TEST REPORT

ST/SG/AC.10/11 Rev.5 Section 38.3

AMENDMENTS TO THE FIFTH REVISED EDITION OF THE RECOMMENDATIONS ON THE TRANSPORT OF DANGEROUS GOODS, MANUAL OF TEST AND CRITERIA

(Section 38.3: Lithium batteries)

Report reference No.	STR12118038S
Tested by (name+ signature)	Anne Ma
Approved by (+ signature)	Ailis Ma
Date of issue	Nov. 13, 2012
Testing laboratory	SEM.Test Compliance Service Co., Ltd.
Address	3/F, Jinbao Commerce Building, Xin'an Fanshen Road, Bao'an District, Shenzhen, P.R.C. (518101)
Testing location	As above
Applicant	GlobTek, Inc.
Address	186 Veterans Dr. Northvale, NJ 07647 USA
Manufacturer	GlobTek (Suzhou) Co., Ltd.
Address	Building 4, No.76, Jin Ling East Rd., Suzhou Industrial Park, Suzhou, Jiangsu 215021, China
Standard	ST/SG/AC.10/11Rev.5 Section 38.3
Test procedure	Type approved
Procedure deviation	N.A.
Non-standard test method	N.A.

Product Name	Lithium Polymer Battery
Trademark	GlobTek
Model/type reference	BL1400C1850001S2PRML
Ratings	3.7V, 10.4Wh (2800mAh)
Max. charge voltage	4.2V
Max. charge current	2800mA
Standard charge current	560mA

Max. discharge current .....:	2800mA
Standard discharge current .....:	560mA
Charge cut-off voltage .....:	4.3±0.02V
Discharge cut-off voltage .....:	2.5±0.035V

Shape of Battery .....:	☐ Cylindrical Battery ☒ Prismatic Battery ☐ Coin Battery/Button Battery

Particulars: test item vs. test requirements

Classification .....:	☐ Lithium metal batteries ☐ Lithium metal cells ☒ Lithium ion batteries ☐ Lithium ion cells
Samples Type .....:	☐ Large battery ☐ Large cell ☒ Small battery ☐ Small cell
Dimension .....:	L : 52.0mm W: 37.0mm T : 19.0mm

Mass of apparatus .....:	70.5g

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 .....:	Nov. 01, 2012
Date(s) of performance of test .....:	Nov. 01, 2012 to Nov. 13, 2012

Test Conclusion:

The Lithium Polymer Battery submitted by GlobTek, Inc. is tested according to Section 38.3 of Amendments to the Fifth Revised Edition of the Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria (ST/SG/AC.10/11/Rev.5).

Test Result: Pass.

ST/SG/AC.10/11Rev.5 Section 38.3			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
38.3.4	**Procedure**		**P**
	Test 1 to 5 must be conducted in sequence on the same cell or battery.		P
	Test 6 and 8 should be conducted using not otherwise tested cells or batteries.		P
	Test 7 may be conducted using undamaged batteries previously used in tests 1 to 5 for purposes of testing on cycled batteries.		P
38.3.4.1	**Test 1: Altitude Simulation**		**P**
38.3.4.1.1	Purpose		P
	This test simulates air transport under low-pressure conditions.		-
38.3.4.1.2	Test procedure		P
	stored at a pressure	11.6 kPa	-
	ambient temperature (20 ± 5℃)	24℃	-
	Stored times(⩾ 6 hours)	8 hours	-
38.3.4.1.3	Requirement		P
	Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.	No mass loss, no leakage, no venting, no disassembly, no rupture and no fire. Battery after testing is not less than 90% of its voltage immediately prior to this procedure.	P

Group	**No.**	**Mass M of Test Battery (g)**			**OCV (V)**		
		M1 (before the test)	M2 (after the test)	Mass Loss limit (0.1%)	OCV1 (before the test)	OCV2 (after the test)	OCV (≥90%)
Group A (at first cycle, in fully charged states)	01	70.098	70.096	0.003%	4.198	4.196	99.952%
	02	70.013	70.010	0.004%	4.188	4.187	99.976%
	03	70.396	70.394	0.003%	4.194	4.191	99.928%
	04	70.159	70.158	0.001%	4.193	4.190	99.928%
Group B (after fifty cycles ending in fully charged states)	05	69.673	69.670	0.004%	4.192	4.190	99.952%
	06	70.326	70.324	0.003%	4.191	4.190	99.976%
	07	70.332	70.331	0.001%	4.196	4.195	99.976%
	08	70.842	70.840	0.003%	4.191	4.190	99.976%

Remark

1. Mass loss (%)=(M1-M2)/M1*100% (Where M_1 is the mass before the test and M_2 is the mass after the test).
2. When mass loss does not exceed the value in Table: Mass loss limit, it shall be considered as "no mass loss".
3. The OCV of each test cell after testing is not less than 90% of its voltage immediately prior to this procedure.
4. Ambient temperature: 24℃

Conclusion:

Lithium Polymer Battery had passed altitude simulation test.

ST/SG/AC.10/11Rev.5 Section 38.3			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
38.3.4.2	**Test 2: Thermal Test**		**P**
38.3.4.2.1	Purpose		-
	This test assesses cell and battery seal integrity and internal electrical connections. The test is conducted using rapid and extreme temperature changes.		-
38.3.4.2.2	Test procedure		P
	Test temperature and stored hours	1) 75℃, ≥6h 2) -40℃, ≥6h	-
	The maximum time interval	Between test temperature extremes is 30 minutes.	-
	Test times	repeated 10 times	-
	After which all test cells and batteries are to be stored for 24 hours at ambient temperature (20±5℃)	24℃	-
	For large cells and batteries the duration of exposure to the test temperature extremes should be at least 12 hours.	Small battery	N
38.3.4.2.3	Requirement		P
	Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.	No mass loss, no leakage, no venting, no disassembly, no rupture and no fire. Battery after testing is not less than 90% of its voltage immediately prior to this procedure.	P

Group	**No.**	**Mass M of Test Battery (g)**			**OCV (V)**		
		M1 (before the test)	M2 (after the test)	Mass Loss limit (0.1%)	OCV1 (before the test)	OCV2 (after the test)	OCV (≥90%)
Group A (at first cycle, in fully charged states)	01	70.096	70.062	0.049%	4.196	4.152	98.951%
	02	70.010	69.980	0.043%	4.187	4.142	98.925%
	03	70.394	70.362	0.045%	4.191	4.150	99.022%
	04	70.158	70.130	0.040%	4.190	4.149	99.021%
Group B (after fifty cycles ending in fully charged states)	05	69.670	69.637	0.047%	4.190	4.155	99.165%
	06	70.324	70.300	0.034%	4.190	4.145	98.926%
	07	70.331	70.302	0.041%	4.195	4.140	98.689%
	08	70.840	70.816	0.034%	4.190	4.148	98.998%

Remark

1. Mass loss (%)=(M1-M2)/M1*100% (Where M_1 is the mass before the test and M_2 is the mass after the test).
2. When mass loss does not exceed the value in Table: Mass loss limit, it shall be considered as "no mass loss".
3. The OCV of each test cell after testing is not less than 90% of its voltage immediately prior to this procedure.
4. Ambient temperature: 24℃

Conclusion:

Lithium Polymer Battery had passed thermal test.

ST/SG/AC.10/11Rev.5 Section 38.3			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
38.3.4.3	**Test 3: Vibration**		**P**
38.3.4.3.1	Purpose		P
	This test simulates vibration during transport.		-
38.3.4.3.2	Test procedure		P
	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.		P
	Duration	15min	-
	Frequency range	7Hz.....200Hz.....7Hz	-
	Amplitude	0.8mm	-
	This cycle shall be repeated 12 times for a total of 3 hours for each of three mutually perpendicular mounting positions of the cell.		-
38.3.4.3.3	Requirement		P
	Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.	There is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire.	P

Group	**No.**	**Mass M of Test Battery (g)**			**OCV (V)**		
		M1 (before the test)	M2 (after the test)	Mass Loss limit (0.1%)	OCV1 (before the test)	OCV2 (after the test)	OCV (≥90%)
Group A (at first cycle, in fully charged states)	01	70.062	70.060	0.003%	4.152	4.150	99.952%
	02	69.980	69.977	0.004%	4.142	4.140	99.952%
	03	70.362	70.360	0.003%	4.150	4.149	99.976%
	04	70.130	70.128	0.003%	4.149	4.147	99.952%
Group B (after fifty cycles ending in fully charged states)	05	69.637	69.634	0.004%	4.155	4.154	99.976%
	06	70.300	70.298	0.003%	4.145	4.143	99.952%
	07	70.302	70.300	0.003%	4.140	4.137	99.928%
	08	70.816	70.815	0.001%	4.148	4.145	99.928%

Remark

1. Mass loss (%)=(M1-M2)/M1*100% (Where M_1 is the mass before the test and M_2 is the mass after the test).
2. When mass loss does not exceed the value in Table: Mass loss limit, it shall be considered as "no mass loss".
3. The OCV of each test cell after testing is not less than 90% of its voltage immediately prior to this procedure.
4. Ambient temperature: 24℃

Conclusion:

Lithium Polymer Battery had passed vibration test.

ST/SG/AC.10/11Rev.5 Section 38.3			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
38.3.4.4	**Test 4: Shock**		**P**
38.3.4.4.1	Purpose		P
	This test simulates possible impacts during transport.		-
38.3.4.4.2	Test procedure		P
	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.	This is small batteries.	-
	a half-sine shock of peak acceleration	150 g_n	-
	Pulse duration	6ms	-
	the positive direction followed	three times shocks	-
	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.		-
38.3.4.4.3	Requirement		P
	Cells and batteries meet this requirement if there is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire and if the open circuit voltage of each test cell or battery after testing is not less than 90% of its voltage immediately prior to this procedure. The requirement relating to voltage is not applicable to test cells and batteries at fully discharged states.	There is no mass loss, no leakage, no venting, no disassembly, no rupture and no fire.	P

Group	**No.**	**Mass M of Test Battery (g)**			**OCV (V)**		
		M1 (before the test)	M2 (after the test)	Mass Loss limit (0.1%)	OCV1 (before the test)	OCV2 (after the test)	OCV (≥90%)
Group A (at first cycle, in fully charged states)	01	70.060	70.058	0.003%	4.150	4.148	99.952%
	02	69.977	69.974	0.004%	4.140	4.137	99.928%
	03	70.360	70.358	0.003%	4.149	4.147	99.952%
	04	70.128	70.126	0.003%	4.147	4.145	99.952%
Group B (after fifty cycles ending in fully charged states)	05	69.634	69.632	0.003%	4.154	4.153	99.976%
	06	70.298	70.296	0.003%	4.143	4.140	99.928%
	07	70.300	70.297	0.004%	4.137	4.136	99.976%
	08	70.815	70.813	0.003%	4.145	4.141	99.903%

Remark

1. Mass loss (%)=(M1-M2)/M1*100% (Where M_1 is the mass before the test and M_2 is the mass after the test).
2. When mass loss does not exceed the value in Table: Mass loss limit, it shall be considered as "no mass loss".
3. The OCV of each test cell after testing is not less than 90% of its voltage immediately prior to this procedure.
4. Ambient temperature: 24℃

Conclusion:

Lithium Polymer Battery had passed shock test.

ST/SG/AC.10/11Rev.5 Section 38.3			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
38.3.4.5	**Test 5: External Short Circuit**		**P**
38.3.4.5.1	Purpose		P
	This test simulates an external short circuit.		P
38.3.4.5.2	Test procedure		P
	The cell or battery to be tested shall be temperature stabilized so that its external case temperature reaches 55℃.		-
	Short circuit condition with a total External resistance of less than 0.1ohm.		-
	The cell or battery must be observed for a further six hours for the test to be concluded.		-
	This short circuit condition is continued for at least one hour after the cell or battery external case temperature has returned to 55℃.		-
38.3.4.5.3	Requirement		P
	Cells and batteries meet this requirement if their external temperature does not exceed 170℃ and there is no disassembly, no rupture and no fire within six hours of this test.	Battery external temperature does not exceed 170℃, and there is no disassembly, no fire and no rupture within six hours of this test.	P

Group	**No.**	**External Highest Temperature (℃)**	**Criteria**	**Result**
Group A (at first cycle, in fully charged states)	01	56.3	Battery external temperature does not exceed 170℃, and there is no disassembly, no fire and no rupture within six hours of this test	P
	02	55.9		P
	03	56.2		P
	04	55.7		P
Group B (after fifty cycles ending in fully charged states)	05	55.8		P
	06	56.4		P
	07	55.8		P
	08	55.5		P
Ambient temperature: 23℃				

Conclusion:

Lithium Polymer Battery had passed external short circuit test.

ST/SG/AC.10/11Rev.5 Section 38.3			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
38.3.4.6	**Test 6: Impact**	The test sample Component cell of rechargeable batteries.	**P**
38.3.4.6.1	Purpose		P
	This test simulates an impact.		P
38.3.4.6.2	Test procedure		P
	- Dropped height	61±2.5cm,	-
	- mass	9.1Kg	-
	- diameter bar	15.8mm	-
	- Impact position: 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 diameter curved surface lying across the centre of the test sample, Prismatic cell is also to be rotated 90 degrees around its longitudinal axis so that both the wide and narrow sides will be subjected to the impact.		P
	A coin or button cell is to be impacted with the flat surface of the sample parallel to the flat surface and the 15.8 mm diameter curved surface lying across its centre.		N
38.3.4.6.3	Requirement		P
	Cells and component cells meet this requirement if their external temperature does not exceed 170℃ and there is no disassembly and no fire within six hours of this test.	After the test, The, component Cells external temperature does not exceed 170℃ and there is no disassembly and no fire within six hours of this test.	P

Group	**No.**	**Component cells external temperature (℃)**	**Criteria**	**Result**
Group C, at first cycle at 50% of the design rated capacity (Horizontal)	09	32.6	The component Cells external temperature does not exceed 170℃ and there is no disassembly and no fire within six hours of this test.	P
	10	29.2		P
	11	30.0		P
	12	31.8		P
	13	30.7		P
Group D, at first cycle at 50% of the design rated capacity (Vertical)	14	26.5		P
	15	34.4		P
	16	32.5		P
	17	32.3		P
	18	28.6		P
Ambient temperature: 24.0℃				

Conclusion:

Lithium Polymer Battery had passed Impact test.

ST/SG/AC.10/11Rev.5 Section 38.3			
Clause	**Requirement – Test**	**Result - Remark**	**Verdict**
38.3.4.7	**Test 7: Overcharge**		**P**
38.3.4.7.1	Purpose		P
	This test evaluates the ability of a rechargeable battery to withstand an overcharge condition.		-
38.3.4.7.2	Test procedure		P
	The charge current	2×2800mA=5600mA, Twice the manufacturer's recommended maximum continuous charge current.	P
	The minimum voltage of the test:		P
	a) The minimum voltage of the test (The manufacturer's recommended charge voltage is not more than 18V).	2×4.2V=8.4V, the lesser of two times the maximum charge voltage of the battery or 22V,	P
	b) The minimum voltage of the test (The manufacturer's recommended charge voltage is more than 18V).		N
	Ambient temperature.	24℃	-
	The duration of the test.	24 hours	-
38.3.4.7.3	Requirement		P
	Rechargeable batteries meet this requirement if there is no disassembly and no fire within seven days of the test.	There is no disassembly and no fire within seven days of the test.	P

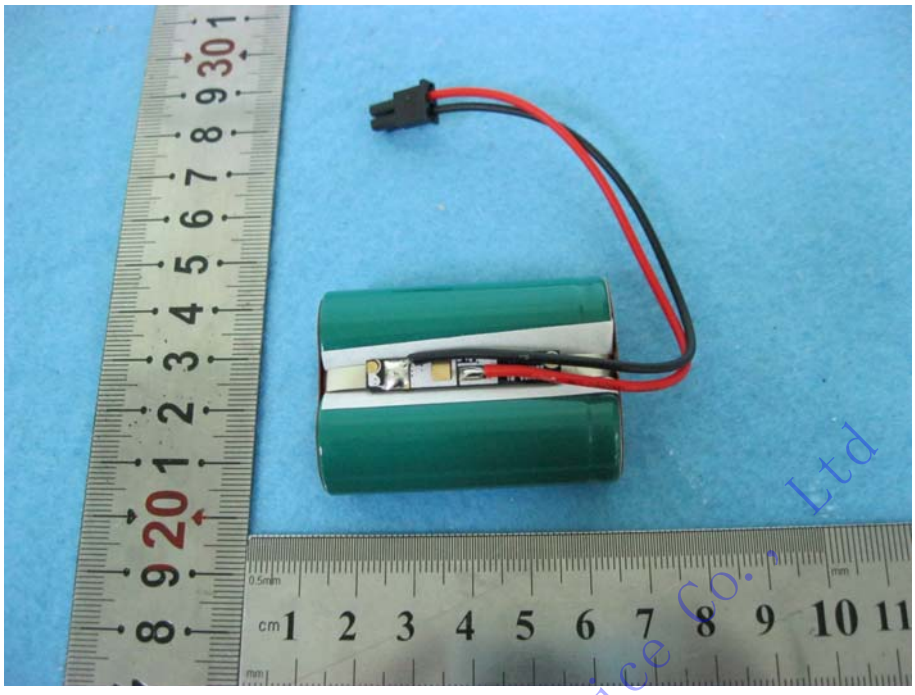
Group	**No.**	**Criteria**	**Result**
Group A (at first cycle, in fully charged states)	01	There is no disassembly and no fire within seven days of the test.	P
	02		P
	03		P
	04		P
Group B (after fifty cycles ending in fully charged states)	05		P
	06		P
	07		P
	08		P
Ambient temperature: 24℃			

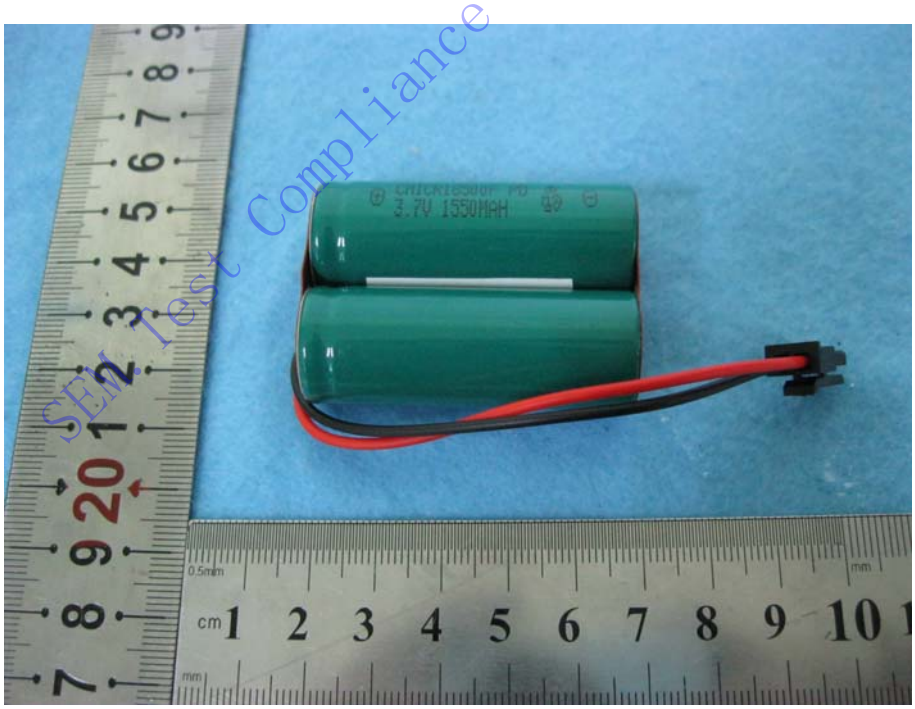
Conclusion:

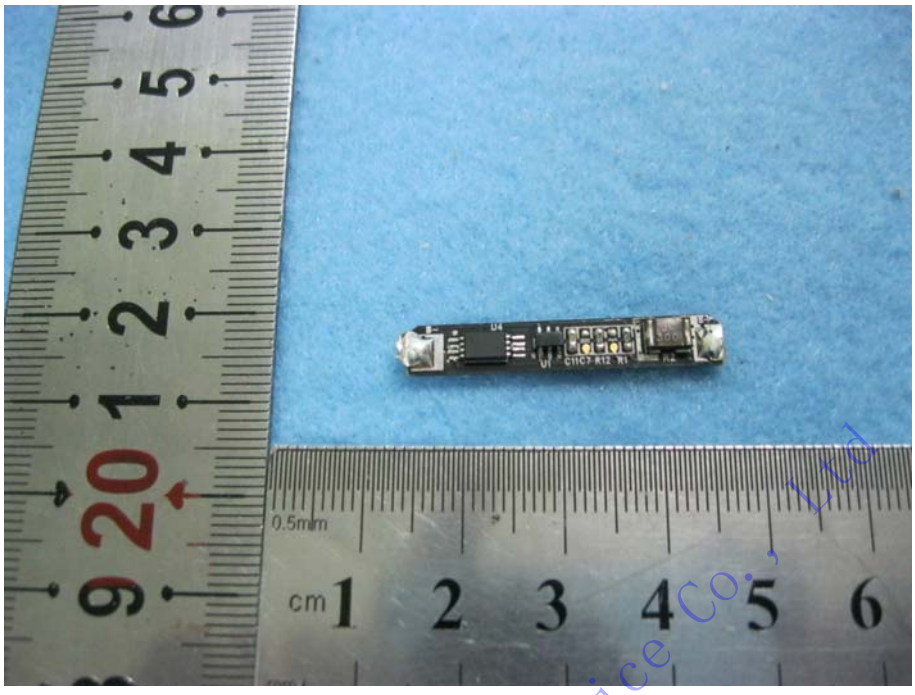
Lithium Polymer Battery had passed overcharge test.

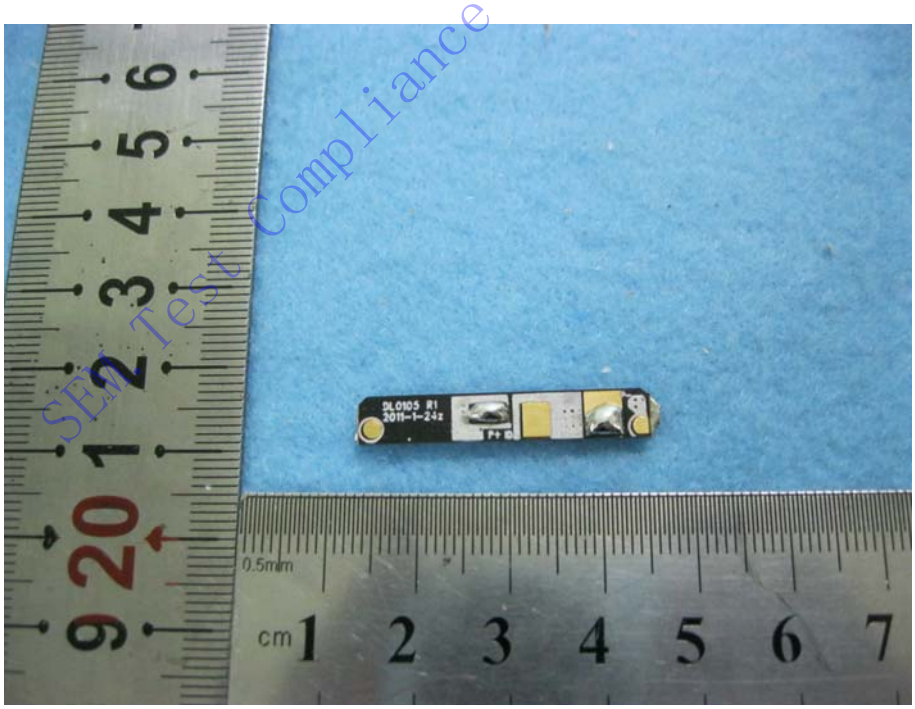
Photos

Model: BL1400C1850001S2PRML









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