TEST REPORT
United Nations, Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria, Chapter 38.3

Test Summary:	
Applicant's name:	
Name:	Orient Technology (S) Pte Ltd
Address	178 Paya Lebar Road. #07-06
Phone number	409030 Singapore
Email	+65 63553388
Website	sales@orient-technology.com.sg
Manufacturer's name:	
Name:	Orient Technology (S) Pte Ltd
Address	178 Paya Lebar Road. #07-06
Phone number	409030 Singapore
Email	+65 63553388
Website	sales@orient-technology.com.sg
Testing laboratory:	
Name	Underwriters Laboratories Taiwan Co., Ltd.
Address	No. 260, Daye Rd., Beitou Dist., Taipei City, TW-112, Chinese Taipei
Phone number	+886-2-7737-2434
Email	customerservice.tw@ul.com
Website	https://taiwan.ul.com/
Testing site:	
Name	Underwriters Laboratories Taiwan Co., Ltd.
Address	No. 260, Daye Rd., Beitou Dist., Taipei City, TW-112, Chinese Taipei
Test report number.	UN38.3-4791664066-1
Date of issue	2025-06-04
Edition of UN Manual of Tests and Criteria used	United Nations, Recommendations on the Transport of Dangerous Goods, Manual of Test and Criteria, Chapter 38.3/ ☐ Rev.7/Amend.1 ☒ Rev.8 ☐ Rev. _____
Test item:	☐ cell / ☒ battery / ☐ product
Physical description	
Chemistry	☐ lithium metal / ☒ lithium ion / ☐ sodium ion
Type	☐ primary / ☒ secondary
Mass	0.598kg
Lithium content (for lithium metal)	N/A
Wh rating (for lithium ion)	97.92Wh
Cell configuration (X-S/Y-P)	4-S/2-P
Model / Type reference	i4311-BATT
Ratings	14.4Vdc, Nominal Capacity: 6700mAh, Minimum Capacity: 6800mAh, 97.92Wh
Overall dimensions	115.8mm*90mm*44.04mm

List of tests conducted and results:	(Pass, Fail, or N/A - not applicable)
T.1: Altitude simulation.....:	Pass
T.2: Thermal test.....:	Pass
T.3: Vibration.....:	Pass
T.4: Shock.....:	Pass
T.5: External short circuit .....:	Pass
T.6: ☐ Impact / ☐ Crush.....:	N/A
T.7: Overcharge .....:	Pass
T.8: Forced discharge .....:	N/A
Remarks.....:	N/A
Assembled battery testing.....:	☐ UN 38.3.3 (f) / ☐ UN 38.3.3 (g) / ☒ N/A

Test summary date .....:	2025-06-04	
Test summary by (name + title + signature) .....:	Ee Ling Teh	
Approved by (name + title + signature) .....:	Joy Shen	

Test item particulars..... :	
Testing.....:	
Date of receipt of test item .....:	2025-04-16
Date (s) of performance of tests.....:	2025-05-05-TO 2025-05-22

General remarks:

The test results presented in this report relate only to the object tested.
This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory.
"(See Enclosure #)" refers to additional information appended to the report.
"(See appended table)" refers to a table appended to the report.

Throughout this report a ☐ comma / ☒ point is used as the decimal separator.

General product information:

Product Description:

Electronic components mounted on PWB with 4-series, 2-parallel certified Li-ion cells and secured together by plastic enclosure through ultrasonic welding.

Additional Information:

Disclaimer:
The laboratory is not responsible when the information is supplied by the customer and can affect the validity of results.
Battery cell specification is supplied by the customer.

For statement of conformity, simple acceptance (Section 8.2.1 of ISO/IEC Guide 98-4) was applied as decision rule for measurement in this test report.

- Pass - the measured value is below the acceptance limit, AL = TL.
- Fail - the measured value is above the acceptance limit, AL = TL.
- AL: Acceptance Limit.
- TL: Tolerance Limit (Specification Limit).
- Level of risk: PFA (Probability of False Accept) less than 50 %.

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

38.3.4.1	**TABLE: Altitude**							Pass
Sample No.	Pre-condition	Open circuit voltage before test (V)	Mass before test (g)	Open circuit voltage after test (V)	Mass after test (g)	Mass loss (%)	Voltage remain (%)	Results
8363862-S1	(C)	16.39	595.35	16.38	595.27	0.013	99.94	A
8363862-S2	(C)	16.38	595.80	16.38	595.73	0.012	100.00	A
8363862-S3	(C)	16.38	594.95	16.38	594.85	0.017	100.00	A
8363862-S4	(C)	16.38	597.16	16.37	597.02	0.023	99.94	A
8363862-S5	(D)	16.38	594.88	16.38	594.81	0.012	100.00	A
8363862-S6	(D)	16.38	594.27	16.37	594.21	0.010	99.94	A
8363862-S7	(D)	16.36	594.10	16.36	594.03	0.012	100.00	A
8363862-S8	(D)	16.36	594.95	16.36	594.86	0.015	100.00	A

Supplementary information:

Precondition:

A: Fully discharged state.
B: Undischarged state.
C: First cycle in fully charged state.
D: After 25 cycles ending in fully charged state.

Results:

A: No leakage, no venting, no short-circuit (voltage not remain 90%), no rupture, no disassembly (explosion), and no fire.
B: Other (please explain)

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

38.3.4.2	**TABLE: Thermal Test**							Pass
Sample No.	Pre-condition	Open circuit voltage before test (V)	Mass before test (g)	Open circuit voltage after test (V)	Mass after test (g)	Mass loss (%)	Voltage remain (%)	Results
8363862-S1	(C)	16.38	595.27	16.34	595.21	0.010	99.76	A
8363862-S2	(C)	16.38	595.73	16.34	595.66	0.012	99.76	A
8363862-S3	(C)	16.38	594.85	16.34	594.78	0.012	99.76	A
8363862-S4	(C)	16.37	597.02	16.34	596.89	0.022	99.82	A
8363862-S5	(D)	16.38	594.81	16.34	594.73	0.013	99.76	A
8363862-S6	(D)	16.37	594.21	16.33	594.12	0.015	99.76	A
8363862-S7	(D)	16.36	594.03	16.33	593.94	0.015	99.82	A
8363862-S8	(D)	16.36	594.86	16.33	594.81	0.008	99.82	A

Supplementary information:

Precondition:

A: Fully discharged state.
B: Undischarged state.
C: First cycle in fully charged state.
D: After 25 cycles ending in fully charged state.

Results:

A: No leakage, no venting, no short-circuit (voltage not remain 90%), no rupture, no disassembly (explosion), and no fire.
B: Other (please explain)

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

38.3.4.3	**TABLE: Vibration**							Pass
Sample No.	Pre-condition	Open circuit voltage before test (V)	Mass before test (g)	Open circuit voltage after test (V)	Mass after test (g)	Mass loss (%)	Voltage remain (%)	Results
8363862-S1	(C)	16.34	595.21	16.34	595.19	0.003	100.00	A
8363862-S2	(C)	16.34	595.66	16.34	595.65	0.002	100.00	A
8363862-S3	(C)	16.34	594.78	16.33	594.77	0.002	99.94	A
8363862-S4	(C)	16.34	596.89	16.34	596.88	0.002	100.00	A
8363862-S5	(D)	16.34	594.73	16.33	594.72	0.002	99.94	A
8363862-S6	(D)	16.33	594.12	16.33	594.11	0.002	100.00	A
8363862-S7	(D)	16.33	593.94	16.33	593.93	0.002	100.00	A
8363862-S8	(D)	16.33	594.81	16.32	594.79	0.003	99.94	A

Supplementary information:

Precondition:

A: Fully discharged state.
B: Undischarged state.
C: First cycle in fully charged state.
D: After 25 cycles ending in fully charged state.

Results:

A: No leakage, no venting, no short-circuit (voltage not remain 90%), no rupture, no disassembly (explosion), and no fire.
B: Other (please explain)

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

38.3.4.4	**TABLE: Shock**							Pass
Sample No.	Pre-condition	Open circuit voltage before test (V)	Mass before test (g)	Open circuit voltage after test (V)	Mass after test (g)	Mass loss (%)	Voltage remain (%)	Results
8363862-S1	(C)	16.34	595.19	16.34	595.19	0.000	100.00	A
8363862-S2	(C)	16.34	595.65	16.34	595.65	0.000	100.00	A
8363862-S3	(C)	16.33	594.77	16.33	594.77	0.000	100.00	A
8363862-S4	(C)	16.34	596.88	16.33	596.88	0.000	99.94	A
8363862-S5	(D)	16.33	594.72	16.33	594.72	0.000	100.00	A
8363862-S6	(D)	16.33	594.11	16.33	594.11	0.000	100.00	A
8363862-S7	(D)	16.33	593.93	16.32	593.92	0.002	99.94	A
8363862-S8	(D)	16.32	594.79	16.32	594.79	0.000	100.00	A

Supplementary information:

Precondition:

A: Fully discharged state.
B: Undischarged state.
C: First cycle in fully charged state.
D: After 25 cycles ending in fully charged state.

Results:

A: No leakage, no venting, no short-circuit (voltage not remain 90%), no rupture, no disassembly (explosion), and no fire.
B: Other (please explain)

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

38.3.4.5	**TABLE: External short-circuit**					Pass
Sample No.	Pre-condition	Open circuit voltage before test (V)	Open circuit voltage after test (V)	Maximum case temperature (°C)	Total external resistance (mΩ)	Results
8363862-S1	(C)	16.34	---	57.0	84.7	A
8363862-S2	(C)	16.34	---	57.3	83.8	A
8363862-S3	(C)	16.33	---	57.6	79.6	A
8363862-S4	(C)	16.33	---	57.6	82.1	A
8363862-S5	(D)	16.33	---	57.3	79.1	A
8363862-S6	(D)	16.33	---	57.4	80.3	A
8363862-S7	(D)	16.32	---	57.4	83.7	A
8363862-S8	(D)	16.32	---	57.7	79.7	A

Supplementary information:

Precondition:

A: Fully discharged state.
B: Undischarged state.
C: First cycle in fully charged state.
D: After 25 cycles ending in fully charged state.

Results:

A: No excessive temperature rise (above 170°C), no disassembly (explosion), and no fire.
B: Other (please explain)

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

38.3.4.6a	**TABLE: Impact**			N/A
Sample No.	Pre-condition	Open circuit voltage before test (V)	Maximum case temperature (°C)	Results

Supplementary information:

Precondition:

A: Undischarged.
B: Fully discharged.
C: First cycle at 50% of rated capacity.
D: 25 cycles ending at 50% of rated capacity.

Results:

A: No excessive temperature rise (above 170°C), no disassembly (explosion), and no fire.
B: Other (please explain)

38.3.4.6b	**TABLE: Crush**						N/A
Sample No.	Open circuit voltage before test (V)	Voltage drop of the cell (mV)	Applied force (kN)	Thickness before test (mm)	Thickness after test (mm)	Maximum case temperature (°C)	Results

Supplementary information:

Precondition:

A: Undischarged.
B: Fully discharged.
C: First cycle in one-half discharged state.
D: After 25 cycles in one-half discharged state.

Results:

A: No excessive temperature rise (above 170°C), no disassembly (explosion), and no fire.
B: Other (please explain)

UN 38.3			
Clause	Requirement + Test	Result - Remark	Verdict

38.3.4.7	**TABLE: Overcharge**			Pass
Sample No.	Precondition	Open circuit voltage before test (V)	Measured Overcharge Current, (mA)	Results
8363862-S9	(A)	16.39	6.8095	A,B
8363862-S10	(A)	16.39	6.8086	A,B
8363862-S11	(A)	16.39	6.8029	A,B
8363862-S12	(A)	16.39	6.8008	A,B
8363862-S13	(B)	16.39	6.8023	A,B
8363862-S14	(B)	16.38	6.8031	A,B
8363862-S15	(B)	16.30	6.8037	A,B
8458888-S1	(B)	16.39	6.8087	A,B

Supplementary information:

Precondition:

A: First cycle in fully charged state.
B: After 25 cycles ending in fully charged state.

Results:

A: No disassembly (explosion), and no fire.
B - The battery's protective circuitry activated, and the current was reduced to about 0 A.

Notes:
Charging current: 3.4A*2=6.8A
Charging voltage: 22.0Vdc (16.4Vdc*2=32.8Vdc)

38.3.4.8	**TABLE: Forced discharge**				N/A
Sample No.	Precondition	Open circuit voltage before test (V)	Measured reverse charging current (A)	Total time for reversed charging application (min)	Results

Supplementary information:

Precondition:

A: Fully discharged state.
B: First cycle in fully discharged state.
C: After 25 cycles ending in fully discharged state.

Results:

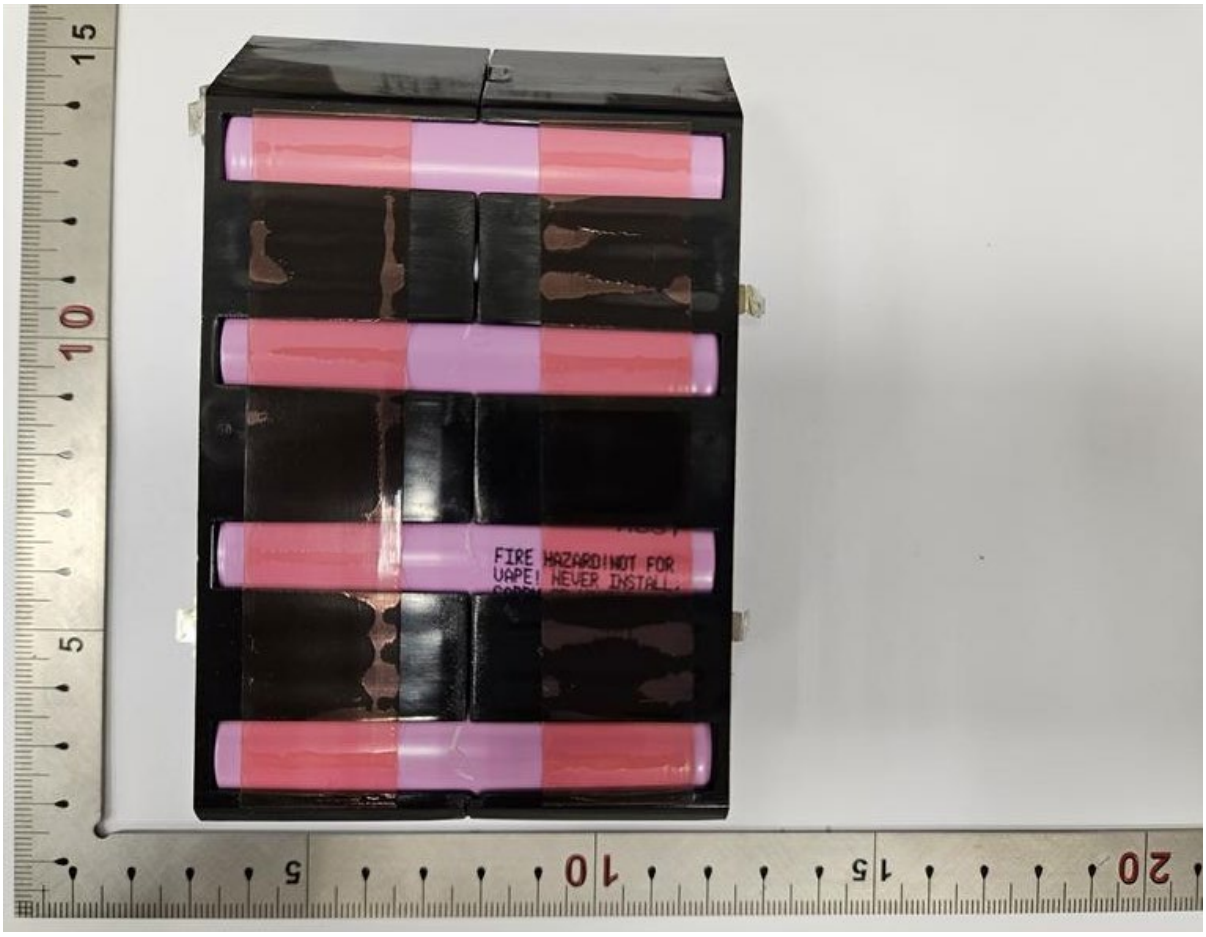
A: No disassembly (explosion), and no fire.
B: Sample opened and leaked electrolyte

ENCLOSURE

Supplement Id	Description
01	Overall view
02	Internal view
03	Specification
04-1~2	Critical component list
05	Packaging Method

ID 01

ID 02



ID 03

3 DESCRIPTION AND MODEL

Description	: Cylindrical Li-ion rechargeable cell
Cell Model	: Samsung INR18650-35E
Configuration	: 4 series 2 parallel (8 cells)
Model Number	: OTPLI104500
Model Name	: 4INR1865035E-2-BRY
Customer Model Number	: i4311-BATT

4 GENERAL SPECIFICATIONS

Unless otherwise specified, the cell is fresh cell and tested by standard charge and discharge

Item			Specification	
4.1.	Capacity	Minimum	6800mAh	
		Nominal	6700mAh	
4.2.	Nominal Voltage		14.4V	
4.3.	Rated Energy		97.92 Wh	
4.4.	Std Charging Current		3.4A (Limited by charger), cut-off 500mA	
4.5.	Charging Voltage		16.4V (Limited by Charger)	
4.6.	Continuous Discharge Current		13A Max	
4.7.	End of Discharge		10.8V (2.7V/cell)	
4.8.	Internal Resistance		TBD	
4.9.	Weight		TBD	
4.10.	Operating Temperature		Charge	0°C ~ 55°C
			Discharge	-20°C ~ 60°C
4.11.	Storage Condition		1 year	-20°C ~ 23°C, 60% RH Max
			3 months	-20°C ~ 45°C, 60% RH Max
			1 months	-20°C ~ 60°C, 60% RH Max

※1 After the battery pack assembly, maximum charge and discharge current will be limited by protection circuit, connector wire or device.

ID 04-1

	TABLE: Critical components information				Pass
Object / part No.	**Manufacturer/ trademark**	**Type / model**	**Technical data**	**Standard**	**Mark(s) of conformity[1)]**
01. Connectors and Receptacles (secondary SELV circuits)	Interchangeable	Metal/Plastic	Copper alloy pins housed in bodies of PWB rated V-1 minimum.	UL 94, UL746C	UL.
01a. Connectors and Receptacles (secondary SELV circuits) (Alternate)	Interchangeable	Interchangeable	--	UL 498 UL 1977	UL.
02. Label	Interchangeable	Interchangeable	60 degree C if maximum surface temperature not specified.	UL 969	UL.
03. Internal Plastic Part Materials (for parts greater than 1.75cm³)	Interchangeable	Interchangeable	Min. V-2.	UL 94, UL746C	UL. Tested in this report.
04. PWB	Chun Shen Enterprise Co Ltd	2V-0	Minimum 0.1mm thickness, V-0, 130 degree C.	UL 796	UL(E69038). Tested in this report.
04a. PWB (Alternate)	Interchangeable	Interchangeable	V-1, 105 degree C.	UL 796	UL.
05. Battery cells (4S-2P)	Samsung SDI Co., Ltd.	INR18650-35E++	3.6 Vdc, 3400mAh, 12.24Wh	IEC 62133-2:2017, IEC 62133-2:2017/AMD1:2021	IEC (CBTC No.: JPTUV-145078, issued on 2023-03-06, CBTR Ref. No.: CN233H95 001, issued on 2023-03-01 by TUV Rheinland CBTL)
06. IC (U2)	Texas Instruments	BQ24610RGET	--	--	Tested in this report.
07. IC (U4)	Texas Instruments	BQ40Z50-R2	--	--	Tested in this report.
08. MOSFET (Q12)	Infineon	BSZ0901NS	--	--	Tested in this report.
09. MOSFET (Q13)	Infineon	BSZ0901NS	--	--	Tested in this report.

ID 04-2

10. Fuse (F1)	Dexerials Corporation	SFK-1830X	62Vdc, 30A	UL 248-1, UL 248-14	UL (E167588). Tested in this report.
12. Fuse (F2)	Bel Fuse Inc	C1H	32Vdc, 25A	UL 248-1, UL 248-14	UL(E20624). Tested in this report.
13. Plastic Enclosure (Top and Bottom casing)	LG CHEM LTD	LUPOY GN1008RF	Minimum 0.8 mm thickness, V-0, 80 degree C.	UL 94, UL746C	UL(E67171). Tested in this report.
14. Cell Holder (Left and Right)	LG CHEM LTD	LUPOY GN1008RF	Minimum 0.8 mm thickness, V-0, 80 degree C.	UL 94, UL746C	UL(E67171). Tested in this report.
15. Thermistor (RT1)	Thinking Electronic Industrial Co., Ltd	NTSE0103	10Kohm at 25 degree C.	UL1434	UL(E138827). Tested in this report.
15a. Thermistor (RT1) (Alternate)	Interchangeable	Interchangeable	10Kohm at 25 degree C.	UL1434	UL.
16. Thermistor (RT2)	Thinking Electronic Industrial Co., Ltd	NTSE0103	10Kohm at 25 degree C.	UL1434	UL(E138827). Tested in this report.
16a. Thermistor (RT2) (Alternate)	Interchangeable	Interchangeable	10Kohm at 25 degree C.	UL1434	UL.

Supplementary information:

[1)] Provided evidence ensures the agreed level of compliance. See OD-CB2039.

[2)] Description line content is optional. Main line description needs to clearly detail the component used for testing.

[3)] The CBTL has verified the component information.

[4)] License available upon request for UL standard

ID 05