TEST REPORT
EN62133
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 Number. .....:	LCS171221035AS
Date of issue .....:	2018-01-17
Total number of pages.....:	24 pages
Tested by (name + signature) .....:	Starry Li
Checked by (name + signature) ...:	Tiny Yang
Approved by (name + signature) .:	Hart Qiu
Applicant's name.....:	Shenzhen KVD Communication Equipment Limited
Address .....:	Lenovo R&D Center 2F-B, South First Road, High-tech Park, Nanshan District, Shenzhen, Guangdong, China
Test specification:	
Standard.....:	EN 62133: 2013
Test result .....:	Pass
Non-standard test method.....:	N/A
Testing laboratory .....:	Shenzhen LCS Compliance Testing Laboratory Ltd.
Address .....:	1/F, Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Testing location.....:	As above
Test item description .....:	Rechargeable Li-ion Battery
Trade Mark .....:	N/A
Manufacturer.....:	Shenzhen KVD Communication Equipment Limited
Address .....:	A, 3rd floor, Building A2, Silicon valley Digital Industrial Park, 22nd of Dafu industrial area, Aobei Community, Guanlan town, Longhua District, Shenzhen 518000
Model/Type reference .....:	BAT17M15580
Ratings .....:	3.8V, 5580mAh, 21.2Wh

Note:

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

Attachment 1: Photo documentation (3 pages).

Summary of testing:

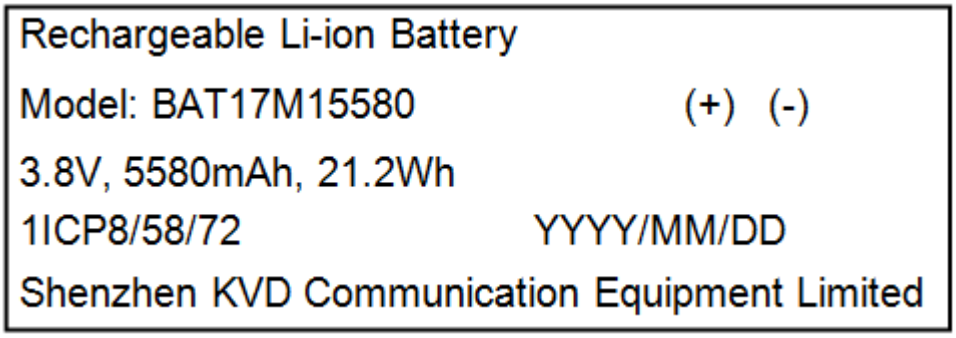
Tests performed (name of test and test clause):	**Testing location:**

cl.5.6.2 Design recommendation (Lithium system);
cl.8.1 Charging procedure for test purposes (for Cells and Batteries);
cl.8.2.1 Continuous charging at constant voltage (Cells);
cl.8.3.1 External short circuit (Cell);
cl.8.3.2 External short circuit (Batteries);
cl.8.3.3 Free fall (Cells and Batteries);
cl.8.3.4 Thermal abuse (Cells);
cl.8.3.5 Crush (Cells);
cl.8.3.6 Over-charging of battery(Batteries);
cl.8.3.7 Forced discharge (Cells);
cl.8.3.8 Transport tests(Cells);
 	
cl.8.3.9 was not evaluated by client request, not comply with the requirements of France, Japan, Republic of Korea, Switzerland.
 	
Tests are made with the number of cells and batteries specified in EN 62133: 2013 Table 2.
	Shenzhen LCS Compliance Testing Laboratory Ltd.
	1/F, Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China

☒ **The product fulfils the requirements of EN 62133: 2013**

Copy of marking plate:

The artwork below may be only a draft.



Remark:

“YYYY/MM/DD” means the date of manufacture

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 1116mA constant current until 4.35V, then constant voltage until charge current reduces to 111.6mA at ambient 20°C±5°C
Discharge current (0.2 I_t A) ..... :	1116mA
Specified final voltage ..... :	3.0V
Chemistry ..... :	☐ nickel systems ..... ☒ lithium systems
Recommend of charging limit for lithium system	
Upper limit charging voltage per cell.....:	4.35V
Maximum charging current.....:	2790mA
Charging temperature upper limit.....:	60°C
Charging temperature lower limit.....:	0°C
Polymer cell electrolyte type ..... :	☐ gel polymer ☐ solid polymer ☒N/A
Possible test case verdicts:	
- test case does not apply to the test object.....:	N/A
- test object does meet the requirement.....:	P (Pass)
- test object does not meet the requirement.....:	F (Fail)
Testing.....:	
Date of receipt of test item .....:	2017-12-22
Date (s) of performance of tests.....:	2017-12-22 to 2018-01-10

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.

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

General product information:

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

The main features of the battery pack 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
BAT17M15580 (Battery)	5580mAh	3.8V	1116mA	1116mA	2790mA	5580mA	4.35V	3.0V

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

Model	Upper limit charge voltage	Taper-off current	Lower charge temperature	Upper charge temperature
BAT17M15580 (Battery)	4.35V	279mA	0°C	60°C

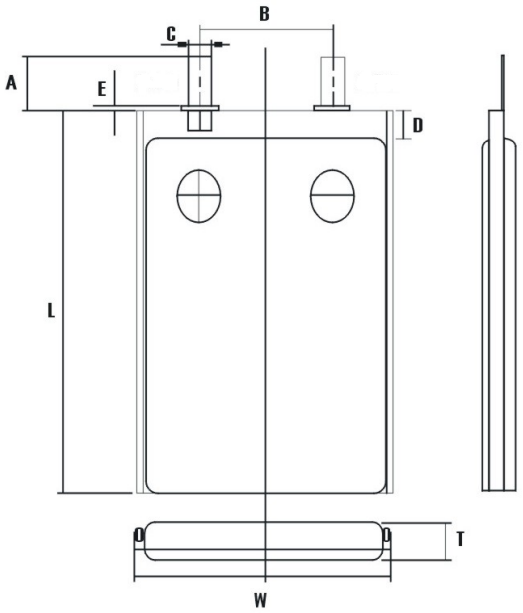
The main features of the cell in the battery pack are shown as below (clause 8.1.1):

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
V755872P (Cell)	5580mAh	3.8V	1116mA	1116mA	2790mA	5580mA	4.35V	3.0V

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

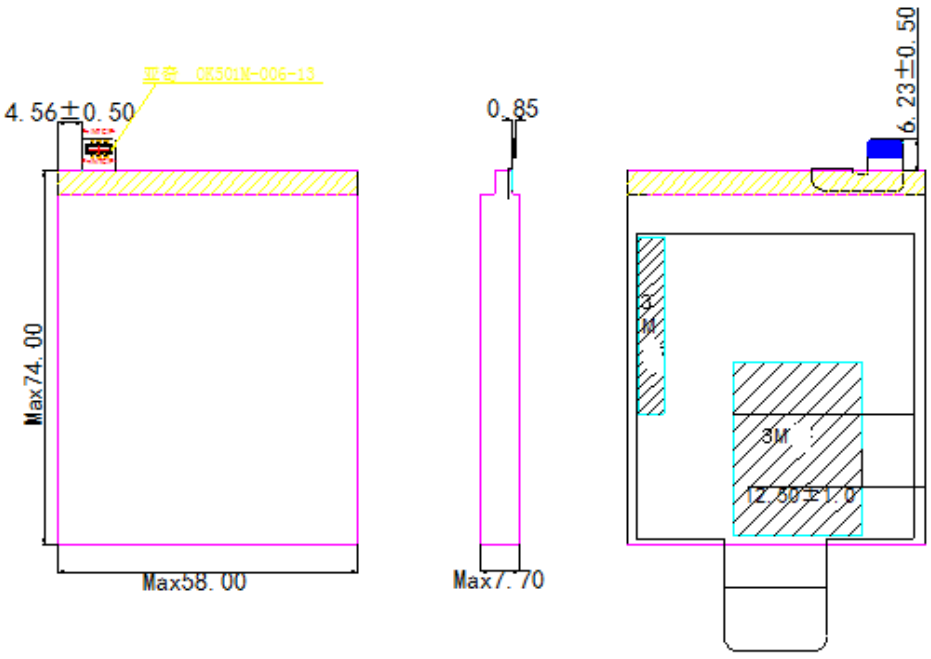
Model	Upper limit charge voltage	Taper-off current	Lower charge temperature	Upper charge temperature
V755872P (Cell)	4.35V	279mA	0°C	60°C

Construction (unit: mm):



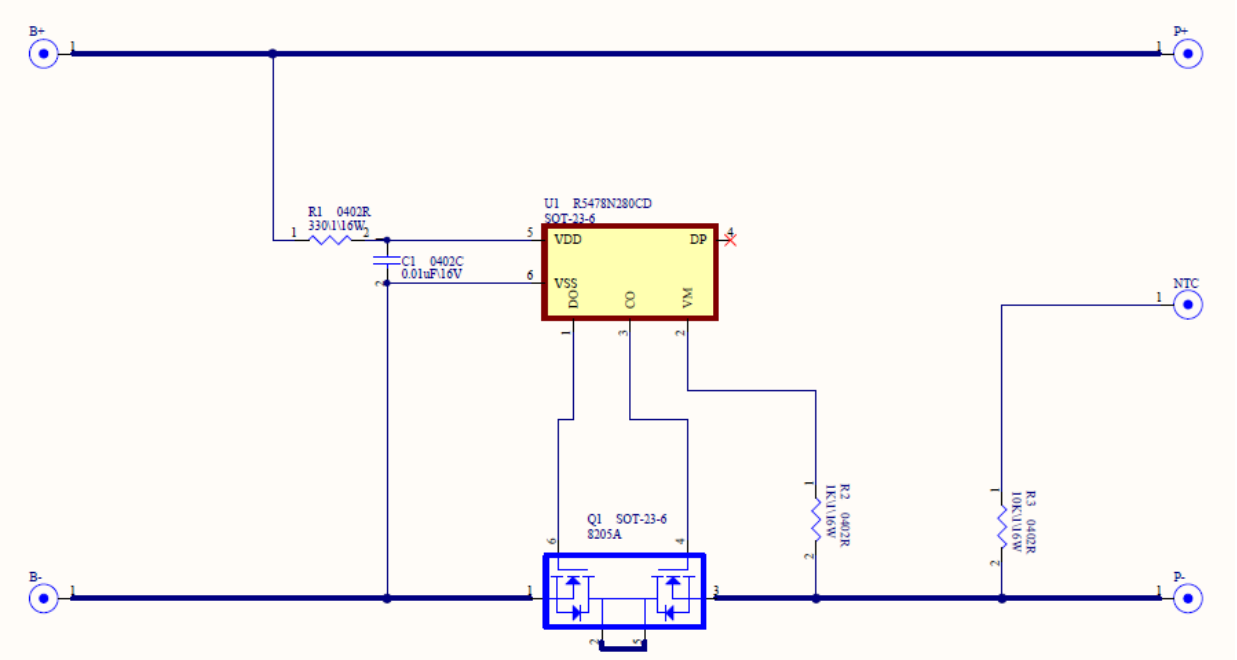
Item	Specifications
T	7.5mm max.
W	58.0mm max.
L	71.5mm max.

Cell



Battery (unit: mm)

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	Venting mechanism exists on 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 manufacturer's specifications.	P
5.5	Terminal contacts		P

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Clause	Requirement + Test	Result - Remark	Verdict
	Terminals have a clear polarity marking on the external surface of the battery	The “ +” and “ -” polarity explicitly marked on surface of the battery	P
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current	DC terminal connector complied with the requirements.	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	Single cell battery.	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		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		N/A
	- Charging voltage of the cell does not exceed the different upper limit of the charging voltage determined through Clause 8.1.2, NOTE 1.	Max. Charging voltage: 4.35V, not exceed 4.35V specified in Clause 8.1.2, NOTE 1.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	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
	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. Quality plan provided.	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. 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

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Clause	Requirement + Test	Result - Remark	Verdict
7.2.2	Vibration		N/A
	Results: No fire. No explosion. No leakage	(See Table 7.2.2)	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
	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..... :	(See Table 7.3.1)	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..... :	(See Table 7.3.2)	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

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Clause	Requirement + Test	Result - Remark	Verdict
	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..... :	(See Table 7.3.6)	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..... :	(See Table 7.3.8)	N/A
7.3.9	Forced discharge		N/A
	Results: No fire. No explosion..... :	(See Table 7.3.9)	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		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 0-60°C declared. 65°C used for upper limit tests; -5°C used for lower limit tests.	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	Upper limit charging voltage: 4.35V	P
	A valid rationale was provided to ensure the safety of the cell (see Figure A.1) ..... :	4.35V applied.	P
8.2	Intended use		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 case exists.	N/A
	Oven temperature (°C)..... :		—

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Clause	Requirement + Test	Result - Remark	Verdict
	Results: No physical distortion of the battery casing resulting in exposure of internal components		N/A
8.3	Reasonably foreseeable misuse		P
8.3.1	External short circuit (cell)	Tested complied.	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
	The cells were tested until one of the following occurred: - 24 hours elapsed; or	Tested complied.	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)	<500g, small cell.	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

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Clause	Requirement + Test	Result - Remark	Verdict
	Results: No fire. No explosion..... :	(See Table 8.3.5)	P
8.3.6	Over-charging of battery	Tested complied.	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	Tested complied.	P
	Manufacturer's documentation provided to show compliance with UN Recommendations on Transport of Dangerous Goods		P
8.3.9	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: - 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 ..... :	(See Table 8.3.9)	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 specifications.	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 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, information relating to hazard avoidance resulting from a system analysis is provided to the end user ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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.	The battery is marked in accordance with IEC 61960, also see page 3.	P
	Batteries marked with an appropriate caution statement.		N/A
10.3	Other information		P
	Storage and disposal instructions marked on or supplied with the battery.	Information for disposal instructions mentioned in manufacturer's specifications.	P
	Recommended charging instructions marked on or supplied with the battery.	Information for recommended charging instructions mentioned in manufacturer's specifications.	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		P
A.3.2	Upper limit charging voltage	Max. charging voltage: 4.35V	P
A.3.2.1	General		P
A.3.2.2	Explanation of safety viewpoint		P
A.3.2.3	Safety requirements, when different upper limit charging voltage is applied	4.35V applied.	P
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

EN 62133: 2013			
Clause	Requirement + Test	Result - Remark	Verdict
A.4.2.2	Safety consideration when a different recommended temperature range is applied	Charging temperature for cell declared by client is: 0-60°C	P
A.4.3	High temperature range	Charging high temperature declared by client is 60°C	P
A.4.3.1	General		P
A.4.3.2	Explanation of safety viewpoint		P
A.4.3.3	Safety considerations when specifying charging conditions in high temperature range		P
A.4.3.4	Safety consideration when specifying new upper limit in high temperature range	65°C applied.	P
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 low temperature range		P
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range	-5°C applied.	P
A.4.5	Scope of the application of charging 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
	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
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

	TABLE: Critical components information				P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity [1)]
Cell	Shenzhen KVD Communication Equipment Limited	V755872P	3.8V, 5580mAh, 21.2Wh	EN 62133: 2013	Tested with appliance
PCB	Interchangeable	Interchangeable	V-0, 130ºC	--	--
Protection IC (U1)	SEIKO	MM3280JB5	V_{CU}=4.4±0.05V V_{DL}=2.8±0.1V	--	Tested with appliance
MOSFET (Q2)	Shenzhen Developer Microelectronics Co., Ltd	8205A	V_{DS}:20V V_{GS}:±12V I_D:7.5A	--	Tested with appliance
Supplementary information: **[1)] Provided evidence ensures the agreed level of compliance.**					

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:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

7.2.2	TABLE: Vibration	N/A

Model	OCV at start of test, (Vdc)	Results

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

7.3.1	TABLE: Incorrect installation (cells)	N/A

Model	OCV of reversed cell, (Vdc)	Results

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

7.3.2	TABLE: External short circuit	N/A

Model	Ambient (at 20℃ ± 5ºC or 55°C ± 5 ºC)	OCV at start of test, (Vdc)	Resistance of circuit, (Ω)	Maximum case temperature rise ΔT, (ºC)	Results

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

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

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

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

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

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**

Supplementary information:

- No fire or explosion
- No leakage
- Leakage
- Fire
- Explosion
- Bulge
- Others (please explain)

8.2.1	TABLE: Continuous charging at constant voltage (cells)			P
Model	**Recommended charging voltage V_c, (Vdc)**	**Recommended charging current I_{rec}, (mA)**	**OCV at start of test, (Vdc)**	**Results**
Cell #1	4.35	1116	4.34	P
Cell #2	4.35	1116	4.33	P
Cell #3	4.35	1116	4.34	P
Cell #4	4.35	1116	4.34	P
Cell #5	4.35	1116	4.34	P

Supplementary information:

- No fire or explosion
- No leakage

8.3.1	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**
Samples charged at charging temperature upper limit (65°C)					
Cell #1	23.5	4.32	82	117.4	P
Cell #2	23.7	4.31	84	116.2	P
Cell #3	23.8	4.32	83	113.2	P
Cell #4	23.8	4.31	83	115.3	P
Cell #5	23.7	4.32	82	114.5	P
Samples charged at charging temperature lower limit (-5°C)					
Cell #6	23.6	4.25	83	115.4	P
Cell #7	23.6	4.24	83	114.6	P
Cell #8	23.5	4.24	84	114.3	P
Cell #9	23.7	4.25	82	115.5	P
Cell #10	23.6	4.25	82	112.7	P

Supplementary information:

- No fire, no explosion

8.3.2	TABLE: External short circuit (battery)				P
Model	**Ambient, (℃)**	**OCV at start of test, (Vdc)**	**Resistance of circuit, (mΩ)**	**Maximum case temperature ~~rise~~ ΔT, (°C)**	**Results**
Samples charged at charging temperature upper limit (65°C)					
Battery #1	55.5	4.32	82	55.7	P
Battery #2	55.4	4.32	83	55.6	P
Battery #3	55.5	4.32	84	55.7	P
Battery #4	55.4	4.31	83	55.7	P
Battery #5	55.6	4.32	83	55.9	P
Samples charged at charging temperature lower limit (-5°C)					
Battery #6	55.6	4.25	82	55.8	P
Battery #7	55.4	4.26	81	55.7	P
Battery #8	55.5	4.25	83	55.9	P
Battery #9	55.6	4.25	82	55.9	P
Battery #10	55.6	4.25	84	55.8	P

Supplementary information:

- No fire, no explosion

8.3.5	TABLE: Crush (cells)				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 (65°C)					
Cell #1	4.32	4.31	--	--	P
Cell #2	4.32	4.31	--	--	P
Cell #3	4.31	4.31	--	--	P
Cell #4	4.32	4.32	--	--	P
Cell #5	4.31	4.31	--	--	P
Samples charged at charging temperature lower limit (-5°C)					
Cell #6	4.24	4.24	--	--	P
Cell #7	4.25	4.24	--	--	P
Cell #8	4.24	4.23	--	--	P
Cell #9	4.24	4.24	--	--	P
Cell #10	4.24	4.24	--	--	P

Note:

A 13kN force applied at the wide side of prismatic cells.

No voltage abrupt drop occurred.

Supplementary information:

- No fire or explosion

8.3.6	TABLE: Over-charging of battery			P
Constant charging current (A).....:		**11.16**		–
Supply voltage (Vdc).....:		**5**		–
Model	**OCV before charging, (Vdc)**	**Resistance of circuit, (Ω)**	**Maximum outer casing temperature, (°C)**	**Results**
Battery #1	3.32	--	36.4	P
Battery #2	3.31	--	38.2	P
Battery #3	3.31	--	37.3	P
Battery #4	3.33	--	36.2	P
Battery #5	3.31	--	37.2	P

Supplementary information:

- No fire or explosion

8.3.7	TABLE: Forced discharge (cells)			P
Model	**OCV before application of reverse charge, (Vdc)**	**Measured Reverse charge I_t, (mA)**	**Time for reversed charge, (minutes)**	**Results**
Cell #1	3.31	5580	90	P
Cell #2	3.33	5580	90	P
Cell #3	3.32	5580	90	P
Cell #4	3.32	5580	90	P
Cell #5	3.31	5580	90	P

Supplementary information:

- No fire or explosion

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)**	**Voltage drop, (mV)**	**Results**

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

-- End of Report --

Attachment 1

Photo Documentation

Product: Rechargeable Li-ion Battery

Type Designation: BAT17M15580

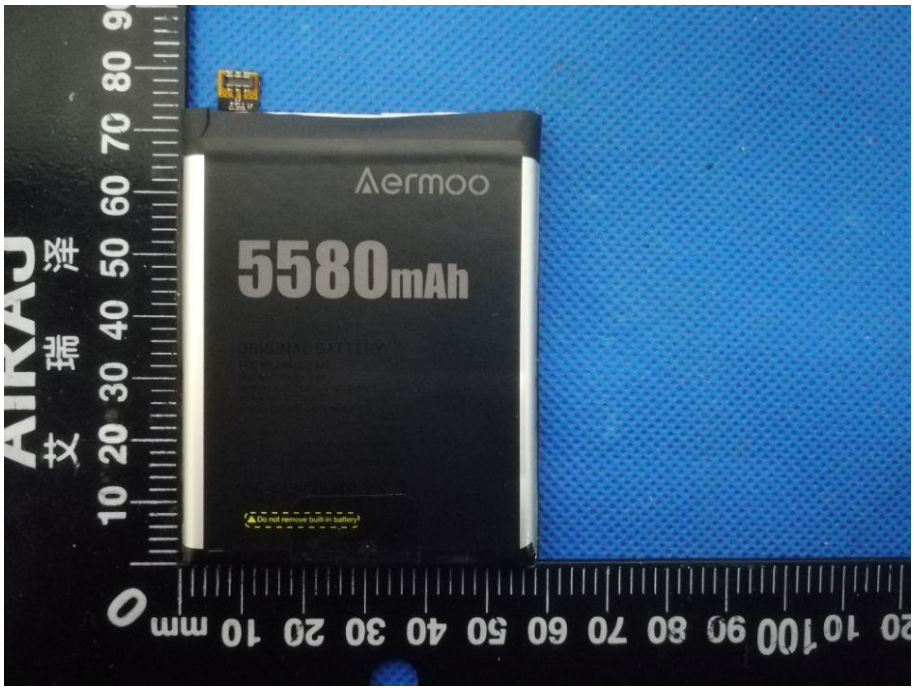


Figure 1 Front view of battery

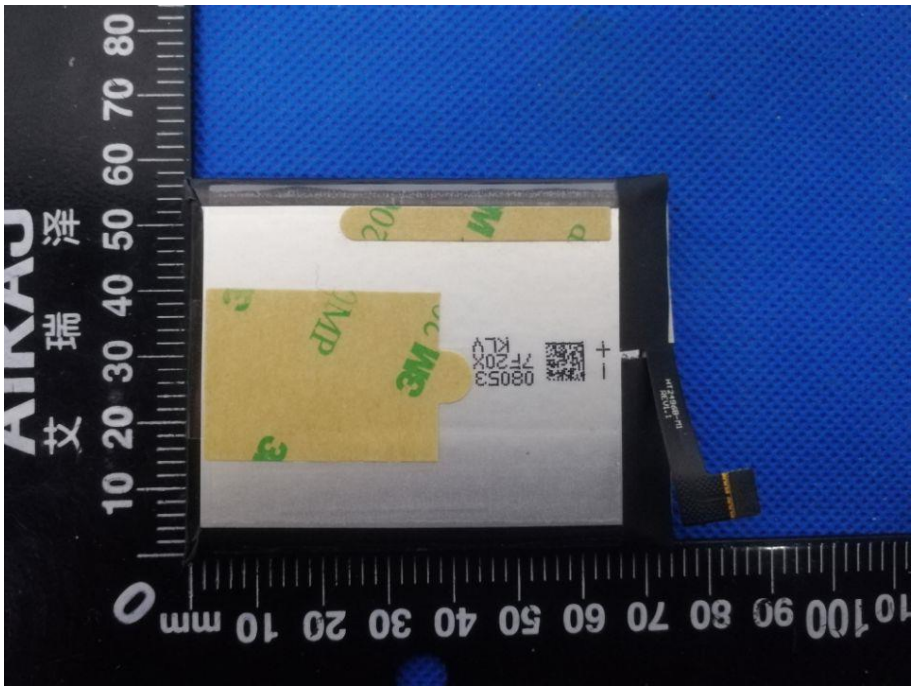


Figure 2 Back view of battery

Product: Rechargeable Li-ion Battery

Type Designation: BAT17M15580

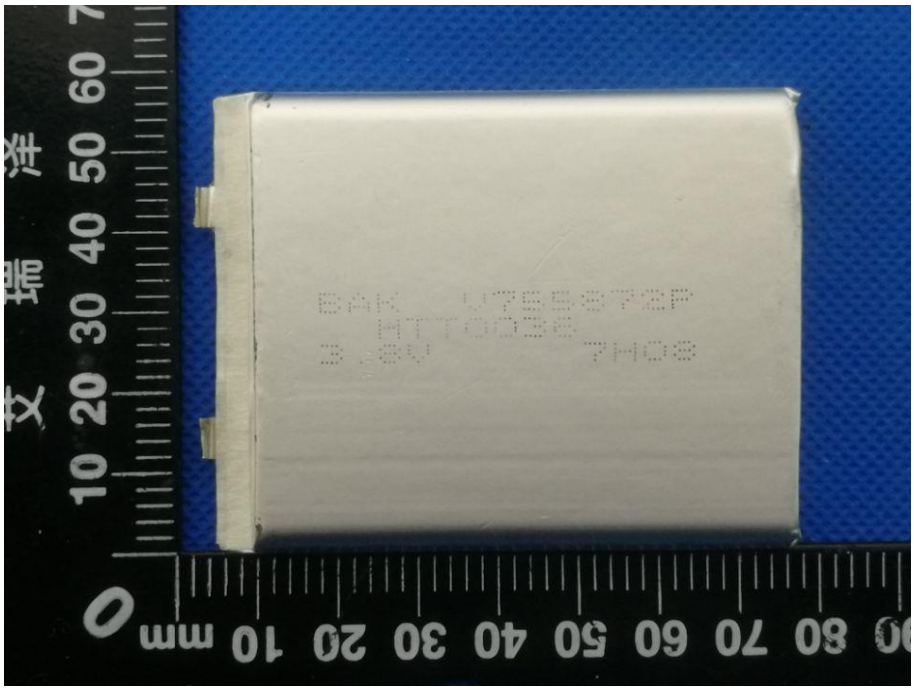


Figure 3 Front view of cell

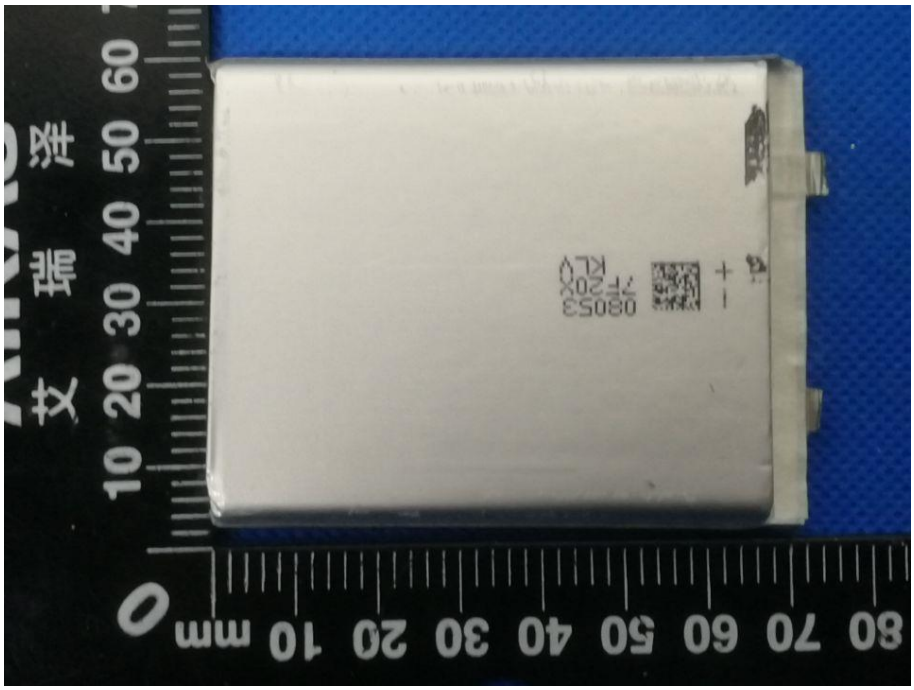


Figure 4 Back view of cell

Product: Rechargeable Li-ion Battery

Type Designation: BAT17M15580

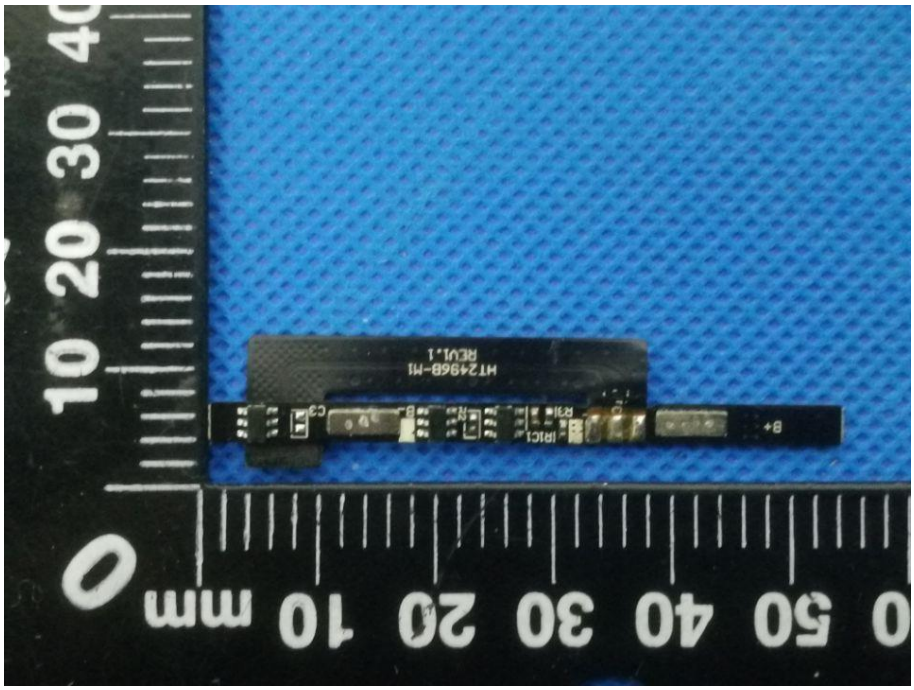


Figure 5 Front view of PCB

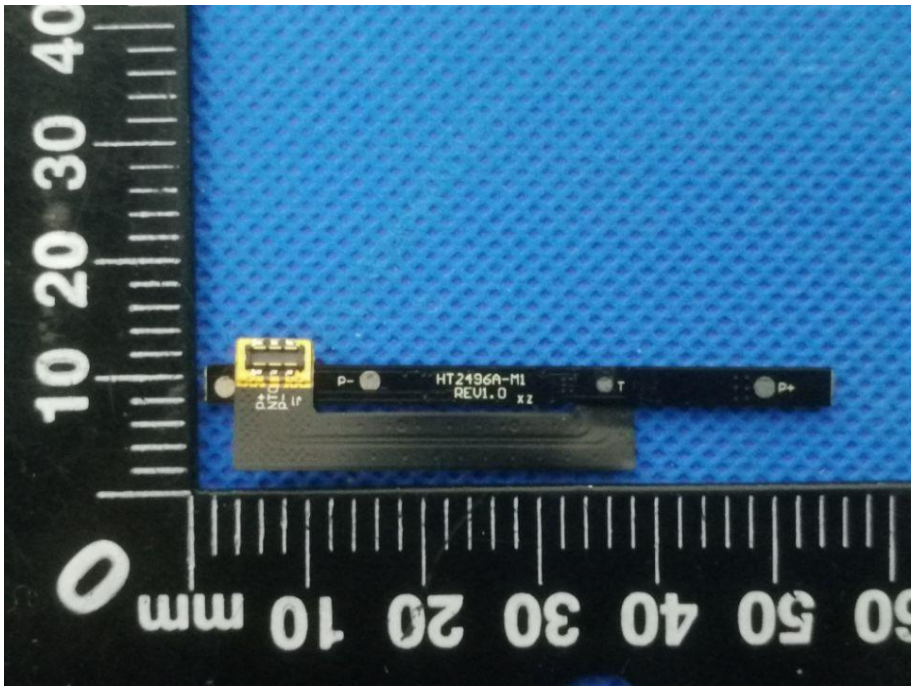


Figure 6 Back view of PCB