

Model	INR18650/33gge	Spec. No.	INR18650/33gge	Version No.	A
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1.0. Scope

This product specification has been prepared to specify the rechargeable lithium-ion cell to be supplied to customer

2.0. Description and Model

2.1 Description Lithium-ion rechargeable cell

2.2 Model name INR18650/33gge

3.0. Nominal Specifications

Item	Specification
3.1 Typical Discharge Capacity	3200mAh Charge: 1550mA, 4.20V, CCCV 62mA cut-off Discharge: 620mA, 2.50V DC cut-off
3.2 Minimum Discharge Capacity	3100mAh Charge: 1550mA, 4.20V, CCCV 62mA cut-off Discharge: 620mA, 2.50V DC cut-off
3.3 Typical Voltage	3.60V
3.4 Standard Charge	CCCV, 0.5C (1550mA), 4.20±0.05V, 62mA cut-off
3.5 Rapid Charge	CCCV, 3100mA, 4.20±0.05V, 62mA cut-off (not for cycle life)
3.6 Standard Discharge	DC, 620mA, 2.50V cut-off
3.7 Max. Continuous Discharge	DC, 10A, 2.50V cut-off
3.8 Charge/Discharge Voltage Range	4.20~2.50V
3.9 Cell Weight	46.0±2.0g
3.10 Cell Dimensions	Height: 65.00±0.15mm Diameter: 18.35±0.10mm
3.11 Operation Temperature (Cell Surface Temperature)	Charge: 0 to 15 °C ≤ 0.2C (620mA)
	Charge: 15 to 50 °C ≤ 1.0C (3100mA)
	Discharge: -20 to 60°C

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3.12 Storage Temperature (At Shipping SOC)	1 year	0~25°C			
	3 months	0~45°C			
	1 month	0~60°C			

4.0. Outline Dimensions

See the attachment (Fig. 1).

5.0. Appearance

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

6.0. Standard Test Condition

6.1 Environment Condition

Unless otherwise specified, all tests stated in this specification are conducted at temperature $25 \pm 2^\circ\text{C}$ and humidity under 65% RH.

6.2 Measuring Equipment

(1) Amp-meter and volt-meter

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

(2) Slide caliper

The slide caliper should have 0.01mm scale.

(3) Impedance meter

The impedance meter with AC 1 kHz should be used.

7.0. Characteristics

7.1 Standard Charge

Standard Charge means charging the cell CCCV with charge current 1550mA (0.5C), constant voltage 4.20V and 62mA cut-off in CV mode at 25°C for capacity.

7.2 Rapid Charge

Rapid Charge means charging the cell CCCV with charge current 3100mA (1C), constant voltage 4.20V and 62mA cut-off in CV mode at 25°C .

7.3 Standard Discharge Capacity

The Standard Discharge Capacity is the initial discharge capacity of the cell, which is

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measured with discharge current of 620mA and cut-off voltage of 2.50V at 25°C after the standard charge.

Minimum Discharge Capacity \geq 3100mAh
(Referring IEC61960-2011 Standard)

7.4 Initial Internal Impedance

Initial Internal Impedance is measured at AC 1kHz at shipping SOC.

Initial Internal Impedance \leq 30m Ω

7.5 Discharge Rate Capabilities

Discharge capacity is measured with the various currents in the following table and 2.50V cut-off after the standard charge.

Item	Discharge Condition		
Current	620mA	3100mA	9300mA
Rate	0.2C	1.0C	3.0C
Relative Capacity	100%	\geq 90%	\geq 90%

Note: Relative capacity is divided by the discharge capacity of 620mA.

7.6 Temperature dependence of discharge capacity

Capacity comparison at each temperature, measured after storage at the test environment according to the below table with discharge constant current 620mA (0.2C) and 2.50V cut-off after the standard charge at 25°C.

Item	Discharge Temperature		
Temperature	-20°C	25°C	55°C
Storage Time	4h	4h	4h
Relative Capacity	\geq 70%	100%	\geq 90%

Note: Relative capacity is divided by the 620mA discharge capacity at 25°C.

7.7 Cycle Life

Charge: 0.5C (1550mA), 4.20V, 155mA cut-off.

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Discharge: 1C (3100mA), 3.00V cut-off.

Rest time: 10min after charge and 30min after discharge.

Capacity after 800 cycles.

Capacity $\geq 70\% C_i$ (C_i : the first discharge capacity of cycle life test at $25 \pm 2^\circ\text{C}$)

7.8 Storage Characteristics

Initial Capacity: Standard discharge capacity.

Retention Capacity: The standard discharge capacity after fully standard charged storage at condition in the following table.

Recovery Capacity: The standard discharge capacity of three times cycles after fully standard charged storage at condition in the following table.

Retention Ratio= Retention Capacity/ Initial Capacity*100%

Recovery Ratio= Recovery Capacity/ Initial Capacity*100%

Item	Retention Ratio	Recovery Ratio
25°C 28Days	$\geq 85\%$	$\geq 90\%$
60°C 7Days	$\geq 80\%$	$\geq 85\%$
45°C 28Days	/	$\geq 85\%$

7.9 Status of the cell as of ex-factory

The cell should be shipped in 3.45V to 3.60V charging voltage range (20~30% SOC).

8.0. Mechanical Characteristics

8.1 Free fall test

Test method: Each fully standard charged cell is dropped three times from a height of 1.0m onto a flat concrete floor at $20 \pm 5^\circ\text{C}$. The cells are dropped so as to obtain impacts in random orientations. After the test, the cells shall be put on rest for a minimum of 1h and then a visual inspection shall be performed.

Criteria: No fire, no explosion.

Free fall test is according to the IEC62133-2017 standard.

8.2 Vibration test

Test method: The vibration shall be a sinusoidal waveform with a logarithmic sweep

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between 7Hz and 200Hz and back to 7Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell. One of the directions of vibration must be perpendicular to the terminal face. The logarithmic frequency sweep is increased from 7 Hz a peak acceleration of 1 gn is maintained until 18 Hz is reached. The amplitude is then maintained at 0.8 mm (1.6 mm total excursion) and the frequency increased until a peak acceleration of 8 gn occurs. A peak acceleration of 8 gn is then maintained until the frequency is increased to 200 Hz.

Criteria: No fire, no explosion, no leakage, with less than 10% of OCV drop.

Vibration test is according to the UN38.3 standard.

9.0. Safety

9.1 Overcharge test

Test method: Fully standard discharged cell is charged with 3100mA to 6.3V or until charging time up to 1h.

Criteria: No fire, no explosion.

Overcharge test is according to the GBT31485-2015 standard.

9.2 External Short-circuit test

Test method: Fully standard charged cell is to be short-circuited by connecting the positive and negative terminals of the cell with a circuit load having a resistance load less than 5mΩ. Until the test time is lasting to 10min.

Criteria: No fire, no explosion.

External short-circuit test is according to the GBT 31485-2015 standard.

9.3 Forced Discharge test

Test method: A fully standard discharged cell is subjected to forced discharge at 3100mA (1C) for 90 min.

Criteria: No fire, no explosion.

Forced discharge test is according to the GBT31485-2015 standard.

9.4 Heating test

Test method: To heat up the standard charged cell at heating rate 5℃ ±2℃ per minute up to 130℃ ±2℃ and keep the cell in oven for 30 minutes.

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Criteria: No fire, no explosion.

Heating test is according to the GBT31485-2015 standard.

9.5 Altitude Simulation test

Test method: Fully standard charged cell is to be stored at a pressure of 11.6 kPa or less for at least six hours at ambient temperature ($20\pm 5^{\circ}\text{C}$).

Criteria: No fire, no explosion and no leakage with less than 10% of OCV drop.

Altitude Simulation test is according to the UN38.3 standard.

9.6 Thermal test

Test method: Fully standard charged cell is to be stored for at least 90 minutes at a test temperature equal to $-40\pm 2^{\circ}\text{C}$, followed by storage for at least 110 minutes at a test temperature equal to $85\pm 2^{\circ}\text{C}$. The time interval from $25\pm 2^{\circ}\text{C}$ to $-40\pm 2^{\circ}\text{C}$ is 60 minutes, from $-40\pm 2^{\circ}\text{C}$ to $25\pm 2^{\circ}\text{C}$ is 60 minutes, from $25\pm 2^{\circ}\text{C}$ to $85\pm 2^{\circ}\text{C}$ is 90 minutes, from $85\pm 2^{\circ}\text{C}$ to $25\pm 2^{\circ}\text{C}$ is 70 minutes, respectively. This procedure is to be repeated until 5 total cycles are complete.

Criteria: No fire, no explosion.

Thermal test is according to the GBT31485-2015 standard.

9.7 Crush Test

Test method: A fully standard charged cell is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram or similar force mechanism. The flat surfaces are to be brought in contact with the cells and the crushing is to be continued until an applied force of 13 ± 1 kN is reached. Once the maximum force has been obtained is to be released. The cell is to be crushed with its longitudinal axis parallel to the flat surfaces of the crushing apparatus.

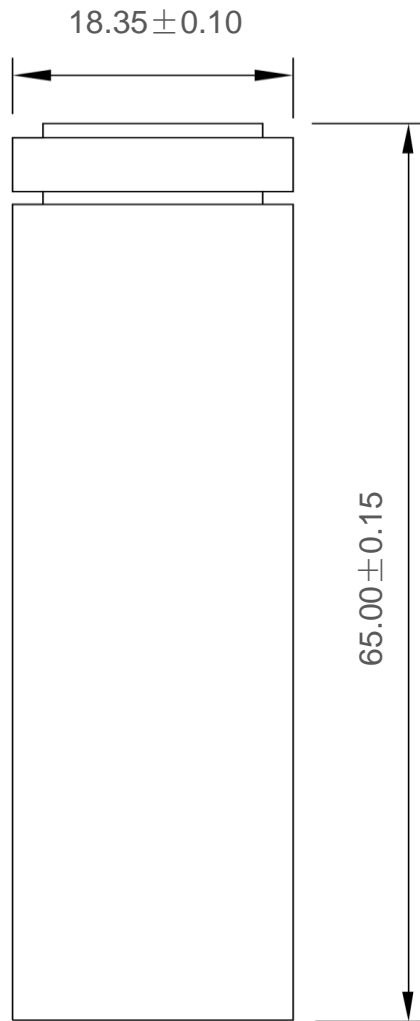
Criteria: No fire, no explosion.

Crush test is according to the UL1642-2012 standard.

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Attachment:

Fig 1:

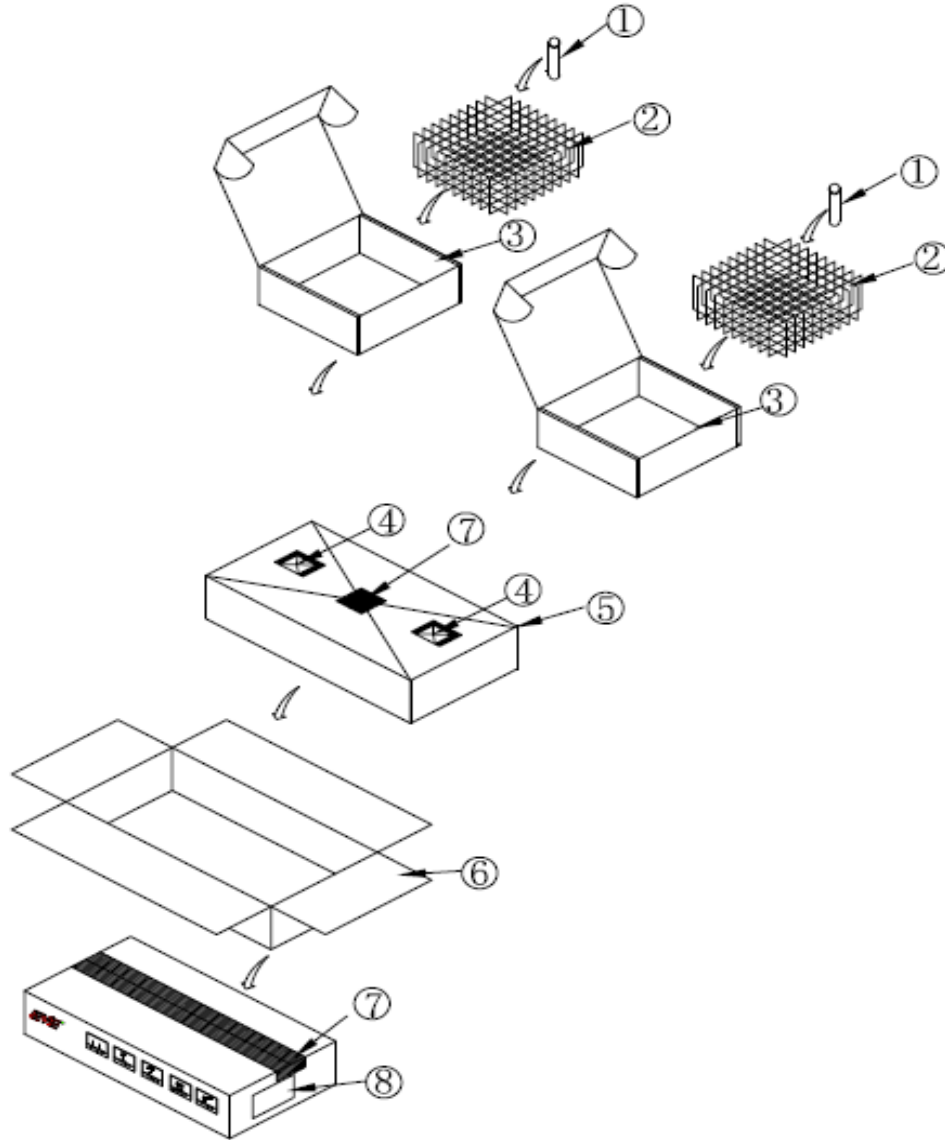


Unit: mm
with tube

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Attachment:

Fig 2:



NO.	Part Name	Material	Q'Ty
1	Cell	Cylindrical	200 pcs/box
2	Packing Guide	Manila	36 pcs/box
3	Box(Packing Case In)	SW	2 pcs/box
4	Silicagel	Si	2 pcs/box
5	Bag PE	PE	1 pcs/box
6	Box(Packing Case Out)	SW/DW	1 pcs/box
7	Tape	PE	0.01 rol/box
8	Product Label	Art Paper	1 pcs/box

Fig. 2. Package drawing