



Prüfbericht - Nr.: CN229L9B 001		Seite 1 von 33 Page 1 of 33	
<i>Test Report No.:</i>			
Auftraggeber: <i>Client:</i>	Guangxi Donglai New Energy Technology Co. LTD (South of Xingguang Hele City) Extension of Yingbin Avenue, Taocheng Town, Daxin County, Chongzuo City, Guangxi, P.R. China		
Gegenstand der Prüfung: <i>Test item:</i>	Rechargeable Lithium Ion Cell		
Bezeichnung: <i>Identification:</i>	See table 4 on page 5	Serien-Nr.: <i>Serial No.:</i>	N/A
Wareneingangs-Nr.: <i>Receipt No.:</i>	168365118	Eingangsdatum: <i>Date of receipt:</i>	2022-03-30
Prüfört: <i>Testing location:</i>	Dongguan ZRLK Testing Technology Co., Ltd. Building D, No.2, Jinyuyuan Industrial Park, No.18, West Industrial Road, Songshan Lake High-tech Industrial Development Zone, Dongguan City 523808, Guangdong, P.R. China		
Prüfgrundlage: <i>Test specification:</i>	UL 1642:2020		
Prüfergebnis: <i>Test Result:</i>	Der Prüfgegenstand entspricht oben genannter Prüfgrundlage(n). The test item passed the test specification(s).		
Prüflaboratorium: <i>Testing Laboratory:</i>	TÜV Rheinland (Shenzhen) Co., Ltd. 1F East & 2-4F, Cybio Technology Building No.1, No.16 Kejibei 2nd Road, High- Tech Industrial Park North Nanshan District, 518057, Shenzhen, China		
geprüft/ tested by:		kontrolliert/ reviewed by:	
			
2022-05-18 Joe Wang / Project Engineer		2022-05-18 Harris Yin / Reviewer	
Datum <i>Date</i>	Name/Stellung <i>Name/Position</i>	Unterschrift <i>Signature</i>	Datum <i>Date</i>
			Name/Stellung <i>Name/Position</i>
			Unterschrift <i>Signature</i>
Sonstiges/ Other Aspects:			
TÜV Rheinland TÜVus mark approval procedure. The complete test report includes the following documents: - UL 1642 Test report (33 pages); - Attachment 1: Equipment list (1 page); - Attachment 2: Photo documents (3 pages).			
Abkürzungen:	<i>P(ass) = entspricht Prüfgrundlage</i>	Abbreviations:	<i>P(ass) = passed</i>
	<i>F(ail) = entspricht nicht Prüfgrundlage</i>		<i>F(ail) = failed</i>
	<i>N/A = nicht anwendbar</i>		<i>N/A = not applicable</i>
	<i>N/T = nicht getestet</i>		<i>N/T = not tested</i>
Dieser Prüfbericht bezieht sich nur auf das o.g. Prüfmuster und darf ohne Genehmigung der Prüfstelle nicht auszugsweise vervielfältigt werden. Dieser Bericht berechtigt nicht zur Verwendung eines Prüfzeichens.			
<i>This test report relates to the a. m. test sample. Without permission of the test center this test report is not permitted to be duplicated in extracts. This test report does not entitle to carry any safety mark on this or similar products.</i>			

Test item particulars:

Information about the product needed to establish a correct test program, such as product mobility, type of power connections and similar. (Test item particulars are selected by the TRF Originator base on the requirements in the standard)

Designation : See table 4 on page 5

Trademark : N/A

Nominal voltage : 3.7V

Rated capacity : See table 4 on page 5

Maximum charge voltage : 4.20V

End discharge voltage : 2.75V

Manufacturer's charge method : Charge the cell at 0.5C CC to 4.20V, then 4.20V CV until charging current reaches 0.01C.

Utilization Type : Technician replaceable cell

Sample Number : ZKS220300864 C001 to ZKS220300864 C115 for 18650-1500mAh-10C;
ZKS220300864 C116 to ZKS220300864 C230 for 18650-2000mAh-10C;
ZKS220300864 C231 to ZKS220300864 C345 for 18650-2600mAh-3C

Possible test case verdicts:

Test case does not apply to the test object : N/A

Test object does meet the requirement : P(ass)

Test object does not meet the requirement : F(ail)

Testing:

Date of receipt of test item : 2022-03-26

Date(s) of performance of tests : 2022-03-26 to 2022-04-28

General remarks:

This report shall not be reproduced, except in full, without the written approval of the testing laboratory.

The test results presented in this report relate only to the object tested.

"(see remark #)" refers to a remark appended to the report.

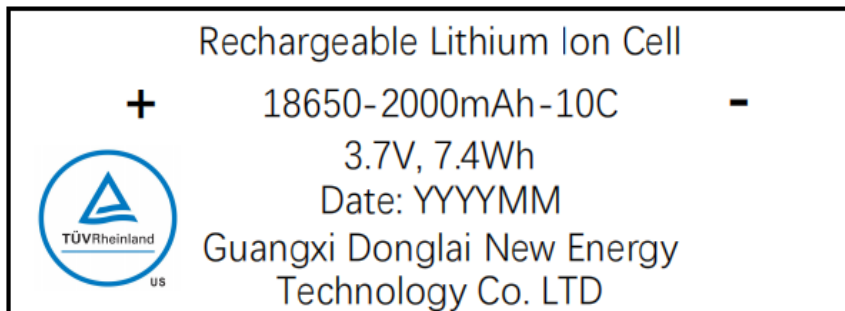
"(see appended table)" refers to a table appended to the report.

Throughout this report a point is used as the decimal separator.

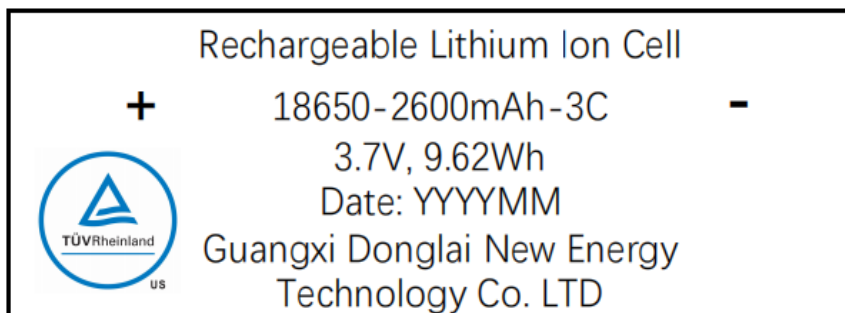
Copy of marking plate:



Label 1 for model 18650-1500mAh-10C



Label 2 for model 18650-2000mAh-10C



Label 3 for model 18650-2600mAh-3C

Remark: Due to similarity of the marking plate, only three representative models listed above.

Summary of testing:

The cell is evaluated in this test report per the following test items according to UL 1642:2020

Charging method declared by the manufacturer:

Charge the cell at 0.5C CC to 4.20V, then 4.20V CV until charging current reaches 0.01C.

Test items:

- cl.10 Short-Circuit Test;
- cl.11 Abnormal Charging Test;
- cl.13 CrushTest;
- cl.14 ImpactTest;
- cl.15 Shock Test;
- cl.16 Vibration Test;
- cl.17 Heating Test;
- cl.18 Temperature Cycling Test;
- cl.19 Low Pressure (Altitude Simulation) Test;
- cl.20 Projectile Test.

Description of the product:

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

- 1) These tested cells have not been evaluated in combination with charger(s) or host product(s). Additional evaluation to determine compliance may be required on the combination(s) in the end product evaluation.
- 2) The tested cells were evaluated for a maximum charge current and maximum voltage limit outlined in the Table below. The end product evaluation shall ensure that current and voltage limits noted are maintained.
- 3) The fourteen models (Model name: 18650-1500mAh-5C, 18650-1500mAh-10C, 18650-1800mAh, 18650-1800mAh-5C, 18650-2000mAh, 18650-2000mAh-3C, 18650-2000mAh-5C, 18650-2000mAh-10C, 18650-2200mAh, 18650-2200mAh-5C, 18650-2500mAh, 18650-2500mAh-3C, 18650-2600mAh, 18650-2600mAh-3C) are identical (same shape, same size, same chemical system, using same material), except the model name, capacity, discharge rate and the capacity. The tested models 18650-1500mAh-10C, 18650-2000mAh-10C and 18650-2600mAh-3C are representatives of all models.
- 4) The charging temperature is 0~45°C and the discharging temperature is -20~55°C.

- Table 1: Electrical parameter of model 18650-1500mAh-10C:

Model	Rated capacity	Nominal voltage	Nominal Charge current	Nominal discharge current	Max. charge current	Max. discharge current	Max. charge voltage	End discharge voltage
18650-1500mAh-10C	1500mAh	3.7V	750mA	15000mA	1500mA	22500mA	4.20V	2.75V

- Table 2: Electrical parameter of model 18650-2000mAh-10C :

Model	Rated capacity	Nominal voltage	Nominal Charge current	Nominal discharge current	Max. charge current	Max. discharge current	Max. charge voltage	End discharge voltage
18650-2000mAh-10C	2000mAh	3.7V	1000mA	20000mA	2000mA	30000mA	4.20V	2.75V

- Table 3: Electrical parameter of model 18650-2600mAh-3C:

Model	Rated capacity	Nominal voltage	Nominal Charge current	Nominal discharge current	Max. charge current	Max. discharge current	Max. charge voltage	End discharge voltage
18650-2600mAh-3C	2600mAh	3.7V	1300mA	7800mA	2600mA	13000mA	4.20V	2.75V

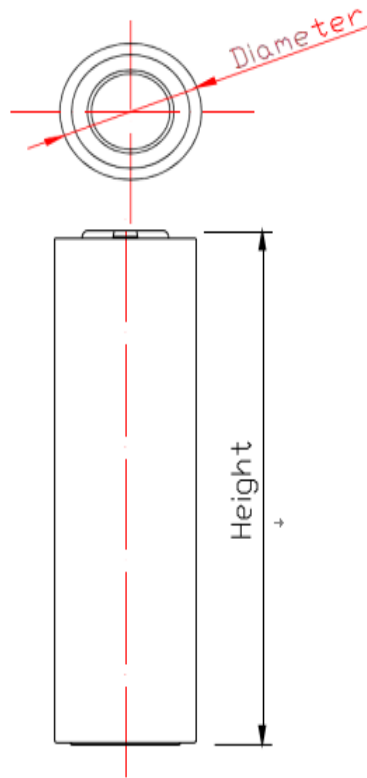
Remark: other models feature, see Table 4.

- Table 4: All of the models:

Model	Energy density (Wh/L)	Rated capacity (mAh)	Max. Diameter (mm)	Max. Height (mm)	Nominal charge current (mA)	Nominal discharge current (mA)	Max. charge current (mA)	Max. discharge current (mA)
18650-1500mAh-5C	316.3	1500	18.5	65.3	750	7500	1500	12000
18650-1500mAh-10C	316.3	1500	18.5	65.3	750	15000	1500	22500
18650-1800mAh	379.6	1800	18.5	65.3	900	900	1800	900
18650-1800mAh-5C	379.6	1800	18.5	65.3	900	9000	1800	14400
18650-2000mAh	421.8	2000	18.5	65.3	1000	1000	2000	1000
18650-2000mAh-3C	421.8	2000	18.5	65.3	1000	6000	2000	10000
18650-2000mAh-5C	421.8	2000	18.5	65.3	1000	10000	2000	16000
18650-2000mAh-10C	421.8	2000	18.5	65.3	1000	20000	2000	30000
18650-2200mAh	464.0	2200	18.5	65.3	1100	1100	2200	1100
18650-2200mAh-5C	464.0	2200	18.5	65.3	1100	11000	2200	17600
18650-2500mAh	527.2	2500	18.5	65.3	1250	1250	2500	1250
18650-2500mAh-3C	527.2	2500	18.5	65.3	1250	7500	2500	12500
18650-2600mAh	548.3	2600	18.5	65.3	1300	1300	2600	1300
18650-2600mAh-3C	548.3	2600	18.5	65.3	1300	7800	2600	13000

Note: All the models have the same nominal voltage 3.7V and the same end discharge voltage 2.75V, and have the same Max. charge voltage 4.20V.

Construction:



Height*Diameter=65.3 (max) * 18.5 (max)
Cell (Unit: mm)

Factory location:

Guangxi Donglai New Energy Technology Co. LTD
(South of Xingguang Hele City) Extension of Yingbin Avenue, Taocheng Town, Daxin County, Chongzuo City,
Guangxi, P.R. China

UL 1642:2020			
Clause	Requirement + Test	Result - Remark	Verdict
INTRODUCTION			
1	Scope		P
2	General		P
3	Glossary		P
CONSTRUCTION			
4	General		N/A
4.1	Casing		N/A
4.1.1	The casing of a lithium battery shall have the strength and rigidity necessary to resist the abuses to which it may be subjected, without resulting in a risk of fire. The casing of a user-replaceable lithium battery shall have the strength and rigidity necessary to resist the abuses to which it may be subjected without resulting in a risk of injury to persons.	Technician replaceable cell without enclosure.	N/A
4.1.2	A cell of a user-replaceable battery shall be in a rigid casing of sufficient strength to prevent flexing. A tool providing the mechanical advantage of a pliers, screwdriver, or hacksaw shall be the minimum capable of opening the user-replaceable cell casing, if opening of the casing will expose metallic lithium.	See above	N/A
4.2	Electrolyte		N/A
4.2.1	A user-replaceable battery shall not contain pressurized vapor or liquid that could spray materials into the eyes or leak more than 5 mL of liquid when the battery casing is punctured under normal laboratory conditions, 23 ±2°C (73 ±3.6°F).	Technician-replaceable Batteries.	N/A
4.3	Use		N/A
4.3.1	A lithium battery shall be protected from abnormal charging currents during use. A battery tested and found acceptable for the charging current, I_c (see Section 11), under fault conditions specified by the manufacturer, shall be protected from larger charging currents in the end product application by: a) Two blocking components, such as diodes, or b) One blocking component and one current limiting component, such as a resistor or a fuse. The current limiting component shall limit the charging current to one-third the value used in the Abnormal Charging Test, Section 11.	Cell only	N/A
PERFORMANCE			
5	General		P
5.1	Technician-replaceable Batteries		P

UL 1642:2020			
Clause	Requirement + Test	Result - Remark	Verdict
5.1.1	Technician-replaceable lithium cells or batteries are to be tested as described in Sections 10 – 20. Section 12, Forced-Discharge Test, is applicable only to cells intended to be used in series-connected multicell applications such as battery packs. For multicell installations, also see 5.3.1.		P
5.1.2	When a fire or explosion occurs as a result of the Crush Test, Section 13, or the Impact Test, Section 14, or the cell or battery ruptures to the extent that the aluminum test cage is penetrated during the Projectile Test, Section 20; the use of the technician replaceable cell or battery shall be restricted to applications in which it is not exposed to, or is protected from, any conditions shown to cause a fire or explosion.	No fire or explosion occurs	P
5.1.3	Cells and batteries subjected to the Shock Test, Section 15, Vibration Test, Section 16, Temperature Cycling Test, Section 18, and Low Pressure (Altitude Simulation) Test, Section 19, shall also not leak or vent. For these tests, unacceptable leakage is determined to have occurred when the resulting mass loss exceeds the values shown in Table 5.1, Venting and leakage mass loss criteria.	No leak or vent	P
5.2	User-replaceable Batteries		N/A
5.2.1	User-replaceable lithium cells or batteries are to be tested as described in Sections 10 – 20. Section 12, Forced Discharge Test, is applicable only to cells intended to be used in multicell applications such as battery packs. In addition to complying with the requirements for a technician replaceable cell or battery as specified in 5.1.1, a user-replaceable cell or battery shall not explode or ignite when subjected to the Crush Test, Section 13, or the Impact Test, Section 14. A user-replaceable battery shall comply with the requirements for Sections 10 – 20 and with the applicable construction requirements outlined in Section 4. Secondary lithium cells shall not be considered user-replaceable.	Technician-replaceable cell	N/A
5.2.2	Sets of five specimens each are to be used for the Projectile Test, Section 20.3; see Table 6.1. When only one specimen from a set of five does not comply with the requirements, another set of five specimens is to be tested. All specimens from this second set shall comply with the requirements.	Technician-replaceable cell	N/A
5.3	Multicell Installations		N/A

UL 1642:2020			
Clause	Requirement + Test	Result - Remark	Verdict
5.3.1	A technician-replaceable or user-replaceable cell intended for use in multicell installations or battery packs shall also be tested as described in 10.3 and Section 12. No fire or explosion shall occur as a result of these tests. In addition, batteries subjected to the test described in 10.3 shall meet the requirements as described in 5.1.1 and 5.2.1 for a cell or battery subjected to the Short-Circuit Test, Section 10.	Single cell.	N/A
6	Samples		P
6.1	Fully charged primary cells or batteries and primary cells or batteries that have been conditioned by partial or complete discharge, or both, are to be used for the tests described in Sections 10 – 20. The number of samples to be used in each test for a primary cell or battery is shown in Table 6.1. When a group of cells or batteries of different sizes, but similar chemistries is involved, selected sizes representative of the range are to be tested.	The samples are secondary cells.	N/A
6.2	Fully charged secondary cells or batteries and secondary cells or batteries that have been conditioned by charge-discharge cycling are to be used for the tests described in Sections 10 – 20. The number of samples to be used in each test for a secondary cell or battery is shown in Table 6.2. When a group of cells or batteries of different sizes, and similar chemistries is involved, selected sizes representative of the range are to be tested.	The samples are secondary technician-replaceable cells. Prepared as required.	P
6.3	Prior to conducting the testing in Section 17, the lithium ion cell samples shall be pre-conditioned as outlined in 6.4 and 6.5.	Prepared as required.	P
6.4	For the heating test of Section 17, two sets of five lithium ion cell samples are to be fully discharged (i.e. to the manufacturer's specified end point voltage). The samples are then placed in a test chamber and conditioned for 1 to 4 h (5 samples at the upper temperature limit and 5 samples at the lower temperature limit of the operating region) as outlined in Table 6.3.	Prepared as required.	P
6.5	While still in the test chamber set at the temperature limits, the samples are charged (5 samples at the upper temperature limit and 5 samples at lower temperature limit) at the specified maximum charging current and upper limit charging voltage per Table 6.3, using a constant voltage charging method. Charging is continued until the charge current is reduced to the specified end of charge conditions (i.e. 0.05 times the charge current).	Prepared as required.	P
7	Conditioning of Samples		P
7.1	Discharge		N/A

UL 1642:2020			
Clause	Requirement + Test	Result - Remark	Verdict
7.1.1	Primary batteries are to be completely discharged by connecting their terminals through resistors that provide the desired level of discharge within 60 days. Batteries are to be discharged at room temperature. Cells with a liquid cathode such as thionyl chloride or sulfur dioxide, shall also be conditioned by one-half discharge	The samples are secondary cells.	N/A
7.1.2	For solid electrolyte and other types of primary lithium batteries that cannot be discharged within 60 days because of the small currents they inherently produce, longer discharge times plus discharge at higher temperatures may be used to obtain the desired level of discharge. The manufacturer's recommended discharge procedures are to be followed so as to obtain the required discharge level in the minimum time.	The samples are secondary cells.	N/A
7.2	Charge-discharge cycling		P
7.2.1	Secondary cells are to be conditioned at 25°C (77°F). Cells are continuously cycled as per the manufacturer's specifications. The specification shall be such that the full rated capacity of the cell is utilized and the number of cycles accumulated shall be at least equal to 25% of the advertised cycle life of the cell or cycled continuously for 90 days, whichever is shorter. Cycling is to be done either individually or in groups. Cells are to be recharged prior to testing as indicated in Table 6.2.	The samples are cycled at manufacturer's factory before they were sent for test.	P
8	Important test considerations		P
8.1	Some lithium batteries are capable of exploding when the tests described in Sections 10 – 20 are conducted. It is important that personnel be protected from the flying fragments, explosive force, sudden release of heat, and noise that results from such explosions. The test area is to be well ventilated to protect personnel from possible harmful fumes or gases.	Prepared the tests as required.	P
8.2	As an additional precaution, the temperatures on the surface of the battery casings shall be monitored during the tests described in Sections 10, 11, 12, 13, and 14. All personnel involved in the testing of lithium batteries are to be instructed never to approach a lithium battery while the surface temperature exceeds 90°C (194°F) and not to touch the lithium battery while the surface temperature exceeds 45°C (113°F).	Prepared the tests as required.	P
8.3	For protection, the Projectile Test, Section 20 is to be conducted in a room separate from the observer.	Prepared the tests as required.	P
9	Temperature Measurements		P

UL 1642:2020			
Clause	Requirement + Test	Result - Remark	Verdict
9.1	Temperatures are to be measured by thermocouples consisting of wires not larger than 24 AWG (0.21 mm ²) and not smaller than 30 AWG (0.05 mm ²) and a potentiometer-type instrument.	Prepared the tests as required.	P
9.2	The temperature measurements on the batteries are to be made with the measuring junction of the thermocouple held tightly against the metal casing of the battery.	Prepared the tests as required.	P
TESTS FOR TECHNICIAN-REPLACEABLE AND USER-REPLACEABLE BATTERIES			
ELECTRICAL TESTS			
10	Short-Circuit Test		P
10.1	Each test sample battery, in turn, is to be short-circuited by connecting the positive and negative terminals of the battery with a circuit load having a resistance load of 80±20 mΩ. The temperature of the battery case is to be recorded during the test. The battery is to discharge until a fire or explosion is obtained, or until it has reached a completely discharged state of less than 0.2 V and the battery case temperature has returned to ±10°C (±18°F) of ambient temperature. The voltage at the end of the test may not reach 0.2 V due to operation of protective devices in the circuit. The return to near ambient of the battery (cell) casing is an indication of ultimate results.	Tested as required. See table 10	P
10.2	Tests are to be conducted at 20 ±5°C (68 ±9°F) and at 55 ±5°C (131 ±9°F). The batteries are to reach equilibrium at 20 ±5°C or 55 ±5°C, as applicable, before the terminals are connected.	Tested as required.	P
10.3	A battery is to be tested individually unless the manufacturer indicates that it is intended for use in series or parallel. For series or parallel use, additional tests on five sets of batteries are to be conducted using the maximum number of batteries to be covered for each configuration.	Tested as required.	P
10.4	When an overcurrent protective device activates during the test, the test shall be repeated with the battery supply connected to the maximum load that does not cause the protective device to open. Protective devices that are relied upon to meet the compliance criteria for the short circuit test shall comply with 2.3.1.	Only one single lithium-ion cell, no over-current or thermal protective device was integrated into the cell.	N/A
10.5	The samples shall not explode or catch fire.	The test results meet the requirements.	P
11	Abnormal Charging Test		P
11.1	Primary cells or batteries shall comply with 11.2 – 11.7.	Secondary cell	N/A
11.2	Cells or batteries conditioned in accordance with Tables 6.1, as applicable, are to be used for this test. The batteries are to be tested in an ambient temperature of 20 ±5°C (68 ±9°F).		N/A

UL 1642:2020			
Clause	Requirement + Test	Result - Remark	Verdict
11.3	<p>Each test sample battery is to be subjected to a charging current of three times the current I_c, specified by the manufacturer by connecting it in opposition to a dc-power supply. The specified charging current is to be obtained by connecting a resistor of the specified size and rating in series with the battery. The test charging time is to be calculated using the formula:</p> $t_c = \frac{2.5C}{3(I_c)}, \text{ in which}$ <p>t_c is the charging time in hour C is the capacity of the cell/batteiy in ampere-hours, and I_c is the maximum charging current, in amperes, specified by the manufacturer. The minimum charging time is to be 7 hours.</p>		N/A
11.4	<p>When a non-resettable overcurrent or protective device operates during the test, the test is to be repeated at a charge current below the level that the protective device operates. When a resettable protective device operates during the test, the protector is allowed to reset to a total of 10 cycles; or until the appropriate charging time has been completed, but not less than 7 hours. Protective devices that are relied upon to meet the compliance criteria for the abnormal charging test shall comply with 2.3.1.</p>		N/A
11.5	The samples shall not explode or catch fire.		N/A
11.6	Secondary cells or batteries shall comply with 11.7 – 11.10.	See table 11, tested as required	P
11.7	Cells or batteries conditioned in accordance with Tables 6.2, as applicable, are to be used for this test. The batteries are to be tested in an ambient temperature of $20 \pm 5^\circ\text{C}$ ($68 \pm 9^\circ\text{F}$).	Tested as required.	P
11.8	Each test sample battery is to be discharged at a constant current of 0.2 C/1 h, to a manufacturer specified discharge endpoint voltage. The cell or battery is then to be charged with a constant maximum specified output voltage and a current limit of three times the maximum charging current I_c , specified by the manufacturer. Charging duration is to be 7 hours or the time required to reach the manufacturer's specified end-of-charge condition, whichever is greater.	Tested as required.	P

UL 1642:2020			
Clause	Requirement + Test	Result - Remark	Verdict
11.9	When a non-resettable overcurrent or protective device operates during the test, the test shall be repeated at an overcharging current below the level that the protection device operates. When a resettable protective device operates during the test, the protector is to be allowed to reset to a total of 10 cycles; or until the appropriate charging time has been completed, but not less than 7 hours. Protective devices that are relied upon to meet the compliance criteria for the abnormal charging test shall comply with 2.3.1.	The samples are to be tested without any assistance of over-current or thermal protective devices.	N/A
11.10	The samples shall not explode or catch fire.	No explosion or catch fire during and after the test	P
12	Forced-Discharged Test		N/A
12.1	This test is intended for cells that are to be used in series-connected, multicell applications, such as battery packs.	One single cell	N/A
12.2	A fully discharged cell is to be force-discharged by connecting it in series with fully charged cells of the same kind. The number of fully charged cells to be connected in series with the discharged cell is to equal the maximum number less one of the cells to be covered for series use. Five cells are to be completely discharged, at room temperature.		N/A
12.3	Once the fully discharged cell is connected in series with the specified number of fully charged cells the resultant battery pack is to be short circuited.		N/A
12.4	The positive and negative terminals of the sample are to be connected with a copper wire with a resistance load of $80 \pm 20 \text{m}\Omega$. The sample is to discharge until a fire or explosion is obtained, or until it has reached a completely discharged state of less than 0.2V and the battery case temperature has returned to $\pm 10^\circ\text{C}$ (18°F) of ambient temperature. The voltage at the end of the test may not reach 0.2V due to operation of protective devices in the circuit. The return to near ambient of the cell casing is an indication of ultimate results.		N/A
12.5	When an overcurrent or protective operates during the test, the test shall be repeated with the battery supply connected to the maximum load that does not cause the protective device to open. Protective devices that are relied upon to meet the compliance criteria for the forced discharge test shall comply with 2.3.1.		N/A
12.6	The samples shall not explode or catch fire.		N/A
MECHANICAL TESTS			
13	Crush Test		P

UL 1642:2020			
Clause	Requirement + Test	Result - Remark	Verdict
13.1	A battery is to be crushed between two flat surfaces. The force for the crushing is to be applied by a hydraulic ram or similar force mechanism. The flat surfaces are to be brought in contact with the cells and the crushing is to be continued until an applied force of 13 ±1 kN (3000 ±224 lbs) is reached. Once the maximum force has been obtained it is to be released.	Tested as required. See table 13	P
13.2	A cylindrical, pouch or prismatic cell is to be crushed with its longitudinal axis parallel to the flat surfaces of the crushing apparatus. A prismatic cell is also to be rotated 90° around its longitudinal axis so that both the wide and narrow sides will be subjected to the crushing force. Each sample is to be subjected to a crushing force in only one direction. Separate samples are to be used for each test. Exception: For Lithium ion systems, a cylindrical, pouch or prismatic cell is to be crushed with its longitudinal axis parallel to the flat surface of the crushing apparatus. Each sample is to be subjected to a crushing force in only one direction. Test only the wide side of pouch and prismatic cells.	Tested as required. The sample are cylindrical lithium-ion cells.	P
13.3	A coin or button battery is to be crushed with the flat surface of the battery parallel with the flat surfaces of the crushing apparatus.	Not a coin or button battery	N/A
13.4	The samples shall not explode or catch fire.	No explosion or catch fire during and after the test	P
14	Impact Test		P
14.1	A test sample battery is to be placed on a flat surface. A 15.8 ±0.1-mm (5/8 ±0.004-in) diameter bar is to be placed across the center of the sample. A 9.1 ±0.46-kg (20 ±1-lb) weight is to be dropped from a height of 610 ±25 mm (24 ±1 in) onto the sample. See Figure 14.1.	Prepared the test as required. See table 14	P
14.2	A cylindrical, pouch or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8-mm (5/8-in) diameter curved surface lying across the center of the test sample. A prismatic cell is also to be rotated 90° around its longitudinal axis so that both the wide and narrow sides are subjected to the impact. Each sample is to be subjected to only a single impact. Separate samples are to be used for each test. Exception: For Lithium ion systems, a cylindrical, pouch or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15.8-mm (5/8-in) diameter curved surface lying across the center of the test sample. Each sample is to be subjected to only a single impact. Test only the wide side of pouch and prismatic cells.	Tested as required. The sample are cylindrical lithium-ion cells.	P

UL 1642:2020			
Clause	Requirement + Test	Result - Remark	Verdict
14.3	A coin or button battery is to be impacted with the flat surface of the test sample parallel to the flat surface and the 15.8-mm (5/8-in) diameter curved surface lying across its center.	Not a coin or button battery	N/A
14.4	The samples shall not explode or catch fire.	No explosion or catch fire during and after the test	P
15	Shock Test		P
15.1	The cell is to be secured to the testing machine by means of a rigid mount which supports all mounting surfaces of the cell. Each cell shall be subjected to a total of three shocks of equal magnitude. The shocks are to be applied in each of three mutually perpendicular directions unless it has only two axes of symmetry in which case only two directions shall be tested. Each shock is to be applied in a direction normal to the face of the cell. For each shock the cell is to be accelerated in such a manner that during the initial 3 ms the minimum average acceleration is 75 g (where g is the local acceleration due to gravity). The peak acceleration shall be between 125 and 175 g. Cells shall be tested at a temperature of 20 ± 5°C (68 ± 9°F).	Prepared the test as required. See table 15	P
15.2	The samples shall not explode or catch fire. In addition, the sample shall not vent or leak as described in 5.1.1.	No explosion or catch fire, the sample not vent or leak	P
16	Vibration Test		P
16.1	A battery is to be subjected to simple harmonic motion with an amplitude of 0.8 mm (0.03 inch) [1.6 mm (0.06 inch) total maximum excursion].	Prepared the test as required. See table 16.	P
16.2	The frequency is to be varied at the rate of 1 Hz/min between 10 and 55 Hz, and return in not less than 90 nor more than 100 min. The battery is to be tested in three mutually perpendicular directions. For a battery that has only two axes of symmetry, the battery is to be tested perpendicular to each axis.	Tested as required.	P
16.3	The samples shall not explode or catch fire. In addition the sample shall not vent or leak as described in 5.1.1.	The test results meet the requirements.	P
ENVIRONMENTAL TESTS			
17	Heating Test		P

UL 1642:2020			
Clause	Requirement + Test	Result - Remark	Verdict
17.1	A battery is to be heated in a gravity convection or circulating air oven with an initial temperature of 20 ±5°C (68±9°F). The temperature of the oven is to be raised at a rate of 5 ±2°C (9±3.6°F) per minute to a temperature of 130 ±2°C (266±3.6°F) and remain for 10 min. The sample shall return to room temperature (20±5°C) and then be examined. For batteries specified for temperatures above 100°C (212°F), the conditioning temperature shall be increased from 130 ±2°C (266±3.6°F), to 30±2°C (86±3.6°F) above the manufacturers maximum specified temperature. For a battery of lithium metal chemistry, the conditioning temperature shall be increased to a maximum of 170 ±2°C (338±3.6°F).	Tested as required. Oven temperature: 130°C.	P
17.2	The samples shall not explode or catch fire.	The test results meet the requirements.	P
18	Temperature Cycling Test		P
18.1	The batteries are to be placed in a test chamber and subjected to the following cycles: a) Raising the chamber-temperature to 70 ±3°C (158 ±5°F) within 30 minutes and maintaining this temperature for 4 hours. b) Reducing the chamber temperature to 20 ±3°C (68 ±5°F) within 30 minutes and maintaining this temperature for 2 hours. c) Reducing the chamber temperature to minus 40 ±3°C (minus 40 ±5°F) within 30 minutes and maintaining this temperature for 4 hours. d) Raising the chamber temperature to 20 ±3°C (68 ±5°F) within 30 minutes. e) Repeating the sequence for a further 9 cycles. f) After the 10th cycle, storing the batteries for a minimum of 24 hours, at a temperature of 20 ±5°C (68 ±9°F) prior to examination.	Tested as required. See table 18	P
18.2	The samples shall not explode or catch fire. In addition, the samples shall not vent or leak as described in 5.1.1.	The test results meet the requirements.	P
19	Low Pressure (Altitude Simulation) Test		P
19.1	Sample batteries are to be stored for 6 hours at an absolute pressure of 11.6 kPa (1.68 psi) and a temperature of 20 ± 3°C (68 ± 5°F).	Tested as required. See table 19	P
19.2	The samples shall not explode or catch fire as a result of the Low Pressure (Altitude Simulation) Test. In addition, the samples shall not vent or leak as described in 5.1.1.	The test results meet the requirements.	P
FIRE EXPOSURE TEST			
20	Projectile Test		P
20.1	When subjected to the test described in 20.2 - 20.5 no part of an exploding cell or battery shall penetrate the wire screen such that some or all of the cell or battery protrudes through the screen.	The test results meet the requirements.	P

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Clause	Requirement + Test	Result - Remark	Verdict
20.2	Each test sample cell or battery is to be placed on a screen that covers a 102-mm (4-inch) diameter hole in the center of a platform table. The screen is to be constructed of steel wire mesh having 20 openings per 25.4 mm (1 in) and a wire diameter of 0.43 mm (0.017 in).	Prepared the test as required.	P
20.3	The screen is to be mounted 38 mm (1-1/2 in) above a Meker type burner. The fuel and air flow rates are to be set to provide a bright blue flame that causes the supporting screen to glow a bright red.	Prepared the test as required.	P
20.4	An eight-sided covered wire cage, 610-mm (2-ft) across and 305-mm (1-ft) high, made from metal screening is to be placed over the test sample. See Figure 20.1. The metal screening is to be constructed from 0.25-mm (0.010-in) diameter aluminum wire with 16 -18 wires per 25.4 mm (1 inch) in each direction.	Tested as required.	P
20.5	The sample is to be heated and shall remain on the screen until it explodes or the cell or battery has ignited and burned out. It is not required to secure the sample in place unless it is at risk of falling off the screen before the test is completed. When required, the sample shall be secured to the screen with a single wire tied around the sample.	Tested as required.	P
MARKING			
21	General		P
21.1	A battery shall be legibly and permanently marked with: a) The manufacturer's name, trade name, or trademark or other descriptive marking by which the organization responsible for the product may be identified; b) A distinctive ("catalog" or "model") number or the equivalent; c) The date or other dating period of manufacture not exceeding any three consecutive months.	See marking plate on page 3	P
21.2	If a manufacturer produces a battery at more than one factory, each battery package shall have a distinctive marking to identify it as the product of a particular factory.	One single factory	N/A
22	Primary Batteries		N/A
22.1	A primary battery shall be marked with the word "WARNING" and the following or an equivalent statement: "Risk of fire and burns. Do not recharge, open, crush, heat above (the manufacturer's specified temperature rating), or incinerate." If space does not permit marking on the battery, the marking may be on the smallest unit package.	Secondary cell	N/A

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Clause	Requirement + Test	Result - Remark	Verdict
22.2	<p>The packaging for a user-replaceable battery shall be marked with the word "CAUTION" and the following or equivalent statements:</p> <p>"Risk of fire and burns. Do not recharge, disassemble, heat above (the manufacturer's specified temperature rating), or incinerate. Keep battery out of reach of children and in original package until ready to use. Dispose of used batteries promptly."</p>		N/A
22.3	<p>For user replaceable lithium primary coin cells (3.0 V) the packaging shall also include the following or equivalent: "WARNING – Never put batteries in mouth. Swallowing may lead to serious injury or death. If ingested, immediately seek medical attention and have the doctor phone the National Capital Poison Control Center." This marking may be combined with the marking of 22.2, if the signal word "WARNING" is used instead of "CAUTION."</p>		N/A

Critical Components					
Material: e.g. external enclosure, PCB, closed-end connector, sleeves, cord anchorage etc					
Components with winding: e.g. motor, transformer, magnetic coil etc.					
Other components: e.g. switch, thermostat, heater, plug, internal wire, capacitor, relay, varistor etc.					
Object/ Part No.	Manufacturer/ trademark	Type/ Model	Technical data	Standard	Mark(s) of conformity
Electrolyte	Xinxiang Shenglin Energy Co. LTD	SL-3021B	LiPF ₆ +DEC+EC	--	--
Separator	Shenzhen Jinxuan New Energy Materials Co. LTD	(9+2+2) μ m*61mm	PP+PE, Shutdown temperature: 130°C	--	--
Negative electrode	Xinxiang Boruida Power Material Co., LTD	BR-04CY	Graphite, CMC, SBR, Conductive Additive, Copper foil	--	--
Positive electrode	Hunan Kingfuli New Energy Co. LTD	KP-05A	LiNi _x Co _y Mn _{1-x-y} O ₂ , Ni: Co: Mn= 5: 2: 3, PVDF, Conductive Additive, Aluminum foil	--	--
Case	Chongqing Ruiming New Energy Technology Co., LTD	18.15mm*68.3mm*0.22 mm	Steel	--	--

10	TABLE: Short-Circuit Test (model: 18650-1500mAh-10C)					P
Fully Charged Cell						
Ambient temperature: 23.9°C						
Sample No.	ZKS220300864 C001	ZKS220300864 C002	ZKS220300864 C003	ZKS220300864 C004	ZKS2203008 64 C005	
Tmax(°C)	114.4	113.5	115.3	113.4	114.0	
Failure Mode	No	No	No	No	No	
Ambient temperature: 57.6°C						
Sample No.	ZKS220300864 C011	ZKS220300864 C012	ZKS220300864 C013	ZKS220300864 C014	ZKS2203008 64 C015	
Tmax(°C)	128.6	123.4	126.5	124.4	124.7	
Failure Mode	No	No	No	No	No	
Cycled Cell						
Ambient temperature: 22.4°C						
Sample No.	ZKS220300864 C006	ZKS220300864 C007	ZKS220300864 C008	ZKS220300864 C009	ZKS2203008 64 C010	
Tmax(°C)	111.5	108.6	118.4	115.7	113.2	
Failure Mode	No	No	No	No	No	
Ambient temperature: 58.1°C						
Sample No.	ZKS220300864 C016	ZKS220300864 C017	ZKS220300864 C018	ZKS220300864 C019	ZKS2203008 64 C020	
Tmax(°C)	126.0	124.1	126.1	124.6	130.0	
Failure Mode	No	No	No	No	No	
Supplementary information: Tmax was recorded on the centre of the cell sureface. No explode or catch fire.						

10	TABLE: Short-Circuit Test (model: 18650-2000mAh-10C)					P
Fully Charged Cell						
Ambient temperature: 24.1°C						
Sample No.	ZKS220300864 C116	ZKS220300864 C117	ZKS220300864 C118	ZKS220300864 C119	ZKS2203008 64 C120	
Tmax(°C)	124.9	120.4	126.1	120.5	127.1	
Failure Mode	No	No	No	No	No	
Ambient temperature: 57.0°C						
Sample No.	ZKS220300864 C126	ZKS220300864 C127	ZKS220300864 C128	ZKS220300864 C129	ZKS2203008 64 C130	
Tmax(°C)	129.9	130.8	123.1	127.6	121.7	
Failure Mode	No	No	No	No	No	
Cycled Cell						
Ambient temperature: 23.1°C						
Sample No.	ZKS220300864 C121	ZKS220300864 C122	ZKS220300864 C123	ZKS220300864 C124	ZKS2203008 64 C125	
Tmax(°C)	128.8	129.4	127.5	129.4	125.9	
Failure Mode	No	No	No	No	No	
Ambient temperature: 57.4°C						
Sample No.	ZKS220300864 C131	ZKS220300864 C132	ZKS220300864 C133	ZKS220300864 C134	ZKS2203008 64 C135	
Tmax(°C)	130.4	123.5	127.3	128.9	130.0	
Failure Mode	No	No	No	No	No	
Supplementary information:						
Tmax was recorded on the centre of the cell sureface.						
No explode or catch fire.						

10	TABLE: Short-Circuit Test (model: 18650-2600mAh-3C)					P
Fully Charged Cell						
Ambient temperature: 23.7°C						
Sample No.	ZKS220300864 C231	ZKS220300864 C232	ZKS220300864 C233	ZKS220300864 C234	ZKS2203008 64 C235	
Tmax(°C)	87.2	83.1	85.7	86.1	91.0	
Failure Mode	No	No	No	No	No	
Ambient temperature: 55.4°C						
Sample No.	ZKS220300864 C236	ZKS220300864 C237	ZKS220300864 C238	ZKS220300864 C239	ZKS2203008 64 C240	
Tmax(°C)	87.1	87.4	85.5	86.1	93.4	
Failure Mode	No	No	No	No	No	
Cycled Cell						
Ambient temperature: 22.8°C						
Sample No.	ZKS220300864 C241	ZKS220300864 C242	ZKS220300864 C243	ZKS220300864 C244	ZKS2203008 64 C245	
Tmax(°C)	78.2	82.7	85.8	86.6	85.1	
Failure Mode	No	No	No	No	No	
Ambient temperature: 55.4°C						
Sample No.	ZKS220300864 C246	ZKS220300864 C247	ZKS220300864 C248	ZKS220300864 C249	ZKS2203008 64 C250	
Tmax(°C)	91.1	86.6	87.2	90.5	86.2	
Failure Mode	No	No	No	No	No	
Supplementary information:						
Tmax was recorded on the centre of the cell surface.						
No explode or catch fire.						

11	TABLE: Abnormal Charging Test (model: 18650-1500mAh-10C)					P
Ambient temperature: 22.0						
Id	<u>0.3A</u>		Ue	<u>2.75V</u>		
Ic	<u>1.5A</u>		Uc	<u>4.20V</u>		
Fully Charged Cell						
Sample No.	ZKS220300864 C021	ZKS220300864 C022	ZKS220300864 C023	ZKS220300864 C024	ZKS22030086 4 C025	
Tmax(°C)	30.1	28.7	29.8	29.3	29.1	
Failure Mode	No	No	No	No	No	
Cycled cell						
Sample No.	ZKS220300864 C026	ZKS220300864 C027	ZKS220300864 C028	ZKS220300864 C029	ZKS22030086 4 C030	
Tmax(°C)	28.5	30.9	29.9	30.0	29.5	
Failure Mode	No	No	No	No	No	
Supplementary information: Tmax was recorded on the centre of the cell surface; Test current is 4.5A. No explode or catch fire.						

11	TABLE: Abnormal Charging Test (model: 18650-2000mAh-10C)					P
Ambient temperature: 23.4°C						
Id	<u>0.4A</u>		Ue	<u>2.75V</u>		
Ic	<u>2A</u>		Uc	<u>4.20V</u>		
Fully Charged Cell						
Sample No.	ZKS220300864 C136	ZKS220300864 C137	ZKS220300864 C138	ZKS220300864 C139	ZKS22030086 4 C140	
Tmax(°C)	34.8	33.7	34.6	37.0	35.2	
Failure Mode	No	No	No	No	No	
Cycled cell						
Sample No.	ZKS220300864 C141	ZKS220300864 C142	ZKS220300864 C143	ZKS220300864 C144	ZKS22030086 4 C145	
Tmax(°C)	36.6	34.7	36.8	34.0	35.5	
Failure Mode	No	No	No	No	No	
Supplementary information: Tmax was recorded on the centre of the cell surface; Test current is 6A. No explode or catch fire.						

11	TABLE: Abnormal Charging Test (model: 18650-2600mAh-3C)					P
Ambient temperature: 24.6°C						
Id	<u>0.52A</u>		Ue	<u>2.75V</u>		
Ic	<u>2.6A</u>		Uc	<u>4.20V</u>		
Fully Charged Cell						
Sample No.	ZKS220300864 C251	ZKS220300864 C252	ZKS220300864 C253	ZKS220300864 C254	ZKS2203008 64 C255	
Tmax(°C)	46.1	47.8	47.3	47.2	47.1	
Failure Mode	No	No	No	No	No	
Cycled cell						
Sample No.	ZKS220300864 C256	ZKS220300864 C257	ZKS220300864 C258	ZKS22030086 4 C259	ZKS22030086 4 C260	
Tmax(°C)	49.6	48.5	48.1	48.0	47.2	
Failure Mode	No	No	No	No	No	
Supplementary information: Tmax was recorded on the centre of the cell surface; Test current is 7.8A. No explode or catch fire.						

13	TABLE: Crush Test (model: 18650-1500mAh-10C)					P
Ambient temperature: 22.2°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C031	ZKS220300864 C032	ZKS220300864 C033	ZKS220300864 C034	ZKS2203008 64 C035	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Crush direction	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	
Failure mode	No	No	No	No	No	
Cycled cell						
Sample No.	ZKS220300864 C036	ZKS220300864 C0037	ZKS220300864 C038	ZKS220300864 C039	ZKS2203008 64 C040	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Crush direction	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	
Failure mode	No	No	No	No	No	

Supplementary information: no explosion or catch fire.

13	TABLE: Crush Test (model: 18650-2000mAh-10C)					P
Ambient temperature: 22.8°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C146	ZKS220300864 C147	ZKS220300864 C148	ZKS220300864 C149	ZKS2203008 64 C150	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Crush direction	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	
Failure mode	No	No	No	No	No	
Cycled cell						
Sample No.	ZKS220300864 C151	ZKS220300864 C152	ZKS220300864 C153	ZKS220300864 C154	ZKS2203008 64 C155	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Crush direction	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	Longitudinal axis parallel to the flat surface	
Failure mode	No	No	No	No	No	
Supplementary information: no explosion or catch fire.						

13	TABLE: Crush Test (model: 18650-2600mAh-3C)					P
Ambient temperature: 22.3°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C261	ZKS220300864 C262	ZKS220300864 C263	ZKS220300864 C264	ZKS2203008 64 C265	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Crush direction	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	
Failure mode	No	No	No	No	No	
Cycled cell						
Sample No.	ZKS220300864 C266	ZKS220300864 C267	ZKS220300864 C268	ZKS220300864 C269	ZKS2203008 64 C270	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Crush direction	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	
Failure mode	No	No	No	No	No	
Supplementary information: no explosion or catch fire.						

14	TABLE: Impact Test (model: 18650-1500mAh-10C)					P
Ambient temperature: 20.3°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C041	ZKS220300864 C042	ZKS22030086 4 C043	ZKS220300864 C044	ZKS22030086 4 C045	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Impact direction	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	
Failure mode	No	No	No	No	No	
Cycled cell						
Sample No.	ZKS220300864 C046	ZKS220300864 C047	ZKS220300864 C048	ZKS220300864 C049	ZKS22030086 4 C050	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Impact direction	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	
Failure mode	No	No	No	No	No	
Supplementary information: no explosion or catch fire.						

14	TABLE: Impact Test (model: 18650-2000mAh-10C)					P
Ambient temperature: 23.1°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C156	ZKS220300864 C157	ZKS220300864 C158	ZKS220300864 C159	ZKS2203008 64 C160	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Impact direction	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	
Failure mode	No	No	No	No	No	
Cycled cell						
Sample No.	ZKS220300864 C161	ZKS220300864 C162	ZKS220300864 C163	ZKS220300864 C164	ZKS2203008 64 C165	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Impact direction	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	
Failure mode	No	No	No	No	No	
Supplementary information: no explosion or catch fire.						

14	TABLE: Impact Test (model: 18650-2600mAh-3C)					P
Ambient temperature: 23.7°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C271	ZKS220300864 C272	ZKS220300864 C273	ZKS220300864 C274	ZKS2203008 64 C275	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Impact direction	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	
Failure mode	No	No	No	No	No	
Cycled cell						
Sample No.	ZKS220300864 C276	ZKS220300864 C277	ZKS220300864 C278	ZKS220300864 C279	ZKS2203008 64 C280	
Catch fire	No	No	No	No	No	
Explode	No	No	No	No	No	
Impact direction	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	Longitudinal axis	
Failure mode	No	No	No	No	No	
Supplementary information: no explosion or catch fire.						

15	TABLE: Shock Test (model: 18650-1500mAh-10C)					P
Ambient temperature: 21.9°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C051	ZKS220300864 C052	ZKS220300864 C053	ZKS220300864 C054	ZKS2203008 64 C055	
Mass before test (g)	42.000	41.966	41.906	41.978	41.894	
Mass after test (g)	41.992	41.960	41.902	41.972	41.890	
Mass loss ratio (%)	0.019	0.014	0.010	0.014	0.010	
Cycled cell						
Sample No.	ZKS220300864 C056	ZKS220300864 C057	ZKS220300864 C058	ZKS220300864 C059	ZKS2203008 64 C060	
Mass before test (g)	42.246	41.975	42.079	42.065	41.937	
Mass after test (g)	42.242	41.969	42.072	42.060	41.932	
Mass loss ratio (%)	0.009	0.014	0.017	0.012	0.012	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

15	TABLE: Shock Test (model: 18650-2000mAh-10C)					P
Ambient temperature: 23.2°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C166	ZKS220300864 C167	ZKS220300864 C168	ZKS220300864 C169	ZKS2203008 64 C170	
Mass before test (g)	42.952	42.901	42.851	43.039	42.985	
Mass after test (g)	42.949	42.900	42.847	43.035	42.983	
Mass loss ratio (%)	0.007	0.002	0.009	0.009	0.005	
Cycled cell						
Sample No.	ZKS220300864 C171	ZKS220300864 C172	ZKS220300864 C173	ZKS220300864 C174	ZKS2203008 64 C175	
Mass before test (g)	42.825	42.769	42.843	42.528	42.694	
Mass after test (g)	42.821	42.766	42.841	42.527	42.691	
Mass loss ratio (%)	0.009	0.007	0.005	0.002	0.007	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

15	TABLE: Shock Test (model: 18650-2600mAh-3C)					P
Ambient temperature: 24.1°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C281	ZKS220300864 C282	ZKS220300864 C283	ZKS220300864 C284	ZKS2203008 64 C285	
Mass before test (g)	44.556	44.569	44.573	44.622	44.519	
Mass after test (g)	44.553	44.567	44.571	44.619	44.517	
Mass loss ratio (%)	0.007	0.004	0.004	0.007	0.004	
Cycled cell						
Sample No.	ZKS220300864 C286	ZKS220300864 C287	ZKS220300864 C288	ZKS220300864 C289	ZKS2203008 64 C290	
Mass before test (g)	44.485	44.534	44.467	44.475	44.539	
Mass after test (g)	44.482	44.531	44.465	44.473	44.536	
Mass loss ratio (%)	0.007	0.007	0.004	0.004	0.007	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

16	TABLE: Vibration Test (model: 18650-1500mAh-10C)					P
Ambient temperature: 22.5°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C061	ZKS220300864 C062	ZKS220300864 C063	ZKS220300864 C064	ZKS2203008 64 C065	
Mass before test (g)	41.965	41.963	41.944	41.896	42.186	
Mass after test (g)	41.951	41.950	41.930	41.881	42.170	
Mass loss ratio (%)	0.033	0.031	0.033	0.036	0.038	
Cycled cell						
Sample No.	ZKS220300864 C066	ZKS220300864 C067	ZKS220300864 C068	ZKS220300864 C069	ZKS2203008 64 C070	
Mass before test (g)	41.939	42.013	42.094	42.004	42.069	
Mass after test (g)	41.923	42.001	42.081	41.992	42.054	
Mass loss ratio (%)	0.038	0.029	0.031	0.029	0.036	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

16	TABLE: Vibration Test (model: 18650-2000mAh-10C)					P
Ambient temperature: 23.2°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C176	ZKS220300864 C177	ZKS220300864 C178	ZKS220300864 C179	ZKS2203008 64 C180	
Mass before test (g)	42.865	42.967	42.728	42.635	42.918	
Mass after test (g)	42.860	42.961	42.721	42.629	42.910	
Mass loss ratio (%)	0.012	0.014	0.016	0.014	0.019	
Cycled cell						
Sample No.	ZKS220300864 C181	ZKS220300864 C182	ZKS220300864 C183	ZKS220300864 C184	ZKS2203008 64 C185	
Mass before test (g)	43.085	42.867	42.542	42.693	42.725	
Mass after test (g)	43.077	42.860	42.536	42.686	42.720	
Mass loss ratio (%)	0.019	0.016	0.014	0.016	0.012	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

16	TABLE: Vibration Test (model: 18650-2600mAh-3C)					P
Ambient temperature: 23.8°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C291	ZKS220300864 C292	ZKS220300864 C293	ZKS220300864 C294	ZKS2203008 64 C295	
Mass before test (g)	44.660	44.518	44.637	44.522	44.486	
Mass after test (g)	44.652	44.511	44.630	44.515	44.478	
Mass loss ratio (%)	0.018	0.016	0.016	0.016	0.018	
Cycled cell						
Sample No.	ZKS220300864 C296	ZKS220300864 C297	ZKS220300864 C298	ZKS220300864 C299	ZKS2203008 64 C300	
Mass before test (g)	44.586	44.537	44.519	44.465	44.551	
Mass after test (g)	44.581	44.528	44.511	44.457	44.545	
Mass loss ratio (%)	0.011	0.020	0.018	0.018	0.013	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

18	TABLE: Temperature Cycling Test (model: 18650-1500mAh-10C)					P
Ambient temperature: 21.8°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C091	ZKS220300864 C092	ZKS220300864 C093	ZKS220300864 C094	ZKS2203008 64 C095	
Mass before test (g)	41.961	41.972	42.031	41.896	41.902	
Mass after test (g)	41.937	41.944	42.004	41.870	41.877	
Mass loss ratio (%)	0.057	0.067	0.064	0.062	0.060	
Cycled cell						
Sample No.	ZKS220300864 C096	ZKS220300864 C097	ZKS220300864 C098	ZKS220300864 C099	ZKS2203008 64 C100	
Mass before test (g)	42.167	41.941	42.018	41.899	42.008	
Mass after test (g)	42.140	41.916	41.990	41.875	41.983	
Mass loss ratio (%)	0.064	0.060	0.067	0.057	0.060	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

18	TABLE: Temperature Cycling Test (model: 18650-2000mAh-10C)					P
Ambient temperature: 21.3°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C206	ZKS220300864 C207	ZKS220300864 C208	ZKS220300864 C209	ZKS2203008 64 C210	
Mass before test (g)	42.592	42.687	42.925	43.125	42.867	
Mass after test (g)	42.571	42.671	42.908	43.105	42.851	
Mass loss ratio (%)	0.049	0.037	0.040	0.046	0.037	
Cycled cell						
Sample No.	ZKS220300864 C211	ZKS220300864 C212	ZKS220300864 C213	ZKS220300864 C214	ZKS2203008 64 C215	
Mass before test (g)	42.528	43.272	42.867	42.925	42.398	
Mass after test (g)	42.515	43.250	42.848	42.908	42.375	
Mass loss ratio (%)	0.031	0.051	0.044	0.040	0.054	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

18	TABLE: Temperature Cycling Test (model: 18650-2600mAh-3C)					P
Ambient temperature: 23.6°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C321	ZKS220300864 C322	ZKS220300864 C323	ZKS220300864 C324	ZKS2203008 64 C325	
Mass before test (g)	44.496	44.511	44.620	44.538	44.443	
Mass after test (g)	44.475	44.490	44.601	44.520	44.426	
Mass loss ratio (%)	0.047	0.047	0.043	0.040	0.038	
Cycled cell						
Sample No.	ZKS220300864 C326	ZKS220300864 C327	ZKS220300864 C328	ZKS220300864 C329	ZKS2203008 64 C330	
Mass before test (g)	44.486	44.608	44.475	44.522	44.538	
Mass after test (g)	44.468	44.591	44.459	44.505	44.518	
Mass loss ratio (%)	0.040	0.038	0.036	0.038	0.045	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

19	TABLE: Low Pressure (Altitude Simulation) Test (model: 18650-1500mAh-10C)					P
Ambient temperature: 22.4°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C101	ZKS220300864 C102	ZKS220300864 C103	ZKS220300864 C104	ZKS2203008 64 C105	
Mass before test (g)	42.103	41.987	41.898	42.076	41.963	
Mass after test (g)	42.097	41.981	41.890	42.069	41.955	
Mass loss ratio (%)	0.014	0.014	0.019	0.017	0.019	
Cycled cell						
Sample No.	ZKS220300864 C106	ZKS220300864 C107	ZKS220300864 C108	ZKS220300864 C109	ZKS2203008 64 C110	
Mass before test (g)	41.992	41.895	42.034	41.973	42.037	
Mass after test (g)	41.985	41.890	42.030	41.968	42.030	
Mass loss ratio (%)	0.017	0.012	0.010	0.012	0.017	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

19	TABLE: Low Pressure (Altitude Simulation) Test (model: 18650-2000mAh-10C)					P
Ambient temperature: 21.9°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C216	ZKS220300864 C217	ZKS220300864 C218	ZKS220300864 C219	ZKS2203008 64 C220	
Mass before test (g)	42.592	42.867	42.925	42.467	42.967	
Mass after test (g)	42.588	42.865	42.920	42.465	42.962	
Mass loss ratio (%)	0.009	0.005	0.012	0.005	0.012	
Cycled cell						
Sample No.	ZKS220300864 C221	ZKS220300864 C222	ZKS220300864 C223	ZKS220300864 C224	ZKS2203008 64 C225	
Mass before test (g)	42.872	42.769	42.685	42.721	42.818	
Mass after test (g)	42.870	42.766	42.681	42.719	42.815	
Mass loss ratio (%)	0.005	0.007	0.009	0.005	0.007	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

19	TABLE: Low Pressure (Altitude Simulation) Test (model: 18650-2600mAh-3C)					P
Ambient temperature: 22.5°C						
Fully Charged Cell						
Sample No.	ZKS220300864 C331	ZKS220300864 C332	ZKS220300864 C333	ZKS220300864 C334	ZKS2203008 64 C335	
Mass before test (g)	44.472	44.604	44.513	44.540	44.402	
Mass after test (g)	44.469	44.600	44.510	44.537	44.399	
Mass loss ratio (%)	0.007	0.009	0.007	0.007	0.007	
Cycled cell						
Sample No.	ZKS220300864 C336	ZKS220300864 C337	ZKS220300864 C338	ZKS220300864 C339	ZKS2203008 64 C340	
Mass before test (g)	44.458	44.637	44.521	44.518	44.564	
Mass after test (g)	44.455	44.635	44.518	44.514	44.561	
Mass loss ratio (%)	0.007	0.004	0.007	0.009	0.007	
Supplementary information: no explosion or catch fire, in addition the sample did not vent or leak. Max loss less than 0.1%						

--End of report--

Attachment 1
CN229L9B 001
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Produkte
Products

	Eq. No.	Name	Manufacturer	Model No.	Date of Calibration	Date of next Calibration
<input checked="" type="checkbox"/>	ZKSB-1001	Battery Test System	RePower	CTS 5V-5A	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1002	Battery Test System	RePower	CTS 5V-10A	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1003	Battery Test System	RePower	CTS 20V-10A	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1004	Power bank test system	RePower	CTS 6V-5A	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1006	Temperature Chamber cycling	Kewen	TEMI880(408)	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1007	Impact tester	DGBELL	BE-5066	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1009	Free fall tester	DGBELL	BE-F-315S	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1010	Oven	GWS	SPH101	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1011	Oven	Shengxin	101-3	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1012	Vacuum chamber	GaoXin	GX3020-ZC80	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1013	Vibration tester	LABTONE	EV203	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1014	Shock tester	LABTONE	HSKT10	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1015	Projectile Tester	DGBELL	BE-6046	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1016	Battery function tester	Chaoshishi	RBM-200	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1017	Forced internal short circuit tester	DGBELL	BE-6045W	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1018	Electronic Digital Calliper	UPM	ST-089	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1020	Electronic balance	Huazhi	HZK-FA 300	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1021	Multimeter	FLUKE	287C	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1022	Electronic Load	ITECH	IT8511	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1023	Temperature measurement recorder	Toprie Electronic Co., Ltd.	TP700	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1025	Resister	ZRLK	ZKSB-033	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1026	Washing tester	CEPREI	7206A	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1027	Battery protect circuit test system	CEPREI	7207A	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1028	DC Low-resistance tester	Yangzi	YD 2511	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1029	DC power supply	GWINSTEK	PSP-2010	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1030	DC power supply	GWINSTEK	PSW 80-27	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1037	Glove box	Nangjing Nangda	1	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1039	Rapid temperature changes test chamber	Xingtuo	AFT-150B	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1045	Battery Test System	RePower	CTS 60V-40A	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1064	Digital Thermometer & Hygrometer	Shenzhen UYIGAO	CTH-608	2022-01-12	2023-01-11
<input type="checkbox"/>	ZKSB-1078	ESD TEST GENERATOR	TESEQ	NSG438	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1081	External short circuit tester	ZRLK	ZKSB-032	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSB-1090	Crush tester	DGBELL	BE-6047	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSS-1051	Timer	AnBiao instrument	PC396	2022-01-12	2023-01-11
<input checked="" type="checkbox"/>	ZKSS-1100	Digital caliper	N/A	1-150mm	2022-01-12	2023-01-11

Dongguan ZRLK Testing Technology Co., Ltd.

Building D, No. 2, Jinyuyuan Industrial Park, No.18, West Industrial Road, Songshan Lake High-tech Industrial Development Zone, Dongguan City 523808, Guangdong, P.R. China

Product: Rechargeable Lithium Ion Cell

Type Designation: 18650-1500mAh-5C, 18650-1500mAh-10C, 18650-1800mAh, 18650-1800mAh-5C, 18650-2000mAh, 18650-2000mAh-3C, 18650-2000mAh-5C, 18650-2000mAh-10C, 18650-2200mAh, 18650-2200mAh-5C, 18650-2500mAh, 18650-2500mAh-3C, 18650-2600mAh, 18650-2600mAh-3C

Remark: The tested models 18650-1500mAh-10C, 18650-2000mAh-10C and 18650-2600mAh-3C are representatives of all models.



Figure 1 Side view of cell (Model: 18650-1500mAh-10C)

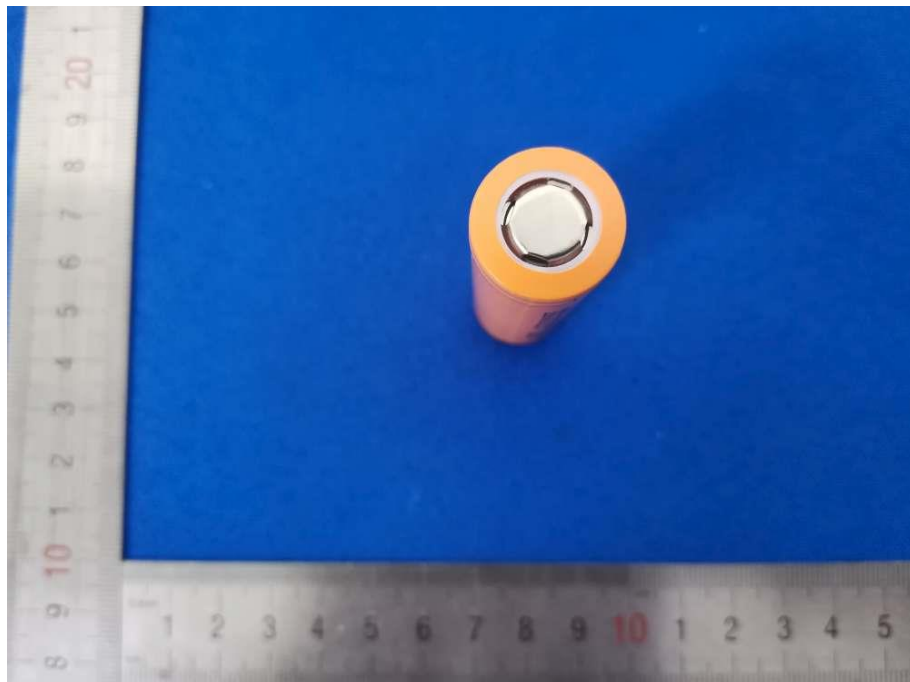


Figure 2 Terminal view of cell (Model: 18650-1500mAh-10C)

Product: Rechargeable Lithium Ion Cell

Type Designation: 18650-1500mAh-5C, 18650-1500mAh-10C, 18650-1800mAh, 18650-1800mAh-5C, 18650-2000mAh, 18650-2000mAh-3C, 18650-2000mAh-5C, 18650-2000mAh-10C, 18650-2200mAh, 18650-2200mAh-5C, 18650-2500mAh, 18650-2500mAh-3C, 18650-2600mAh, 18650-2600mAh-3C



Figure 3 Side view of cell (Model: 18650-2000mAh-10C)

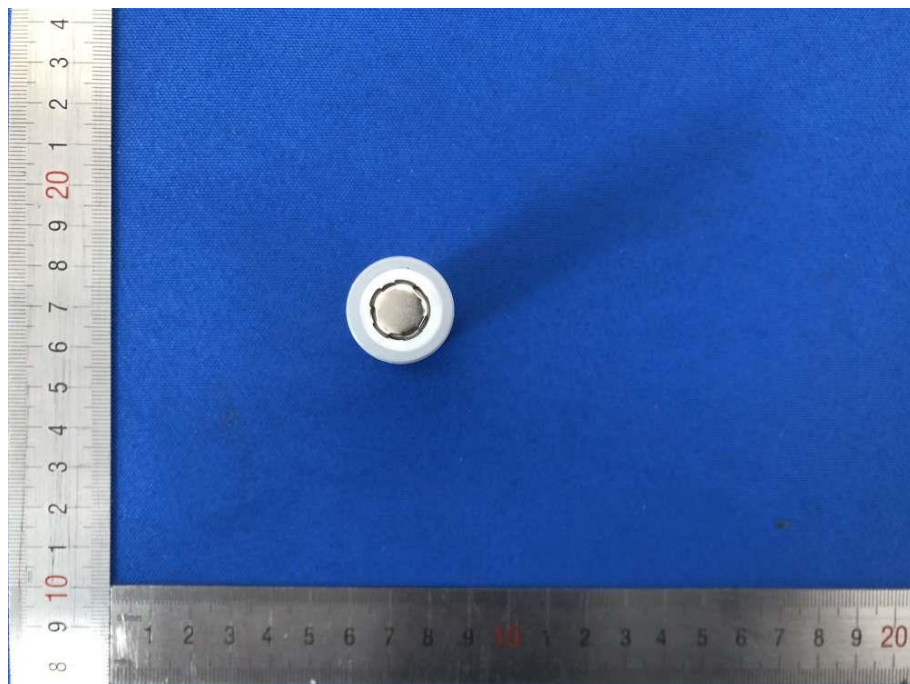


Figure 4 Terminal view of cell (Model: 18650-2000mAh-10C)

Product: Rechargeable Lithium Ion Cell

Type Designation: 18650-1500mAh-5C, 18650-1500mAh-10C, 18650-1800mAh, 18650-1800mAh-5C, 18650-2000mAh, 18650-2000mAh-3C, 18650-2000mAh-5C, 18650-2000mAh-10C, 18650-2200mAh, 18650-2200mAh-5C, 18650-2500mAh, 18650-2500mAh-3C, 18650-2600mAh, 18650-2600mAh-3C



Figure 5 Side view of cell (Model: 18650-2600mAh-3C)

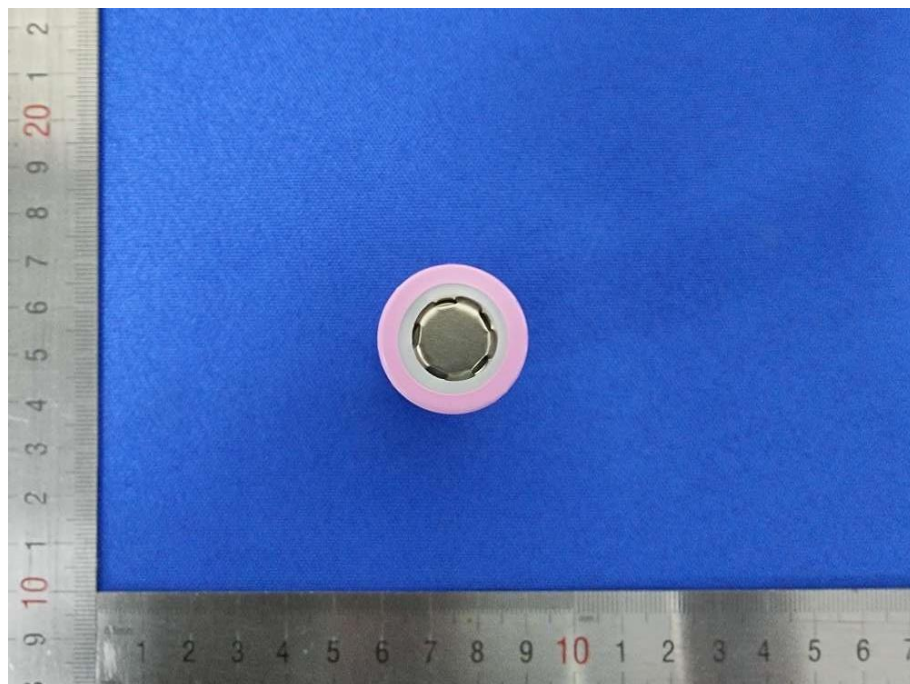


Figure 6 Terminal view of cell (Model: 18650-2600mAh-3C)