

TEST REPORT

Report No.: BCTC2009001493B

Applicant: Shenzhen Huafurui Technology Co., Ltd.

Product Name: Li-Polymer Battery

Product Type: CBT-A061

Tested Date: 2020-08-26~2020-09-06


Issued Date: 2020-09-18

Shenzhen BCTC Testing Co., Ltd

| | |
|--|---|
| IEC 62133-2 Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems | |
| Report Number.: | BCTC2009001493B |
| Date of issue | 2020-09-18 |
| Total number of pages.....: | 30 pages |
| Applicant's name.....: | Shenzhen Huaforui Technology Co., Ltd. |
| Address | Unit 1401 &1402, 14/F, Jin qi zhi gu mansion (No. 4 building of Chong wen Garden), Crossing of the Liu xian street and Tang ling road, Tao yuan street, Nan shan district, Shenzhen, P.R. China |
| Test specification: Standard: IEC 62133-2:2017 Test procedure: Commission Test Non-standard test method: N/A | |
| Test Report Form No.....: | IEC62133_2A |
| Test Report Form(s) Originator | DEKRA |
| Master TRF.....: | Dated 2017-08-10 |
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| | |
|--|---|
| Test item description | Li-Polymer Battery |
| Trade Mark | -- |
| Manufacturer | Zhongshan Tianmao Battery Co., Ltd. No.208, Qianjin One Road, Xin Qianjin Village, Tanzhou Town, Zhongshan City, China. |
| Model/Type reference | CBT-A061 |
| Ratings | 3.85V, 3000mAh, 11.55Wh |

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

| | | |
|--|--|---|
| Testing Laboratory: | Shenzhen BCTC Testing Co., Ltd. | |
| Testing location/ address | BCTC Building & 1-2F, East of B Building, Pengzhou Industrial Park, Fuyuan 1st Road, Qiaotou, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China | |
| Tested by (name, function, signature) | Dawn Zhou (Project handler) |   |
| Approved by (name, function, signature) ... | Peter Pan (Reviewer) |   |

List of Attachments (including a total number of pages in each attachment):

National Differences (0 page)

Summary of testing:
Tests performed (name of test and test clause):

7.1 Charging procedure for test purposes;
7.2.1 Continuous charging at constant voltage(cells);
7.3.1 External short circuit (cell);
7.3.2 External short circuit (battery);
7.3.3 Free fall(cell and battery);
7.3.4 Thermal abuse (cells);
7.3.5 Crush (cells);
7.3.6 Over-charging of battery;
7.3.7 Forced discharge (cells);
7.3.8 Mechanical test (batteries)
7.3.9 Design evaluation – Forced internal short-circuit (cells)
Tests are made with the number of batteries specified in Table 1 of IEC 62133-2:2017

Testing location:

Shenzhen BCTC Testing Co., Ltd.
BCTC Building & 1-2F, East of B Building,
Pengzhou Industrial Park, Fuyuan 1st Road,
Qiaotou, Fuyong Street, Bao'an District,
Shenzhen, Guangdong, China

Summary of compliance with National Differences (List of countries addressed):

N/A

☒ **The product fulfils the requirements of EN 62133-2: 2017**

Copy of marking plate:

The artwork below may be only a draft. The use of certification marks on a product must be authorized by the respective NCBs that own these marks.

Li-Polymer Battery
CBT-A061
3.85V, 3000mAh, 11.55Wh
1ICP7/45/65 YYYYMMDD
Zhongshan Tianmao Battery Co., Ltd.

Remark:

“YYYY” represents the year of manufacture;

“MM” represents the month of manufacture;

“DD” represents the date of manufacture.

| | |
|---|---|
| Test item particulars..... : | |
| Classification of installation and use..... : | To be defined in final product |
| Supply Connection | DC electrode tab |
| Recommend charging method declared by the manufacturer | Charge at constant current 600mA until the voltage reaches 4.4V, then charge at 4.4V until charge current declines to 60mA. |
| Discharge current (0,2 It A) | 600mA |
| Specified final voltage..... : | 3.0V |
| Upper limit charging voltage per cell..... : | 4.4V |
| Maximum charging current | 1500mA |
| Charging temperature upper limit | 55°C |
| Charging temperature lower limit..... : | 0°C |
| Polymer cell electrolyte type..... : | <input type="checkbox"/> gel polymer <input type="checkbox"/> solid polymer <input checked="" type="checkbox"/> N/A |
| Possible test case verdicts: | |
| - test case does not apply to the test object..... : N/A | |
| - test object does meet the requirement..... : P (Pass) | |
| - test object does not meet the requirement..... : F (Fail) | |
| Testing..... : | |
| Date of receipt of test item | 2020-08-26 |
| Date (s) of performance of tests | 2020-08-26 to 2020-09-06 |
| General remarks: | |
| "(See Enclosure #)" refers to additional information appended to the report. "(See appended table)" refers to a table appended to the report. Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator. | |
| Name and address of factory (ies)..... : | Zhongshan Tianmao Battery Co., Ltd. No.208, Qianjin One Road, Xin Qianjin Village, Tanzhou Town, Zhongshan City, China. |
| General product information and other remarks: | |
| Only test are performed in this report. The technology documentations, which should be provided by the manufacturer for the review requirement of IEC 62133, are not included in this report. This battery is constructed with one lithium-ion cell, and has overcharge, over-discharge, over current and short-circuits proof circuit. The cell consists of the positive electrode plate, negative electrode plate, separator, electrolyte and aluminum plastic film case. | |



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|------------|--|---------------------------------------|---------|
| 4 | PARAMETER MEASUREMENT TOLERANCES | | P |
| | Parameter measurement tolerances | | P |
| 5 | GENERAL SAFETY CONSIDERATIONS | | P |
| 5.1 | General | | P |
| | Cells and batteries so designed and constructed that they are safe under conditions of both intended use and reasonably foreseeable misuse | | P |
| 5.2 | Insulation and wiring | | P |
| | The insulation resistance between the positive terminal and externally exposed metal surfaces of the battery (excluding electrical contact surfaces) is not less than 5 MΩ | No externally exposed metal surfaces. | N/A |
| | Insulation resistance (MΩ) : | | — |
| | Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements | | P |
| | Orientation of wiring maintains adequate clearance and creepage distances between conductors | | P |
| | Mechanical integrity of internal connections accommodates reasonably foreseeable misuse | | P |
| 5.3 | Venting | | P |
| | Battery cases and cells incorporate a pressure relief mechanism or are constructed so that they relieve excessive internal pressure at a value and rate that will preclude rupture, explosion and self-ignition | | P |
| | Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief | | N/A |
| 5.4 | Temperature, voltage and current management | See below | P |
| | Batteries are designed such that abnormal temperature rise conditions are prevented | | P |
| | Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer | | P |
| | Batteries are provided with specifications and charging instructions for equipment manufacturers so that specified chargers are designed to maintain charging within the temperature, voltage and current limits specified | Specification provided. | P |
| 5.5 | Terminal contacts | | P |
| | The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current | | P |



| IEC 62133-2: 2017 | | | |
|-------------------|--|----------------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance | | P |
| | Terminal contacts are arranged to minimize the risk of short-circuit | | P |
| 5.6 | Assembly of cells into batteries | | P |
| 5.6.1 | General | | P |
| | Each battery have an independent control and protection for current, voltage, temperature and any other parameter required for safety and to maintain the cells within their operating region | Single cell battery. | P |
| | This protection may be provided external to the battery such as within the charger or the end devices | | N/A |
| | If protection is external to the battery, the manufacturer of the battery provide this safety relevant information to the external device manufacturer for implementation | | N/A |
| | If there is more than one battery housed in a single battery case, each battery have protective circuitry that can maintain the cells within their operating regions | | N/A |
| | Manufacturers of cells specify current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly | | P |
| | Batteries that are designed for the selective discharge of a portion of their series connected cells incorporate circuitry to prevent operation of cells outside the limits specified by the cell manufacturer | | N/A |
| | Protective circuit components added as appropriate and consideration given to the end-device application | | P |
| | The manufacturer of the battery provide a safety analysis of the battery safety circuitry with a test report including a fault analysis of the protection circuit under both charging and discharging conditions confirming the compliance | | N/A |
| 5.6.2 | Design recommendation | | P |
| | For the battery consisting of a single cell or a single cellblock, it is recommended that the charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Table 2 | | P |



| IEC 62133-2: 2017 | | | |
|-------------------|--|---------------------------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that the voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Table 2, by monitoring the voltage of every single cell or the single cellblocks | | N/A |
| | For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that charging is stopped when the upper limit of the charging voltage is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks | | N/A |
| | For batteries consisting of series-connected cells or cell blocks, nominal charge voltage not be counted as an overcharge protection | | N/A |
| | For batteries consisting of series-connected cells or cell blocks, cells have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer | | N/A |
| | It is recommended that the cells and cell blocks not discharged beyond the cell manufacturer's specified final voltage | | P |
| | For batteries consisting of series-connected cells or cell blocks, cell balancing circuitry incorporated into the battery management system | | N/A |
| 5.6.3 | Mechanical protection for cells and components of batteries | | P |
| | Mechanical protection for cells, cell connections and control circuits within the battery provided to prevent damage as a result of intended use and reasonably foreseeable misuse | | P |
| | The mechanical protection can be provided by the battery case or it can be provided by the end product enclosure for those batteries intended for building into an end product | To be evaluated in end-product. | N/A |
| | The battery case and compartments housing cells designed to accommodate cell dimensional tolerances during charging and discharging as recommended by the cell manufacturer | | N/A |
| | For batteries intended for building into a portable end product, testing with the battery installed within the end product considered when conducting mechanical tests | | N/A |
| 5.7 | Quality plan | | P |



| IEC 62133-2: 2017 | | | |
|-------------------|---|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | The manufacturer prepares and implements a quality plan that defines procedures for the inspection of materials, components, cells and batteries and which covers the whole process of producing each type of cell or battery | | P |
| 5.8 | Battery safety components | | P |
| | According annex F | | P |

| | | | |
|----------|--|--|-----|
| 6 | TYPE TEST AND SAMPLE SIZE | | P |
| | Tests are made with the number of cells or batteries specified in Table 1 using cells or batteries that are not more than six months old | Tests are performed according to specified in Table 1 of this standard. The samples are not more than six months old. | P |
| | Coin cells with resistance $\leq 3 \Omega$ (measured according annex D) are tested according table 1 | | N/A |
| | Unless otherwise specified, tests are carried out in an ambient temperature of $20^\circ\text{C} \pm 5^\circ\text{C}$ | | P |
| | The safety analysis of 5.6.1 identify those components of the protection circuit that are critical for short-circuit, overcharge and overdischarge protection | | P |
| | When conducting the short-circuit test, consideration given to the simulation of any single fault condition that is likely to occur in the protecting circuit that would affect the short-circuit test | | P |

| | | | |
|------------|---|--|---|
| 7 | SPECIFIC REQUIREMENTS AND TESTS | | P |
| 7.1 | Charging procedure for test purposes | | P |
| 7.1.1 | First procedure | | P |
| | This charging procedure applies to subclauses other than those specified in 7.1.2 | | P |
| | Unless otherwise stated in this document, the charging procedure for test purposes is carried out in an ambient temperature of $20^\circ\text{C} \pm 5^\circ\text{C}$, using the method declared by the manufacturer | | P |
| | Prior to charging, the battery have been discharged at $20^\circ\text{C} \pm 5^\circ\text{C}$ at a constant current of 0,2 It A down to a specified final voltage | | P |
| 7.1.2 | Second procedure | | P |
| | This charging procedure applies only to 7.3.1, 7.3.4, 7.3.5, and 7.3.9 | | P |



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|------------|--|--|---------|
| | After stabilization for 1 h and 4 h, respectively, at ambient temperature of highest test temperature and lowest test temperature, as specified in Table 2, cells are charged by using the upper limit charging voltage and maximum charging current, until the charging current is reduced to 0,05 It A, using a constant voltage charging method | Charge temperature 0-55°C declared. 60°C and -5°C were used as highest test temperature and lowest test temperature during tests. | P |
| 7.2 | Intended use | | P |
| 7.2.1 | Continuous charging at constant voltage (cells) | | P |
| | Fully charged cells are subjected for 7 days to a charge using the charging method for current and standard voltage specified by the cell manufacturer | | P |
| | Results: No fire. No explosion. No leakage | (See appended table 7.2.1) | P |
| 7.2.2 | Case stress at high ambient temperature (battery) | | N/A |
| | Oven temperature (°C) | | — |
| | Results: No physical distortion of the battery case resulting in exposure of internal protective components and cells | | N/A |
| 7.3 | Reasonably foreseeable misuse | | P |
| 7.3.1 | External short-circuit (cell) | | P |
| | The cells were tested until one of the following occurred: | | P |
| | - 24 hours elapsed; or | | N/A |
| | - The case temperature declined by 20 % of the maximum temperature rise | | P |
| | Results: No fire. No explosion..... | (See appended table 7.3.1) | P |
| 7.3.2 | External short-circuit (battery) | | P |
| | The batteries were tested until one of the following occurred: | | P |
| | - 24 hours elapsed; or | | P |
| | - The case temperature declined by 20 % of the maximum temperature rise | | P |
| | In case of rapid decline in short circuit current, the battery pack remained on test for an additional one hour after the current reached a low end steady state condition | | N/A |
| | A single fault in the discharge protection circuit conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test | | P |



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|--------|--|----------------------------|---------|
| | A single fault applies to protective component parts such as MOSFET, fuse, thermostat or positive temperature coefficient (PTC) thermistor | Single fault on U2 | P |
| | Results: No fire. No explosion..... : | (See appended table 7.3.2) | P |
| 7.3.3 | Free fall | | P |
| | Results: No fire. No explosion | | P |
| 7.3.4 | Thermal abuse (cells) | | P |
| | Oven temperature (°C) | | — |
| | Results: No fire. No explosion | | P |
| 7.3.5 | Crush (cells) | | P |
| | The crushing force was released upon: | | P |
| | - The maximum force of 13 kN ± 0,78 kN has been applied; or | | P |
| | - An abrupt voltage drop of one-third of the original voltage has been obtained | | N/A |
| | Results: No fire. No explosion..... : | (See appended table 7.3.5) | P |
| 7.3.6 | Over-charging of battery | | P |
| | The supply voltage which is: | | P |
| | - 1,4 times the upper limit charging voltage presented in Table A.1 (but not to exceed 6,0 V) for single cell/cell block batteries or | 6V used for test. | P |
| | - 1,2 times the upper limit charging voltage resented in Table A.1 per cell for series connected multi-cell batteries, and | | N/A |
| | - Sufficient to maintain a current of 2,0 It A throughout the duration of the test or until the supply voltage is reached | | P |
| | Test was continued until the temperature of the outer casing: | | P |
| | - Reached steady state conditions (less than 10 °C change in 30-minute period); or | | N/A |
| | - Returned to ambient | | P |
| | Results: No fire. No explosion..... : | (See appended table 7.3.6) | P |
| 7.3.7 | Forced discharge (cells) | | P |
| | If the discharge voltage reaches the negative value of upper limit charging voltage within the testing duration, the voltage is maintained at the negative value of the upper limit charging voltage by reducing the current for the remainder of the testing duration | | N/A |



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|---------|---|-----------------------------------|---------|
| | If the discharge voltage does not reach the negative value of upper limit charging voltage within the testing duration, the test is terminated at the end of the testing duration | | P |
| | Results: No fire. No explosion..... : | (See appended table 7.3.7) | P |
| 7.3.8 | Mechanical tests (batteries) | | P |
| 7.3.8.1 | Vibration | | P |
| | Results: No fire, no explosion, no rupture, no leakage or venting. : | (See appended table 7.3.8.1) | P |
| 7.3.8.2 | Mechanical shock | | P |
| | Results: No leakage, no venting, no rupture, no explosion and no fire : | (See appended table 7.3.8.2) | P |
| 7.3.9 | Design evaluation – Forced internal short-circuit (cells) | France, Japan, Korea, Switzerland | P |
| | The cells complied with national requirement for : | | — |
| | The pressing was stopped upon: | | P |
| | - A voltage drop of 50 mV has been detected; or | | N/A |
| | - The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) has been reached | 400 N. | P |
| | Results: No fire : | (See appended table 7.3.9) | P |

| | | | |
|------------|---|--|-----|
| 8 | INFORMATION FOR SAFETY | | P |
| 8.1 | General | | P |
| | Manufacturers of secondary cells ensure that information is provided about current, voltage and temperature limits of their products | Information is given in manufacturer's specifications. | P |
| | Manufacturers of batteries ensure that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards | Information is given in manufacturer's specifications. | P |
| | Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product | | N/A |
| | As appropriate, any information relating to hazard avoidance resulting from a system analysis provided to the end user | | N/A |
| | Do not allow children to replace batteries without adult supervision | | N/A |
| 8.2 | Small cell and battery safety information | Not small battery. | N/A |



| IEC 62133-2: 2017 | | | |
|-------------------|---|--|----------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | The following warning language is to be provided with the information packaged with the small cells and batteries or equipment using them: | | N/A |
| | - Keep small cells and batteries which are considered swallowable out of the reach of children | | N/A |
| | - Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion | | N/A |
| | - In case of ingestion of a cell or battery, seek medical assistance promptly | | N/A |
| 9 | MARKING | | P |
| 9.1 | Cell marking | Not cell. | N/A |
| | Cells marked as specified in IEC 61960, except coin cells | | N/A |
| | Coin cells whose external surface area is too small to accommodate the markings on the cells show the designation and polarity | | N/A |
| | By agreement between the cell manufacturer and the battery and/or end product manufacturer, component cells used in the manufacture of a battery need not be marked | | N/A |
| 9.2 | Battery marking | | P |
| | Batteries marked as specified in IEC 61960, except for coin batteries | The battery is marked in according with IEC 61960. | P |
| | Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity. Batteries also marked with an appropriate caution statement | Not coin battery | N/A |
| | Terminals have clear polarity marking on the external surface of the battery | See page 3. | P |
| | Batteries with keyed external connectors designed for connection to specific end products need not be marked with polarity markings if the design of the external connector prevents reverse polarity connections | | N/A |
| 9.3 | Caution for ingestion of small cells and batteries | Not small battery. | N/A |
| | Coin cells and batteries identified as small batteries according to 8.2 include a caution statement regarding the hazards of ingestion in accordance with 8.2 | | N/A |



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|------------|--|--|---------|
| | When small cells and batteries are intended for direct sale in consumer-replaceable applications, caution for ingestion given on the immediate package | | N/A |
| 9.4 | Other information | | P |
| | Storage and disposal instructions | Information is given in manufacturer's specifications. | P |
| | Recommended charging instructions | Information is given in manufacturer's specifications. | P |

| | | | |
|-----------|---|----------------|-----|
| 10 | PACKAGING AND TRANSPORT | | P |
| | Packaging for coin cells not small enough to fit within the limits of the ingestion gauge of Figure 3 | Not coin cell. | N/A |
| | The materials and packaging design are chosen so as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants | | P |

| | | | |
|----------------|---|---|-----|
| ANNEX A | CHARGING AND DISCHARGING RANGE OF SECONDARY LITHIUM ION CELLS FOR SAFE USE | | P |
| A.1 | General | | P |
| A.2 | Safety of lithium ion secondary battery | | P |
| A.3 | Consideration on charging voltage | | P |
| A.3.1 | General | | P |
| A.3.2 | Upper limit charging voltage | | P |
| A.3.2.1 | General | | P |
| A.3.2.2 | Explanation of safety viewpoint | | N/A |
| A.3.2.3 | Safety requirements, when different upper limit charging voltage is applied | 4.4V applied. | N/A |
| A.4 | Consideration of temperature and charging current | | P |
| A.4.1 | General | | P |
| A.4.2 | Recommended temperature range | Charging temperature range declared by client is 0-55°C | P |
| A.4.2.1 | General | | P |
| A.4.2.2 | Safety consideration when a different recommended temperature range is applied | | P |
| A.4.3 | High temperature range | 60°C used for test. | P |
| A.4.3.1 | General | | P |



| IEC 62133-2: 2017 | | | |
|-------------------|---|---------------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| A.4.3.2 | Explanation of safety viewpoint | | P |
| A.4.3.3 | Safety considerations when specifying charging conditions in the high temperature range | | P |
| A.4.3.4 | Safety considerations when specifying a new upper limit in the high temperature range | | P |
| A.4.4 | Low temperature range | -5°C used for test. | P |
| A.4.4.1 | General | | P |
| A.4.4.2 | Explanation of safety viewpoint | | P |
| A.4.4.3 | Safety considerations, when specifying charging conditions in the low temperature range | | P |
| A.4.4.4 | Safety considerations when specifying a new lower limit in the low temperature range | | P |
| A.4.5 | Scope of the application of charging current | | P |
| A.4.6 | Consideration of discharge | | P |
| A.4.6.1 | General | | P |
| A.4.6.2 | Final discharge voltage and explanation of safety viewpoint | | P |
| A.4.6.3 | Discharge current and temperature range | | P |
| A.4.6.4 | Scope of application of the discharging current | | P |
| A.5 | Sample preparation | | P |
| A.5.1 | General | | P |
| A.5.2 | Insertion procedure for nickel particle to generate internal short | | P |
| A.5.3 | Disassembly of charged cell | | P |
| A.5.4 | Shape of nickel particle | | P |
| A.5.5 | Insertion of nickel particle in cylindrical cell | | N/A |
| A.5.5.1 | Insertion of nickel particle in winding core | | N/A |
| A.5.5.2 | Marking the position of the nickel particle on both ends of the winding core of the separator | | N/A |
| A.5.6 | Insertion of nickel particle in prismatic cell | | P |
| A.6 | Experimental procedure of the forced internal short-circuit test | | P |
| A.6.1 | Material and tools for preparation of nickel particle | | P |
| A.6.2 | Example of a nickel particle preparation procedure | | P |
| A.6.3 | Positioning (or placement) of a nickel particle | | P |
| A.6.4 | Damaged separator precaution | | P |
| A.6.5 | Caution for rewinding separator and electrode | | P |



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|--------|---|-----------------|---------|
| A.6.6 | Insulation film for preventing short-circuit | | P |
| A.6.7 | Caution when disassembling a cell | | P |
| A.6.8 | Protective equipment for safety | | P |
| A.6.9 | Caution in the case of fire during disassembling | | P |
| A.6.10 | Caution for the disassembling process and pressing the electrode core | | P |
| A.6.11 | Recommended specifications for the pressing device | | P |

| | | |
|----------------|--|----------|
| ANNEX B | RECOMMENDATIONS TO EQUIPMENT MANUFACTURERS AND BATTERY ASSEMBLERS | P |
|----------------|--|----------|

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|----------------|---|------------|
| ANNEX C | RECOMMENDATIONS TO THE END-USERS | N/A |
|----------------|---|------------|

| | | |
|----------------|---|--|
| ANNEX D | MEASUREMENT OF THE INTERNAL AC RESISTANCE FOR COIN CELLS | N/A |
| D.1 | General | N/A |
| D.2 | Method | N/A |
| | A sample size of three coin cells is required for this measurement..... : | (See appended table D.2) N/A |
| | Coin cells with an internal resistance of less than or equal to 3 Ω are subjected to the testing according to Clause 6 and Table 1 | N/A |
| | Coin cells with an internal resistance greater than 3 Ω require no further testing | N/A |

| | | |
|----------------|--------------------------------|----------|
| ANNEX E | PACKAGING AND TRANSPORT | P |
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| ANNEX F | COMPONENT STANDARDS REFERENCES | N/A |
|----------------|---------------------------------------|------------|



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|--------|--------------------|-----------------|---------|
|--------|--------------------|-----------------|---------|

| TABLE: Critical components information | | | | | | P |
|--|--|------------------|--|------------------|-------------------------------------|---|
| Object / part No. | Manufacturer / trademark | Type / model | Technical data | Standard | Mark(s) of conformity ¹⁾ | |
| PCB | GUANGZHOU JP-WH PRECISION CIRCUIT CO., LTD. | JP-S2 | V-0, 105°C | -- | -- | |
| IC(U1) | TAIWAN HYCON Co., Ltd | HY2113-UH2B | V _{CU} : 4.475V±0.025V, V _{DL} : 2.5V±0.05V, Discharging overcurrent detection voltage: 0.15V±0.015V T _{opr} : -40 to 85°C | -- | -- | |
| MOSFET(U2) | JIANGSU CHANGJIANG ELECTRONICS TECHNOLOGY CO., LTD | CJCD2005 | V _{ds} : 20V, V _{gs} : ±12V I _d : 8A, I _{dm} : 50A; T _{stg} : -55°C~150°C | -- | -- | |
| NTC(R3) | MURATA MFG CO LTD | NCP15XH103F 03RC | 10KΩ±1%, B=3380 | -- | -- | |
| Connector | OCN TECHNOLOGY | OK-501F006-13 | 30V AC/DC -25°C to 85°C | -- | -- | |
| Cell | ZHONGSHAN TIANMAO BATTERY CO., LTD. | 624464PPN | 3.85V, 3000mAh | IEC62133-2: 2017 | Tested with appliance | |
| - Anode | Jiangxi Zichen Technology Co., Ltd | G49 | Graphite | -- | -- | |
| - Cathode | HuNan Shanshan Advanced Material Co., Ltd. | LC9000E | LiCoO ₂ | -- | -- | |
| - Separator | Shenzhen xu ran Electronic Co., Ltd | 11±2μm | PE+PVDF+Al ₂ O ₃ two layers | -- | -- | |
| - Electrolyte | Shenzhen Capchem Technology Co., Ltd | LBC3045Q19 | LiPF ₆ , Dimethyl carbonate, Ethyl acetate, Ethylene carbonate | -- | -- | |
| -The Aluminum Plastic Composite Film | DNP | D-EL40H | 113μ | -- | -- | |
| Supplementary information: N/A | | | | | | |



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|--------|--------------------|-----------------|---------|
|--------|--------------------|-----------------|---------|

| 7.2.1 | TABLE: Continuous charging at constant voltage (cells) | | | | P |
|---|--|--|-----------------------|---------|---|
| Sample no. | Recommended charging voltage V _c (Vdc) | Recommended charging current I _{rec} (A) | OCV before test (Vdc) | Results | |
| 01 | 4.4 | 0.6 | 4.382 | A, B | |
| 02 | 4.4 | 0.6 | 4.385 | A, B | |
| 03 | 4.4 | 0.6 | 4.384 | A, B | |
| 04 | 4.4 | 0.6 | 4.387 | A, B | |
| 05 | 4.4 | 0.6 | 4.379 | A, B | |
| Supplementary information: A - No fire or explosion; B - No leakage; C - Others (please explain). | | | | | |

| 7.3.1 | TABLE: External short-circuit (cell) | | | | P |
|---|--------------------------------------|-----------------------|----------------------------|--------------------------------------|---------|
| Sample no. | Ambient T (°C) | OCV before test (Vdc) | Resistance of circuit (mΩ) | Maximum case temperature rise ΔT (K) | Results |
| Samples charged at charging temperature upper limit 60°C | | | | | |
| 06 | 55.6 | 4.382 | 85 | 63.8 | A, C |
| 07 | 55.6 | 4.379 | 84 | 48.7 | A, C |
| 08 | 55.6 | 4.385 | 83 | 56.8 | A, C |
| 09 | 55.6 | 4.382 | 83 | 51.7 | A, C |
| 10 | 55.6 | 4.381 | 87 | 57.6 | A, C |
| Samples charged at charging temperature lower limit -5°C | | | | | |
| 11 | 55.3 | 4.287 | 87 | 60.4 | A, C |
| 12 | 55.3 | 4.292 | 83 | 45.8 | A, C |
| 13 | 55.3 | 4.285 | 85 | 55.7 | A, C |
| 14 | 55.3 | 4.278 | 83 | 51.9 | A, C |
| 15 | 55.3 | 4.281 | 85 | 54.0 | A, C |
| Supplementary information: A - No fire or explosion; B - The test was completed after 24 hours elapsed; C - The test was completed after the cell casing cooled to 20% of the maximum temperature rise; D - Others (please explain). | | | | | |



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|--------|--------------------|-----------------|---------|
|--------|--------------------|-----------------|---------|

| 7.3.2 | TABLE: External short-circuit (battery) | | | | | P |
|------------|---|-----------------------|----------------------------|--------------------------------------|----------------------------------|---------|
| Sample no. | Ambient T (°C) | OCV before test (Vdc) | Resistance of circuit (mΩ) | Maximum case temperature rise ΔT (K) | Component single fault condition | Results |
| 16 | 23.7 | 4.378 | 83 | 93.8 | U2 | A, C |
| 17 | 23.7 | 4.382 | 87 | 85.0 | U2 | A, C |
| 18 | 23.7 | 4.385 | 84 | 82.6 | U2 | A, C |
| 19 | 23.7 | 4.379 | 81 | 88.7 | U2 | A, C |
| 20 | 23.7 | 4.381 | 79 | 1.6 | -- | A, D |

Supplementary information:

A - No fire or explosion;

B - The test was completed after 24 hours elapsed;

C - The test was completed after the case temperature declined by 20 % of the maximum temperature rise;

D - Rapid decline in short circuit current, the battery pack remained on test for an additional one hour after the current reaches a low end steady state condition;

E - Others (please explain).

| 7.3.5 | TABLE: Crush (cells) | | | P |
|--|-----------------------|--|---|---------|
| Sample no. | OCV before test (Vdc) | OCV at removal of crushing force (Vdc) | Maximum force applied to the cell during crush (kN) | Results |
| Samples charged at charging temperature upper limit 60°C | | | | |
| 37 | 4.384 | 4.384 | 13 | A, B |
| 38 | 4.388 | 4.388 | 13 | A, B |
| 39 | 4.389 | 4.389 | 13 | A, B |
| 40 | 4.372 | 4.372 | 13 | A, B |
| 41 | 4.381 | 4.381 | 13 | A, B |
| Samples charged at charging temperature lower limit -5°C | | | | |
| 42 | 4.277 | 4.277 | 13 | A, B |
| 43 | 4.289 | 4.289 | 13 | A, B |
| 44 | 4.292 | 4.292 | 13 | A, B |
| 45 | 4.290 | 4.290 | 13 | A, B |
| 46 | 4.289 | 4.289 | 13 | A, B |

Supplementary information:

A - No fire or explosion;

B - Force released after maximum level reached;

C - An abrupt voltage drop of one-third of the original voltage has been obtained;

D - Others (please explain).



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|--------|--------------------|-----------------|---------|
|--------|--------------------|-----------------|---------|

| 7.3.6 | TABLE: Over-charging of battery | | | P |
|---|--|------------------------------|-------------------------------------|----------|
| Constant charging current (A) | | 6 | | — |
| Supply voltage (Vdc) | | 6 | | — |
| Sample no. | OCV before charging (Vdc) | Total charging time (minute) | Maximum outer case temperature (°C) | Results |
| 47 | 3.329 | 60 | 25.3 | A, C |
| 48 | 3.352 | 60 | 24.7 | A, C |
| 49 | 3.301 | 60 | 25.4 | A, C |
| 50 | 3.334 | 60 | 23.4 | A, C |
| 51 | 3.337 | 60 | 24.1 | A, C |
| Supplementary information: A - No fire or explosion; B - The temperature of the outer casing reached steady state conditions (less than 10 °C change in 30-minute period); C - The temperature of the outer casing returned to ambient; D - Others (please explain). | | | | |

| 7.3.7 | TABLE: Forced discharge (cells) | | | P |
|--|--|-----------------------------------|-------------------------------------|----------|
| Sample no. | OCV before application of reverse charge (Vdc) | Measured reverse charge I_t (A) | Lower limit discharge voltage (Vdc) | Results |
| 52 | 3.314 | 3.0 | -4.2 | A, C |
| 53 | 3.310 | 3.0 | -4.2 | A, C |
| 54 | 3.290 | 3.0 | -4.2 | A, C |
| 55 | 3.220 | 3.0 | -4.2 | A, C |
| 56 | 3.310 | 3.0 | -4.2 | A, C |
| Supplementary information: A - No fire or explosion; B - The voltage reach negative value of upper limit charging voltage; C - The voltage did not reach negative value of upper limit charging voltage; D - Others (please explain). | | | | |



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|--------|--------------------|-----------------|---------|
|--------|--------------------|-----------------|---------|

| 7.3.8.1 | TABLE: Vibration | | | | | P |
|---|-----------------------|----------------------|----------------------|---------------------|---------|---|
| Sample no. | OCV before test (Vdc) | OCV after test (Vdc) | Mass before test (g) | Mass after test (g) | Results | |
| 57 | 4.383 | 4.383 | 39.307 | 39.307 | A | |
| 58 | 4.384 | 4.384 | 39.654 | 39.653 | A | |
| 59 | 4.379 | 4.379 | 39.365 | 39.364 | A | |
| Supplementary information: A - No fire. No explosion. No leakage. No venting. No rupture; B - Others (please explain). | | | | | | |

| 7.3.8.2 | TABLE: Mechanical shock | | | | | P |
|---|-------------------------|----------------------|----------------------|---------------------|---------|---|
| Sample no. | OCV before test (Vdc) | OCV after test (Vdc) | Mass before test (g) | Mass after test (g) | Results | |
| 60 | 4.379 | 4.379 | 39.593 | 39.593 | A | |
| 61 | 4.382 | 4.382 | 39.437 | 39.437 | A | |
| 62 | 4.389 | 4.389 | 39.532 | 39.532 | A | |
| Supplementary information: A - No fire. No explosion. No leakage. No venting. No rupture; B - Others (please explain). | | | | | | |

| 7.3.9 | TABLE: Forced internal short circuit (cells) | | | | | P |
|---|--|-----------------------|---------------------------------|------------------------------|---------|---|
| Sample no. | Chamber ambient T (°C) | OCV before test (Vdc) | Particle location ¹⁾ | Maximum applied pressure (N) | Results | |
| Samples charged at charging temperature upper limit 60°C | | | | | | |
| 63 | 45 | 4.382 | 1 | 400 | P | |
| 64 | 45 | 4.385 | 1 | 400 | P | |
| 65 | 45 | 4.386 | 1 | 400 | P | |
| 66 | 45 | 4.380 | 1 | 400 | P | |
| 67 | 45 | 4.378 | 1 | 400 | P | |
| Samples charged at charging temperature lower limit -5°C | | | | | | |
| 68 | 10 | 4.280 | 1 | 400 | P | |
| 69 | 10 | 4.277 | 1 | 400 | P | |
| 70 | 10 | 4.282 | 1 | 400 | P | |
| 71 | 10 | 4.281 | 1 | 400 | P | |
| 72 | 10 | 4.280 | 1 | 400 | P | |



IEC 62133-2: 2017

| Clause | Requirement + Test | Result - Remark | Verdict |
|--------|--------------------|-----------------|---------|
|--------|--------------------|-----------------|---------|

Supplementary information:

¹⁾ Identify one of the following:

1: Nickel particle inserted between positive and negative (active material) coated area.

2: Nickel particle inserted between positive aluminium foil and negative active material coated area.

A - No fire or explosion;

B - Others (please explain).

| D.2 | TABLE: Internal AC resistance for coin cells | | | | N/A |
|------------|--|----------------|--------------------|-----------------------|-----|
| Sample no. | Ambient T (°C) | Store time (h) | Resistance Rac (Ω) | Results ¹⁾ | |
| | | | | | |
| | | | | | |
| | | | | | |

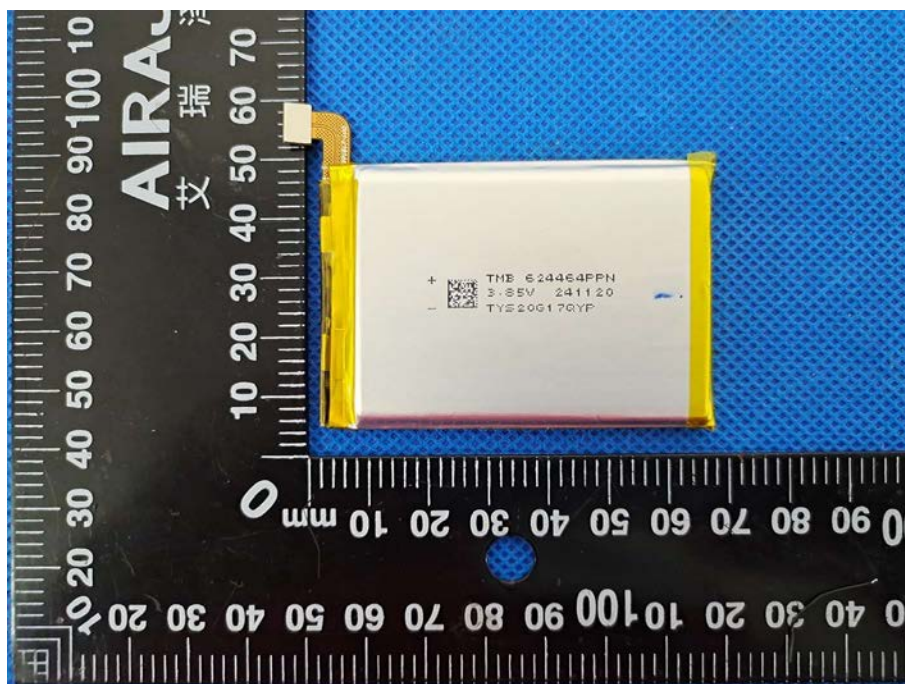
Supplementary information:

¹⁾ Coin cells with internal resistance less than or equal to 3 Ω, see test result on corresponding tables

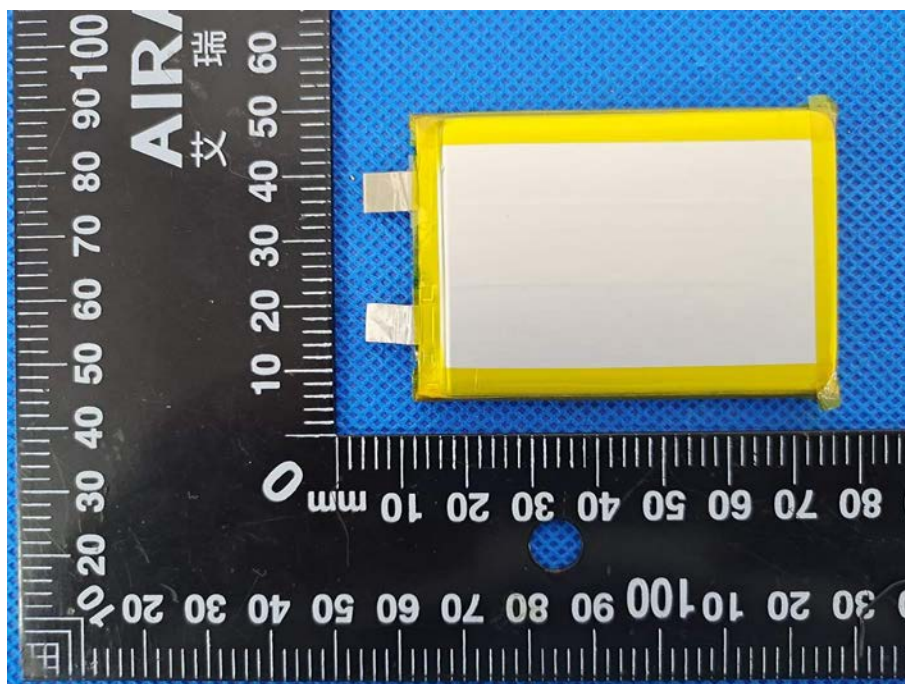
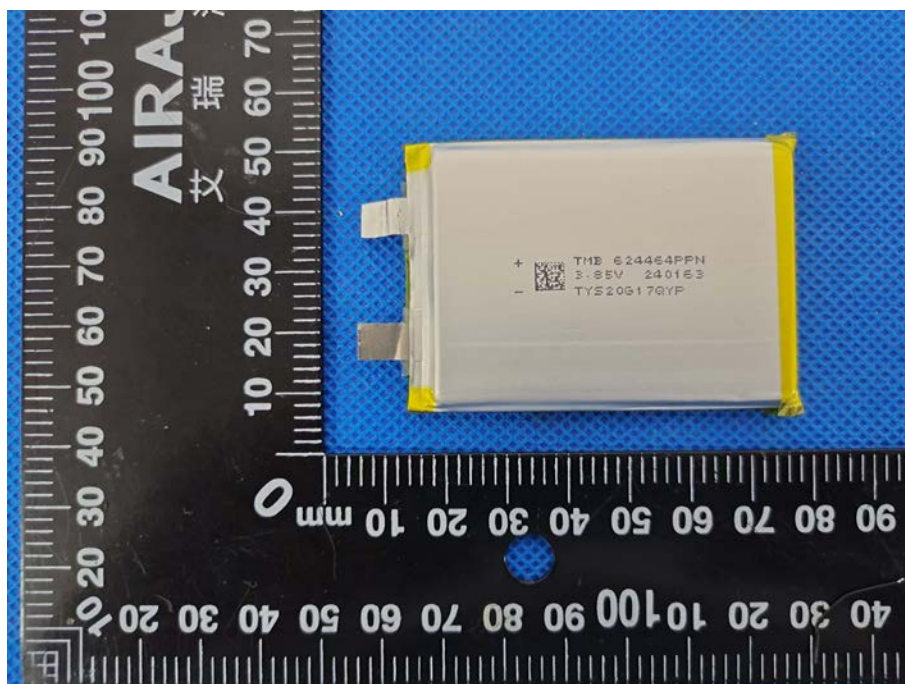
Enclosure

| Supplement ID | Description |
|---------------|----------------------------|
| 01 | Over view photograph |
| 02 | Internal cell photograph |
| 03 | PWB photograph |
| 04 | Dimension drawing |
| 05 | Specification |
| 06 | Circuit diagram and layout |

ID 01-Over view photograph

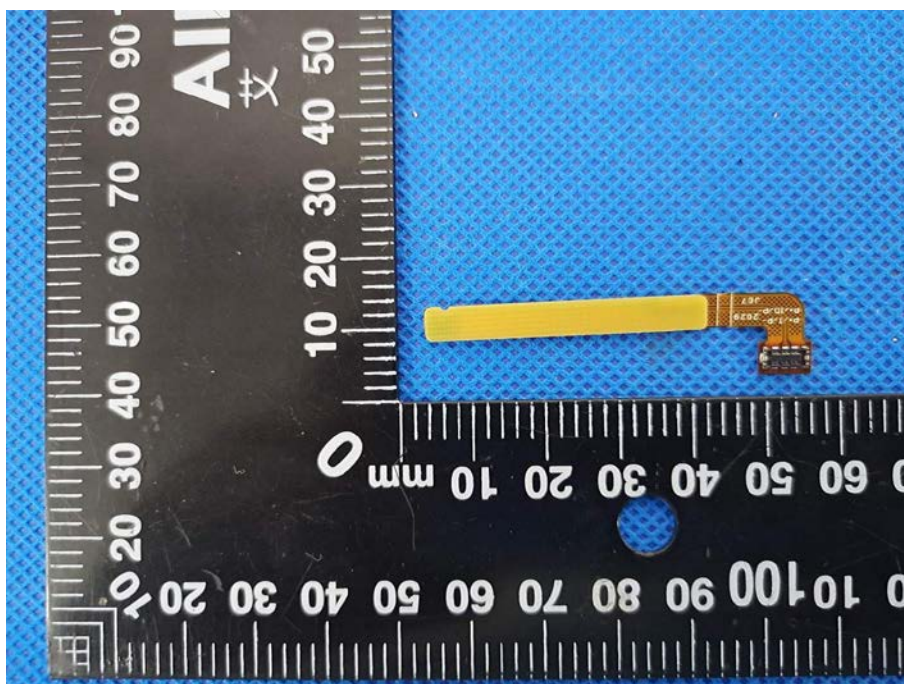
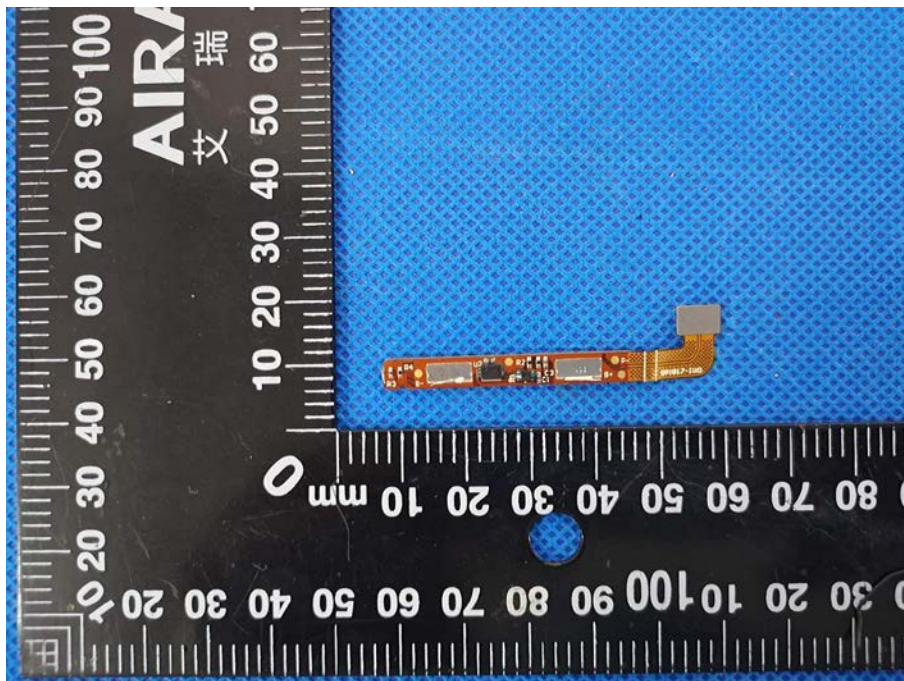


ID 02- Internal cell photograph

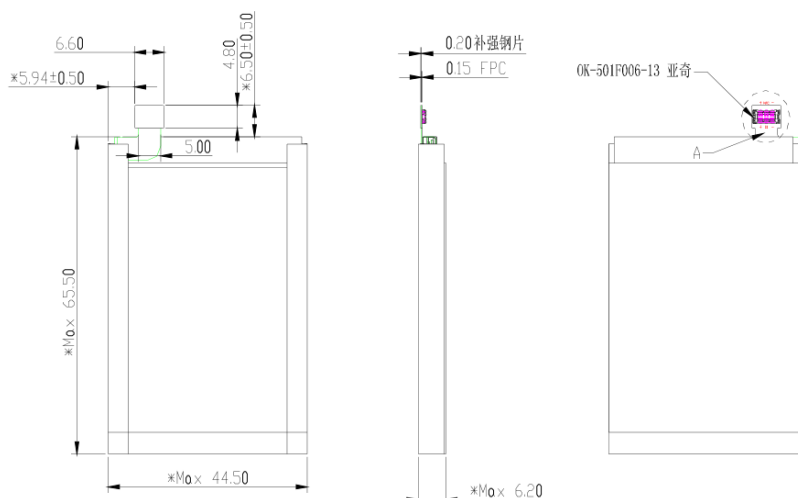




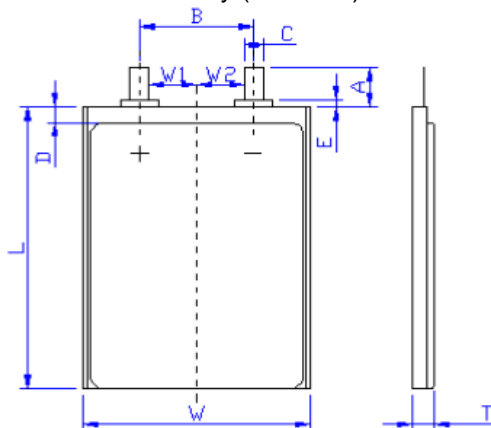
ID 03- PWB photograph



ID 04-Dimension drawing



Battery (unit: mm)



| 尺寸代码 Size code | 尺寸项目 The size of the project | 尺寸 size (mm) |
|----------------|---|---------------------|
| T | 电芯厚度 (Thickness) | $6.16^{+0}_{-0.35}$ |
| W | 电芯宽度 (Width) | $44.5^{+0}_{-1.5}$ |
| L | 电芯高度 (Length) | $64.0^{+0}_{-1.5}$ |
| A | 极耳外露 (Tab Length) | 8 ± 1.0 |
| B | 极耳中心距 (Distance between center of 2 tabs) | 20.0 ± 1.0 |
| W1 | 正极耳与电芯中心距离 | 7.0 |
| W2 | 负极耳与电芯中心距离 | 7.0 |
| C | 极耳宽度 (Tab width) | 6.0 ± 0.2 |
| D | 顶封宽度 (Top sealing Width) | 3.0 ± 0.5 |
| E | 极耳胶外露 (Sealant Length) | $0.2 \sim 1.7$ |

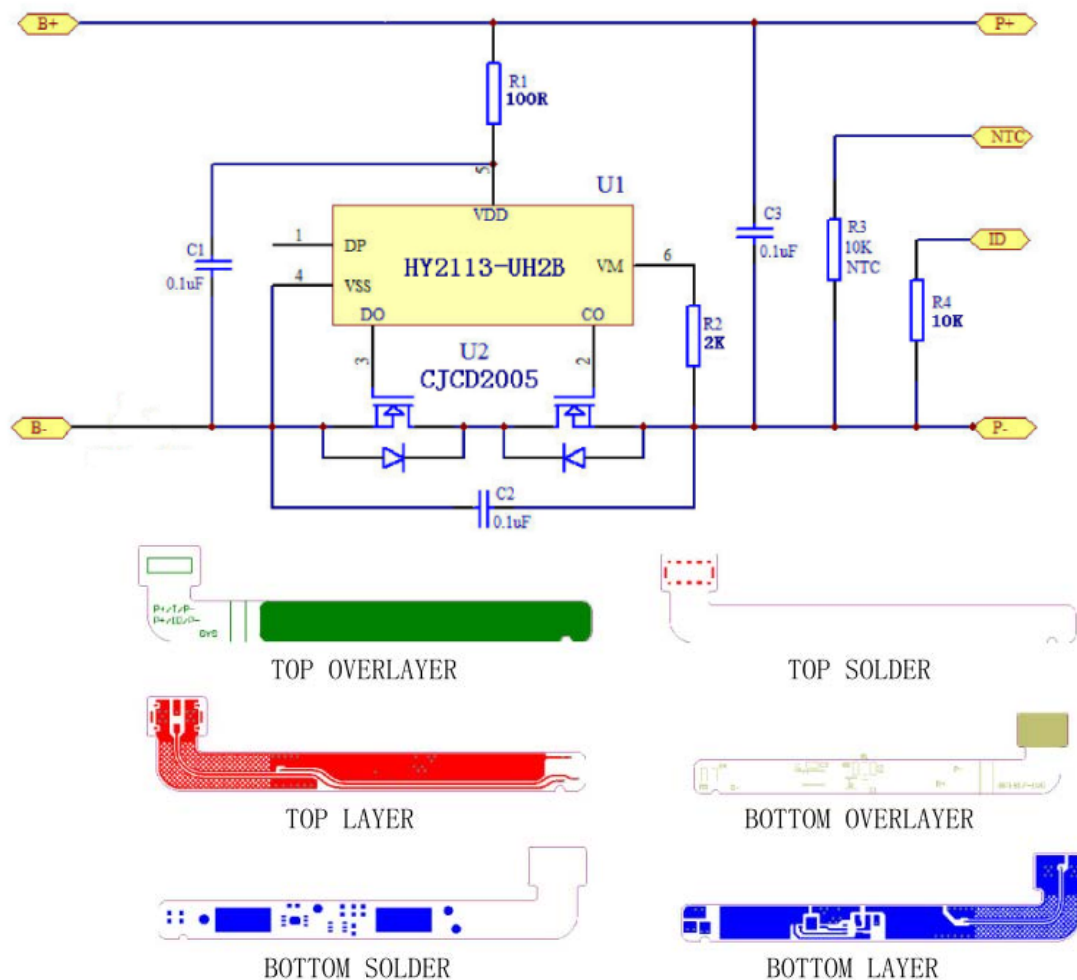
Cell

ID 05-Specification

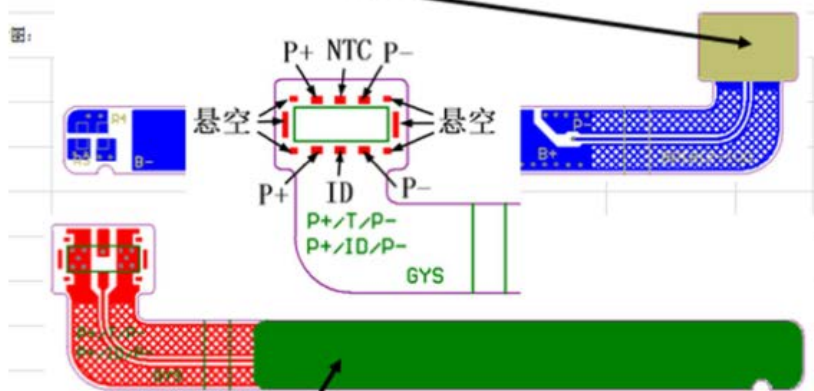
| | | |
|-------------------------------|---|---|
| Product name | Rechargeable Lithium Polymer Cell | Li-Polymer Battery |
| Model No. | 6224464PPN | CBT-A061 |
| Nominal Voltage | 3.85V | 3.85V |
| Nominal Capacity | 3000mAh | 3000mAh |
| Recommend charging voltage | 4.4V | 4.4V |
| Recommend charging current | 600mA | 600mA |
| End of charging current | 60mA | 60mA |
| Max. charging voltage | 4.4V | 4.4V |
| Max. charging current | 1500mA | 1500mA |
| Upper limit charging voltage | 4.4V | 4.4V |
| End of discharging voltage | 3.0V | 3.0V |
| Recommend discharging current | 600mA | 600mA |
| Max. discharging current | 1500mA | 1500mA |
| Operation Temperature | Charge: 0°C~55°C Discharge: -20°C~60°C | Charge: 0°C~55°C Discharge: -20°C~60°C |



ID 06-Circuit diagram and layout



钢片补强: 7.2*4.8*0.2mm, 倒圆角半径0.3mm。



STATEMENT

1. The equipment lists are traceable to the national reference standards.
2. The test report can not be partially copied unless prior written approval is issued from our lab.
3. The test report is invalid without stamp of laboratory.
4. The test report is invalid without signature of person(s) testing and authorizing.
5. The test process and test result is only related to the Unit Under Test.
6. The quality system of our laboratory is in accordance with ISO/IEC17025.
7. If there is any objection to report, the client should inform issuing laboratory within 15 days from the date of receiving test report.

Address:

1-2F, East of B Building, Pengzhou Industrial Park, Fuyuan 1st Road, Qiaotou, Fuyong Street, Bao'an District, Shenzhen, Guangdong, China

TEL: 400-788-9558

P. C.: 518103

FAX: 0755-33229357

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***** END *****