



TEST REPORT 检测报告



REPORT No.报告号: DTI20242908D

Date 日期:2024-06-06

Page 1 of 4

Applicant Company Name:
申请单位名称 :

Applicant Company Address:
申请单位地址:

Report on the submitted samples said to be:
委托检测的样品及申请者对样品的说明如下 :

Sample Name 样品名称 : Li-ion Polymer Battery 锂离子聚合物电池

Sample No.样品型号 : 351423

Manufacturer 制造商 :

Manufacturer Address
制造商地址 :

Sample Receiving Date : May 31, 2024
收样日期 : 2024 年 05 月 31 日

Testing Period : From May 31, 2024 to June 05, 2024
测试周期 : 2024 年 05 月 31 日至 2024 年 06 月 05 日

Results : Please refer to next page(s).
测试结果 : 参见后续页。

Summary of Test Results:
测试结果概要:

TEST REQUEST 测试要求

Regulation(EU) 2023/1542 concerning batteries and waste batteries, amending Directive 2008/98/EC and Regulation (EU) 2019/1020 and repealing Directive 2006/66/EC on Mercury, Cadmium and Lead Content
A 电池和废电池的法规(EU) 2023/1542、修订指令 2008/98/EC 和法规(EU) 2019/1020、废除指令 2006/66/EC 和指令 2006/66/EC 中关于汞、镉和铅含量要求。

CONCLUSION 结论

Pass
合格

Shenzhen Deesev Testing International Corp
深圳市德泽威技术检测有限公司

Approved by: Tommy Jiang
lab manager
批准 实验室主任



TEST REPORT 检测报告



REPORT No.报告号: DTI20242908D

Date 日期:2024-06-06

Page 2 of 4

Results:
测试结果:

A. Regulation(EU) 2023/1542 concerning batteries and waste batteries on Mercury, Cadmium and Lead
Content 法规(EU) 2023/1542 电池和废电池的汞、镉和铅含量

Test method:

测试方法:

Test method: With reference to IEC 62321-4:2013+AMD1:2017 and IEC 62321-5:2013. Analysis was performed by inductively coupled plasma optical emission spectrometer(ICP-OES)

参照标准 IEC 62321-4:2013+AMD1:2017 和 IEC 62321-5:2013, 采用 ICP-OES 进行分析。

| Item 项目 | Unit 单位 | MDL | Results 测试结果 | Limit (% by weight) 限量 (重量百分比) |
|-----------------------|------------|--------|-----------------|-----------------------------------|
| Mercury Content 汞(Hg) | % | 0.0001 | ND | 0.0005 |
| Cadmium Content 镉(Cd) | % | 0.0005 | ND | 0.002 |
| Lead Content 铅(Pb) | % | 0.0005 | ND | 0.01 * |
| Conclusion 结论 | / | / | Pass 合格 | / |

Remark:

备注:

*1 = From 18 August 2024, portable batteries, whether or not incorporated into appliances, shall not contain more than 0,01 % of lead (expressed as lead metal) by weight.;

从 2024 年 8 月 18 日起, 便携式电池, 无论是否安装在电器中, 含铅量不得超过 0.01%(以金属铅表示)。

*2 = The restriction set out in point 1 shall not apply to portable zinc-air button cells until 18 August 2028;

在 2028 年 8 月 18 日之前, 第 1 点规定的限制不适用于便携式锌空气按钮电池

*3 = All batteries containing more than 0,002 % cadmium or more than 0,004 % lead, shall be marked with the chemical symbol for the metal concerned: Cd or Pb.

所有镉含量超过 0.002%或铅含量超过 0.004%的电池, 都必须标有有关金属的化学符号:Cd 或 Pb。



TEST REPORT 检测报告



中国认可
国际互认
检测
TESTING
CNAS L8083

REPORT No.报告号: DTI20242908D

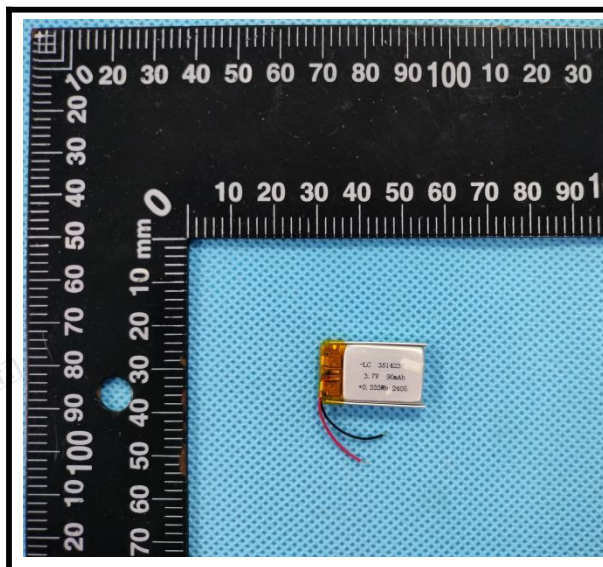
Date 日期:2024-06-06

Page 3 of 4

Note:

注释:

- ND = Not Detected
ND = 未检出
- MDL = Method Detection Limit
MDL = 方法检出限
- % = percentage by weight
% = 重量百分比
- 0.1% = 1000mg/kg, mg/kg = ppm
- Results shown are of total weight of the battery sample.
测试结果基于电池干重。
- Decision rule: According to DTI-CX-39-2022 《Decision rule for conformity of the test results》
判定规则：依据 DTI-CX-39-2022 《检测结果符合性判定规则》进行判定
- Photo appendix is included
样品照片见附录。
- This test report is modified from the test report DTI20242908 and the replaced report is invalid now.
这份报告由 DTI20242908 修改，并且原报告 DTI20242908 作废。

Appendix
附录Photograph of Sample
样品照片

*** End of Report ***

*** 报告结束 ***

Statement 声明:

1. The test report is invalid without the signature of the approver, the "special seal" and the seam seal of the report;
检测报告无批准人签字、“专用章”及报告骑缝章无效;
2. The sample and sample information are provided by the applicant, and the applicant is responsible for its authenticity, and DTI has not verified its authenticity;
样品及样品信息由申请者提供, 申请者应对其真实性负责, DTI 未核实其真实性;
3. The test results in this report are only responsible for the tested samples;
本报告检测结果仅对受测样品负责;
4. Without the written consent of DTI, this report may not be copied in part.
未经 DTI 书面同意, 不得部分复制本报告。



中国认可
国际互认
检测
TESTING
CNAS L13753



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.....: S03A24031268L00101

Date of issue.....: 2024-04-15

Total number of pages.....: 28

Tested by (name + signature).....: Andre Gao

Andre Gao

Reviewed by (name + signature).....: Regen Hu

Regen Hu

Approved by (name + signature).....: Rod Liu

Rod Liu



Testing Laboratory Name: Guangdong ESTL Technology Co., Ltd.

Laboratory address: Room 101, 201-208, Unit 1, & Room 201, Unit 4, Building 1, No.9 /Room 101, Unit 2, Building 1, No.11, Zongbu 2nd Road, Songshanhu Park, Dongguan, Guangdong, China

Applicant.....:

Address.....:

Test specification:

Standard.....: IEC 62133-2:2017, IEC 62133-2:2017/AMD1:2021

EN 62133-2:2017, EN 62133-2:2017/A1:2021

Test item description.....: Li-ion Battery

Trade Mark.....: N/A

Manufacturer.....:

Address.....:

Factory.....:

Address.....:

Model/Type reference.....: LC 351423

Ratings.....: 3.7V, 90mAh, 0.333Wh

| | |
|---|---|
| List of Attachments (including a total number of pages in each attachment): N/A | |
| <p>Summary of testing:</p> <p>The unit is charging the empty cell and discharging the full charged cell according to the rating.</p> <p>Note:</p> <p>Charging procedures for test purposes:</p> <p>(1) Unless otherwise stated, the charging procedure for test purposes is carried out in an ambient temperature of $20\pm 5^{\circ}\text{C}$, using the method declared by the manufacturer. Prior to charging, the battery/cell shall have been discharged at $20\pm 5^{\circ}\text{C}$ at a constant current of 0.2 It A down to a specified final voltage.</p> <p>(2) After stabilization for 1 to 4 hours respectively at ambient temperature of highest test temperature 45°C and lowest test temperature 0°C.</p> | |
| <p>Tests performed (test clause and name of test):</p> <p>Test items:</p> <p>cl.7.2.1 Continuous charging at constant voltage (cells);</p> <p>cl.7.2.2 Case stress at high ambient temperature (battery);</p> <p>cl.7.3.1 External short-circuit (cell);</p> <p>cl.7.3.2 External short-circuit (battery);</p> <p>cl.7.3.3 Free fall (cell and battery);</p> <p>cl.7.3.4 Thermal abuse (cells);</p> <p>cl.7.3.5 Crush (cells);</p> <p>cl.7.3.6 Over-charging of battery;</p> <p>cl.7.3.7 Forced discharge (cells);</p> <p>cl.7.3.8 Mechanical tests (batteries);</p> <p>- 7.3.8.1 Vibration</p> <p>- 7.3.8.2 Mechanical shock</p> <p>cl.7.3.9 Forced internal short-circuit (cells).</p> <p>Cl. 8.2 Small cell and battery safety information</p> <p>Tests are made with the number of cells and batteries specified in IEC 62133-2:2017, IEC 62133-2:2017/AMD1:2021 Table 1.</p> | <p>Testing location:</p> <p>Guangdong ESTL Technology Co., Ltd. Room 101, 201-208, Unit 1, & Room 201, Unit 4, Building 1, No.9 /Room 101, Unit 2, Building 1, No.11, Zongbu 2nd Road, Songshanhu Park, Dongguan, Guangdong, China</p> |
| Summary of compliance with National Differences (List of countries addressed):N/A | |
| <p><input checked="" type="checkbox"/> The product fulfils the requirements of <u>EN62133-2: 2017, EN 62133-2:2017/A1:2021</u></p> | |

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.

| | | |
|----------|----------------|---------------|
| Red(+) | LC 351423 | 1ICP4/14/24 |
| | 3.7V | 90mAh 0.333Wh |
| | Li-ion Battery | |
| Black(-) | YYMMDD | |

Remark:

- 1.“YY” means to years; “MM” means to months; “DD” means to days.
- 2.The “+” represents the anode; The “-” represents the cathode.

Below information will be marked on the immediate package.

Caution:

- Keep small cells and batteries which are considered swallowable out of the reach of children.
- Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion.
- In case of ingestion of a cell or battery, seek medical assistance promptly.
- If children use the battery, their guardians should explain the proper handling.

| | |
|---|--|
| Test item particulars | : N/A |
| Classification of installation and use | : To be defined in final product |
| Supply connection | : Lead wire |
| Recommend charging method declared by the manufacturer | : CC/CV |
| Discharge current (0,2 I_t A) | : 18mA |
| Maximum discharging current | : 90mA |
| Specified final voltage | : 3.0V |
| Recommend of charging limit for lithium system | |
| Upper limit charging voltage per cell | : 4.2V |
| Maximum charging current | : 90mA |
| Charging temperature upper limit | : 45°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 (Not Applicable) |
| - test object does meet the requirement..... | : P (Pass) |
| - test object does not meet the requirement..... | : F (Fail) |
| Testing : | |
| Date of receipt of test item | : 2024-03-29 |
| Date (s) of performance of tests | : 2024-03-30 to 2024-04-09 |
| General remarks: | |
| The test results presented in this report relate only to the object tested. | |
| This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. | |
| Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator. | |

General product information and other remarks:

This battery is constructed with single Li-ion Cell, and has overcharge, over-discharge, over current and short-circuits proof circuit.

The main features of the battery are shown as below:

| Model | Rated capacity | Nominal voltage | Nominal Charge Current | Nominal Discharge Current | Maximum Charge Current | Maximum Discharge Current | Limited Charge Voltage | Cut-off Voltage |
|-----------|----------------|-----------------|------------------------|---------------------------|------------------------|---------------------------|------------------------|-----------------|
| LC 351423 | 90mAh | 3.7V | 18mA | 18mA | 90mA | 90mA | 4.2V | 3V |

The main features of the battery are shown as below:

| Model | Upper limit charge voltage | Taper-off current | Lower charge temperature | Upper charge temperature |
|-----------|----------------------------|-------------------|--------------------------|--------------------------|
| LC 351423 | 4.2V | 0.9mA | 0°C | 45°C |

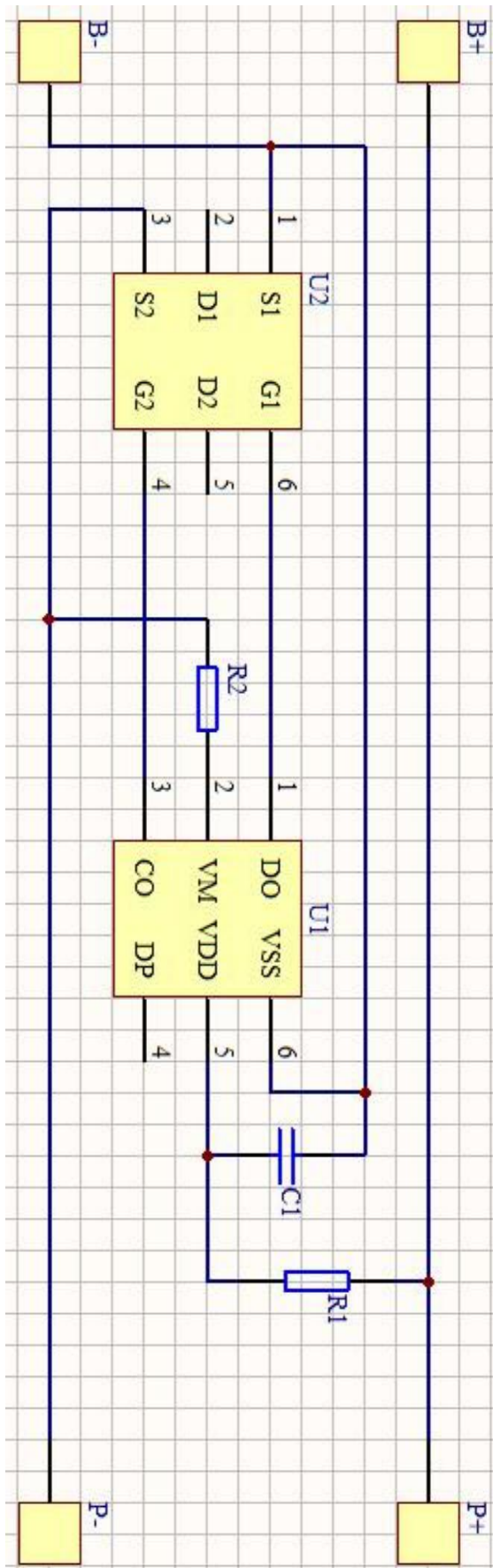
The main features of the cell in the battery are shown as below:

| Model | Rated capacity | Nominal voltage | Nominal Charge Current | Nominal Discharge Current | Maximum Charge Current | Maximum Discharge Current | Limited Charge Voltage | Cut-off Voltage |
|------------------|----------------|-----------------|------------------------|---------------------------|------------------------|---------------------------|------------------------|-----------------|
| LC 351423 (Cell) | 90mAh | 3.7V | 18mA | 18mA | 90mA | 90mA | 4.2V | 3V |

The main features of the cell in the battery are shown as below:

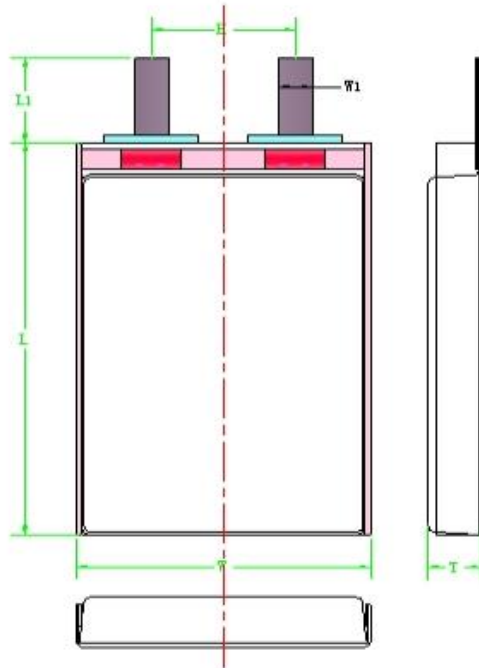
| Model | Upper limit charge voltage | Taper-off current | Lower charge temperature | Upper charge temperature |
|------------------|----------------------------|-------------------|--------------------------|--------------------------|
| LC 351423 (Cell) | 4.2V | 0.9mA | 0°C | 45°C |

Circuit diagram:



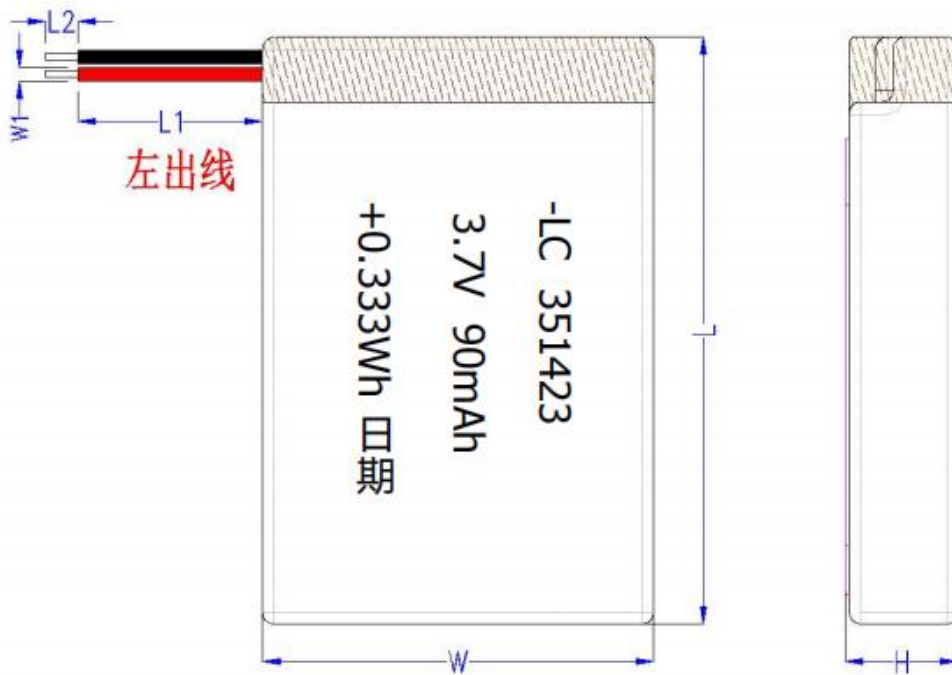
Construction:

Cell



Cell: Max. 3.6mm (T) x Max. 14.0mm (W) x Max. 23.3mm (L)

Battery:



Battery: Max. 3.5mm (H) x Max. 14.0mm (W) x Max. 25.0mm (L)

| 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 | Not metal surfaces exists. | 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 | Venting mechanism exists on the narrow side of pouch cell. | 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 | | P |
| | Batteries are designed such that abnormal temperature rise conditions are prevented | Overcharge, over discharge, over current and short-circuit proof circuit used in this battery. See tests of clause 7. | 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 | The charging limits specified in manufacturer's specifications. | 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 | | | |
|-------------|--|---|---------|
| 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 | | P |
| | This protection may be provided external to the battery such as within the charger or the end devices | Protection circuit 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 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 | Current, voltage and temperature limits specified by cell manufacturer. | 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 | Battery without selective discharge function. | 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 | | P |
| 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 |
| | 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 |

| 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 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 | | N/A |
| | 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 | | N/A |
| | 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 | | 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 |
| | 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 | Complied. Quality plan provided. | P |
| 5.8 | Battery safety components | | N/A |

| IEC 62133-2 | | | |
|-------------|---|-------------------------------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 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 | | P |
| | Coin cells with resistance $\leq 3 \Omega$ (measured according annex D) are tested according table 1 | Not coin cells | N/A |
| | Unless otherwise specified, tests are carried out in an ambient temperature of $20 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$ | | 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 $20 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$, using the method declared by the manufacturer | | P |
| | Prior to charging, the battery have been discharged at $20 \text{ }^\circ\text{C} \pm 5 \text{ }^\circ\text{C}$ 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 |
| | After stabilization for 1 h to 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 0-45°C declared. | P |
| 7.2 | Intended use | | P |
| 7.2.1 | Continuous charging at constant voltage (cells) | Tests Complied. | 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) | Tested complied. | P |

| IEC 62133-2 | | | |
|-------------|--|--|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Oven temperature (°C)..... : | 70°C ± 2°C | — |
| | Results: No physical distortion of the battery case resulting in exposure of internal protective components and cells | No physical distortion of the battery case | P |
| 7.3 | Reasonably foreseeable misuse | See below | P |
| 7.3.1 | External short-circuit (cell) | Tests Complied. | 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) | Tested complied. | P |
| | The batteries 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 |
| | 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 | | P |
| | 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 |
| | A single fault applies to protective component parts such as MOSFET, fuse, thermostat or positive temperature coefficient (PTC) thermistor | Single fault applies on MOSFET (U2) | P |
| | Results: No fire. No explosion..... : | (See appended table 7.3.2) | P |
| 7.3.3 | Free fall | Tests Complied. | P |
| | Results: No fire. No explosion | No fire. No explosion | P |
| 7.3.4 | Thermal abuse (cells) | Tests Complied. | P |
| | Oven temperature (°C)..... : | 130°C ± 2°C | — |
| | Results: No fire. No explosion | No fire. No explosion | P |
| 7.3.5 | Crush (cells) | Tests Complied. | 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 | Tests Complied. | P |

| IEC 62133-2 | | | |
|-------------|---|-----------------------------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 presented 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) | Tests Complied. | 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 |
| | - 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 |
| 7.3.8 | Mechanical tests (batteries) | | P |
| 7.3.8.1 | Vibration | Tests Complied. | 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 | Tests Complied. | 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) | Tests Complied. | P |
| | The cells complied with national requirement for.....: | France, Japan, Korea, Switzerland | — |
| | 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 | 400N for prismatic cells | P |

| IEC 62133-2 | | | |
|-------------|---|--|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | Results: no fire.....: | (See appended table 7.3.9) | P |
| 8 | INFORMATION FOR SAFETY | | P |
| 8.1 | General | | P |
| | Manufacturers of secondary cells provides information about current, voltage and temperature limits of their products | Information is provided in manufacturer's specification. | P |
| | Manufacturers of batteries provides information regarding how to minimize and mitigate hazards to equipment manufacturers or end-users | Information is provided in manufacturer's specification. | 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 | | N/A |
| 8.2 | Small cell and battery safety information | Small cell and battery. | P |
| | The following warning language is to be provided with the information packaged with the small cells and batteries or equipment using them: | | P |
| | - Keep small cells and batteries which are considered swallowable out of the reach of children | | P |
| | - Swallowing may lead to burns, perforation of soft tissue, and death. Severe burns can occur within 2 h of ingestion | | P |
| | - In case of ingestion of a cell or battery, seek medical assistance promptly | | P |
| 9 | MARKING | | P |
| 9.1 | Cell marking | | P |
| | 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 | | P |
| 9.2 | Battery marking | | P |
| | Batteries are marked as specified in IEC 61960, except for coin batteries | | P |
| | Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity | Not coin batteries. | N/A |

| IEC 62133-2 | | | |
|-------------|--|---|----------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| | 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 | Small cell and battery. | P |
| | 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 | | P |
| 9.4 | Other information | | P |
| | The following information are marked on or supplied with the battery: | | P |
| | - Storage and disposal instructions | Information for storage and disposal instructions mentioned in manufacturer's specifications. | P |
| | - Recommended charging instructions | Information for recommended charging instructions mentioned in manufacturer's specifications. | 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 | Not Coin cells. | N/A |

| IEC 62133-2 | | | |
|----------------|---|---|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 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 | Charging voltage is 4.2V. | P |
| A.3.2 | Upper limit charging voltage | 4.2V | 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 | | N/A |
| A.4 | Consideration of temperature and charging current | | P |
| A.4.1 | General | | P |
| A.4.2 | Recommended temperature range | See A.4.2.2 | P |
| A.4.2.1 | General | | P |
| A.4.2.2 | Safety consideration when a different recommended temperature range is applied | Charging temperature declared by client is: 0-45°C. | N/A |
| A.4.3 | High temperature range | | N/A |
| A.4.3.1 | General | | N/A |
| A.4.3.2 | Explanation of safety viewpoint | | N/A |
| 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 | | N/A |
| A.4.4.1 | General | | N/A |
| A.4.4.2 | Explanation of safety viewpoint | | N/A |
| A.4.4.3 | Safety considerations, when specifying charging conditions in the low temperature range | | N/A |
| 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 | | P |

| IEC 62133-2 | | | |
|----------------|--|--------------------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| 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 |
| 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 |
| 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 | | N/A |
| | Coin cells with an internal resistance greater than 3 Ω require no further testing..... : | (See appended table D.2) | 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 |

| IEC 62133-2 | | | |
|--------------------|---------------------------------------|-----------------|------------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| ANNEX F | COMPONENT STANDARDS REFERENCES | | N/A |

| 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 | | LC351423 | 3.7V, 90mAh | IEC 62133-2:2017, IEC 62133-2:2017/AMD1:2021 | Tested with appliance |
| -Positive electrode | LEYOU NEW ENERGY MATERIALS (WUXI) CO., LTD | E0211 | LiCoO ₂ | -- | -- |
| -Negative electrode | Ganzhou RFT Technology Co., Ltd. | AGF-1B | Graphite | -- | -- |
| -Separator | SUMSUNG SDI., LTD | wqdqeq | PE, Shut down temperature:130°C | -- | -- |
| -Electrolyte | DONGGUAN SHANSHAN BATTERY MATERIALS CO., LTD | 180472 | LiPF ₆ +EC+EMC+DE C | -- | -- |
| PCB | Interchangeable | Interchangeable | V-0, 130°C | UL 796 | UL approved |
| Lead wire | Interchangeable | Interchangeable | 30AWG, 80°C, 30V | UL 758 | UL approved |
| IC (U1) | Dongguan Baiqiang Power Technology Co., Ltd. | S8261-G3J | Overcharge detection voltage: $4.28 \pm 0.05V$, Overdischarge detection voltage: $3.0 \pm 0.10V$, Ta: -40°C to +85°C | -- | Tested with appliance |
| MOSFET (U2) | Dongguan Baiqiang Power Technology Co., Ltd. | 8205 | V _{DS} : 20V, V _{GS} : $\pm 12V$ ID: 6A, T _J , T _{STG} : -55°C to +150°C | -- | Tested with appliance |

Supplementary information:

¹⁾ Provided evidence ensures the agreed level of compliance. See OD-2039.

| 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 V _c (Vdc) | Recommended charging current I _{rec} (A) | OCV before test (Vdc) | Results | |
| C1 | 4.2 | 0.018 | 4.183 | A | |
| C2 | 4.2 | 0.018 | 4.182 | A | |
| C3 | 4.2 | 0.018 | 4.185 | A | |
| C4 | 4.2 | 0.018 | 4.181 | A | |
| C5 | 4.2 | 0.018 | 4.180 | A | |

Supplementary information:
A - No fire. No explosion. No leakage.
B - Fire.
C - Explosion.
D - Leakage.
E - Bulge.
F - Others.

| 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 (45°C) | | | | | | |
| C6 | 56.4 | 4.181 | 81 | 54.7 | A, E, H | |
| C7 | 56.5 | 4.183 | 83 | 59.0 | A, E, H | |
| C8 | 56.5 | 4.185 | 85 | 54.6 | A, E, H | |
| C9 | 56.4 | 4.182 | 85 | 47.6 | A, E, H | |
| C10 | 56.5 | 4.179 | 83 | 57.5 | A, E, H | |
| Samples charged at charging temperature lower limit (0°C) | | | | | | |
| C11 | 57.3 | 4.122 | 83 | 55.1 | A, E, H | |
| C12 | 57.4 | 4.115 | 85 | 51.9 | A, E, H | |
| C13 | 57.4 | 4.118 | 89 | 62.3 | A, E, H | |
| C14 | 57.4 | 4.116 | 91 | 55.4 | A, E, H | |
| C15 | 57.4 | 4.120 | 87 | 56.4 | A, E, H | |

Supplementary information:
A - No fire. No explosion.
B - Fire.
C - Explosion.
D - Leakage.
E - Bulge.
F - Others.
G - The test was completed after 24 h.
H - The test was completed after the cell casing cooled to 20% of the maximum temperature rise.

| IEC 62133-2 | | | | | | |
|---|--|-----------------------|----------------------------|--------------------------------------|----------------------------------|----------|
| 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 |
| B4 | 21.1 | 4.181 | 84 | 86.4 | SC-U2 | A, H, E |
| B5 | 20.8 | 4.183 | 91 | 83.2 | SC-U2 | A, H, E |
| B6 | 20.7 | 4.182 | 93 | 84.9 | SC-U2 | A, H, E |
| B7 | 20.7 | 4.180 | 85 | 80.3 | SC-U2 | A, H, E |
| B8 | 21.5 | 4.181 | 82 | 0.2 | Normal | A, F |
| Supplementary information: | | | | | | |
| SC: short-circuit | | | | | | |
| OC: open-circuit | | | | | | |
| A - No fire. No explosion. | | | | | | |
| B - Fire. | | | | | | |
| C - Explosion. | | | | | | |
| D - Leakage. | | | | | | |
| E - Bulge. | | | | | | |
| F - Others (please explain). -rapid decline in short circuit current, the battery pack should remain on test for an additional one hour after the current reaches a low end steady state condition. | | | | | | |
| G – The test was completed after 24 h. | | | | | | |
| H – The test was completed after the cell casing cooled to 20% of the maximum temperature rise. | | | | | | |
| I- Others. | | | | | | |

| 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 (45°C) | | | | | |
| C29 | 4.182 | -- | 13.0 | A, G | |
| C30 | 4.181 | -- | 13.0 | A, G | |
| C31 | 4.183 | -- | 13.0 | A, G | |
| C32 | 4.182 | -- | 13.0 | A, G | |
| C33 | 4.182 | -- | 13.0 | A, G | |
| Samples charged at charging temperature lower limit (0°C) | | | | | |
| C34 | 4.120 | -- | 13.0 | A, G | |
| C35 | 4.119 | -- | 13.0 | A, G | |
| C36 | 4.121 | -- | 13.0 | A, G | |
| C37 | 4.117 | -- | 13.0 | A, G | |
| C38 | 4.120 | -- | 13.0 | A, G | |

| IEC 62133-2 | | | |
|---|--------------------|-----------------|---------|
| Clause | Requirement + Test | Result - Remark | Verdict |
| Supplementary information: A - No fire. No explosion. B - Fire. C - Explosion. D - Leakage. E - Bulge. F - Others (please explain). G – Force released after maximum level reached H – Force released after abrupt voltage drop of one-third the original value. | | | |

| 7.3.6 | TABLE: Over-charging of battery | | | P |
|---|---------------------------------|------------------------------|-------------------------------------|---------|
| Constant charging current (A).....: | 0.18 | | | — |
| Supply voltage (Vdc).....: | 5.88 | | | — |
| Sample No. | OCV before charging (Vdc) | Total charging time (minute) | Maximum outer case temperature (°C) | Results |
| B12 | 3.312 | 127 | 34.2 | A |
| B13 | 3.309 | 127 | 34.9 | A |
| B14 | 3.315 | 127 | 34.8 | A |
| B15 | 3.321 | 127 | 34.0 | A |
| B16 | 3.311 | 127 | 35.4 | A |
| Supplementary information: A - No fire. No explosion. B - Fire. C - Explosion. D - Leakage. E - Bulge. F - Others. | | | | |

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

| 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 | |
| C39 | 3.311 | 0.09 | 3.0 | A, E, H | |
| C40 | 3.315 | 0.09 | 3.0 | A, E, H | |
| C41 | 3.321 | 0.09 | 3.0 | A, E, H | |
| C42 | 3.308 | 0.09 | 3.0 | A, E, H | |
| C43 | 3.314 | 0.09 | 3.0 | A, E, H | |

Supplementary information:
A - No fire. No explosion.
B - Fire.
C - Explosion.
D - Leakage.
E - Bulge.
F - Others.
G - The voltage reached negative value of upper limit charging voltage within 90 min.
H - The voltage did not reach negative value of upper limit charging voltage.

| 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 | |
| B17 | 4.182 | 4.180 | 2.097 | 2.096 | A | |
| B18 | 4.180 | 4.180 | 2.089 | 2.088 | A | |
| B19 | 4.181 | 4.180 | 2.099 | 2.097 | A | |

Supplementary information:
A - No fire. No explosion. No leakage. No venting. No rupture.
B - Fire.
C - Explosion.
D - Leakage.
E - Venting.
F - Rupture.
G - Bulge.
H - Others.

| 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 | |
| B20 | 4.185 | 4.185 | 2.083 | 2.083 | A | |
| B21 | 4.183 | 4.183 | 2.085 | 2.085 | A | |
| B22 | 4.184 | 4.184 | 2.096 | 2.096 | A | |

Supplementary information:
A - No fire. No explosion. No leakage. No venting. No rupture.
B - Fire.
C - Explosion.
D - Leakage.
E - Venting.
F - Rupture.

| 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 (45°C) | | | | | | |
| C44 | 45 | 4.177 | 1 | 400 | A, H | |
| C45 | 45 | 4.176 | 1 | 400 | A, H | |
| C46 | 45 | 4.175 | 1 | 400 | A, H | |
| C47 | 45 | 4.177 | 1 | 400 | A, H | |
| C48 | 45 | 4.173 | 1 | 400 | A, H | |
| Samples charged at charging temperature lower limit (0°C) | | | | | | |
| C49 | 0 | 4.110 | 1 | 400 | A, H | |
| C50 | 0 | 4.112 | 1 | 400 | A, H | |
| C51 | 0 | 4.113 | 1 | 400 | A, H | |
| C52 | 0 | 4.111 | 1 | 400 | A, H | |
| C53 | 0 | 4.115 | 1 | 400 | A, H | |

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
B - Fire
C - Explosion.
D - Leakage.
E - Bulge.
F - Others.
G - Test concluded when 50 mV voltage drop occurred prior to reaching force limit
H - Test concluded when 400 N pressure was reached and 50 mV voltage drop was not achieved
I - Test was concluded when fire occurred

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

| 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 an internal resistance less than or equal to 3 Ω, see test result on corresponding tables according to Clause 6 and Table 1.

Photos

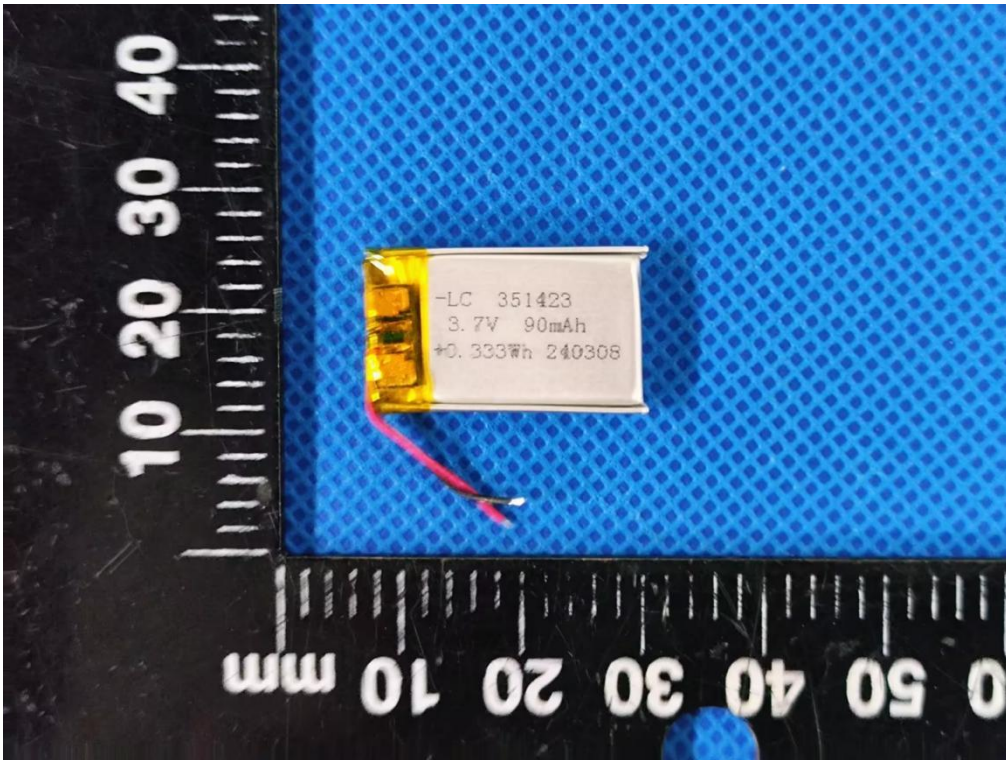


Fig. 1

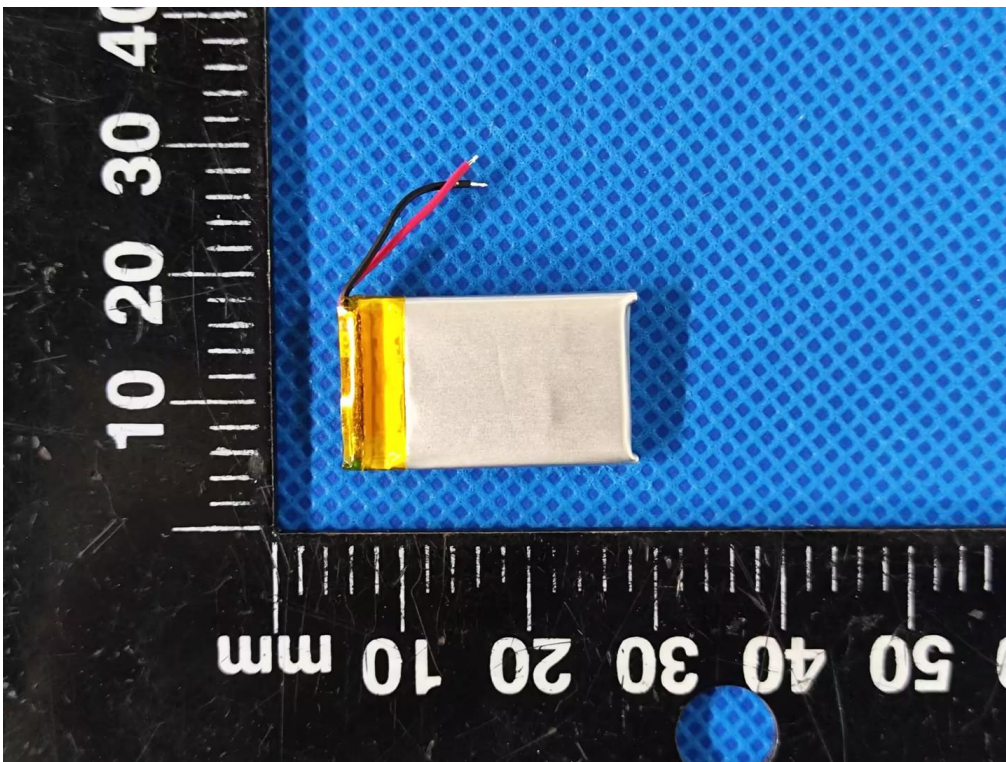


Fig. 2

Photos

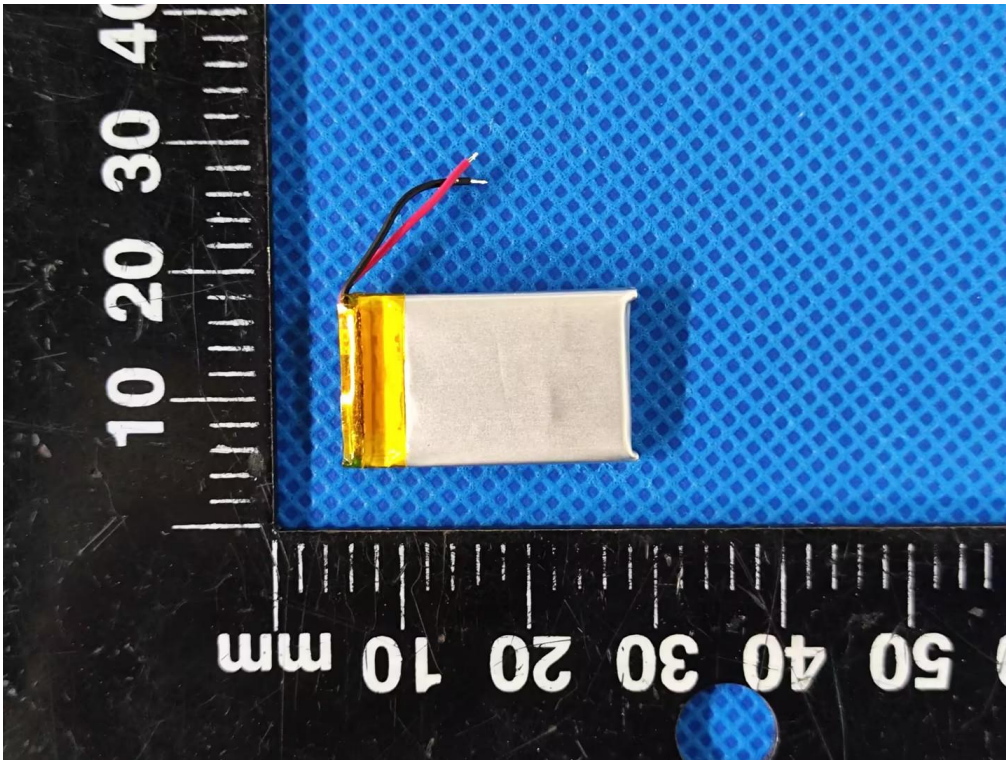


Fig. 3

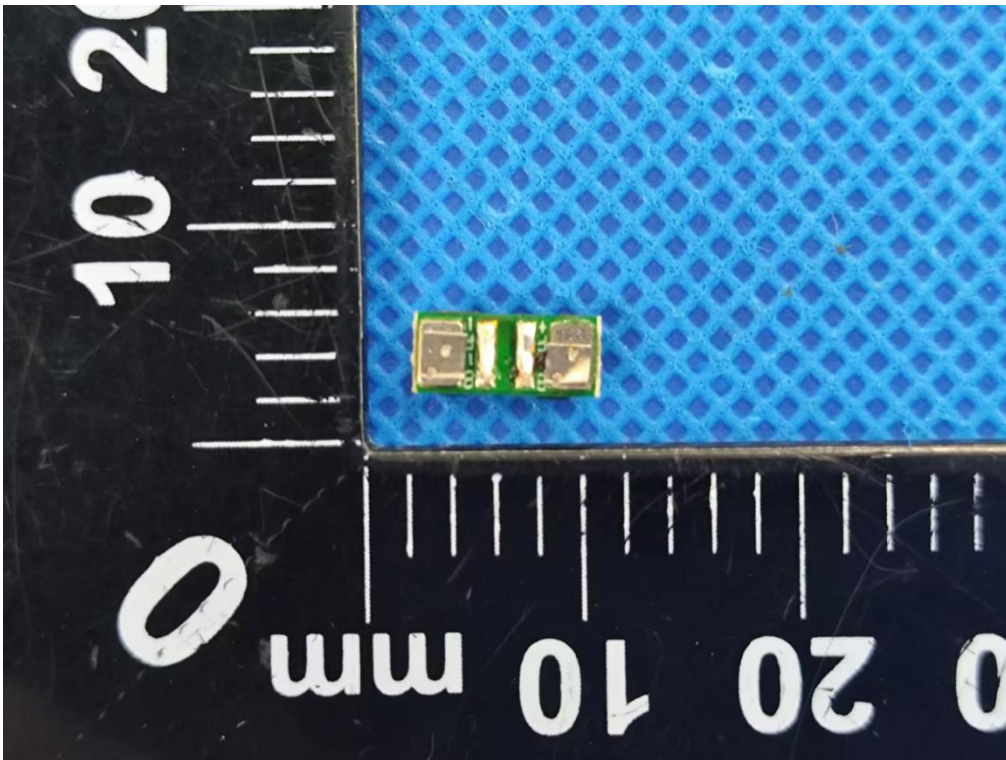


Fig. 4

Photos



Fig. 5

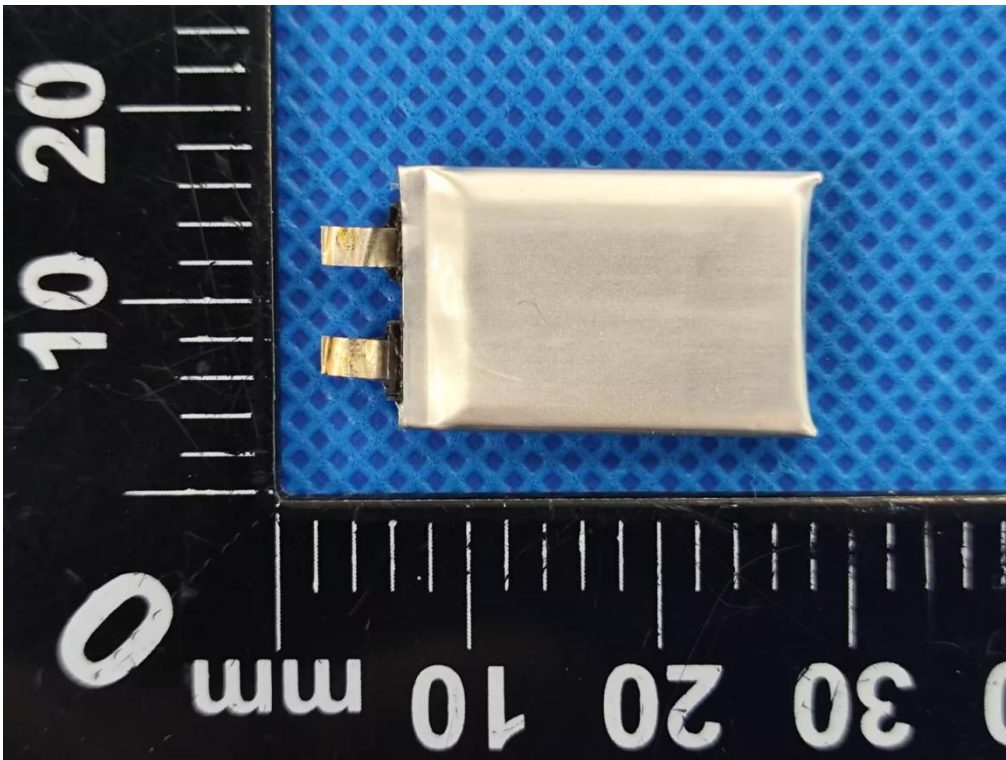


Fig. 6

--- End of Report ---