

TEST REPORT

IEC 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 Number..... : LCS170420141AS

Date of issue : 2017-05-06

Total number of pages : 23 pages

Tested by (name + signature) : Starry Li

Checked by (+ signature) : Rick Zhu

Approved by (name + signature) : Tiny Yang



Applicant's name :

Address :

Test specification:

Standard : IEC 62133: 2012 (Second Edition)

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 Lithium-ion Polymer Cell

Trade Mark : N/A

Manufacturer : Same as applicant

Address : Same as applicant

Model/Type reference..... : 105568

Ratings..... : 3.7V, 5000mAh, 18.5Wh

Note:

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List of Attachments (including a total number of pages in each attachment): Attachment 1: Photo documentation (1 page).	
Summary of testing:	
Tests performed (name of test and test clause): cl.5.6.2 Design recommendation (Lithium system); cl.8.1 Charging procedure for test purposes (for Cells); cl.8.2.1 Continuous charging at constant voltage (Cells); cl.8.3.1 External short circuit (Cell); cl.8.3.3 Free fall (Cells); cl.8.3.4 Thermal abuse (Cells); cl.8.3.5 Crush (Cells); cl.8.3.7 Forced discharge (Cells); cl.8.3.8 Transport tests(Cells) The electrolyte type of this cell doesn't belong to polymer, 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 specified in IEC 62133: 2012 (Second Edition) Table 2.	Testing location: Shenzhen LCS Compliance Testing Laboratory Ltd. 1/F, Xingyuan Industrial Park, Tongda Road, Bao'an Avenue, Bao'an District, Shenzhen, Guangdong, China
Summary of compliance with National Differences: BE, BY, CN, DE, DK, FI, GB, HU, NL, NO, SA, SE, SG, SI, US BE=Belgium, BY= Belarus, CN=China, DE=Germany, DK=Denmark, FI=Finland, GB=United Kingdom , HU=Hungary, NL=Netherlands, NO=Norway, SA=Saudi Arabia, SE=Sweden, SG=Singapore SI=Slovenia, US=United States of America <input checked="" type="checkbox"/> The product fulfils the requirements of <u>EN 62133: 2013</u>	

Copy of marking plate:

The artwork below may be only a draft.

- Rechargeable Lithium-ion Polymer Cell
105568 3.7V 5000mAh 18.5Wh
ICP10/56/72 20170426
+

Test item particulars.....:	
Classification of installation and use.....:	To be defined in final product
Supply connection.....:	Electrode Tab
Recommend charging method declared by the manufacturer	Charging the cell with 1000mA constant current until 4.2V, then constant voltage until charge current reduces to 250mA at ambient 20°C±5°C
Discharge current (0.2 I_t A)	1000mA
Specified final voltage	3.0V
Chemistry	<input type="checkbox"/> nickel systems <input checked="" type="checkbox"/> lithium systems
Recommend of charging limit for lithium system	
Upper limit charging voltage per cell.....:	4.25V
Maximum charging current	5000mA
Charging temperature upper limit	45°C
Charging temperature lower limit.....:	10°C
Polymer cell electrolyte type	<input type="checkbox"/> gel polymer <input type="checkbox"/> solid polymer <input checked="" type="checkbox"/> 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	2017-04-21
Date (s) of performance of tests	2017-04-21 to 2017-05-06
General remarks:	
<p>The test results presented in this report relate only to the object tested.</p> <p>This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.</p> <p>"(See Enclosure #)" refers to additional information appended to the report.</p> <p>"(See appended table)" refers to a table appended to the report.</p> <p>Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.</p>	
Name and address of factory (ies) : Same as applicant	

General product information:

The cell consists of the positive electrode plate, negative electrode plate, separator, electrolyte and case. The positive and negative electrode plates are housed in the case in the state being separated by the separator.

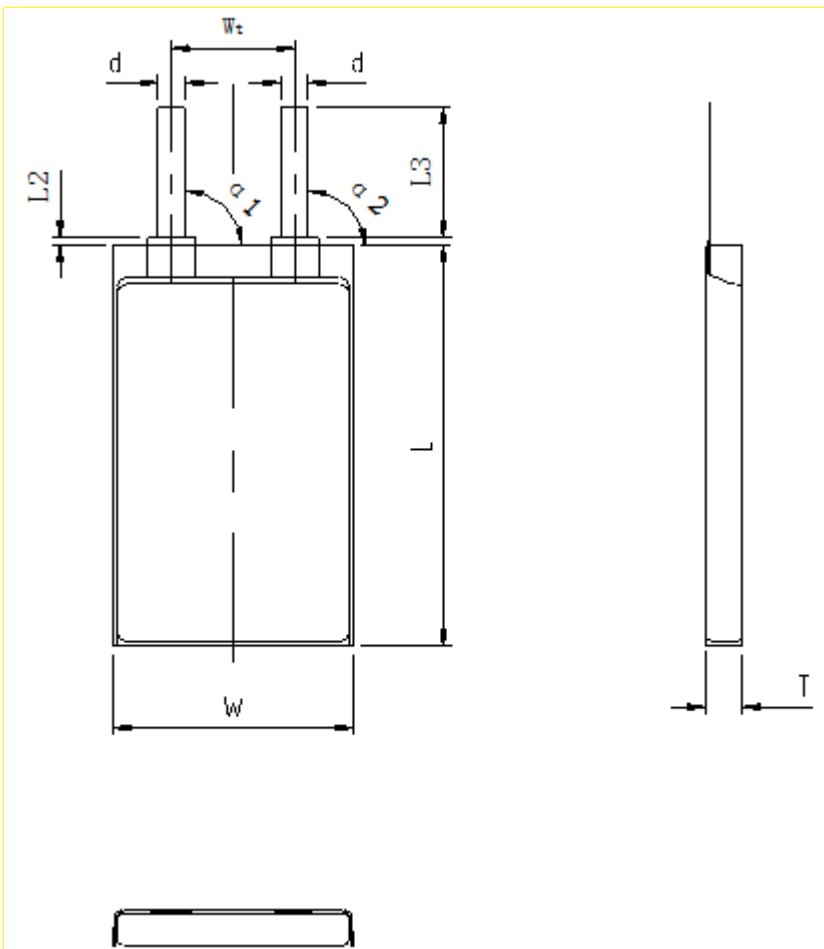
The main features of the cell are shown as below (clause 8.1.1):

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
105568	5000mAh	3.7V	1000mA	1000mA	5000mA	5000mA	4.20V	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
105568	4.25V	250mA	10°C	45°C

Construction (unit: mm):



Item 检测项目	Specifications 技术规格
T	10.00mm max.
W	55.00mm max.
L	68.50mm max.
L2	0.20~2.00 mm
L3	9.00 ± 1.00mm
d	4.00 ± 0.20mm
Wt	32.00 ± 2.00mm
α 1	90 ± 5 °
α 2	90 ± 5 °

Cell

Circuit diagram: N/A

IEC 62133: 2012			
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 the narrow side of the pouch cell	P
	Encapsulation used to support cells within an outer casing does not cause the battery to overheat during normal operation nor inhibit pressure relief		N/A
5.4	Temperature/voltage/current management	Cell only	N/A
	Batteries are designed such that abnormal temperature rise conditions are prevented		N/A
	Batteries are designed to be within temperature, voltage and current limits specified by the cell manufacturer		N/A
	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		N/A
5.5	Terminal contacts		P
	Terminals have a clear polarity marking on the external surface of the battery	see page 3.	P

IEC 62133: 2012			
Clause	Requirement + Test	Result - Remark	Verdict
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current	Electrode Tab 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	Cell only	N/A
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	Cell only	N/A
	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.		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

IEC 62133: 2012			
Clause	Requirement + Test	Result - Remark	Verdict
	- The voltages of any one of the single cells or single cellblocks does not exceed the different upper limit of the charging voltage, determined through Clause 8.1.2, NOTE 1, by monitoring the voltage of every single cell or the single cellblocks		N/A
	For the battery consisting of series-connected plural single cells or series-connected plural cellblocks: - Charging is stopped when the upper limit of the charging voltage, specified in Clause 8.1.2, Table 4, is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks; or		N/A
	- Charging is stopped when the upper limit of the different charging voltage, determined through Clause 8.1.2, NOTE 1, is exceeded for any one of the single cells or single cellblocks by measuring the voltage of every single cell or the single cellblocks		N/A
5.7	Quality plan		P
	The manufacturer prepares and implements a quality plan that defines procedures for the inspection of materials, components, cells and batteries and which covers the whole process of producing each type of cell or battery	Complied. ISO 9001: 2008 certificate 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
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) :		—

IEC 62133: 2012			
Clause	Requirement + Test	Result - Remark	Verdict
	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 \pm 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..... :	(See Table 7.3.6)	N/A
7.3.7	Low pressure		N/A
	Chamber pressure (kPa)..... :		—

IEC 62133: 2012			
Clause	Requirement + Test	Result - Remark	Verdict
	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	45°C used for upper limit test temperature. 10°C used for lower limit test temperature.	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 systems 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		P
8.2.1	Continuous charging at constant voltage (cells)	Test 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)	70	—
	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)	Test complied.	P
	The cells were tested until one of the following occurred: - 24 hours elapsed; or		N/A

IEC 62133: 2012			
Clause	Requirement + Test	Result - Remark	Verdict
	- 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)	Cell only	N/A
	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		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)	N/A
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	Test 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)	Test complied.	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	Cell only	N/A
	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		N/A
	Results: No fire. No explosion..... :	(See Table 8.3.6)	N/A

IEC 62133: 2012			
Clause	Requirement + Test	Result - Remark	Verdict
8.3.7	Forced discharge (cells)	Test complied.	P
	Results: No fire. No explosion..... :	(See Table 8.3.7)	P
8.3.8	Transport tests	Test 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 :		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

10	Marking		P
10.1	Cell marking		P
	Cells marked as specified in the applicable cell standards: IEC 61951-1, IEC 61951-2 or IEC 61960.	IEC 61960	P
10.2	Battery marking	Cell only	N/A
	Batteries marked in accordance with the requirements for the cells from which they are assembled.		N/A

IEC 62133: 2012			
Clause	Requirement + Test	Result - Remark	Verdict
	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	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	4.25V applied.	N/A
A.4	Consideration of temperature and charging current		P
A.4.1	General		P
A.4.2	Recommended temperature range	See A.4.2.2.	P
A.4.2.1	General		P
A.4.2.2	Safety consideration when a different recommended temperature range is applied	Charging temperature for cell declared by client is: 10-45°C	P
A.4.3	High temperature range	Charging high temperature declared by client is 45°C	N/A
A.4.3.1	General		N/A
A.4.3.2	Explanation of safety viewpoint		N/A
A.4.3.3	Safety considerations when specifying charging conditions in high temperature range		N/A

IEC 62133: 2012			
Clause	Requirement + Test	Result - Remark	Verdict
A.4.3.4	Safety consideration when specifying new upper limit in high temperature range	45°C applied.	N/A
A.4.4	Low temperature range	Charging low temperature declared by client is 10°C.	N/A
A.4.4.1	General		N/A
A.4.4.2	Explanation of safety viewpoint		N/A
A.4.4.3	Safety considerations, when specifying charging conditions in low temperature range		N/A
A.4.4.4	Safety considerations when specifying a new lower limit in the low temperature range	10°C applied.	N/A
A.4.5	Scope of the application of charging current		N/A
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 Grand Powersource Co., Ltd.	105568	3.7V, 5000mAh	IEC62133	Tested with appliance
-Positive electrode	Su Zhou Longeneng Technology Co., Ltd.	LN-N5H	LiCoO ₂	-	-
-Negative electrode	Jiangmen Rongtan Technology Co., Ltd	A711KP	Graphite	-	-
-Electrolyte	Tianjing Jinniu Technology Co., Ltd.	JN-SZGL-1301	LiPF ₆ +DEC+EC	-	-
-Separator	YITU	20um	Polypropylene, Shutdown temperature: 135°C	-	-
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: <ul style="list-style-type: none">- 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:			
<div>- No fire or explosion</div> <div>- No leakage</div> <div>- Leakage</div> <div>- Fire</div> <div>- Explosion</div> <div>- Bulge</div> <div>- Others (please explain)</div>			

7.3.1	TABLE: Incorrect installation (cells)		N/A
Model		OCV of reversed cell, (Vdc)	Results
Supplementary information:			
<div>- No fire or explosion</div> <div>- No leakage</div> <div>- Leakage</div> <div>- Fire</div> <div>- Explosion</div> <div>- Bulge</div> <div>- Others (please explain)</div>			

7.3.2	TABLE: External short circuit				N/A
Model	Ambient (at 20°C ± 5°C or 55°C ± 5 °C)	OCV at start of test, (Vdc)	Resistance of circuit, (Ω)	Maximum case temperature rise ΔT, (°C)	Results
Supplementary information: <ul style="list-style-type: none"> - 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: <ul style="list-style-type: none">- 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: <ul style="list-style-type: none">- 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:					
<div>- No fire or explosion</div> <div>- No leakage</div> <div>- Leakage</div> <div>- Fire</div> <div>- Explosion</div> <div>- Bulge</div> <div>- Others (please explain)</div>					

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	
Cell #1	4.20	1.0	4.17	P	
Cell #2	4.20	1.0	4.17	P	
Cell #3	4.20	1.0	4.18	P	
Cell #4	4.20	1.0	4.17	P	
Cell #5	4.20	1.0	4.18	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, (Ω)	Maximum case temperature rise ΔT , (°C)	Results	
Samples charged at charging temperature upper limit (45°C)						
Cell #1	24.2	4.23	0.081	136.6	P	
Cell #2	24.3	4.22	0.082	141.7	P	
Cell #3	24.1	4.22	0.082	138.2	P	
Cell #4	24.3	4.23	0.081	139.1	P	
Cell #5	24.2	4.22	0.082	142.2	P	
Samples charged at charging temperature lower limit (10°C)						
Cell #6	24.2	4.18	0.083	137.2	P	
Cell #7	24.2	4.18	0.080	142.3	P	
Cell #8	24.3	4.19	0.081	141.2	P	
Cell #9	24.2	4.17	0.081	138.8	P	
Cell #10	24.1	4.18	0.082	139.4	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 (45°C)						
Cell #1	4.23	4.21	--	--	P	
Cell #2	4.22	4.21	--	--	P	
Cell #3	4.23	4.21	--	--	P	
Cell #4	4.23	4.22	--	--	P	
Cell #5	4.22	4.21	--	--	P	
Note: A 13kN force applied at the wide side of prismatic cells. No voltage abrupt drop occurred. Supplementary information: - No fire or explosion						

8.3.7	TABLE: Forced discharge (cells)				P
Model	OCV before application of reverse charge, (Vdc)	Measured Reverse charge I _r , (A)	Time for reversed charge, (minutes)	Results	
Cell #1	3.34	5.0	90	P	
Cell #2	3.35	5.0	90	P	
Cell #3	3.34	5.0	90	P	
Cell #4	3.34	5.0	90	P	
Cell #5	3.35	5.0	90	P	
Supplementary information: - No fire or explosion					

8.3.8 T-5	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	
Cell #1	55.2	4.13	0.081	88.5	P	
Cell #2	55.3	4.13	0.082	88.2	P	
Cell #3	55.3	4.14	0.082	88.4	P	
Cell #4	55.3	4.14	0.081	88.4	P	
Cell #5	55.2	4.13	0.081	88.4	P	
Cell #6	55.4	4.13	0.083	88.6	P	
Cell #7	55.2	4.14	0.083	88.7	P	
Cell #8	55.2	4.13	0.082	88.8	P	
Cell #9	55.4	4.14	0.081	88.4	P	
Cell #10	55.3	4.13	0.080	88.4	P	
Supplementary information: The external short-circuit test of 10 pcs samples performed after the test of Altitude, Thermal cycling, Vibration and Shock in sequence. - No excessive temperature rise, no rupture, no explosion and no fire						

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

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Report No.: LCS170420141AS

Product: Rechargeable Lithium-ion Polymer Cell

Type Designation: 105568

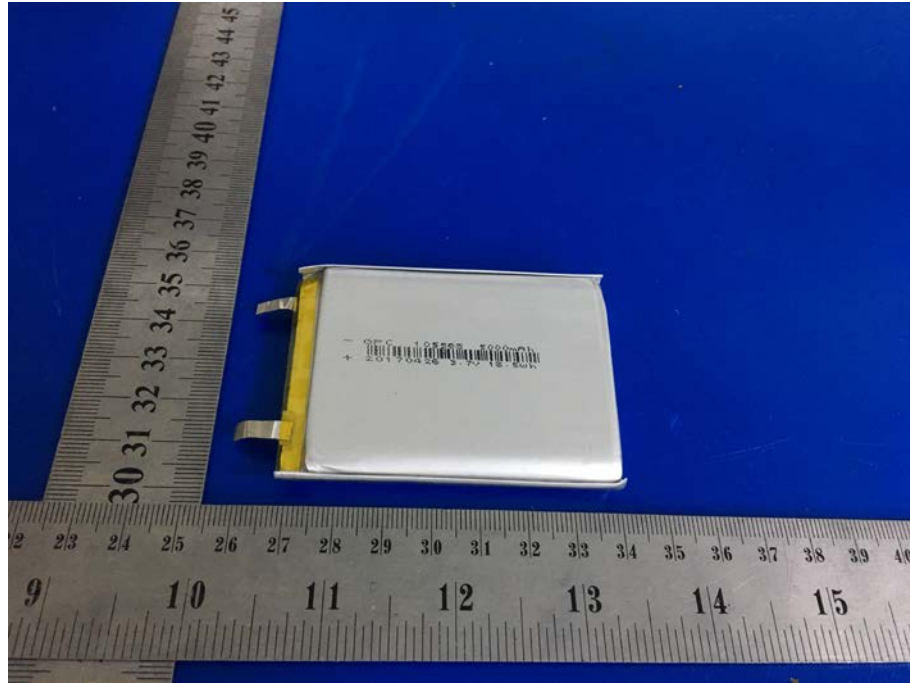


Figure 1

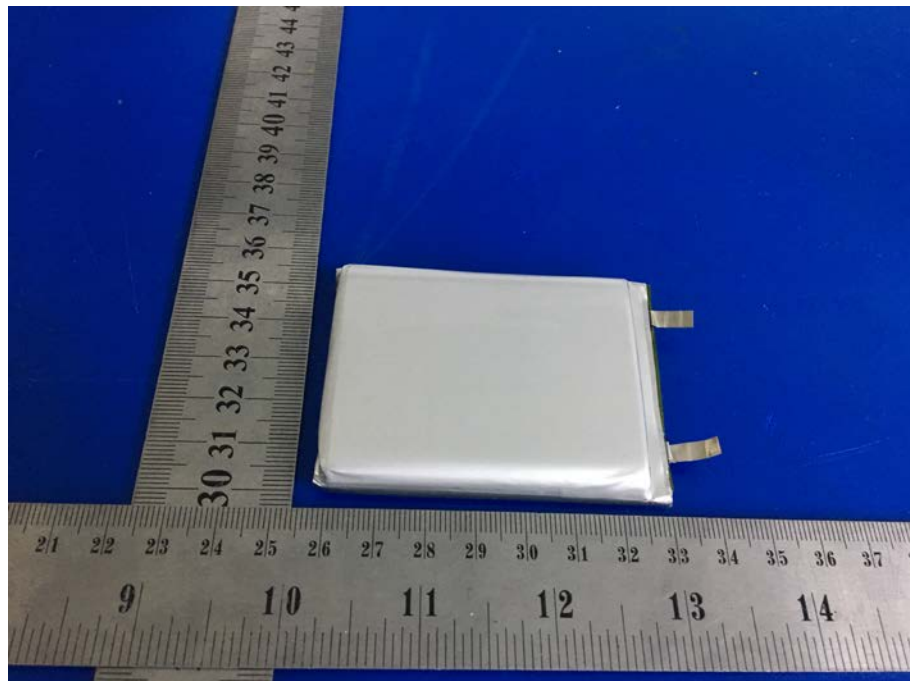


Figure 2