

1. Scope

This specification describes technical parameters and test standards for the lithium-ion rechargeable cell GGE18650 C12-2500mAh, These parameters and standards mainly refer to GB 31241-2014, UL1642, IEC62133 and UN38.3.

2. Product Specification

2.1 Type: Cylindrical Lithium-ion Rechargeable Cell

2.2 Model: ICR18650 C12 - 2500mAh

3. Basic Characteristics

Technical Parameters	Specification		Condition/Note
3.1 Capacity	Typical	2580mAh	Standard charge/discharge (Refer to 4.1 and 4.3)
	Minimum	2500mAh	
3.2 Rate Capacity	Min. 2450mAh		Rate charge/discharge (Refer to 4.2 and 4.4)
3.3 Nominal Voltage	3.6V		
3.4 Internal Impedance	≤18mΩ		AC 1kHz
3.5 Standard Charge (Refer to 4.1)	0.5C(1250mA)		Constant current
	4.2V		Constant voltage
	0.05C(125mA)		End condition(Cut off)
3.6 Rate Charge (Refer to 4.2)	4A		Constant current
	4.2V		Constant voltage
	100mA		End condition(Cut off)
3.7 Max. Continuous Discharge Current	20A		Without cut-off temperature
	30A		Cut-off temperature: 80°C
3.8 Charge Cut-off Voltage	4.2V		
3.9 Discharge Cut-off Voltage	2.5V		
3.10 Weight	45.4 ± 1.0g		
3.11 Max. Dimension	Diameter (Φ)	18.6mm	
	Height (H)	65.2mm	
3.12 Operating Temperature (Charge)	Temperature	Max. Continuous Charge Current	
	0°C ≤ T ≤ 10°C	2.5A	
	10°C < T ≤ 50°C	4A	

3.13 Operating Temperature (Discharge)	-20°C ~ 80°C	Over temperature protection $\leq 75^{\circ}\text{C}$, and re-discharge temperature $< 60^{\circ}\text{C}$
3.14 Charging Temperature	$0^{\circ}\text{C} \leq T(\text{surface}) \leq 50^{\circ}\text{C}$	Charge to 4.1V
3.15 Storage Temperature	One month	-20°C ~ 50°C
	Three months	-20°C ~ 45°C
	One year	-20°C ~ 25°C
		30% SOC, recovery ratio $\geq 80\%$

4. Standard Conditions for Test

1. Without stating specifically, all the electrical characteristics are obtained under the following conditions: Ambient temperature: $25 \pm 2^{\circ}\text{C}$; Relative humidity: $\leq 75\%$.

2. Without stating specifically, all the safety tests are conducted under the following conditions: Ambient temperature: $20 \pm 5^{\circ}\text{C}$; Relative humidity: $\leq 75\%$.

4.1 Standard Charge	0.5C(1250mA), CC-CV to 4.2V, 0.05C(125mA) cut off
4.2 Rate Charge	4A, CC-CV to 4.2V, 100mA cut off
4.3 Standard Discharge	0.2C(500mA), CC to 2.5V
4.4 Rate Discharge	10A, CC to 2.5V

5. Characteristics

5.1 Electrical Characteristics

Items	Test Procedure	Requirements
5.1.1 Nominal Voltage	Charge as described in 4.1, and discharge as described in 4.3. Calculate the average working voltage during discharge process.	3.6V
5.1.2 Nominal Capacity	Charge as described in 4.1, rest less than 1h, and discharge as described in 4.3.	$\geq 2500\text{mAh}$
5.1.3 Rate Capacity	Charge as described in 4.1, rest less than 1h, and discharge with the current of 10A and cut off at 2.5V.	$\geq 2450\text{mAh}$
5.1.4 Cycle Life	Fully charge as described in 4.2, rest for 30min, and discharge with the current of 20A to 2.5V and then rest for 45min. Repeat cycling till discharge capacity in 2 successive cycles is less than 1500mAh.	250 Cycles $\geq 1500\text{mAh}$

5.1.5 Rate Performance	Fully charge as described in 4.2, rest for 30min, and discharge with different constant currents and cut off at 2.5V. Calculate the ratio of above capacities to the rate capacity(2450mAh).	5A	≥ 97%
		10A	≥ 100%
		20A	≥ 95%
5.1.6 Discharge at High Temperature	Fully charge as described in 4.2, rest for 3h in the environment with temperature of 60°C, and discharge as described in 4.4. Calculate the ratio of above capacity to the rate capacity(2450mAh).	25°C	≥ 100%
		60°C	≥ 100%
5.1.7 Charge at High Temperature	Fully discharge as described in 4.4, rest for 3h in the environment with temperature of 50°C, and charge as described in 4.2. Calculate the ratio of above capacity to the rate capacity(2450mAh).	25°C	≥ 100%
		50°C	≥ 95%
5.1.8 Storage at High Temperature	Charge as described in 4.2, store in the environment with temperature of 60 ± 2°C for 30 days, and discharge as described in 4.4. Calculate the ratio of above capacity to the rate capacity(2450mAh).	Retention ratio ≥ 80% (1960mAh)	

5.2 Electrical Tests

Items	Test Procedure	Requirements
5.2.1 Short Circuit at 20 ± 5°C	The sample cell should be fully charged as described in 4.1, and short-circuited by connecting positive and negative terminals with a circuit load having a resistance of 80 ± 20mΩ at 20 ± 5°C. The temperature of the case should be measured during the test. The cell should remain on test for 24 hours or until the temperature of the case declines by 20% of the maximum temperature.	No fire , no explosion, and maximum surface temperature ≤ 150°C
5.2.2 Short Circuit at High Temperature	The sample cell should be fully charged as described in 4.1, and stored at 55 ± 5°C for 1h ~ 4h. Then the cell is to be short-circuited by connecting positive and negative terminals with a circuit load having a resistance of 80 ± 20mΩ. The temperature of the case should be measured during the test. The cell should remain on test for 24 hours or until the temperature of the case declines by 20% of the	No fire , no explosion, and the maximum surface temperature ≤ 150°C

	maximum temperature.	
5.2.3 Abnormal Charge	The sample cell should be discharged as described in 4.3, and subjected to the charging process to 4.6V with the current of the greater one between the 3C and three times of the charging current recommended by the manufacturer. The temperature of the case should be measured during the test. The test should be continued until the charging time reaches 7 hours or the temperature of the case declines by 20% of the maximum temperature.	No fire, no explosion
5.2.4 Forced-Discharge	The sample cell should be discharged as described in 4.3, and subjected to the forced discharge process with the reverse current of 1C. The test time is 90 min.	No fire, no explosion

5.3 Mechanical Tests

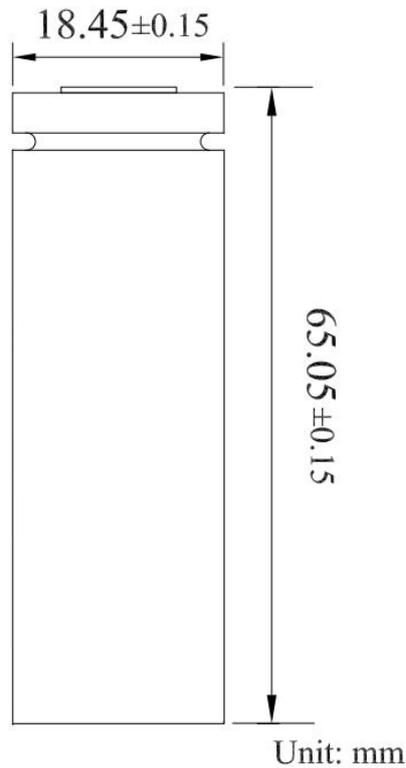
Items	Test Procedure	Requirements
5.3.1 Vibration	<p>The sample cell should be fully charged as described in 4.1, and firmly secured to the platform of the vibration machine. Test conditions are:</p> <ul style="list-style-type: none"> a) Scanning mode: sinusoidal waveform with the logarithmic scanning mode; b) Frequency range: 7Hz~200Hz; c) Specific mode: start at the frequency of 7Hz, and maintain the peak acceleration of 1g_n until the frequency is increased to 18Hz; maintain the amplitude of 0.8mm (1.6mm total excursion) and increase frequency to ~50Hz; maintain the peak acceleration of 8g_n until the frequency is increased to 200Hz; back to 7Hz; d) Scanning time of each cycle: 15min. <p>The above process should be conducted at both axial and radical directions(three mutually perpendicular directions for prismatic and pouch</p>	No fire, no explosion, and no leakage.

	cell). The test should be repeated 12 times for 3 hours in each direction.	
5.3.2 Drop	The sample cell should be fully charged as described in 4.1, and dropped onto a flat concrete floor from 1m height. The positive and negative electrode side should be dropped once, respectively, and the cylindrical surface twice. Each cell should be dropped four times.	No fire, no explosion.

5.4 Environmental Tests

Items	Test Procedure	Requirements
5.4.1 Temperature Cycling	<p>The sample cell should be fully charged as described in 4.1, and stored in a test chamber. Test conditions are:</p> <p>a) Raise the chamber temperature to $72 \pm 2^{\circ}\text{C}$ and maintain this temperature for at least 6 hours;</p> <p>b) Reduce the chamber temperature to $-40 \pm 2^{\circ}\text{C}$ and maintain this temperature for at least 6 hours;</p> <p>c) Repeat above steps 10 times.</p> <p>The time interval between two test temperatures should be less than 30 minutes.</p>	No fire, no explosion and no leakage
5.4.2 Low Pressure	The sample cell should be fully charged as described in 4.1, stored for 6 hours in the environment with the absolute pressure of 11.6kPa (1.68psi) and the temperature of $20 \pm 5^{\circ}\text{C}$, and observed for 1 hour.	No fire, no explosion, and no leakage
5.4.3 Heating	The sample cell should be fully charged as described in 4.1, and placed in a gravity or circulating air convection oven with initial temperature of $20 \pm 5^{\circ}\text{C}$. Raise the oven temperature at a rate of $5 \pm 2^{\circ}\text{C}/\text{min}$ to the test temperature of $130 \pm 2^{\circ}\text{C}$ and remain at this temperature for 30 minutes.	No fire, No explosion.

6. Outline Dimensions



7. Cautions

Please read this specification carefully before testing or using the cells because improper handling of the Li-ion cells may lead to efficiency loss, heating, electrolyte leakage, ignition or even explosion.

7.1 Caution in Use

7.1.1 Abnormal operations such as overcharge (voltage $> 4.2V$), over discharge (voltage $< 2.5V$) and overcurrent charge-discharge (maximum current allowed at present temperature) should be prohibited during cell using. It is strictly prohibited to use the cell in the environment easily causing problems, such as static electricity and poor sealing (water and dust entering).

7.1.2 Charging with the current more than 4A, using in the high-temperature/low-temperature, vibration, or humid environment, and matching unstable cells will reduce the cycle life of the cell.

7.1.3 The cell shall not be used in the environment of high frequency microwave or ultrasonic wave. When using in series and parallel, it is recommended to coat the high-voltage wire with electromagnetic insulation cover to prevent the electromagnetic wave from damaging adjacent devices and human body.

7.1.4 Avoid overlapping or contact between the positive and negative terminal wires of the battery to reduce the risk of short circuit.

7.1.5 The battery should be charged and discharged in strict accordance with this specification to ensure the battery's cycle life and safety.

7.1.6 When the batteries are assembled in a module for use, the cells with the same capacity, internal resistance, batch and charged state shall be used. The packing standard of the batteries should be strictly in accordance with the technical agreement. The temperature difference inside the battery pack should be less than 5°C when the pack is working.

7.1.7 Do not charge the battery when temperature is less than 0°C. Please store it in the environment with temperature more than 0°C for a period of time before charging. Recommended store time as follows:

Outside Temperature	$-5^{\circ}\text{C} \leq T \leq 0^{\circ}\text{C}$	$-10^{\circ}\text{C} \leq T \leq -5^{\circ}\text{C}$	$-15^{\circ}\text{C} \leq T \leq -10^{\circ}\text{C}$	$-20^{\circ}\text{C} \leq T \leq -15^{\circ}\text{C}$
Time	2h	5h	8h	10h

7.2 Safety Caution

7.2.1 The battery should be placed away from babies and children. If there is any emergency such as deglutition, scald or explosion, please go to the hospital immediately.

7.2.2 When charging or discharging the battery, please use professional test equipment designed for Li-ion batteries. Do not use ordinary constant current or constant voltage (CC/CV) power chargers without limitation of current or voltage. These chargers do not protect the battery from being overcharged and over-discharged, and may lead to function failure and be dangerous.

7.2.3 When charging, discharging, or assembling the battery, avoid reversing the positive and negative terminals. Or it would lead to overcharge and over-discharge of the battery, causing serious failure, or even explosion.

7.2.4 Do not solder the battery directly. Do not disassemble the battery.

7.2.5 Do not put the battery in pockets or bags with metal objects, such as necklaces, hairpins, coins, screws, etc. Neither store the battery without proper isolation, nor connect the positive and negative electrodes directly with conductive materials. Or the battery may be short-circuited.

7.2.6 Do not hammer, throw or trample the battery. Do not put the battery into washing machines or high-pressure containers.

7.2.7 Keep the battery away from heat sources, such as fires, heaters, etc. Do not use or store the battery in direct sunlight or at places where temperature could exceed 60°C. Or the battery may generate excessive heat, ignite and fail.

7.2.8 Do not get the battery wet or throw it into water. When the battery is not in use, place it in a dry environment with relatively low temperature.

7.2.9 If the battery becomes abnormally hot, give out smell, change color, deform or show any other abnormalities during using, testing or storing, please stop using or testing immediately. Attempt to isolate the battery and stay away.

7.2.10 If the leaking electrolyte from the battery gets into your eyes, do not rub your eyes. Rinse the

eyes with clean water and seek medical attention if problems remain. If the electrolyte gets onto the skin or clothing, wash with clean water immediately.

8. Packing

Cells need to be at half-charged state when packed. The surface of the packing boxes shall contain the following information: product name, type, nominal voltage, quantity, gross weight, date, capacity and impedance.

9. Transportation

During transportation, do not subject the cells or the boxes to violent shaking, bumps, rain or direct sunlight.

10. Long-term Storage

When delivered, cells are charged to the voltage of 3.48V ~ 3.68V. Storing cells at/more than 80% SOC for a long time will lead to capacity loss and cycle life loss, please keep cells into use within 90 days when the capacity is more than 80%.

Cells may have lower capacity than they're expected due to the self-discharge when cells are to be delivered at 20% SOC.

Do not use or store the cells when the voltage is less than 2.5V.

11. Warranty

The warranty period of this product is 12 months from the ex-factory date. This warranty will be void if the cells are used in ways that deviate from this specification.

12. Exclusion of Liability

The company is not liable for any problems arising from non compliance with this specification.

The company is not liable for any problems arising from the use of electrical circuits, battery packs and chargers.

The company does not guarantee the quality of the defective batteries caused by customers in the battery assembly process after shipment.

13. Statements

The information in this specification is subjected to change without prior notice.

For those applications not described here, please consult your nearest CHAM Sales Office or Distributors.