

UL Test Center
ShenZhen Oceansun Battery Co. ,Ltd

UN 38.3 Test Report

User:

Product Name: Polymer Lithium-ion Battery

Submittal unit: Central Research Department of Oceansun

Cell Specification: OSL513446P-3.33Wh

| | |
|--------------|----------------------|
| Tested by: | JX Zeng, Jan,22,2009 |
| Checked by: | HJ Cao,Jan,2,2009 |
| Reviewed by: | SS Yin,Jan,22,2009 |

UL Test Center, ShenZhen Oceansun Battery Co. ,Ltd

Test Report

| | | | |
|-------------------|---|------------|------------|
| Sample name | Polymer Lithium-ion Battery 513446P-3.33Wh | | |
| Submittal unit | UL Test Center, ShenZhen Oceansun Battery Co. ,Ltd | | |
| Test method | United Nations Recommendations on the Transport of Dangerous Goods | | |
| Judgment criteria | United Nations Recommendations on the Transport of Dangerous Goods | | |
| Sample appearance | silver square solid | | |
| Date of test | 2009/01/12-2009/01/21 | Sample NO. | 0901120002 |
| Test items | Altitude Simulation, Thermal Test , Vibration Test , Shock Test , External Short Circuit, Impact Test, Overcharge Test, Forced Discharge Test | | |
| Test conclusion | Samples have passed UN38.3 Test, and the test results proved to be qualified. | | |
| | | | |

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| NO. | Test items | Criteria requirement or criteria article NO. | Test result | Conclusion | Remark |
|--------------------------------|--------------------------|--|----------------------|------------|--------|
| 1 | Altitude Simulation Test | United Nations Recommendations on the Transport of Dangerous Goods (4th) thereafter call " Manual of Tests and Criteria UN38.3(4th)" for short, Test T.1 | see attached table 1 | pass | / |
| 2 | Thermal Test | Manual of Tests and Criteria UN38.3(4th) Test T.2 | see attached table 2 | pass | / |
| 3 | Vibration Test | Manual of Tests and Criteria UN38.3(4th)Test T.3 | see attached table 3 | pass | / |
| 4 | Shock Test | Manual of Tests and Criteria UN38.3(4th)Test T.4 | see attached table 4 | pass | / |
| 5 | External Short Circuit | Manual of Tests and Criteria UN38.3(4th) Test T.5 | see attached table 5 | pass | / |
| 6 | Impact Test | Manual of Tests and Criteria UN38.3(4th) Test T.6 | see attached table 6 | pass | / |
| 7 | Forced Discharge Test | Manual of Tests and Criteria UN38.3(4th) Test T.7 | see attached table 7 | pass | / |
| 8 | Drop Test (Full Carton) | Manual of Tests and Criteria UN38.3(4th) Test T.8 | see attached table 8 | pass | / |
| Test environment and condition | | Ambience temperature: 20 ±5℃ | | | |

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Test Report-attached table 1

| NO. | 1 | Name of test item | | Altitude Simulation | | | | |
|-----|-------------------------|-------------------|------------------------|---------------------|------------------------|------------|--------|-------------|
| | | | | before test | | after test | | Mass loss/% |
| | | Mass/g | open-circuit voltage/V | Mass/g | open-circuit voltage/V | | | |
| 1 | first fully charged | 17.498 | 4.183 | 17.496 | 4.182 | 0.01 | 99.98 | O |
| 2 | first fully charged | 17.507 | 4.185 | 17.507 | 4.184 | 0.00 | 99.98 | O |
| 3 | first fully charged | 17.505 | 4.184 | 17.504 | 4.184 | 0.00 | 100.00 | O |
| 4 | first fully charged | 17.526 | 4.182 | 17.524 | 4.179 | 0.01 | 99.93 | O |
| 5 | first discharged | 17.473 | | 17.472 | | 0.00 | | O |
| 6 | first discharged | 17.521 | | 17.521 | | 0.00 | | O |
| 7 | first discharged | 17.486 | | 17.486 | | 0.00 | | O |
| 8 | first discharged | 17.508 | | 17.508 | | 0.00 | | O |
| 9 | fully charged 50 cycles | 17.504 | 4.185 | 17.502 | 4.182 | 0.01 | 99.93 | O |
| 10 | fully charged 50 cycles | 17.523 | 4.184 | 17.521 | 4.180 | 0.01 | 99.90 | O |
| 11 | fully charged 50 cycles | 17.493 | 4.183 | 17.493 | 4.181 | 0.00 | 99.95 | O |
| 12 | fully charged 50 cycles | 17.502 | 4.181 | 17.500 | 4.180 | 0.01 | 99.98 | O |
| 13 | discharged 50 cycles | 17.498 | | 17.496 | | 0.01 | | O |
| 14 | discharged 50 cycles | 17.520 | | 17.519 | | 0.00 | | O |
| 15 | discharged 50 cycles | 17.485 | | 17.484 | | 0.00 | | O |
| 16 | discharged 50 cycles | 17.510 | | 17.509 | | 0.00 | | O |

Remark: L-leakage; V- venting ; D-disassembly; R- rupture; F- fire; O-no leakage, no venting, no disassembly, no rupture and no fire.

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Test Report-attached table 2

| NO. | 2 | Name of test item | | Thermal Test | | | | |
|-----|-------------------------|-------------------|------------------------|--------------|------------------------|------------|--------|-------------|
| | | | | before test | | after test | | Mass loss/% |
| | | Mass/g | open-circuit voltage/V | Mass/g | open-circuit voltage/V | | | |
| 1 | first fully charged | 17.496 | 4.181 | 17.496 | 4.178 | 0.00 | 99.93 | O |
| 2 | first fully charged | 17.493 | 4.183 | 17.492 | 4.181 | 0.00 | 99.95 | O |
| 3 | first fully charged | 17.509 | 4.184 | 17.508 | 4.180 | 0.00 | 99.90 | O |
| 4 | first fully charged | 17.531 | 4.187 | 17.530 | 4.186 | 0.00 | 99.98 | O |
| 5 | first fully discharged | 17.511 | | 17.510 | | 0.00 | | O |
| 6 | first fully discharged | 17.535 | | 17.533 | | 0.01 | | O |
| 7 | first fully discharged | 17.510 | | 17.510 | | 0.00 | | O |
| 8 | first fully discharged | 17.525 | | 17.524 | | 0.00 | | O |
| 9 | fully charged 50 cycles | 17.501 | 4.180 | 17.500 | 4.176 | 0.00 | 99.90 | O |
| 10 | fully charged 50 cycles | 17.515 | 4.186 | 17.515 | 4.185 | 0.00 | 99.98 | O |
| 11 | fully charged 50 cycles | 17.472 | 4.189 | 17.471 | 4.186 | 0.00 | 99.93 | O |
| 12 | fully charged 50 cycles | 17.509 | 4.187 | 17.509 | 4.187 | 0.00 | 100.00 | O |
| 13 | discharged 50 cycles | 17.493 | | 17.492 | | 0.00 | | O |
| 14 | discharged 50 cycles | 17.499 | | 17.499 | | 0.00 | | O |
| 15 | discharged 50 cycles | 17.505 | | 17.503 | | 0.01 | | O |
| 16 | discharged 50 cycles | 17.501 | | 17.500 | | 0.00 | | O |

Remark: L-leakage; V- venting ; D-disassembly; R- rupture; F- fire; O-no leakage, no venting, no disassembly, no rupture and no fire.

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Test Report-attached table 3

| NO. | 3 | Name of test item | | Vibration Test | | | | |
|------------|-------------------------|-------------------|------------------------|----------------|------------------------|-------------|--------------------|------------------|
| Sample No. | Sample state | before test | | after test | | Mass loss/% | residual voltage/% | other phenomenon |
| | | Mass/g | open-circuit voltage/V | Mass/g | open-circuit voltage/V | | | |
| 1 | first fully charged | 17.498 | 4.187 | 17.496 | 4.183 | 0.01 | 99.90 | O |
| 2 | first fully charged | 17.510 | 4.180 | 17.509 | 4.177 | 0.00 | 99.93 | O |
| 3 | first fully charged | 17.466 | 4.185 | 17.466 | 4.179 | 0.00 | 99.86 | O |
| 4 | first fully charged | 17.510 | 4.184 | 17.509 | 4.183 | 0.00 | 99.98 | O |
| 5 | first fully discharged | 17.475 | | 17.474 | | 0.00 | | O |
| 6 | first discharged | 17.479 | | 17.477 | | 0.01 | | O |
| 7 | first discharged | 17.495 | | 17.494 | | 0.00 | | O |
| 8 | first discharged | 17.511 | | 17.510 | | 0.00 | | O |
| 9 | fully charged 50 cycles | 17.533 | 4.184 | 17.533 | 4.180 | 0.00 | 99.90 | O |
| 10 | fully charged 50 cycles | 17.493 | 4.186 | 17.493 | 4.184 | 0.00 | 99.95 | O |
| 11 | fully charged 50 cycles | 17.510 | 4.183 | 17.509 | 4.182 | 0.00 | 99.98 | O |
| 12 | fully charged 50 cycles | 17.481 | 4.182 | 17.480 | 4.179 | 0.00 | 99.93 | O |
| 13 | discharged 50 cycles | 17.506 | | 17.504 | | 0.01 | | O |
| 14 | discharged 50 cycles | 17.522 | | 17.521 | | 0.00 | | O |
| 15 | discharged 50 cycles | 17.525 | | 17.524 | | 0.00 | | O |
| 16 | discharged 50 cycles | 17.501 | | 17.500 | | 0.00 | | O |

Remark: L-leakage; V- venting ; D-disassembly; R- rupture; F- fire; O-no leakage, no venting, no disassembly, no rupture and no fire.

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Test Report-attached table 4

| NO. | 4 | Name of test item | | Shock Test | | | | |
|------------|-------------------------|-------------------|------------------------|------------|------------------------|-------------|--------------------|--------------------|
| Sample No. | Sample state | before test | | after test | | Mass loss/% | residual voltage/% | other phenomention |
| | | Mass/g | open-circuit voltage/V | Mass/g | open-circuit voltage/V | | | |
| 1 | first fully charged | 17.515 | 4.186 | 17.515 | 4.185 | 0.00 | 99.98 | O |
| 2 | first fully charged | 17.491 | 4.185 | 17.489 | 4.183 | 0.01 | 99.95 | O |
| 3 | first fully charged | 17.489 | 4.187 | 17.488 | 4.184 | 0.00 | 99.93 | O |
| 4 | first fully charged | 17.505 | 4.183 | 17.503 | 4.182 | 0.01 | 99.98 | O |
| 5 | first discharged | 17.513 | | 17.512 | | 0.00 | | O |
| 6 | first discharged | 17.494 | | 17.494 | | 0.00 | | O |
| 7 | first discharged | 17.509 | | 17.507 | | 0.01 | | O |
| 8 | first discharged | 17.532 | | 17.530 | | 0.01 | | O |
| 9 | fully charged 50 cycles | 17.509 | 4.187 | 17.509 | 4.186 | 0.00 | 99.98 | O |
| 10 | fully charged 50 cycles | 17.495 | 4.186 | 17.495 | 4.184 | 0.00 | 99.95 | O |
| 11 | fully charged 50 cycles | 17.511 | 4.186 | 17.511 | 4.183 | 0.00 | 99.93 | O |
| 12 | fully charged 50 cycles | 17.533 | 4.184 | 17.532 | 4.182 | 0.00 | 99.95 | O |
| 13 | discharged 50 cycles | 17.510 | | 17.510 | | 0.00 | | O |
| 14 | discharged 50 cycles | 17.525 | | 17.524 | | 0.00 | | O |
| 15 | discharged 50 cycles | 17.483 | | 17.481 | | 0.01 | | O |
| 16 | discharged 50 cycles | 17.485 | | 17.483 | | 0.01 | | O |

Remark: L-leakage; V- venting ; D-disassembly; R- rupture; F- fire; O-no leakage, no venting, no disassembly, no rupture and no fire.

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Test Report-attached table 5

| NO. | 5 | Name of test item | External Short Circuit |
|------------|-------------------------|------------------------------------|------------------------|
| Sample No. | Sample state | External highest temperature/ ℃ | other phenomenon |
| 1 | first fully charged | 114.8 | O |
| 2 | first fully charged | 114.2 | O |
| 3 | first fully charged | 112.6 | O |
| 4 | first fully charged | 116.5 | O |
| 5 | first discharged | 72.9 | O |
| 6 | first discharged | 72.2 | O |
| 7 | first discharged | 72.6 | O |
| 8 | first discharged | 75.1 | O |
| 9 | fully charged 50 cycles | 115.2 | O |
| 10 | fully charged 50 cycles | 112.7 | O |
| 11 | fully charged 50 cycles | 116.4 | O |
| 12 | fully charged 50 cycles | 115.7 | O |
| 13 | discharged 50 cycles | 72.4 | O |
| 14 | discharged 50 cycles | 75.1 | O |
| 15 | discharged 50 cycles | 76.4 | O |
| 16 | discharged 50 cycles | 77.1 | O |

Remark: D-disassembly; R- rupture; F- fire; O-no disassembly, no rupture and no fire.

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Test Report-attached table 6

| NO. | 6 | Name of test item | Impact Test |
|------------|----------------------|----------------------------------|------------------|
| Sample No. | Sample state | External Highest Temperature/ °C | other phenomenon |
| 1 | first 50% capacity | 118.6 | O |
| 2 | first 50% capacity | 119.4 | O |
| 3 | first 50% capacity | 115.0 | O |
| 4 | first 50% capacity | 107.5 | O |
| 5 | first 50% capacity | 110.1 | O |
| 6 | 50 cycles discharged | 80.0 | O |
| 7 | 50 cycles discharged | 78.5 | O |
| 8 | 50 cycles discharged | 80.4 | O |
| 9 | 50 cycles discharged | 80.9 | O |
| 10 | 50 cycles discharged | 79.8 | O |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |
| | | | |

Remark: D-disassembly; F- fire; O-no disassembly, and no fire.

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Test Report-attached table 7

| NO. | 7 | Name of test item | Forced Discharge Test |
|------------|-------------------------|-------------------|-----------------------|
| Sample No. | Sample state | test phenomenon | |
| 1 | first fully charged | | O |
| 2 | first fully charged | | O |
| 3 | first fully charged | | O |
| 4 | first fully charged | | O |
| 5 | first fully discharged | | O |
| 6 | first discharged | | O |
| 7 | first discharged | | O |
| 8 | first discharged | | O |
| 9 | fully charged 50 cycles | | O |
| 10 | fully charged 50 cycles | | O |
| 11 | fully charged 50 cycles | | O |
| 12 | fully charged 50 cycles | | O |
| 13 | discharged 50 cycles | | O |
| 14 | discharged 50 cycles | | O |
| 15 | discharged 50 cycles | | O |
| 16 | discharged 50 cycles | | O |

Remark: D-disassembly; F- fire; O-no disassembly, and no fire.

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Drop Test Report-attached table 8

Test condition:

Charged cell to 4.2V,fill in the carton package,drop from 120cm from X,Y,Z direction,once/side,total 6 drops.

| | | | |
|--------------------|-----------------------------|-------------------|--|
| Sample name & NO. | 513446-3.33Wh | Storage condition | Room temperature |
| Test Item | Drop from a height of 1.2 m | Apparatus name | Drop test-bed |
| Temperature (°C) | 22.9 | Test basis | United Nations Recommendations on the Transport of Dangerous Goods- Manual of Tests and Criteria |
| Humidity(%) | 47 | Test date | 2009-1-5 |
| Inner packing | PET box | Outer packing | Carton |

| NO. | 8 | Name of test item | Drop Test (Full Carton) |
|------------|---------------|--|-------------------------|
| Sample No. | Sample state | test phenomenon | |
| 1 | fully charged | no fire;no leakage;cell/carton no damage | |
| 2 | fully charged | no fire;no leakage;cell/carton no damage | |
| 3 | fully charged | no fire;no leakage;cell/carton no damage | |
| 4 | fully charged | no fire;no leakage;cell/carton no damage | |
| 5 | fully charged | no fire;no leakage;cell/carton no damage | |
| 6 | fully charged | no fire;no leakage;cell/carton no damage | |
| 7 | fully charged | no fire;no leakage;cell/carton no damage | |
| 8 | fully charged | no fire;no leakage;cell/carton no damage | |
| 9 | fully charged | no fire;no leakage;cell/carton no damage | |
| 10 | fully charged | no fire;no leakage;cell/carton no damage | |

Conclusion: Pass