Prepared		Document No.	Date	Rev
LGCRP/BRD	Roh, Suk Myung	LRB-PS-CY260	2006-04-15	5
Approved		Description		
LGCRP/BRD	Ku, Cha Hun	Lithium Ion ICR18650 B1		

PRODUCT SPECIFICATION

Rechargeable Lithium Ion Battery

Model : ICR18650 B1

Revision History

REVISION	DATE	ORIGINATOR	REASON FOR CHANGE
0	2004-08-10	Roh, Suk Myung	Original Release
1	2005-02-14	Roh, Suk Myung	Formula Change
2	2005-04-26	Roh, Suk Myung	Information Update
3	2005-10-19	Park, Sunju	Information Update
4	2006-03-07	Park, Sunju	Information Update
5	2006-04-13	Park, Sunju	Information Update

Prepared	Reviewed	Approved
Roh, Suk Myung	Ku, Cha Hun	Kim, Soo Ryoung
Date : **'05. 04. 26.**	Date : **'05. 04. 26.**	Date : **'05. 04. 26.**

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1. Scope

This product specification defines the requirements of the rechargeable lithium ion battery to be supplied to the customer by LG Chem, Ltd. Should there be any additional information required by the customer, customers are advised to contact LG Chem, Ltd. before selecting a solution.

2. Description and Model

2.1 Description : Rechargeable Lithium Ion Battery
2.2 Model : ICR18650 B1

3. Technical Information

3.1	Capacity	Nominal	:	2600 mAh (by standard charge and discharge)
		Minimum	:	2500 mAh
3.2	Nominal Voltage		:	Average 3.75 V
3.3	Standard Charge		:	Constant Current and Constant Voltage (CC/CV)
				Current = 1275 mA
				Voltage = 4.35 V
				End Current = 50 mA
3.4	Max. Charge Current		:	2550 mA
3.5	Standard Discharge		:	Constant Current (CC)
				Current = 510 mA
				End Voltage = 3.0 V
3.6	Max. Discharge Current		:	5100 mA (for continuous discharge)
3.7	Weight		:	Approx. 46.5 g
3.8	Operating Temperature	Charge	:	0 to 45 ^{o}C
		Discharge	:	-20 to 45 ^{o}C
3.9	Storage Temperature	1 month	:	-20 to 45 ^{o}C
		3 months	:	-20 to 45 ^{o}C
		1 year	:	-20 to 20 ^{o}C

4. Cell Dimensions

Diameter : 18.3 ± 0.1 mm (Max. 18.4 mm)
Height : 64.9 ± 0.2 mm (Max. 65.1 mm)

5. Appearances

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

6. Characteristics

6.1 Standard Charge

Unless otherwise specified, “Standard Charge” shall consist of charging at constant current of 2040mA. The cell shall then be charged at constant voltage of 4.35V while tapering the charge current. Charging shall be terminated when the charging current has tapered to 100mA. For test purposes, charging shall be performed at 23ºC ± 2ºC.

6.2 Standard Discharge

“Standard Discharge” shall consist of discharging at a constant current of 510mA to 3.0V. Discharging is to be performed at 23 ºC ± 2 ºC unless otherwise noted (such as capacity versus temperature).

6.3 Initial Capacity

Cells shall be charged per 6.1 and discharged per 6.2 within 1 hour after full charge. Initial capacity shall meet the following requirement.

Initial Capacity ≥ 2500 mAh

6.4 Cycle Life

Cells shall be charged at constant current of 2040mA to 4.35V with end current of 50mA. Cells shall be discharged at constant current of 1275mA to 3.0V. Cells are to rest 10 minutes after charge and 20 minutes after discharge. A cycle is defined as one charge and one discharge. Discharge capacity shall be measured per 6.1 and 6.2 after 300 cycles.

Discharge capacity (301th Cycle) ≥ 75 % (of minimum capacity in 3.1)

6.4.1 Cycle Life at 5°C

A cycle is defined as one charge and one discharge. Discharge capacity shall be measured per 6.1 and 6.2 after 50 cycles at 5°C.

Discharge capacity (50th Cycle) ≥ 40 % (of minimum capacity in 3.1)

6.5 Initial AC Impedance

Initial AC impedance is measured at 1kHz after standard charge.

Initial AC Impedance ≤ 70 mΩ (with PTC)

6.6 Temperature Dependency of Capacity

Cells shall be charged per 6.1 at 23ºC ± 2ºC and discharged per 6.2 at the following temperatures. Relative capacity at each temperature shall meet the following.

Charge Temp.	Discharge Temperature			
23ºC	-10 ºC	0 ºC	23 ºC	45 ºC
	70 %	90 %	100 %	95 %

6.7 Storage Characteristics

Cells shall be charged per 6.1 and stored in a temperature-controlled environment at 23ºC ± 2ºC for 30 days. After storage, cells shall be discharged per 6.2 to obtain the remaining capacity.

Remaining capacity ≥ 90 % (of minimum capacity in 3.1)

6.8 Cell Voltage (as of shipment)

Voltage range : 3.7 ~ 3.9 V

7. Mechanical Characteristics

7.1 Drop Test

Test method : Cells charged per 6.1 are dropped onto an wooden floor from 4 feet height for 3 cycles, where each cycle consists of 3 drops, 2 drops from each cell terminal and 1drop from the side of cell can (Total number of drops = 9). After test, cells are discharged per 6.2 and cycled per 6.1 and 6.2 for 3 cycles to obtain recovered capacity.

Criteria : No leakage, Capacity recovery rate ≥ 80 %

7.2 Vibration Test

Test method : Cells charged per 6.1 are vibrated for 90 minutes per each of the three mutually perpendicular axis (x, y, z) with an amplitude of 0.8mm, frequency of 10Hz to 55Hz and sweep of 1Hz change per minute. After test, cells are discharged per 6.2 and cycled per 6.1 and 6.2 for 3 cycles to obtain recovered capacity.

Criteria : No leakage, Capacity recovery rate ≥ 80 %

8. Environmental Test

8.1 High Temperature Storage Test

Test method : Cells are charged per 6.1 and stored in a temperature-controlled environment at 60ºC for 1 week. After test, cells are discharged per 6.2 and cycled per 6.4 for 3 cycles to obtain recovered capacity.

Criteria : No leakage, Capacity recovery rate ≥ 80 %

8.2 High Temperature and High Humidity Test

Test method : Cells are charged per 6.1 and stored at 60ºC (95% RH) for 168 hours. After test, cells are discharged per 6.2 and cycled per 6.4 for 3 cycles to obtain recovered capacity.

Criteria : No leakage, No rust, Capacity recovery rate ≥ 80 %

8.3 Thermal Shock Test

Test method : 65ºC (8Hrs) ← 3hrs → -20ºC (8Hrs) for 8 cycles with cells charged per 6.1. After test, cells are discharged per 6.2 and cycled per 6.4 for 3 cycles to obtain recovered capacity.

Criteria : No leakage, Capacity recovery rate ≥ 80 %

9. Safety Test

9.1 Abnormal Charge Test

Test method : Cells are discharged per 6.2, then charged at constant current of 7650mA and constant voltage of 4.35V while tapering the charge current. Charging is continued for 48 hours (Per UL1642).

Criteria : No rupture, No fire

9.2 External Short-circuiting Test

Test method : Cells are charged per 6.1, and the positive and negative terminal is connected by a 100mΩ-wire for 1 hour (Per UL1642).

Criteria : No rupture, No fire

9.3 Overdischarge Test

Test method : Cells are discharged at constant current of 510mA to 250% of the minimum capacity (Per UL1642).

Criteria : No rupture, No fire

9.4 Nail Test

Test method : A nail (diameter : 2.5~5mm) is penetrated vertically through the center of cells charged per 6.1 and left for 6 hours.

Criteria : No rupture, No fire

9.5 Heating Test

Test method : Cells are charged per 6.1 and heated in a circulating air oven at a rate of 5ºC per minute to 130ºC. At 130ºC, oven is to remain for 10 minutes before test is discontinued (Per UL1642).

Criteria : No rupture, No fire

9.6 Impact Test

Test method : Cells charged per 6.1 are impacted with their longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8mm diameter bar (Per UL1642).

Criteria : No rupture, No fire

9.7 Crush Test

Test method : Cells charged per 6.1 are crushed with their longitudinal axis parallel to the flat surface of the crushing apparatus (Per UL1642).

Criteria : No rupture, No fire

10. Standard Test Conditions

Unless otherwise specified, all tests stated in this Product Specification are conducted at temperature 23±2ºC and humidity 65 ± 20 %RH.

11. Product Liability

The coverage of LG Chem, Ltd. is for the cell itself, while the customer assumes the liability of the product including the cell and its protection circuit.

12. Warranty

As long as the cell is treated in accordance with this Product Specification and/or Proper Use and Handling, LG Chem, Ltd. warrants that the cell should be free from any defect for a period of 1 year from date of manufacturing.

The warranty set forth above or described in Proper Use and Handling excludes a defect which is not related to manufacturing on the cell.

13. Others

Any matter not included in this specification shall be conferred between the both parties.

This document shall replace the document bearing a former revision index, and customers are kindly requested to destroy the former document in possession.

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Fig 1. Dimensional Drawing of ICR18650 B1