	> 93 %	> 80%

## 7. Safety Test

Test Item	Test Method	Criteria
7.1 High Temperature	Storing a Cell at 90 for 4 hours after charged at 4.2 V	No leakage
7.2 High Temperature and High Humidity	Storing a Cell at 60 ( 90 % RH ) for 168 hours after charged at 4.2V.	No leakage
7.3 Thermal Shock Test	Storing a fully charged Cell(4.2V) at 60 for 2hour and at -20 for 2hour (1 cycle). Total 10 cycles with the maximum transition time, 5mins.	No leakage
7.4 Overcharge Test ( with PTC )	Charging the Cell up to 250% of its Nominal capacity(1800mAh) with 1C rate at 25 for 2.5 hours.	No explosion, No fire
7.5 Hot Box Test	A cell is to be heated in a gravity convection oven. The temperature of the oven is to be raised at a rate of $5 \pm 2$ per minute to a temperature of $130 \pm 2$ and remain for 30 minutes at the temperature before the test is discontinued.	No explosion, No fire
7.6 Impact Test	A test cell is to be placed on a flat surface. The bar of 9.1 kg weight and 15.8 mm diameter is dropped from a height of 610	No explosion, No fire



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	mm onto the cell.	
7.7 Short-Circuit Test	A Cell is to be short-circuited by connecting the positive and negative terminals of the battery with copper wire having a maximum resistance load of 100m .	No fire or no explosion, until it is completely discharged
7.8 Applying Pressure	Giving Pressure on whole surface of a fully charged cell with 7kg <sub>f</sub> for 72 hours	No leakage, No weight decrease

### 8. Shipment

The Cell shall be shipped in about 25% charged state. (Cell voltage range: 3.7 ~ 3.8 V)  
It is not specified more than 25% capacity remain at customer, because of self -discharge.

### 9. Warranty Period

The Warranty Period of battery is one year from the date of shipment. However, even though the problem occurs within this period, PowerCell won't replace a new battery for free as long as the problem is not due to the failure of PowerCell manufacturing process or is due to customer's abuse or misuse.

- PowerCell will not be responsible for trouble occurred by handling outside of the precautions in this specification.
- PowerCell will not be responsible for trouble occurred by matching electric circuit, battery pack and charger.
- PowerCell will be exempt from guaranteeing any defect cells during assembling after acceptance.

### 10. Precautions and Safety Instructions

Lithium-Ion rechargeable batteries subject to abusive conditions can cause damage to the battery and/or personal injury. Please read and observe the standard battery precautions below before using.



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**Note 1.** The customer is required to contact PowerCell in advance, if and when the customer needs other applications or operating conditions than those described in this document.

**Note 2.** PowerCell will take no responsibility for any accident when the cell is used under other conditions than those described in this Document.

### 10.1 Standard Battery Precaution:

- a. Do not expose the battery to extreme heat or flame.
- b. Do not short circuit, over-charge or over-discharge the battery.
- c. Do not subject the battery to strong mechanical shocks.
- d. Do not immerse the battery in water or sea water, or get it wet..
- e. Do not reverse the polarity of the battery for any reason.
- f. Do not disassemble or modify the battery.
- g. Do not remove charge/discharge protection circuitry.
- h. Do not handle or store with metallic like necklaces, coins or hairpins, etc.
- i. Do not use the battery with conspicuous damage or deformation.
- j. Do not connect battery to the plug socket or car-cigarette-plug.
- k. Do not make the direct soldering onto a battery. Weld spot welding lead plate onto a battery.
- l. Do not touch a leaked battery directly.
- m. Do not use for other equipment.
- n. Do not use Lithium-ion battery in mixture.
- o. Do not use or leave the battery under the blazing sun (or in heated car by sunshine).
- p. Keep battery away from children.
- q. Do use the specified charger and observe charging requirement.
- r. Do not drive a nail into the battery, strike it by hammer or tread it.
- s. Do not give battery impact or fling it.

### 10.2 Battery Operation Instruction:





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### A. Charging

- Charge the battery in a temperature range of 0°C to + 45°C.
- Charge the battery at a constant current of 0.5C until 4.20±0.03V per cell is attained. Charge rates greater than 1C are NOT recommended. (C : Rated Capacity of Battery)
- Maintain charge voltage at 4.20V per cell until current diminishes to 50mA (recommended for maximum capacity).

*\* Use a constant voltage, constant current (CV/CC) lithium-ion (Li+) battery charge controller.*

*\* Do not continue to charge battery over specified time.*

### B. Discharging

- Recommended cut-off voltage to 3.0V. Recommended maximum discharge rate is 1C at constant current.
- For maximum performance, discharge the battery in a temperature range of –20°C to + 45°C.

### C. Protection Circuit

A protection circuit is provided for protecting the battery against damage and/or performance deterioration. The circuit must include :

#### **a. Overcharge Protection (to stop charging)**

- A maximum voltage threshold of 4.25V (±0.025V).
- If the maximum charging voltage is surpassed, the protection circuit interrupts or stops charging.

#### **b. Over-discharge Protection (to stop discharging)**

- Voltage threshold of 2.5V or less is NOT recommended.
- If the battery is discharged below the cut-off voltage, the protection circuit stops discharging.

#### **c. Over-current Protection (to protect terminals against possible short circuiting)**

- If current exceeding the battery rating or recommendations flows during charging or discharging, the charge or discharge process stops.

### D. Storage Recommendations

- Storage Temperature and Humidity
  - Storage the battery at temperature range –20 ~ +35°C, low humidity and no corrosive gas



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atmosphere.

- No condensation on the battery
- b. Long Period Storage
  - In case of long period storage (more than 3 months), storage the battery at temperature range  $-10 \sim +20^{\circ}\text{C}$ , low humidity, no corrosive gas atmosphere.
  - No condensation on the battery

### 11. Consultation

As to the obscurity, contact the following.

**PowerCell Korea Inc.** Sales & Marketing Division

[sales@powercellkorea.com](mailto:sales@powercellkorea.com)

Tel : +82-42-864-0255

Fax : +82-42-864-4342

### 12. Requirement for Safety Assurance

For the sake of safety assurance, please discuss the equipment design, its system and protection circuit of Lithium-ion battery with PowerCell in advance.

And consult about the high rate current, rapid charge and special application in the same way.