Test Report issued under the responsibility of

TEST REPORT
EN 62133
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

Report Reference No.....:	19PNS050067 04001
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Address .....:	Room 202, Floor 2, Building A, Yiquan Building,Fuqian Road No.436, Jitang Community, Guanlan Street, Longhua New District, Shenzhen City.
Test specification:	
Standard .....:	EN 62133: 2013 (Second Edition)
Test procedure .....:	N/A
Non-standard test method.....:	N/A
Test item description .....:	Li-ion Battery
Trade Mark .....:	AUN
Model/Type reference .....:	602030
Ratings .....:	3.7V, 300mAh, 1.11Wh

List of Attachments (including a total number of pages in each attachment):
- Photos documentation (3 pages)

Summary of testing:

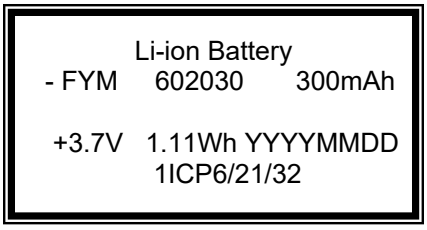
Tests performed (name of test and test clause):	**Testing location:**
Test items: cl.5.6.2 Design recommendation(Lithium system); cl.8.1 Charging procedure for test purposes (Cell and Battery) cl.8.2.1 Continuous charging at constant voltage (Cell) cl.8.3.1 External short circuit (Cell) cl.8.3.2 External short circuit (Battery) cl.8.3.3 Free fall (Cell and Battery) cl.8.3.4 Thermal abuse (Cell) cl.8.3.5 Crush (Cell) cl.8.3.6 Over-charging of battery cl.8.3.7 Forced Discharge (Cell) cl.8.3.8 Transport tests (Cell) cl.8.3.9 Design evaluation – Forced internal short circuit (Cell) The electrolyte type of this cell doesn't belong to polymer, and the additional test cl.8.3.9 was carried out to evaluate the cell. Tests are made with the number of batteries and cells specified in EN 62133: 2013 (Second Edition) Table 2.	All tests as described in Test Case and Measurement Sections were performed at the laboratory described on page 1.

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.



Test item particulars :	
Classification of installation and use :	N/A
Supply connection :	DC connector
Recommend charging method declaired by the manufacturer :	Charging the battery with 190mA constant current and 4.2V constant voltage until the current reduces to 15mA at ambient 20°C±5°C
Discharge current (0,2 I_t A) :	60mA
Specified final voltage :	3.0V
Chemistry :	☐ nickel systems ☒ lithium systems
Recommend of charging limit for lithium system	
Upper limit charging voltage per cell :	4.25V
Maximum charging current :	150mA
Charging temperature upper limit :	45°C
Charging temperature lower limit :	10°C
Polymer cell electrolyte type :	☐ gel polyme ☐ solid polymer ☒ N/A
Test case verdicts	
Test case does not apply to the test object :	N/A
Test item does meet the requirement :	P(Pass)
Test item does not meet the requirement :	F(Fail)
Testing	
Date of receipt of test item :	2019-05-15
Date(s) of performance of test :	2019-05-15 to 2019-05-30

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 testing laboratory.

Throughout this report a point (~~comma~~) is used as the decimal separator.

General product information:

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

The main features of the battery are shown as below (clause 8.1.1):

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
602030 (battery)	300mAh	3.7V	60mA	60mA	150mA	150mA	4.2V	2.75V

The main features of the battery are shown as below (clause 8.1.2):

Model	Upper limit charge voltage	Taper-off current	Lower charge temperature	Upper charge temperature
602030 (battery)	4.25V	15mA	10°C	45°C

The main features of the cell in the battery are shown as below (clause 8.1.1):

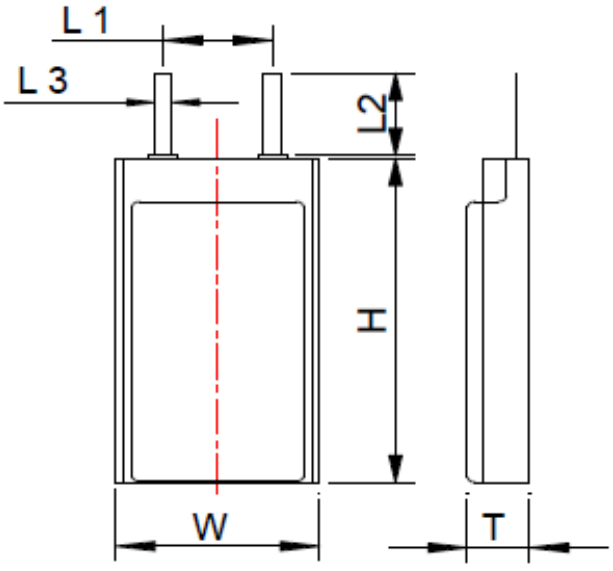
Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
602030 (cell)	300mAh	3.7V	60mA	60mA	150mA	150mA	4.2V	2.55V

The main features of the cell in the battery are shown as below (clause 8.1.2):

Model	Upper limit charge voltage	Taper-off current	Lower charge temperature	Upper charge temperature
602030 (cell)	4.25V	15mA	10°C	45°C

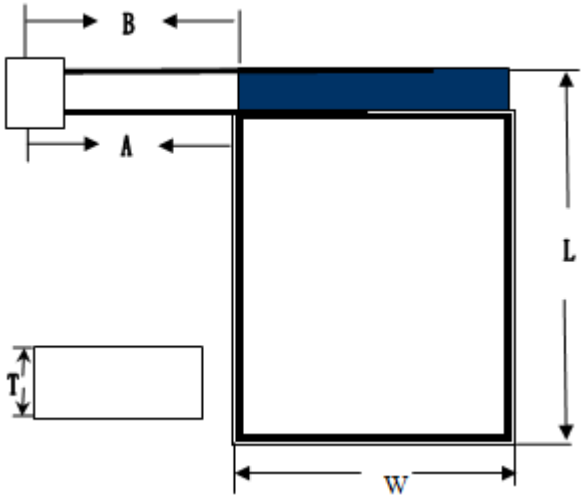
Construction:

Cell dimension:



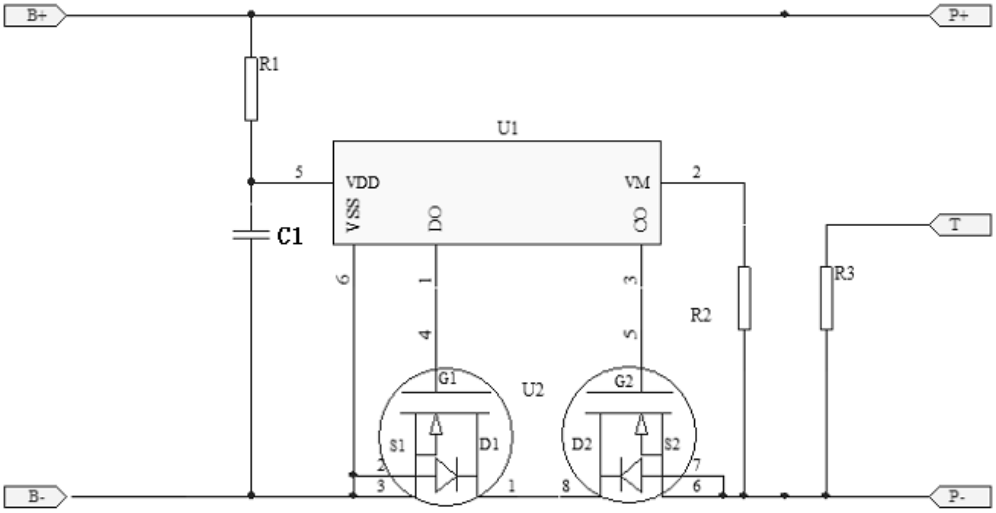
T(max.): W(max.) : H(max.):=6.0mm: 20.5mm: 32.0mm

Battery dimension:



T(max.): W(max.) : L(max.):=6mm: 20.5mm: 32.0mm

Circuit diagram:



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Clause	Requirement + Test	Result - Remark	Verdict
4	**Parameter measurement tolerances**		**P**
	Parameter measurement tolerances		P
5	**General safety considerations**		**P**
5.1	General		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 case 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 creepage and clearance 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	On the narrow side of the 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/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 8.	P
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer	See above.	P
	Batteries are provided with specifications and charging instructions for equipment manufacturers so that associated 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
	Terminals have a clear polarity marking on the external surface of the battery	See the marking on page 2	P

EN 62133			
Clause	Requirement + Test	Result - Remark	Verdict
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current		P
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance		P
	Terminal contacts are arranged to minimize the risk of short circuits		P
5.6	Assembly of cells into batteries		P
5.6.1	If there is more than one battery housed in a single battery case, cells used in the assembly of each battery have closely matched capacities, be of the same design, be of the same chemistry and be from the same manufacturer	Single cell battery	N/A
	Each battery has an independent control and protection		N/A
	Manufacturers of cells make recommendations about current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly		N/A
	Batteries that are designed for the selective discharge of a portion of their series connected cells incorporate separate circuitry to prevent the cell reversal caused by uneven discharges		N/A
	Protective circuit components are added as appropriate and consideration given to the end-device application		N/A
	When testing a battery, the manufacturer of the battery provides a test report confirming the compliance according to this standard		N/A
5.6.2	Design recommendation for lithium systems only		P
	For the battery consisting of a single cell or a single cellblock: - Charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Clause 8.1.2, Table 4; or	Charging voltage: 4.2V, not exceed 4.25V specified in Clause 8.1.2, Table 4.	P
	- Charging voltage of the cell does not exceed the different upper limit of the charging voltage determined through Clause 8.1.2, NOTE 1.		N/A
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks: - The voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Clause 8.1.2, Table 4, by monitoring the voltage of every single cell or the single cellblocks; or	Single cell battery.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	- The voltages of any one of the single cells or single cellblocks does not exceed the different upper limit of the charging voltage, determined through Clause 8.1.2, NOTE 1, 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: - Charging is stopped when the upper limit of the charging voltage, specified in Clause 8.1.2, Table 4, is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks; or		N/A
	- Charging is stopped when the upper limit of the different charging voltage, determined through Clause 8.1.2, NOTE 1, 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
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. ISO 9001 Certificate supplied.	P
6	**Type test conditions**		**P**
	Tests were made with the number of cells or batteries specified in Table 1 for nickel-cadmium and nickel-metal hydride systems and Table 2 for lithium systems, using cells or batteries that are not more than six months old	Complied. Table 2 for Lithium system.	P
	Unless noted otherwise in the test methods, testing was conducted in an ambient of 20°C ± 5°C.	Tests are carried out at 20°C ± 5°C.	P
7	**Specific requirements and tests (nickel systems)**		**N/A**
7.1	Charging procedure for test purposes	Lithium system.	N/A
7.2	Intended use		N/A
7.2.1	Continuous low-rate charging (cells)		N/A
	Results: No fire. No explosion		N/A
7.2.2	Vibration		N/A
	Results: No fire. No explosion. No leakage		N/A
7.2.3	Moulded case stress at high ambient temperature		N/A
	Oven temperature (°C) .....:		—
	Results: No physical distortion of the battery casing resulting in exposure if internal components		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.2.4	Temperature cycling		N/A
	Results: No fire. No explosion. No leakage.		N/A
7.3	Reasonably foreseeable misuse		N/A
7.3.1	Incorrect installation cell		N/A
	The test was carried out using: - Four fully charged cells of the same brand, type, size and age connected in series, with one of them reversed; or		N/A
	- A stabilized dc power supply.		N/A
	Results: No fire. No explosion .....:		N/A
7.3.2	External short circuit		N/A
	The cells or 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		N/A
	Results: No fire. No explosion .....:		N/A
7.3.3	Free fall		N/A
	Results: No fire. No explosion.		N/A
7.3.4	Mechanical shock (crash hazard)		N/A
	Results: No fire. No explosion. No leakage.		N/A
7.3.5	Thermal abuse		N/A
	Oven temperature (°C) .....:		—
	Results: No fire. No explosion.		N/A
7.3.6	Crushing of cells		N/A
	The crushing force was released upon: - The maximum force of 13 kN ± 1 kN has been applied; or		N/A
	- An abrupt voltage drop of one-third of the original voltage has been obtained		N/A
	The cell is prismatic type and a second set of samples was tested, rotated 90° around longitudinal axis compared to the first set		N/A
	Results: No fire. No explosion .....:		N/A
7.3.7	Low pressure		N/A
	Chamber pressure (kPa) .....:		—
	Results: No fire. No explosion. No leakage.		N/A
7.3.8	Overcharge		N/A
	Results: No fire. No explosion .....:		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
7.3.9	Forced discharge		N/A
	Results: No fire. No explosion .....:		N/A
8	**Specific requirements and tests (lithium systems)**		**P**
8.1	Charging procedures for test purposes		P
8.1.1	First procedure: This charging procedure applied to tests other than those specified in 8.1.2	Complied.	P
8.1.2	Second procedure: This charging procedure applied to the tests of 8.3.1, 8.3.2, 8.3.4, 8.3.5, and 8.3.9	Complied.	P
	If a cell's specified upper and/or lower charging temperature exceeds values for the upper and/or lower limit test temperatures of Table 4, the cells were charged at the specified values plus 5 °C for the upper limit and minus 5 °C for the lower limit	Charge temperature 10-45°C declared.	N/A
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1) .....:		P
	For a different upper limit charging voltage (i.e. other than for lithium cobalt oxide systems at 4,25 V), the applied upper limit charging voltage and upper limit charging temperatures were adjusted accordingly	4.25V applied.	N/A
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1) .....:		N/A
8.2	Intended use	See below.	P
8.2.1	Continuous charging at constant voltage (cells)	Tested complied.	P
	Results: No fire. No explosion .....:	(See Table 8.2.1)	P
8.2.2	Moulded case stress at high ambient temperature (battery)	No moulded casing exists	N/A
	Oven temperature (°C) .....:		—
	Results: No physical distortion of the battery casing resulting in exposure of internal components		N/A
8.3	Reasonably foreseeable misuse	See below.	P
8.3.1	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
	Results: No fire. No explosion .....:	(See Table 8.3.1)	P
8.3.2	External short circuit (battery)		P

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Clause	Requirement + Test	Result - Remark	Verdict
	The batteries were tested until one of the following occurred: - 24 hours elapsed; or		P
	- The case temperature declined by 20% of the maximum temperature rise		N/A
	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
	Results: No fire. No explosion ..... :	(See Table 8.3.2)	P
8.3.3	Free fall		P
	Results: No fire. No explosion.	No fire. No explosion.	P
8.3.4	Thermal abuse (cells)		P
	The cells were held at 130°C ± 2°C for: - 10 minutes; or	Tested complied.	P
	- 30 minutes for large cells (gross mass of more than 500 g as defined in IEC 62281)		N/A
	Oven temperature (°C) ..... :	130°C	—
	Gross mass of cell (g)..... :	<500g, small cell.	—
	Results: No fire. No explosion.	No fire. No explosion.	P
8.3.5	Crush (cells)		P
	The crushing force was released upon: - The maximum force of 13 kN ± 1 kN has been applied; or	Tested complied.	P
	- An abrupt voltage drop of one-third of the original voltage has been obtained; or		N/A
	- 10% of deformation has occurred compared to the initial dimension		N/A
	Results: No fire. No explosion ..... :	(See Table 8.3.5)	P
8.3.6	Over-charging of battery		P
	Test was continued until the temperature of the outer casing: - 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 Table 8.3.6)	P
8.3.7	Forced discharge (cells)		P
	Results: No fire. No explosion ..... :	(See Table 8.3.7)	P
8.3.8	Transport tests		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Manufacturer's documentation provided to show compliance with UN Recommendations on Transport of Dangerous Goods	T-1, T-2, T-3 and T-4 tested complied. No leakage, no venting, no short-circuit, no rupture, no explosion and no fire. T-5, See Table 8.3.8. T-6 is identical to clause 8.3.5.	P
8.3.9	Design evaluation – Forced internal short circuit (cells)	Tested complied.	P
	The cells complied with national requirement for ..... :	France, Japan, Korea and Switzerland.	—
	The pressing was stopped upon: - A voltage drop of 50 mV has been detected; or		N/A
	- The pressing force of 800 N (cylindrical cells) or 400 N (prismatic cells) has been reached	400 N	P
	Results: No fire.....:	(See Table 8.3.9)	P
9	**Information for safety**		**P**
	The manufacturer of secondary cells ensures that information is provided about current, voltage and temperature limits of their products.	Information for safety mentioned in manufacturer's specification.	P
	The manufacturer of batteries ensures that equipment manufacturers and, in the case of direct sales, end-users are provided with information to minimize and mitigate hazards.	Information for safety mentioned in manufacturer's specification.	P
	Systems analyses performed by device manufacturers to ensure that a particular battery design prevents hazards from occurring during use of a product		N/A
	As appropriate, information relating to hazard avoidance resulting from a system analysis is provided to the end user.....:		N/A
10	**Marking**		**P**
10.1	Cell marking		N/A
	Cells marked as specified in the applicable cell standards: IEC 61951-1, IEC 61951-2 or IEC 61960.	The final product is battery.	N/A
10.2	Battery marking		P
	Batteries marked in accordance with the requirements for the cells from which they are assembled.	See marking plate on page 2.	P
	Batteries marked with an appropriate caution statement.	Caution statement provided in the marking plate.	P
10.3	Other information		P

EN 62133			
Clause	Requirement + Test	Result - Remark	Verdict
	Storage and disposal instructions marked on or supplied with the battery.	Information for disposal instructions mentioned in manufacturer's specification.	P
	Recommended charging instructions marked on or supplied with the battery.	Information for recommended charging instructions mentioned in manufacturer's specification.	P
11	**Packaging**		**P**
	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 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	Charging voltage is 4.2V.	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		N/A
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied	4.25V 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: 10-45°C	P
A.4.3	High temperature range	Not higher than the temperature range specific in this standard.	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 high temperature range		N/A
A.4.3.4	Safety consideration when specifying new upper limit in high temperature range		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
A.4.4	Low temperature range	Charging low temperature declared by client is: 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 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.5	Sample preparation		P
A.5.1	General		P
A.5.2	Insertion procedure for nickel particle to generate internal short		P
	The insertion procedure carried out at 20°C±5°C and under -25 °C of dew point		P
A.5.3	Disassembly of charged cell		P
A.5.4	Shape of nickel particle		P
A.5.5	Insertion of nickel particle to cylindrical cell		N/A
A.5.5.1	Insertion of nickel particle to winding core		N/A
A.5.5.2	Mark the position of nickel particle on the both end of winding core of the separator		N/A
A.5.6	Insertion of nickel particle to prismatic cell		P

Tables

	TABLE: Critical components information				P
Object/part no.	**Manufacturer/ trademark**	**Type/model**	**Technical data**	**Standard**	**Mark(s) of conformity [1)]**
PCB	Interchangeable	Interchangeable	Min. V-1, Min. 130ºC	UL 796	UL approved
Protective IC (U1)	Shenzhen Developer Microelectronics Co., Ltd	DW01	V_{CU}=4.28±0.025V, V_{DL}=2.4±0.1V	--	Tested with appliance
MOSFET (U2)	Shenzhen Puolop Electronics Co., Ltd	PT8205	V_{DS}=20V, I_D=6A, V_{GS}=±12V	--	Tested with appliance
Wire	Interchangeable	Interchangeable	Min. 32AWG, min. 105°C, min. 30V, VW-1	UL 758	UL approved
Cell	Dongguan AUN Technolony CO., LTD	602030	3.7V, 300mAh	EN 62133: 2013	Tested with appliance
-Positive electrode	SHENZHEN HUABO ENERGY MATERIAL CO., LTD	C-001	Thickness: 14±2μm, Wide * Length: 26.0mm x110mm, LiCoO2, Carbon black, PVdF, Conductive Additive	--	Tested with appliance
-Negative electrode	Tongling Keyu Electronic Material Co., LTD	A-002	Thickness: 8±2μm, Wide * Length: 27.0mm x 123mm, Graphite, CMC, SBR, Conductive, Additive, Copper foil	--	Tested with appliance
-Separator	SHENZHEN CITY TOGETHER INTO ENERGY TECHNOLOGY CO., LTD	NM12-H	Thickness: 12μm, Length * Wide: 304mm x 29.0mm, Polypropylene, shutdown temperature: 130°C	--	Tested with appliance
-Electrolyte	Henan Huarui Advanced Materials Co., LTD	HR221	Conductivity: 10.6±0.5mS/cm, LiPF6+DEC+EC	--	Tested with appliance

Supplementary information:

[1)] Provided evidence ensures the agreed level of compliance. See OD-CB2039.

Tables

7.2.1	TABLE: Continuous low rate charge (cells)				N/A
Model	**Recommended charging method, (CC, CV, or CC/CV)**	**Recommended charging voltage V_c, (Vdc)**	**Recommended charging current I_{rec}, (A)**	**OCV at start of test, (Vdc)**	**Results**
--	--	--	--	--	--
--	--	--	--	--	--
Supplementary information:					

7.2.2	TABLE: Vibration	N/A
Model	**OCV at start of test, (Vdc)**	**Results**
--	--	--
--	--	--
Supplementary information:		

7.3.1	TABLE: Incorrect installation (cells)	N/A
Model	**OCV of reversed cell, (Vdc)**	**Results**
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--	--	--
Supplementary information:		

7.3.2	TABLE: External short circuit					N/A
Model	**Ambient (at 20°C ± 5ºC or 55°C ± 5°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature rise ΔT, (°C)**	**Results**	
--	--	--	--	--	--	
--	--	--	--	--	--	
Supplementary information:						

7.3.6	TABLE: Crush			N/A
Model	**OCV at start of test, (Vdc)**	**OCV at removal of crushing force, (Vdc)**	**Results**	
--	--	--	--	
--	--	--	--	
Supplementary information:				

7.3.8	TABLE: Overcharge			N/A
Model	**OCV prior to charging, (Vdc)**	**Maximum charge current, (A)**	**Time for charging, (hours)**	**Results**
--	--	--	--	--
--	--	--	--	--

Tables

Supplementary information:

7.3.9	TABLE: Forced discharge (cells)			N/A
Model	**OCV before application of reverse charge, (Vdc)**	**Measured reverse charge I_t, (A)**	**Time for reversed charge, (minutes)**	**Results**
--	--	--	--	--
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Supplementary information:				

8.2.1	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**
602030	4.20	0.06	4.18	P
602030	4.20	0.06	4.19	P
602030	4.20	0.06	4.18	P
602030	4.20	0.06	4.18	P
602030	4.20	0.06	4.18	P
Supplementary information: No fire, no explosion, no leakage.				

8.3.1	TABLE: External short circuit (cell)				P
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature rise ΔT, ~~(°C)~~**	**Results**
Samples charged at charging temperature upper limit (45°C)					
602030	23.5	4.22	0.077	91.6	P
602030	23.5	4.23	0.075	89.0	P
602030	23.5	4.23	0.078	93.1	P
602030	23.5	4.22	0.075	83.8	P
602030	23.5	4.22	0.074	81.4	P
Samples charged at charging temperature lower limit (10°C)					
602030	23.5	4.19	0.073	94.5	P
602030	23.5	4.18	0.073	92.1	P
602030	23.5	4.19	0.071	87.4	P
602030	23.5	4.20	0.074	90.1	P
602030	23.5	4.19	0.072	93.3	P
Supplementary information: No fire, no explosion.					

Tables

8.3.2	TABLE: External short circuit (battery)				P
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum case temperature rise ΔT, ~~(°C)~~**	**Results**
Samples charged at charging temperature upper limit (45°C)					
602030	55.3	4.22	0.078	0.3	P
602030	55.3	4.23	0.081	0.4	P
602030	55.3	4.23	0.077	0.3	P
602030	55.3	4.23	0.076	0.1	P
602030	55.3	4.22	0.073	0.2	P
Samples charged at charging temperature lower limit (-5°C)					
602030	55.3	4.20	0.071	0.3	P
602030	55.3	4.19	0.075	0.3	P
602030	55.3	4.19	0.070	0.2	P
602030	55.3	4.18	0.082	0.1	P
602030	55.3	4.19	0.073	0.1	P
Supplementary information: No fire, no explosion.					

8.3.5	TABLE: Crush				P
Model	**OCV at start of test, (Vdc)**	**OCV at removal of crushing force, (Vdc)**	**Width/ diameter of cell before crush, (mm)**	**Required deformation for crush, (mm)**	**Results**
Samples charged at charging temperature upper limit (45°C)					
602030	4.22	4.22	-	-	P
602030	4.23	4.23	-	-	P
602030	4.23	4.23	-	-	P
602030	4.23	4.23	-	-	P
602030	4.22	4.22	-	-	P
Samples charged at charging temperature upper limit (10°C)					
602030	4.19	4.19	-	-	P
602030	4.18	4.18	-	-	P
602030	4.19	4.19	-	-	P
602030	4.20	4.20	-	-	P
602030	4.19	4.19	-	-	P
Supplementary information: No fire, no explosion.					

Tables

8.3.6	TABLE: Over-charging of battery	P
Constant charging current (A).....:	0.3	—
Supply voltage (Vdc).....:	5.0	—

Model	OCV before charging, (Vdc)	Resistance of circuit, (Ω)	Maximum outer casing temperature, (°C)	Results
602030	3.31	--		
602030	3.32	--		
602030	3.32	--		
602030	3.33	--		
602030	3.34	--		
Supplementary information: No fire, no explosion.				

8.3.7	TABLE: Forced discharge (cells)			P
Model	**OCV before application of reverse charge, (Vdc)**	**Measured Reverse charge I_t, (A)**	**Time for reversed charge, (minutes)**	**Results**
602030	3.18	0.3	90	P
602030	3.19	0.3	90	P
602030	3.23	0.3	90	P
602030	3.15	0.3	90	P
602030	3.16	0.3	90	P
Supplementary information: No fire, no explosion.				

8.3.8 T-5	TABLE: External short circuit (cell)				P
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (mΩ)**	**Maximum case temperature rise ΔT, (~~°C~~)**	**Results**
602030	55.5	4.18	77	56.1	P
602030	55.5	4.18	78	57.2	P
602030	55.5	4.17	78	57.3	P
602030	55.5	4.17	77	59.4	P
602030	55.5	4.18	79	49.1	P
602030	55.5	4.18	78	53.7	P
602030	55.5	4.17	81	58.1	P
602030	55.5	4.18	82	67.1	P

Tables

602030	55.5	4.18	77	53.5	P
602030	55.5	4.18	79	61.7	P

Supplementary information:
The external short-circuit test of 10 pcs samples performed after the test of Altitude, Thermal cycling, Vibration and Shock in sequence.
- No explosion temperature rise, no rupture, no explosion and no fire

8.3.9	**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**
602030	10	4.18	1	400	**P**
602030	10	4.19	1	400	**P**
602030	10	4.19	1	400	**P**
602030	10	4.20	1	400	**P**
602030	10	4.19	1	400	**P**
602030	45	4.22	1	400	**P**
602030	45	4.23	1	400	**P**
602030	45	4.23	1	400	**P**
602030	45	4.23	1	400	**P**
602030	45	4.22	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

Photos

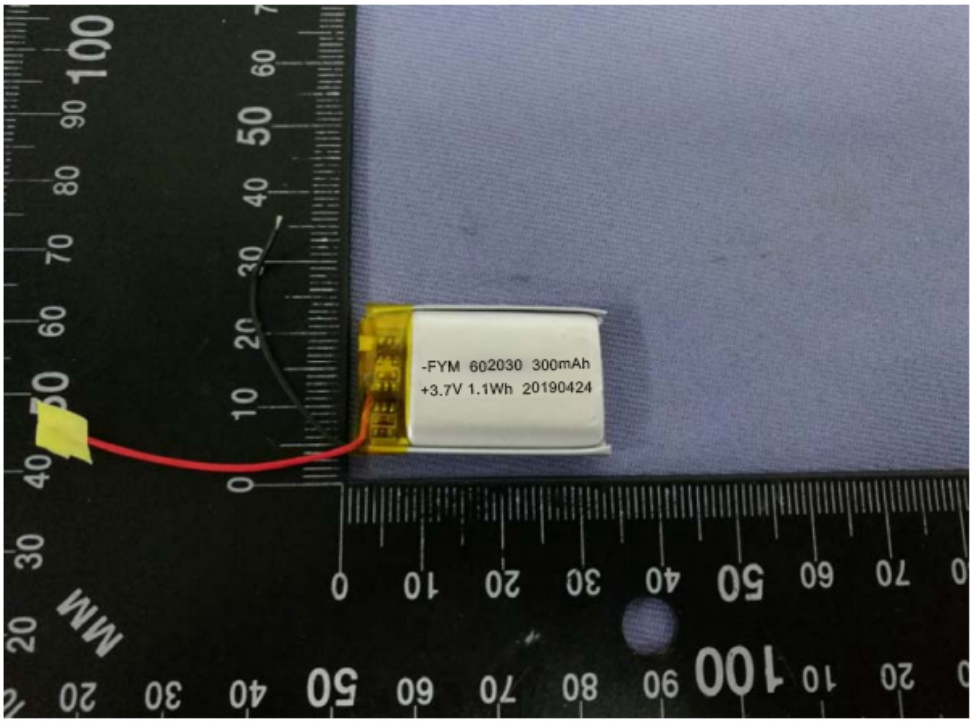

Fig.1 General view 1 of battery

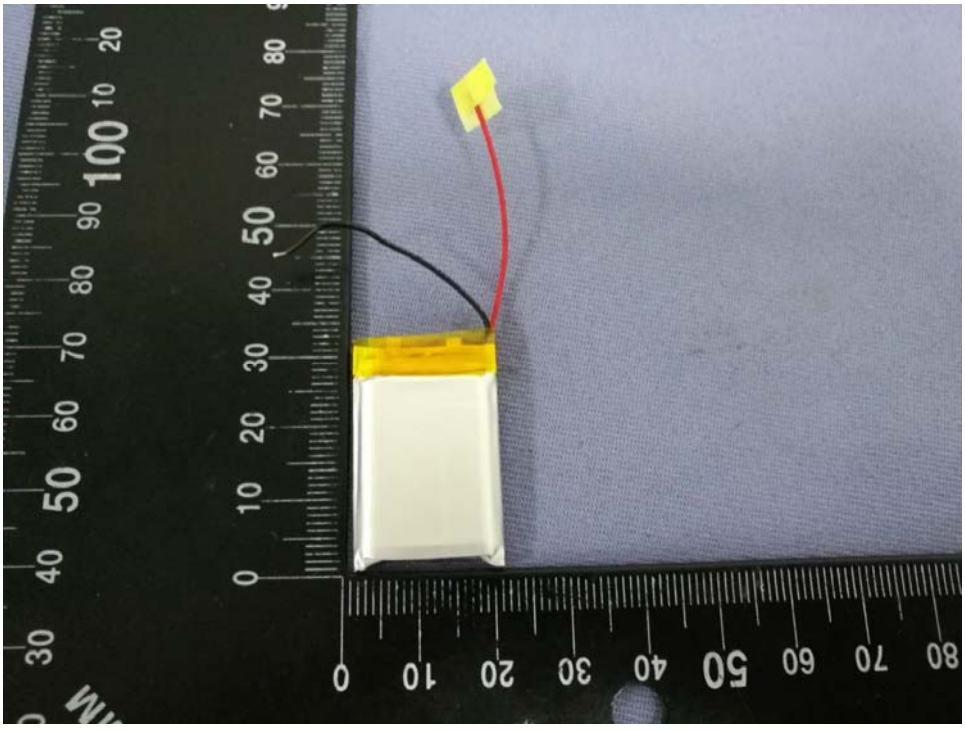

Fig.2 General view 2 of battery

Photos

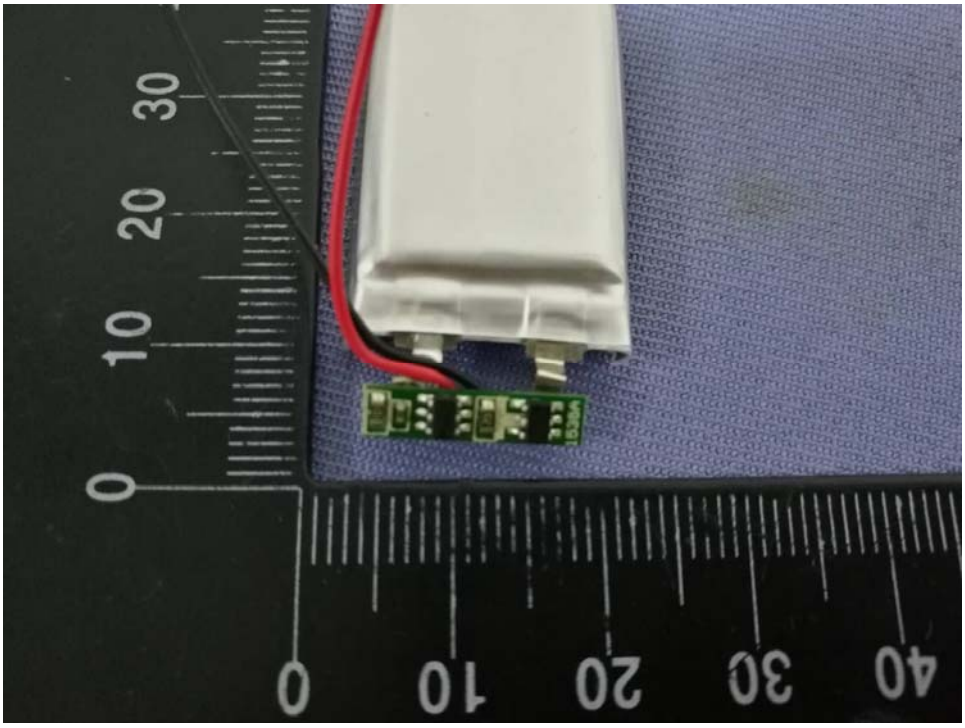

Fig.3 Component side view of PCB

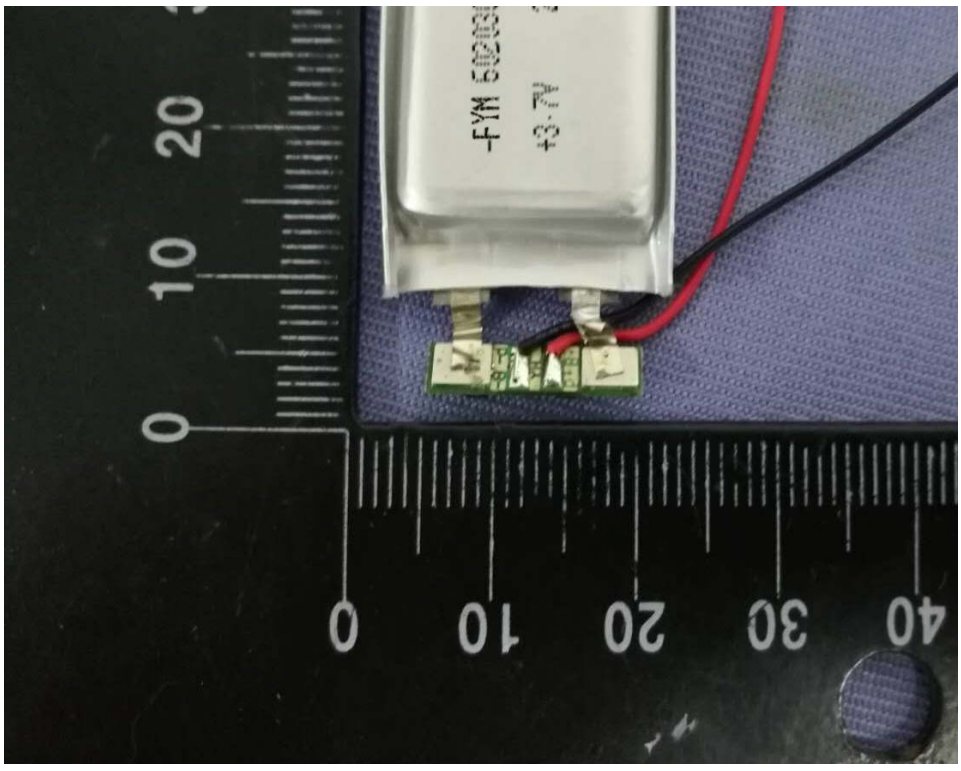

Fig.4 Trace side view of PCB

Photos

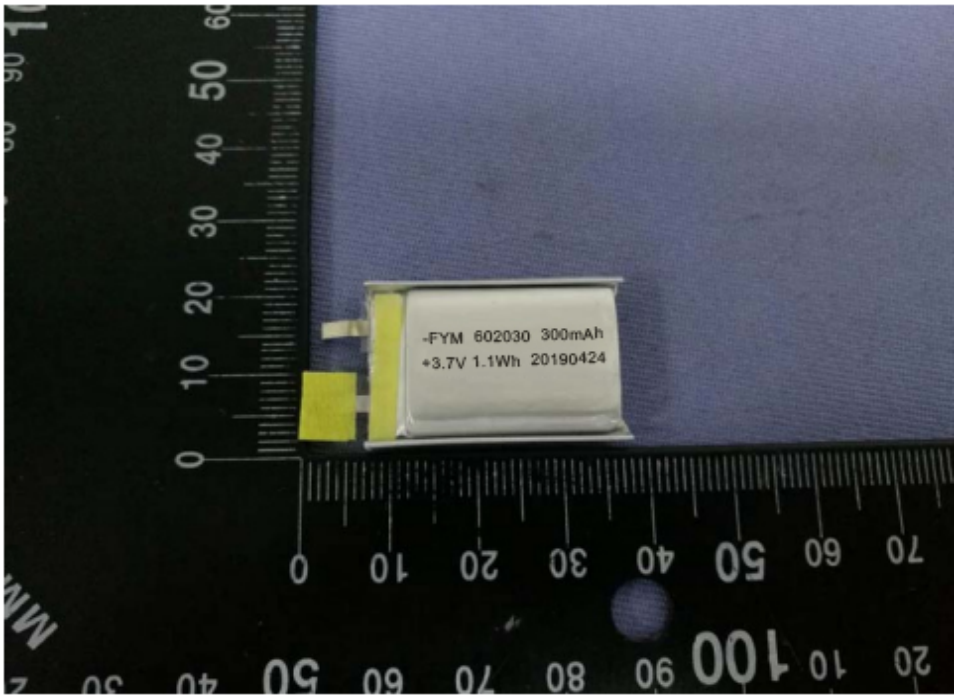

Fig.5 General view of cell

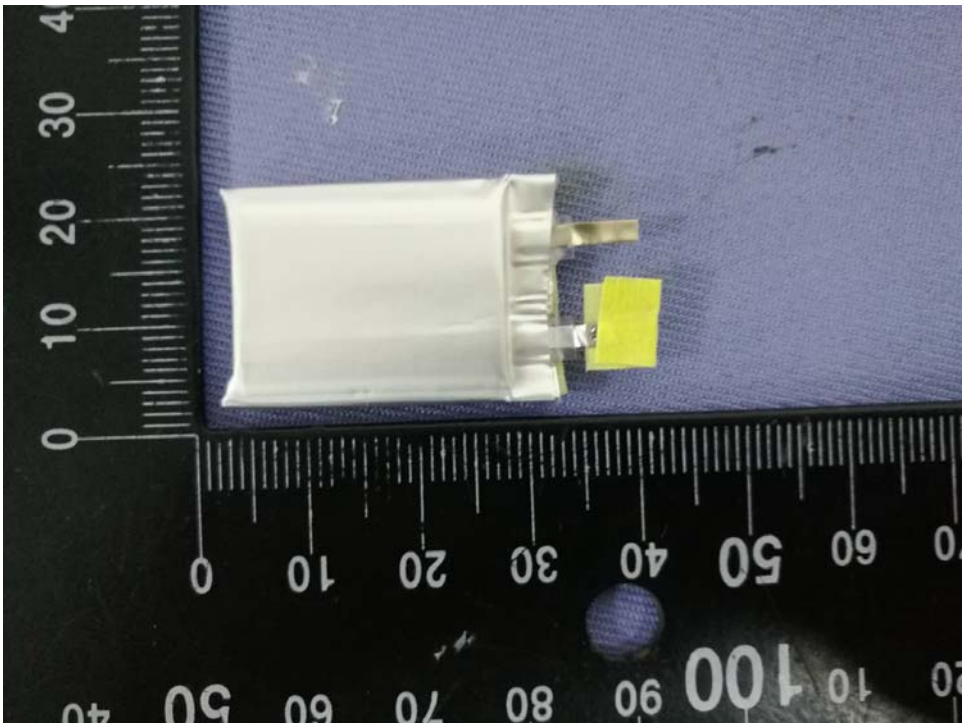

Fig.6 General view of cell