Lithium Ion Battery

Specification

MODEL:INB7.4-60E0(7.4V6Ah)

Prepared By/Date	Checked By/Date	Approved By/Date

Customer Approval	Signature/Date
	Company Name
	Company Stamp

Shenzhen Huarui Xinchuang Technology Co.,Ltd

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Amendment Records

Edition	Description	Prepared by	Approved by	Date
A	First Edition	nancy		2020-01-07

1. Scope

The specification shall be applied to Li-Ion battery Pack of INB7.4-26E2 which is ROHS compliant.

2. Specification

No.	Item	General Parameter	Remark
1	Typical Capacity	6.0Ah	Discharge: 0.2C A Cut-off voltage:5.0V/cell
2	Minimum Capacity	5.8mAh	
3	Nominal Voltage	7.4V	
4	Open Circuit Voltage	6.6V~8.4V	
5	Max. Charge voltage	8.4V	
6	Standard charge current	N/A	0.5C
7	Max. charge current	N/A	1C
8	Standard discharge current	N/A	1C
9	Max. continuous discharge current	N/A	2C
10	Discharge cut-off voltage	3.0V/cell	

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11	Operating Temperature	0~45℃	Charging
		-20~60℃	Discharging
12	Storage Temperature	-10℃～45℃	Less than 1 month
		-10℃～40℃	Less than 3 months
		-10℃～30℃	Less than 6 months
13	Approx. Weight	200g	
14	Dimension	L*W*H 37*37*67mm	
15	Life Expectation	Residual capacity is more rated capacity	1. Charge: CC@0.2C to 4.2V, then CV till current to 0.05 C 2. Rest: 30min. 3. Discharge: 0.2C to 2.5V/cell Temperature:20±5℃ Carry out 500cycles
16	Assembly method	INR18650EC-3.0Ah	2S2P
17	Housing material	PVC sleeve	
18	PCM	NO	
19	Wires	NTC 10k ohm Wire AWG 22 Length 100mm	Connector Molex 5264-04 Pin 1 Red Positive / Pin 2 Empty / Pin 3 NTC Yellow / / PIN 4 Black negative

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3. Performance And Test Conditions

5.2 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±5 ℃ 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 15~30℃ and humidity 25~85%RH.

5.3 Measuring Instrument or Apparatus

- Dimension Measuring Instrument

The dimension measurement shall be implemented by instruments with equal or more precision scale of 0.01mm.

- Voltmeter

Standard class specified in the national standard or more sensitive class having inner impedance more than 10kΩ/V

- Ammeter

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

- Impedance Meter

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

5.4 Standard Charge/Discharge

- Standard Charge : 0.3C

Charging at 0.3C constant current until the battery reaches 8.4V. The battery shall then be charged at constant voltage of 8.4V while tapering the charge current. Charging shall be terminated when the current has tapered to 0.05C. Charge time is approx 3 hours, The battery shall demonstrate no permanent degradation when charged between 0 ºC and 45 ºC.

- Standard Discharge : 0.2C

Battery shall be discharged at a constant current of 0.2 C to 5.0V/cell @ 20 5 ºC

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

5.5 Appearance

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

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4. Handling of battery

1.1. 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 terminals 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.

- Mechanical shock

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

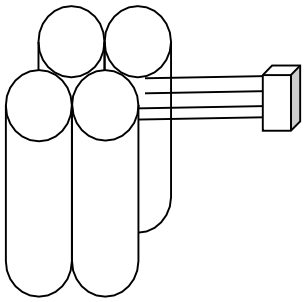
5. Period of Warranty

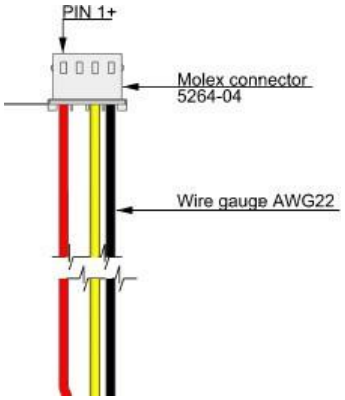
The period of warranty is 12 months from the date of shipment. Huarui Xinchuang guarantees to give a replacement in case of battery with defects proven due to manufacturing process instead of the customer abuse and misuse.

6. Storing the Batteries

The batteries should be stored at room temperature, charged to about 30% to 50% of capacity. We recommend that battery to be charged once each three months to prevent over-discharge.

7. Indicative Picture





NTC 10k ohm,
Wire AWG 22, Length 100mm
Connector Molex 5264-04 Pin 1 Red Positive / Pin 2 Empty / Pin 3 NTC Yellow / / PIN 4 Black negative
Dimensions: L37*W37*H67mm

8. The specification is for reference only and subject to change when we make the samples.

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Specification Approval Sheet

Model：INR18650EC-3.0Ah

Prepared By/Date(RD)	Reviewed by/Date	Checked By/Date (QA)	Approved By/Date

Customer Approval	Signature	Date
	Company Name ：	
	Company Stamp ：	

AMENDMENT RECORDS

Revision	Description	Prepared	Approval	Date
A0	New release			

Content

4 *Scope*

This document describes the Product Specification of the Lithium-ion rechargeable battery cell.

5 *Model：INR18650EC-3.0Ah*

6 *Specification*

No.	Items	Specifications
1	Charge cut-off voltage	4.2V
2	Nominal voltage	3.6V
3	Minimal capacity	2900mAh @ 0.2C Discharge
4	Nominal capacity	3000mAh @ 0.2C Discharge
5	Charge current	0℃~10℃0.1C 10℃~45℃0.3C
6	Standard charging method	0.2C CC (constant current) charge to 4.2V, then CV (constant voltage 4.2V) charge till charge current decline to ≤ 0.03C
7	Charging time	Standard charge: 5.0 hours Ref
8	Max. continue discharge current	3C (≤45°C)
9	Discharge cut-off voltage	2.5V
10	Operating temperature	Charging: 0℃～45℃ Discharging: -20℃～ 60℃ (Cell skin temperature cannot exceed 80°C)
11	Storage temperature /humidity	Temperature 0℃～ +35℃ Humidity 65%±20 %RH (Recommended to store 23 ± 5°C for long term stor age)
12	Cell Weight	≤47.5g
13	Cell Dimension	Length: 65.0±0. 2 mm Width: 18.3±0. 15 mm

7 *Battery Cell Performance Criteria*

7.1 Electrical characteristics

No.	Items	Test Method and Condition			Criteria
1	Standard Charge	Charging the cell initially with constant current at 0.2C and then with constant voltage at 4.2V till charge current declines to 0.02C.			N.A.
2	Rated Cap 0.2C	Capacity measured with discharge current of 0.2C with 2.5V cut-off voltage after the standard charge.			≥2900mAh
	Rated Cap 1C	Capacity measured with discharge current of 1C with 2.5V cut-off voltage after the standard charge.			≥2800mAh
	Rated Cap 3C	Capacity measured with discharge current of 3C with 2.5V cut-off voltage after the standard charge.			≥2700mAh
3	Cycle Life	Test condition： Temperature: 23± 5°C Charge: 0.3C CC to 4.2V, and CV to 0.02C cut off Discharge: 0.5C discharge to 2.5V 80% or more of 1st cycle capacity at 0.5C discharge of operation			≥300 times
4	Storage Performance	Battery cell stored at 25°C with 50% SOC			
			1Month	3Month	6Month
		Cap Retention	90%	85%	80%
		Cap Recovery	95%	90%	85%
5	Initial Impedance	Internal resistance measured at AC 1KHz after 50% charge			≤ 40mohm
6	Cell Voltage	As of shipment			3.65V ~ 3.8V

1.2. Safety Performance

No.	Items	Test Method and Condition	Criteria
1	Overcharge (1C/6.3V)	After standard charge, cell is to be charged at 1C current until the voltage achieves 6.3V or the total charging time achieves 60 min. Observing the cell temperature while testing, the peak temperature will be less than 150℃. Keep 1h.	No explosion No fire
2	Over Discharge	After standard charge, cell is to be discharged at 1C1 current for 90min; Keep 1 hour.	No explosion No fire No leakage

3	Nail test	After standard charge, cell is to be penetrated with a steel nail which is high temperature resistance with diameter φ5 mm～φ 8 mm at the speed of 20～30 mm/s from the vertical direction of cell electrode. The steel nail should be kept in the cell. Keep 1h.	No explosion No fire
4	Heating test (130°C)	After standard charge, cell is to be heated in a circulating air oven. The temperature of the oven is raised to 130±2℃ at the rate of 5±2℃/min and remains for 60 minutes. Keep 1h.	No explosion No fire

1.3. Environmental and Mechanical Test

No.	Items	Test Method and Condition	Criteria
1	Free Drop	After standard charge, the cell is to be dropped onto the cement floor damage, no leakage, no from 1.5m height at each of X, Y and Z directions 2 times. Test the open circuit voltage of cell. Keep 1h.	
2	Vibration	After standard charge, the cell is to be attached to a vibration table and tested under the following conditions： The Sine Wane is applied to the vibration test. The testing frequency is from 7Hz to 200Hz, and then to 7Hz with total sweep time 15 min by the logarithm scanning method. The logarithm scanning method: 7Hz~8Hz with the acceleration of 9.8 m/s2, keep amplitude of 0.8mm to the acceleration of 78.4 m/s2(50Hz), and then keep the acceleration of 78.4 m/s2 to 200Hz frequency. Direction: the cell is to be tested in three mutually perpendicular to X/Y/Z axis for total 3h, every direction repeat 12 times. Test the open circuit voltage of cell.	
3	Crush test	After standard charge, cell is to be crushed with its longitudinal axis parallel to two flat surfaces. The crushing plate is a half cylinder with a radius of 75mm.The testing speed is (5±1) mm/s. The crushing will be continued until the voltage of cell reaches 0V or the deformation amount reaches 30% or an applied force of 200KN is reached. Keep 1h.	No explosion No fire
4	Shock test	After standard charge, cell is to be short-circuited by connecting the positive and negative terminals under the temperature of 25℃±2℃ with a maximum resistance load of 5mΩ for 10min. Observing the cell temperature while testing, the peak temperature will be less than 150℃. Keep 1h.	No explosion No fire No leakage

5	Sea water Immersing	After standard charge, cell is to be thoroughly immersed in 3.5% (weight percentage) NaCl solution for 2h, or no obvious reaction can be seen. Keep 1h.	No explosion No fire

1.4. Visual inspection

There shall be no such defect as scratch, flaw, crack, and leakage, which may adversely affect commercial value of the cell.

1.5. Standard environmental test condition

Unless otherwise specified, all tests stated in this Product Specification are conducted at below condition:
Temperature: 23 ± 5°C
Humidity: 65 ± 20% RH

2. Storage and Others

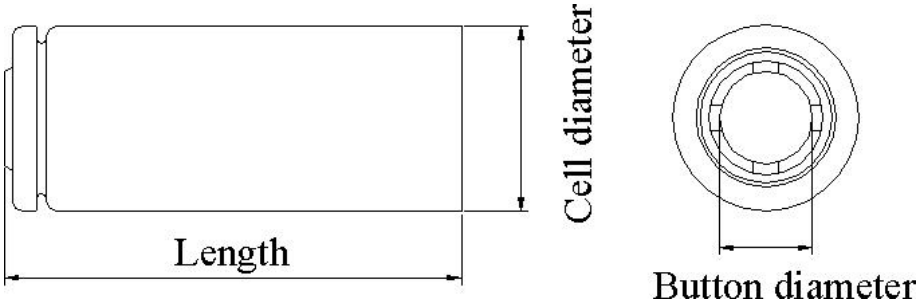
3.1 Long Time Storage

If the Cell is stored for a long time, the cell's storage voltage should be 3.7V ~ 3.9V and the cell is to be stored in a condition as No. 4.4.

3.2 Others

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

4 Battery Cell Drawing (all unit in mm, not in scale)



Cell Diameter (mm)	Cell Length (mm)	Button Diameter (mm)
18.3±0 .15	65.0±0. 2	15.0±0.3

Handling Precautions and Guideline
For Lithium-Ion Rechargeable Batteries

Preface

This document of 'Handling Precautions and Guideline' shall be applied to the battery cells.

Note (1):

The customer is requested to contact **Huarui Xinchuang** in advance, if and when the customer needs other applications or operating conditions than those described in this document. Additional experimentation may be required to verify performance and safety under such conditions.

Note (2):

Huarui Xinchuang will take no responsibility for any accident when the cell is used under other conditions than those described in this document.

Note (3):

Huarui Xinchuang will inform, in a written form, the customer of improvement(s) regarding proper use and handling of the cell if it is necessary.

1) Charging

- Charging current:
  Charging current should be less than the maximum charge current specified in the Product Specification. Charging with higher current than recommended value may cause damage to cell electrical, mechanical and safety performance and could lead to heat generation or leakage.
- Charging voltage:
  Charging shall be done by voltage less than that specified in the Product Specification (4.2V/cell). Charging beyond 4.2V, which is the absolute maximum voltage, must be strictly prohibited. The charger shall be designed to comply with this condition. Charging with higher voltage than maximum voltage may cause damage to the cell electrical, mechanical safety performance and could lead to heat generation or leakage.
- Charging temperature:
  The cell shall be charged within 0°C ~ 45°C range in the Product Specification.
- Prohibition of reverse charging:
  Reverse charging is prohibited. The cell shall be connected correctly. The polarity has to be confirmed before wiring. In case of the cell is connected improperly, the cell cannot be charged. Reverse charging may cause damage to the cell which may lead to degradation of cell performance and damage the cell, which will cause heat generation or leakage.

2) Discharging

- Discharging current
  The cell shall be discharged at less than the maximum discharge current specified in the Product Specification. High discharging current may reduce the discharging capacity significantly or cause over-heat.
- Discharging temperature
  The cell shall be discharged within -20°C ~ 60°C range specified in the Product Specification.
- Over-discharging

It should be noted that the cell would be at an over-discharged state by its self-discharge characteristics in case the cell is not used for long time. In order to prevent over-discharging, the cell shall be charged

Periodically to maintain between 3.7V and 3.9V. Over-discharging may causes loss of cell performance, characteristics, or battery functions. The charger shall be equipped with a device to prevent further discharging exceeding a cut-off voltage specified in the Product Specification. Also the charger shall be equipped with a device to control the recharging procedures as follows:

The cell battery pack shall start with a low current (0.01C) for 15 - 30 minutes, i.e. pre-charging, before rapid charging starts. The rapid charging shall be started after the (individual) cell voltage has been reached above 3V within 15 - 30 minutes that can be determined with the use of an appropriate timer for pre-charging. In case the (individual) cell voltage does not rise to 3V within the pre-charging time, then the charger shall have functions to stop further charging and display the cell/pack is at abnormal state.

3) Protection Circuit Module (PCM)

The cell/battery pack shall be with a PCM that can protect cell/battery pack properly. PCM shall have functions of (1) overcharging prevention, (2) over-discharging prevention, and (3) over current prevention to maintain safety and prevent significant deterioration of cell performance. The over current can occur by external short circuit.

- Overcharging prohibition:

  Overcharging prevention function shall stop charging if any one of the cells of the battery pack reaches 4.2V.

- Over-discharge prohibition:

  Over-discharging prevention function shall work to avoid further drop in cell voltage of 2.5V or less per cell in any cell of the battery pack. It is recommended that the dissipation current of PCM shall be minimized to 0.5uA or less with the over-discharge prevention.

  The protection function shall monitor each bank of the battery pack and control the current all the time.

4) Storage

The cell shall be storied within -10°C ~ 35°C range environmental conditions. If the cell has to be stored for a long time (Over 3 months), the environmental condition should be:

Temperature: 23 ± 5°C

Humidity: 65 ± 20 %RH

The voltage for a long time storage shall be 3.7V~3.9V range.

5) 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 within the battery pack, which may cause generation of smoke or firing.

- Prohibition of disassembly

  - Never disassemble the cells

    The disassembling may generate internal short circuit in the cell, which may cause gassing, firing, or other problems.

  - Electrolyte is harmful

    LIP battery should not have liquid from electrolyte flowing, but in case the electrolyte come into contact with the skin, or eyes, physicians shall flush the electrolyte immediately with fresh water and medical advice is to be sought.

- Prohibition of dumping of cells into fire
  Never incinerate nor dispose the cells in fire. These may cause firing of the cells, which is very dangerous and is prohibited.
- Prohibition of cells immersion into liquid such as water
  The cells shall never be soaked with liquids such as water, seawater, and drinks such as soft drinks, juices, coffee or others.
- Battery cells replacement
  The battery replacement shall be done only by either cells supplier or device supplier and never be done by the user.
- Prohibition of use of damaged cells
  The cells might be damaged during shipping by shock. If any abnormal features of the cells are found such as damages in a plastic envelop of the cell, deformation of the cell package, smelling of an electrolyte, an electrolyte leakage and others, the cells shall never be used any more.
  The Cells with a smell of the electrolyte or a leakage shall be placed away from fire to avoid firing.

Customer Inquiry

Model:

Version:

The customer is requested to write down your information and contact **Huarui Xinchuang** in advance, if and when the customer needs applications or operating conditions other than those described in this document. **Huarui Xinchuang** could design and build such products according to your special request.

	Special Request	Criter ia
1		
2		
3		
4		
5		

Company Name：_____Signature：_____Date：_____

PTC Specifications

PTC Part No.：PTC18RH6

Rated electrical performance：

Maximum operating voltage：15Vdc

Maximum operating current：40A

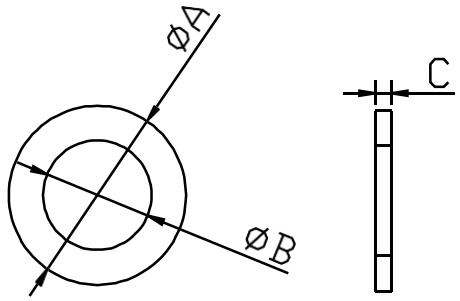


Chart Ⅰ Size：

A		B		C	
Min	Max	Min	Max	Min	Max
16.5	16.6	10.0	10.15	0.25	0.35

Action/non-action current						20°C，10A，Maximum action time（S）	Resistance R (20°C、mΩ)		Resista 1hopera 20°
0℃（A）		20℃（A）		60℃（A）			Min	Max	Max
non-action current	Action	non-action current	Action	non-action current	Action				
3.5	8.0	3.0	6.0	2.5	5.0	5	10	15	30

Chart Ⅱ Electrical performance parameters：

Certification： UL（E340030）

Note： Exceeding the rated current or voltage may cause the product to break down or catch fire.Material Certification:

Issue date	Approval		Audit		Tabulation	

Specification For PPTC

PN.：PTC18RH6

Operating Voltage:

15V

dc Interrupt Current:

40A

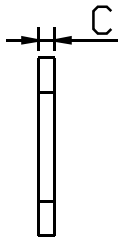


TABLE I. DIMENSIONS:

A		B		C	
MIN	MAX	MIN	MAX	MIN	MAX

Unit :mm

TABLE II. PERFORMANCE RATINGS: As measured in blade fixtures.

Current Trip Limitsl						Max Time To Trip AT 20° C, 10.0 A	Resistance @ 20°C mΩ		One-hour Post-trip Resistance @ 20°C mΩ		Max Tripped-state Power Dissipation Watts @ 20°C, 15V
0° C		20° C		60° C							
Hold	Trip	Hold	Trip	Hold	Trip		Min	Max	Max	typical	
3.5	8.0	3.0	6.0	2.5	5.0	5	10	15	30	1.5*R	1.5

CAUTION: Operation beyond the rated voltage or current may result in rupture, electrical arcing Materials Information:

ROHS Compliant

Directive 2002/95/EC Compliant

Pb-Free

	v a l					t i o n