



UN TEST REPORT

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|---------------------------|---|
| Report Number | SDI-UN-181002-02 |
| Date of issue | 2018.10.02 |
| Test period | 2018.09.13 ~ 2018.10.01 |
| 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 |
| Address | 467, Beonyeong-ro, Seobuk-gu, Cheonan-si, Chungcheongnam-do, Korea |
| 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 (1 S- 1 P) |
| Model Name | EB-BG975ABU |
| Ratings | 3.85V 4000mAh (15.4 Wh) |
| Mass | 56.699g |

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 | |
| T-7 | Overcharge | PASS | |
| T-8 | Forced Discharge | PASS | |

| | Name | Signature | Date |
|-------------|---------------|-----------|------------|
| Reported by | Ham hyung woo | | 2018.10.02 |
| Approved by | Hong Jong P.1 | | 2018.10.02 |

| 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"/> voltage drop (Less than 10%) See below table |

| Sample No. | Sample Condition | Voltage Before Test(V) | Weight Before Test(g) | Voltage After Test(V) | Weight After Test(g) | Percent of Voltage Drop(%) | Percent of Weight Loss(%) |
|------------|------------------|------------------------|-----------------------|-----------------------|----------------------|----------------------------|---------------------------|
| 1 | A | 4.330 | 56.717 | 4.330 | 56.717 | 100.0 | 0.00 |
| 2 | A | 4.331 | 56.829 | 4.331 | 56.829 | 100.0 | 0.00 |
| 3 | A | 4.331 | 56.651 | 4.331 | 56.651 | 100.0 | 0.00 |
| 4 | A | 4.331 | 56.823 | 4.331 | 56.823 | 100.0 | 0.00 |
| 5 | A | 4.330 | 56.557 | 4.330 | 56.556 | 100.0 | 0.00 |
| 6 | B | 4.332 | 56.805 | 4.332 | 56.805 | 100.0 | 0.00 |
| 7 | B | 4.328 | 56.675 | 4.328 | 56.674 | 100.0 | 0.00 |
| 8 | B | 4.329 | 56.622 | 4.328 | 56.622 | 100.0 | 0.00 |
| 9 | B | 4.325 | 56.719 | 4.325 | 56.719 | 100.0 | 0.00 |
| 10 | B | 4.328 | 56.695 | 4.328 | 56.695 | 100.0 | 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"/> Voltage drop (Less than 10%) See below table |

| Sample No. | Sample Condition | Voltage Before Test(V) | Weight Before Test(g) | Voltage After Test(V) | Weight After Test(g) | Percent of Voltage Drop(%) | Percent of Weight Loss(%) |
|------------|------------------|------------------------|-----------------------|-----------------------|----------------------|----------------------------|---------------------------|
| 1 | A | 4.330 | 56.717 | 4.250 | 56.714 | 98.2 | 0.01 |
| 2 | A | 4.331 | 56.829 | 4.251 | 56.826 | 98.2 | 0.01 |
| 3 | A | 4.331 | 56.651 | 4.251 | 56.651 | 98.2 | 0.00 |
| 4 | A | 4.331 | 56.823 | 4.251 | 56.820 | 98.2 | 0.01 |
| 5 | A | 4.330 | 56.556 | 4.250 | 56.552 | 98.2 | 0.01 |
| 6 | B | 4.332 | 56.805 | 4.251 | 56.801 | 98.1 | 0.01 |
| 7 | B | 4.328 | 56.674 | 4.249 | 56.674 | 98.2 | 0.00 |
| 8 | B | 4.328 | 56.622 | 4.249 | 56.622 | 98.2 | 0.00 |
| 9 | B | 4.325 | 56.719 | 4.246 | 56.715 | 98.2 | 0.01 |
| 10 | B | 4.328 | 56.695 | 4.248 | 56.691 | 98.2 | 0.01 |

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"/> voltage drop (Less than 10%) See below table |

| Sample No. | Sample Condition | Voltage Before Test(V) | Weight Before Test(g) | Voltage After Test(V) | Weight After Test(g) | Percent of Voltage Drop(%) | Percent of Weight Loss(%) |
|------------|------------------|------------------------|-----------------------|-----------------------|----------------------|----------------------------|---------------------------|
| 1 | A | 4.250 | 56.714 | 4.250 | 56.714 | 100.0 | 0.00 |
| 2 | A | 4.251 | 56.826 | 4.250 | 56.825 | 100.0 | 0.00 |
| 3 | A | 4.251 | 56.651 | 4.251 | 56.650 | 100.0 | 0.00 |
| 4 | A | 4.251 | 56.820 | 4.251 | 56.820 | 100.0 | 0.00 |
| 5 | A | 4.250 | 56.552 | 4.250 | 56.552 | 100.0 | 0.00 |
| 6 | B | 4.251 | 56.801 | 4.251 | 56.800 | 100.0 | 0.00 |
| 7 | B | 4.249 | 56.674 | 4.248 | 56.673 | 100.0 | 0.00 |
| 8 | B | 4.249 | 56.622 | 4.249 | 56.622 | 100.0 | 0.00 |
| 9 | B | 4.246 | 56.715 | 4.246 | 56.714 | 100.0 | 0.00 |
| 10 | B | 4.248 | 56.691 | 4.248 | 56.691 | 100.0 | 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)

| 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"/> voltage drop (Less than 10%) See below table |

| Sample No. | Sample Condition | Voltage Before Test(V) | Weight Before Test(g) | Voltage After Test(V) | Weight After Test(g) | Percent of Voltage Drop(%) | Percent of Weight Loss(%) |
|------------|------------------|------------------------|-----------------------|-----------------------|----------------------|----------------------------|---------------------------|
| 1 | A | 4.250 | 56.714 | 4.250 | 56.714 | 100.0 | 0.00 |
| 2 | A | 4.250 | 56.825 | 4.250 | 56.824 | 100.0 | 0.00 |
| 3 | A | 4.251 | 56.650 | 4.251 | 56.650 | 100.0 | 0.00 |
| 4 | A | 4.251 | 56.820 | 4.251 | 56.820 | 100.0 | 0.00 |
| 5 | A | 4.250 | 56.552 | 4.250 | 56.552 | 100.0 | 0.00 |
| 6 | B | 4.251 | 56.800 | 4.251 | 56.800 | 100.0 | 0.00 |
| 7 | B | 4.248 | 56.673 | 4.248 | 56.672 | 100.0 | 0.00 |
| 8 | B | 4.249 | 56.622 | 4.248 | 56.621 | 100.0 | 0.00 |
| 9 | B | 4.246 | 56.714 | 4.246 | 56.714 | 100.0 | 0.00 |
| 10 | B | 4.248 | 56.691 | 4.247 | 56.691 | 100.0 | 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 | 57 | O |
| 3 | A | 57 | O |
| 4 | A | 57 | O |
| 5 | A | 57 | O |
| 6 | B | 57 | O |
| 7 | B | 57 | O |
| 8 | B | 57 | O |
| 9 | B | 57 | O |
| 10 | 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°C 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°C, <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(°C) | Test result |
|------------|------------------|------------------------|-------------------------|-------------|
| T6-1 | C | 3.770 | 23 | O |
| T6-2 | C | 3.770 | 23 | O |
| T6-3 | C | 3.770 | 24 | O |
| T6-4 | C | 3.770 | 24 | O |
| T6-5 | C | 3.770 | 24 | O |
| T6-6 | D | 3.770 | 24 | O |
| T6-7 | D | 3.770 | 24 | O |
| T6-8 | D | 3.770 | 24 | O |
| T6-9 | D | 3.770 | 24 | O |
| T6-10 | D | 3.770 | 24 | O |

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 | 4.330 | O |
| T7-2 | A | 4.330 | O |
| T7-3 | A | 4.330 | O |
| T7-4 | A | 4.331 | O |
| T7-5 | B | 4.328 | O |
| T7-6 | B | 4.330 | O |
| T7-7 | B | 4.329 | O |
| T7-8 | B | 4.330 | 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

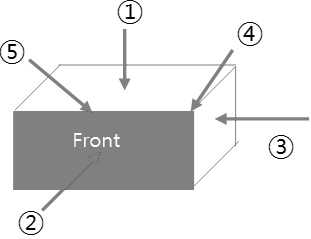
Charge voltage : 8.8V, Charge current : 6.4A, Test time : 24Hr

| | | |
|--------------|---|--|
| 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 | D | O | T8-11 | E | O |
| T8-2 | D | O | T8-12 | E | O |
| T8-3 | D | O | T8-13 | E | O |
| T8-4 | D | O | T8-14 | E | O |
| T8-5 | D | O | T8-15 | E | O |
| T8-6 | D | O | T8-16 | E | O |
| T8-7 | D | O | T8-17 | E | O |
| T8-8 | D | O | T8-18 | E | O |
| T8-9 | D | O | T8-19 | E | O |
| T8-10 | D | O | T8-20 | E | O |

Supplementary Information:
 Sample Condition D : at first cycle, in fully discharged states (10 pcs)
 Sample Condition E : 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 : 4A, Test duration : 1Hr

| P1 | Package Drop Test | Results |
|------------------|--|---|
| <p>Procedure</p> | <p>IATA Dangerous Goods Regulations Each package must be capable of withstanding a 1.2m drop test in any orientation</p>  | <ul style="list-style-type: none"> <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>See below photo</p> |

| Battery Qty per box | Battery weight (kg) | Net weight per box (kg) |
|---------------------|---------------------|-------------------------|
| 160 | 0.056 | 8.96 |

| | Before Test | After Test |
|--------------------|---|--|
| <p>Weight (kg)</p> | 10.12 | 10.12 |
| <p>Test result</p> |  |  |

Sample Photo

| front | back |
|---|--|
|  |  |

- End of Report -