

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, use in portable applications — Part 2: Lithium systems	
Test Report No.....	RSH200911050-SF
Tested by (+ signature)	Tilly Liu <i>Tilly Liu</i>
Reviewed by (+ signature).....	David Yang
Date of issue.....	2020-12-02
Testing laboratory.....	Bay Area Compliance Laboratories Corp. (Dongguan)
Address	No.69, Pulongcun, Puxinhu Industry Area, Tangxia, Dongguan, Guangdong, China
Testing location.....	1F., No.91,Luyi Road, Tianxin Community, Tangxia Town, Dongguan, Guangdong/523718
Applicant's name.....	M5Stack Technology Co., Ltd
Address.....	106, 1st Floor, Building 1, Bright Technology Park, 88 Zhuguang North Road, Xili Taoyuan Street, Nanshan District, Shenzhen, Guangdong,China
Manufacturer's name.....	DONGGUAN FLYOUNG ENERGY ELECTRONIC CO.,LTD
Address.....	4F, A4 Buildings, 1 Zone, Songhu Zhigu Research and Development Center Liaobu Town,Dongguan City
Test specification:	
Standard	IEC 62133-2:2017
Test Report Form No.....	IEC62133_2A
Test Report Form(s) Originator	DEKRA
Master TRF	Dated 2017-08-10
Test item description:	
Product designation.....	Rechargeable Li-ion Polymer Battery
Model/Type reference	302030
Ratings.....	3.7V, 140mAh, 0.5Wh

Note: The test data was only valid for the test sample(s). This test report is prepared for the customer shown above and for the specific product described herein. It must not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Dongguan).

Summary of testing:

Tests performed (name of test and test clause):

Test items:

cl.7.1 Charging procedure for test purposes
(for Cells and Batteries);
cl.7.2.1 Continuous charging at constant voltage
(Cells);
cl.7.3.1 External short circuit (Cells);
cl.7.3.2 External short circuit (Batteries);
cl.7.3.3 Free fall (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);
Tests are made with the number of cells and
batteries specified in IEC 62133-2:2017.

Testing location:

**Bay Area Compliance Laboratories Corp.
(Dongguan)**

1F., No.91, Luyi Road, Tianxin Community,
Tangxia Town, Dongguan, Guangdong/523718

Summary of compliance with National Differences:

N/A

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.

Rechargeable Li-ion Polymer Battery

Model: 302030 (ICP4/21/31)

3.7V 140mAh 0.5Wh

Manufacturer: DONGGUAN FLYOUNG ENERGY ELECTRONIC CO.,LTD

Date: YYYY-MM-DD

Red wire: + Black wire: -

Made in China



Test item particulars:	
Classification of installation and use.....:	Build-in and use in portable application
Supply connection	DC Wire
Recommend charging method declared by the manufacturer.....:	CC/CV
Discharge current (0.2I_t A)	28mA
Specified final voltage.....:	2.75V
Maximum charging current.....:	70mA
Charging temperature upper limit.....:	45°C
Charging temperature lower limit.....:	10°C
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement	P (Pass)
- test object does not meet the requirement.....:	F (Fail)
Testing:	
Date of receipt of test item	2020-09-15
Date (s) of performance of tests	2020-09-21 to 2020-10-25
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. The information is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report. "(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 point is used "." as the decimal separator.	

General product information:

This battery is constructed with one cell, and has overcharge, over-discharge, over current and short-circuits proof circuit.

The main features of the battery are shown as below:

Model	Nominal Capacity	Nominal Voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
302030	140mAh	3.7V	28mA	28mA	70mA	140mA	4.20V	2.75V

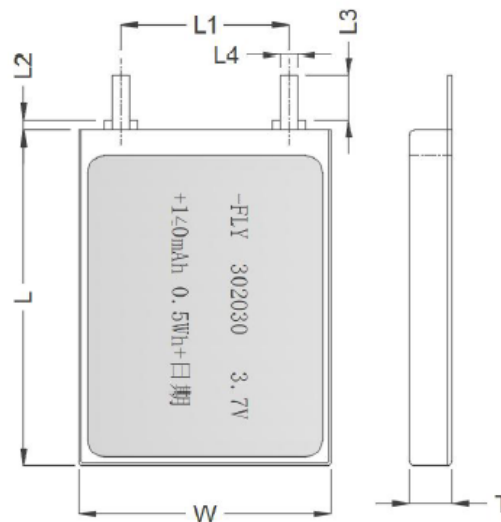
The main features of the cell are shown as below:

Model	Nominal Capacity	Nominal Voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
302030	140mAh	3.7V	28mA	28mA	70mA	140mA	4.20V	2.75V

The main features of the cell are shown as below:

Model	Upper limit charge voltage	Taper-off current	Lower charge temperature	Upper charge temperature
302030	4.20V	7mA	10°C	45°C

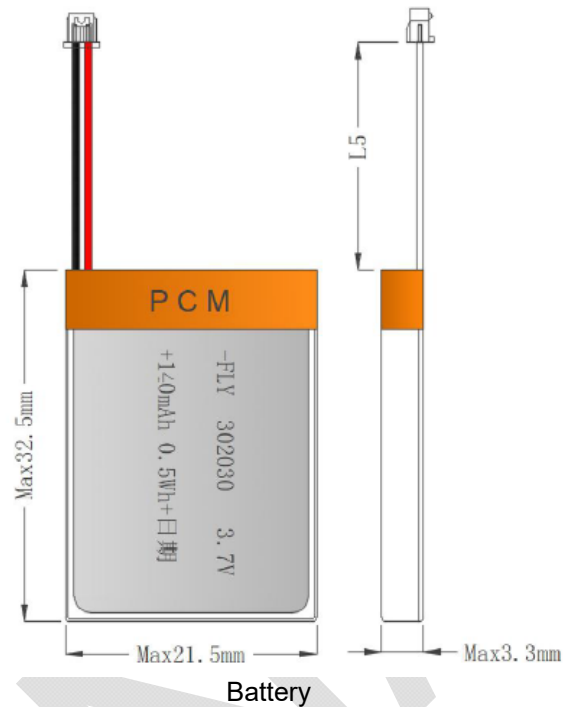
Construction: (Unit: mm)



Cell

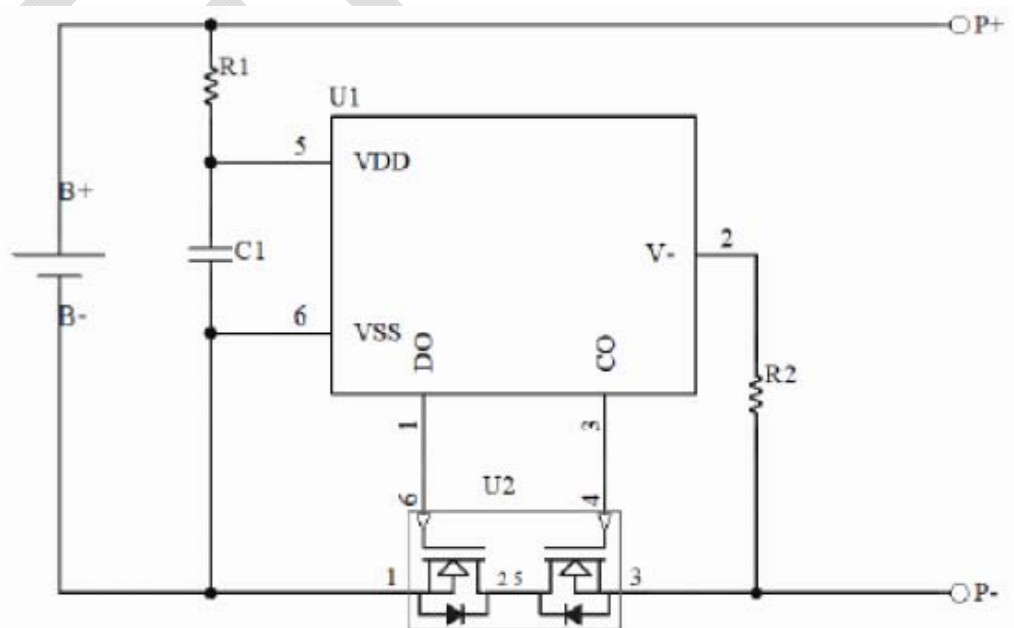
T (max.): W (max): H (max.)= 3.3mm:21.0mm:31.0mm

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T (max.): W (max.): H (max.)= 3.30mm:21.5mm:32.5mm

The principle diagram of the PCB:



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IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
4	PARAMETER MEASUREMENT TOLERANCES		P
	Parameter measurement tolerances		P
5	GENERAL SAFETY CONSIDERATIONS		P
5.1	General		P
	Cells and batteries so designed and constructed that they are safe under conditions of both intended use and reasonably foreseeable misuse		P
5.2	Insulation and wiring		P
	The insulation resistance between the positive terminal and externally exposed metal surfaces of the battery (excluding electrical contact surfaces) is not less than 5 MΩ	No metal surface 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	Vent design in 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		P
5.4	Temperature, voltage and current management		P
	Batteries are designed such that abnormal temperature rise conditions are prevented		N/A
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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 the user manual.	P
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		N/A
	Terminal contacts are arranged to minimize the risk of short-circuit.		P
5.6	Assembly of cells into batteries	Single cell battery.	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		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		N/A
	Protective circuit components added as appropriate and consideration given to the end-device application		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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	1S1P	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
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that charging is stopped when the upper limit of the charging voltage is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks		N/A
	For batteries consisting of series-connected cells or cell blocks, nominal charge voltage not be counted as an overcharge protection		N/A
	For batteries consisting of series-connected cells or cell blocks, cells have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer		N/A
	It is recommended that the cells and cell blocks not discharged beyond the cell manufacturer's specified final voltage		P
	For batteries consisting of series-connected cells or cell blocks, cell balancing circuitry incorporated into the battery management system		N/A
5.6.3	Mechanical protection for cells and components of batteries		P
	Mechanical protection for cells, cell connections and control circuits within the battery provided to prevent damage as a result of intended use and reasonably foreseeable misuse.		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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		P
5.8	Battery safety components		P
	According annex F		P
6	TYPE TEST AND SAMPLE SIZE		P
	Tests are made with the number of cells or batteries specified in Table 1 using cells or batteries that are not more than six months old		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 $20^\circ\text{C} \pm 5^\circ\text{C}$	Tests are carried out at $20^\circ\text{C} \pm 5^\circ\text{C}$.	P
	The safety analysis of 5.6.1 identify those components of the protection circuit that are critical for short-circuit, overcharge and overdischarge protection		P
	When conducting the short-circuit test, consideration given to the simulation of any single fault condition that is likely to occur in the protecting circuit that would affect the short-circuit test	MOSFET	P
7	SPECIFIC REQUIREMENTS AND TESTS		P
7.1	Charging procedure for test purposes		P

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Clause	Requirement + Test	Result - Remark	Verdict
7.1.1	First procedure		P
	This charging procedure applies to subclauses other than those specified in 7.1.2		P
	Unless otherwise stated in this document, the charging procedure for test purposes is carried out in an ambient temperature of $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$, using the method declared by the manufacturer		P
	Prior to charging, the battery have been discharged at $20^{\circ}\text{C} \pm 5^{\circ}\text{C}$ at a constant current of 0,2 It A down to a specified final voltage		P
7.1.2	Second procedure		P
	This charging procedure applies only to 7.3.1, 7.3.4, 7.3.5, and 7.3.9		P
	After stabilization for 1h and 4h, 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 0,05ItA, using a 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)		N/A
	Oven temperature ($^{\circ}\text{C}$)..... :		—
	Results: No physical distortion of the battery case resulting in exposure of internal protective components and cells		N/A
7.3	Reasonably foreseeable misuse		P
7.3.1	External short-circuit (cell)		P
	The cells were tested until one of the following occurred:		—
	- 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise		P

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Clause	Requirement + Test	Result - Remark	Verdict
	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:		—
	- 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		N/A
	A single fault in the discharge protection circuit conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test		P
	A single fault applies to protective component parts such as MOSFET, fuse, thermostat or positive temperature coefficient (PTC) thermistor	MOSFET	P
	Results: No fire. No explosion..... :	(See appended table 7.3.2).	P
7.3.3	Free fall	1.0m	P
	Results: No fire. No explosion	No fire. No explosion	P
7.3.4	Thermal abuse (cells)		P
	Oven temperature (°C)..... :	130°C	—
	Results: No fire. No explosion	No fire. No explosion	P
7.3.5	Crush (cells)		P
	The crushing force was released upon:		—
	- The maximum force of 13 kN ± 0,78 kN has been applied;		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	5.88V	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- 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	0.28A	P
	Test was continued until the temperature of the outer casing:		P
	- Reached steady state conditions (less than 10 °C change in 30-minute period); or		N/A
	- Returned to ambient		P
	Results: No fire. No explosion..... :	(See appended table 7.3.6).	P
7.3.7	Forced discharge (cells)		P
	If the discharge voltage reaches the negative value of upper limit charging voltage within the testing duration, the voltage is maintained at the negative value of the upper limit charging voltage by reducing the current for the remainder of the testing duration		N/A
	If the discharge voltage does not reach the negative value of upper limit charging voltage within the testing duration, the test is terminated at the end of the testing duration		P
	Results: No fire. No explosion..... :	(See appended table 7.3.7).	P
7.3.8	Mechanical tests (batteries)		P
7.3.8.1	Vibration		P
	Results: No fire, no explosion, no rupture, no leakage or venting. :	(See appended table 7.3.8.1).	P
7.3.8.2	Mechanical shock		P
	Results: No leakage, no venting, no rupture, no explosion and no fire :	(See appended table 7.3.8.2).	P
7.3.9	Design evaluation – Forced internal short-circuit (cells)	Polymer cell.	N/A
	The cells complied with national requirement for :	France, Japan, Korea, Switzerland	—
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	Results: No fire		N/A
8	INFORMATION FOR SAFETY		P
8.1	General		P
	Manufacturers of secondary cells ensure that information is provided about current, voltage and temperature limits of their products	Show in cell specification	P
	Manufacturers of batteries ensure that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards		P
	Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product		P
	As appropriate, any information relating to hazard avoidance resulting from a system analysis provided to the end user		P
	Do not allow children to replace batteries without adult supervision		P
8.2	Small cell and battery safety information		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		N/A
	Cells marked as specified in IEC 61960, except coin cells		N/A
	Coin cells whose external surface area is too small to accommodate the markings on the cells show the designation and polarity		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	By agreement between the cell manufacturer and the battery and/or end product manufacturer, component cells used in the manufacture of a battery need not be marked		N/A
9.2	Battery marking		P
	Batteries marked as specified in IEC 61960, except for coin batteries	Battery marked in accordance with IEC 61960.	P
	Coin batteries whose external surface area is too small to accommodate the markings on the batteries show the designation and polarity. Batteries also marked with an appropriate caution statement		N/A
	Terminals have clear polarity marking on the external surface of the battery		P
	Batteries with keyed external connectors designed for connection to specific end products need not be marked with polarity markings if the design of the external connector prevents reverse polarity connections	Red line connecting the "+", Back line connecting the "-".	P
9.3	Caution for ingestion of small cells and batteries		N/A
	Coin cells and batteries identified as small batteries according to 8.2 include a caution statement regarding the hazards of ingestion in accordance with 8.2		N/A
	When small cells and batteries are intended for direct sale in consumer-replaceable applications, caution for ingestion given on the immediate package		N/A
9.4	Other information		P
	Storage and disposal instructions	Information for disposal instructions mentioned in manufacturer's specifications.	P
	Recommended charging instructions	Information for disposal instructions mentioned in manufacturer's specifications.	P
10	PACKAGING AND TRANSPORT		P
	Packaging for coin cells not small enough to fit within the limits of the ingestion gauge of Figure 3		N/A

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	The materials and packaging design are chosen so as to prevent the development of unintentional electrical conduction, corrosion of the terminals and ingress of environmental contaminants		P

ANNEX A	CHARGING AND DISCHARGING RANGE OF SECONDARY LITHIUM ION CELLS FOR SAFE USE		P
A.1	General		P
A.2	Safety of lithium ion secondary battery		P
A.3	Consideration on charging voltage		P
A.3.1	General		P
A.3.2	Upper limit charging voltage		P
A.3.2.1	General		P
A.3.2.2	Explanation of safety viewpoint		P
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		P
A.4.2.1	General		P
A.4.2.2	Safety consideration when a different recommended temperature range is applied	Charging temperature range is 10°C~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		N/A
A.4.4	Low temperature range	10°C	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

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Clause	Requirement + Test	Result - Remark	Verdict
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		N/A
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	Pack specified final voltage 2.75V, not exceed 2.75V specified by cell manufacture.	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
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

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Clause	Requirement + Test	Result - Remark	Verdict
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		N/A
ANNEX D	MEASUREMENT OF THE INTERNAL AC RESISTANCE FOR COIN CELLS		N/A
D.1	General		N/A
D.2	Method		N/A
	A sample size of three coin cells is required for this measurement..... :	(See appended table D.2)	N/A
	Coin cells with an internal resistance of less than or equal to 3 Ω are subjected to the testing according to Clause 6 and Table 1		N/A
	Coin cells with an internal resistance greater than 3 Ω require no further testing		N/A
ANNEX E	PACKAGING AND TRANSPORT		N/A
ANNEX F	COMPONENT STANDARDS REFERENCES		P

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IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict

TABLE: Critical components information (#)					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity 1)
PCB	Shenzhen guangchengda Circuit Technology Co., Ltd	0402	15±0.1mm*3.2±0.1mm*0.6±0.1mm,	--	Tested with appliance
Protection IC (U1)	Shenzhen Dipu Electronic Co., Ltd	DW01	Over charge detection voltage: 4.25±0.1V Over discharge detection voltage: 2.45±0.15V	--	Tested with appliance
MOSFET (U2)	Shenzhen Dipu Electronic Co., Ltd	8205	Drain-Source VoltageVDS = 20V, Gate-Source VoltageVGS = +12V	--	Tested with appliance
Lead wire	DongGuanLingzhong Electronic Co., Ltd	3302	28# 0.8mm	--	Tested with appliance
Cell	DONGGUAN FLYOUNG ENERGY ELECTRONIC CO.,LTD	302030	3.7V, 140mAh	IEC62133-2:2017	Tested with appliance
-Positive electrode	Jiangmen KanHoo Industry CO., LTD	103	LiCoO ₂ , PVDF, Conductive, Copper Foil	--	Tested with appliance
-Negative electrode	DaLian Hongguang Lithium Co.,Ltd	HG-8D	Graphite, Conductive, Copper Foil	--	Tested with appliance
-Electrolyte	HENAN HUARUI ADVANCED MATERIALS TECHNOLOGY CO., LTD	HR306	Total dissolved solids(25 °C)9.4±0.5ms /cm, free acid(HF) ≤ 30PPM, water content(H2O) ≤ 10PPM	--	Tested with appliance

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IEC 62133-2: 2017					
Clause	Requirement + Test			Result - Remark	Verdict
-Separator	AsahiKASEI	16um	Width:19.0+0.5/-0mm, Shutdown temperature:135℃-140℃ single layer, thickness: 16um±2 um. Porosity≥36%	--	Tested with appliance
Supplementary information: 1) Provided evidence ensures the agreed level of compliance. See OD-CB2039.					
(#): The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.					

IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict

7.2.1	TABLE: Continuous charging at constant voltage (cells)			P
Sample no.	Recommended charging voltage Vc (Vdc)	Recommended charging current I _{rec} (mA)	OCV before test (Vdc)	Results
C-1	4.20	28	4.158	P
C-2	4.20	28	4.156	P
C-3	4.20	28	4.158	P
C-4	4.20	28	4.162	P
C-5	4.20	28	4.159	P
Supplementary information: - No fire or explosion - No leakage - Others (please explain)				

7.3.1	TABLE: External short-circuit (cell)				P
Sample no.	Ambient T (°C)	OCV before test (Vdc)	Resistance of circuit (mΩ)	Maximum case temperature (°C)	Results
Samples charged at charging temperature upper limit 45°C					
C-1	55.0	4.161	93.3	118.7	P
C-2	55.0	4.146	94.2	119.6	P
C-3	55.0	4.161	91.5	122.4	P
C-4	55.0	4.148	94.6	123.8	P
C-5	55.0	4.162	92.7	121.6	P
Samples charged at charging temperature lower limit 10°C					
C-6	55.0	4.068	93.3	118.6	P
C-7	55.0	4.069	94.2	125.2	P
C-8	55.0	4.074	91.5	119.3	P
C-9	55.0	4.069	94.6	124.5	P
C-10	55.0	4.075	92.7	122.2	P
Supplementary information: - No fire or explosion - Others (please explain)					

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IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.2	TABLE: External short-circuit (battery)					P
Sample no.	Ambient T (°C)	OCV before test (Vdc)	Resistance of circuit (mΩ)	Maximum case temperature (°C)	Component single fault condition	Results
B-1	22.0	4.156	93.4	102.8	Yes	P
B-2	22.0	4.154	92.3	101.3	Yes	P
B-3	22.0	4.156	93.5	22.4	NO	P
B-4	22.0	4.153	92.7	22.5	NO	P
B-5	22.0	4.157	94.6	22.7	NO	P

Supplementary information:

- No fire or explosion
- Others (please explain)

7.3.5	TABLE: Crush (cells)				P
Sample no.	OCV before test (Vdc)	OCV at removal of crushing force (Vdc)	Maximum force applied to the cell during crush (kN)	Results	
Samples charged at charging temperature upper limit 45°C					
C-1	4.148	4.148	13.060	P	
C-2	4.150	4.150	13.038	P	
C-3	4.147	4.147	13.066	P	
C-4	4.152	4.152	13.093	P	
C-5	4.145	4.145	13.072	P	
Samples charged at charging temperature lower limit 10°C					
C-6	4.076	4.076	13.040	P	
C-7	4.072	4.072	13.074	P	
C-8	4.071	4.071	13.109	P	
C-9	4.072	4.072	13.087	P	
C-10	4.076	4.076	13.099	P	

Supplementary information:

- No fire or explosion
- Others (please explain)

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IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict

7.3.6	TABLE: Over-charging of battery			P
Constant charging current (A)		0.28	—	
Supply voltage (Vdc)		5.88	—	
Sample no.	OCV before charging (Vdc)	Total charging time (minute)	Maximum outer case temperature (°C)	Results
B-1	3.425	30	27.8	P
B-2	3.436	30	27.7	P
B-3	3.424	30	27.9	P
B-4	3.513	30	27.4	P
B-5	3.428	30	27.8	P
Supplementary information: - No fire or explosion - Others (please explain)				

7.3.7	TABLE: Forced discharge (cells)			P
Sample no.	OCV before application of reverse charge (Vdc)	Measured reverse charge I_t (mA)	Lower limit discharge voltage (Vdc)	Results
C-1	3.415	140	2.75	P
C-2	3.422	140	2.75	P
C-3	3.520	140	2.75	P
C-4	3.429	140	2.75	P
C-5	3.437	140	2.75	P
Supplementary information: - No fire or explosion - Others (please explain)				

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
B-1	4.152	4.152	3.488	3.488	P
B-2	4.155	4.155	3.423	3.423	P
B-3	4.157	4.156	3.485	3.485	P

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IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict

Supplementary information:

- No fire or explosion
- No rupture
- No leakage
- No venting
- Others (please explain)

7.3.8.2	TABLE: Mechanical shock				P
Sample no.	OCV before test (Vdc)	OCV after test (Vdc)	Mass before test (g)	Mass after test (g)	Results
B-1	4.161	4.161	3.482	3.482	P
B-2	4.158	4.157	3.477	3.477	P
B-3	4.153	4.153	3.481	3.481	P

Supplementary information:

- No fire or explosion
- No rupture
- No leakage
- No venting
- Others (please explain)

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:

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
- Others (please explain)

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

Supplementary information:

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

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List of test equipment used:

Instrument Name	No.	Manufacturer	Calibration Date	Due Date	Equipment status
Battery Crush Tester	T-08-BT002	GAOXIN	2020/05/07	2021/05/06	☒ Yes ☐ No
Battery Thermal Abuse Tester	T-08-BT005	GAOXIN	2020/03/13	2021/03/12	☒ Yes ☐ No
Drop Tester	T-08-BT006	GAOXIN	2020/04/03	2021/04/02	☒ Yes ☐ No
Forced Internal Short Circuit Tester	T-08-BT007	BELL	2020/05/07	2021/05/06	☒ Yes ☐ No
Electric Vibration Test Machine	T-08-BT012	DONGLING	2020/09/11	2021/09/10	☒ Yes ☐ No
Hydraulic Shock Test Machine	T-08-SF275	DONGLING	2020/07/06	2021/07/05	☒ Yes ☐ No
Digital Multimeter	T-08-BT017	FLUKE	2020/04/08	2021/04/07	☒ Yes ☐ No
Stopwatch	T-08-BT021	LEAP	2020/03/31	2021/03/30	☒ Yes ☐ No
High-low Temperature Test Chamber	T-08-BT024	BACL	2020/03/11	2021/03/10	☒ Yes ☐ No
Multipath temperature tester	T-08-BT025	RONGXIN	2020/07/28	2021/07/27	☒ Yes ☐ No
Milliohmmeter	T-08-BT026	ViCi	2020/07/01	2021/06/30	☒ Yes ☐ No
Electronic Balance	T-08-BT027	YINGHENG	2020/08/26	2021/08/25	☒ Yes ☐ No
Battery Charge-Discharge Testing System	T-08-BT028	NEWARE	2020/10/13	2021/10/12	☒ Yes ☐ No
DC Power Supply	T-08-BT031	QJE	2020/03/16	2021/03/15	☒ Yes ☐ No
DC Power Supply	T-08-BT032	QJE	2020/03/16	2021/03/15	☒ Yes ☐ No
DC Power Supply	T-08-BT033	QJE	2020/03/16	2021/03/15	☒ Yes ☐ No
High-Low Temperature short-circuit Tester	T-08-BT037	GAOXIN	2020/05/12	2021/05/11	☒ Yes ☐ No
Battery Charge-Discharge Testing System	T-08-BT038	NEWARE	2020/03/18	2021/03/17	☒ Yes ☐ No
Battery Charge-Discharge Testing System	T-08-SF226	NEWARE	2020/06/10	2021/06/09	☒ Yes ☐ No

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Sample Photos

Photo 1

[✓] General view of battery

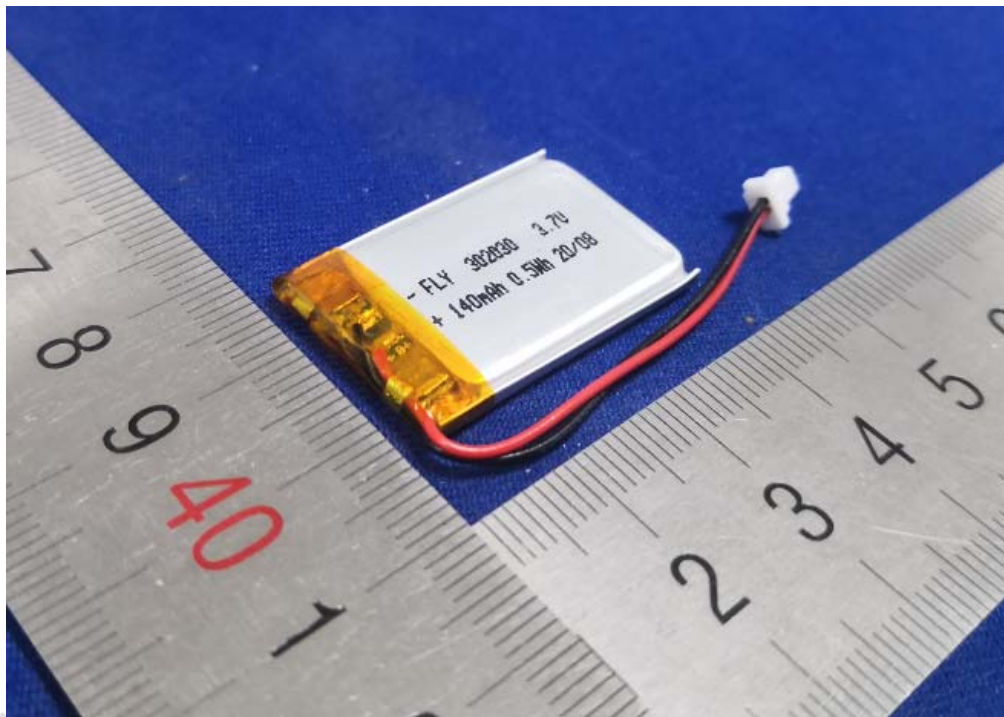
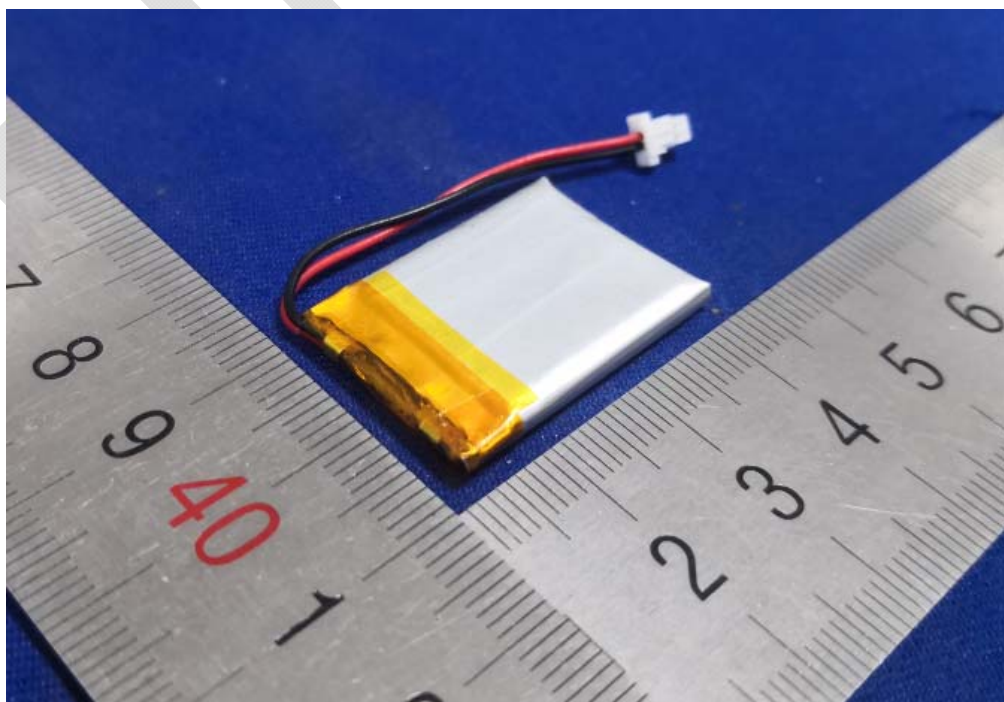


Photo 2

[✓] General view of battery



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Photo 3

[✓] General view of battery

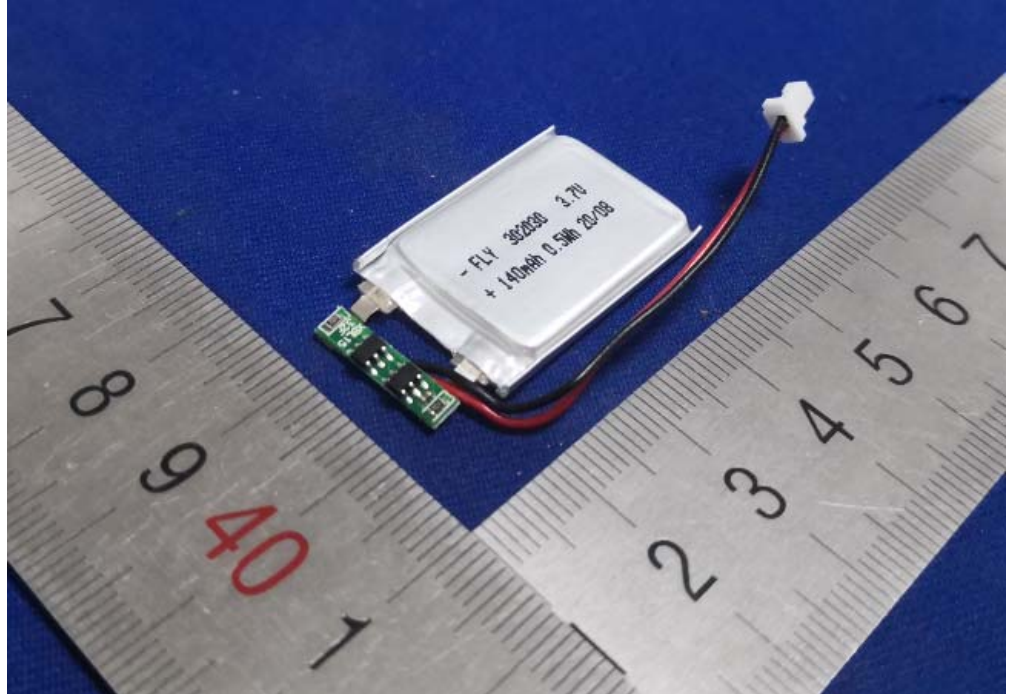
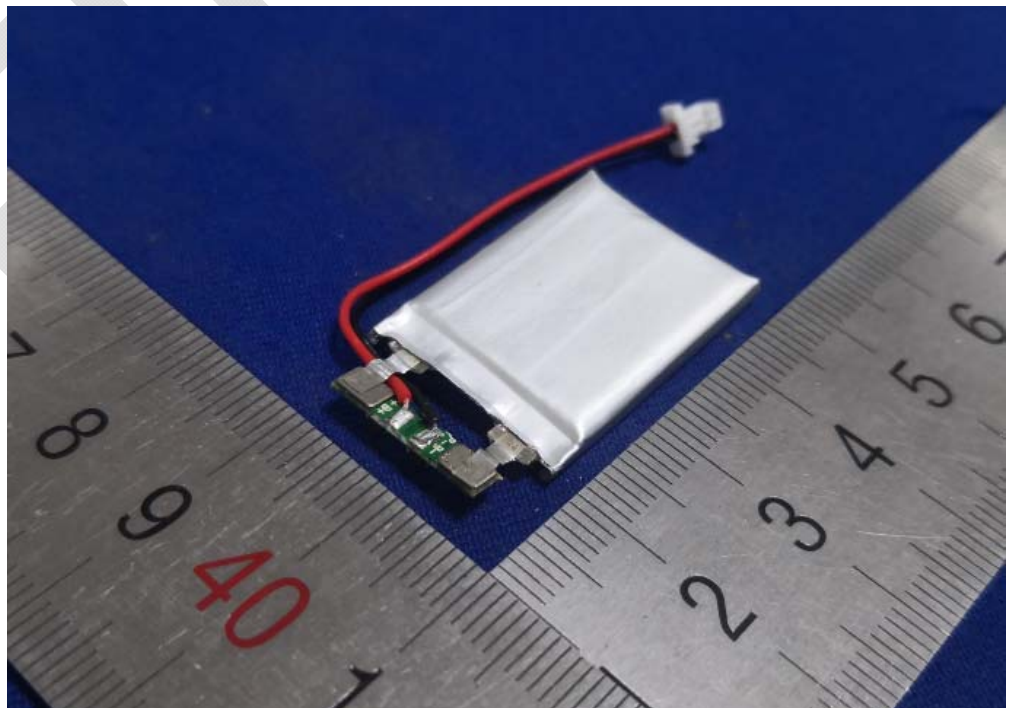


Photo 4

[✓] General view of battery



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Photo 5

[✓] General view of cell

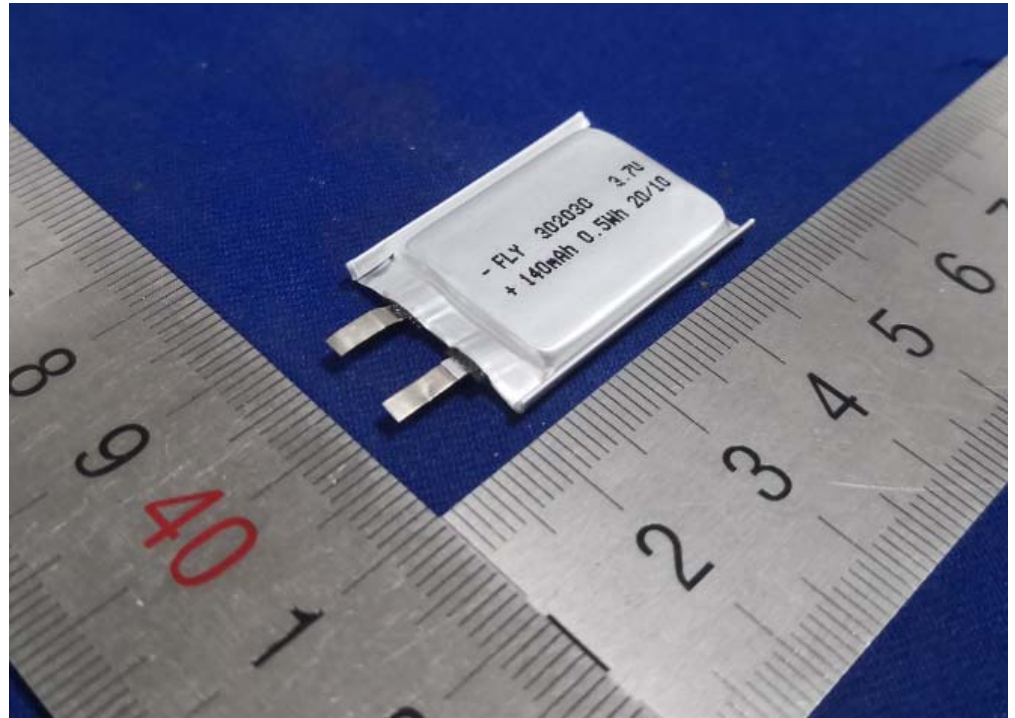
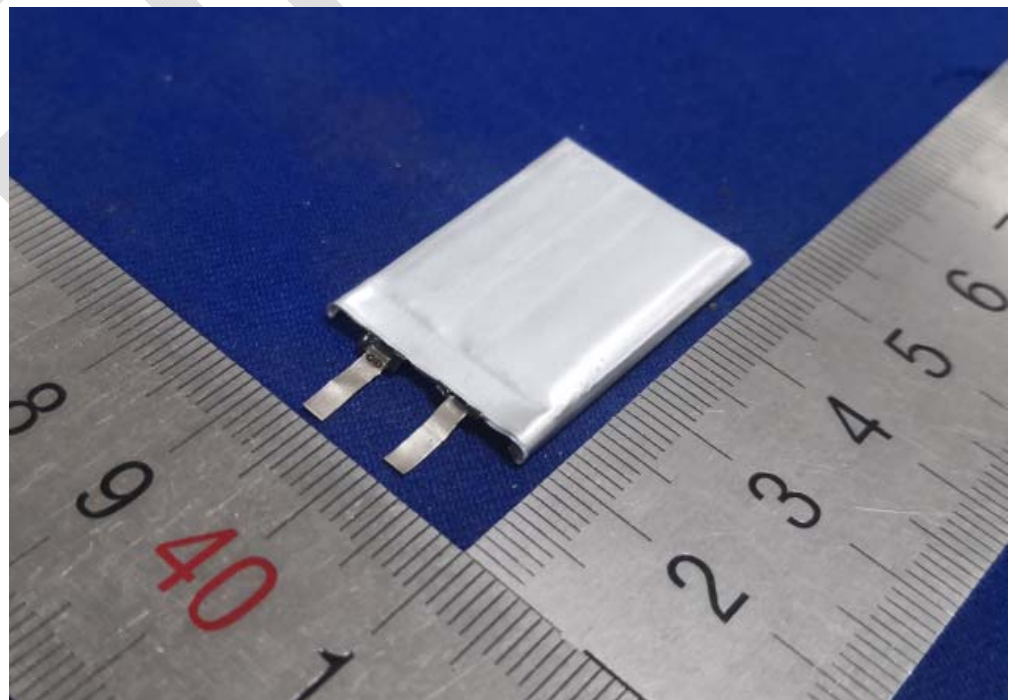


Photo 6

[✓] General view of cell



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Photo 7

[✓] General view of
PCB

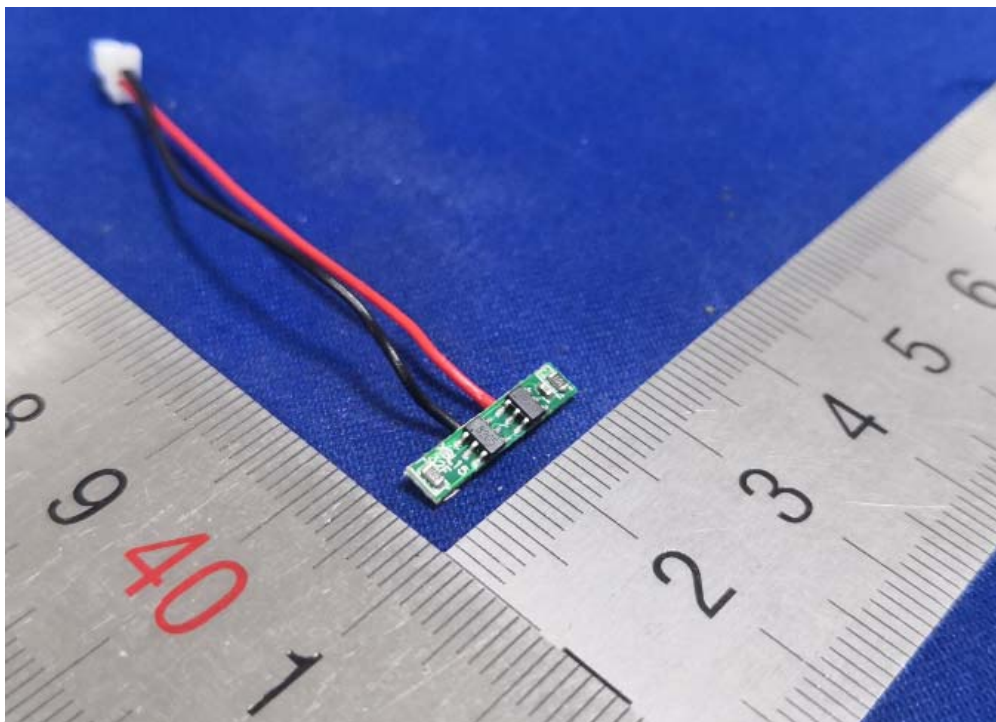
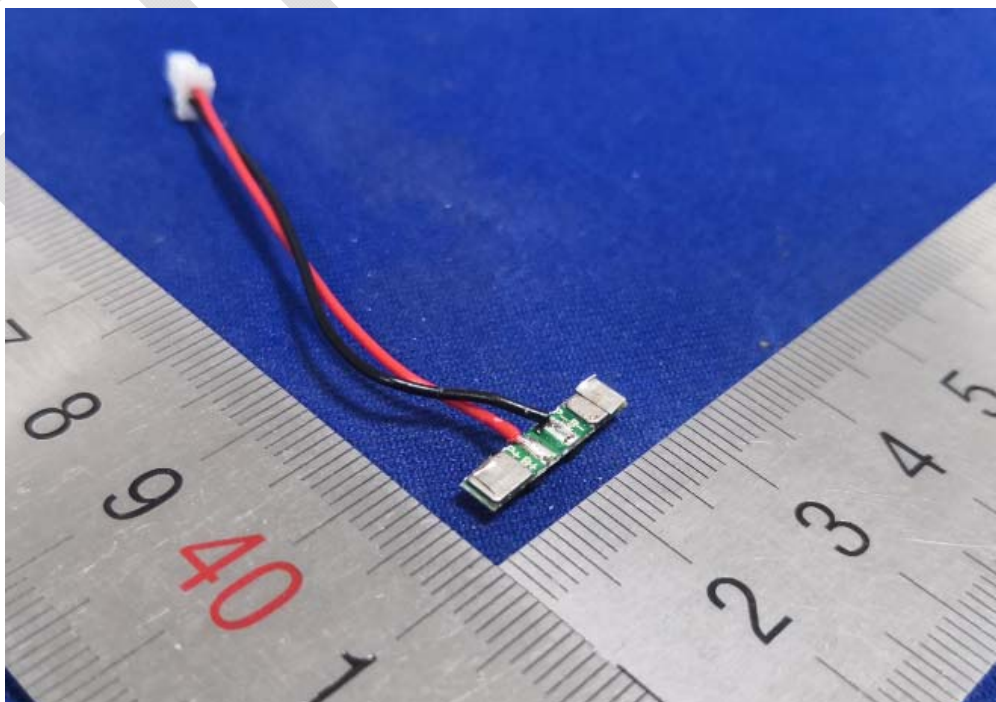


Photo 8

[✓] General view of
PCB



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Directions

1. The information marked # is provided by the applicant, the laboratory is not responsible for its authenticity and this information can affect the validity of the result in the test report.
2. Unless otherwise stated the results shown in this test report refer only to the sample(s) tested.
3. Otherwise required by the applicant or Product Regulations, Decision Rule in this report did not consider the uncertainty.
4. The extended uncertainty given in this report is obtained by combining the standard uncertainty times the coverage factor K with the 95% confidence interval.
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*****END OF REPORT*****