

Report No. : TSZ23090156-P01-R01

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Test Report

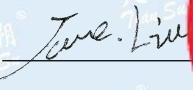
Client	:	
Address	:	

The following sample(s) and sample information was/were submitted and identified by/on the behalf of the client

Sample Name	:	Lithium-ion battery
Model/P.O. No.	:	401012-30mAh/ 400909-25mAh/ 400911-28mAh/ 401012-35mAh/ 450909-30mAh/ 450911-33mAh/ 701116-80mAh/ 380909-25mAh/ 501012-45mAh/ 501012-40mAh/ 902030-500mAh/ 601530-250mAh/ 701525-240mAh/ 401030-90mAh/ 402030-150mAh/ 502030-200mAh/ 602030-300mAh/ 602040-350mAh/ 701230-230mAh/601230-180mAh
Manufacturer	:	
Received Date	:	Sep 11, 2023
Test Period	:	Sep 11, 2023~Sep 14, 2023
Test Requested	:	Regulation (EU) 2023/1542

Conclusion	
- Lead(Pb), Cadmium(Cd), Mercury(Hg)	PASS

For Further Details, Please Refer To the Following Page(s)

Approved by: 

Date: Sep 14, 2023



Add: Building 1/4, No.2, Jinlong Road, Longgang District, Shenzhen, Guangdong, China.

Post Code: 518116

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Test Methods

Test Items	Test Method	Equipment
Lead(Pb), Cadmium(Cd)	IEC 62321-5:2013	ICP-OES
Mercury(Hg)	IEC 62321-4:2013+AMD1:2017	ICP-OES

Test Results

Test components	Test Item(s)	MDL (%)	Result(s) (%)	Limit (%)
Lithium-ion battery	Lead(Pb)	0.0005	N.D.	0.0100
	Cadmium(Cd)	0.0005	N.D.	0.0020
	Mercury(Hg)	0.0001	N.D.	0.0005

Note:

- N.D.=Not Detected (<MDL); MDL=method detection limit.

According to regulation (EU) 2023/1542, 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.

- The relevant chemical symbol indicating the heavy metal content shall be printed beneath the separate collection symbol and shall cover an area of at least one-quarter the size of that symbol.

Test Process:

Test Lead(Pb) ,Cadmium(Cd) , Mercury(Hg) concentration:

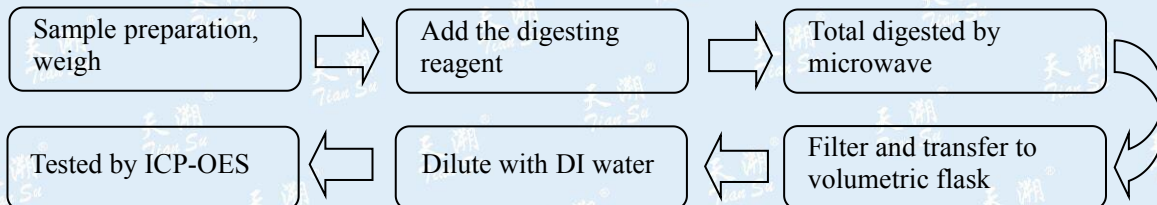
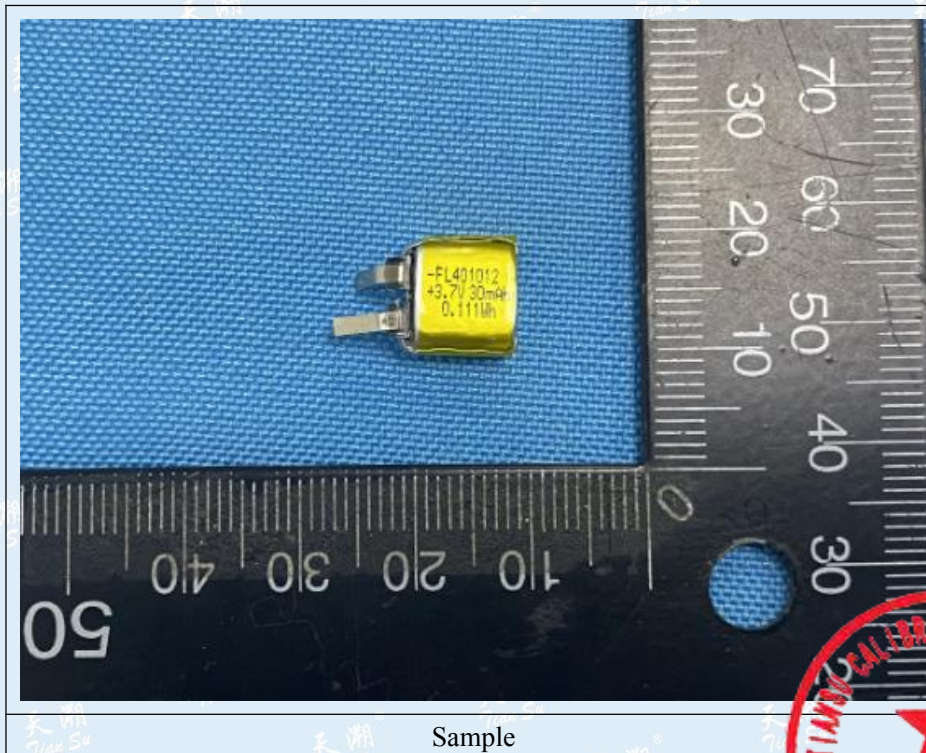


Photo of the sample



Sample

***** End of report *****

This report is invalid without the Special Seal of Tiansu. This report shall not be altered, increased or deleted. The results shown in this report refer only to the sample(s) tested.





中国认可
国际互认
检测
TESTING
CNAS L3150



TEST REPORT

Product Name : Li-ion Polymer Battery

Model Number : FL602030

Prepared for
Address

:
:

Prepared by
Address

: EMTEK(DONGGUAN) CO., LTD.
: Room 111&112, Building 8, -1&2F, Office Building 2, Zone
A, Zhongda Marine Biotechnology Research and
Development Base, No.9, Xincheng Avenue, Songshan
Lake High-Tech Industrial Development Zone, Dongguan,
Guangdong, China

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Report Number : EDG2411280077S00301R
Date(s) of Tests : November 24 to December 23, 2024
Date of issue : January 2, 2025



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.....: EDG2411280077S00301R

Date of issue.....: January 2, 2025

Total number of pages.....: 27

Testing Laboratory.....: EMTEK(DONGGUAN) CO., LTD.

Address.....: Room 111&112, Building 8, -1&2F, Office Building 2, Zone A, Zhongda Marine Biotechnology Research and Development Base, No.9, Xincheng Avenue, Songshan Lake High-Tech Industrial Development Zone, Dongguan, Guangdong, China

Tested by (name + signature).....: Niko Li 

Approved by (+ signature).....: Nicol Lee  

Applicant's name.....:

Address.....:

Test specification:

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

Test procedure.....: N/A

Non-standard test method.....: N/A

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

Trade Mark.....: N/A

Manufacturer.....:

Manufacturer address.....:

Model/Type reference : FL602030

Ratings.....: 3.7V, 300mAh, 1.11Wh

Summary of testing:

Tests performed (name of test and test clause):

cl.7.1 Charging procedure for test purposes (for Cells and Batteries);
cl.7.2.1 Continuous charging at constant voltage (Cells);
cl.7.2.2 Case stress at high ambient temperature (batteries);
cl.7.3.1 External short circuit (Cells);
cl.7.3.2 External short circuit (Batteries);
cl.7.3.3 Free fall (for Cells and Batteries);
cl.7.3.4 Thermal abuse (Cells);
cl.7.3.5 Crush (Cells);
cl.7.3.6 Over-charging of Battery;
cl.7.3.7 Forced discharge (Cells);
cl.7.3.8 Mechanical tests (Batteries);
cl.7.3.8.1 Vibration(Batteries);
cl.7.3.8.2 Mechanical shock(Batteries);
cl.7.3.9 Forced internal short-circuit (cells);

Tests are made with the number of cells and batteries specified in IEC/IEC 62133-2 Table 1.

Testing location:

All tests as described in Test Case and Measurement Sections were performed at the laboratory described on page 2

Subcontracted Test Condition:

N/A

Summary of compliance with National Differences

List of countries addressed:

☒ The product fulfils the requirements of IEC 62133-2:2017 and IEC 62133-2:2017/AMD1:2021

Copy of marking plate:

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

Li-ion Polymer Battery

Model: FL602030

3.7V, 300mAh, 0.11Wh 1ICP6/20/30

CAUTION:

- * Don't decomposition or Short circuit!
- * Forbid bum and damage the battery!

Date: YYYYMMDD

Made in China

Battery specification contain following warnings:

- Keep small cells and batteries which are considered swallow able 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.

Remark:

YYYY: Year, MM: Month, DD: Date

Test item particulars..... :	
Classification of installation and use..... :	To be defined in final product
Supply connection..... :	DC wire lead
Recommend charging method declared by the manufacturer..... :	Charging the battery with 150mA constant current and 4.25V constant voltage until the current reduces to 12mA at ambient 20°C ± 5° °C
Discharge current (0,2ItA)..... :	60mA
Specified final voltage..... :	2.75V
Chemistry	☐ nickel systems..... ☒ lithium systems
Recommend of charging limit for lithium system	
Upper limit charging voltage per cell..... :	4.25V
Maximum charging current..... :	450mA
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..... :	November 24,2024
Date (s) of performance of tests..... :	November 24,2024 to December 23, 2024
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. "(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.	

General product information:

The EUT model FL602030 is Li-ion Polymer Battery, This battery is constructed with single cell in 1S1P, and has overcharge, over-discharge, over current and short-circuits proof circuit.

The main features of the battery pack are shown as below (clause 7.1.1):

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
FL602030	300mAh	3.7V	150mA	150mA	450mA	450mA	4.25V	2.75V

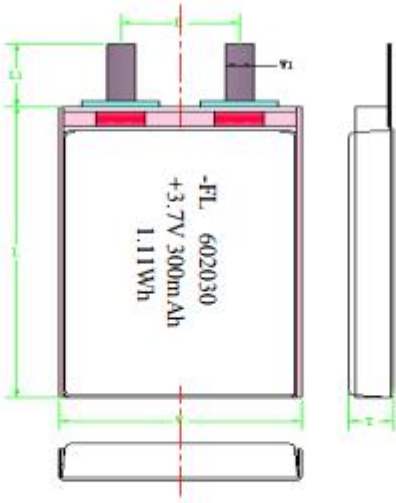
The main features of the cell in the battery pack are shown as below (clause 7.1.1):

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
FL602030	300mAh	3.7V	150mA	150mA	450mA	450mA	4.25V	2.75V

Continued: (Clause 7.1.2)

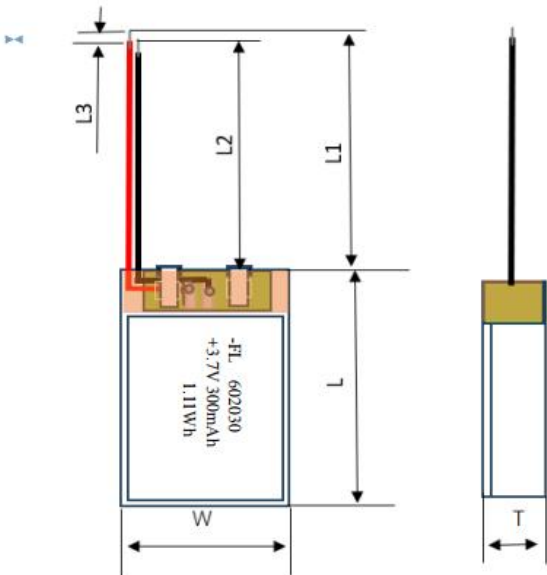
Model	Taper-off current	Upper limit charge voltage	Lower charge temperature	Upper charge temperature
FL602030	6mA	4.25V	0°C	45°C

Construction:
Cell:



厚度T	宽度W	长度L
$6.0^{+0.1}_{-0.5}$	$20.0^{+0.1}_{-0.5}$	$30.5^{+0.5}_{-0.5}$
UNIT 单位: MM		

Battery:



厚度T	宽度W	长度L	L1	L2	线径φ	L3线头外露长度	其它
$6.0^{+0.2}_{-0.3}$	$20.0^{+0.2}_{-0.5}$	$32.2^{+0.3}_{-0.5}$	45^{+2}_{-2}	40^{+2}_{-2}	0.8	$1.5^{+0.5}_{-0.5}$	左出线
UNIT 单位: mm							

The diagram shows a differential amplifier circuit. It consists of a 741 op-amp (U1) and a differential pair (U2). The op-amp is configured with its non-inverting input (pin 5) connected to a biasing network of resistor R1 and capacitor C1, which is connected to the B+ input. The inverting input (pin 6) is connected to the B- input. The op-amp's output (pin 4) is connected to the P+ output. The differential pair (U2) is connected with its inputs (pins 1 and 3) to the B- input and its outputs (pins 2 and 4) to the P- output. The differential pair is biased by a resistor R2 connected to the P+ output. The differential pair is also connected to the op-amp's output (pin 4) and the P- output.

IEC 62133-2			
Access to the World			
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		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		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		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		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 Access to the World			
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 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	Single cell battery	P
	This protection may be provided external to the battery such as within the charger or the end devices		N/A
	If protection is external to the battery, the manufacturer of the battery provide this safety relevant information to the external device manufacturer for implementation		N/A
	If there is more than one battery housed in a single battery case, each battery 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	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		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		P

IEC 62133-2			
Access to the World			
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	Mechanical protection for cell connections and control circuits provided.	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		N/A
	The battery case and compartments housing cells are 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 is considered when conducting mechanical tests		N/A
5.7	Quality plan		P

IEC 62133-2			
Access to the World			
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	Complied. Quality plan provided.	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	Tests are performed according to specified in Table 1 of this standard. The samples are not more than six months old.	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 $\pm$ 5 °C	Tests are carried out at 20°C $\pm$ 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 $\pm$ 5 °C, using the method declared by the manufacturer		P
	Prior to charging, the battery has been discharged at 20 °C $\pm$ 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			
Access to the World			
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	Charging temperature specified by client is 0-45°C, 45°C and 0°C were used as highest test temperature and lowest test temperature during tests.	P
7.2	Intended use		P
7.2.1	Continuous charging at constant voltage (cells)	Test 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)		P
	Oven temperature (°C)..... :		—
	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)	Test Complied.	P
	The batteries were tested until one of the following occurred:		P
	- 24 hours elapsed; or		P
	- The case temperature declined by 20 % of the maximum temperature rise		P
	In case of rapid decline in short circuit current, the battery pack remained on test for an additional one hour after the current reached a low end steady state condition		N/A
	A single fault in the discharge protection circuit is conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test	Single fault conducted on four samples.	P
	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 on MOS (U2)	P

IEC 62133-2			
Access to the World			
Clause	Requirement + Test	Result - Remark	Verdict
	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		P
7.3.5	Crush (cells)		P
	The crushing force was released upon:		P
	- The maximum force of 13 kN ± 0,78 kN has been applied; or		P
	- An abrupt voltage drop of one-third of the original voltage has been obtained		N/A
	Results: no fire, no explosion.....:	(See appended table 7.3.5)	P
7.3.6	Over-charging of battery	Test Complied.	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	5.95V applied.	P
	- 1,2 times the upper limit charging voltage resented in Table A.1 per cell for series connected multi-cell batteries, and	1S1P	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
	- 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		P

IEC 62133-2			
Access to the World			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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)	Test 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	P
	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 for safety mentioned in manufacturer's specifications.	P
	Manufacturers of batteries provides information regarding how to minimize and mitigate hazards to equipment manufacturers or end-users	Information for safety mentioned in manufacturer's specifications.	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
	Do not allow children to replace batteries without adult supervision		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

IEC 62133-2			
Access to the World			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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	The final product is battery.	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	The battery is marked in accordance with IEC 61960, see page 3.	P
	Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity	Not coin battery.	N/A
	Batteries are marked with an appropriate caution statement	See page 3.	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:	Information is given in manufacturer's specifications.	P
	- Storage and disposal instructions	Information is given in manufacturer's specifications.	P

IEC 62133-2 Access to the World			
Clause	Requirement + Test	Result - Remark	Verdict
	- Recommended charging instructions		P

10	PACKAGING AND TRANSPORT		N/A
	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	Complied.	P
A.3	Consideration on charging voltage	Complied.	P
A.3.1	General	Max. Charging voltage 4.25V for the pack.	P
A.3.2	Upper limit charging voltage	4.25V	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	4.25V applied.	P
A.4	Consideration of temperature and charging current		P
A.4.1	General		P
A.4.2	Recommended temperature range	Charging temperature range declared by client is 0-45°C	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	P
A.4.3	High temperature range	45°C	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	45°C applied.	N/A
A.4.4	Low temperature range	Charging lower temperature declared by client 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		P

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Clause	Requirement + Test	Result - Remark	Verdict
A.4.5	Scope of the application of charging current		P
A.4.6	Consideration of discharge		P
A.4.6.1	General		P
A.4.6.2	Final discharge voltage and explanation of safety viewpoint		P
A.4.6.3	Discharge current and temperature range		P
A.4.6.4	Scope of application of the discharging current		P
A.5	Sample preparation		P
A.5.1	General		P
A.5.2	Insertion procedure for nickel particle to generate internal short		P
A.5.3	Disassembly of charged cell		P
A.5.4	Shape of nickel particle		P
A.5.5	Insertion of nickel particle in cylindrical cell		N/A
A.5.5.1	Insertion of nickel particle in winding core		N/A
A.5.5.2	Marking the position of the nickel particle on both ends of the winding core of the separator		N/A
A.5.6	Insertion of nickel particle in prismatic cell		P
A.6	Experimental procedure of the forced internal short-circuit test		P
A.6.1	Material and tools for preparation of nickel particle		P
A.6.2	Example of a nickel particle preparation procedure		P
A.6.3	Positioning (or placement) of a nickel particle		P
A.6.4	Damaged separator precaution		P
A.6.5	Caution for rewinding separator and electrode		P
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		N/A
ANNEX C	RECOMMENDATIONS TO THE END-USERS		N/A
ANNEX D	MEASUREMENT OF THE INTERNAL AC RESISTANCE FOR COIN CELLS		N/A

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



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Clause	Requirement + Test	Result - Remark		Verdict

TABLE: Critical components information					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity ¹⁾
PCB	Interchangeable	Interchangeable	V-0, 130°C	UL796	UL approved
Tap	Interchangeable	Interchangeable	130°C	UL510	UL approved
IC (U1)	Techpublic	DW01	V _{cu} : 4.25-4.31V, V _{pL} : 2.9-3.1V, ToPR:-40°C-95°	--	Tested with appliance
MOS (U2)	Fuman Microelectronics Group Co., LTD	8205A	V _{GS} : ±12V V _{DS} : 20V	--	Tested with appliance
Cell		FL602030	3.7V, 300mAh	IEC 62133-2: 2017, IEC 62133-2:2017/AMD1:2021	Test with appliance
-Positive electrode	Shenzhen Ruiyuan New energy Technology Co., LTD	RYNCM-HT523	LiNi0.5Co0.2Mn0.3O2 , Aluminum Foil	--	--
-Negative electrode	Shenzhen Sheng lithium new material Co., LTD	G08	Graphite, Copper Foil	--	--
-Separator	Shenzhen Shunjia material Co., LTD	16μm	PE, Shutdown temperature: 130°C	--	--
-Electrolyte	Xu Chang Zidu new energy Co., LTD.	ZD-DZWH-2001	LiPF6+EC+DEC+EMC	--	--
Supplementary information: ¹⁾ Provided evidence ensures the agreed level of compliance.					

7.2.1	TABLE: Continuous charging at constant voltage (cells)				P
Model	Recommended charging voltage V _c , (Vdc)	Recommended charging current I _{rec} , (A)	OCV at start of test, (Vdc)	Results	
Cell #01	4.20	0.15	4.15	P	
Cell #02	4.20	0.15	4.15	P	
Cell #03	4.20	0.15	4.14	P	
Cell #04	4.20	0.15	4.14	P	
Cell #05	4.20	0.15	4.14	P	
Supplementary information:					
- No fire					
- No Explosion					
- No leakage					

7.3.1	TABLE: External short circuit (cell)					P
Model	Ambient, (°C)	OCV at start of test, (Vdc)	Resistance of circuit, (Ω)	Maximum case temperature rise ΔT _r , (°C)	Results	
Samples charged at charging temperature upper limit (55°C)						
Cell #06	55.1	4.14	0.086	109.2	P	
Cell #07	55.1	4.15	0.085	112.4	P	
Cell #08	55.1	4.14	0.083	111.7	P	
Cell #09	55.1	4.15	0.083	117.4	P	
Cell #10	55.1	4.14	0.086	113.8	P	
Samples charged at charging temperature lower limit (0°C)						
Cell #11	55.1	4.10	0.085	111.1	P	
Cell #12	55.1	4.09	0.082	120.0	P	
Cell #13	55.1	4.09	0.088	111.3	P	
Cell #14	55.1	4.11	0.086	114.6	P	
Cell #15	55.1	4.09	0.087	111.9	P	
Supplementary information:						
- No fire						
- No Explosion						

7.3.2	TABLE: External short circuit (battery)					P
Model	Ambient, (°C)	OCV at start of test, (Vdc)	Resistance of circuit, (Ω)	Maximum case temperature rise ΔT_r , (°C)	Results	
Battery #01	24.1	4.15	0.084	110.3	P	
Battery #02	24.1	4.15	0.083	118.6	P	
Battery #03	24.1	4.14	0.088	113.5	P	
Battery #04	24.1	4.14	0.086	112.8	P	
Battery #05	24.1	4.14	0.088	24.6	P	
Supplementary information: Single fault: Short U2 Pin(1, 3) of Battery #01~#04 - No fire - No Explosion						

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 (55°C)					
C029	4.13	4.13	13.0	P	
C030	4.15	4.14	13.1	P	
C031	4.15	4.14	13.1	P	
C032	4.14	4.14	13.1	P	
C033	4.14	4.13	13.1	P	
Samples charged at charging temperature lower limit(0°C)					
C034	4.09	4.09	13.0	P	
C035	4.11	4.10	13.0	P	
C036	4.10	4.08	13.1	P	
C037	4.11	4.10	13.1	P	
C038	4.10	4.09	13.1	P	
Supplementary information: - No fire or explosion					

7.3.6	TABLE: Over-charging of battery				P
Constant charging current (A).....:			0.6		—
Supply voltage (Vdc).....:			5.95		—
Model	OCV before charging, (Vdc)	Total charging time (minute)	Maximum outer casing temperature, (°C)	Results	
Battery #09	3.21	60	30.2	P	
Battery #10	3.22	60	30.3	P	
Battery #11	3.21	60	29.8	P	
Battery #12	3.25	60	29.9	P	
Battery #13	3.24	60	30.1	P	
Supplementary information:					
- Leakage					
- Fire					
- Explosion					
Test Ambient is 23.4°C.					

7.3.7	TABLE: Forced discharge (cells)				P
Model	OCV before application of reverse charge, (Vdc)	Measured Reverse Charge I _r , (A)	Lower limit discharge voltage (Vdc)	Results	
Cell #39	3.23	0.3	2.75	P	
Cell #40	3.20	0.3	2.75	P	
Cell #41	3.22	0.3	2.75	P	
Cell #42	3.22	0.3	2.75	P	
Cell #43	3.24	0.3	2.75	P	
Supplementary information: - No fire - No 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	
Battery #11	4.16	4.15	6.404	6.404	P	
Battery #12	4.15	4.15	6.399	6.399	P	
Battery #13	4.15	4.15	6.408	6.418	P	
Supplementary information: - No fire or explosion - The ambient temperature is 23.6°C						

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	
Battery #14	4.15	4.15	6.395	6.395	P	
Battery #15	4.15	4.15	6.397	6.397	P	
Battery #16	4.14	4.14	6.409	6.409	P	
Supplementary information: - No fire or explosion - The ambient temperature is 23.6°C						

7.3.9	TABLE: Forced internal short circuit (cells)					P
Model	Chamber ambient, (°C)	OCV at start of test, (Vdc)	Particle location ¹⁾	Maximum applied pressure, (N)	Results	
Cell #44	45	4.14	1	400	P	
Cell #45	45	4.15	1	400	P	
Cell #46	45	4.14	1	400	P	
Cell #47	45	4.14	1*	400	P	
Cell #48	45	4.15	1*	400	P	
Cell #49	0	4.10	1	400	P	
Cell #50	0	4.09	1	400	P	
Cell #51	0	4.09	1	400	P	
Cell #52	0	4.10	1*	400	P	
Cell #53	0	4.10	1*	400	P	
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. - No fire or explosion - No leakage						

Photo

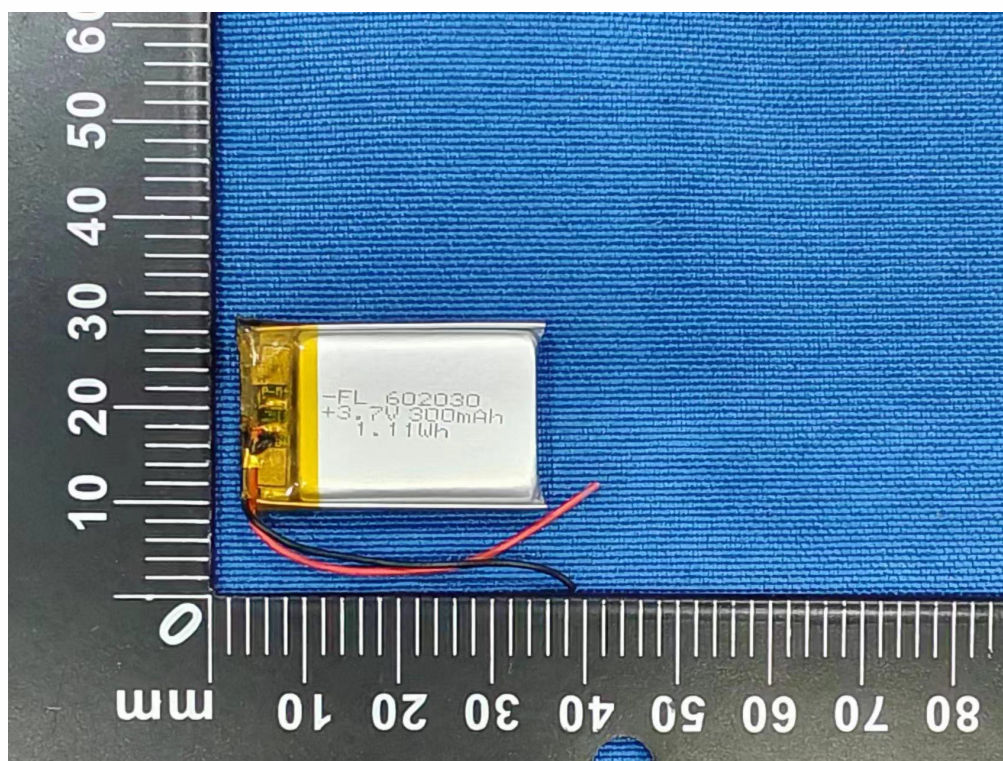


Figure 1 Over view of battery

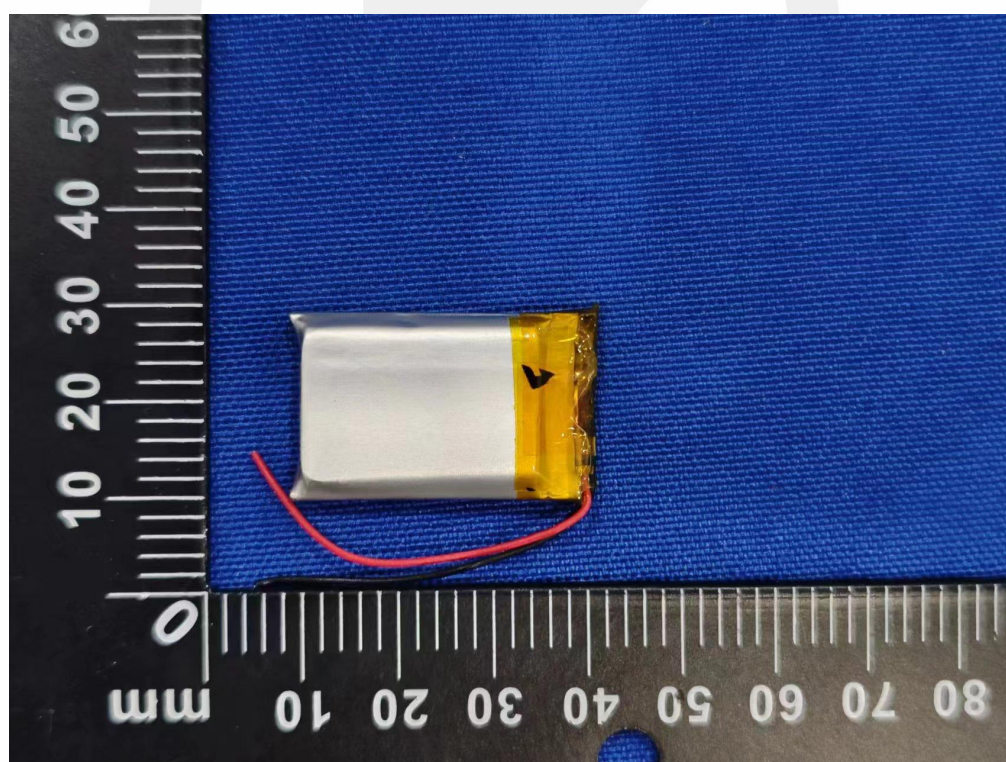


Figure 2 Back view of Battery

Photo

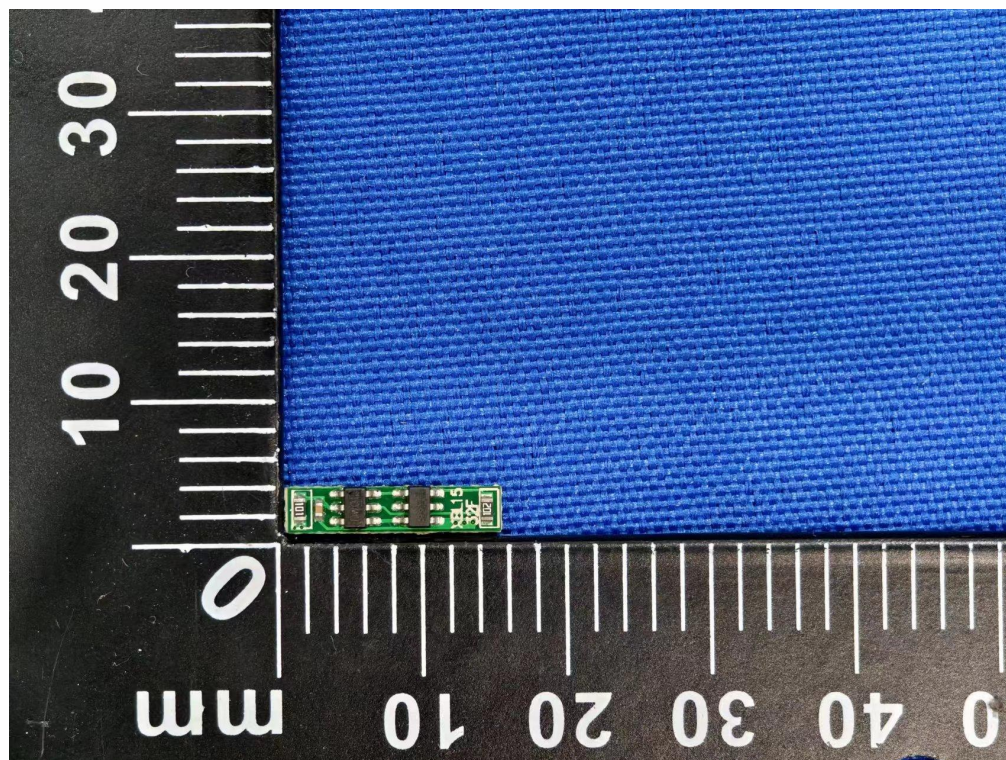


Figure 2 Front view of PCB

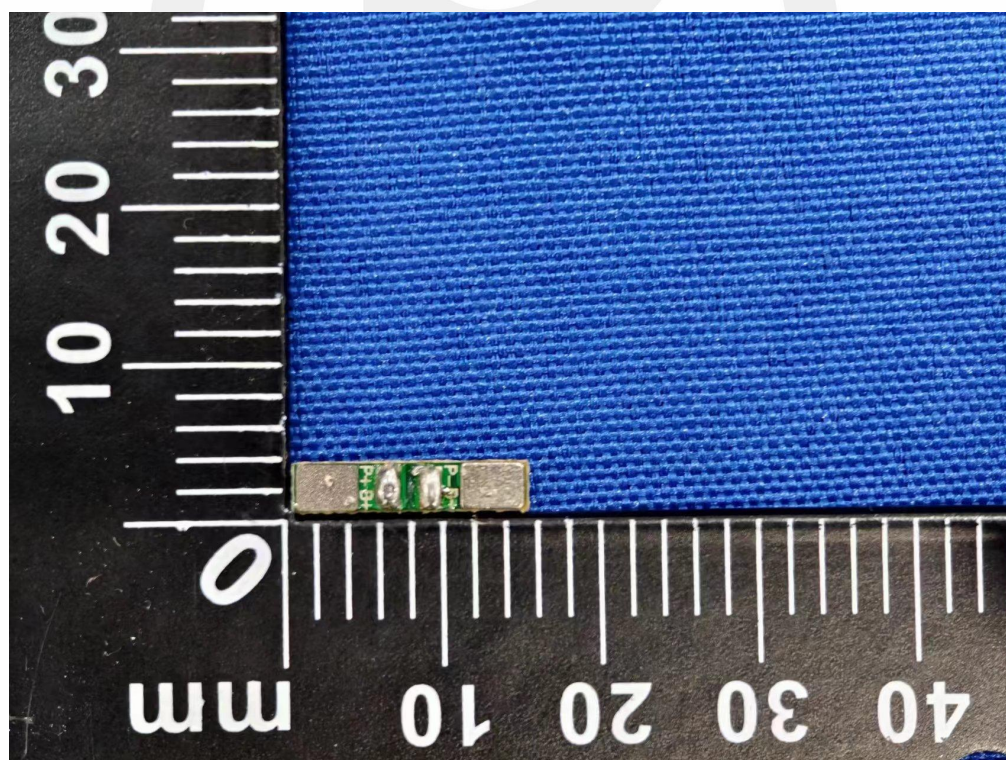


Figure 4 Back view of PCB

Photo

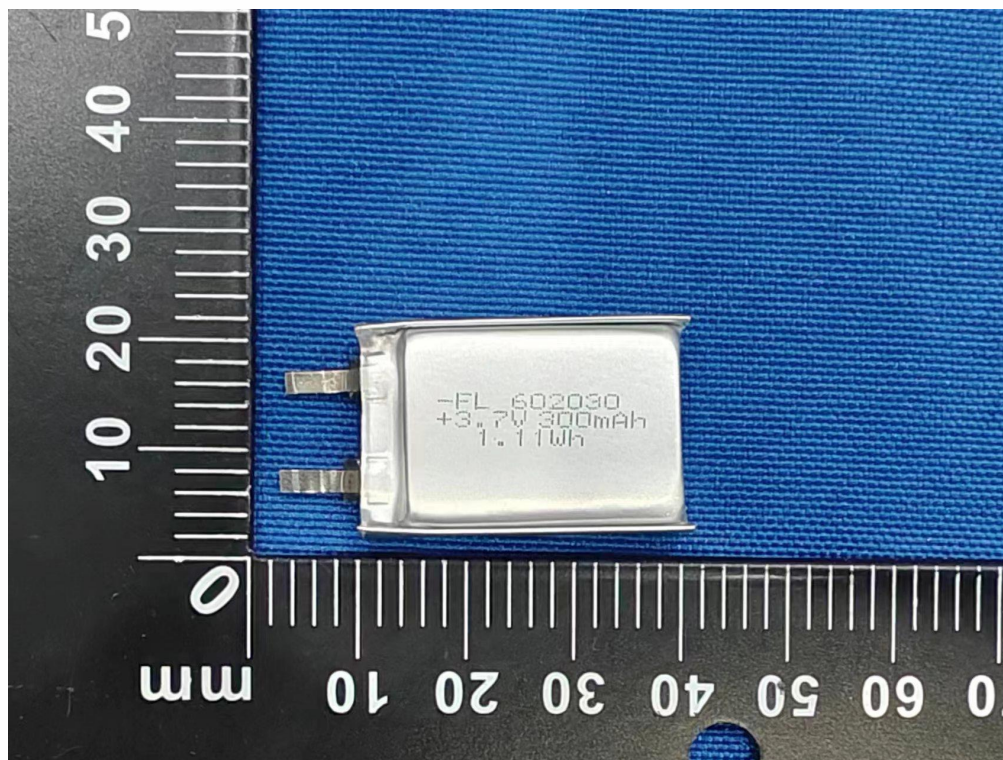


Figure 5 Front view of Cell

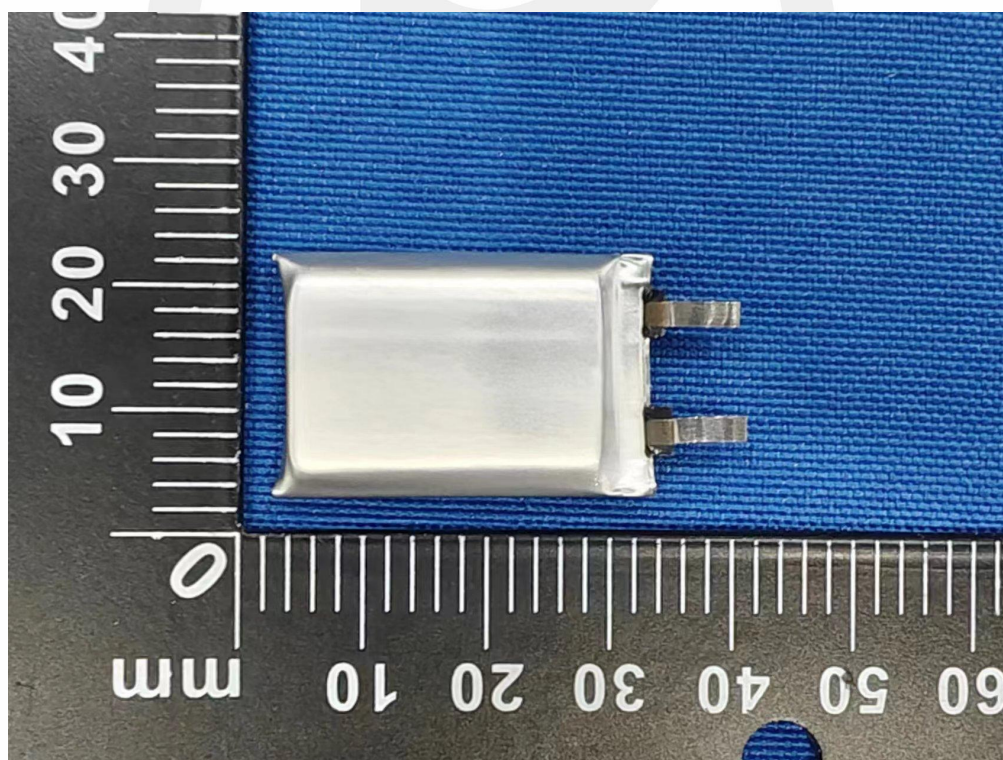


Figure 6 Side view of Cell

■ End of Report –

声明

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