CHAM BATTERY TECHNOLOGY CO., LTD

Specifications

Lithium Ion Rechargeable Cell

High Energy Cylindrical Cell

Cell Type: CMICR18500F-1700mAh

Prepared by:	Checked by:	Approved by:

Publication date:		Effective date:
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1. Scope

This specification describes the technological parameters and testing standard for the lithium ion rechargeable cell manufactured and supplied byCTECHI.

2. Products specified

2.1 Name Cylindrical Lithium Ion Rechargeable Cell

2.2 Type CTICR18500F-1700mAh

3. References

In this specification reference is made to: GB/T182847-2000, UL1642 and IEC61960-1:2000.

4. Caution:

4.1. Please read these specifications carefully before testing or using the cell as improper handling of a Li-ion cell may result in lose of efficiency, heating, ignition, electrolyte leakage or even explosion.

4.2 While testing the cell by charging and discharging, please use test-equipment especially designed for Li-ion cell. Do not use ordinary constant current and constant voltage (CC/CV) power supplies. These do not protect the cell from being overcharged and over-discharged, resulting in possible loss of functionality or danger.

4.3 When charging and discharging cells or packing them into equipment, reversing the positive and negative terminals will result in overcharging and over-discharging of the cell(s). This could lead to serious loss of efficiency and even explosions.

4.4 Do not solder directly on the cell. Do not resolve the cell.

4.5 Do not put cell(s) in pockets or bags together with metal products such as necklaces, hairpins, coins, screws, etc. Neither stores them together without proper isolation. Do not connect the positive and negative electrode directly with each other through conductive materials. This can result in a short circuit of the cell.

4.6 Do not beat, throw or trample the cell, do not put the cell into washing machines or high-pressure containers.

4.7 Keep the cell away from heat sources such as fires, heaters, etc. Do not use or store cell(s) at locations where the temperature can exceed 60℃， such as in direct sunlight. This may lead to the generation of excessive heat, ignition and lose of efficiency.

4.8 Do not get cells wet or throw them into water. When not in use, place the cells in a dry environment at low temperatures.

4.9 While during use, testing or storing cells, cells become hot, distribute a smell, change color, deform or show any other abnormalities, please stop using or testing immediately. Attempt to isolate the cell and keep it away from other cells.

4.10 Should electrolyte get into the eyes, do not rub the eyes, rinse the eyes with clean water and seek medical attention if problems remain. If electrolyte gets onto the skin or clothing, wash with clean water immediately.

5. Basic characteristics

5.1 Capacity（25±5℃）	Nominal Capacity： 1700mAh (1.70A Discharge) Minimum Capacity：1670mAh (0.85A Discharge)
5.2 Nominal Voltage	3.7V
5.3 Internal Impedance	≤ 70mΩ
5.4 Discharge Cut-off Voltage	3.0V
5.5 Max Charge Voltage	4.20±0.05V
5.6 Standard Charge Current	0.85A
5.7 Rapid Charge Current	1.70A
5.8 Standard Discharge Current	0.85A
5.9 Rapid Discharge Current	1.70A
5.10 Max Pulse Discharge Current	3.0A
5.11 Weight	34.0±1g
5.12 Max. Dimension	Diameter(Ø): 18.3mm Height (H): 49.1mm
5.13 Operating Temperature	Charge: 0 ~ 45℃ Discharge: -20 ~ 60℃
5.14 Storage Temperature	During 1 month: -5 ~ 35℃ During 6 months: 0 ~ 35℃

6. Standard conditions for test

All the tests need to be done within one month after the delivery date under the following conditions :

Ambient Temperature:25±5℃; Relative Huimdity:65±20%

Standard Charge	Constant Current and Constant Voltage (CC/CV) Current = 0.85A Final charge voltage = 4.2V Final charge Current = 0.030A
Standard Discharge	Constant Current (CC) Current = 0.85A End Voltage = 3.0V

7. Appearance

All surfaces must be clean, without damages, leakage and corrosion. Each product will have a product label identifying the model.

▪8. Characteristics

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In this section, the Standard Conditions of Tests are used as described in part 6.

8.1 Electrical Performances

Items	Test procedure	Requirements
8.1.1 Nominal Voltage	The average value of the working voltage during the whole discharge process.	3.7V
8.1.2 Discharge Performance	The discharge capacity of the cell, measured with 1.7A down to 3.0V within 1 hour after a completed charge.	≥57min
8.1.3 Capacity Retention	After 28 days storage at 25±5℃, after having been completely charged and discharged at 0.34A, discharge to 3.0V, the residual capacity is above 90%	Capacity≥1530mAh
8.1.4 Cycle Life	After 300 cycles at 100% DOD. Charge and discharge at 0.85A, the residual discharge capacity is above 80% of nominal capacity.	≥300 cycles
8.1.5 Storage	(Within 3 months after manufactured) The cells is charged with 0.85A to 40-50% capacity and stored at ambient temperature 25±5℃, 65±20%RH for 12 months. After the 12 months storage period the cell is fully charged and discharged to 3.0V with 0.34A	Discharge time≥4h

8.2 Safety Performances

Items		Test procedure	Requirements
8.2.1	Short Circuit	The cell is to be short-circuited by connecting the positive and negative terminals of the cell directly with copper wire with a resistance of less than 0.05Ω.	No fire no explosion.
8.2.2	Impact Test	A test sample battery is to be placed on a flat surface. A 5/8 inch (15.8mm) diameter bar is to be placed across the center of the sample. A 20 pound (9.1kg) weight is to be dropped from a height of 24 ±1 inch (610±25mm) onto the sample.	No fire no explosion.
8.2.3	Overcharge (3C/10V)	The cell is connected with a thermocouple and put in a fume hood. The positive and negative terminals are connected to a DC power supply set at 5.1A and 10V until the cell reaches 10V and the current drops to approximately 0A. Monitor the temperature of cell. When the temperature of the cell is approximately 10℃ less than the peak value, the test is completed.	No fire, no explosion.
8.2.4	Thermal shock	After standard charging, heat the cell to 150±2℃ at a rate of 5±2℃ /min and keep it at this temperature during 10 minutes.	No fire, no explosion.

8.3 Environmental tests

Items	Test procedure	Requirements
8.3.1 High temperature performance	The fully charged cell is put at 55±2℃ for 2 hours and then discharged to 3.0V at 1.7A.	Capacity≥1439mAh
8.3.2 Low temperature performance	The fully charged cell is placed during 16-24 hours at -20±2℃ and then discharge to 2.75V at 0.34A.	Capacity≥1190mAh
8.3.3 Anti-vibration	The fully charged cell is fixed on a platform and vibrated in the X , Y and Z directions for 30minutes at the speed 10ct/min Frequency: 10~30Hz, Vibration amplitude 0.38mm. Frequency: 30~55Hz, Vibration amplitude 0.19mm.	No deformation should be visible. Not leak, smoke and/or explode. Voltage should be not less than 3.6V.
8.3.4 Drop Test	The fully charged cell is dropped from a height of 1m onto a 15~20mm hard board in X, Y and Z directions once for all axis. Then the cell is discharged at 1.7A to 3.0V followed by 3 or more cycles with the standard charge rate and a discharge at 1.7A.	No fire, no explosion. Discharge Time≥51min

9．Packing

Cells are at a half-charged state when packed. The packing box surface will contain the following: name, type, nominal voltage, quantity, gross weight, date, capacity and impedance.

10．Transportation

During transport, do not subject the cell(s) or the box (es) to violent shaking, bumps, rain and direct sunlight. Keep the cell(s) at a half-charged state.

11．Long-term Storage

The cell should be used within a short period after charging because long-term storage may cause loss of capacity by self-discharging. If the cell is kept for a long time(3months or more), It is strongly recommended that the cell is stored at dry and low-temperature and Keep the cell(s) at a half-charged state. the cell should be shipped in 50% charged state. In this case, OCV is from 3.65V to 3.85V. Our shipping voltage is 3.75-3.80v . because storage at higher voltage may cause loss of characteristics.

- over a period of 1 month: -5 ~ 35℃, relative humidity: ≤75%.
- over a period of 6 months: -20~ 25℃, relative humidity: ≤75%.

12．Warranty

12.1 The warranty period of this product is 12 months starting at the date of delivery from the factory.

12.2 Warranty will be void if the cells are used outside these specifications.

12.3 CHAM will not be liable for any damages, personal, material, immaterial or otherwise, when the cells are used outside these specifications.

13．Changes of specifications

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

14. For reference only

The information contained in this document is for reference only and should not be used as a basis for product guarantee or warranty. For applications other than those described here, please consult your nearest CHAM Sales Office or Distributors.

15.Pack Quality Requirement for safety and quality

15.1 The battery pack's consumption current.

- Sleep Mode : Under 250uA.
- Shut Down Mode : Under 10uA / Under 3.0V.
  Under 1uA / Under 2.5V.

15.2 Operating Charging Voltage of a cell.

- Normal operating voltage of a cell is 4.20V
- Max operating voltage of a cell is 4.25V.

15.3 Pre-charging function

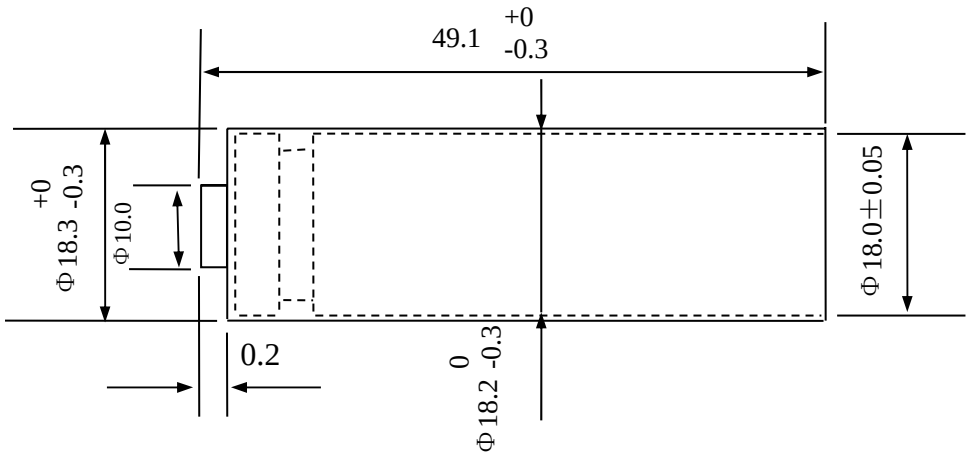
- Pre-charge function should be implemented to prevent abnormal high rate charging after deep discharge.
- Pre-charging condition Operation : Under 3.0V
- Charging current : Under 150mA/Cell.(Continuous)
- Pre-charge stop (Normal Charge Start) : All cells reach 3.0V

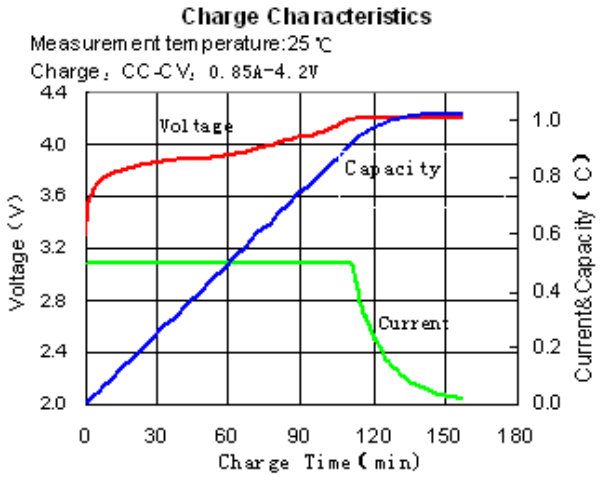
15.4. Cell voltage monitoring system.

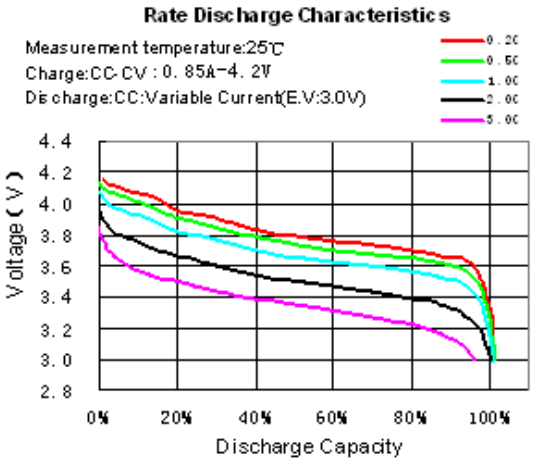
- The system (Charger or Pack) should equip a device to monitor each Cell voltage and to stop charging if a cell imbalance happened.

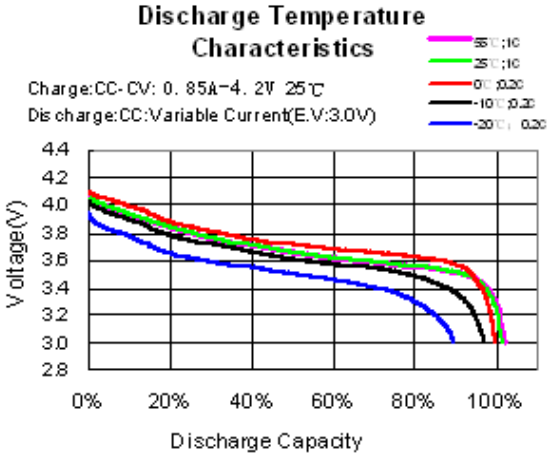
▪ 15. Appendix

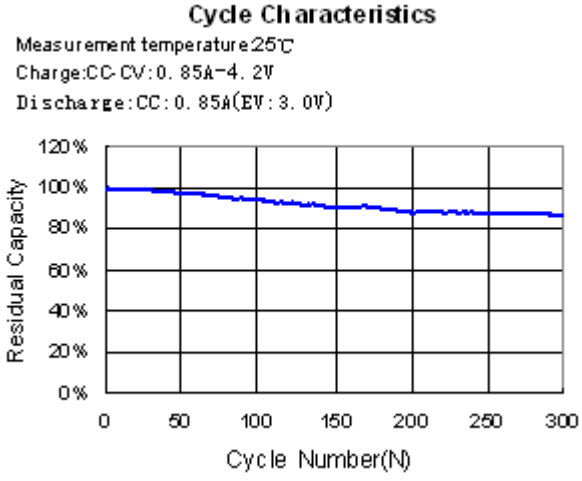
External Dimensions (mm)



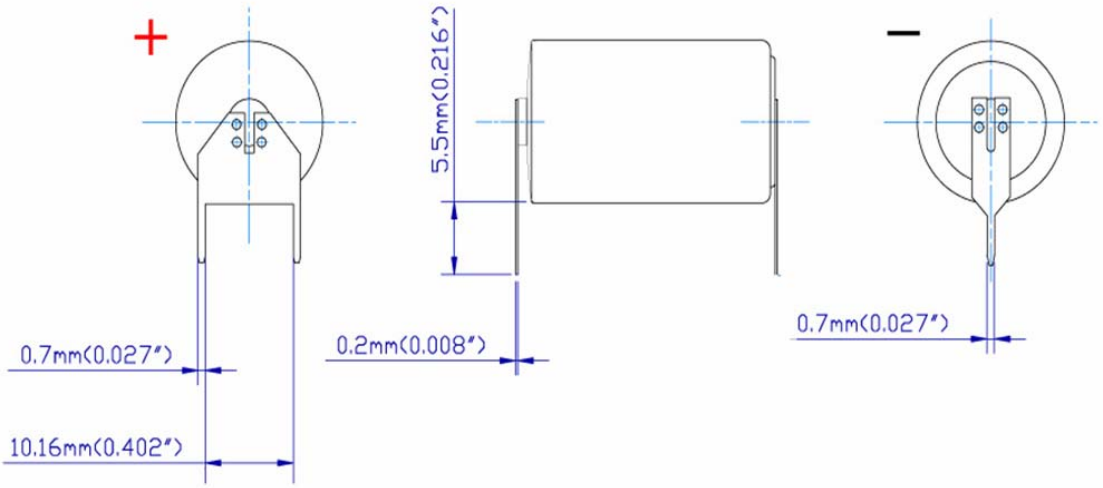








Drawing of Pins



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High Energy Cylindrical Cell

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1. Scope

This specification describes the technological parameters and testing standard for the lithium ion rechargeable cell manufactured and supplied by Cham Battery Technology Co. Ltd.

2. Products specified

2.1 Name Cylindrical Lithium Ion Rechargeable Cell

2.2 Type CMICR18500F-1700mAh

3. References

In this specification reference is made to: GB/T182847-2000, UL1642 and IEC61960-1:2000.

4. Caution:

4.1. Please read these specifications carefully before testing or using the cell as improper handling of a Li-ion cell may result in lose of efficiency, heating, ignition, electrolyte leakage or even explosion.

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5. Basic characteristics

5.1 Capacity（25±5℃）	Nominal Capacity： 1700mAh (1.70A Discharge) Minimum Capacity：1670mAh (0.85A Discharge)
5.2 Nominal Voltage	3.7V
5.3 Internal Impedance	≤ 70mΩ
5.4 Discharge Cut-off Voltage	3.0V
5.5 Max Charge Voltage	4.20±0.05V
5.6 Standard Charge Current	0.85A
5.7 Rapid Charge Current	1.70A
5.8 Standard Discharge Current	0.85A
5.9 Rapid Discharge Current	1.70A
5.10 Max Pulse Discharge Current	3.0A
5.11 Weight	34.0±1g
5.12 Max. Dimension	Diameter(Ø): 18.3mm Height (H): 49.1mm
5.13 Operating Temperature	Charge: 0 ~ 45℃ Discharge: -20 ~ 60℃
5.14 Storage Temperature	During 1 month: -5 ~ 35℃ During 6 months: 0 ~ 35℃

6. Standard conditions for test

All the tests need to be done within one month after the delivery date under the following conditions :

Ambient Temperature:25±5℃; Relative Huimdity:65±20%

Standard Charge	Constant Current and Constant Voltage (CC/CV) Current = 0.85A Final charge voltage = 4.2V Final charge Current = 0.030A
Standard Discharge	Constant Current (CC) Current = 0.85A End Voltage = 3.0V

7. Appearance

All surfaces must be clean, without damages, leakage and corrosion. Each product will have a product label identifying the model.

▪8. Characteristics

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In this section, the Standard Conditions of Tests are used as described in part 6.

8.1 Electrical Performances

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8.1.2 Discharge Performance	The discharge capacity of the cell, measured with 1.7A down to 3.0V within 1 hour after a completed charge.	≥57min
8.1.3 Capacity Retention	After 28 days storage at 25±5℃, after having been completely charged and discharged at 0.34A, discharge to 3.0V, the residual capacity is above 90%	Capacity≥1530mAh
8.1.4 Cycle Life	After 300 cycles at 100% DOD. Charge and discharge at 0.85A, the residual discharge capacity is above 80% of nominal capacity.	≥300 cycles
8.1.5 Storage	(Within 3 months after manufactured) The cells is charged with 0.85A to 40-50% capacity and stored at ambient temperature 25±5℃, 65±20%RH for 12 months. After the 12 months storage period the cell is fully charged and discharged to 3.0V with 0.34A	Discharge time≥4h

8.2 Safety Performances

Items	Test procedure	Requirements
8.2.1 Short Circuit	The cell is to be short-circuited by connecting the positive and negative terminals of the cell directly with copper wire with a resistance of less than 0.05Ω.	No fire no explosion.
8.2.2 Impact Test	A test sample battery is to be placed on a flat surface. A 5/8 inch (15.8mm) diameter bar is to be placed across the center of the sample. A 20 pound (9.1kg) weight is to be dropped from a height of 24 ±1 inch (610±25mm) onto the sample.	No fire no explosion.
8.2.3 Overcharge (3C/10V)	The cell is connected with a thermocouple and put in a fume hood. The positive and negative terminals are connected to a DC power supply set at 5.1A and 10V until the cell reaches 10V and the current drops to approximately 0A. Monitor the temperature of cell. When the temperature of the cell is approximately 10℃ less than the peak value, the test is completed.	No fire, no explosion.
8.2.4 Thermal shock	After standard charging, heat the cell to 150±2℃ at a rate of 5±2℃ /min and keep it at this temperature during 10 minutes.	No fire, no explosion.

8.3 Environmental tests

Items	Test procedure	Requirements
8.3.1 High temperature performance	The fully charged cell is put at 55±2℃ for 2 hours and then discharged to 3.0V at 1.7A.	Capacity≥1439mAh
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8.3.4 Drop Test	The fully charged cell is dropped from a height of 1m onto a 15~20mm hard board in X, Y and Z directions once for all axis. Then the cell is discharged at 1.7A to 3.0V followed by 3 or more cycles with the standard charge rate and a discharge at 1.7A.	No fire, no explosion. Discharge Time≥51min

9．Packing

Cells are at a half-charged state when packed. The packing box surface will contain the following: name, type, nominal voltage, quantity, gross weight, date, capacity and impedance.

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- over a period of 1 month: -5 ~ 35℃, relative humidity: ≤75%.
- over a period of 6 months: -20~ 25℃, relative humidity: ≤75%.

12 . Warranty

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- Shut Down Mode : Under 10uA / Under 3.0V.
  Under 1uA / Under 2.5V.

15.2 Operating Charging Voltage of a cell.

- Normal operating voltage of a cell is 4.20V
- Max operating voltage of a cell is 4.25V.

15.3 Pre-charging function

- Pre-charge function should be implemented to prevent abnormal high rate charging after deep discharge.
- Pre-charging condition Operation : Under 3.0V
- Charging current : Under 150mA/Cell.(Continuous)
- Pre-charge stop (Normal Charge Start) : All cells reach 3.0V

15.4. Cell voltage monitoring system.

- The system (Charger or Pack) should equip a device to monitor each Cell voltage and to stop charging if a cell imbalance happened.

▪ 15. Appendix

External Dimensions (mm)