

Applicant	Shenzhen Bofuneng Battery Co., Ltd. A & E Building, Chunyang Industrial Park, Zhugushi Road, Wulian Community, Longcheng, Longgang, Shenzhen, Guangdong, China
Manufacturer: Address	Same as applicant Same as applicant
Factory	••
Test object / Model:	Lithium-ion Cell / 18650 2000mAh
Test specifications / Test standard Test procedure	ST/SG/AC.10/11/Rev.5/Section 38.3/Amend.2 SGS-CSTC
Test Report Form No	UN_BATT_201407
Test Report Form(s) Originator:	SGS-CSTC
Master TRF	Dated 2014-07
Purpose of examination	Commission Test
Summary of testing	The sample(s) tested complies with the requirements of ST/SG/AC.10/11/Rev.5 Section 38.3/Amend.2 UNITED NATIONS "Recommendations on the transport of dangerous goods" Manual of test and Criteria ST/SG/AC.10/11/Rev.5 38.3/Amend.2 None
CTC SAF	



Rachel Long

Project Engineer

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1. Function / Description:

Lithium-ion Cell

2. Ratings:

Model	18650 2000mAh
Rated Voltage	3,7V
Rated Capacity	2000mAh
Max. charge current:	2000mA
Max. discharge current:	6000mA

3. Test information:

Possible test case verdicts:

- test case does not apply to the test object:
- test object does meet the requirement:
- test object does not meet the requirement:

N/A (Not Applicable) P (Pass) F (Fail)

The tests were done in the Electrical Safety Laboratory of SGS-CSTC in Shenzhen. Test item was received on 2015-04-03. Tests were performed from 2015-04-03 to 2015-04-16. Ambient temp.: 20 °C ± 5 °C

These tests fulfil the requirements of standard ISO/IEC 17025. When determining the test conclusion, the Measurement Uncertainty of test has been considered.

4. Test result:

	ST/SG/AC.10/11/Rev.5/Section 38.3/Amend.2								
Clause	Requirement + Test	Result - Remark	Verdict						
38.3.4	Procedure		Р						
	Test T.1: Altitude simulation		Р						
	Test procedure: Test cells and batteries shall be stored at a pressure of 11,6 kPa or less for at least six hours at ambient temperature (20 ± 5 °C).		Ρ						
38.3.4.1	Requirement: Cells and batteries Mass loss limit: ≤0,1%;		Р						
	Open circuit voltage changed not less than 90%, the requirement relating to voltage is not applicable to test cells and batteries at full discharged states.		Р						
	No leakage, no venting, no disassembly, no rupture and no fire.		Р						

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SGS-CSTC Standards Technical Services Co., Ltd.

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	Test T.2: Thermal test	Р
38.3.4.2	Test procedure: Test cells and batteries are to be stored for at least six hours at a test temperature equal to 75 ± 2 °C, followed by storage for at least six hours at a test temperature equal to -40 ± 2 °C. The maximum time interval between test temperature extremes is 30 minutes. This procedure is to be repeated 10 times, after which all test cells and batteries are to be stored for 24 hours at ambient temperature (20 ± 5 °C). For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.	Ρ
	Requirement: Cells and batteries Mass loss limit: ≤0,1%	Р
	Open circuit voltage changed not less than 90%, the requirement relating to voltage is not applicable to test cells and batteries at full discharged states.	Р
	No leakage, no venting, no disassembly, no rupture and no fire.	Р
	Test T.3: Vibration	Р
38.3.4.3	Test procedure: Cells and batteries are firmly secured to the platform of the vibration machine without distorting the cells in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 Hz and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting position of the cell. One of the directions of vibration must be perpendicular to the terminal face. The logarithmic frequency sweep is as follows: from 7 Hz a peak acceleration of 1 g _n is maintained until 18 Hz is reached. The amplitude is then maintained at 0,8 mm (1,6 mm total excursion) and the frequency increased until a peak acceleration of 8 g _n occurs (approximately 50Hz). A peak acceleration of 8 g _n is then maintained until the frequency is increased to 200 Hz	Ρ
	Requirement: Cells and batteries Mass loss limit: ≤0,1%	Р
	Open circuit voltage changed not less than 90%, the requirement relating to voltage is not applicable to test cells and batteries at full discharged states.	Р
	No leakage, no venting, no disassembly, no rupture and no fire.	Р

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	Test T.4: Shock		Р
38.3.4	Test procedure: Test cells and batteries shall be secured to the testing machine by means of a rigid mount which will support all mounting surfaces of each test battery. Each cell or battery shall be subjected to a half-sine shock of peak acceleration of 150 gn and pulse duration of 6 milliseconds. Each cell or battery shall be subjected to three shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicular mounting positions of the cell or battery for a total of 18 shocks. However, large cells and large batteries shall be subjected to a half-sine or peak acceleration of 50 gn and pulse duration of 11 milliseconds. Each cell or battery is subjected to three shocks in the positive direction followed by three shocks in the positive direction followed by three shocks in the positive direction followed by the negative direction of each of three mutually perpendicular mounting positions of the cell for a total of 18 shocks.		Ρ
	Requirement: Cells and batteries Mass loss limit: ≤0,1%		Р
	Open circuit voltage changed not less than 90%, the requirement relating to voltage is not applicable to test cells and batteries at full discharged states.		Ρ
	No leakage, no venting, no disassembly, no rupture and no fire.		Ρ
	Test T.5: External short circuit		Р
38.3.4.5	Test procedure: The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches 55 ± 2 °C and then the cell or battery shall be subjected to a short circuit condition with a total external resistance of less than 0,1 ohm at 55 ± 2 °C. This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 55 ± 2 °C, the cell or battery must be observed for a further six hour for the test to be concluded		Ρ
	Requirement: Cell's or batteries' external temperature not exceed 170 °C.	See Table 5 for detail.	Р
	No disassembly, no rupture and no fire within six hours.		Р

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	Test T.6: Impact / Crush	Р
	Test procedure 1: Impact The sample cell or component cell is to be placed on a flat smooth surface.	Ρ
	A 15.8 mm \pm 0.1mm diameter, at least 6 cm long, or the longest dimension of the cell, whichever is greater, Type 316 stainless steel bar is to be placed across the centre of the sample.	Ρ
	A 9.1 kg \pm 0.1 kg mass is to be dropped from a height of 61 \pm 2.5 cm at the intersection of the bar and sample in a controlled manner using a near frictionless, vertical sliding track or channel with minimal drag on the falling mass. The vertical track or channel used to guide the falling mass shall be oriented 90 degrees from the horizontal supporting surface.	Ρ
38.3.4.6	The test sample is to be impacted with its longitudinal axis parallel to the flat surface and perpendicular to the longitudinal axis of the 15,8 mm \pm 0.1mm diameter curved surface lying across the centre of the test sample. Each sample is to be subjected to only a single impact.	Ρ
	Test procedure 2: Impact A cell or component cell is to be crushed between two flat surfaces. The crushing is to be gradual with a speed of approximately 1,5 cm/s at the first point of contact. The crushing is to be continued until the first of the three options below is reached.	Ρ
	(a) The applied force reaches 13 kN \pm 0.78 kN; or	Р
	(b) The voltage of the cell drops by at least 100 mV; or	Р
	(c) The cell is deformed by 50% or more of its original thickness.	Р
	Requirement: Cell's or batteries' external temperature not exceed 170 °C.	Р
	No disassembly, no rupture and no fire within six hours.	Р
	Test T.7: Overcharge	 Р
38.3.4.7	Test procedure: The charge current shall be twice the manufacturer's recommended maximum continuous charge current. The minimum voltage of the test shall be as follows:	Ρ

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	(a) When the manufacturer's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V.	Ρ
	(b) When the manufacturer's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage.	Ρ
	Requirement: No disassembly, no rupture and no fire within seven days.	Р
	Test T.8: Force discharge	Р
	Test procedure: Each cell shall be forced discharged at ambient temperature by connecting it in series with a 12V D.C. power supply at an initial current equal to the maximum discharge current specified by the manufacturer.	Ρ
38.3.4.8	The specified discharge current is to be obtained by connecting a resistive load of the appropriate size and rating in series with the test cell. Each cell shall be forced discharged for a time interval (in hours) equal to its rated capacity divided by the initial test current (in ampere).	Ρ
	Requirement: No disassembly, no rupture and no fire within seven days.	Ρ

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Sample No.	Mass prior to test		After Test T.1 Altitude simulation		After Test T.2 Thermal test		After Test T.3 Vibration		After Test T.4 Shock/		T.5 Externa I short circuit /
110.	Mass	OCV	Mass loss	Charge ratio	Mass loss	Charg e ratio	Mass loss	Charge ratio	Mass loss	Charg e ratio	Temp (⁰C)
	(g)	(V)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)	、 ,
1#	43,192	4,226	0,004	99,8	0,014	99,9	0,009	99,9	0,011	99,9	78,3
2#	43,180	4,228	0,012	99,9	0,007	99,8	0,005	99,8	0,014	99,9	77,6
3#	43,185	4,224	0,007	99,9	0,016	99,9	0,007	99,9	0,007	99,9	78,4
4#	43,186	4,227	0,005	99,8	0,009	99,9	0,011	99,9	0,007	99,9	81,9
5#	43,194	4,229	0,009	99,9	0,014	99,9	0,009	99,9	0,009	99,9	77,9
6#	43,185	4,225	0,007	99,8	0,007	99,9	0,009	99,9	0,009	99,9	78,4
7#	43,182	4,224	0,007	99,9	0,009	99,8	0,007	99,9	0,005	99,9	81,9
8#	43,185	4,226	0,007	99,9	0,007	99,9	0,007	99,8	0,009	99,9	78,0
9#	43,180	4,221	0,005	99,9	0,007	99,9	0,007	99,9	0,007	99,9	79,6
10#	43,179	4,223	0,007	99,9	0,009	99,8	0,006	99,9	0,009	99,9	74,9

T 1	to	Т5	test	data	

T6 test data									
Sample No.	11#	12#	13#	14#	15#				
Mass prior to test-OCV (V)	3,732	3,720	3,726	3,729	3,731				
Maximum case temperature rise T, (°C)	24,3	25,6	27,3	25,4	26,2				

Sample No.									
Mass prior to test-OCV (V)									

T7 tost data

Sample No.	16#	17#	18#	19#	20#	21#	22#	23#	24#	25#
Mass prior to test-OCV (V)	3,125	3,131	3,130	3,127	3,126	3,134	3,122	3,120	3,119	3,121
Sample No.	26#	27#	28#	29#	30#	31#	32#	33#	34#	35#
Mass prior to test-OCV (V)	3,127	3,131	3,130	3,128	3,126	3,121	3,118	3,125	3,126	3,127

T8 test data

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Samples remark:

#1-#10: At first cycle, in fully charged state. (T1-T5) #11-#15: At first cycle at 50% of the design rayed capacity.(T6) #1-#4: At first cycle, in fully charged state. (T7) #36-#39: At fifty cycles ending in fully charged state. (T7) #16-#25: At first cycle, in fully charged state. (T8) #26-#35: At fifty cycles ending in fully charged state. (T8)

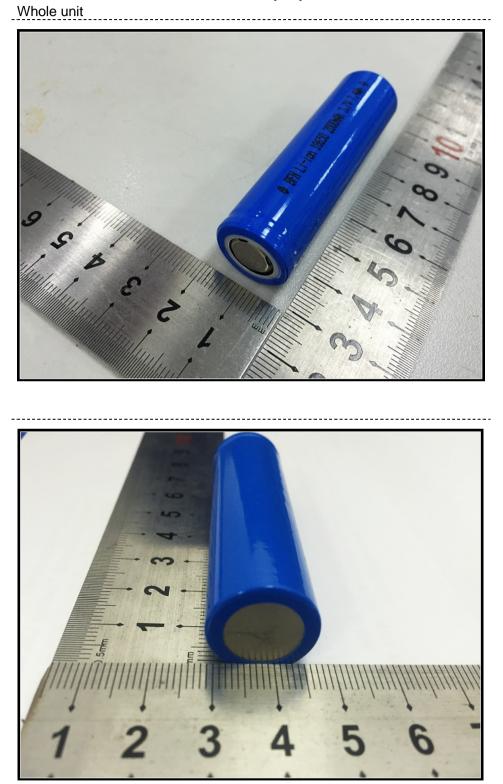
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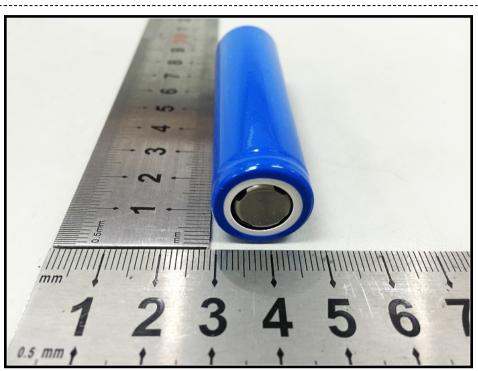
Attachment: Sample photos



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