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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. :	50262495 001
Date of issue :	14 Jun., 2019
Total number of pages :	27 pages
Name of Testing Laboratory preparing the Report :	**Shenzhen NCT Testing Technology Co., Ltd**
Applicant's name :	ANHUI PINYOU BATTERY CO., LTD
Address :	Building10, Innovation Park, Economic Development Area New district, Huaibei City, Anhui Province, P. R. China
Test specification:	
Standard :	IEC 62133-2:2017
Test procedure :	CB Scheme
Non-standard test method :	N/A
Test Report Form No. :	IEC62133_2A
Test Report Form(s) Originator :	DEKRA
Master TRF :	Dated 2017-08-10

If this Test Report Form is used by non-IECEE members, the IECEE/IEC logo and the reference to the CB Scheme procedure shall be removed.

This report is not valid as a CB Test Report unless signed by an approved CB Testing Laboratory and appended to a CB Test Certificate issued by an NCB in accordance with IECEE 02.

General disclaimer:

The test results presented in this report relate only to the object tested.
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Test item description ..... :	Rechargeable Li-ion Cell
Trade Mark ..... :	PY
Manufacturer ..... :	Same as applicant
Model/Type reference ..... :	1) PY 18650 1200mAh; 2) PY 18650 1800mAh; 3) PY 18650 2000mAh; 4) PY 18650 2200mAh; 5) PY 18650 2500mAh
Ratings ..... :	3.7V, 1) 1200mAh; 2) 1800mAh; 3) 2000mAh; 4) 2200mAh; 5) 2500mAh

Responsible Testing Laboratory (as applicable), testing procedure and testing location(s):

☒	**CB Testing Laboratory:**	**Shenzhen NCT Testing Technology Co., Ltd**	
Testing location/ address.....:		1&4/ F, No. B Building, Mianshang Younger Pioneer Park, Hangcheng Road, Gushu Xixiang Street, Baoan District, Shenzhen, China	
Tested by (name, function, signature).....:		Vicky Kuang (Project Engineer)	
Approved by (name, function, signature)...:		Hely Wang (Reviewer)	
☐	**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 (8 pages).

Summary of testing:

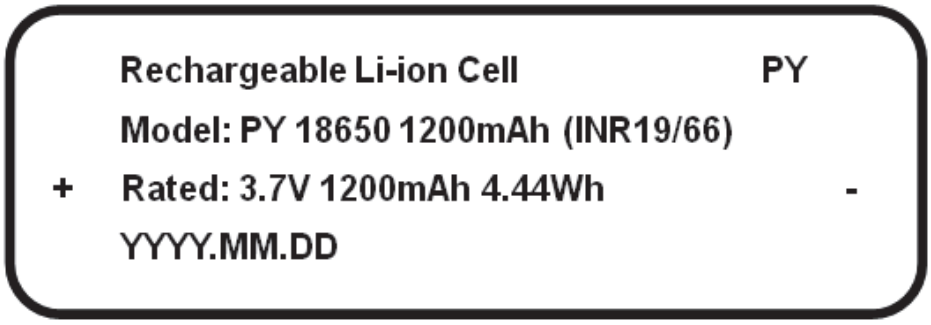
Tests performed (name of test and test clause):	**Testing location:**
cl.7.1 Charging procedure for test purposes (for Cells); cl.7.2.1 Continuous charging at constant voltage (Cells); cl.7.3.1 External short circuit (Cells); cl.7.3.3 Free fall (Cells); cl.7.3.4 Thermal abuse (Cells); cl.7.3.5 Crush (Cells); cl.7.3.7 Forced discharge (Cells); cl.7.3.9 Design evaluation – Forced internal short circuit (Cells) Tests are made with the number of cells specified in IEC 62133-2: 2017 Table 1.	**Shenzhen NCT Testing Technology Co., Ltd** 1&4/ F, No. B Building, Mianshang Younger Pioneer Park, Hangcheng Road, Gushu Xixiang Street, Baoan District, Shenzhen, China

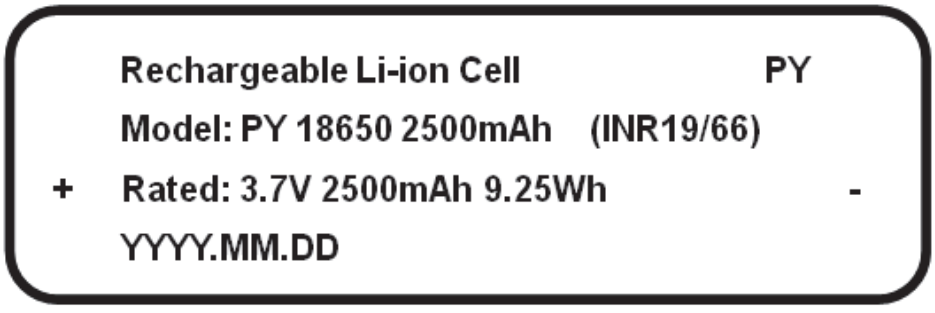
Summary of compliance with National Differences (List of countries addressed):

☒ **The product fulfils the requirements of EN62133-2: 2017**

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.





Date code:
1) YYYYMMDD
"YYYY" means year, for example "2019" means 2019 year.
"MM" means month, for example "01" means January.
"DD" means date.

2) These labels are representative, the labels of other models are identical to these except for the model name and capacity.

Test item particulars.....:	
Classification of installation and use.....:	To be defined in final product
Supply Connection.....:	Electrode plate
Recommend charging method declared by the manufacturer.....:	Charging the battery with 0.2CmA constant current until 4.2V, then constant voltage until the charge current reduces to 0.05CmA at ambient 20°C±5°C.
Discharge current (0,2 lt A).....:	0.2CmA
Specified final voltage.....:	3.0V
Upper limit charging voltage per cell.....:	4.2V
Maximum charging current.....:	1CmA
Charging temperature upper limit.....:	45°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.....:	05 May, 2019
Date (s) of performance of tests.....:	05 May, 2019 to 06 Jun., 2019

General remarks:

"(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

General product information and other remarks:

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

All models have the same size, structure, chemistry, design and manufacturer except for the model number and capacity.
The tested models PY 18650 1200mAh, PY 18650 1800mAh, PY 18650 2000mAh and PY 18650 2500mAh are representatives of other models.

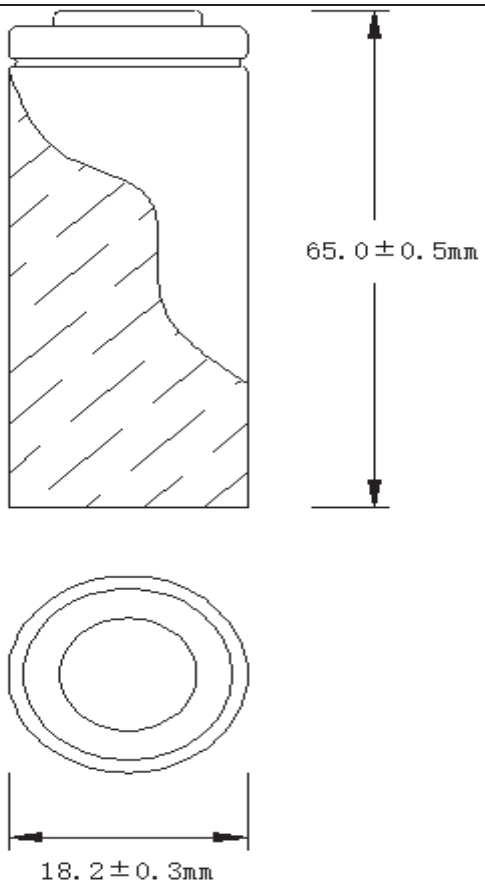
The main features of the cell are shown as below (clause 7.1.1):

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Final Voltage
PY 18650 1200mAh	1200mAh	3.7V	240mA	240mA	1200mA	3600mA	4.2V	3.0V
PY 18650 1800mAh	1800mAh	3.7V	360mA	360mA	1800mA	5400mA	4.2V	3.0V
PY 18650 2000mAh	2000mAh	3.7V	400mA	400mA	2000mA	6000mA	4.2V	3.0V
PY 18650 2200mAh	2200mAh	3.7V	440mA	440mA	2200mA	6600mA	4.2V	3.0V
PY 18650 2500mAh	2500mAh	3.7V	500mA	500mA	2500mA	7500mA	4.2V	3.0V

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

Model	Upper limit charge voltage	Taper-off current	Lower charge temperature	Upper charge temperature
PY 18650 1200mAh	4.2V	60mA	0°C	45°C
PY 18650 1800mAh	4.2V	90mA	0°C	45°C
PY 18650 2000mAh	4.2V	100mA	0°C	45°C
PY 18650 2200mAh	4.2V	110mA	0°C	45°C
PY 18650 2500mAh	4.2V	125mA	0°C	45°C

Construction:



Cell

Circuit diagram:
None, cell only.

IEC 62133-2			
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**	Cell only.	N/A
	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		N/A
	Insulation resistance (MΩ) ..... :		—
	Internal wiring and insulation are sufficient to withstand maximum anticipated current, voltage and temperature requirements		N/A
	Orientation of wiring maintains adequate clearance and creepage distances between conductors		N/A
	Mechanical integrity of internal connections accommodates reasonably foreseeable misuse		N/A
5.3	**Venting**		N/A
	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 side 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**		N/A
	Batteries are designed such that abnormal temperature rise conditions are prevented	Cell only.	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 specified chargers are designed to maintain charging within the temperature, voltage and current limits specified		N/A
5.5	**Terminal contacts**		P
	The size and shape of the terminal contacts ensure that they can carry the maximum anticipated current	The “+” and “-” polarity explicitly marked on surface of the cell.	P

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Clause	Requirement + Test	Result - Remark	Verdict
	External terminal contact surfaces are formed from conductive materials with good mechanical strength and corrosion resistance	Complied. Electrode plate complied with the requirements.	P
	Terminal contacts are arranged to minimize the risk of short-circuit		P
5.6	**Assembly of cells into batteries**	Cell only.	N/A
5.6.1	General		N/A
	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		N/A
	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		N/A
	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		N/A
5.6.2	Design recommendation		N/A
	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	Cell only.	N/A

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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, 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		N/A
	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	Cell only.	N/A
	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		N/A
	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		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		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

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Clause	Requirement + Test	Result - Remark	Verdict
	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**		N/A
	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	Cell only.	N/A
	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	Cell only.	N/A

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

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Clause	Requirement + Test	Result - Remark	Verdict
	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 range: 0°C-45°C declared. -5°C used for lower limit tests. 45°C used for upper limit tests.	P
7.2	**Intended use**		P
7.2.1	Continuous charging at constant voltage (cells)		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 0.2CmA.	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)	Cell only.	N/A
	Oven temperature (°C) ..... :		—
	Results: No physical distortion of the battery case resulting in exposure of internal protective components and cells		N/A
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:		P
	- 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 table 7.3.1)	P
7.3.2	External short-circuit (battery)	Cell only.	N/A
	The batteries 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		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
	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		N/A
	A single fault applies to protective component parts such as MOSFET, fuse, thermostat or positive temperature coefficient (PTC) thermistor		N/A
	Results: No fire. No explosion ..... :		N/A

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Clause	Requirement + Test	Result - Remark	Verdict
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 ± 0,78 kN 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	Cell only.	N/A
	The supply voltage which is:		N/A
	- 1,4 times the upper limit charging voltage presented in Table A.1 (but not to exceed 6,0 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		N/A
	- Sufficient to maintain a current of 2,0 It A throughout the duration of the test or until the supply voltage is reached		N/A
	Test was continued until the temperature of the outer casing:		N/A
	- 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 ..... :		N/A
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 table 7.3.7)	P
7.3.8	Mechanical tests (batteries)		N/A
7.3.8.1	Vibration	Cell only.	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
	Results: No fire, no explosion, no rupture, no leakage or venting. ..... :		N/A
7.3.8.2	Mechanical shock	Cell only.	N/A
	Results: No leakage, no venting, no rupture, no explosion and no fire ..... :		N/A
7.3.9	Design evaluation – Forced internal short-circuit (cells)	Tested complied.	P
	The cells complied with national requirement for .....:	France, Japan, Republic of Korea, Switzerland	—
	The pressing was stopped upon:		P
	- 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	800N for cylindrical cells.	P
	Results: No fire ..... :	(See appended table 7.3.9)	P
8	**INFORMATION FOR SAFETY**		P
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		N/A
	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 cells.	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 swallowable 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

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
9	**MARKING**		P
9.1	**Cell marking**		P
	Cells marked as specified in IEC 61960, except coin cells	See marking plate on page 4.	P
	Coin cells whose external surface area is too small to accommodate the markings on the cells show the designation and polarity	Not coin cells.	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**		N/A
	Batteries marked as specified in IEC 61960, except for coin batteries		N/A
	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		N/A
	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 cells.	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**		N/A
	Storage and disposal instructions		N/A
	Recommended charging instructions		N/A

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

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict

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
A.3	**Consideration on charging voltage**	Complied.	P
A.3.1	General		P
A.3.2	Upper limit charging voltage	4.2V applied.	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 range 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

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
A.4.6.1	General		P
A.4.6.2	Final discharge voltage and explanation of safety viewpoint	Cell specified final voltage 3.0V, not exceed 3.0V specified by cell manufacturer.	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**		P
A.5.1	General		P
A.5.2	Insertion procedure for nickel particle to generate internal short		P
A.5.3	Disassembly of charged cell		P
A.5.4	Shape of nickel particle		P
A.5.5	Insertion of nickel particle in cylindrical cell		P
A.5.5.1	Insertion of nickel particle in winding core		P
A.5.5.2	Marking the position of the nickel particle on both ends of the winding core of the separator		P
A.5.6	Insertion of nickel particle in prismatic cell		N/A
A.6	**Experimental procedure of the forced internal short-circuit test**		P
A.6.1	Material and tools for preparation of nickel particle		P
A.6.2	Example of a nickel particle preparation procedure		P
A.6.3	Positioning (or placement) of a nickel particle		P
A.6.4	Damaged separator precaution		P
A.6.5	Caution for rewinding separator and electrode		P
A.6.6	Insulation film for preventing short-circuit		P
A.6.7	Caution when disassembling a cell		P
A.6.8	Protective equipment for safety		P
A.6.9	Caution in the case of fire during disassembling		P
A.6.10	Caution for the disassembling process and pressing the electrode core		P
A.6.11	Recommended specifications for the pressing device		P
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
D.1	**General**	Not coin cells.	N/A

IEC 62133-2			
Clause	Requirement + Test	Result - Remark	Verdict
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

	TABLE: Critical components information				P
Object / part No.	**Manufacturer / trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
Cell	ANHUI PINYOU BATTERY CO.	PY 18650 1200mAh	3.7V, 1200mAh	IEC 62133-2: 2017	Tested with appliance
Cell	ANHUI PINYOU BATTERY CO.	PY 18650 1800mAh	3.7V, 1800mAh	IEC 62133-2: 2017	Tested with appliance
Cell	ANHUI PINYOU BATTERY CO.	PY 18650 2000mAh	3.7V, 2000mAh	IEC 62133-2: 2017	Tested with appliance
Cell	ANHUI PINYOU BATTERY CO.	PY 18650 2200mAh	3.7V, 2200mAh	IEC 62133-2: 2017	Tested with appliance
Cell	ANHUI PINYOU BATTERY CO.	PY 18650 2500mAh	3.7V, 2500mAh	IEC 62133-2: 2017	Tested with appliance
Parts used in all above cells.					
-Positive electrode	GEM CO., LTD	L5550	$LiNi_{0.5}Co_{0.2}Mn_{0.3}O_2$	--	Tested with appliance
-Negative electrode	Dongguan Kaijin New energy Technology Shares Co., Ltd	KD-401	Carbon ≥99.9% Ash ≤0.1%	--	Tested with appliance
-Separator	Shenzhen senior technology material Co., LTD.	SW517E	PE, Shutdown Temperature: 135°C	--	Tested with appliance
-Electrolyte	Zhuhai Smoothway Electronic Material Co., Ltd	SWKD2-C005	$LiPF_6$, Chromaticity: ≤50Hazen Moisture: ≤20ppm Free Acid(as HF): ≤50ppm Density:1.22-1.28g/cm^3 Conductivity(25°C): 10.0-12.0mS/cm	--	Tested with appliance
-PTC	POLYTRONICS TECHNOLOGY CORP	SMD1206P300 SLR	V_{max}=6V, I_h=3.0A, I_t=6.0A	UL 1434	UL E201431
Supplementary information: [1)] Provided evidence ensures the agreed level of compliance. See OD-CB2039.					

7.2.1	TABLE: Continuous charging at constant voltage (cells)			P
Sample no.	**Recommended charging voltage Vc (Vdc)**	**Recommended charging current I_{rec} (A)**	**OCV before test (Vdc)**	**Results**
for model PY 18650 1200mAh				
Cell #1	4.20	0.24	4.19	P
Cell #2	4.20	0.24	4.19	P
Cell #3	4.20	0.24	4.19	P
Cell #4	4.20	0.24	4.19	P
Cell #5	4.20	0.24	4.19	P
for model PY 18650 1800mAh				
Cell #1	4.20	0.36	4.19	P
Cell #2	4.20	0.36	4.18	P
Cell #3	4.20	0.36	4.18	P
Cell #4	4.20	0.36	4.18	P
Cell #5	4.20	0.36	4.18	P
for model PY 18650 2000mAh				
Cell #1	4.20	0.40	4.19	P
Cell #2	4.20	0.40	4.18	P
Cell #3	4.20	0.40	4.19	P
Cell #4	4.20	0.40	4.19	P
Cell #5	4.20	0.40	4.18	P
for model PY 18650 2500mAh				
Cell #1	4.20	0.50	4.18	P
Cell #2	4.20	0.50	4.19	P
Cell #3	4.20	0.50	4.19	P
Cell #4	4.20	0.50	4.19	P
Cell #5	4.20	0.50	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) (for model PY 18650 1200mAh)					
Cell #1	54.6	4.18	87.8	75.2	P
Cell #2	54.6	4.19	85.6	75.0	P
Cell #3	54.6	4.18	86.5	73.3	P

Cell #4	54.6	4.19	87.5	78.2	P
Cell #5	54.6	4.19	84.9	75.2	P
Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 1200mAh)					
Cell #6	54.9	4.17	81.9	75.7	P
Cell #7	54.9	4.18	86.6	75.1	P
Cell #8	54.9	4.17	85.3	75.0	P
Cell #9	54.9	4.17	84.3	78.0	P
Cell #10	54.9	4.18	86.7	78.0	P
Samples charged at charging temperature upper limit (45°C) (for model PY 18650 1800mAh)					
Cell #1	54.8	4.18	81.3	77.5	P
Cell #2	54.8	4.18	82.8	75.9	P
Cell #3	54.8	4.18	80.1	76.3	P
Cell #4	54.8	4.19	84.7	77.3	P
Cell #5	54.8	4.18	86.5	76.0	P
Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 1800mAh)					
Cell #6	54.7	4.18	85.2	78.2	P
Cell #7	54.7	4.18	87.4	80.9	P
Cell #8	54.7	4.17	83.3	75.0	P
Cell #9	54.7	4.17	82.6	75.5	P
Cell #10	54.7	4.17	88.5	75.4	P
Samples charged at charging temperature upper limit (45°C) (for model PY 18650 2000mAh)					
Cell #1	55.6	4.18	82.5	75.7	P
Cell #2	55.6	4.18	78.3	78.0	P
Cell #3	55.6	4.18	82.3	74.7	P
Cell #4	55.6	4.18	81.7	78.8	P
Cell #5	55.6	4.17	85.5	79.6	P
Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 2000mAh)					
Cell #6	55.3	4.16	85.4	79.5	P
Cell #7	55.3	4.16	83.4	74.6	P
Cell #8	55.3	4.17	78.3	75.4	P
Cell #9	55.3	4.16	82.2	77.4	P
Cell #10	55.3	4.16	80.8	81.2	P
Samples charged at charging temperature upper limit (45°C) (for model PY 18650 2500mAh)					
Cell #1	53.9	4.17	86.5	77.5	P
Cell #2	53.9	4.18	87.6	75.9	P
Cell #3	53.9	4.17	88.2	76.3	P
Cell #4	53.9	4.18	88.4	77.3	P
Cell #5	53.9	4.18	89.1	76.0	P

Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 2500mAh)					
Cell #6	52.9	4.17	87.6	75.7	P
Cell #7	52.9	4.16	88.4	75.1	P
Cell #8	52.9	4.15	89.3	75.0	P
Cell #9	52.9	4.17	86.4	76.0	P
Cell #10	52.9	4.16	85.8	76.0	P
Supplementary information: - No fire or explosion					

7.3.2	**TABLE: External short-circuit (battery)**					**N/A**
Sample no.	**Ambient T (°C)**	**OCV before test (Vdc)**	**Resistance of circuit (mΩ)**	**Maximum case temperature ~~rise ΔT~~, °C**	**Component single fault condition**	**Results**
Supplementary information: - No fire or explosion						

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) (for model PY 18650 1200mAh)				
Cell #1	4.19	4.19	12.99	P
Cell #2	4.19	4.19	13.00	P
Cell #3	4.18	4.18	12.98	P
Cell #4	4.19	4.19	13.01	P
Cell #5	4.18	4.18	13.02	P
Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 1200mAh)				
Cell #6	4.18	4.18	13.01	P
Cell #7	4.17	4.17	12.98	P
Cell #8	4.17	4.17	13.01	P
Cell #9	4.18	4.18	12.99	P
Cell #10	4.17	4.17	13.02	P
Samples charged at charging temperature upper limit (45°C) (for model PY 18650 1800mAh)				

Cell #1	4.19	4.18	13.03	P
Cell #2	4.18	4.18	13.00	P
Cell #3	4.18	4.17	13.05	P
Cell #4	4.19	4.18	13.01	P
Cell #5	4.18	4.18	13.02	P
Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 1800mAh)				
Cell #6	4.18	4.17	13.01	P
Cell #7	4.17	4.17	13.04	P
Cell #8	4.18	4.17	13.01	P
Cell #9	4.18	4.18	13.00	P
Cell #10	4.17	4.17	13.02	P
Samples charged at charging temperature upper limit (45°C) (for model PY 18650 2000mAh)				
Cell #1	4.18	4.18	12.99	P
Cell #2	4.17	4.17	13.00	P
Cell #3	4.18	4.17	12.98	P
Cell #4	4.18	4.18	13.01	P
Cell #5	4.17	4.17	13.02	P
Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 2000mAh)				
Cell #6	4.17	4.17	13.01	P
Cell #7	4.16	4.15	12.98	P
Cell #8	4.16	4.16	13.01	P
Cell #9	4.16	4.16	12.99	P
Cell #10	4.16	4.16	13.02	P
Samples charged at charging temperature upper limit (45°C) (for model PY 18650 2500mAh)				
Cell #1	4.17	4.17	13.01	P
Cell #2	4.18	4.18	13.03	P
Cell #3	4.18	4.18	13.04	P
Cell #4	4.18	4.18	13.02	P
Cell #5	4.18	4.18	13.04	P
Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 2500mAh)				
Cell #6	4.16	4.16	13.03	P
Cell #7	4.15	4.15	13.06	P
Cell #8	4.16	4.16	13.01	P
Cell #9	4.16	4.16	13.02	P
Cell #10	4.15	4.15	13.03	P

Note:
A 13KN force applied at the longitudinal axis of cylindrical cells. No voltage abrupt drop occurred.
Supplementary information:
- No fire
- No explosion

7.3.6	TABLE: Over-charging of battery				N/A
Constant charging current (A) .....:					—
Supply voltage (Vdc) .....:					—
Sample no.	**OCV before charging (Vdc)**	**Total charging time (minute)**	**Maximum outer case temperature (°C)**	**Results**	

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 (A)**	**Lower limit discharge voltage (Vdc)**	**Results**
for model PY 18650 1200mAh				
Cell #1	3.17	1.2	-4.20	P
Cell #2	3.16	1.2	-4.20	P
Cell #3	3.17	1.2	-4.20	P
Cell #4	3.18	1.2	-4.20	P
Cell #5	3.17	1.2	-4.20	P
for model PY 18650 1800mAh)				
Cell #1	3.08	1.8	-4.20	P
Cell #2	3.08	1.8	-4.20	P
Cell #3	3.09	1.8	-4.20	P
Cell #4	3.09	1.8	-4.20	P
Cell #5	3.09	1.8	-4.20	P
for model PY 18650 2000mAh				
Cell #1	3.22	2.00	-4.20	P
Cell #2	3.21	2.00	-4.20	P
Cell #3	3.23	2.00	-4.20	P

Cell #4	3.22	2.00	-4.20	P
Cell #5	3.21	2.00	-4.20	P
for model PY 18650 2500mAh				
Cell #1	3.11	2.50	-4.20	P
Cell #2	3.10	2.50	-4.20	P
Cell #3	3.14	2.50	-4.20	P
Cell #4	3.11	2.50	-4.20	P
Cell #5	3.14	2.50	-4.20	P

Supplementary information:

- No fire or explosion

7.3.8.1	TABLE: Vibration				N/A
Sample no.	**OCV before test (Vdc)**	**OCV after test (Vdc)**	**Mass before test (g)**	**Mass after test (g)**	**Results**

Supplementary information:

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

7.3.8.2	TABLE: Mechanical shock				N/A
Sample no.	**OCV before test (Vdc)**	**OCV after test (Vdc)**	**Mass before test (g)**	**Mass after test (g)**	**Results**

Supplementary information:

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

7.3.9	TABLE: Forced internal short circuit (cells)				P
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 (45°C) (for model PY 18650 1200mAh)					

Cell #1	45	4.18	1	800	P
Cell #2	45	4.17	1	800	P
Cell #3	45	4.17	1	800	P
Cell #4	45	4.17	1	800	P
Cell #5	45	4.18	1	800	P
Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 1200mAh)					
Cell #6	-5	4.16	1	800	P
Cell #7	-5	4.17	1	800	P
Cell #8	-5	4.17	1	800	P
Cell #9	-5	4.16	1	800	P
Cell #10	-5	4.16	1	800	P
Samples charged at charging temperature upper limit (45°C) (for model PY 18650 1800mAh)					
Cell #1	45	4.17	1	800	P
Cell #2	45	4.17	1	800	P
Cell #3	45	4.18	1	800	P
Cell #4	45	4.17	1	800	P
Cell #5	45	4.17	1	800	P
Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 1800mAh)					
Cell #6	-5	4.16	1	800	P
Cell #7	-5	4.16	1	800	P
Cell #8	-5	4.17	1	800	P
Cell #9	-5	4.16	1	800	P
Cell #10	-5	4.16	1	800	P
Samples charged at charging temperature upper limit (45°C) (for model PY 18650 2000mAh)					
Cell #1	45	4.17	1	800	P
Cell #2	45	4.16	1	800	P
Cell #3	45	4.16	1	800	P
Cell #4	45	4.17	1	800	P
Cell #5	45	4.16	1	800	P
Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 2000mAh)					
Cell #6	-5	4.15	1	800	P
Cell #7	-5	4.15	1	800	P
Cell #8	-5	4.15	1	800	P
Cell #9	-5	4.16	1	800	P
Cell #10	-5	4.15	1	800	P
Samples charged at charging temperature upper limit (45°C) (for model PY 18650 2500mAh)					
Cell #1	45	4.16	1	800	P
Cell #2	45	4.17	1	800	P

Cell #3	45	4.16	1	800	P
Cell #4	45	4.17	1	800	P
Cell #5	45	4.16	1	800	P
Samples charged at charging temperature lower limit (-5°C) (for model PY 18650 2500mAh)					
Cell #6	-5	4.15	1	800	P
Cell #7	-5	4.16	1	800	P
Cell #8	-5	4.16	1	800	P
Cell #9	-5	4.15	1	800	P
Cell #10	-5	4.15	1	800	P

Supplementary information:

[1)] Identify one of the following:

1: Nickel particle inserted between positive and negative (active material) coated area.

2: Nickel particle inserted between positive aluminium foil and negative active material coated area.

- No fire or explosion

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:

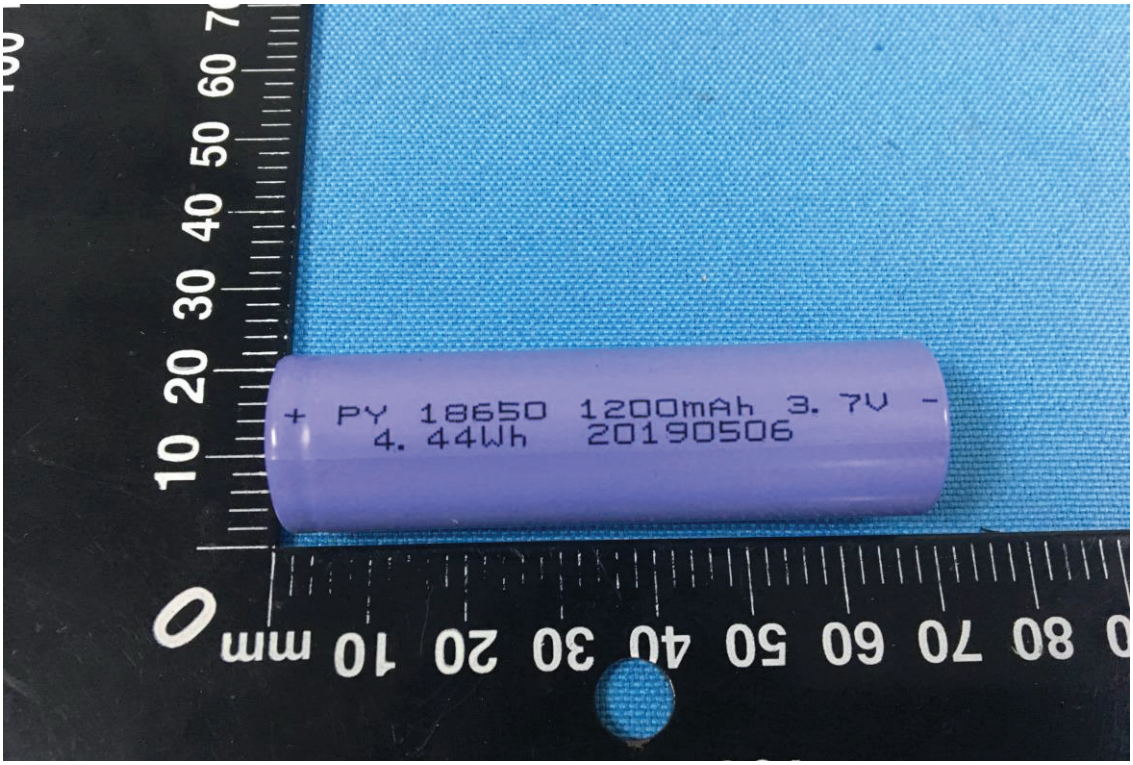
[1)] Coin cells with internal resistance less than or equal to 3 Ω, see test result on corresponding tables

-- End of Report --

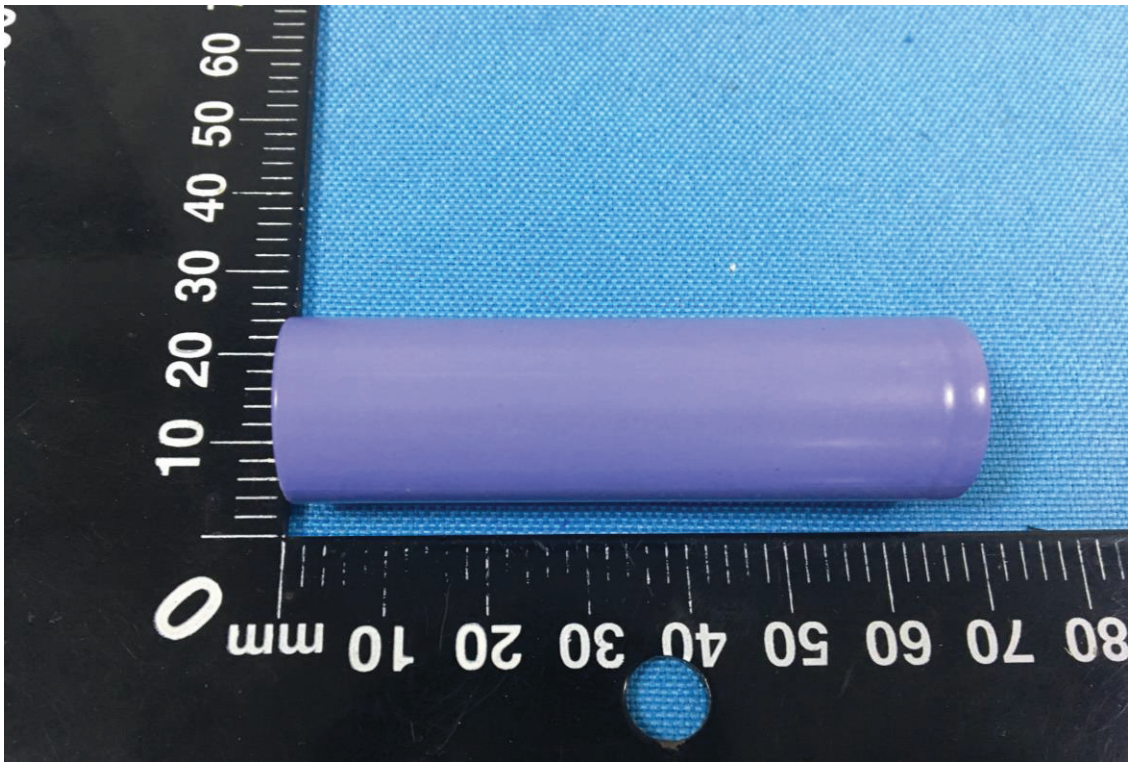
Attachment 1 Photo Documentation

Product: Rechargeable Li-ion Cell

Type Designation: PY 18650 1200mAh, PY 18650 1800mAh, PY 18650 2000mAh, PY 18650 2200mAh, PY 18650 2500mAh



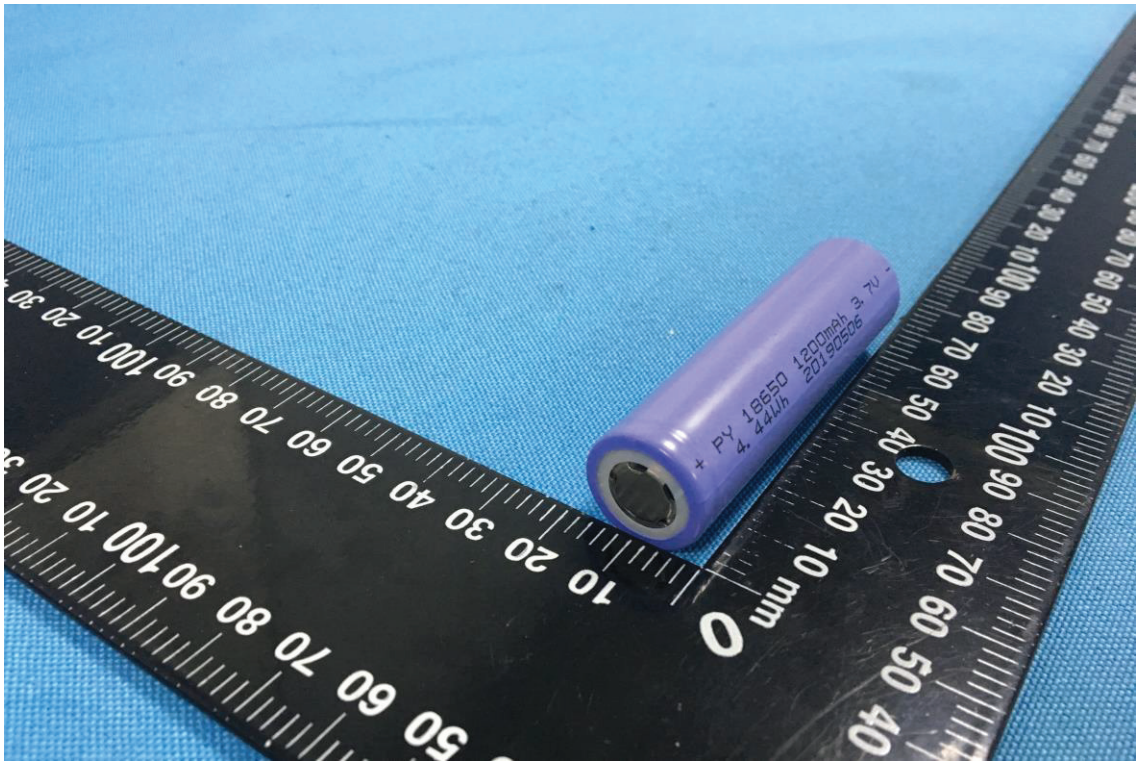
Picture 1. Front view of cell for model PY 18650 1200mAh



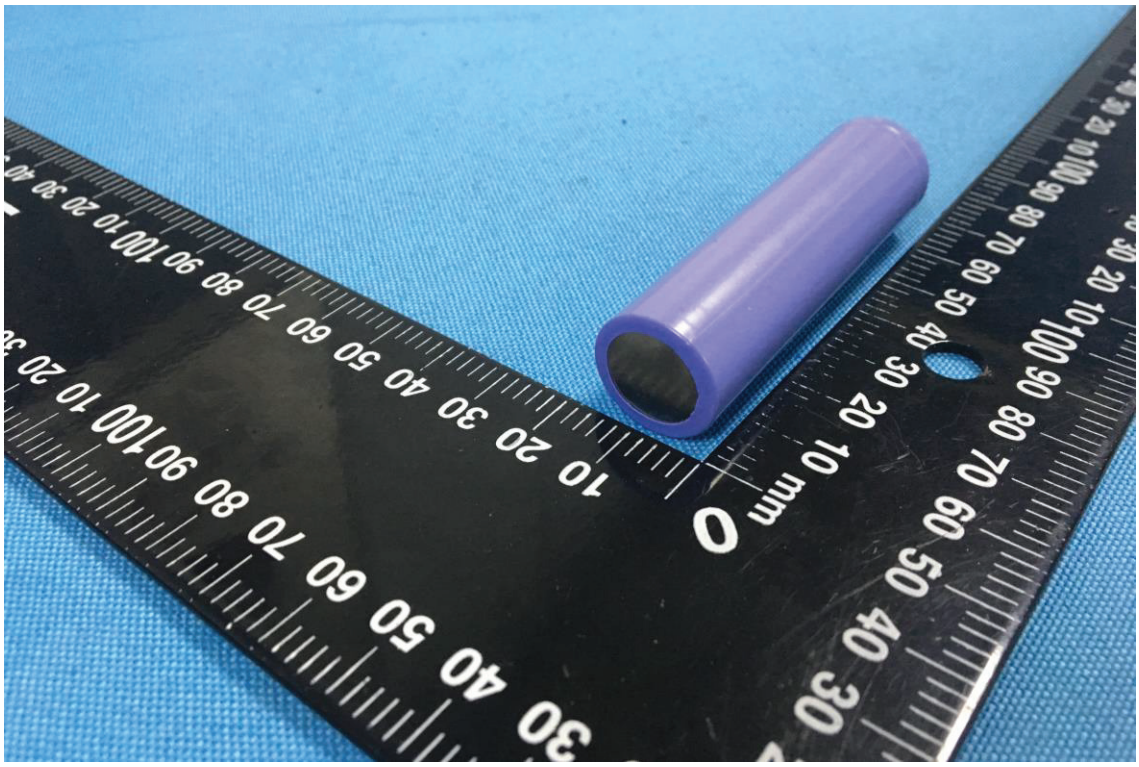
Picture 2. Back view of cell for model PY 18650 1200mAh

Product: Rechargeable Li-ion Cell

Type Designation: PY 18650 1200mAh, PY 18650 1800mAh, PY 18650 2000mAh, PY 18650 2200mAh, PY 18650 2500mAh



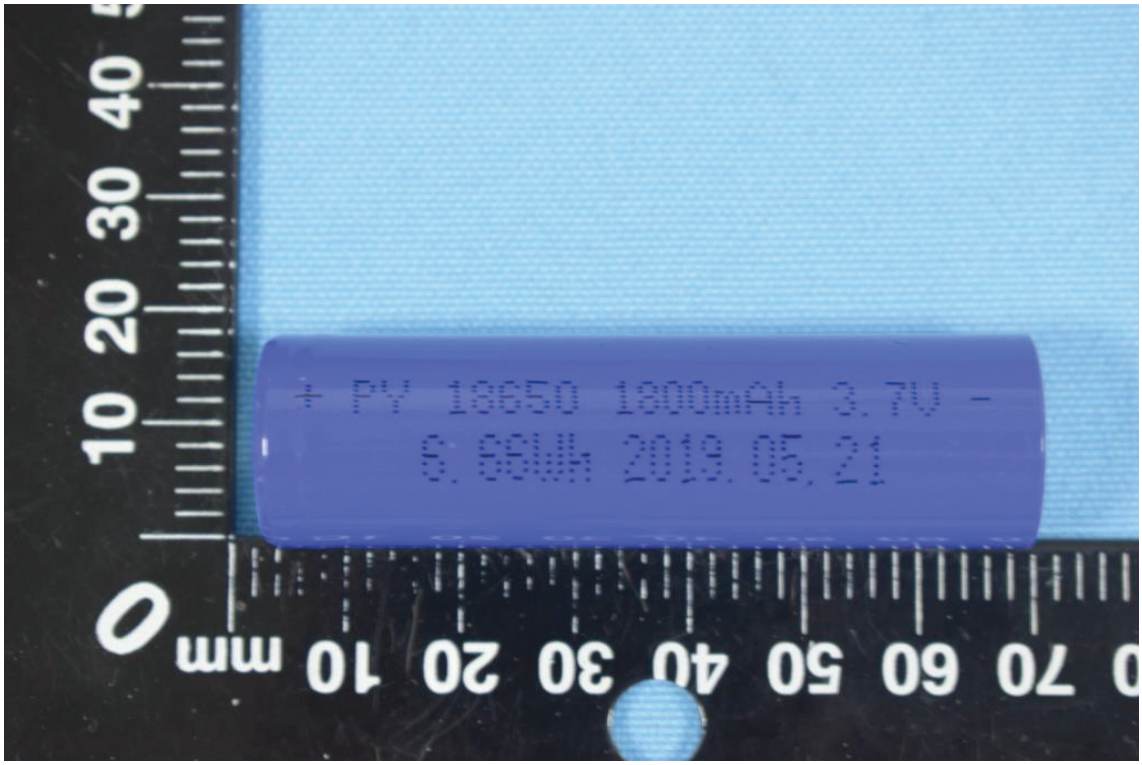
Picture 3. Side view-1 of cell for model PY 18650 1200mAh



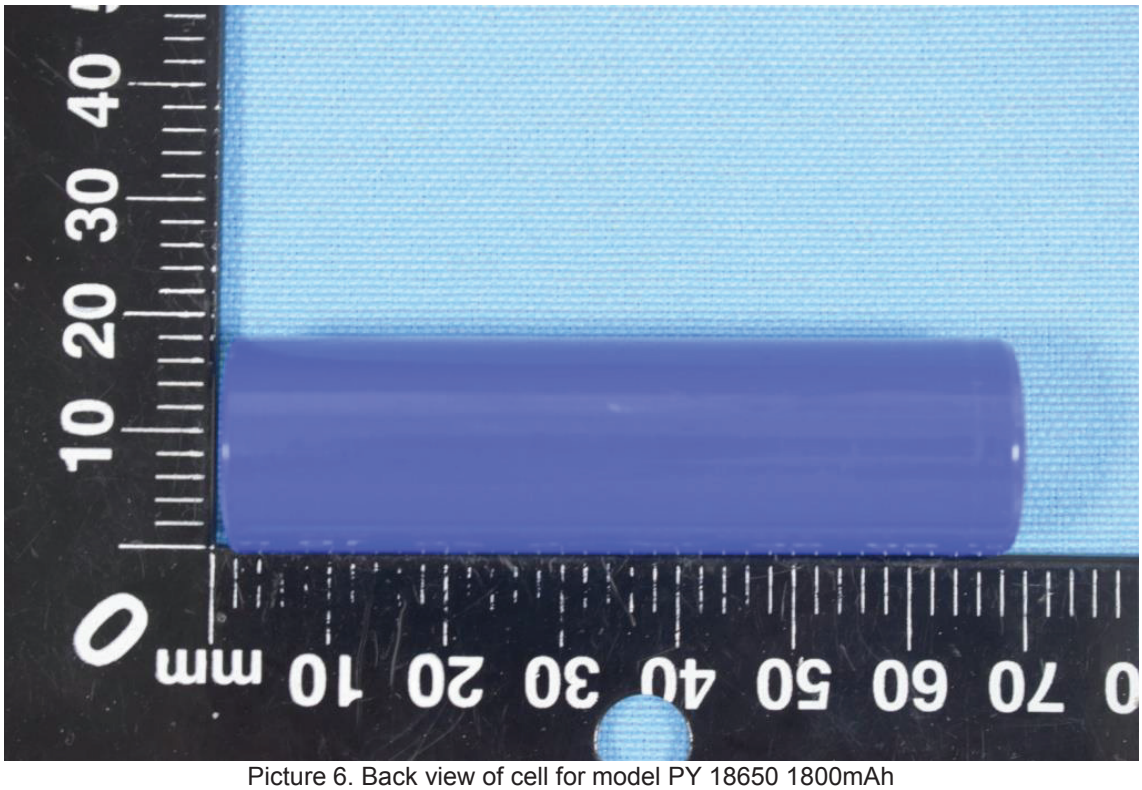
Picture 4. Side view-2 of cell for model PY 18650 1200mAh

Product: Rechargeable Li-ion Cell

Type Designation: PY 18650 1200mAh, PY 18650 1800mAh, PY 18650 2000mAh, PY 18650 2200mAh, PY 18650 2500mAh



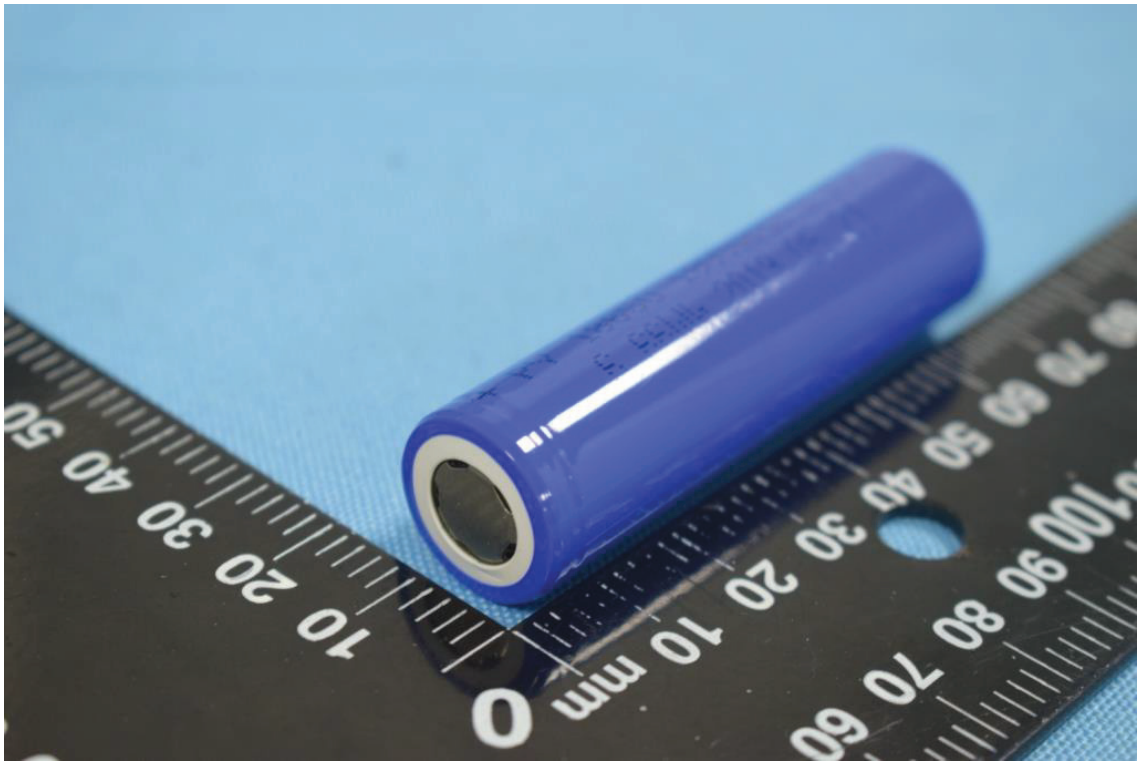
Picture 5. Front view of cell for model PY 18650 1800mAh



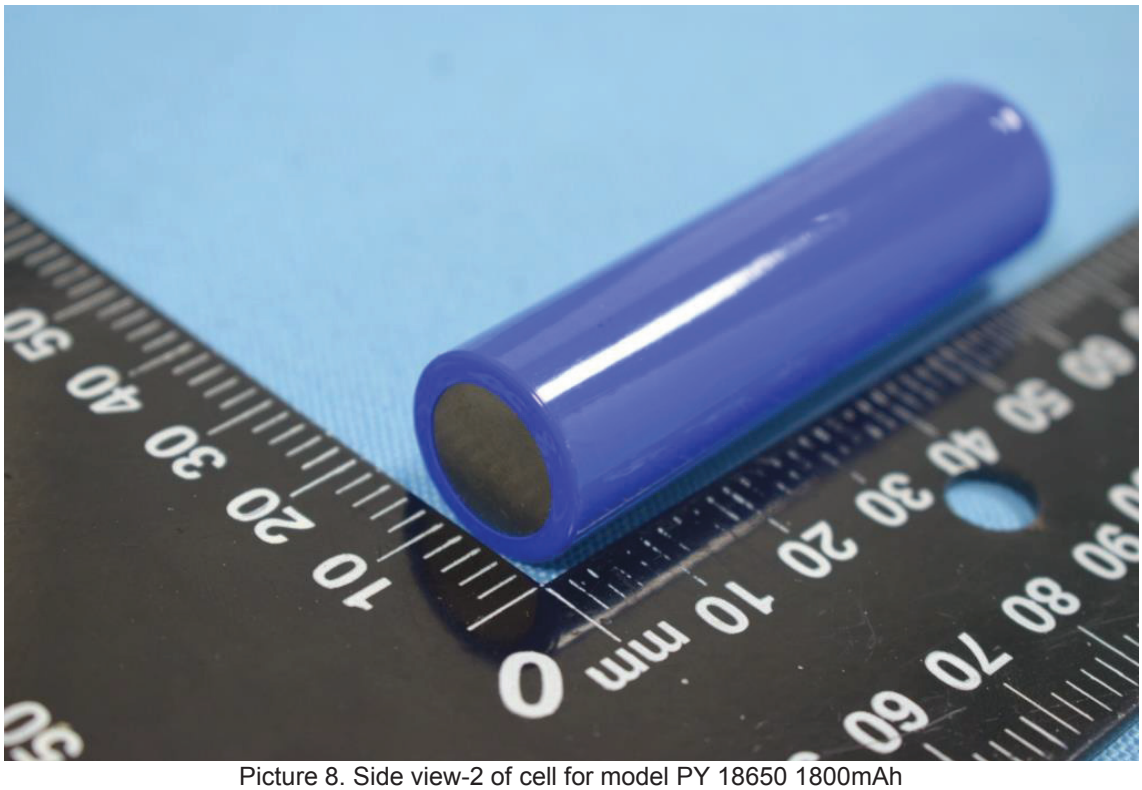
Picture 6. Back view of cell for model PY 18650 1800mAh

Product: Rechargeable Li-ion Cell

Type Designation: PY 18650 1200mAh, PY 18650 1800mAh, PY 18650 2000mAh, PY 18650 2200mAh, PY 18650 2500mAh



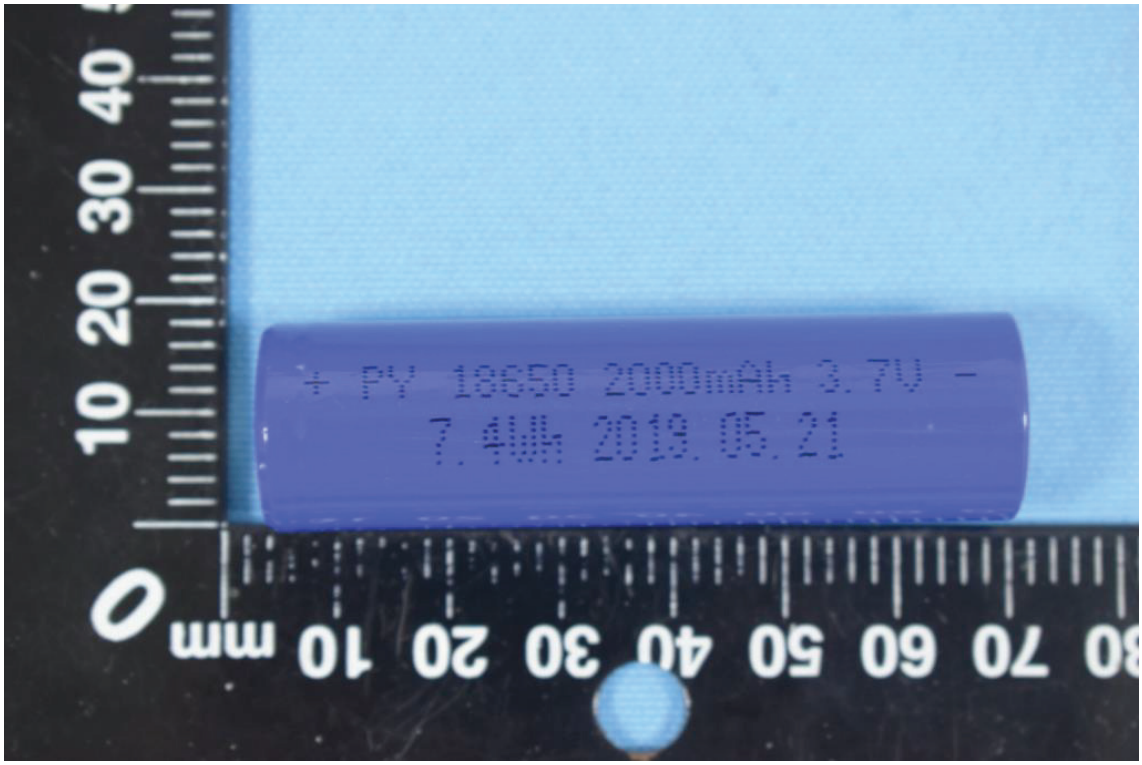
Picture 7. Side view-1 of cell for model PY 18650 1800mAh



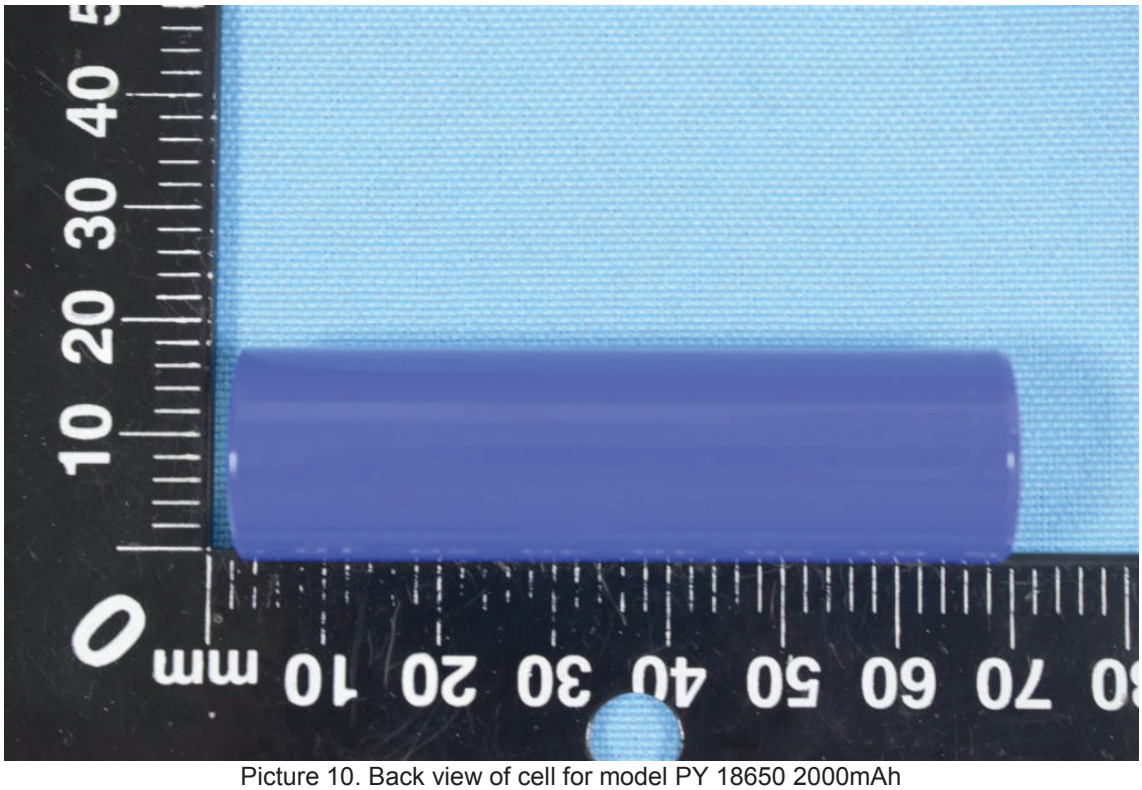
Picture 8. Side view-2 of cell for model PY 18650 1800mAh

Product: Rechargeable Li-ion Cell

Type Designation: PY 18650 1200mAh, PY 18650 1800mAh, PY 18650 2000mAh, PY 18650 2200mAh, PY 18650 2500mAh



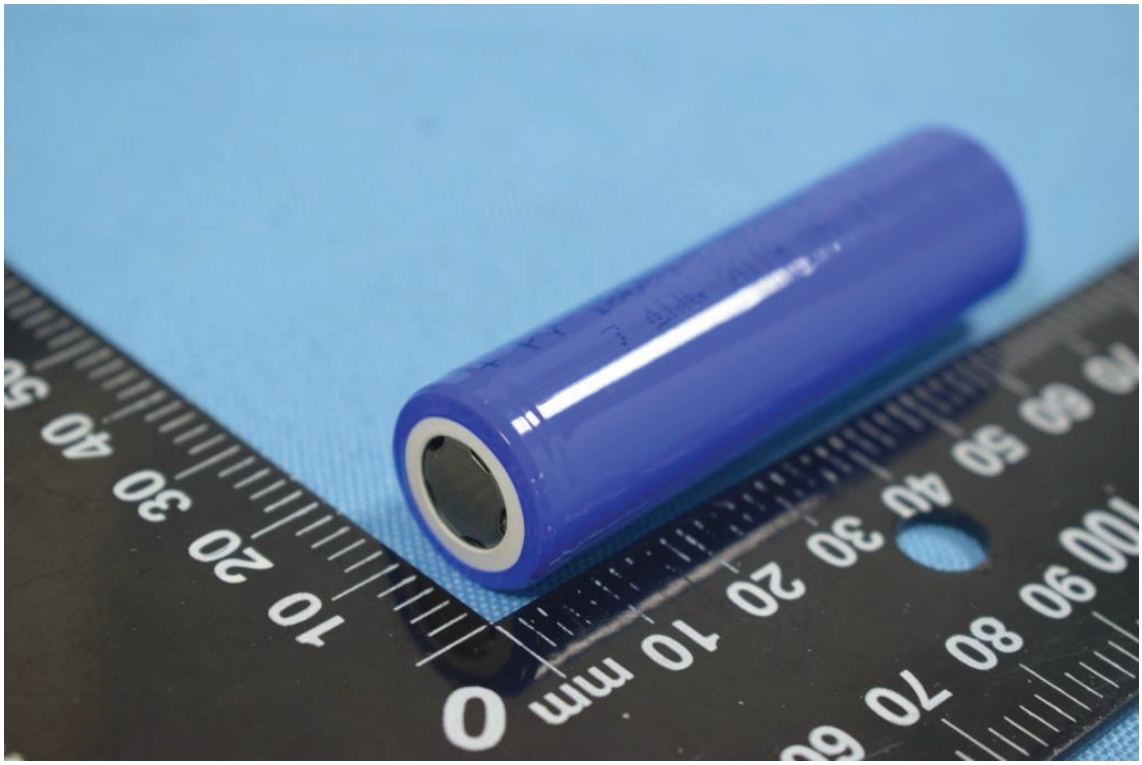
Picture 9. Front view of cell for model PY 18650 2000mAh



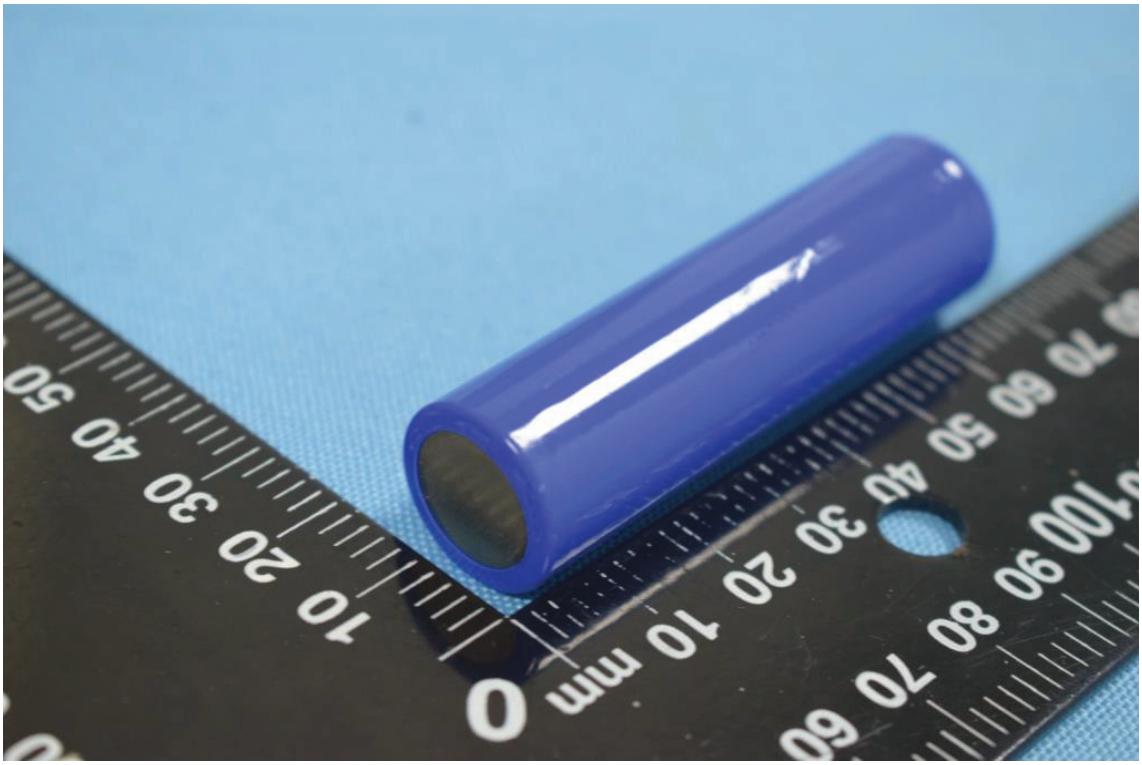
Picture 10. Back view of cell for model PY 18650 2000mAh

Product: Rechargeable Li-ion Cell

Type Designation: PY 18650 1200mAh, PY 18650 1800mAh, PY 18650 2000mAh, PY 18650 2200mAh, PY 18650 2500mAh



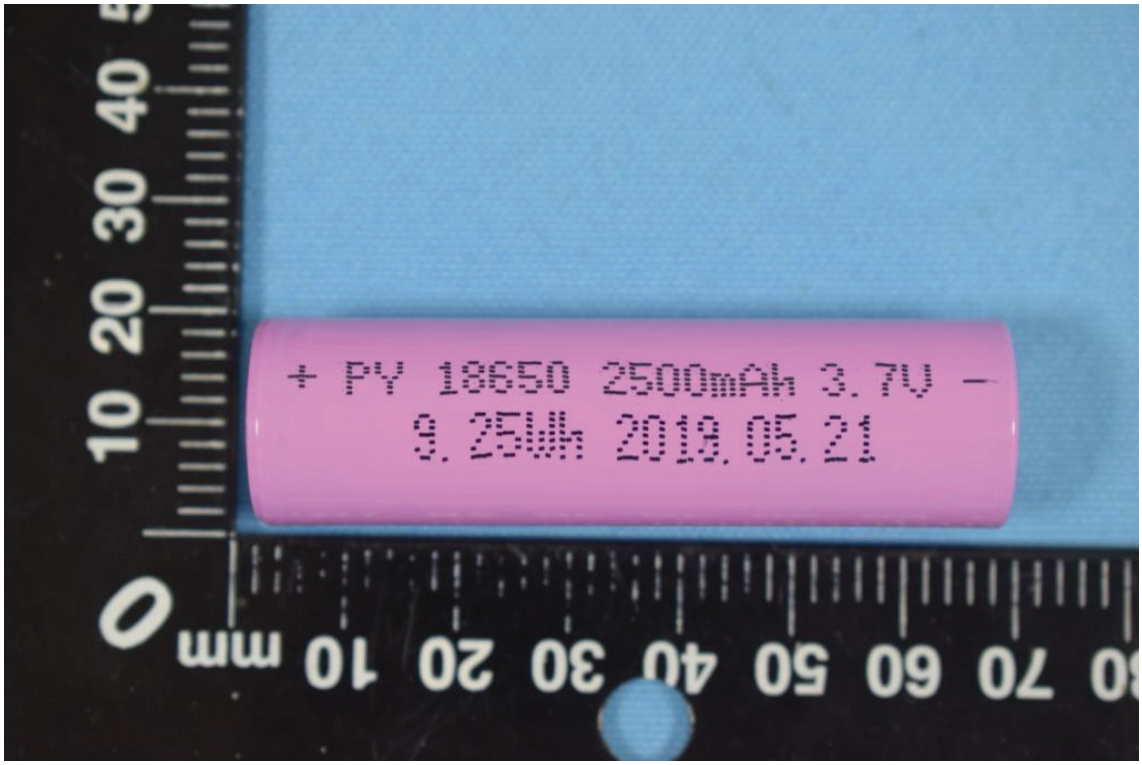
Picture 11. Side view-1 of cell for model PY 18650 2000mAh



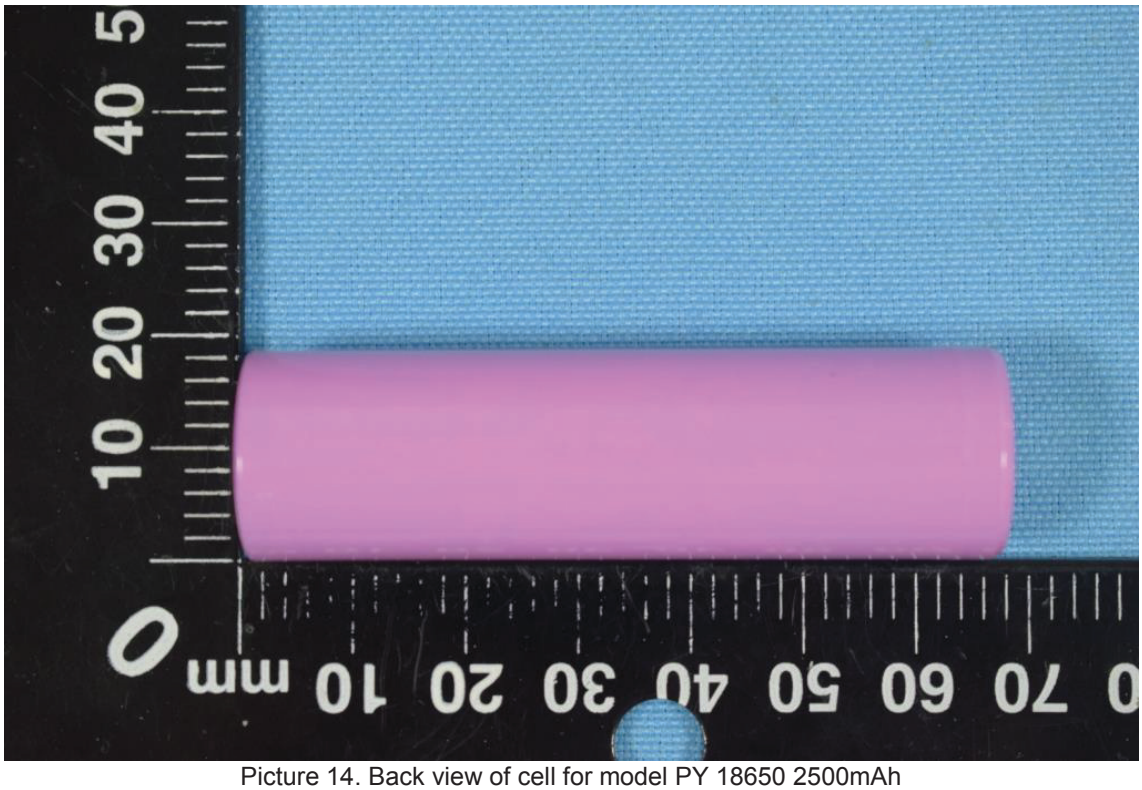
Picture 12. Side view-2 of cell for model PY 18650 2000mAh

Product: Rechargeable Li-ion Cell

Type Designation: PY 18650 1200mAh, PY 18650 1800mAh, PY 18650 2000mAh, PY 18650 2200mAh, PY 18650 2500mAh



Picture 13. Front view of cell for model PY 18650 2500mAh



Picture 14. Back view of cell for model PY 18650 2500mAh

Product: Rechargeable Li-ion Cell

Type Designation: PY 18650 1200mAh, PY 18650 1800mAh, PY 18650 2000mAh, PY 18650 2200mAh, PY 18650 2500mAh

Picture 15. Side view-1 of cell for model PY 18650 2500mAh

Picture 16. Side view-2 of cell for model PY 18650 2500mAh