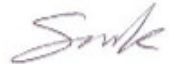


Revision 07

Model name : BL1850B

Executive Div.	Safety Center	Confidential	
	Name / Title	Signature	Date
Reported by	Kim Hyunsuk		2015. 2.10
Approved by	Kim Lian		2015. 2.10

Test report; UN Manual of Tests and Criteria,
Part III, Subsection 38.3

2013, Rev.5, Amend.2

Document No : SDI-UN-P150209-02

SAMSUNG SDI
Energy Business Division



Product Information

1. Model name: BL1850B
2. Product classification: Li rechargeable battery pack (5S-2P)
3. Nominal voltage: 18V
4. Rated capacity: 5,000mAh
5. Wh Capacity: 90Wh
6. Weight of product: 615g
7. Test Date: 2014/12/08 ~2014/12/23
8. Test Location: **SAMSUNG SDI Safety Center, 508 Sungsungdong, Cheonan
Chungcheongnamdo, Korea**

Test summary

Test No.	Test item	Relating Std.	Test begins on (YYYY/MM/DD)	Test Completed on (YYYY/MM/DD)	Judgment (Pass/Fail)
T1	Altitude simulation	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.1	2014/12/08	2014/12/09	Pass
T2	Thermal test	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.2	2014/12/09	2014/12/15	Pass
T3	Vibration	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.3	2014/12/15	2014/12/16	Pass
T4	Shock	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.4	2014/12/16	2014/12/17	Pass
T5	External short circuit	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.5	2014/12/17	2014/12/18	Pass
T6	Impact / Crush	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.6	2014/08/27	2014/08/28	Pass
T7	Overcharge	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.7	2014/12/15	2014/12/23	Pass
T8	Forced discharge	UN Manual of Tests and Criteria, Part III, Subsection 38.3.4.8	2013/08/02	2013/08/10	Pass
Total Judgment(Pass/Fail)					Pass

- Tests T-1 through T-5 shall be conducted in sequence with the same cell/pack/single cell battery.
- For test 6, test should be conducted for Li-ion cells or component cell contained in a battery.
- T7 shall be performed only for Li-ion rechargeable battery or rechargeable single cell battery not cell.
- T8 should be conducted for Li-ion cells or component cell contained in a battery.

T-1~T-5) Transportation Test (Test Result: Pass)

Fresh pack 100% SOC							50 cycled pack 100% SOC						
Initial							Initial						
No.	Weight(g)	OCV(V)					No.	Weight(g)	OCV(V)				
1	614.28	20.41					1	614.07	20.39				
2	613.94	20.41					2	614.11	20.39				
3	614.18	20.40					3	614.03	20.39				
4	614.02	20.40					4	613.99	20.40				
T1							T1						
No.	Weight(g)	OCV(V)	Mass Loss(%)	Residual OCV(%)	Appearance	Result	No.	Weight(g)	OCV(V)	Mass Loss(%)	Residual OCV(%)	Appearance	Result
1	614.27	20.41	0.00	100.00	O	Pass	1	614.06	20.39	0.00	100.00	O	Pass
2	613.94	20.41	0.00	100.00	O	Pass	2	614.10	20.38	0.00	99.95	O	Pass
3	614.15	20.39	0.00	99.95	O	Pass	3	614.03	20.39	0.00	100.00	O	Pass
4	614.02	20.39	0.00	99.95	O	Pass	4	614.01	20.40	0.00	100.00	O	Pass
T2							T2						
No.	Weight(g)	OCV(V)	Mass Loss(%)	Residual OCV(%)	Appearance	Result	No.	Weight(g)	OCV(V)	Mass Loss(%)	Residual OCV(%)	Appearance	Result
1	614.25	20.35	0.00	99.71	O	Pass	1	614.04	20.34	0.00	99.75	O	Pass
2	613.91	20.36	0.00	99.76	O	Pass	2	614.05	20.34	0.01	99.80	O	Pass
3	614.11	20.34	0.01	99.75	O	Pass	3	614.01	20.35	0.00	99.80	O	Pass
4	613.99	20.35	0.00	99.80	O	Pass	4	613.98	20.36	0.00	99.80	O	Pass
T3							T3						
No.	Weight(g)	OCV(V)	Mass Loss(%)	Residual OCV(%)	Appearance	Result	No.	Weight(g)	OCV(V)	Mass Loss(%)	Residual OCV(%)	Appearance	Result
1	614.24	20.35	0.00	99.71	O	Pass	1	614.03	20.34	0.00	99.75	O	Pass
2	613.91	20.36	0.00	99.76	O	Pass	2	614.04	20.34	0.00	99.80	O	Pass
3	614.10	20.34	0.00	99.75	O	Pass	3	614.01	20.35	0.00	99.80	O	Pass
4	613.99	20.35	0.00	99.80	O	Pass	4	613.98	20.36	0.00	99.80	O	Pass
T4							T4						
No.	Weight(g)	OCV(V)	Mass Loss(%)	Residual OCV(%)	Appearance	Result	No.	Weight(g)	OCV(V)	Mass Loss(%)	Residual OCV(%)	Appearance	Result
1	614.23	20.35	0.00	100.00	O	Pass	1	614.02	20.34	0.00	100.00	O	Pass
2	613.91	20.35	0.00	99.95	O	Pass	2	614.03	20.34	0.00	100.00	O	Pass
3	614.09	20.33	0.00	99.95	O	Pass	3	614.01	20.35	0.00	100.00	O	Pass
4	613.99	20.34	0.00	99.95	O	Pass	4	613.97	20.34	0.00	99.90	O	Pass
T5							T5						
No.	Max T(°C)	Appearance				Result	No.	Max T(°C)	Appearance				Result
1	68	O				Pass	1	66	O				Pass
2	68	O				Pass	2	66	O				Pass
3	70	O				Pass	3	68	O				Pass
4	69	O				Pass	4	66	O				Pass

[Criteria] T1~T4: No Leakage / No Venting / No Disassembly / No Rupture / No Fire / Residual OCV not less than 90%

T5: External temperature does not exceed 170°C, no disassembly, no rupture, and no fire within 6 hours of this test

T-6) Impact/Crush Test (Test Result: Pass)

■ Cell type

☒ Cylindrical cells not less than 18.0 mm in diameter

☐ Prismatic, Pouch, Cylindrical cells less than 18.0 mm in diameter

■ Test procedure

☒ Impact

☐ Crush

Fresh Cell 50% SOC				
	Initial	T6		
No.	OCV(V)	Max Temp(°C)	Appearance	Result
1	3.65	24	0	Pass
2	3.65	22	0	Pass
3	3.65	24	0	Pass
4	3.65	24	0	Pass
5	3.65	25	0	Pass
[Appearance] O-No Disassembly, No Fire / D-Disassembly / F-Fire				
[Criteria] External temperature does not exceed 170°C, no disassembly, and no fire within 6 hours of this test.				

T-7) Over charge Test (Test Result: Pass)

■ Test condition: 25.2V / 18A / 24Hr

Fresh pack 100% SOC			50 cycled pack 100% SOC	
No.	Appearance	Result	Appearance	Result
1	0	Pass	0	Pass
2	0	Pass	0	Pass
3	0	Pass	0	Pass
4	0	Pass	0	Pass
[Appearance] 0-No Disassembly, No Fire / D-Disassembly / F-Fire				
[Criteria] No disassembly and no fire within 7 days of the test				

T-8) Forced discharge Test (Test Result: Pass)

■ Test condition:

- Initial test current: 20A

- Time interval: 8min

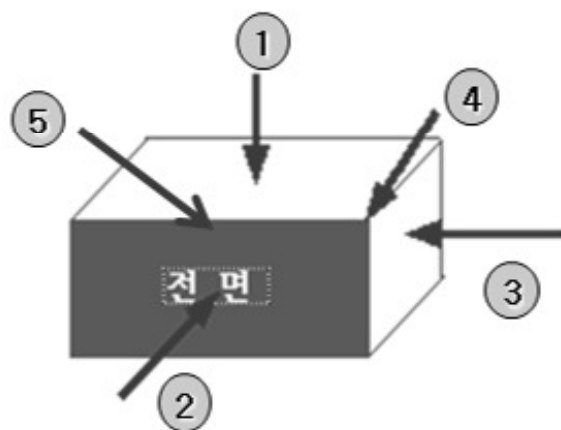
Fresh cell 0% SOC				50 cycled cell 0% SOC		
No.	Max. tempe(°C)	Appearance	Result	Max. temp(°C)	Appearance	Result
1	98	0	Pass	105	0	Pass
2	99	0	Pass	100	0	Pass
3	100	0	Pass	95	0	Pass
4	101	0	Pass	95	0	Pass
5	92	0	Pass	99	0	Pass
6	90	0	Pass	93	0	Pass
7	95	0	Pass	89	0	Pass
8	92	0	Pass	92	0	Pass
9	93	0	Pass	93	0	Pass
10	99	0	Pass	99	0	Pass
[Appearance] 0-No Disassembly, No Fire / D-Disassembly / F-Fire						
[Criteria] No disassembly and no fire within 7 days of the test						

Annex 1 - 1.2m Packaging Drop Test

■ Test Summary

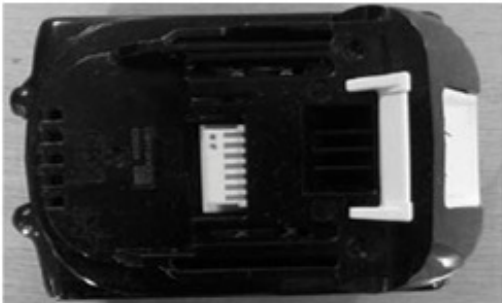
Test No.	Test item	Relating Std.	Test begins on (YYYY/MM/DD)	Test Completed on (YYYY/MM/DD)	Judgment (Pass/Fail)
P1	Packaging Drop	2014 IATA Dangerous Goods Regulations 55 th Edition	2014/12/29	2014/12/29	Pass
Total Judgment(Pass/Fail)					Pass

■ Test Method



P-1 1.2m Packaging Drop Test (Test Result: Pass)

■ Sample Picture

	Front	Back
Sample Picture		

■ Test result

	Before Test	After Test
Weight (Kg)	1.30	1.30
Test Result		
Remark	Outer packaging is damaged but samples inside the package remain intact and no damage, no shifting, no release of contents for samples inside the package.	
Criteria	- Without damage to cells or batteries contained therein. - Without shifting of the contents so as to allow battery to battery(or Cell to cell) contact. - Without release of contents.	