APPLICATION FOR SAFETY
On Behalf of

Lithium-ion Polymer Battery

Model No.: 501030

Prepared for:

Address: B106-109,No.535, Qingshuiqiao Road, Hi-Tech Zone, Ningbo, China

Prepared By: Shenzhen Alpha Product Testing Co., Ltd.

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Date of Test: November 27 to December 11, 2017

Date of Report: December 11, 2017

Report Number: T1872164 05

Version Number: REV0

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. ..... :	T1872164 05
Tested by (name + signature)..... :	Walker zhang
Approved by (name + signature)..... :	Kevin Mei
Date of issue ..... :	December 11, 2017
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Applicant's name ..... :	
Address ..... :	
Manufacturer's name..... :	Shenzhen Jinyuzhou Energy Co.,Ltd
Address ..... :	2 /F, building A, JinHeRui yiquan industrial park, guanlan street, Longhua, Shenzhen,Guangdong,China
Factory's name..... :	Shenzhen Jinyuzhou Energy Co.,Ltd
Address ..... :	2 /F, building A, JinHeRui yiquan industrial park, guanlan street, Longhua, Shenzhen,Guangdong,China
Test specification:	
Standard..... :	EN 62133: 2013
Test procedure ..... :	N/A
Non-standard test method..... :	N/A
Test item description .....:	Lithium-ion Polymer Battery
Trade Mark..... :	N/A
Model/Type reference ..... :	501030
Ratings ..... :	3.7V, 110mAh, 0.407Wh

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 (Batteries) cl.8.2.1 Continuous charging at constant voltage (Cells) cl.8.3.1 External short circuit (Cells) cl.8.3.2 External short circuit (Batteries) cl.8.3.3 Free fall (Batteries) cl.8.3.4 Thermal abuse (Cells) cl.8.3.5 Crush (Cells) cl.8.3.6 Over-charging of battery cl.8.3.7 Forced Discharge (Cells) cl.8.3.8 Transport tests (Cells) Tests are made with the number of batteries specified in EN 62133:2013 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.

501030
3.7V 110mAh 0.407Wh
Black(-) Lithium-ion Polymer Battery
Red (+) YYMMDD ICP5/10/30
Shenzhen Jinyuzhou Energy Co.,Ltd.

Remark:

1. For the YYMMDD, YY is for years, MM is for months, DD is for day.
2. The height of the letters is not less than 2mm, the height of the WEEE logo is not less than 7mm.

Test item particulars :	
Classification of installation and use :	To be defined in final system
Supply connection :	Direct connection on the device.
Recommend charging method declaired by the manufacturer :	Charging the battery with 22mA constant current until 4.20V, then constant voltage until charge current reduces to 5.5mA at ambient 20°C ± 5°C
Discharge current (0.2 I_t A) :	22mA
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 :	110mA
Charging temperature upper limit :	45°C
Charging temperature lower limit :	10°C
Polymer cell electrolyte type :	☒ gel polymer ☐ 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 :	November 27, 2017
Date(s) of performance of test :	November 27 to December 11, 2017

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 1 Rechargeable Li-ion Cells in 1S1P, and the cells comply with the requirements of EN 62133: 2013.

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
501030	110mAh	3.7V	22mA	22mA	110mA	110mA	4.20V	3.0V

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
501030	4.25V	5.5mA	10°C	45°C

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

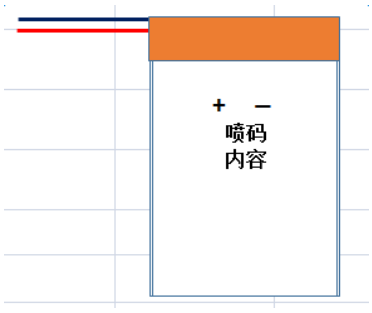
Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
501030	110mAh	3.7V	22mA	22mA	110mA	110mA	4.20V	3.0V

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

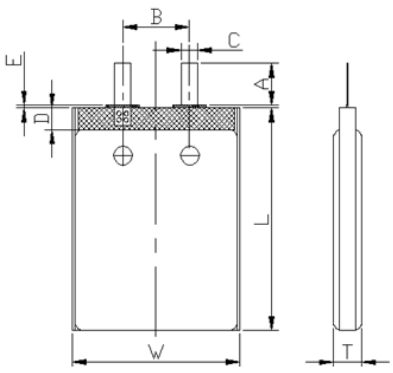
Model	Upper limit charge voltage	Taper-off current	Lower charge temperature	Upper charge temperature
501030	4.25V	5.5mA	10°C	45°C

Construction:

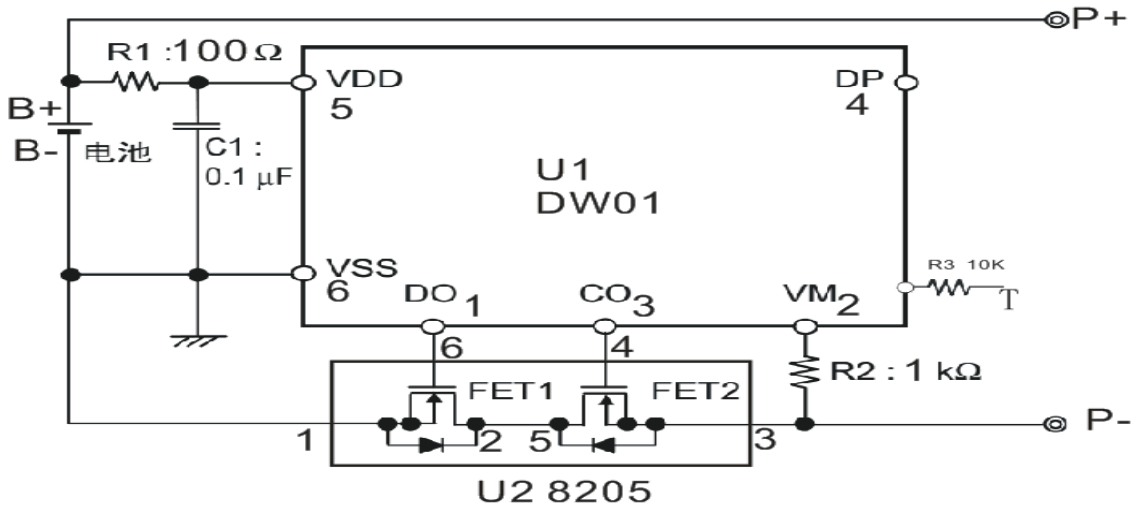
Battery dimension: Max.5.0mm(T) x Max.10.0mm(W) x Max.32.0mm(L)



Cell dimension: Max.5.0mm(T) x Max.10.0mm(W) x Max.32.0mm(L)



Circuit diagram:



EN 62133			
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 accessible metal case has been provided.	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		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/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	Red Wire(+) & Black Wire(-) Were used	P
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current	Appropriate size terminals used.	P
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance		P

EN 62133			
Clause	Requirement + Test	Result - Remark	Verdict
	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		P
	Each battery has an independent control and protection		P
	Manufacturers of cells make recommendations about current, voltage and temperature limits so that the battery manufacturer/designer may ensure proper design and assembly		P
	Batteries that are designed for the selective discharge of a portion of their series connected cells incorporate 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		P
	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		N/A
	- 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

EN 62133			
Clause	Requirement + Test	Result - Remark	Verdict
	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: 2008 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.	P
	Unless noted otherwise in the test methods, testing was conducted in an ambient of 20°C ± 5°C.	The tests are conducted in an ambient of 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
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

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Clause	Requirement + Test	Result - Remark	Verdict
	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
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

EN 62133			
Clause	Requirement + Test	Result - Remark	Verdict
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. 10°C used for lower limit. 45°C used for upper limit.	P
	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	Lithium cobalt oxide system only.	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)		P
	Results: No fire. No explosion. No leakage……...	(See Table 8.2.1)	P
8.2.2	Moulded case stress at high ambient temperature (battery)	In the end product evaluation.	N/A
	Oven temperature (°C) .....:	In the end product evaluation.	—
	Results: No physical distortion of the battery casing resulting in exposure if internal components	In the end product evaluation.	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)	N/A
8.3.2	External short circuit (battery)		P
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	Results: No fire. No explosion .....:	(See Table 8.3.2)	P
8.3.3	Free fall	Fully charged batteries were dropped three times from a height of 1.0 m onto a concrete floor.	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		P
	- 30 minutes for large cells (gross mass of more than 500 g as defined in EN 62281)		N/A
	Oven temperature (°C) .....:	130°C	—
	Gross mass of cell (g)..... :	<500g, small cell.	—
	Results: 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		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
	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)	The cell is polymer type	N/A
	The cells complied with national requirement for ..... :		—

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Clause	Requirement + Test	Result - Remark	Verdict
	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		N/A
	Results: No fire.....:		N/A
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: EN 61951-1, EN 61951-2 or EN 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.	The battery is marked in accordance with EN 61960.	P
	Batteries marked with an appropriate caution statement.	Caution statement provided in the marking plate and manufacturer's specification.	P
10.3	Other information		P
	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

EN 62133			
Clause	Requirement + Test	Result - Remark	Verdict
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		P
A.3.2	Upper limit charging voltage	DC4.25V	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		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	N/A
A.4.3	High temperature range	Charging high temperature declared by client is: 45°C.	P
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	45°C is applied during testing.	P
A.4.3.4	Safety consideration when specifying new upper limit in high temperature range		N/A
A.4.4	Low temperature range	Charging low temperature declared by client is: 10°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 low temperature range		P
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range	10°C is applied during testing.	N/A
A.4.5	Scope of the application of charging current		P
A.5	Sample preparation	The cell is polymer type	N/A
A.5.1	General		N/A
A.5.2	Insertion procedure for nickel particle to generate internal short		N/A
	The insertion procedure carried out at 20°C±5°C and under -25 °C of dew point		N/A
A.5.3	Disassembly of charged cell		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
A.5.4	Shape of nickel particle		N/A
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		N/A

Tables

	TABLE: Critical components information				**P**
Object/part no.	**Manufacturer/ trademark**	**Type/model**	**Technical data**	**Standard**	**Mark(s) of conformity [1)]**
PCB	SHEZHENG JIUHEYONG ELECTRO NICS CO LTD	JHY-D	V-0, 130° C	UL 796	ZPMV2.E311990
Wire	KIM DING TAI GROUP CO LTD	3302	105° C, 30V, 30WAG	UL 758	UL E341631
Cell	Shenzhen jinyuzhouEnergy Co. Ltd.	501030	3.7V, 110mAh,	EN 62133: 2013	Tested with appliance
-Electrolyte	Dongguan Tianfeng Power Material Co. Ltd.	TF-008	EC, PC, DMC, EMC, LiPF6 (1.23 0.03g/cm3)	EN 62133: 2013	Tested with appliance
-Separator	Xinxiang city science and Technology Co Ltd	16UM	310*25*0.016mm	EN 62133: 2013	Tested with appliance
-Positive electrode	DongGuan Liyu Energy Co. Ltd.	LiCoO2, PVDF, NMP, Conductive Additive	121*24*0.97mm	EN 62133: 2013	Tested with appliance
-Negative electrode	DongGuan Liyu Energy Co. Ltd.	Graphite, CMC, SBR, Distilled Water, Conductive	136*24*0.92mm	EN 62133: 2013	Tested with appliance
Supplementary information: 1) Provided evidence ensures the agreed level of compliance.					

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**
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--	--	--	--	--	--
Supplementary information:					

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

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

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

7.3.9	TABLE: Forced discharge (cells)	N/A

Tables

Model	OCV before application of reverse charge, (Vdc)	Measured reverse charge I_t, (A)	Time for reversed charge, (minutes)	Results
--	--	--	--	--
--	--	--	--	--
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**
T178838	4.20	0.022	4.17	P
T178839	4.20	0.022	4.18	P
T178840	4.20	0.022	4.17	P
T178841	4.20	0.022	4.17	P
T178842	4.20	0.022	4.17	P
Supplementary information: No fire, no explosion. no leakage				

8.3.1	TABLE: External short circuit (cells)				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)					
T178843	24.5	4.17	0.078	84.6	P
T178844	24.5	4.16	0.078	85.9	P
T178845	24.5	4.16	0.077	81.5	P
T178846	24.5	4.16	0.076	88.0	P
T178847	24.5	4.15	0.078	87.6	P
Samples charged at charging temperature lower limit (10°C)					
T178848	24.5	4.09	0.075	94.2	P
T178849	24.5	4.10	0.079	89.5	P
T178850	24.5	4.11	0.078	86.4	P
T178851	24.5	4.08	0.078	90.0	P
T178852	24.5	4.08	0.075	93.6	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)					
T178853	55.6	4.16	0.080	0.8	P
T178854	55.6	4.16	0.085	0.5	P
T178855	55.6	4.17	0.082	1.0	P
T178856	55.6	4.16	0.085	1.2	P
T178857	55.6	4.17	0.081	0.8	P
Samples charged at charging temperature lower limit (10°C)					
T178858	55.6	4.11	0.080	1.1	P
T178859	55.6	4.12	0.086	1.0	P
T178860	55.6	4.10	0.083	0.9	P
T178861	55.6	4.11	0.084	1.1	P
T178862	55.6	4.10	0.085	1.3	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)					
T178863	4.14	4.14	--	--	P
T178864	4.15	4.15	--	--	P
T178865	4.15	4.15	--	--	P
T178866	4.16	4.16	--	--	P
T178867	4.14	4.14	--	--	P
Supplementary information: No fire, no explosion.					

8.3.6	TABLE: Over-charging of battery			P
Constant charging current (A).....:		**0.11**		—
Supply voltage (Vdc).....:		**5.0**		—
Model	**OCV before charging, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum outer casing temperature, (°C)**	**Results**
T178868	3.40	--	30.1	P
T178869	3.38	--	29.4	P
T178870	3.44	--	30.2	P
T178871	3.36	--	30.1	P
T178872	3.35	--	30.5	P

Tables

Supplementary information: No fire, no explosion. Test ambient temperature: 24.1°C

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**
T178873	3.38	0.11	90	P
T178874	3.39	0.11	90	P
T178875	3.36	0.11	90	P
T178876	3.34	0.11	90	P
T178877	3.37	0.11	90	P
Supplementary information: No fire, no explosion.				

8.3.8 T-5	**TABLE: External short circuit (cells)**				**P**
Model	**Ambient, (°C)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (mΩ)**	**Maximum case temperature rise ΔT, (°C)**	**Results**
T178878	55.7	4.11	82.5	62.5	P
T178879	55.7	4.15	81.4	58.4	P
T178880	55.7	4.13	80.9	61.7	P
T178881	55.7	4.15	79.5	58.9	P
T178882	55.7	4.14	83.4	59.4	P
T178883	55.7	4.15	80.5	60.3	P
T178884	55.7	4.14	81.9	61.1	P
T178885	55.7	4.13	85.2	58.6	P
T178886	55.7	4.15	82.4	58.5	P
T178887	55.7	4.10	83.3	59.4	P
Supplementary information: No fire, no explosion.					

Tables

8.3.9	TABLE: Forced internal short circuit (cells)				N/A
Model	**Chamber ambient, (°C)**	**OCV at start of test, (Vdc)**	**Particle location [1)]**	**Maximum applied pressure, (N)**	**Results**
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-

Supplementary information:

1:Insertion of nickel particle between positive (active material) coated area and negative (active material) coated area.

2:Insertion of nickel particle between positive aluminium foil (uncoated area) and negative (active material) coated area.

Appendix 1
Photo documentation

Photo 1

Battery view:

(The label on copy of marking plate will replace the label on right side)

[√] front

[ ] rear

[ ] right side

[ ] left side

[ ] top

[ ] bottom

[ ] internal

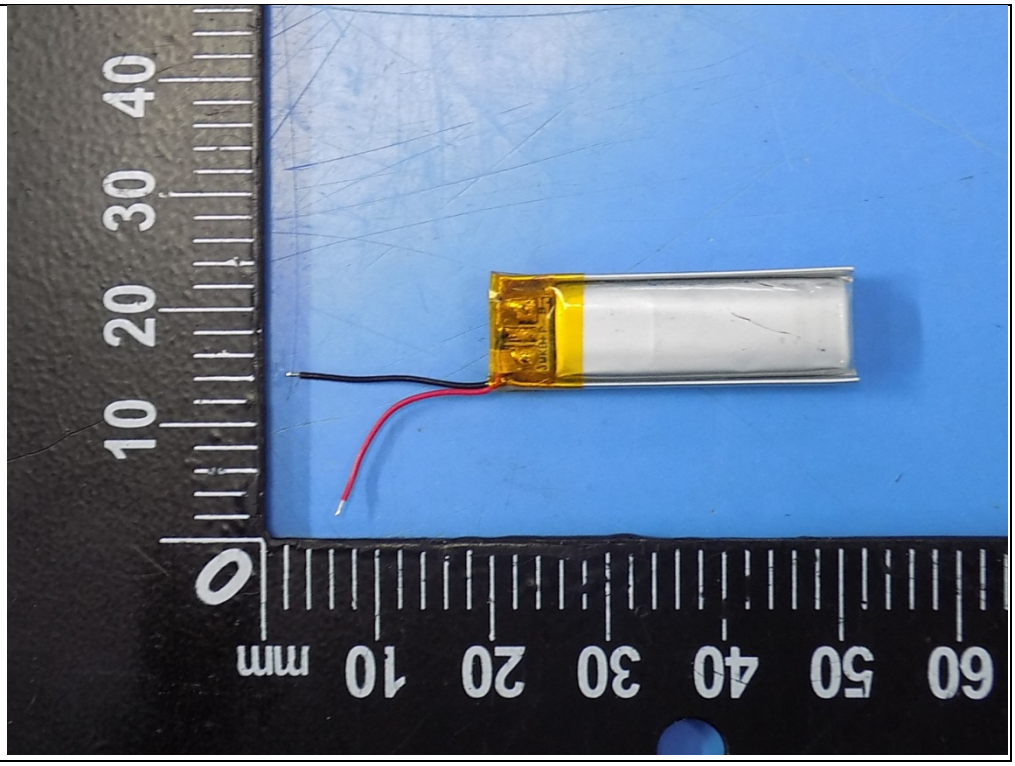


Photo 2

Battery view:

[ ] front

[√] rear

[ ] right side

[ ] left side

[ ] top

[ ] bottom

[ ] internal

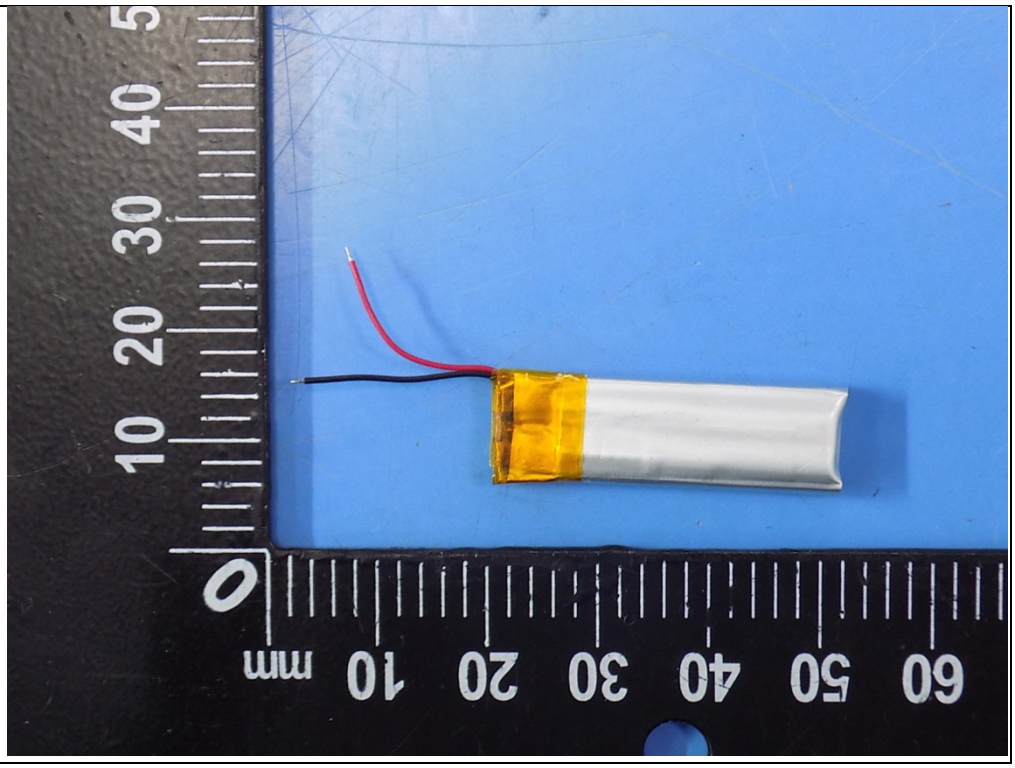


Photo documentation

Photo 3

Battery view:

[ ] front

[ ] rear

[ ] right side

[ ] left side

[ ] top

[ ] bottom

[√] internal

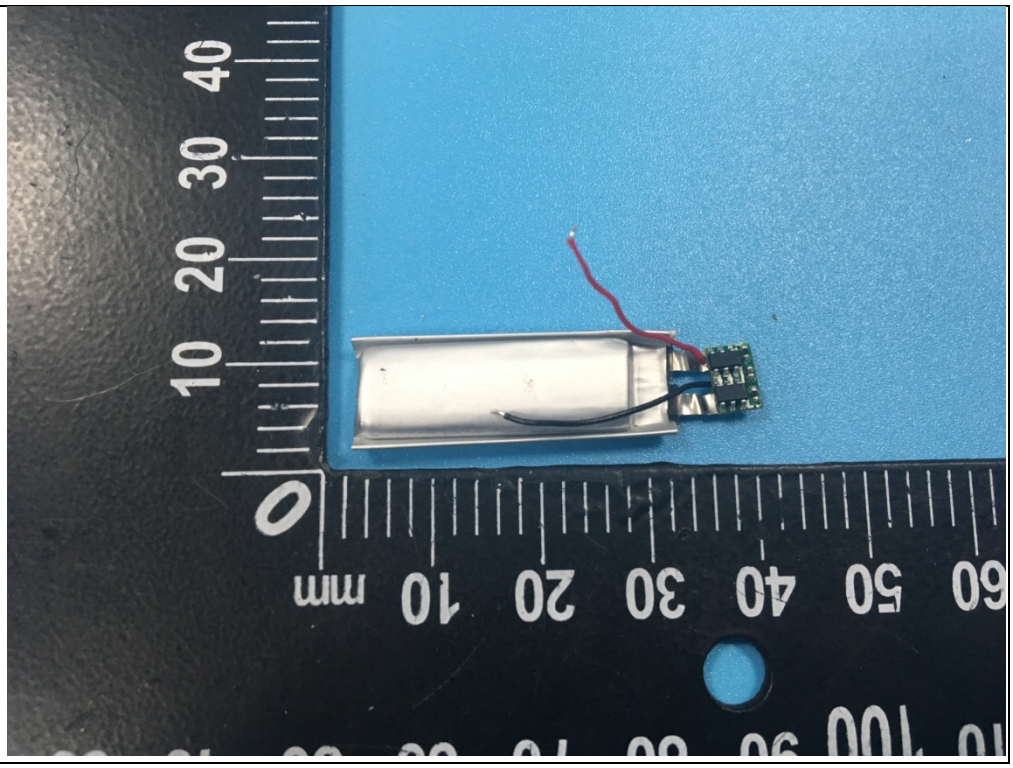


Photo 4

Cell view:

[√] front

[ ] rear

[ ] right side

[ ] left side

[ ] top

[ ] bottom

[ ] internal

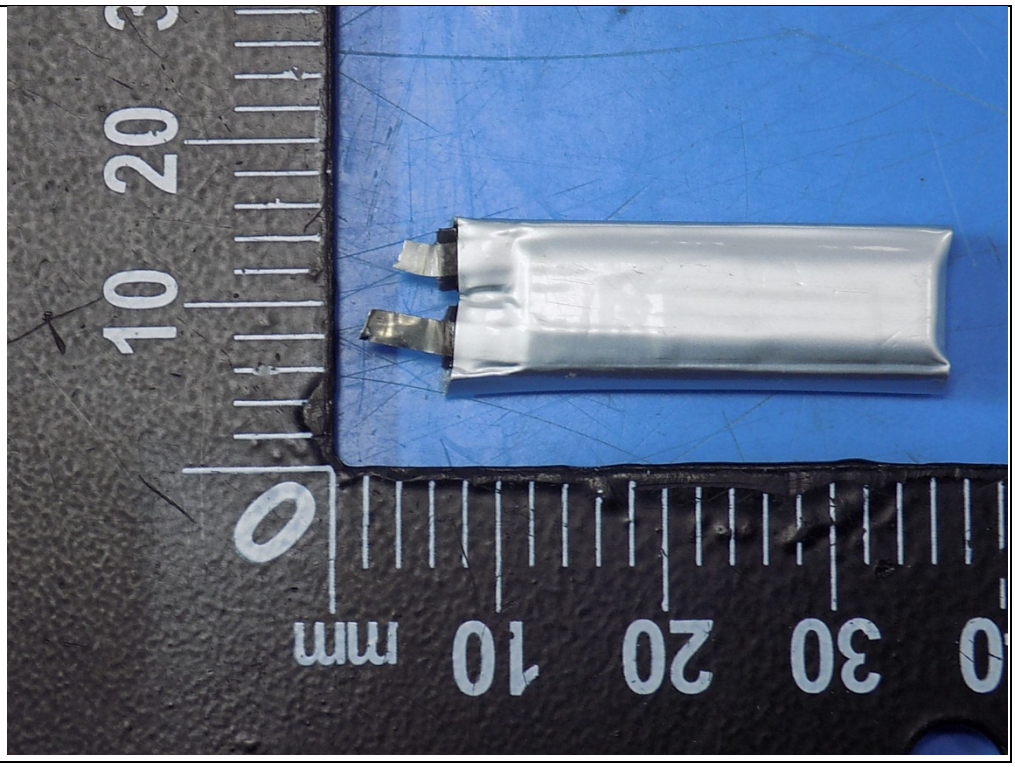


Photo documentation

Photo 5

PCB view:

[√] front

[ ] rear

[ ] right side

[ ] left side

[ ] top

[ ] bottom

[ ] internal

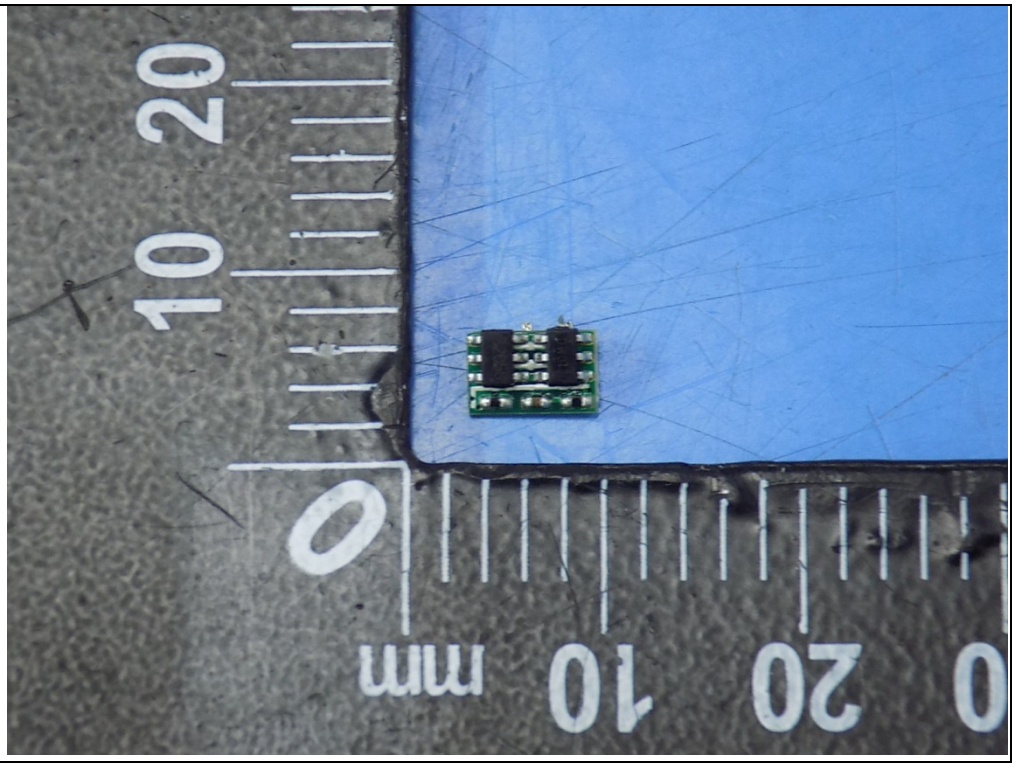


Photo 6

PCB view:

[ ] front

[√] rear

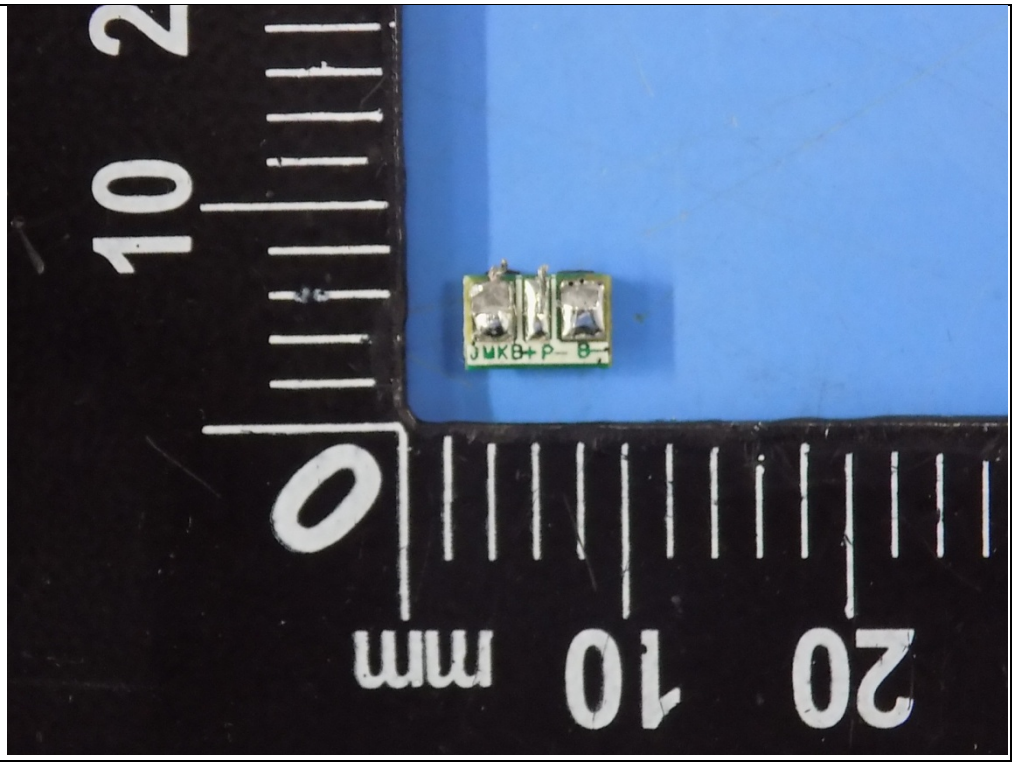
[ ] right side

[ ] left side

[ ] top

[ ] bottom

[ ] internal



---End of report---