

Lithium-ion Rechargeable Specification

Product name: Lithium-ion battery

Product Item: Lithium-ion INR21700 7.2V 5Ah

Specification Approved	PREPARED	
	CHECKED	
	APPROVED	

Revised List

Version No	Description of Revise	Date	Prepared
A0	New Publish	2023/04/07	Joan Li

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1. Scope

This product specification describes HIMAX's Lithium-ion battery. Please using the test methods that recommend in this specification. If you have any opinions or advice about the test items and methods, please contact us.

2. Model

Model: Lithium-ion INR21700 7.2V 5Ah

3. Reference standard

The standard reference GB/T18287-2013, UL1642 and CE61960 technology standards compiled.

4. Specification

Item		Rating	Note
Cell	Type	Lithium-ion Battery	
	Cell Model	INR21700-50E	
	Nominal Capacity	5000mAh	Discharge: 0.2C Cut-off Voltage:2.5V
	Minimum Capacity	4900mAh	Discharge: 0.2C Cut-off Voltage: 2.5V
	Nominal voltage	3.6V	
	Dimension	Cell height : Max.70.80mm Diameter : Φ Max.20.25mm	
	Weight	Approx.69g	
Battery pack	Pack Method	2S1P	
	Nominal Capacity	5Ah	
	Minimum Capacity	4.75Ah	
	Nominal Voltage	7.2V	
	Energy	36.0Wh	
	Charge Voltage	8.4V	
	Discharge cut-off voltage	5.0V	
	Charge Method	CC/CV	
	Standard Charge Current	1000mA	
	Standard Discharge Current	1000mA	
	Max. Charge Current	3000mA	
	Max. Discharge current	3000mA	
	Cycle Life	300 times	80% SOC
Dimension	Refer to drawing		

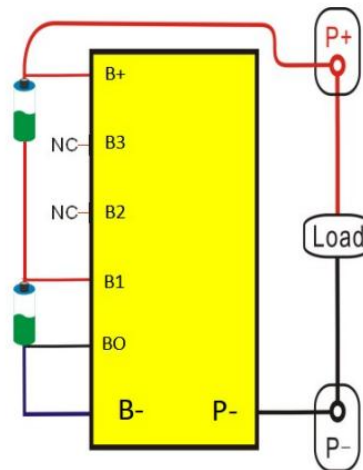
	Output Wire	3302 26# AWG	Length customize
	Output Connector	Customize	
	Weight	Approx.140g	
	Working Temperature Range	Charge: 0°C~45°C Discharge: -20°C~60°C	
	Storage Temperature	-10°C~45°C	

5. PCM Parameter

No.	Item		Standard
1	Charge Current/Discharge Current		≤6.0A
2	Overcharge	Level 1 Over-Charge Detect Voltage	4.25V±0.05V
		Level 1 Over-Charge Delay Time	2s
		Level 1 Over-Charge Reset Voltage	4.10V±0.050V
		Level 2 Over-Charge Detect Voltage	4.35V±0.05V
		Level 2 Over-Charge Delay Time	5s
		Level 2 Over-Charge Reset Voltage	turn off the FET,if failed, cut fuse, software or unrecoverable
		Level 3 Over-Charge Detect Voltage	4.45V±0.05V
		Level 3 Over-Charge Delay Time	2s
		Level 3 Over-Charge Reset Voltage	Fusing , unrecoverable
3	Over-discharge	Level 1 Over-Discharge Detect Voltage	2.50V±0.05V
		Level 1 Over-Discharge Delay Time	2s
		Level 1 Over-Discharge Reset Voltage	3.00V±0.05V
		Level 2 Over-Discharge Detect Voltage	2.20V±0.05V
		Level 2 Over-Discharge Delay Time	5s
		Level 2 Over-Discharge Reset Voltage	turn off the FET,if failed, cut fuse, software or unrecoverable
4	Over-current	Level 1 Over-Charge Detect Current	6.0±1.0A
		Level 1 Over-Charge Delay Time	2s
		Level 1 Over-Charge Reset	turn on the Charging FET

		Level 2 Over-Charge Detect Current	8.0±1.0A
		Level 2 Over-Charge Delay Time	1s
		Level 2 Over-Charge Reset	turn on the Charging FET
		Level 1 Over-Discharge Detect Current	8.0±1.0A
		Level 1 Over-Discharge Delay Time	2s
		Level 1 Over-Discharge Reset	Cut Load ,Auto release
		Level 2 Over-Discharge Detect Current	10.0±1.0A
		Level 2 Over-Discharge Delay Time	1s
		Level 2 Over-Discharge Reset	Cut Load ,Auto release
		Level 3 Over-Discharge Detect Current	12.0±1.0A
		Level 3 Over-Discharge Delay Time	31ms
		Level 3 Over-Discharge Reset	Cut Load ,Auto release
5	Short Circuit	Short-Circuit Detect Current	18-30A
		Short-Circuit Delay Time	500uS
		Reset	Release load

6. Circuit diagram



7. Electrical Performance & test condition

7.1 Standard Test Condition

The battery shall be evaluated within 1 month from the date of arrival.

Unless otherwise stated in these specifications, the following test shall be carried out in an ambient temperature of $20\pm 5^{\circ}\text{C}$, relative humidity of $65\pm 20\%$, Discharge capacity when the battery is discharged at 1A to 5.0V after being standard charged. Five cycles are permitted for this test. The test shall be terminated at the end of the first cycle which meets the requirement.

7.2 Testing Instrument or Apparatus

7.2.1 Dimension Measuring Instrument

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

7.2.2 Voltmeter and Ammeter

Voltmeters and ammeters shall be equal or more precision instruments of $10\text{K}\Omega/\text{V}$ and 0.01Ω .

7.2.3 Impedance Meter

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

7.3 Standard Charge

Standard charge means charging for 6hours using 8.4V/1A charger.

7.4 Standard Discharge

Standard discharge means discharging at 1A down to 5.5V.

7.5 Electrical Performance

Item	Condition	Specification
Open-Circuit Voltage	The open-circuit voltage shall be measured within 24hours after standard charge.	$\geq 8.2\text{V}$
Battery Capacity	The discharge time at 1A shall be measured after standard charge at $20\pm 5^{\circ}\text{C}$ and rest 1hour.	$\geq 95\%$
Cycle Life	The discharge time on standard discharge shall be measured after 300 cycles of standard charge and discharge at $20\pm 5^{\circ}\text{C}$.	$\geq 80\%$
Charge(capacity) retention	The discharge time at 1A shall be measured after standard charge and then storage at $20\pm 5^{\circ}\text{C}$ for 28days.	$\geq 90\%$
Temperature Characteristic 1	After standard charging at $20\pm 5^{\circ}\text{C}$, laying the battery at 55°C for 2hours, then discharge at 1A to 5.0V, record the discharge time .	$\geq 90\%$
Temperature Characteristic 2	After standard charging at $20\pm 5^{\circ}\text{C}$, laying the battery at -10°C for 4hour, then discharge at 1A to 5.0V, record the discharge time .	$\geq 70\%$

8. Mechanical Performance

Item	Condition	Specification
Crush Test	A battery is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram with a 32mm diameter piston. The crushing is to be continued until a pressure reading of 17.2mmPa is reached on the hydraulic ram, applied force of 13kN. Once the maximum pressure has been obtained it is to be released.	No fire, No explosion
Drop Test	The battery has only two axes of symmetry in which case only two directions shall be tested. The battery is to be dropped from a height of 1 meter twice onto concrete ground.	No explosion, No fire, No smoke
Vibration	A full-charged battery is to be subjected to simple harmonic motion with an amplitude of 1.6mm total maximum excursion. The frequency is to be varied at the rate of 1 hertz per minute between 10 and 55 hertz. The cell shall be vibrated for 30 minutes per axis o XYZ axes.	No leakage No Fire No explosion

9. Cell Safety Performance

Item	Condition	Specification
Over charge	At 20±5°C, Cells are discharged per 4.1.2, then charged at constant current of 3 times the max. charge condition and constant voltage of 4.2V while tapering the charge current. Charging is continued for 7 hours .	No explosion, No fire
Over discharge	At 20±5°C, the cell are fully charged with standard charging method and standby at least 1 hour. The cell should be discharged at a current of 1C for 2.5h.	No explosion, No fire
Short-circuit	At 20±5°C, The cells are fully charged with standard charging method and standby at least 1hour. Positive and negative terminal connect with wire (maximum load of 50mΩ) to cause short circuit until its voltage is lower than 0.1V or cell temperature on the surface is back to room temperature ±10°C.	150°C No explosion, No fire The temperature of the surface of the cell are lower than 150°C
Heating	Battery is heated in a circulating air oven at a rate of 5±2°C per min to 130°C, an then placed 30 mins at 130°C.	No explosion, no fire

10. Delivery/Packing/Storage and Shipment

10.1 Approx. 30% charged before delivery, Shipment voltage: 7.2V.

10.2 Pre shipment inspection

The battery should be checked the voltage, resistance and the function of protective circuit before shipment.

10.3 Packing and Shipping

10.3.1 The battery should be transported to the factory assembly, to pay special attention to the packing, in order to avoid transport stress.

10.3.2 The battery should be in a 30% state of charge packaging boxes for transport, in the transport process, prevent severe vibration, shock, extrusion, prevent the sun and rain, should be in automobile, train, ship, airplane and other forms.

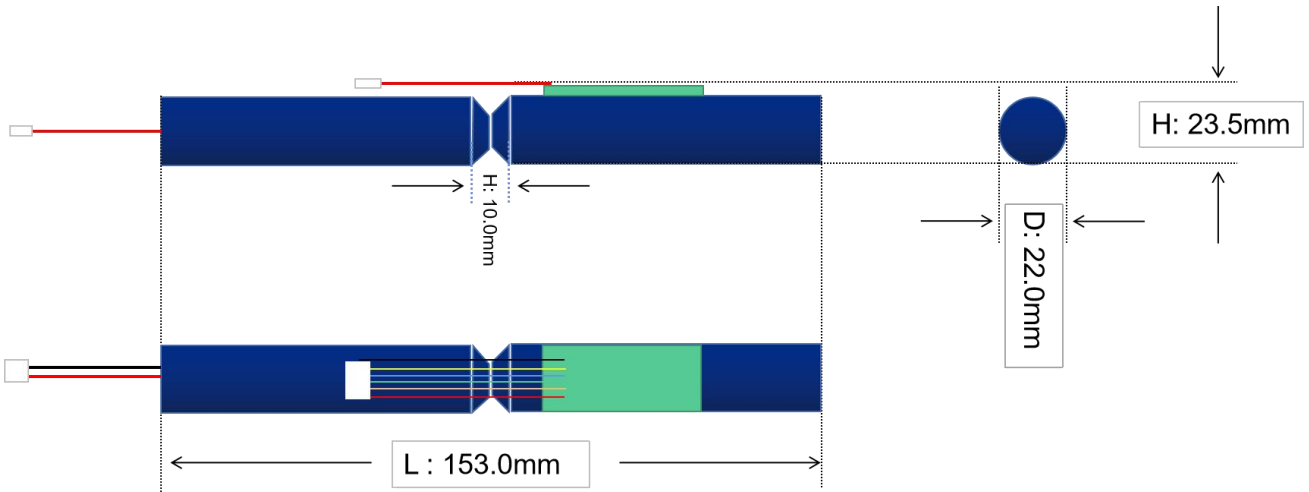
10.4 Abnormal Condition

Do NOT use the battery when it's smell like abnormal cell electrolyte because of transport stress, sag, short circuit or any other.

10.5 Acceptable level


Normal inspection quality standard AQL (%): 0.65.

11. Drawing



Remark :

Dimension : H 23.5 x D 22.0 x L 153.0 mm

Model :	Lithium-ion INR21700 7.2V 5Ah			
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Revision:		Drafted:	Joan Lee	2023.04.07

12. Period of Warranty

The period of warranty is one year from the date of shipment. HIMAX guarantees to give a replacement if battery with defects proved is caused due to defects of manufacturing process instead of the customer abuse or misuse.

13. Warning

To prevent the possibility battery leaking, heating, fire, Please READ this specification carefully before usage and observe the following precautions:

- Ⓞ When recharging, use the Li-ion battery charger specifically for that purpose.
- Ⓞ Do NOT strike battery with any sharp edge parts, such as Ni-tabs, pins and needles.
- Ⓞ Do NOT immerse the battery in water and seawater.
- Ⓞ Do NOT use and leave the battery near a heat source as fire or heater.
- Ⓞ Do NOT reverse the positive and negative terminals.
- Ⓞ Do NOT connect the battery to an electrical outlet.
- Ⓞ Do NOT discard the battery in fire or heat it.
- Ⓞ The battery tabs are NOT so stubborn especially for aluminum tab. Do NOT bend tab.
- Ⓞ Do NOT short-circuit the battery by directly connecting the positive and negative terminal with metal object.
- Ⓞ Do NOT transport and store the battery together with metal objects such as necklaces, hairpins etc.
- Ⓞ Do NOT knock or throw, trampling battery etc.
- Ⓞ Do NOT directly solder the battery and pierce the battery with a nail or other sharp object.
- Ⓞ Do NOT split the battery without permission.

14. Battery operation instruction

14.1 Charging

Charging current: Do NOT surpass the biggest charging current which in this specification.

Charging voltage: Do NOT surpass the highest voltage which in this specification.

Charge temperature: The charge temperature is in according to this specification.

14.2 Discharging

Discharge current: Do NOT surpass the biggest discharge current which in this specification.

Discharging with a higher current may result in the capacity fade and over-heat.

Discharge temperature: The discharge temperature is in according to this specification.

14.3 Over-discharges

After the short time excessively discharges charges immediately can NOT affect the use, but the long time

excessively discharges can cause the battery the performance, battery function losing. The battery long-term has NOT used, has the possibility to be able to be at because of its automatic flashover characteristic certain excessively discharges the condition, for prevented excessively discharges the occurrence, the battery should maintain the certain electric quantity.

14.4 Storing the Batteries

The battery should store in the product specification book stipulation temperature range. If has surpasses above for 3 months the long time storage, suggested to carry on additional charge to the battery.

14.5 Please do NOT continuously charge the battery more than 8 hours.

15. Others

©The customer is requested to contact HIMAX 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.

©HIMAX will take no responsibility for any accident when the battery is used under other conditions than those described in this Document.

©HIMAX will inform, in a written form, the customer of improvement(s) regarding proper use and handing of the battery, if it is deemed necessary.