**Test Report issued under the responsibility of:**

# TEST REPORT
# 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. ..... :** | SZES240100001501 |
| **Date of issue..... :** | 2024-02-01 |
| **Total number of pages ..... :** | 24 Pages |
| **Name of Testing Laboratory preparing the Report ..... :** | **SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch** |
| **Applicant's name..... :** | Ayonz Pty Ltd. |
| **Address..... :** | Unit 40/ 11-21 Underwood Road, Homebush, 2140, New South Wales, Australia |
| **Test specification:** | |
| **Standard ..... :** | IEC 62133-2:2017, IEC 62133-2:2017/AMD1:2021 |
| **Test procedure ..... :** | SGS-CSTC |
| **Non-standard test method ..... :** | N/A |
| **TRF template used ..... :** | IECEE OD-2020-F1:2021, Ed.1.4 |
| **Test Report Form No. ..... :** | IEC62133_2C |
| **Test Report Form(s) Originator.... :** | DEKRA Certification B.V. |
| **Master TRF..... :** | Dated 2022-07-01 |



**This report is not valid as a CB Test Report unless signed by an approved IECEE Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.**

**General disclaimer:**

The test results presented in this report relate only to the object tested.
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| | |
|---|---|
| **Test item description..... :** | Rechargeable Li-ion battery |
| **Trade Mark(s)..... :** | Brooklyn |
| **Manufacturer..... :** | Dongguan Lianguang Electronics Technology Co., Ltd.<br>4/F, Building 3, WangJiao Road #30, HengTang Village, TangXia, Dongguan, Guangdong, China |
| **Model/Type reference..... :** | BRAARB |
| **Ratings..... :** | Rated Voltage: 1,5 V d.c.<br>Rated Capacity: 1400 mAh (2100mWh)<br>Internal Battery: 3,7 V, 600 mAh |

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

| | | | |
|---|---|---|---|
| ☒ | **Testing Laboratory:** | SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch | |
| **Testing location/ address.....:** | | No.2, Jianghao Industrial Factory Area, No.430, Jihua Road, Bantian Street, Longgang District, Shenzhen, Guangdong, China | |
| **Tested by (name, function, signature).....:** | | Lucifer Li / Project Engineer | |
| **Approved by (name, function, signature)...:** | | Rachel Long / Report Reviewer | |

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

Attachment 1: 4 pages of Photos;

Attachment 2: 2 pages of Information for safety;

Attachment 3: 1 page of Packaging;

Attachment 4: 1 page of Product specification;

Attachment 5: 1 page of ISO9001 certificate.

**Summary of testing:**

The sample(s) tested complies with the requirements of IEC 62133-2:2017, IEC 62133-2:2017/AMD1:2021.

Remark: Battery and cell were considered and tested according to standard in this report.

**Tests performed (name of test and test clause):**

☐5.2 Insulation resistance

☒7.2.1 Continuous charging at constant voltage (cells)

☒7.2.2 Case stress at high ambient temperature (battery)

☒7.3.1 External short circuit (cell)

☒7.3.2 External short circuit (battery)

☒7.3.3 Free fall

☒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 tests (batteries)

☐7.3.9 Design evaluation – Forced internal short circuit (cells)

☐Annex D Measurement of the internal AC resistance for coin cells

**Testing location:**

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch

No.2, Jianghao Industrial Factory Area, No.430, Jihua Road, Bantian Street, Longgang District, Shenzhen, Guangdong, China

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

EU Group difference, UK National difference

☒ The product fulfils the requirements of EN 62133-2:2017/A1:2021, BS EN 62133 2:2017+A1:2021

**Use of uncertainty of measurement for decisions on conformity (decision rule):**

☒ No decision rule is specified by the IEC standard, when comparing the measurement result with the applicable limit according to the specification in that standard. The decisions on conformity are made without applying the measurement uncertainty ("simple acceptance" decision rule, previously known as "accuracy method").

☐ Other:… (to be specified, for example when required by the standard or client, or if national accreditation requirements apply)

**Information on uncertainty of measurement:**

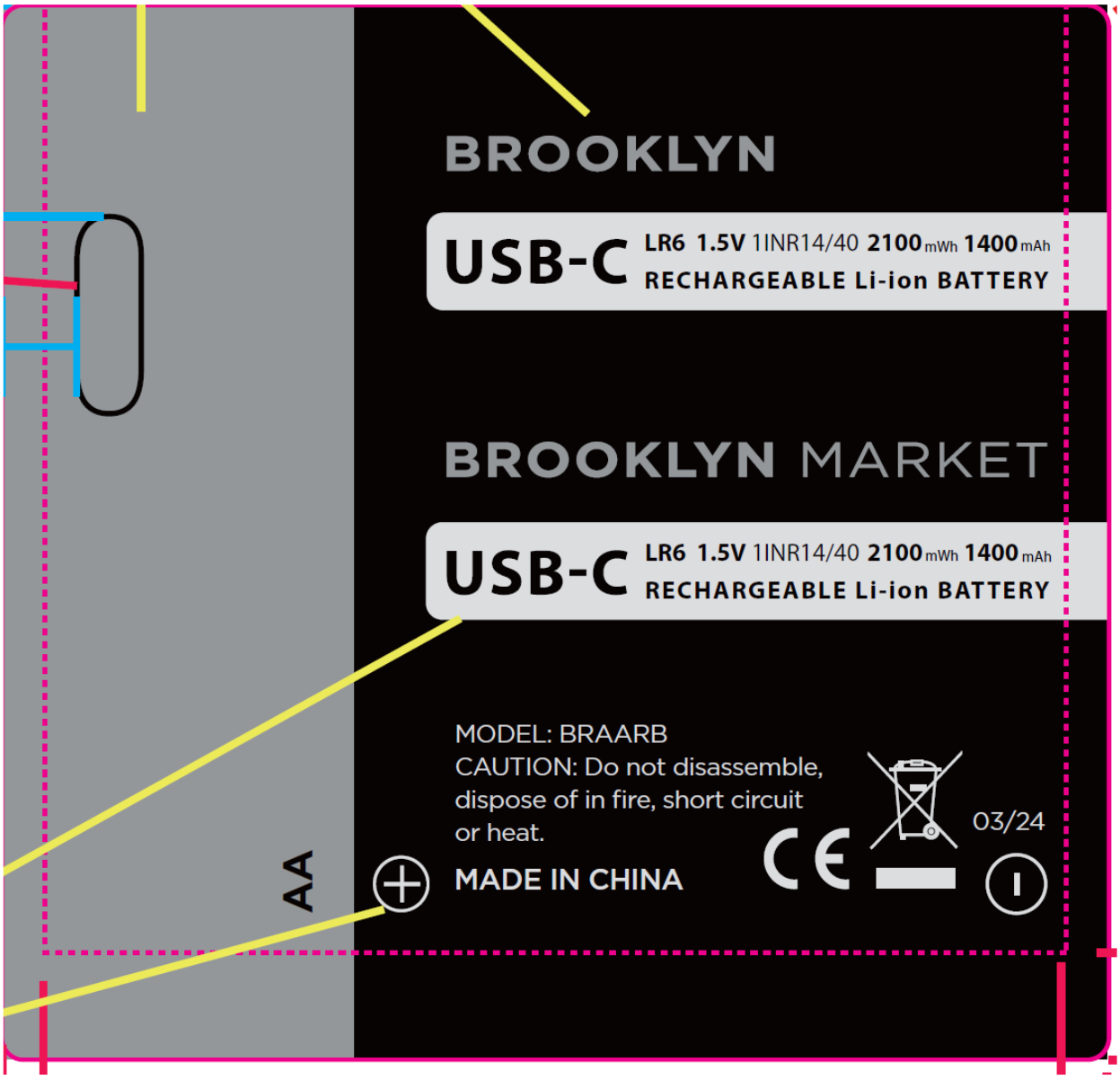
The uncertainties of measurement are calculated by the laboratory based on application of criteria given by OD-5014 for test equipment and application of test methods, decision sheets and operational procedures of IECEE.

IEC Guide 115 provides guidance on the application of measurement uncertainty principles and applying the decision rule when reporting test results within IECEE scheme, noting that the reporting of the measurement uncertainty for measurements is not necessary unless required by the test standard or customer.

Calculations leading to the reported values are on file with the NCB and testing laboratory that conducted the testing.

**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.**




Remark: 1. Terminal of battery pack has clear polarity marking on the external surface;
2. '03/24' refers to manufacturer date, '03' refers to months, '24' refers to years.

| | |
|---|---|
| **Test item particulars .....:** | -- |
| **Classification of installation and use.....:** | -- |
| **Supply Connection .....:** | -- |
| **Recommend charging method declared by the manufacturer.....:** | Power by external power source via Type-C Input: 5 V / 350 mA |
| **Discharge current (0,2 It A).....:** | 0,28 A |
| **Specified final voltage.....:** | Cell: 3,0 V, Pack: 1,1 V |
| **Upper limit charging voltage per cell.....:** | 4,2 V |
| **Maximum charging current.....:** | Type-C Input:5 V / 350 mA<br>Cell: 300 mA |
| **Charging temperature upper limit.....:** | 45°C |
| **Charging temperature lower limit .....:** | 0°C |
| **Polymer cell electrolyte type.....:** | ☐ gel polymer ☐ solid polymer ☒ 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..... :** | 2024-01-04 |
| **Date (s) of performance of tests ..... :** | 2024-01-04 to 2024-01-17 |

**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 ☒ comma / ☐ point is used as the decimal separator.**

**Name and address of factory (ies)..... :** Same as manufacturer

**General product information and other remarks:**

| | |
|---|---|
| Product description: | Rechargeable Li-ion battery |
| Model of pack: | BRAARB |
| Designation of pack: | 1INR14/40 |
| Rated voltage of pack: | 1,5 V |
| Rated capacity of pack: | 1400 mAh |
| Internal Battery: | 3,7 V, 600 mAh |
| Input: | Type-C Input: 5 V / 350 mA |
| Number of cells in battery pack: | One |
| Model of cell: | JX13400 |
| Designation of cell: | INR14/40 |
| Rated voltage of cell: | 3,7 V |
| Rated capacity of cell: | 600 mAh |
| Maximum charge current of cell: | 300 mA |

Remark: See Attachment 4 for more detail.

| IEC 62133-2 | | | |
|---|---|---|---|
| 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 exposed metal surface | 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 clearances 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 | Cell: Seal the seam around the aluminium foil as the venting mechanism.<br>Battery: Metal enclosure wrapping by PVC film, aperture as the venting mechanism of battery. | P |
| | Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief | Metal enclosure was used to support cell, will not cause the battery to overheat during normal operation nor inhibit pressure relief. | P |
| **5.4** | **Temperature, voltage and current management** | | P |
| | Batteries are designed such that abnormal temperature rise conditions are prevented | Protection circuit was used | P |
| | Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer | Protection circuit was used | 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 | See Attachment 4 for detail. | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **5.5** | **Terminal contacts** | | P |
| | The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current | | P |
| | 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 circuits | | P |
| **5.6** | **Assembly of cells into batteries** | | P |
| 5.6.1 | General | | P |
| | Each battery has 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 | | P |
| | This protection may be provided external to the battery such as within the charger or the end devices | The protection is within the battery | 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 has 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 are 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 | Single cell battery<br>The charging voltage of the cell did not exceed upper limit of the charging voltage 4,2 V | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| 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 are not 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 are not discharged beyond the cell manufacturer's specified final voltage | | P |
| | For batteries consisting of series-connected cells or cell blocks, cell balancing circuitry are 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 are 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 | The mechanical protection can be provided by the battery case | P |
| | The battery case and compartments housing cells are designed to accommodate cell dimensional tolerances during charging and discharging as recommended by the cell manufacturer | | P |
| | For batteries intended for building into a portable end product, testing with the battery installed within the end product is considered when conducting mechanical tests | Should be considered in end product evaluation | N/A |
| **5.7** | **Quality plan** | | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| 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 | ISO9001 certificate was submitted.<br>See Attachment 5 for detail. | P |
| **5.8** | **Battery safety components** | | 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 | The production date is 2024-01. | P |
| | The internal resistance of coin cells are measured in accordance with Annex D. Coin cells with internal resistance less than or equal to 3 Ω are tested in accordance with Table 1 | Not coin cell | N/A |
| | Unless otherwise specified, tests are carried out in an ambient temperature of 20 °C ± 5 °C | | P |
| | The safety analysis of 5.6.1 identify those components of the protection circuit that are critical for short-circuit, overcharge and over discharge protection | | P |
| | When conducting the short-circuit test, consideration is 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 °C ± 5 °C, using the method declared by the manufacturer | | P |
| | Prior to charging, the battery has been discharged at 20 °C ± 5 °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 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | After stabilization for 1 h to 4 h, at an ambient temperature of the highest test temperature and the lowest test temperature, respectively, 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 current to constant voltage charging method | | 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) | | P |
| | Oven temperature (°C) ..... : | 70 | — |
| | Results: no physical distortion of the battery case resulting in exposure of internal protective components and cells | | P |
| **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 | Rapid decline in short circuit current, protective electronic circuit operate in normal condition | P |
| | - The case temperature declined by 20 % of the maximum temperature rise | Applied for single fault condition | 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 is conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test | | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | A single fault applies to protective component parts such as MOSFET (metal oxide semiconductor field-effect transistor), fuse, thermostat or positive temperature coefficient (PTC) thermistor | Single fault applies to IC (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) ..... : | 130°C | — |
| | Results: no fire, no explosion | | N/A |
| 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 | | 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 |
| | Discharge a single cell to the lower limit discharge voltage specified by the cell manufacturer | | P |
| | The discharged cell is then subjected to a forced discharge at 1 It A to the negative value of the upper limit charging voltage | | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | - 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 |
| | - 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) | Polymer Cell declaration by manufacturer | N/A |
| | The cells complied with national requirement for ..... : | | — |
| | The pressing was stopped upon: | | N/A |
| | - 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 | | N/A |
| | Results: no fire .....: | | N/A |
| **8** | **INFORMATION FOR SAFETY** | | P |
| **8.1** | **General** | | P |
| | Manufacturers of secondary cells provides information about current, voltage and temperature limits of their products | See Attachment 4 for detail. | P |
| | Manufacturers of batteries provides information regarding how to minimize and mitigate hazards to equipment manufacturers or end-users | See Attachment 2 for detail. | P |
| | Systems analyses are 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 is provided to the end user | | P |
| | Do not allow children to replace batteries without adult supervision | | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **8.2** | **Small cell and battery safety information** | Not small cell or battery | N/A |
| | 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** | Only battery will be marked. | N/A |
| | Cells are 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 are marked as specified in IEC 61960, except for coin batteries | See marking plate for detail | P |
| | Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity | | N/A |
| | Batteries are marked with an appropriate caution statement | | P |
| | - Terminals have clear polarity marking on the external surface of the battery, or | | P |
| | - 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 cell or battery | N/A |
| | Coin cells and batteries identified as small batteries include a caution statement regarding the hazards of ingestion in accordance with 8.2 | | N/A |
| | Small cells and batteries are intended for direct sale in consumer-replaceable applications, caution for ingestion is given on the immediate package | | N/A |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| **9.4** | **Other information** | | P |
| | The following information are marked on or supplied with the battery: | | P |
| | - Storage and disposal instructions | Storage and disposal instructions were supplied with the battery.<br>See Attachment 2 for detail. | P |
| | - Recommended charging instructions | Recommended charging instructions were supplied with the battery.<br>See Attachment 4 for detail. | P |
| **10** | **PACKAGING AND TRANSPORT** | | P |
| | Packaging for coin cells are not be small enough to fit within the limits of the ingestion gauge of Figure 3 | | N/A |
| **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 | | P |
| A.3.2.3 | Safety requirements, when different upper limit charging voltage is applied | The upper limit charging voltage is 4,2 V during test. | N/A |
| **A.4** | **Consideration of temperature and charging current** | | P |
| A.4.1 | General | | P |
| A.4.2 | Recommended temperature range | | P |
| A.4.2.1 | General | | P |
| A.4.2.2 | Safety consideration when a different recommended temperature range is applied | The recommended charging temperature range: 0-45°C in specification. | P |
| A.4.3 | High temperature range | The upper charging temperature is 45 °C | N/A |
| A.4.3.1 | General | | N/A |
| A.4.3.2 | Explanation of safety viewpoint | | N/A |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| A.4.3.3 | Safety considerations when specifying charging conditions in the high temperature range | | N/A |
| A.4.3.4 | Safety considerations when specifying a new upper limit in the high temperature range | | N/A |
| A.4.4 | Low temperature range | The lower charging temperature is 0 °C | 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 | | N/A |
| 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** | | N/A |
| A.5.1 | General | | N/A |
| A.5.2 | Insertion procedure for nickel particle to generate internal short | | N/A |
| A.5.3 | Disassembly of charged cell | | N/A |
| A.5.4 | Shape of nickel particle | | N/A |
| 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 | | N/A |
| **A.6** | **Experimental procedure of the forced internal short-circuit test** | | N/A |
| A.6.1 | Material and tools for preparation of nickel particle | | N/A |
| A.6.2 | Example of a nickel particle preparation procedure | | N/A |
| A.6.3 | Positioning (or placement) of a nickel particle | | N/A |
| A.6.4 | Damaged separator precaution | | N/A |
| A.6.5 | Caution for rewinding separator and electrode | | N/A |
| A.6.6 | Insulation film for preventing short-circuit | | N/A |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |
| A.6.7 | Caution when disassembling a cell | | N/A |
| A.6.8 | Protective equipment for safety | | N/A |
| A.6.9 | Caution in the case of fire during disassembling | | N/A |
| A.6.10 | Caution for the disassembling process and pressing the electrode core | | N/A |
| A.6.11 | Recommended specifications for the pressing device | | N/A |
| **ANNEX B** | **RECOMMENDATIONS TO EQUIPMENT MANUFACTURERS AND BATTERY ASSEMBLERS** | | P |
| **ANNEX C** | **RECOMMENDATIONS TO THE END-USERS** | | P |
| **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 | | N/A |
| | Coin cells with an internal resistance greater than 3 Ω require no further testing ..... : | | N/A |
| | Coin cells with an internal resistance less than or equal to 3 Ω are subjected to the testing according to Clause 6 and Table 1 | | N/A |
| **ANNEX E** | **PACKAGING AND TRANSPORT** | | P |
| **ANNEX F** | **COMPONENT STANDARDS REFERENCES** | | P |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 7.2.1 | TABLE: Continuous charging at constant voltage (cells) | P |
|---|---|---|

| Sample No. | Recommended charging voltage Vc (Vdc) | Recommended charging current $I_{rec}$ (A) | OCV before test (Vdc) | Results |
|---|---|---|---|---|
| Cell: JX13400 (1#) | 4,2 | 0,3 | 4,180 | Pass |
| Cell: JX13400 (2#) | 4,2 | 0,3 | 4,184 | Pass |
| Cell: JX13400 (3#) | 4,2 | 0,3 | 4,181 | Pass |
| Cell: JX13400 (4#) | 4,2 | 0,3 | 4,183 | Pass |
| Cell: JX13400 (5#) | 4,2 | 0,3 | 4,182 | Pass |

**Supplementary information:**
- No fire or explosion
- No leakage

| 7.3.1 | TABLE: External short circuit (cell) | P |
|---|---|---|

| Sample No. | Ambient (°C) | OCV at start of test (Vdc) | Resistance of circuit (mΩ) | Maximum case temperature rise ΔT (K) | Results |
|---|---|---|---|---|---|
| **Samples charged at charging temperature upper limit[1)]** | | | | | |
| Cell: JX13400 (6#) | 56,4 | 4,185 | 87,1 | 68,0 | Pass |
| Cell: JX13400 (7#) | 56,4 | 4,191 | 88,2 | 69,7 | Pass |
| Cell: JX13400 (8#) | 56,4 | 4,189 | 86,4 | 66,3 | Pass |
| Cell: JX13400 (9#) | 56,4 | 4,189 | 81,5 | 68,7 | Pass |
| Cell: JX13400 (10#) | 56,4 | 4,190 | 85,7 | 61,5 | Pass |
| **Samples charged at charging temperature lower limit[2)]** | | | | | |
| Cell: JX13400 (11#) | 54,0 | 4,137 | 82,5 | 68,1 | Pass |
| Cell: JX13400 (12#) | 54,0 | 4,150 | 85,6 | 75,4 | Pass |
| Cell: JX13400 (13#) | 54,0 | 4,144 | 80,9 | 68,4 | Pass |
| Cell: JX13400 (14#) | 54,0 | 4,145 | 83,2 | 71,5 | Pass |
| Cell: JX13400 (15#) | 54,0 | 4,139 | 88,9 | 68,9 | Pass |

**Supplementary information:**
- No fire or explosion

[1)] Cells charged at 45°C by using 4,2 V and 300 mA until the charging current reduced to 30 mA.

[2)] Cells charged at 0°C by using 4,2 V and 300 mA until the charging current reduced to 30 mA.

| 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 |
|---|---|---|---|---|---|---|

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | | |
|---|---|---|---|---|---|---|
| Pack: BRAARB (M4) | 20,5 | 1,525 | 82,4 | --* | Normal | Pass |
| Pack: BRAARB (M5) | 20,5 | 1,521 | 80,3 | 99,4 | SC U2 PIN (2-6) | Pass |
| Pack: BRAARB (M6) | 20,5 | 1,528 | 84,4 | 98,1 | SC U2 PIN (2-6) | Pass |
| Pack: BRAARB (M7) | 20,5 | 1,523 | 88,5 | 98,8 | SC U2 PIN (2-6) | Pass |
| Pack: BRAARB (M8) | 20,5 | 1,524 | 84,1 | 99,4 | SC U2 PIN (2-6) | Pass |

**Supplementary information:**

- No fire or explosion
- SC means short circuit

--* Shut down immediately and test for 24 hours, no max. temperature was noted.

| 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[1)]** | | | | |
| Cell: JX13400 (29#) | 4,191 | 4,191 | 13,001 | Pass |
| Cell: JX13400 (30#) | 4,186 | 4,186 | 12,999 | Pass |
| Cell: JX13400 (31#) | 4,188 | 4,186 | 13,002 | Pass |
| Cell: JX13400 (32#) | 4,189 | 4,189 | 13,001 | Pass |
| Cell: JX13400 (33#) | 4,187 | 4,186 | 12,998 | Pass |
| **Samples charged at charging temperature lower limit[2)]** | | | | |
| Cell: JX13400 (34#) | 4,149 | 4,149 | 13,000 | Pass |
| Cell: JX13400 (35#) | 4,145 | 4,145 | 13,001 | Pass |
| Cell: JX13400 (36#) | 4,142 | 4,142 | 12,998 | Pass |
| Cell: JX13400 (37#) | 4,151 | 4,151 | 13,001 | Pass |
| Cell: JX13400 (38#) | 4,148 | 4,148 | 12,999 | Pass |

**Supplementary information:**

- No fire or explosion
- The maximum force of 13 kN ± 0,78 kN has been applied.

[1)] Cells charged at 45°C by using 4,2 V and 300 mA until the charging current reduced to 30 mA.

[2)] Cells charged at 0°C by using 4,2 V and 300 mA until the charging current reduced to 30 mA.

| 7.3.6 | TABLE: Over-charging of battery | P |
|---|---|---|
| **Constant charging current (A) ..... :** | **2,8** | — |
| **Supply voltage (Vdc) ..... :** | **5,88** | — |

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| Sample No. | OCV before charging (Vdc) | Total charging time (minute) | Maximum outer case temperature (°C) | Results |
|---|---|---|---|---|
| Pack: BRAARB (M12) | 1,532 | 94 | 28,9 | Pass |
| Pack: BRAARB (M13) | 1,528 | 94 | 26,9 | Pass |
| Pack: BRAARB (M14) | 1,532 | 94 | 28,7 | Pass |
| Pack: BRAARB (M15) | 1,531 | 94 | 29,6 | Pass |
| Pack: BRAARB (M16) | 1,529 | 94 | 29,1 | Pass |

**Supplementary information:**

- No fire or explosion
- The ambient temperature was 22,5 °C.
- The maximum charging power was 2,134W (5,88 V*340 mA) for Type-C input port during the test due to electronic circuit cut off higher current.

| 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 |
|---|---|---|---|---|
| Cell: JX13400 (39#) | 3,188 | 0,6 | 3,0 | Pass |
| Cell: JX13400 (40#) | 3,214 | 0,6 | 3,0 | Pass |
| Cell: JX13400 (41#) | 3,157 | 0,6 | 3,0 | Pass |
| Cell: JX13400 (42#) | 3,205 | 0,6 | 3,0 | Pass |
| Cell: JX13400 (43#) | 3,198 | 0,6 | 3,0 | Pass |

**Supplementary information:**

- No fire or explosion

| 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 |
|---|---|---|---|---|---|
| Pack: BRAARB (M17) | 1,532 | 1,530 | 17,21 | 17,20 | Pass |
| Pack: BRAARB (M18) | 1,538 | 1,535 | 17,20 | 17,19 | Pass |
| Pack: BRAARB (M19) | 1,539 | 1,537 | 17,29 | 17,27 | Pass |

**Supplementary information:**

- No fire or explosion
- No rupture
- No leakage
- No venting

| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| 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** |
| Pack: BRAARB (M20) | 1,532 | 1,531 | 17,21 | 17,20 | Pass |
| Pack: BRAARB (M21) | 1,537 | 1,535 | 17,20 | 17,19 | Pass |
| Pack: BRAARB (M22) | 1,535 | 1,533 | 17,28 | 17,26 | Pass |

**Supplementary information:**
- No fire or explosion
- No rupture
- No leakage
- No venting

| 7.3.9 | TABLE: Forced internal short circuit (cells) | | | | N/A |
|---|---|---|---|---|---|
| **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** | | | | | |
| -- | -- | -- | -- | -- | -- |
| **Samples charged at charging temperature lower limit** | | | | | |
| -- | -- | -- | -- | -- | -- |

**Supplementary information:**
--

| 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:**
--

| IEC 62133-2 | | | |
|---|---|---|---|
| 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)]** |
| Cell | Guangdong Jiaxin New Energy Technology Co., Ltd | JX13400 | 3,7 V, 600 mAh | IEC 62133-2:2017, IEC 62133-2:2017/AMD1:2021, EN 62133-2:2017/A1:2021 | Test with appliance |
| -Electrolyte | Huzhou Kunlun power battery material Co., Ltd | SL3021B | Carbonate, Fluor ethylene, Carbonate, Mol Lithium Salt | -- | -- |
| -Separator | Shenzhen Shaitong New Energy Technology Co., Ltd. | -- | PE, Shutdown tempreture:130°C | -- | -- |
| -Positive electrode | Hunan Shanshan Energy Technology Co., Ltd. | T31D | Li (NixCoyMnz)$O_2$ (x:y:z=5:2:3) | -- | -- |
| -Negative electrode | Qingdao Science and Technology Co., Ltd | ZN-2 | Graphite | -- | -- |
| Protect IC (U1) | Sedna Electronics Co., Ltd. | BP5301C | Overcharge detection voltage: 4,225±0,05 V, Over discharge detection voltage: 2,45±0,05 V, Operating Ambient temperature: -40-85°C | -- | -- |
| NTC | SHENZHEN SUNLORD ELECTRONICS CO LTD | SDNT1608X104@3950%TF | R25=100KΩ B25/50: 3950K±1% Topr: -20°C to 100°C | UL 1434 or UL 60730-1 | UL (E352242) |
| IC (U2) | Reach Micro-Electronics technology Co., LTD | LC9205D | VCV:4.225±0.05 V, ICHG:0,5±0,05 mA, TSTG: -65-150°C | -- | -- |

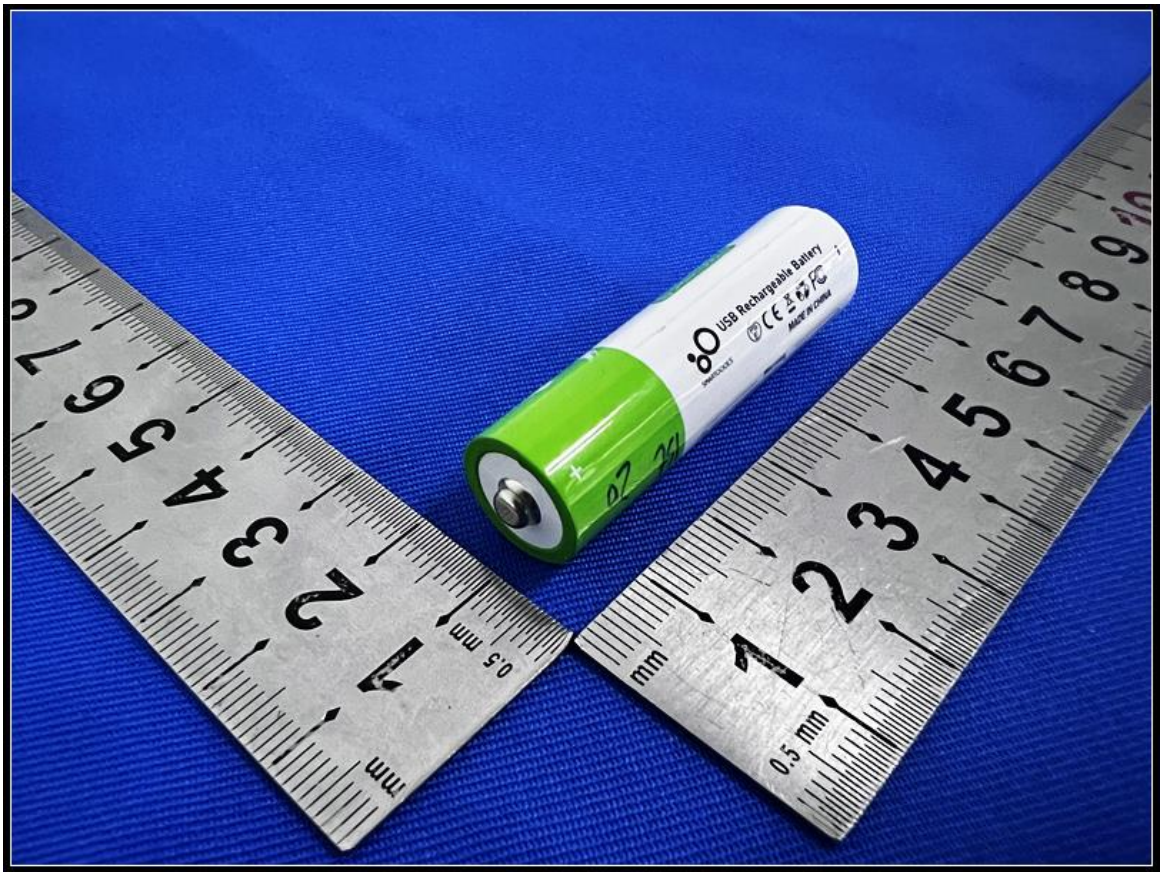
| IEC 62133-2 | | | |
|---|---|---|---|
| Clause | Requirement + Test | Result - Remark | Verdict |

| | | | | | |
|---|---|---|---|---|---|
| PCB | Shenzhen Lutongda Technology Co Ltd | LTD-D | V-0, 130°C | UL 796 | UL (E486889) |
| Plastic positive gasket | CHANG CHUN PLASTICS CO LTD | T-310 | Material: TMC<br>Fire Rating: V-1, Min. Thickness: 1,0 mm<br>Ta:150°C | UL 94<br>UL 746C | UL (E59481) |
| Supplementary information:<br>1) Provided evidence ensures the agreed level of compliance. See OD-CB2039. | | | | | |

---End of report---

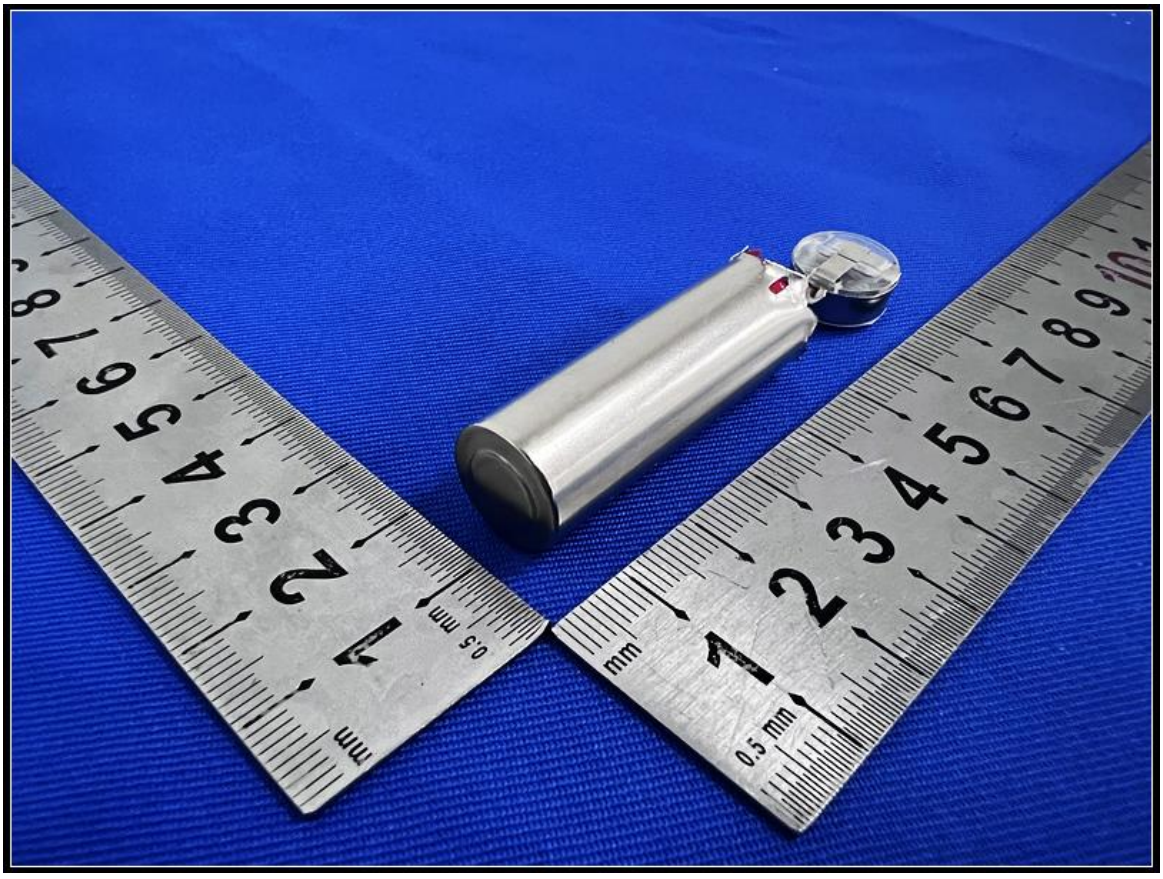
# Attachment 1 Photo documentation

Whole unit

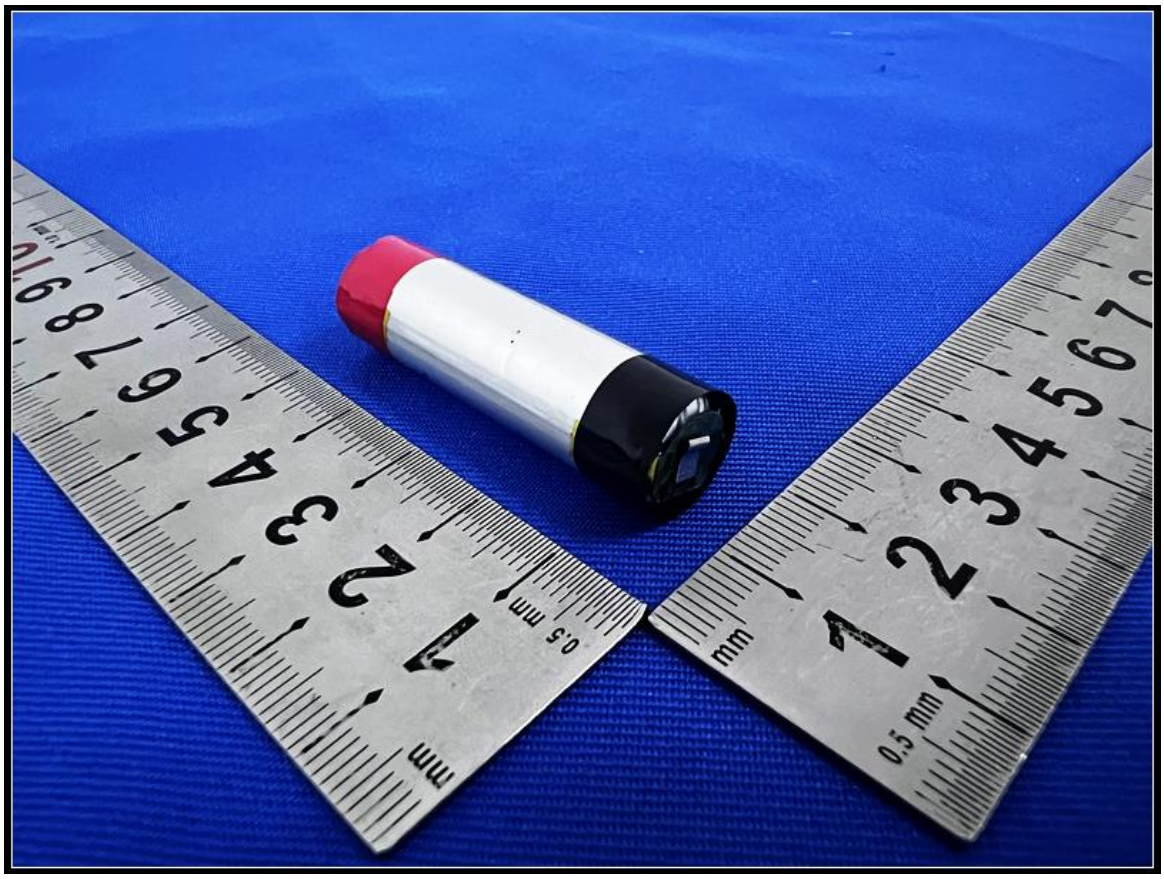
## Attachment 1 Photo documentation

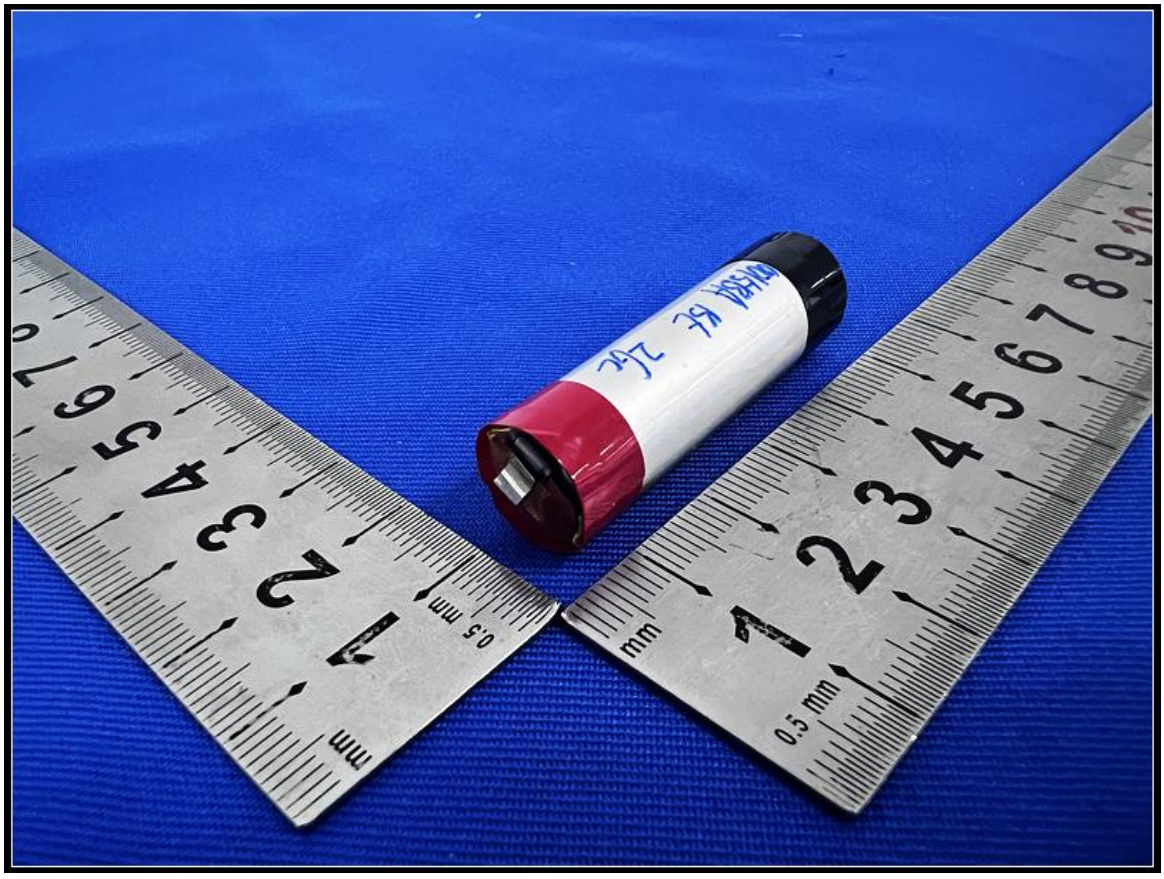
Internal view



## Attachment 1 Photo documentation

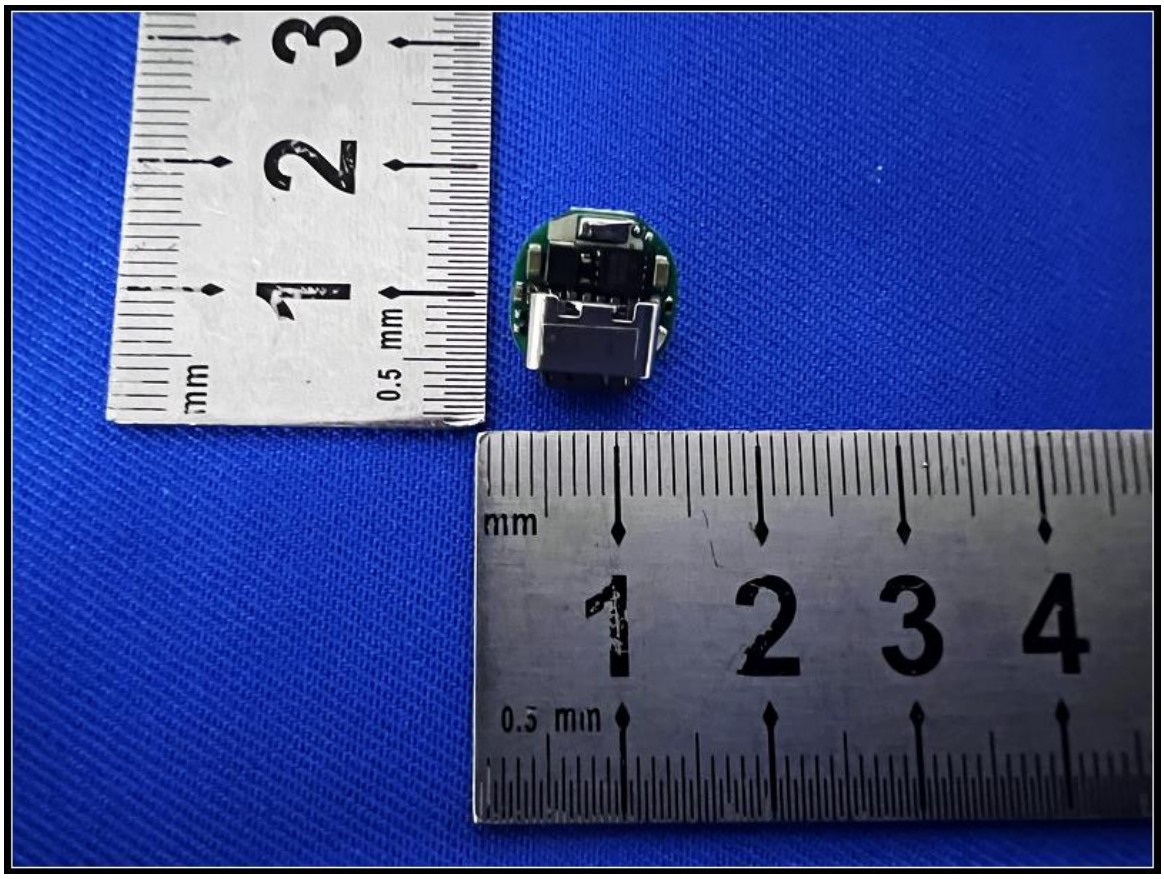
Cell

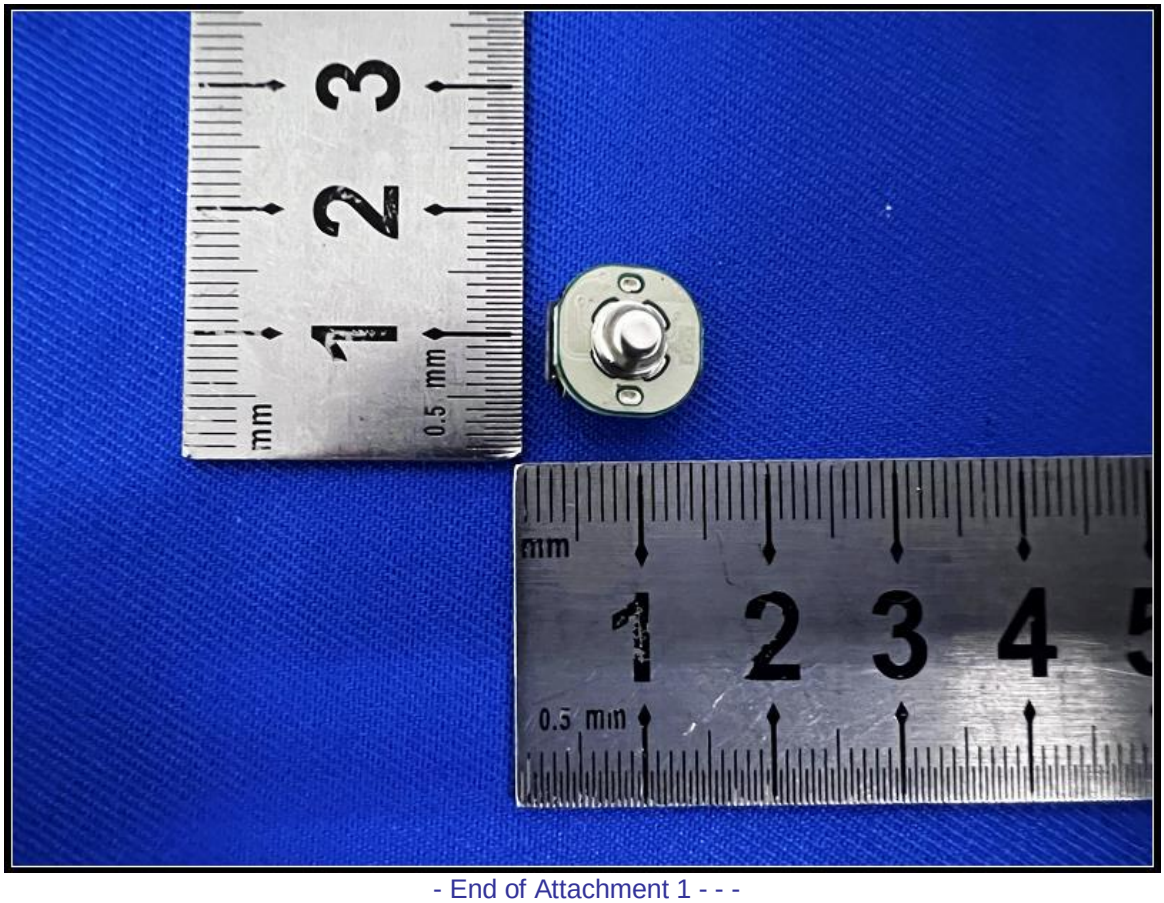




## Attachment 1 Photo documentation

PCB




- End of Attachment 1 - - -

# Attachment 2 Information for safety

## Annex B
(informative)

## Recommendations to equipment manufacturers and battery assemblers

The following represents a typical, but non-exhaustive, list of good advice to be provided by the manufacturer of secondary cells and batteries to equipment manufacturers and battery assemblers.

a) Do not dismantle, open or shred cells. Batteries should be dismantled only by trained personnel. Multi-cell battery cases should be designed so that they can be opened only with the aid of a tool.

b) Compartments should be designed to prevent easy access to the batteries by young children.

c) Do not short-circuit a cell or battery. Do not store cells or batteries haphazardly in a box or drawer where they may short-circuit each other or be short-circuited by conductive materials.

d) Do not remove a cell or battery from its original packaging until required for use.

e) Do not expose cells or batteries to heat or fire. Avoid storage in direct sunlight.

f) Do not subject cells or batteries to mechanical shock.

g) In the event of a cell leaking, do not allow the liquid to come into contact with the skin or eyes. If contact has been made, wash the affected area with copious amounts of water and seek medical advice.

h) Equipment should be designed to prohibit the incorrect insertion of cells or batteries and should have clear polarity marks. Always observe the polarity marks on the cell, battery and equipment and ensure correct use.

i) Do not mix cells of different manufacture, capacity, size or type within a battery.

j) Seek medical advice immediately if a cell or battery has been swallowed.

k) Consult the cell or battery manufacturer on the maximum number of cells which may be assembled in a battery and on the safest way in which cells may be connected.

l) A dedicated charger should be provided for each equipment. Complete charging instructions should be provided for all secondary cells and batteries offered for sale.

m) Keep cells and batteries clean and dry.

n) Wipe the cell or battery terminals with a clean dry cloth if they become dirty.

o) Secondary cells and batteries need to be charged before use. Always refer to the cell or battery manufacturer's instructions and use the correct charging procedure.

p) Do not maintain secondary cells and batteries on charge when not in use.

q) After extended periods of storage, it may be necessary to charge and discharge the cells or batteries several times to obtain maximum performance.

r) Retain the original cell and battery literature for future reference.

s) When disposing of secondary cells or batteries, keep cells or batteries of different electrochemical systems separate from each other.

# Attachment 2 Information for safety

## Annex C
(informative)

### Recommendations to the end-users

The following represents a typical, but non-exhaustive, list of good advice to be provided by the equipment manufacturer to the end-user.

a) Do not dismantle, open or shred secondary cells or batteries.

b) Keep batteries out of the reach of children

Battery usage by children should be supervised. Especially keep small batteries out of reach of small children.

c) Seek medical advice immediately if a cell or a battery has been swallowed.

d) Do not expose cells or batteries to heat or fire. Avoid storage in direct sunlight.

e) Do not short-circuit a cell or a battery. Do not store cells or batteries haphazardly in a box or drawer where they may short-circuit each other or be short-circuited by other metal objects.

f) Do not remove a cell or battery from its original packaging until required for use.

g) Do not subject cells or batteries to mechanical shock.

h) In the event of a cell leaking, do not allow the liquid to come in contact with the skin or eyes. If contact has been made, wash the affected area with copious amounts of water and seek medical advice.

i) Do not use any charger other than that specifically provided for use with the equipment.

j) Observe the plus (+) and minus (−) marks on the cell, battery and equipment and ensure correct use.

k) Do not use any cell or battery which is not designed for use with the equipment.

l) Do not mix cells of different manufacture, capacity, size or type within a device.

m) Always purchase the battery recommended by the device manufacturer for the equipment.

n) Keep cells and batteries clean and dry.

o) Wipe the cell or battery terminals with a clean dry cloth if they become dirty.

p) Secondary cells and batteries need to be charged before use. Always use the correct charger and refer to the manufacturer's instructions or equipment manual for proper charging instructions.

q) Do not leave a battery on prolonged charge when not in use.

r) After extended periods of storage, it may be necessary to charge and discharge the cells or batteries several times to obtain maximum performance.

s) Retain the original product literature for future reference.

t) Use the cell or battery only in the application for which it was intended.

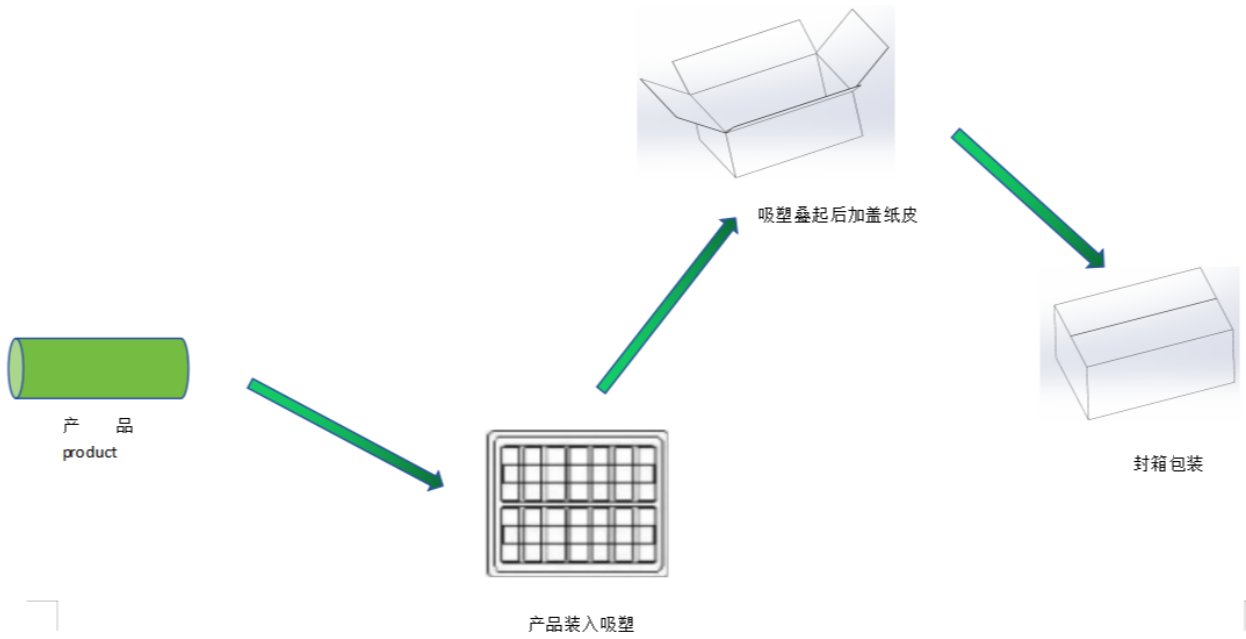
u) When possible, remove the battery from the equipment when not in use.

v) Dispose of properly.

— When disposing of secondary cells or batteries, keep cells or batteries of different electrochemical systems separate from each other.(电池处置信息)

- - - End of Attachment 2 - - -

## Attachment 3 Packaging




- - - End of Attachment 3 - - -

# Attachment 4 Product specification

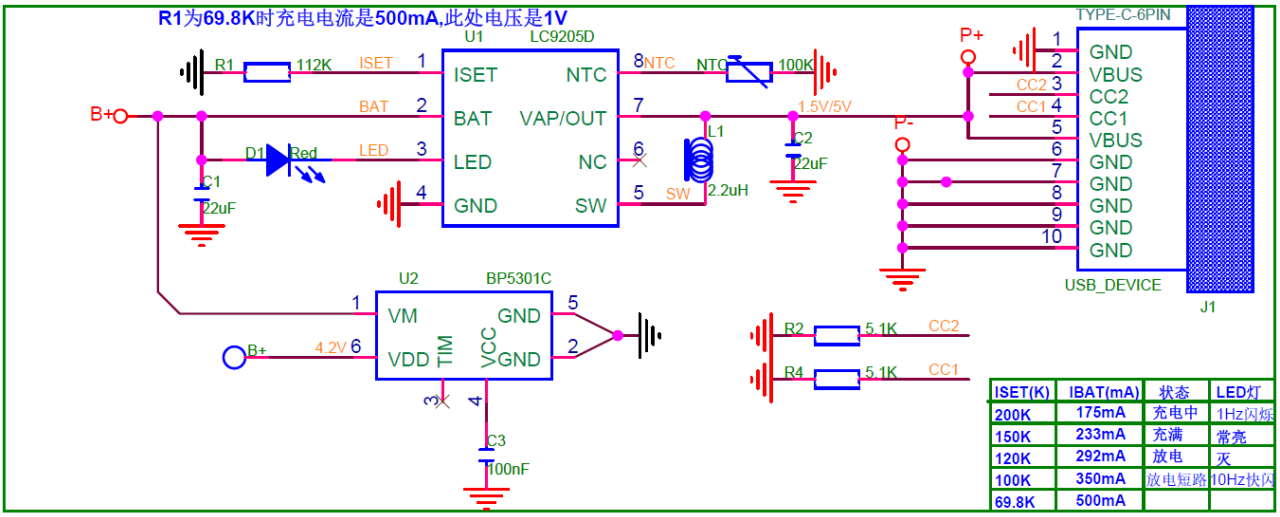
## Specification of Pack

| Item | Rating of Pack |
|---|---|
| Internal Battery | 600 mAh, 3,7 V |
| Nominal Voltage | 1.5 V |
| Rated Capacity | 1400 mAh |
| Discharge Cut-off Voltage | 1.1 V |
| Input | Type-C: DC 5 V / 350 mA |
| Charge Temperature Range | 0 – 45°C |

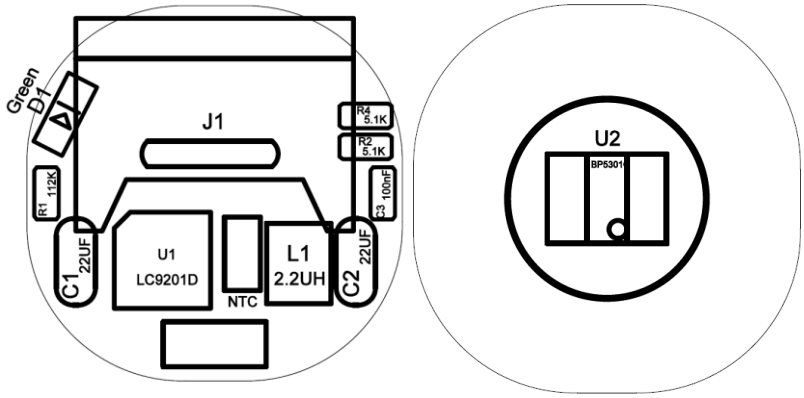
## Specification of Cell

| Item | Rating of cell |
|---|---|
| Rated Capacity | 600 mAh |
| Nominal Voltage | 3.7 V |
| Discharge Cut-off Voltage | 3.0 V |
| Max. Charge Voltage | 4.2 V |
| Max. Charge Current | 300 mA |
| Charge Temperature Range | 0 – 45°C |

## Circuit diagram




## PCB Layout




- - - End of Attachment 4 - - -

## Attachment 5 ISO 9001 certificate

HIC CERTIFICATION

# QUALITY MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the Quality Management System of

Dongguan Lianguang Electronic Technology Co., Ltd

**Registered Address:** Room 301, Building 1, No. 3, Gaoke Gongye 4th Road, Sicun, Tangxia Town, Dongguan City, Guangdong Province

**Audit Address:** 4th Floor, Building 3, No. 30, Wangjiao Road, Hengtang Village, Tangxia Town, Dongguan City, Guangdong Province (Pushun Innovation Valley)

by reason of its

Quality Management System

has been awarded this certificate for compliance with standard

**GB/T 19001-2016 / ISO 9001:2015**

for the

Production and sales of rechargeable batteries

Certificate No: HIC230657

Unified Social Credit Code: 91441900MA4UTHDE31

Date Of Initial Certification: 19 Apr 2023

Certificate Expiry: 18 Apr 2026

签发

证书专用章

IAF CNAS

First supervision Qualified sign

Second supervision Qualified sign

This certificate is issued by Shenzhen Hua Kai Inspection & Certification Co., Ltd., the certified organizations shall regularly accept the supervision. This certificate shall be used in conjunction with the "Notice of Supervisory Qualification" issued by HIC, and if the certificate is marked with a qualified sign, it indicates that the certificate holder has passed the supervision and can keeping the registration qualification. For obtaining the validity of the certificate, please visit http://: www.hicgroup.com.cn.
The certificate information is also available on the CNCA official website: http://www.cnca.gov.cn

HIC Certification Service

- - - End of Attachment 5 - - -