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CUSTOMER NO:

Specification Approval Sheet

MODEL/型号: INR18650(30M)

（11.1Wh 3000mAh 3.7V）

Prepared By/Date	Checked By/Date	Approved By/Date
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Amendment Records

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1 Scope

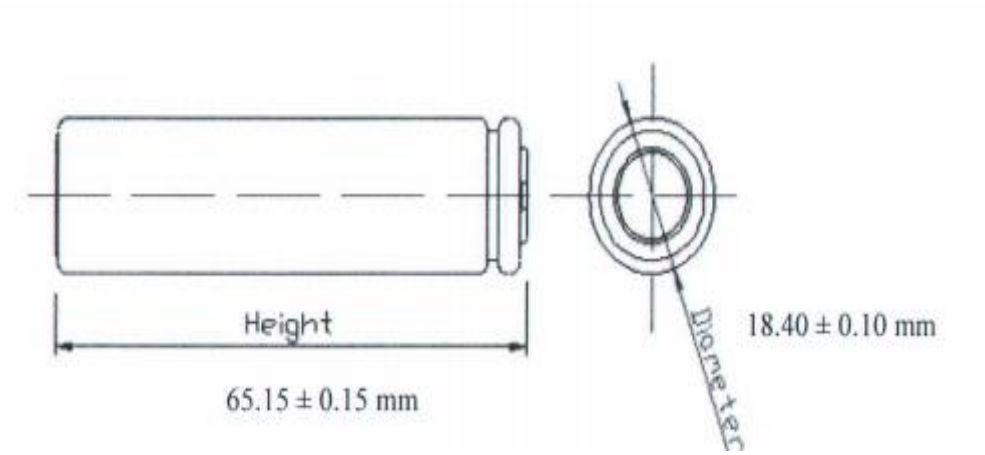
This specification is applies to describe the related Battery product in this Specification and the Battery/cell supplied by Winer Power Co., Ltd only.

2 Model： INR18650 3000mAh 3.7V

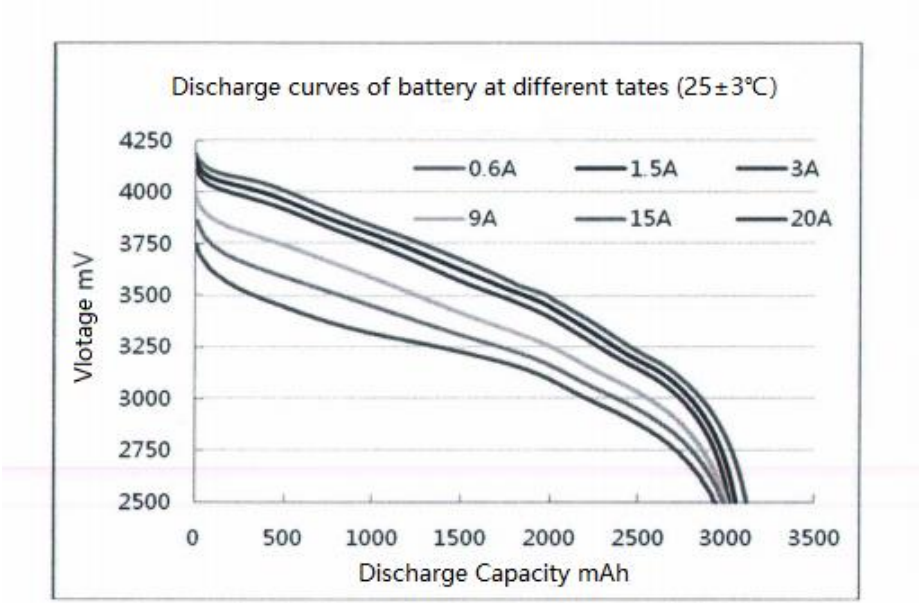
3 Cell Specification

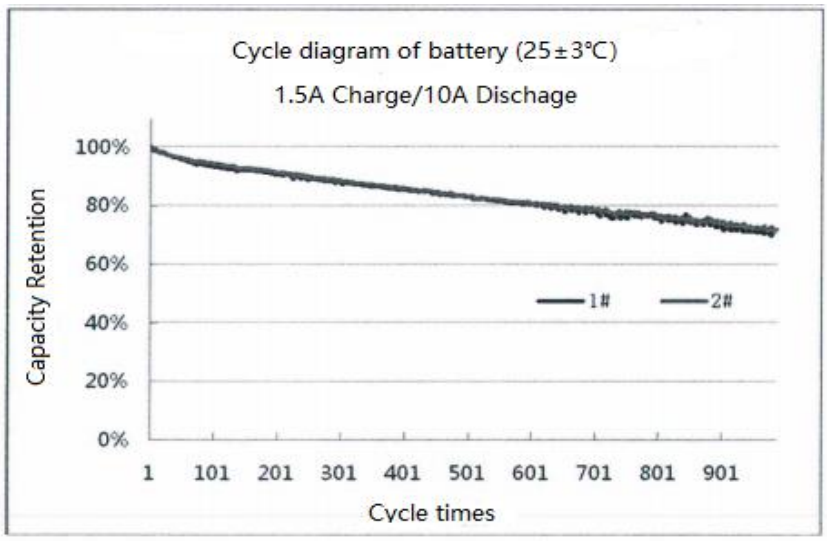
NO.	Item		Specifications	
1	Model		INR18650-3000 (30M)	
2	Can Material		Ni-Iron	
3	Nominal Capacity		3000mmAh Charge:1500mA 4.20V,CCCV60mA cut-offf Discharge:600mA,2.50V discharge cut-off	
4	Min Capacity		3000mmAh Charge:1500mA 4.20V,CCCV60mA cut-offf Discharge:600mA,2.50V discharge cut-off	
5	Nominal Voltage		3.70V	
6	Max Charge Voltage		4.20V	
7	Upper limit charging voltage		4.25V	
8	Standard Discharging Cut-off Voltage		2.50V	
9	Standard Charging Mode		CC-CV(cut-off current is 60mA)	
10	Standard Charging Current		1.5A	
11	Max Charging Current		3.0A	
12	Charging Time	Standard	3h (1.5A)	
		Quick	2h (3.0A)	
13	Max.Continuous Discharge Current		15A	
14	Max.Pulse Discharge Current		30A (2s Pulse)	
15	Standard Diameter of battery(include PET)		18.40±0.10mm	
16	Standard Height of battery(include PET)		65.150±0.15mm	
17	Weight		47.5±1.5g	
18	Initial Impedance (Max.at1000Hz,charged status)		≤18mΩ	
19	Pack consistency		Voltage≤5mV Impedance≤2.5mΩ Capacity≤20mAh	
20	Operating temperature (surface temperature)	Charge	0℃＜T≤20℃	Max.Charge Current 1.5A
			20℃＜T≤50℃	Max.Charge Current 3A
		Disharge	-20℃~80℃	
21	Storage temperature	3 months	-20℃~45℃	
		1 year	0℃~25℃	

4 Cell initial Dimensions



4.1Mainly Capacity graph (For reference only)





5 Battery/Cell performance test Criteria

a.Environmental test condition

Unless otherwise specified, all test stated in this product specification are conduct at 25℃±3℃and test condition

Relative Humidity:60%±25% R.H.

b.Measuring equipment

(1)Amp-meter and volt-meter

The amp-meter and volt-meter should have an accuracy of the grade 0.5mA/mV or higher.

(2) Slide caliper

The slide caliper should have 0.01mm scale.

(3) Impedance meter

The impedance meter with AC 1kHz should be used.

c.Standard charge

Charging the cell CCCV with charge current 0.5C(1.5A), constant voltage 4.20V and 60mA cut-off in CV mode at 25℃±3℃for capacity.

d.Standard discharge capacity

Discharge current of 600mA(0.2C) with 2.50V cut-off at 25℃±3℃with 1 hour after the standard charge.

5.1 Cell Electrical characteristics

No	Items	Test Method and Condition	Criteria
1	Discharge rate capabilities (25℃±3℃)	Standard charged under the comdition of normal atmospheric pressure and the environment temperature 25℃±3℃ and under 65%RH,then rest for 30mins and discharge at 0.6A,1.5A,3A,9A,15A to the discharge cut-off voltage respectively(2.50V).Charge/discharge cycle can be conducted for 3 times before meeting the Standards (the same below)	0.6A≥2900mAh 1.5A≥2900mAh 3.0A≥2900mAh 9.0A ≥2900mAh 15A≥2900mAh
2-1	Capacity retention and recovery (25℃±3℃)	Standard charged under the comdition of normal atmospheric pressure and the environment temperature 25℃±3℃, Stored for 28 days,then discharge at 0.2C to 2.50V measuring residual capacity;Then standard charge/discharge measure recoverable capacity.	Residual capacity≥94 % Recoverable capacity≥97%
2-2	Capacity retention and recovery(60℃)	Standard charged under the comdition of normal atmospheric pressure and the environment temperature 60℃±1℃, Stored for 7 days,then discharge at 0.2C to 2.50V measuring residual capacity;Then standard charge/discharge measure recoverable capacity.	Residual capacity≥85% Recoverable capacity≥94%
3-1	Low Temp erature Performance (-10℃)	The cell shall be charged in accordance with the standard charge.Then stored in the temperature of -10℃±1℃ for 4h,Discharge at the constant current of 0.2C down to the end-of-discharge voltage 2.50V	Discharge capacity ≥2320mAh

No	Items	Test Method and Condition	Criteria
3-2	Low Temperature Performance (-20℃)	The cell shall be charged in accordance with the standard charge.Then stored in the temperature of -20℃±1℃ for 4h,Discharge at the constant current of 0.2C down to the end-of-discharge voltage 2.50V	Discharge capacity ≥2030mAh
4	High Temperature Performance (55℃)	The cell shall be charged in accordance with the standard charge.Then stored in the temperature of 55℃±1℃ for 4h,Discharge at the constant current of 0.2C down to the end-of-discharge voltage 2.50V	Discharge capacity ≥2850mAh
5	Cycle Life (25℃±3℃)	Charge:1.5A charged the cell to 4.20V,then charge to charge with constant voltage till the current less than or equal to 0.02C,rest for 60mins; Discharge:10A discharge to 2.75V,one cycle is finished,rest for 60mins. Repeat the above steps,when the capacity retention rate is less than 70%,the test is over.	1.5A charge/10A discharge≥300cycles

5.4 Mechanical characteristics

No	Items	Test Method and Condition	Criteria
1	Free fall test	The battery to be fully charged in accordance with standard charge condition, then drop the battery three times from a height of 1,0 m onto a concrete floor. The batteries are dropped so as to obtain impacts in random orientations.	No Fire,
2	Vibration test	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 1.6mm. The cell shall be vibrated for 30 minutes per axis of XYZ axes.	No explosion ,No leakage, No fire

5.5 Safety performance

No	Items	Test Method and Condition	Criteria
1	Thermal exposure test	Each fully charged cell, stabilized at room temperature, is placed in a circulating air-convection oven. The oven temperature is raised at a rate of 5 °C/min ± 2 °C/min to a temperature of 130 °C ± 2 °C. The cell remains at this temperature for 10 min before the test is discontinued.	No explosion, No fire
2	Short test	The fully charged battery is to be short-circuited by connecting the positive and negative terminals of the battery with resistance load not exceed 100mΩ.Tests are to be conducted at room temperature 20~25℃.	No explosion, No fire The Temperature of the Battery surface not exceeded than 150℃
3.	Short test	The fully charged battery is to be short-circuited by connecting the positive and negative terminals of the battery with resistance load not exceed 100mΩ.Tests are to be conducted at room temperature about 60-65℃	No explosion, No fire The Temperature of the Battery surface not exceeded than 150℃
4	Forced discharge test	A discharged cell is subjected to a reverse charge at 1C for 90 min.	No explosion, No fire
5	Over charge test	After standard charge, continue to charge with a constant voltage 10V per a cell, holding 8h.	No explosion, No fire,

6 Handling of Cells

6.1 Prohibition short circuit

Never make short circuit cell. It generates very high current, which causes heating of the cells and may cause electrolyte leakage, gassing or explosion these are very dangerous. The LIR tabs may be easily short-circuited by putting them on conductive surface. Such outer short circuit may lead to heat generation and damage of the cell. An appropriate circuitry with PCM shall be employed to protect accidental short circuit of the battery pack.

6.2.Mechanical shock

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

7 Notice for Designing Battery Pack

7.1 Pack toughness

Battery pack should have sufficient strength and the LIR cell inside should be protected from mechanical shocks.

7.2 Cell fixing

The LIR cell should be fixed to the battery pack by its large surface area.

No cell movement in the battery pack should be allowed.

7.3 Inside design

No sharp edge components should be insides the pack containing the LIR cell.

7.4 Tab connection

Ultrasonic welding or spot welding is recommended for LIR tab connection method.

Battery pack should be designed that shear force are not applied to the LIR tabs.

If apply manual solder method to connect tab with PCM, below notice is very important to ensure battery performance:

1) The solder iron should be temperature controlled and ESD safe;
2) Soldering temperature should not exceed 350°C;
3) Soldering time should not be longer than 3s;
4) Soldering times should not exceed 5 times, Keep battery tab cold down before next time soldering;
5) Directly heat cell body is strictly prohibited, Battery may be damaged by heat above approx. 100°C

7.5 For mishaps

Battery pack should be designed not to generate heat even when leakage occurs due to mishaps.

1) Isolate PCM (Protection Circuit Module) from leaked electrolyte as perfectly as possible.
2) Avoid narrow spacing between bare circuit patterns with different voltage.

(Including around connector)

LIR battery should not have liquid from electrolyte, but in case If leaked electrolyte touch bare circuit patterns, higher potential terminal material may dissolve and precipitate at the lower potential terminal, and may cause short circuit. The design of the PCM must have this covered.

8 Notice for Assembling Battery Pack

Shocks, high temperature, or contacts of sharp edge components should not be allowed in battery pack assembling process.

9 Others

9.1 Cell connection

1) Direct soldering of wire leads or devices to the cell is strictly prohibited.

2) Lead tabs with pre-soldered wiring shall be spot welded to the cells.

Direct soldering may cause damage of components, such as separator and insulator, by heat generation.

9.2 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.

9.3 Prohibition of disassembly

1) Never disassemble the cells

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

2) Electrolyte is harmful

LIR 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.

9.4 Prohibition of dumping of cells into fire

Never incinerate nor dispose the cells in fire. These may cause explosion of the cells, which is very dangerous and is prohibited.

9.5 Prohibition of cells immersion into liquid such as water

The cells shall never be soaked with liquids such as water, seawater, drinks such as soft drinks, juices, coffee or others.

9.6 Battery cells replacement

The battery replacement shall be done only by either cells supplier or device supplier and never be done by the user.

9.7 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 or explosion.

10 Period of Warranty

The period of warranty is one year from the date of shipment. Winer Power guarantees to give a replacement in case of cells with defects proven due to manufacturing process instead of the customer abuse and misuse.

11 Storage of the Batteries

The batteries should be stored at room temperature, charged to about 30% to 50% of capacity.

We recommend that batteries be charged about once per half a year to prevent over discharge.

12 Other The Chemical Reaction

Because batteries utilize a chemical reaction, battery performance will deteriorate over time even if stored for a long period of time without being used. In addition, if the various usage conditions such as charge, discharge, ambient temperature, etc. are not maintained within the specified ranges the life expectancy of the battery may be shortened or the device in which the battery is used may be damaged by electrolyte leakage. If the batteries cannot maintain a charge for long periods of time, even when they are charged correctly, this may indicate it is time to change the battery.

13 Note

Any other items which are not covered in this specification shall be agreed by both parties.