

## UN TEST Summary

Testing Laboratory .....	Samsung SDI Co., Ltd
Address .....	467, Beonyeong-ro, Seobuk-gu, Cheonan-si, Chungcheongnam-do, Korea
Contact .....	+82-41-560-3114 / <a href="http://samsungsdi.co.kr/lian55.kim@samsung.com">http://samsungsdi.co.kr/lian55.kim@samsung.com</a>
Manufacturer's name .....	Samsung SDI Co., Ltd
Address .....	467, Beonyeong-ro, Seobuk-gu, Cheonan-si, Chungcheongnam-do, Korea
Contact .....	+82-41-560-3114 / <a href="http://samsungsdi.co.kr/lian55.kim@samsung.com">http://samsungsdi.co.kr/lian55.kim@samsung.com</a>
Test Standard .....	Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria, section 38.3
Description .....	Lithium ion battery
Physical description .....	Cleaner battery
Assembled Battery Testing Requirements .....	Not Applicable



SAMSUNG SDI

### Test Result

No.	Test item	Result	Remark
T-1	Altitude	PASS	
T-2	Thermal Cycling	PASS	
T-3	Vibration	PASS	
T-4	Shock	PASS	
T-5	External Short Circuit	PASS	
T-6	Impact / Crush	PASS	Component cell
T-7	Overcharge	PASS	
T-8	Forced Discharge	PASS	Component cell

Name	Position	Signature	Date
Hom hyung woo	Engineer		2019, 12, 19

**Test report list**

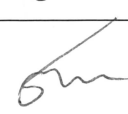
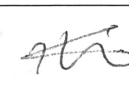
Model Name	Ratings			Mass (g)	Report number	Date of issue	Test period	Rev edition
	V	Ah	Wh					
VCA-SBT90E	21.6	1.8	38.88	Max 432	SDI-UN-P190529-01	2019/5/29	2019/4/9 2019/5/10	Fifth revised edition Amend 2
VCA-SBT90	21.9	2.85	62.42	Max 632.5	SDI-UN-P181221-01	2018/12/21	2018/5/23 2018/7/25	Sixth revised edition Amend 1
VCA-SBT60	21.6	1.8	38.88	420	SDI-UN-P160222-01	2016/2/22	2015/11/16 2016/2/17	2013 Rev5 Amend 2

**UN TEST REPORT**

Report Number.....	SDI-UN-P181221-01
Date of issue.....	2018. 12. 21
Test period.....	2018. 05. 23 ~ 2018. 07. 25
Testing Laboratory .....	Samsung SDI Co., Ltd
Address.....	467, Beonyeong-ro, Seobuk-gu, Cheonan-si, Chungcheongnam-do, Korea
Contact .....	+82-41-560-3114 / http://samsungsdi.co.kr/
Manufacturer's name .....	Samsung SDI Co., Ltd
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Contact .....	+82-41-560-3114 / http://samsungsdi.co.kr/
Test Standard.....	Recommendations on the Transport of Dangerous Goods: Manual of Tests and Criteria, section 38.3 Sixth revised edition Amendment 1
Description .....	Lithium ion battery ( 6S - 1P )
Model Name.....	VCA-SBT90
Ratings .....	21.9 V      2850 mAh    ( 62.42 Wh )
Mass .....	Max 632.5g

**Test Result**

No.	Test item	Result	Remark
T-1	Altitude	PASS	
T-2	Thermal Cycling	PASS	
T-3	Vibration	PASS	
T-4	Shock	PASS	
T-5	External Short Circuit	PASS	
T-6	Impact / Crush	PASS	Component cell
T-7	Overcharge	PASS	
T-8	Forced Discharge	PASS	Component cell

	Name	Signature	Date
Reported by	Park Myung Sun		2018. 12. 21
Approved by	Kim Lian		2018. 12. 21

T1	ALTITUDE SIMULATION TEST	Results
Requirements	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.	<input checked="" type="checkbox"/> No leakage, <input checked="" type="checkbox"/> No venting, <input checked="" type="checkbox"/> No disassembly, <input checked="" type="checkbox"/> No rupture, <input checked="" type="checkbox"/> No fire, <input checked="" type="checkbox"/> No mass loss, (Less than 0.2%) <input checked="" type="checkbox"/> No voltage drop (Residual OCV not less than 90%)  See below table

Sample No.	Sample Condition	Voltage Before Test(V)	Weight Before Test(g)	Voltage After Test(V)	Weight After Test(g)	Residual OCV(%)	Percent of Weight Loss(%)
1	A	24.75	571.67	24.74	571.67	99.96	0.00
2	A	24.77	571.24	24.77	571.24	100.00	0.00
3	A	24.72	571.11	24.72	571.11	100.00	0.00
4	A	24.77	571.05	24.76	571.05	99.96	0.00
5	B	24.76	571.49	24.76	571.49	100.00	0.00
6	B	24.77	571.06	24.76	571.06	99.96	0.00
7	B	24.73	571.50	24.72	571.50	99.96	0.00
8	B	24.72	571.55	24.71	571.55	99.96	0.00

□ Supplementary Information:

Sample Condition A : at first cycle, in fully charged states(5 pcs)

Sample Condition B : after 25th cycles ending in fully charged states(5 pcs)

T2	THERMAL TEST	Results
Requirements	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.	<input checked="" type="checkbox"/> No leakage, <input checked="" type="checkbox"/> No venting, <input checked="" type="checkbox"/> No disassembly, <input checked="" type="checkbox"/> No rupture, <input checked="" type="checkbox"/> No fire, <input checked="" type="checkbox"/> No mass loss, (Less than 0.2%) <input checked="" type="checkbox"/> No voltage drop (Residual OCV not less than 90%)  See below table

Sample No.	Sample Condition	Voltage Before Test(V)	Weight Before Test(g)	Voltage After Test(V)	Weight After Test(g)	Residual OCV(%)	Percent of Weight Loss(%)
1	A	24.74	571.67	24.12	571.67	97.49	0.00
2	A	24.77	571.24	24.10	571.24	97.30	0.00
3	A	24.72	571.11	24.15	571.10	97.69	0.00
4	A	24.76	571.05	24.11	571.04	97.37	0.00
5	B	24.76	571.49	24.15	571.48	97.54	0.00
6	B	24.76	571.06	24.16	571.06	97.58	0.00
7	B	24.72	571.50	24.22	571.50	97.98	0.00
8	B	24.71	571.55	24.19	571.55	97.90	0.00

□ Supplementary Information:

Sample Condition A : at first cycle, in fully charged states(5 pcs)

Sample Condition B : after 25th cycles ending in fully charged states(5 pcs)

T3	VIBRATION TEST	Results
Requirements	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.	<input checked="" type="checkbox"/> No leakage, <input checked="" type="checkbox"/> No venting, <input checked="" type="checkbox"/> No disassembly, <input checked="" type="checkbox"/> No rupture, <input checked="" type="checkbox"/> No mass loss, (Less than 0.2%) <input checked="" type="checkbox"/> No voltage drop (Residual OCV not less than 90%)  See below table

Sample No.	Sample Condition	Voltage Before Test(V)	Weight Before Test(g)	Voltage After Test(V)	Weight After Test(g)	Residual OCV(%)	Percent of Weight Loss(%)
1	A	24.12	571.67	24.12	571.66	100.00	0.00
2	A	24.10	571.24	24.10	571.23	100.00	0.00
3	A	24.15	571.10	24.14	571.10	99.96	0.00
4	A	24.11	571.04	24.11	571.04	100.00	0.00
5	B	24.15	571.48	24.14	571.48	99.96	0.00
6	B	24.16	571.06	24.15	571.05	99.96	0.00
7	B	24.22	571.50	24.22	571.49	100.00	0.00
8	B	24.19	571.55	24.18	571.54	99.96	0.00
<input type="checkbox"/> Supplementary Information: Sample Condition A : at first cycle, in fully charged states(5 pcs) Sample Condition B : after 25th cycles ending in fully charged states(5 pcs)							

T4	SHOCK	Results
Requirements	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.	<input checked="" type="checkbox"/> No leakage, <input checked="" type="checkbox"/> No venting, <input checked="" type="checkbox"/> No disassembly, <input checked="" type="checkbox"/> No rupture, <input checked="" type="checkbox"/> No fire, <input checked="" type="checkbox"/> No mass loss, (Less than 0.2%) <input checked="" type="checkbox"/> No voltage drop (Residual OCV not less than 90%)  See below table

Sample No.	Sample Condition	Voltage Before Test(V)	Weight Before Test(g)	Voltage After Test(V)	Weight After Test(g)	Residual OCV(%)	Percent of Weight Loss(%)
1	A	24.12	571.66	24.11	571.66	99.96	0.00
2	A	24.10	571.23	24.10	571.23	100.00	0.00
3	A	24.14	571.10	24.13	571.10	99.96	0.00
4	A	24.11	571.04	24.10	571.04	99.96	0.00
5	B	24.14	571.48	24.13	571.48	99.96	0.00
6	B	24.15	571.05	24.13	571.05	99.92	0.00
7	B	24.22	571.49	24.21	571.49	99.96	0.00
8	B	24.18	571.54	24.18	571.54	100.00	0.00

□ Supplementary Information:

Sample Condition A : at first cycle, in fully charged states(5 pcs)

Sample Condition B : after 25th cycles ending in fully charged states(5 pcs)

T5	EXTERNAL SHORT-CIRCUIT	Results
Requirements	External temperature does not exceed 170 °C and there is no disassembly, no rupture and no fire within six hours of this test.	<input checked="" type="checkbox"/> No disassembly, <input checked="" type="checkbox"/> No rupture <input checked="" type="checkbox"/> No fire. <input checked="" type="checkbox"/> External Temperature did not exceed 170 °C.  see below table

Sample No.	Sample Condition	Maximum Temperature(°C)	Test result
1	A	57	O
2	A	56	O
3	A	57	O
4	A	58	O
5	B	58	O
6	B	57	O
7	B	57	O
8	B	57	O

□ Supplementary Information:

Sample Condition A : at first cycle, in fully charged states(5 pcs)

Sample Condition B : after 25th cycles ending in fully charged states(5 pcs)

Test result : O-No Disassembly, No Rupture, No Fire / D-Disassembly / R-Rupture / F-Fire



T6	<input type="checkbox"/> Impact / <input checked="" type="checkbox"/> Crush	Results
Requirements	Cells and component cells meet this requirement if their external temperature does not exceed 170℃ and there is no disassembly and no fire during the test and within six hours after this test.	<input checked="" type="checkbox"/> External temperature did not exceed 170℃, <input checked="" type="checkbox"/> no disassembly, <input checked="" type="checkbox"/> no fire during test and within 6 hours after test  See below table

Sample No.	Sample Condition	Voltage Before Test(V)	Maximum Temperature(℃)	Test result
T6-1	C	3.73	27	O
T6-2	C	3.73	26	O
T6-3	C	3.73	26	O
T6-4	C	3.73	27	O
T6-5	C	3.73	25	O
T6-6	D	3.73	20	O
T6-7	D	3.73	25	O
T6-8	D	3.73	20	O
T6-9	D	3.72	20	O
T6-10	D	3.72	20	O
<input type="checkbox"/> Supplementary Information: Sample Condition C : at first cycle, in 50% charged states(5 pcs) Sample Condition D : at 25th cycle, in 50% charged states(5 pcs) Test result : O-No Disassembly, No Fire / D-Disassembly / F-Fire				

T7	OVERCHARGE	Results
Requirements	Rechargeable batteries meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.	<input checked="" type="checkbox"/> No disassembly, <input checked="" type="checkbox"/> no rupture, <input checked="" type="checkbox"/> no fire during the test and within seven days after the test.  See below table

Sample No.	Sample Condition	Voltage Before Test(V)	Test result
T7-1	A	24.72	O
T7-2	A	24.77	O
T7-3	A	24.73	O
T7-4	A	24.71	O
T7-5	B	24.70	O
T7-6	B	24.72	O
T7-7	B	24.73	O
T7-8	B	24.72	O

□ Supplementary Information:

Sample Condition A : at first cycle, in fully charged states(4 pcs)

Sample Condition B : after 25th cycles ending in fully charged states(4 pcs)

Test result : O-No Disassembly, No Fire / D-Disassembly / F-Fire

□ Test Conditions

Charge voltage : 30.72 V, Charge current : 3.1 A, Test time : 24 Hr

T8	FORCED DISCHARGE	Results
Requirements	Rechargeable cells meet this requirement if there is no disassembly and no fire during the test and within seven days after the test.	<input checked="" type="checkbox"/> No disassembly, <input checked="" type="checkbox"/> no rupture, <input checked="" type="checkbox"/> no fire during the test and within seven days after the test.  See below table

Sample No.	Sample Condition	Test result	Sample No.	Sample Condition	Test result
T8-1	E	O	T8-11	F	O
T8-2	E	O	T8-12	F	O
T8-3	E	O	T8-13	F	O
T8-4	E	O	T8-14	F	O
T8-5	E	O	T8-15	F	O
T8-6	E	O	T8-16	F	O
T8-7	E	O	T8-17	F	O
T8-8	E	O	T8-18	F	O
T8-9	E	O	T8-19	F	O
T8-10	E	O	T8-20	F	O

☐ Supplementary Information:

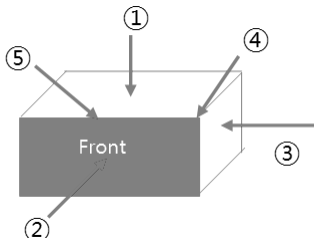
Sample Condition E : at first cycle, in fully discharged states (10 pcs)

Sample Condition F : after 25th cycles ending in fully discharged states(10 pcs)

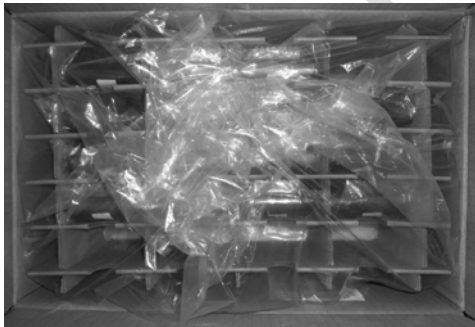

Test result : O-No Disassembly, No Fire / D-Disassembly / F-Fire

☐ Test Conditions

Initial test current : 35 A,      Test duration : 6 min

P1	Package Drop Test	Results
Procedure	<p>IATA Dangerous Goods Regulations Each package must be capable of withstanding a 1.2m drop test in any orientation</p> 	<p><input checked="" type="checkbox"/> Without damage to cells or batteries contained therein,  <input checked="" type="checkbox"/> Without shifting of the contents so as to allow battery to battery(or Cell to cell) contact.  <input checked="" type="checkbox"/> Without release of contents</p> <p>See below photo</p>

Battery Qty per box	Battery weight (kg)	Net weight per box (kg)
15	0.575	8.625

	Before Test	After Test
Weight (kg)	10.30	10.30
Test result		

Sample Photo

front	back
	

- End of Report -