TEST REPORT
IEC 62133-2
Secondary cells and batteries containing alkaline or other non-acid electrolytes – Safety requirements for portable sealed secondary cells, and for batteries made from them, for use in portable applications – Part 2: Lithium systems

Report Number. .....:	LCS190125020AS
Date of issue .....:	2019-02-26
Total number of pages.....:	26 pages
Applicant's name.....:	XINXIN BRANCH(SHENZHEN) ELECTRONIC TECHNOLOGY CO., LTD.
Address .....:	4th Floor, Building A, Jinkaijin Industrial Park, Shilong Community Industrial Second Road, Shiyan Street, Baoan District, Shenzhen
Test specification:	
Standard .....:	IEC 62133-2: 2017
Test procedure .....:	Type Test
Non-standard test method.....:	N/A
Test Report Form No.....:	IEC62133_2A
Test Report Form(s) Originator.....:	DEKRA
Master TRF .....:	Dated 2017-08-10

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description .....:	Li-ion Battery
Trade Mark .....:	N/A
Manufacturer.....:	Same as applicant
Model/Type reference .....:	XXK 18650
Ratings .....:	3.7V, 4400mAh, 16.28Wh

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):		
☒ Testing Laboratory:	Shenzhen LCS Compliance Testing Laboratory Ltd.	
Testing location/ address ..... :	101, 601, Xingyuan Industrial Park, Gushu Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China	
Tested by (name, signature)..... :	Rick Zhu	
Checked by(name, signature) ..... :	Starry Li	
Approved by (name, signature) ..... :	Hart Qiu	
☐ Testing procedure: CTF Stage 1:		
Testing location/ address ..... :		
Tested by (name, function, signature) ..... :		
Approved by (name, function, signature).. :		
☐ Testing procedure: CTF Stage 2:		
Testing location/ address ..... :		
Tested by (name + signature) ..... :		
Witnessed by (name, function, signature). :		
Approved by (name, function, signature).. :		
☐ Testing procedure: CTF Stage 3:		
☐ Testing procedure: CTF Stage 4:		
Testing location/ address ..... :		
Tested by (name, function, signature) ..... :		
Witnessed by (name, function, signature). :		
Approved by (name, function, signature).. :		
Supervised by (name, function, signature) :		

List of Attachments (including a total number of pages in each attachment):

Attachment 1: Photo documentation (4 pages).

Summary of testing:

Tests performed (name of test and test clause):	**Testing location:**
cl.5.6.2 Design recommendation; cl.7.1 Charging procedure for test purposes (for Cells and Batteries); cl.7.2.1 Continuous charging at constant voltage (Cells); cl.7.2.2 Case stress at high ambient temperature (Batteries); cl.7.3.1 External short-circuit (Cells); cl.7.3.2 External short-circuit (Batteries); cl.7.3.3 Free fall (Cells and Batteries); cl.7.3.4 Thermal abuse (Cells); cl.7.3.5 Crush (Cells); cl.7.3.6 Over-charging of battery; cl.7.3.7 Forced discharge (Cells); cl.7.3.8 Mechanical tests (Batteries); cl.7.3.9 was not evaluated by client request, and the applicant declares that this battery isn't to be sold in France, Japan, Republic of Korea and Switzerland. Tests are made with the number of cells and batteries specified in IEC 62133-2: 2017.	**Shenzhen LCS Compliance Testing Laboratory Ltd.** 101, 601, Xingyuan Industrial Park, Gushu Community, Xixiang Street, Bao'an District, Shenzhen, Guangdong, China

Summary of compliance with National Differences (List of countries addressed):

N/A

☒ **The product fulfils the requirements of EN 62133-2: 2017**

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Copy of marking plate:

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

Li-ion Battery
Red (+) Black (-)
Model: XXK 18650
3.7V, 4400mAh, 16.28Wh
1INR19/66-2 YYYY/MM/DD
XINXIN BRANCH(SHENZHEN) ELECTRONIC TECHNOLOGY CO., LTD

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Test item particulars ..... :	
Classification of installation and use ..... :	To be defined in final product
Supply Connection ..... :	DC connector
Recommend charging method declared by the manufacturer..... :	Charging the battery with 880mA constant current and 4.2V constant voltage until the current reduces to 50mA at ambient 20°C ± 5°C
Discharge current (0,2 It A)..... :	880mA
Specified final voltage ..... :	3.0V
Upper limit charging voltage per cell ..... :	4.2V
Maximum charging current..... :	2200mA
Charging temperature upper limit..... :	45°C
Charging temperature lower limit ..... :	10°C
Polymer cell electrolyte type ..... :	☐gel polymer ☐solid polymer ☒N/A
Possible test case verdicts:	
- test case does not apply to the test object ..... :	N/A
- test object does meet the requirement ..... :	P (Pass)
- test object does not meet the requirement ..... :	F (Fail)
Testing ..... :	
Date of receipt of test item..... :	2019-01-24
Date (s) of performance of tests ..... :	2019-01-24 to 2019-02-22

General remarks:

The test results presented in this report relate only to the object tested.
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"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

Manufacturer's Declaration per sub-clause 4.2.5 of IECEE 02:

The application for obtaining a CB Test Certificate includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided.....:	☐ **Yes** ☒ **Not applicable**

When differences exist; they shall be identified in the General product information section.

Name and address of factory (ies) ..... :	Same as applicant.

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General product information and other remarks:

The battery pack constructed with two lithium ion cells in 1S2P, and has overcharge, over-discharge, over current and short-circuits proof circuit.

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

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
XXK 18650	4400mAh	3.7V	880mA	880mA	2200mA	4400mA	4.2V	3.0V

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

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
INR18650-2200A	2200mAh	3.7V	440mA	440mA	1100mA	2200mA	4.2V	2.75V

The main features of the cell in the battery are shown as below (clause 7.1.2):

Model	Upper limit charge voltage	Taper-off current	Lower charge temperature	Upper charge temperature
INR18650-2200A	4.2V	110mA	0°C	45°C

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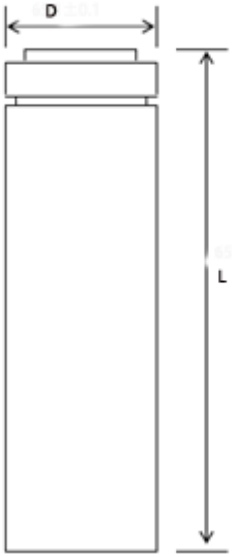
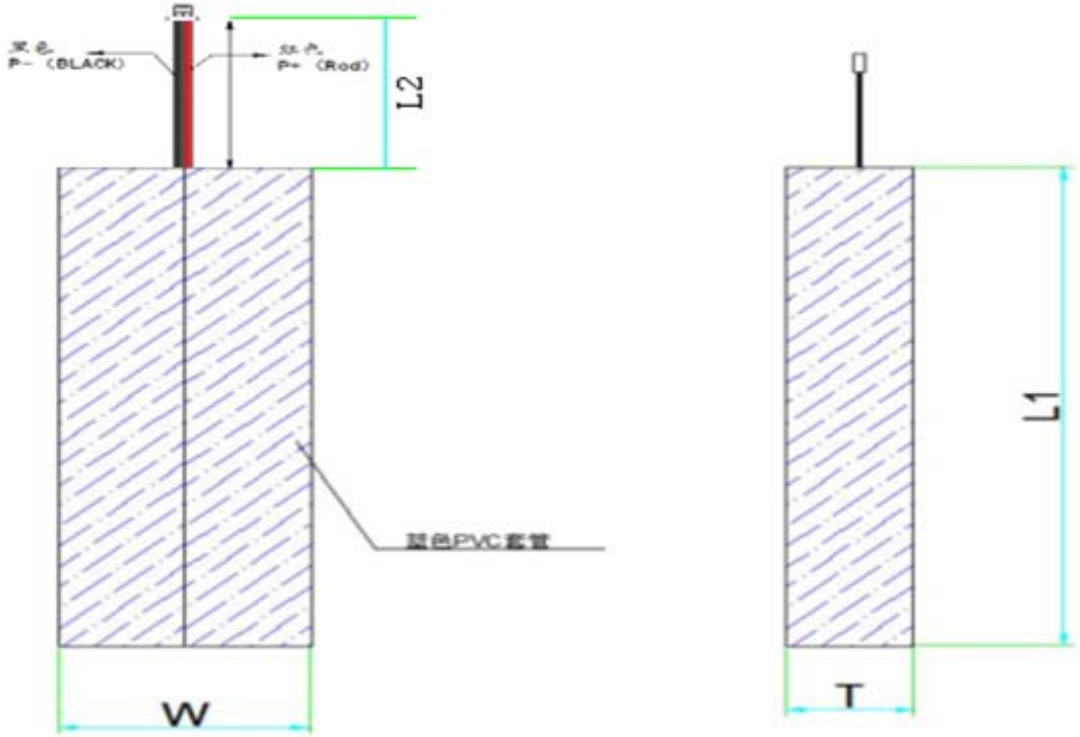
Construction:



D: Max 18.5 L: 65.1±0.1
Cell (Unit: mm)



T*W*L1(Max)=21.5*37.5*67.5
Battery (Unit: mm)

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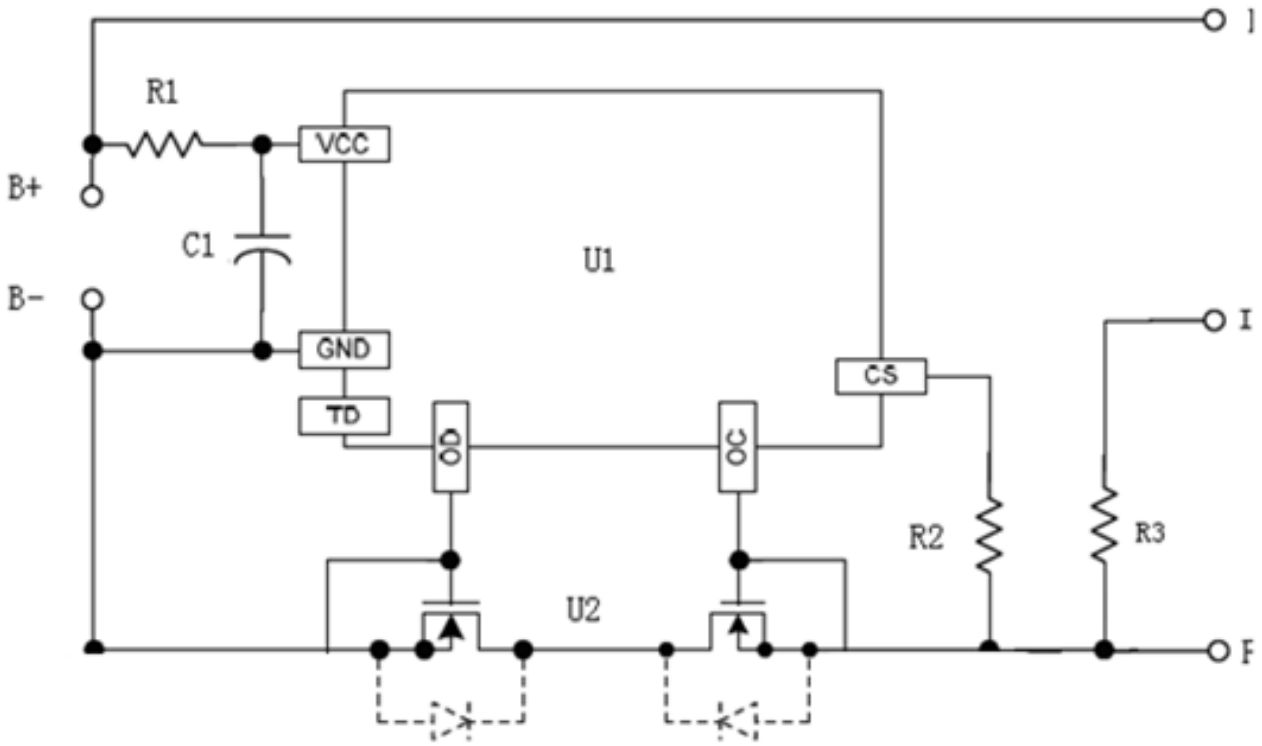
Circuit diagram:



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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 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 clearance and creepage distances between conductors		P
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse		P
5.3	**Venting**		P
	Battery cases and cells incorporate a pressure relief mechanism or are constructed so that they relieve excessive internal pressure at a value and rate that will preclude rupture, explosion and self-ignition	Venting mechanism exists on the top of the cylindrical cell.	P
	Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief		N/A
5.4	**Temperature, voltage and current management**		P
	Batteries are designed such that abnormal temperature rise conditions are prevented	Overcharge, over discharge, over current and short-circuit proof circuit used in this battery. See tests of clause 7.	P
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer	See above.	P

IEC 62133-2: 2017			
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 manufacturer's specification.	P
5.5	**Terminal contacts**		P
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current	DC connector complied with the requirement.	P
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance	Complied	P
	Terminal contacts are arranged to minimize the risk of short-circuit		P
5.6	**Assembly of cells into batteries**		P
5.6.1	General	1S2P	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		N/A
	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	Safety analysis report provided by manufacturer	P
5.6.2	Design recommendation		P
	For the battery consisting of a single cell or a single cellblock, it is recommended that the charging voltage of the cell does not exceed the upper limit of the charging voltage specified in Table 2	Charging voltage: 4.2V, not exceed 4.2V specified in Clause 7.1.2, Table 2.	P
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks, it is recommended that the voltages of any one of the single cells or single cellblocks does not exceed the upper limit of the charging voltage, specified in Table 2, by monitoring the voltage of every single cell or the single cellblocks		N/A
	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	Find voltage of cell: 2.75V not exceed the find voltage specified by the cell manufacturer	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	Mechanical protection for cell connections and control circuits provided.	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	Build-in batteries, mechanical protection for cells should be provided by 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	To be evaluated in find system	N/A
	For batteries intended for building into a portable end product, testing with the battery installed within the end product considered when conducting mechanical tests		N/A
5.7	**Quality plan**		P
	The manufacturer prepares and implements a quality plan that defines procedures for the inspection of materials, components, cells and batteries and which covers the whole process of producing each type of cell or battery	Complied. Quality plan provided.	P
5.8	**Battery safety components**		P
	According annex F	See TABLE: Critical components information	N/A

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 ≤ 3 Ω (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 °C ± 5 °C		P
	The safety analysis of 5.6.1 identify those components of the protection circuit that are critical for short-circuit, overcharge and 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	See clause 7.3.2	P

7	**SPECIFIC REQUIREMENTS AND TESTS**		**P**
7.1	**Charging procedure for test purposes**		P
7.1.1	First procedure		P

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IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
	This charging procedure applies to subclauses other than those specified in 7.1.2		P
	Unless otherwise stated in this document, the charging procedure for test purposes is carried out in an ambient temperature of 20 °C ± 5 °C, using the method declared by the manufacturer	See page 5	P
	Prior to charging, the battery have been discharged at 20 °C ± 5 °C at a constant current of 0,2 It A down to a specified final voltage	See page 5	P
7.1.2	Second procedure		P
	This charging procedure applies only to 7.3.1, 7.3.4, 7.3.5, and 7.3.9		P
	After stabilization for 1 h and 4 h, respectively, at ambient temperature of highest test temperature and lowest test temperature, as specified in Table 2, cells are charged by using the upper limit charging voltage and maximum charging current, until the charging current is reduced to 0,05 It A, using a constant voltage charging method.	Charge temperature 0-45°C declared.	P
7.2	**Intended use**		P
7.2.1	Continuous charging at constant voltage (cells)	Tested complied.	P
	Fully charged cells are subjected for 7 days to a charge using the charging method for current and standard voltage specified by the cell manufacturer	Charging for 7 days with 440mA	P
	Results: No fire. No explosion. No leakage .....:	(See appended table 7.2.1)	P
7.2.2	Case stress at high ambient temperature (battery)	Tested as client request.	P
	Oven temperature (°C) .....:	70°C	—
	Results: No physical distortion of the battery case resulting in exposure of internal protective components and cells	No physical distortion of the battery case resulting in exposure of internal protective components and cells	P
7.3	**Reasonably foreseeable misuse**		P
7.3.1	External short-circuit (cell)	Tested complied.	P
	The cells were tested until one of the following occurred:		N/A
	- 24 hours elapsed; or		N/A
	- The case temperature declined by 20% of the maximum temperature rise		P
	Results: No fire. No explosion .....:	(See appended table7.3.1)	P

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IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
7.3.2	External short-circuit (battery)	Tested complied.	P
	The batteries were tested until one of the following occurred:		P
	- 24 hours elapsed; or		N/A
	- The case temperature declined by 20 % of the maximum temperature rise		P
	In case of rapid decline in short circuit current, the battery pack remained on test for an additional one hour after the current reached a low end steady state condition		P
	A single fault in the discharge protection circuit conducted on one to four (depending upon the protection circuit) of the five samples before conducting the short-circuit test	Single fault conducted on four samples.	P
	A single fault applies to protective component parts such as MOSFET, fuse, thermostat or positive temperature coefficient (PTC) thermistor	Single fault applies on MOSFET (U2)	P
	Results: No fire. No explosion.....:	(See appended table 7.3.2)	P
7.3.3	Free fall	Tested complied.	P
	Results: No fire. No explosion	No fire. No explosion.	P
7.3.4	Thermal abuse (cells)	Tested complied.	P
	Oven temperature (°C).....:	130°C	—
	Results: No fire. No explosion	No fire. No explosion	P
7.3.5	Crush (cells)	Tested complied.	P
	The crushing force was released upon:		P
	- The maximum force of 13 kN±0,78kN has been applied; or		P
	- An abrupt voltage drop of one-third of the original voltage has been obtained		N/A
	Results: No fire. No explosion.....:	(See appended table 7.3.5)	P
7.3.6	Over-charging of battery	Tested complied.	P
	The supply voltage which is:		--
	- 1,4 times the upper limit charging voltage presented in Table A.1 (but not to exceed6,0 V) for single cell/cell block batteries or		N/A
	- 1,2 times the upper limit charging voltage resented in Table A.1 per cell for series connected multi-cell batteries, and	5.88V applied.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	- Sufficient to maintain a current of 2,0 It A throughout the duration of the test or until the supply voltage is reached		P
	Test was continued until the temperature of the outer casing:		P
	- Reached steady state conditions (less than 10°C change in 30-minute period); or		N/A
	- Returned to ambient		P
	Results: No fire. No explosion.....:	(See appended table 7.3.6)	P
7.3.7	Forced discharge (cells)	Tested complied.	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 table7.3.7)	P
7.3.8	Mechanical tests (batteries)		P
7.3.8.1	Vibration	Tested complied.	P
	Results: No fire, no explosion, no rupture, no leakage or venting. .....:	(See appended table 7.3.8.1)	P
7.3.8.2	Mechanical shock	Tested complied.	P
	Results: No leakage, no venting, no rupture, no explosion and no fire.....:	(See appended table 7.3.8.2)	P
7.3.9	Design evaluation – Forced internal short-circuit (cells)		N/A
	The cells complied with national requirement for .....:	Not requested by client, not comply with the requirements of France, Japan, Republic of Korea and 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
	Results: No fire .....:		N/A
8	**INFORMATION FOR SAFETY**		P

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Clause	Requirement + Test	Result - Remark	Verdict
8.1	**General**		P
	Manufacturers of secondary cells ensure that information is provided about current, voltage and temperature limits of their products	Information for safety mentioned in manufacturer's specifications.	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	Information for safety mentioned in manufacturer's specifications.	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, any information relating to hazard avoidance resulting from a system analysis provided to the end user		N/A
	Do not allow children to replace batteries without adult supervision		N/A
8.2	**Small cell and battery safety information**	Not small cell and battery	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 swallow able 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**	The final product is battery.	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
	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

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Clause	Requirement + Test	Result - Remark	Verdict
	Batteries marked as specified in IEC 61960, except for coin batteries	The battery is marked in accordance with IEC 61960, also see page 4.	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		N/A
9.3	**Caution for ingestion of small cells and batteries**	Not small cell and battery	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 safety mentioned in manufacturer's specifications.	P
	Recommended charging instructions	Information for safety 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	Not coin cells	N/A
	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**	Complied.	P

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IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
A.3	**Consideration on charging voltage**	Complied.	P
A.3.1	General		P
A.3.2	Upper limit charging voltage	4.2V	P
A.3.2.1	General		P
A.3.2.2	Explanation of safety viewpoint		N/A
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied	4.2V applied.	N/A
A.4	**Consideration of temperature and charging current**		P
A.4.1	General		P
A.4.2	Recommended temperature range	See A.4.2.2.	P
A.4.2.1	General		P
A.4.2.2	Safety consideration when a different recommended temperature range is applied	Charging temperature declared by client is: 0~45°C	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 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	Charging low temperature declared by client is 0°C	P
A.4.4.1	General		P
A.4.4.2	Explanation of safety viewpoint		P
A.4.4.3	Safety considerations, when specifying charging conditions in the low temperature range		P
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range	No documents provided by manufacturer explaining the lower limit exceed 10°C, -5°C applied for testing in this report for safety considerations.	P
A.4.5	Scope of the application of charging current		P
A.4.6	Consideration of discharge		P
A.4.6.1	General		P

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IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
A.4.6.2	Final discharge voltage and explanation of safety viewpoint		P
A.4.6.3	Discharge current and temperature range		P
A.4.6.4	Scope of application of the discharging current		P
A.5	**Sample preparation**		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
A.6.11	Recommended specifications for the pressing device		N/A
ANNEX B	**RECOMMENDATIONS TO EQUIPMENT MANUFACTURERS AND BATTERY ASSEMBLERS**		N/A
ANNEX C	**RECOMMENDATIONS TO THE END-USERS**		N/A
ANNEX D	**MEASUREMENT OF THE INTERNAL AC RESISTANCE FOR COIN CELLS**		N/A

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IEC 62133-2: 2017			
Clause	Requirement + Test	Result - Remark	Verdict
D.1	**General**	Not coin cells	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**		N/A

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	TABLE: Critical components information				P
Object/part no.	**Manufacturer/ trademark**	**Type/model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Cell	Roofer Energy Technology (Baoshan)Co., Ltd	INR18650-2200A	3.7V, 2200mAh	IEC 62133-2: 2017	Tested with appliance
- Electrolyte	Shantou golden light High Tech Co., Ltd.	A2511	DMC/EC/EMC $LiPF_6$	--	--
- Separator	Xinxiang city science and Technology Co Ltd	61*0.02mm	PP, shutdown temperature 130°C, One layer	--	--
-Negative Electrode	Shenzhen beiterui new energy Limited by Share Ltd	A9	Graphite	--	--
-Positive Electrode	Hunan Shanshan energy Polytron Technologies Inc	T31D/LM011-HD	Li(Ni, Co, Mn) O_2/$LiMn_2O_4$	--	--
PCB	Shenzhen xing yong hao electronics co. LTD	LHX-2840	Thickness: 0.6 MM Fire rating: 94-V0 Heat resistance value: 280 ℃ +/- 10 ℃	--	--
Protect IC (U1)	Shenzhen dept microelectronics co. LTD	DW01/SOT-23-6	Overcharge Protection Voltage: 4.28V±0.025V, Overdischarge Protection Voltage: 2.4V±0.1V, T_{op}r: -40°C ~+85°C	--	Tested with appliance
MOSFET (U2)	Ketong electronics co. LTD	8205A/TSSOP-8	V_{DS}: 20V, V_{GS}: ±10V, I_D: 6A, T_{stg}: -55°C to +150°C	--	Tested with appliance
Wiring	--	1007	22AWG, 80ºC, 300V, VW-1	--	--
Connector	DONGGUAN HAODE WIRE&CABLE TECHNOLOGY CO LTD	SYP	V-0, 120°C, 2Pin	--	--

Supplementary information:

[1)] Provided evidence ensures the agreed level of compliance.

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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**
C01	4.20	440	4.18	P
C02	4.20	440	4.18	P
C03	4.20	440	4.18	P
C04	4.20	440	4.18	P
C05	4.20	440	4.18	P
Supplementary information: - No fire or explosion - No leakage				

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 ~~rise ΔT~~, (°C)**	**Results**
Samples charged at charging temperature upper limit (45°C)					
C06	55.3	4.18	82	102.4	P
C07	55.3	4.17	83	107.2	P
C08	55.3	4.17	74	106.6	P
C09	55.3	4.17	88	109.7	P
C10	55.3	4.17	89	104.3	P
Samples charged at charging temperature lower limit (-5°C)					
C11	55.7	4.13	85	112.3	P
C12	55.7	4.13	84	110.5	P
C13	55.7	4.13	76	110.6	P
C14	55.7	4.12	86	109.8	P
C15	55.7	4.13	85	106.8	P
Supplementary information: - No fire or explosion					

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7.3.2	TABLE: External short-circuit (battery)					P
Sample no.	**Ambient(°C)**	**OCV before test (Vdc)**	**Resistance of circuit (mΩ)**	**Maximum case temperature ~~rise ΔT~~, (°C)**	**Component single fault condition**	**Results**
B4	23.2	4.17	88	103.1	MOSFET (U2) SC	P
B5	23.2	4.17	83	99.6	MOSFET (U2) SC	P
B6	23.2	4.17	82	103.4	MOSFET (U2) SC	P
B7	23.2	4.17	82	105.6	MOSFET (U2) SC	P
B8	23.2	4.18	85	24.4	--	P
Supplementary information: - No fire or explosion *Remark SC: Short circuit						

7.3.5	TABLE: Crush (cells)			P
Sample no.	**OCV before test (Vdc)**	**OCV at removal of crushing force (Vdc)**	**Maximum force applied to the cell during crush (kN)**	**Results**
Samples charged at charging temperature upper limit (45°C)				
C29	4.17	4.17	13	P
C30	4.18	4.16	13	P
C31	4.17	4.16	13	P
C32	4.17	4.16	13	P
C33	4.17	4.17	13	P
Samples charged at charging temperature lower limit (-5°C)				
C34	4.13	4.12	13	P
C35	4.13	4.12	13	P
C36	4.13	4.13	13	P
C37	4.12	4.12	13	P
C38	4.12	4.12	13	P
Supplementary information: - No fire or explosion				

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7.3.6	TABLE: Over-charging of battery				P
Constant charging current (A) .....:		8.8			—
Supply voltage (Vdc).....:		5.88			—
Sample no.	**OCV before charging (Vdc)**	**Total charging time (minute)**	**Maximum outer case temperature (°C)**	**Results**	
B12	3.25	60	33.5	P	
B13	3.28	60	32.4	P	
B14	3.33	60	34.2	P	
B15	3.30	60	31.3	P	
B16	3.34	60	32.4	P	
Supplementary information: - No fire or explosion					

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**
C39	3.23	2200	2.75	P
C40	3.22	2200	2.75	P
C41	3.21	2200	2.75	P
C42	3.22	2200	2.75	P
C43	3.24	2200	2.75	P
Supplementary information: - No fire or explosion				

7.3.8.1	TABLE: Vibration				P
Sample no.	**OCV before test (Vdc)**	**OCV after test (Vdc)**	**Mass before test (g)**	**Mass after test(g)**	**Results**
B17	4.17	4.17	92.432	92.432	P
B18	4.17	4.17	94.213	94.213	P
B19	4.18	4.17	94.242	94.242	P
Supplementary information: - No fire or explosion - No rupture - No leakage - No venting					

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7.3.8.2	TABLE: Mechanical shock				P
Sample no.	**OCV before test (Vdc)**	**OCV after test (Vdc)**	**Mass before test (g)**	**Mass after test(g)**	**Results**
B20	4.17	4.17	93.645	93.643	P
B21	4.17	4.17	93.754	93.752	P
B22	4.18	4.17	94.732	94.731	P

Supplementary information:

- No fire or explosion
- No rupture
- No leakage
- No venting

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

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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

-- End of Report --

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Attachment 1

Photo Documentation

Product: Li-ion Battery

Type Designation: XXK 18650

Figure 1 Front view of battery

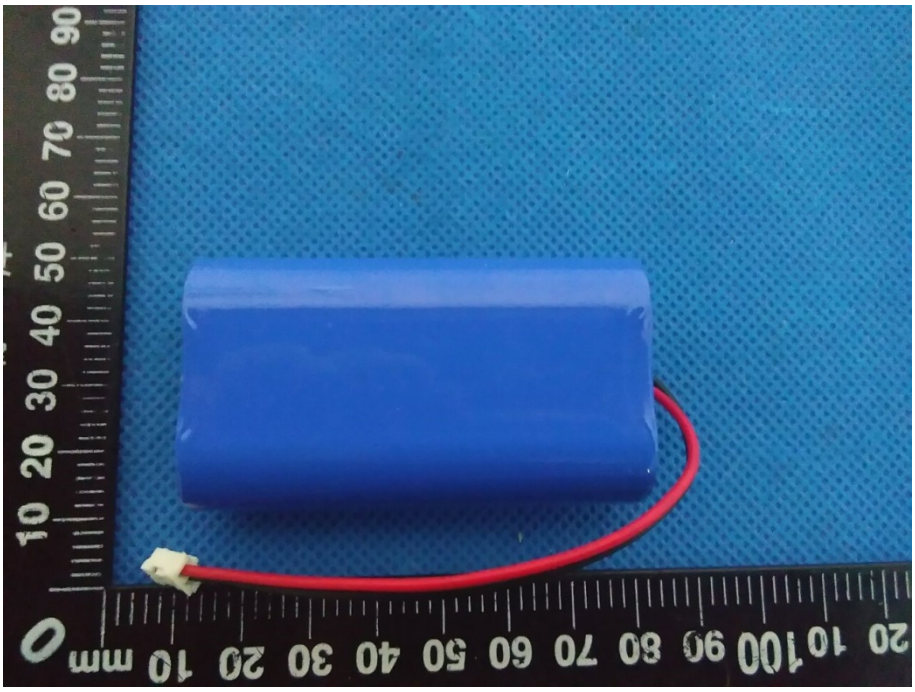

Figure 2 Back view of battery

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Product: Li-ion Battery

Type Designation: XXK 18650

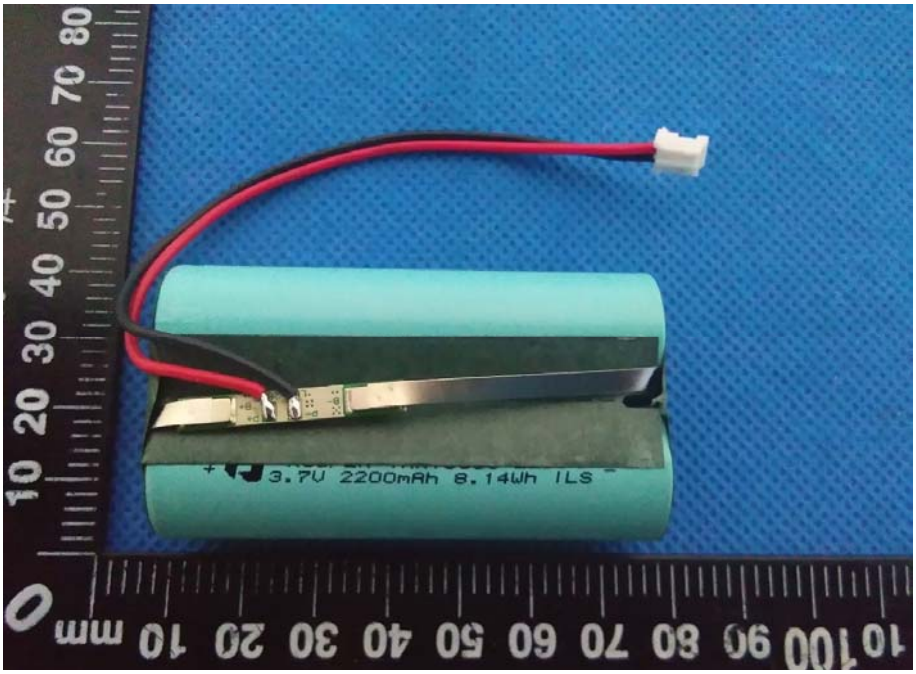

Figure 3 Internal view -1 of battery

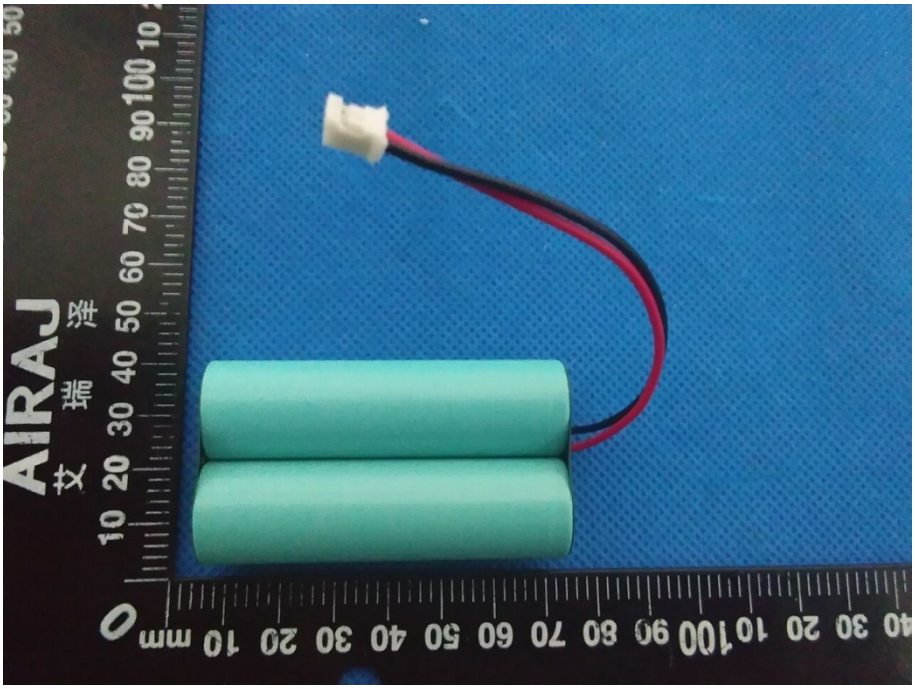

Figure 4 Internal view -2 of battery

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Product: Li-ion Battery

Type Designation: XXK 18650

Figure 5 Front view of cell

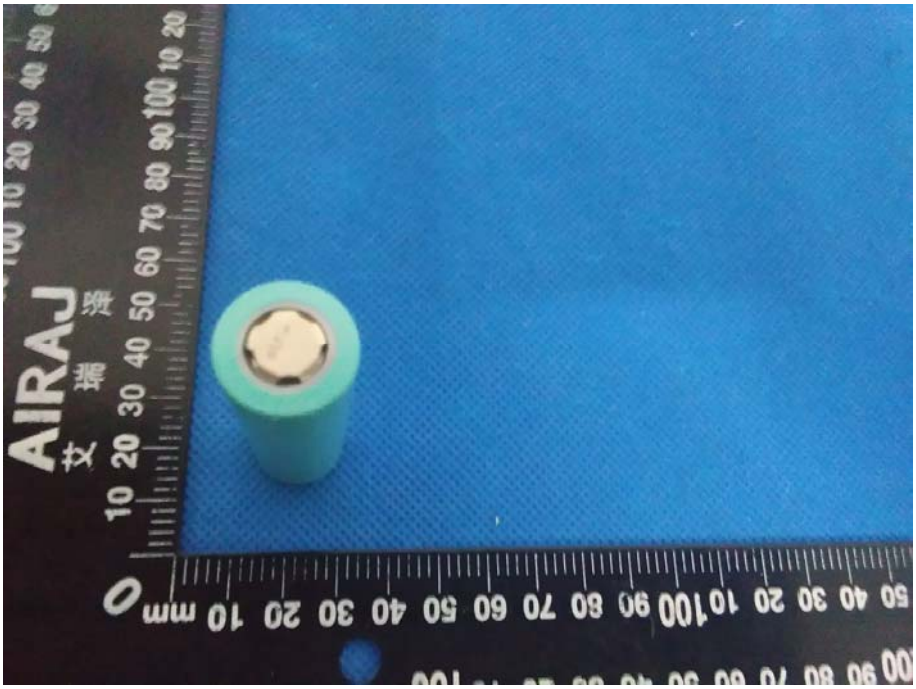

Figure 6 Top view of cell

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Product: Li-ion Battery

Type Designation: XXK 18650

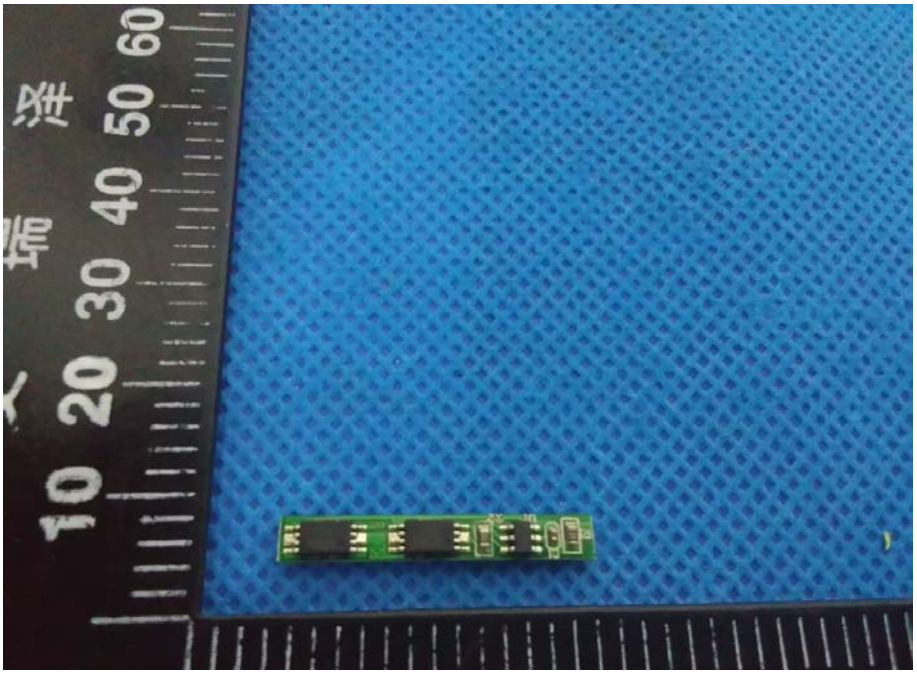

Figure 7 Front view of PCM

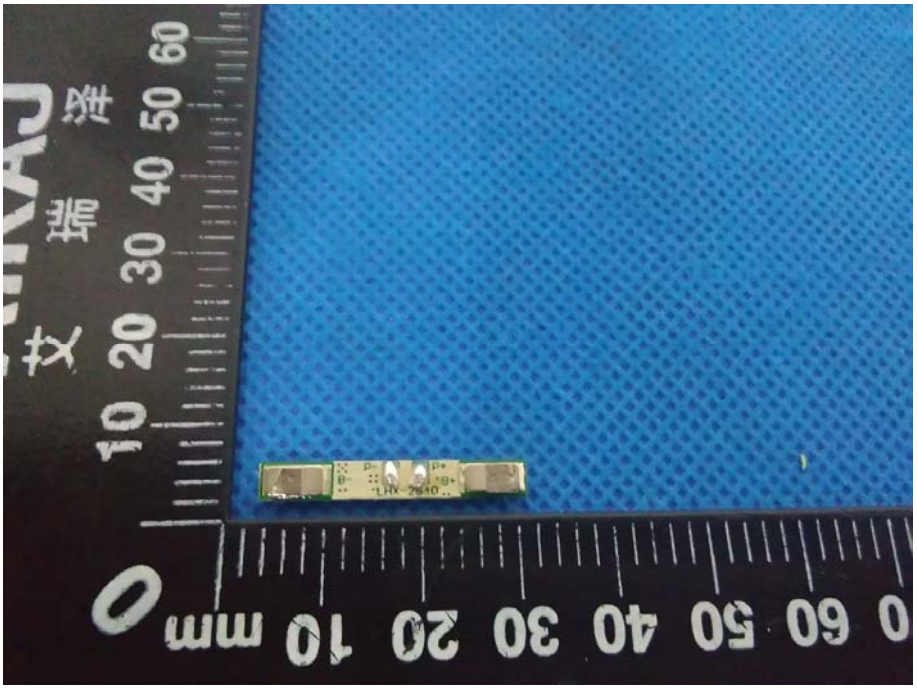

Figure 8 Back view of PCM

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