ZHUHAI COSLIGHT BATTERY CO., LTD.

SPECIFICATION FOR APPROVAL

PRODUCT：Lithium Ion Polymer Rechargeable Battery

MODEL: CA456080G WITHOUT BREAKER

REVISE NO：VER 1.0

FOR:

Customer Approval:

Coslight Approval:

Prepared	R&D Reviewed	MKT Reviewed	Approved
Yuan Liyun	Li Junyi	Liu Houdong	Xu Yanming
Date: 2017-9-18	Date: 2017-9-18	Date: 2017-9-18	Date: 2017-9-18

ZHUHAI COSLIGHT BATTERY CO., LTD.
No.209, Zhufeng Way, Xinqing Science & Technology Park,
Doumen District, Zhuhai, 519180, P.R.China
Tel：86-0756-6199909 Fax： 86-0756-6199910
Email : yanming_xu@cncoslight.com
www.cncoslight.com

Product Revision History

REV.	Date	Revision Description	ORIGINATOR
1.0	2017-9-18	First issue	Ou Ying

Contents

1. Scope

This specification is made to describe the product, product characteristics and performance, relevant measurement conditions and methods applied to the lithium ion polymer rechargeable battery CA456080G WITHOUT BREAKER as specified in

2. Product Name and Product Type

2.1 Product Name

Polymer Lithium Ion Battery

2.2 Product Type

CA456080G WITHOUT BREAKER

3. Product Specifications

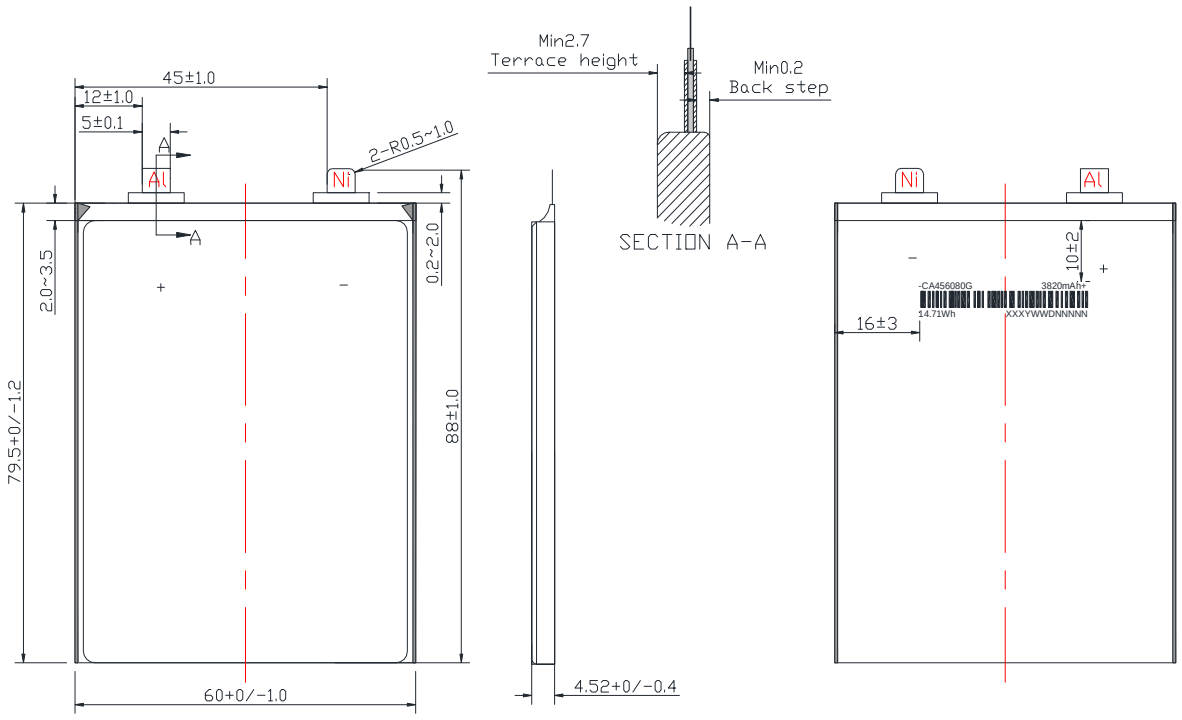
No.	Items	Specifications	Remark
1	Rated Capacity	Typical:4000mAh Min:3820mAh	Charge: Standard charge Discharge:Standard discharge
2	Nominal Voltage	3.85V	
3	Charge Limited Voltage	$4.40^{+0.05}_{-0.01}$V	
4	Discharge Cut-off Voltage	3.0V	
5	Maximum Charge Voltage(for safety)	4.5V	
6	Standard Charge	0.3C (1146 mA) Max. to 4.4 V, then CV to 0.02C cut off	temperature：0~10℃
		0.5C (1910 mA) Max. to 4.4 V, then CV to 0.02C cut off	temperature：10~20℃
		1.0C (3820 mA) to 4.25V,0.5C(1910mA)Max to 4.4V,then CV to 0.02C cut off	temperature：20~50℃
		0.5C (1910 mA) Max. to 4.1 V, then CV to 0.02C cut off	temperature：50~60℃
7	Standard Discharge	Using 0.2C(764mA)constant current discharge to the Discharge Cut-off Voltage	
8	Maximum Continuous Charge Current	1.2C (4584mA)	temperature：20~50℃
9	Maximum Continuous Discharge Current	1.5C (5730mA)	
10	Peak Discharge Current	2C/10s;3C/5s	No fire ;No explosion
11	Operating Temperature and Humidity Range	Charge:0~60℃	
		Humidity: Less than 85% RH	
		Discharge: -20~60℃ Humidity: Less than 85% RH	
12	Storage Temperature and Humidity Range	1 month: -20~60℃ 3 month: -20~45℃ 1 year: -20~20℃ Humidity: 45%~ 90% RH	The battery should cycle once in three month. Recommended storage temperature is 25℃ of SOC 50%.
13	Weight	≤ 56g	
14	Pre-charging	≤0.1C(382mA) ≤3.0V	
15	Charge (Low Voltage)	single cell<1.0V multi-cell<2.0V	Cells should be forbidden to charge or to use again

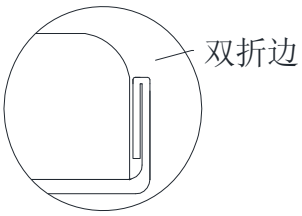
4. Mechanical Characteristics

4. 1 External Dimension

Dimension	Thickness	Width	Height
Maximum	4.52mm	60mm	79.5mm

External Form Figure （all unit in mm)





DETAIL:A
SCALE 5:1

备注:1. 银色铝塑膜
2. 厚度使用1400g PPG测量

4.2 Outside Appearance

The surface is smooth. No mechanical damage. The package membrane has no damage or leakage.

5. Electrical Characteristics

No.	Items	Criteria	Test Condition
1	Open Circuit Voltage	3.75~3.8V	Measure cells at 25 ± 3℃, 20~30% SOC.
2	Internal Impedance	≤ 60 mΩ	Measure cells using an alternate current impedance meter at 1KHz at 25 ± 3℃ after received.
3	Charge Rate Characteristics	0.2C： ≥100% (of Cmin) 0.5C： ≥100% (of Cmin) 1.0C： ≥97% (of Cmin) 1C to 4.25V, 0.5C to 4.4V: ≥100% (of Cmin)	Discharge capacity is measured with constant current 0.2C and 3.0V cut-off after charged with 0.02C cut off current @ 25±3℃:
4	Discharge Rate Characteristics	0.2C： ≥100% (of Cmin) 0. 5C： ≥95% (of Cmin) 1. 0C： ≥90% (of Cmin) 1. 5C： ≥80% (of Cmin)	Discharge capacity is measured with the various currents in under table and 3.0V cut-off after 1C to 4.25V, 0.5C to 4.40V charged with 0.02C cut-off@ 25±3℃
5	Charge Temperature Characteristics	0℃： ≥80% (of Cmin) 25℃： ≥100% (of Cmin) 45℃： ≥98% (of Cmin)	Stored the discharged cells for 3 hrs at 45 ± 2℃, 25± 2℃,0 ± 2℃, and then standard charged at this temperature. Then measured the capacity with discharge constant current 0.2C and 3.0V cut-off @ 25±3℃
6	Discharge Temperature Characteristics	-20℃： ≥50% (of Cmin) -10℃： ≥80% (of Cmin) 0℃： ≥90% (of Cmin) 25℃： ≥100% (of Cmin) 45℃： ≥98% (of Cmin) 60℃： ≥96% (of Cmin)	Capacity comparison at each temperature, measured with discharge constant current 0.2C and 3.0V cut-off after the 1C to 4.25V, 0.5C to 4.40V charged with 0.02C cut-off@ 25±3℃.
7	Storage Characteristics	Recovered Capacity: ≥ 80% (of Cmin) Impedance increase: ≤ 60 mΩ Swelling:≤ 0.46mm Appearance: No leakage	Measured the high rate capacity as the initial capacity. Stored the recharged cells for 7 days at 60 ± 2 ℃ and test the thickness at 60 ± 2 ℃ and then rest for 2 hrs at room temperature, standard discharged after checked the cells ' appearance and impedance.
		Recovered Capacity: ≥ 90% (of Cmin) Impedance: ≤ 60 mΩ Swelling:≤0.1mm Appearance:No leakage, No damage	Measured the rate capacity as the initial capacity. Stored the recharged cells for 28days at room temperature. Standard discharged after checked the cells ' appearance and impedance. Measured recoverable standard discharge capacity and recoverable impedance.

5. Electrical Characteristics

No.	Items	Criteria	Test Condition
8	Cycle Life(25℃)	For 500 Cycles Residual Capacity: ⩾ 80% (of $C_{Initial}$) For 501 Cycles Residual Capacity: ⩾ 80% (of C_{min}) Thickness after 501th cycles: ⩽ 4.88mm(8%)	Carry out 500cycles at 25± 3℃. charge: 1C charge to 4.25V,0.5C charge to 4.4V,cut off 0.02C discharge:0.5C to 3.0V Cells are to rest 10minutes after charge and 10 minutes after discharge. For 501th cycle charge: 1C charge to 4.25V,0.5C charge to 4.4V,cut off 0.02C discharge:0.2C to 3.0V Cells are to rest 10minutes after charge and 10 minutes after discharge.

6. Safety Characteristics

No.	Items	Condition	Specification
1	UL	This cell meet UL1642 safety test criteria	Follow UL1642 request spec
2	IEC62133	This cell meet IEC62133 safety test criteria	Follow IEC62133 request spec
3	BSMI	This cell meet BSMI safety test criteria	Follow BSMI request spec
4	IEEE1725	This cell meet IEEE1725 safety test criteria	Follow IEEE1725 request spec
5	KC	This cell meet KC safety test criteria	Follow KC request spec
6	PSE	This cell meet PSE safety test criteria	Follow PSE request spec
7	GB	This cell meet GB safety test criteria	Follow GB request spec
8	BIS	This cell meet BIS safety test criteria	Follow BIS request spec
9	UN38.3	This cell meet UN38.3 safety test criteria	Follow UN38.3 request spec

7. Reliability Characteristics

No.	Items	Criteria	Test Condition
1	Static Humidity and Temperature Characteristics	Residual Capacity: ⩾ 1910 mAh Recovered Capacity: ⩾ 3056 mAh Swelling: ⩽ 0.46mm Impedance: ⩽ 100mΩ Appearance: No leakage, damage	Measured the high rate capacity as the initial capacity. Stored the recharged cells for 4 days at 60 ± 2℃ and 95%RH, then rest for 4 hrs at room temperature. Standard discharged after checked the cells' appearance and impedance. Measured recoverable standard discharge capacity and recoverable impedance.
2	Vibration Characteristics	OCV Variation: ⩽0.02V Impedance: ⩽ 60mΩ Appearance: No leakage, damage	Measured the initial OCV and impedance after standard charged at 20±5℃. Vibrate the cells for 30minutes on each direction at room temperature in 10min. Amplitude: 1.6mm, (p-p) Vibration: 10-60Hz (sweep 1 oct/min) Direction: X, Y, Z Then measure OCV and impedance.
3	70℃ Storage Characteristics	Recovered Capacity: ⩾ 3056 mAh Swelling: ⩽ 0.46mm Impedance: ⩽ 100mΩ Appearance: No leakage, damage	Measured the high rate capacity as the initial capacity. Stored the recharged cells for 24 hrs at70 ± 2℃, and test the thickness at 70 ± 2℃ and then rest for 2 hrs at room temperature. Standard discharged after checked the cells' appearance and impedance. Measured recoverable standard discharge capacity and recoverable impedance.

Note: the definition and judgment of some terms in the above criteria:

(1) Initial state: including the initial appearance, OCV, impedance, thickness and weight of the cell.

(2) End state: including the end appearance, open circuit voltage, impedance, thickness and weight of the cell.

(3) Residual capacity: the initial discharge capacity of the cell after special measurement.

(4) Recoverable capacity: the cell is subjected a special measurement, the discharge capacity after several charge-discharge cycles.

(5) Standard cycle: the cell is charged with standard charge condition, rest for 10 min., then the cell is discharged to the end voltage with 1C5 A current at 25±5℃.

8. Protection Function

The electrolyte may be decomposed if a lithium ion secondary cell is subjected to a voltage higher than the allowable voltage or is charged with an excessive current, which may be resulted in safety problems. The performance of the cell may be deteriorated if the cell voltage is below 2.0V(single cell<1.0V multi-cell<2.0V). Therefore, Coslight strongly recommended that the cell shall be equipped with breaker and must be equipped with protection circuit that can prevent overcharge, over-discharge, and over-current. Breaker should be connected in series with a cell and it should be contacted to the cell top, as close as possible.

9. Guarantee Period of Quality

Guarantee period of quality is 12 months after sold.

10. Product Responsibility Agreement

The customers must abide by the Product Specification and remarks in using the cells manufactured by Zhuhai Coslight Battery Co., Ltd. The misuse may cause cell heat, fire or rupture. Coslight will NOT be responsible for any accident occurred by handling outside of the precautions in this specification.

Be attention to the package and structure of the polymer lithium ion cell:

a) The case of the polymer lithium ion cell shall be sustained the mechanical impact (collide, dropping, distortion and curve etc.) to protect the polymer lithium ion cell inside.

• Leakage and short-circuit etc. may be occurred if the cell is suffered strong impact.

• Take care in using the polymer lithium ion cell due to its soft package and is easier to be damaged than metal case cell in suffering from impact.

b) The polymer lithium ion cell shall be fastened inside the package to avoid the motion in suffering from mechanical impact such as dropping.

• The cell, PCB and connection wire may be damaged due to the motion of the cell inside the package is suffered from impact such as dropping etc., if the cell inside the package is not fastness.

• Coslight recommends fastening the wider face of the cell inside the package by adhesive tape.

• Do not make any damage to the bottom of the cell due to the bottom of polymer lithium ion cell is easy to be damaged in suffering from impact such as dropping.

c) Avoid connecting of polymer lithium ion cell with sharp or protruded articles.

• The membrane of polymer lithium ion cell is easy to be damaged by sharp articles, which may be resulted in the leakage of electrolyte.

• Put an isolated membrane between cell and PCB to avoid them connecting directly if the PCB of cell is put on the surface of the polymer lithium ion cell.

• Avoid to put sharp articles, protruded part of PCB (PTC, over-current sheet etc.) or connecting wire on the surface of polymer lithium ion cell directly.

•Avoid concentrating pressure on the cell to fasten the cell during the designing, because the performance of the cell may be decreased if the cell is extruded in a relative small area.

d) Be attention to the variation of the thickness of polymer lithium ion cell during charge-discharge:

• The thickness of polymer lithium ion cell may be increased a little during charge-discharge, if the design do not consider the variation of the thickness, the package may be damaged and the performance of the cell may be decreased due to the cell extrudes the case of cell, connecting wire or cell itself resulted •from the thickness increase.

e) Keep the polymer lithium ion cell away from thermal source:

• Some performance of polymer lithium ion cell may de decreased if the cell is working or storage beyond the required temperature range.

f) If the connection of the package case and cap is welded by supersonic, there shall be no gap between case and cap during welding to avoid the energy created by supersonic welding passing to polymer lithium ion cell or PCM.

• Polymer lithium ion cell or PCM may be damaged by the energy created by supersonic welding.

11. Handling precautions on Lithium ion secondary cell

To assure product safety, there shall be precautions below.

! Danger

• Use dedicated chargers and follow the specified conditions when charging the cell.

• Use the cell only in the specified equipment.

• Do not heat or put the cell into the fire. Also do not wet the cell.

• Do not use, leave cell close to fire or inside of a car where temperature may be above 60℃. Also do not charge / discharge in such conditions.

• Do not put or store cell together with metal articles such as necklaces, hairpins, coins, or screws.

• Do not short circuit the (+) and (-) terminals with metal conductors.

• Do not place cell in a device with the (+) and (-) in a reverse way.

• Do not penetrate cell with a sharp articles such as a needle.

• Do not disassemble the cell.

• Do not weld the cell directly.

• Do not use a cell with serious scar or deformation.

• Thoroughly read the user's manual before use, inaccurate handling of polymer lithium ion cell may results in heat, fire, explosion, damage or the capacity loss of the cell.

! Warning

• Do not put cell into a heating vessel, washing machine or high-pressure container.

• Do not use cell with primary batteries, or batteries of a different package, type, or brand.

• Stop charging the cell if charging is not completed within the specified time.

• If liquid leaking from the cell gets into your eyes, do not rub your eyes. Wash them well with clean water and call physician immediately.

• Keep away from cell immediately when leakage or foul odor is detected.

• Wash well with clean water immediately if liquid leaks onto your skin or clothes.

• If liquid leaking from the cell gets into your eyes, do not rub your eyes. Wash them well with clean water and call physician immediately.

! Caution

• Store batteries out of reach of children so that they are not accidentally swallowed.

• If younger children use the cell, their guardians should explain the proper handling.

• Be sure to read the user's manual and cautions on handling thoroughly before using the cell,.

• Batteries have cycle life. Using one new cell the same to the old one to replace it if work time of the equipment using cell as power sources becomes much shorter than the usual.

• Remove it from the equipment and store in a place with low humidity and temperature if the cell is not used for an extended period.

• Keep it far away from articles or materials with static electric charges while the cell is charged, used or stored.

• Wipe with a dry clothe before using the cell if the terminals of the cell become dirty.

12. Information of Company

ZHUHAI COSLIGHT BATTERY CO., LTD.
No.209, Zhufeng Way, Xinqing Science & Technology Park,
Doumen District, Zhuhai, 519180, P.R.China
Tel：86-0756-6199909 Fax： 86-0756-6199910
Email : yanming_xu@cncoslight.com
www.cncoslight.com