

UN38.3 Test Summary

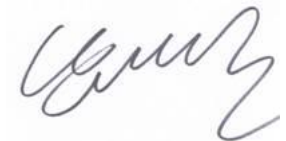
The following product has been evaluated according to the 5th revised edition Amendment 2 of the UN Manual of Tests and Criteria.
We, LG Chem, Ltd., hereby certify that this battery meets the requirements of the regulation for transportation of lithium-ion cells, batteries and single cell batteries.




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Description		List of Test Completed	
Test Report Number	QAE-EF02-141204-PKL14L2P22	Test 1. Altitude Simulation	Pass
Date of test report	2014.12.04	Test 2. Thermal Test	Pass
Model name	L14L2P22	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	7.6 V	Test 5. External Short Circuit	Pass
Capacity	35.0 Wh	Test 6. Impact or Crush	Pass
Weight	157.0 g	Test 7. Overcharge	Pass
Dimensions	198.00mm X 79.80mm X 4.70mm	Test 8. Forced Discharge	Pass

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UN Test Report

- L14L2P22(Nom.35Wh, 7.6V) -

목 차

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2014. 12. 04

1. UN Transportation Regulation Test

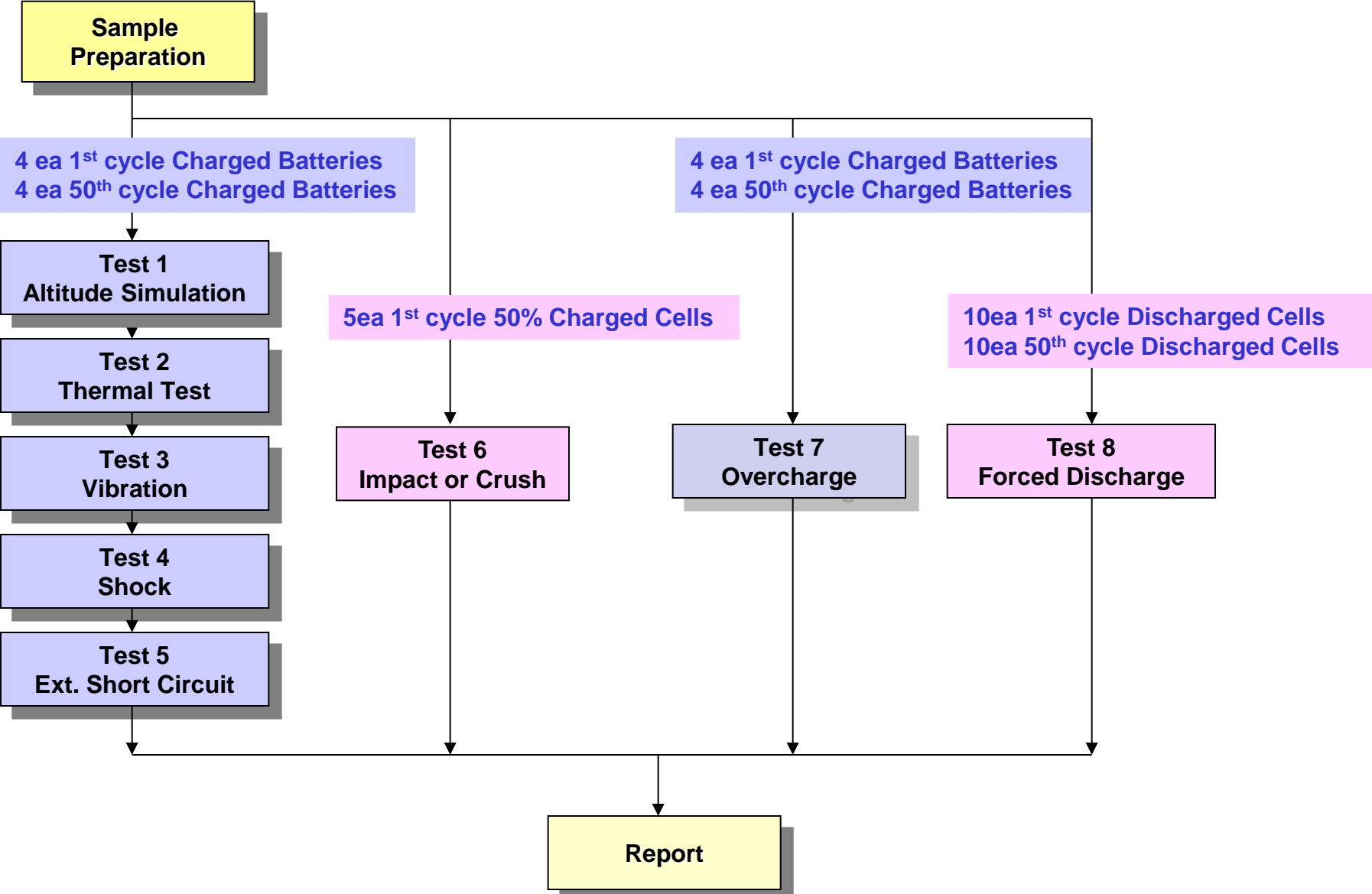
Rev.5 / Amd.2

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- Measuring mass before/ after each test (If M<1g, less than 0.5%, If 1g≤M≤75g, less than 0.2%, If M>75g, less than 0.1%) - Measuring voltage before/ after each test (more than 90%) - No leakage, no venting, no disassembly, no rupture, no fire
Test 2. Thermal Test	[72±2℃,6hr ↔ -40±2℃,6hr,interval max. 30min] x 10cycle Storing at 20±5℃ for 24h	
Test 3. Vibration	[7Hz↔200Hz↔7Hz, in 15min] x 12 times x 3 direction 1) sinusoidal waveform with a logarithmic sweep 2) 7Hz 18Hz (maintaining 1gn) app. 50Hz (until 8gn) 200Hz (maintaining 8gn), 1.6mm total excursion	- No disassembly, no rupture, no fire within 6 hours after the test - Temp. monitoring (max. 170℃)
Test 4. Shock	Half sine shock (peak acceleration : 150gn, pulse duration : 6msec) x 6 (±x, y, z), direction x 3 cycle	
Test 5. External Short Circuit	100mΩ ext. short-circuit at 55±2℃ 1hr continue after returning at 55±2℃	- No disassembly, no fire within 6 hours after the test - Temp. monitoring (max. 170℃)
Test 6. Impact for cylindrical cells (> 18mm diameter)	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	
Test 6. Crush for cylindrical cells (≤ 18mm diameter) for prismatic, pouch, coin/button cells	Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation	- No disassembly, no fire within 7 days after the test
Test 7. Overcharge	Current = Manufacturer's recommended max. continuous charge current X 2 Voltage 1.If charge voltage ≤ 18V, V (min.) = 2 x (max. charge voltage) or V (min.) = 22V. 2.If charge voltage > 18V, V (min.) = 1.2 x (max. charge voltage)	
Test 8. Forced Discharge	Discharge at max. discharge current (with 12V DC power supply), Duration time = rated capacity/initial test current	

* Tests through T1-T5 shall be conducted in sequence with the same samples.

* We declare that the above-mentioned test is the result of being checked according to UN Test (Manual of Test and Criteria ST/SG/AC.10/11/Rev.5/Amd.2)

2. Test Procedure



3-1. T1-T4 Test Result

Before			Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
NO.	OCV	Mass	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result	OCV	Mass	Residual OCV(%)	Mass Loss(%)	Result

A. 1st cycle fully state

Charge	1	8.671	156.61	8.666	156.59	99.94	0.013	Pass	8.552	156.58	98.68	0.006	Pass	8.550	156.57	99.98	0.006	Pass	8.547	156.57	99.96	0.000	Pass
	2	8.641	156.69	8.633	156.67	99.91	0.013	Pass	8.528	156.67	98.78	0.000	Pass	8.527	156.67	99.99	0.000	Pass	8.524	156.67	99.96	0.000	Pass
	3	8.653	156.50	8.643	156.48	99.88	0.013	Pass	8.539	156.48	98.80	0.000	Pass	8.536	156.48	99.96	0.000	Pass	8.533	156.47	99.96	0.006	Pass
	4	8.653	156.37	8.634	156.37	99.78	0.000	Pass	8.523	156.36	98.71	0.006	Pass	8.521	156.36	99.98	0.000	Pass	8.518	156.36	99.96	0.000	Pass
	Ave.	8.655	156.54	8.644	156.53	99.88	0.010	-	8.536	156.52	98.74	0.003	-	8.534	156.52	99.98	0.002	-	8.531	156.52	99.96	0.002	-

B. 50th cycle fully state

Charge	5	8.664	156.70	8.654	156.70	99.88	0.000	Pass	8.553	156.70	98.83	0.000	Pass	8.550	156.69	99.96	0.006	Pass	8.547	156.68	99.96	0.006	Pass
	6	8.665	156.81	8.651	156.81	99.84	0.000	Pass	8.541	156.80	98.73	0.006	Pass	8.540	156.79	99.99	0.006	Pass	8.540	156.79	100.00	0.000	Pass
	7	8.666	156.78	8.656	156.77	99.88	0.006	Pass	8.545	156.76	98.72	0.006	Pass	8.542	156.76	99.96	0.000	Pass	8.538	156.75	99.95	0.006	Pass
	8	8.656	156.13	8.648	156.12	99.91	0.006	Pass	8.544	156.12	98.80	0.000	Pass	8.541	156.11	99.96	0.006	Pass	8.538	156.10	99.96	0.006	Pass
	Ave.	8.663	156.61	8.652	156.60	99.88	0.003	-	8.546	156.60	98.77	0.003	-	8.543	156.59	99.97	0.005	-	8.541	156.58	99.97	0.005	-

Requirement	<ul style="list-style-type: none"> - Measuring mass before/after each test (If M>75g, less than 0.1%, 1g≤M≤75, less than 0.2%, M<1g, less than 0.5%) - Measuring voltage before/after each test (more than 90%, only charged samples) - No leakage, no venting, no disassembly, no rupture, no fire
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3-2. T5/T7 Test Result

EXT.Short Circuit (T5)

	NO.	Initial OCV(V)	Max. Temp (°C)	Result
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A. 1st cycle fully state

Charge	1	8.547	56.62	Pass
	2	8.524	55.41	Pass
	3	8.533	55.82	Pass
	4	8.518	54.99	Pass
	MAX.	8.547	56.62	-

Test Condition

- 100mΩ ext. short-circuit at 55±2°C

Over Charge (T7)

	NO.	Initial OCV(V)	Max. Temp (°C)	Result
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A. 1st cycle fully state

Charge	9	8.650	23.75	Pass
	10	8.649	23.68	Pass
	11	8.646	24.43	Pass
	12	8.648	23.56	Pass
	MAX.	8.650	24.43	-

Test Condition

- Max. Charge Current : 2305mA
 - CC/CV 2I_{max}(4610mA) 17.4V cut-off 24Hr

EXT.Short Circuit (T5)

	NO.	Initial OCV(V)	Max. Temp (°C)	Result
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B. 50th cycle fully state

Charge	5	8.547	56.53	Pass
	6	8.540	56.40	Pass
	7	8.538	55.70	Pass
	8	8.538	55.82	Pass
	MAX.	8.547	56.53	-

Requirement

- Temperature ≤ 170 (°C)
 - No disassembly, no rupture, no fire within 6 hours after the test

Over Charge (T7)

	NO.	Initial OCV(V)	Max. Temp (°C)	Result
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B. 50th cycle fully state

Charge	13	8.624	24.91	Pass
	14	8.621	23.31	Pass
	15	8.629	24.84	Pass
	16	8.621	25.09	Pass
	MAX.	8.629	25.09	-

Requirement

- No disassembly, no fire within 7 day after the test

3-3. T6/T8 Test Result (ICP595490A1)

Crush (T6)

Direction	NO.	Initial OCV(V)	Max. Temp (°C)	Result
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A. 1st cycle 50% charged state (Direction :Flat)

Flat	C-1	3.816	22.57	Pass
	C-2	3.817	22.44	Pass
	C-3	3.816	22.42	Pass
	C-4	3.817	22.47	Pass
	C-5	3.816	22.48	Pass
MAX.		3.817	22.57	-

Test Condition

- Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation

Requirement

- Temperature ≤ 170 (°C)
- No disassembly, no fire within 6 hours after the test

Forced Discharge (T8)

NO.	Initial OCV(V)	Max. Temp (°C)	Result
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A. 1st cycle fully Discharged state

C-6	3.112	46.32	Pass
C-7	3.110	45.74	Pass
C-8	3.109	44.21	Pass
C-9	3.115	47.13	Pass
C-10	3.109	48.21	Pass
C-11	3.116	47.56	Pass
C-12	3.108	47.46	Pass
C-13	3.114	47.20	Pass
C-14	3.110	48.49	Pass
C-15	3.114	47.32	Pass
MAX.	3.116	48.49	-

B. 50th cycle fully discharged state

C-16	3.221	44.84	Pass
C-17	3.222	44.26	Pass
C-18	3.218	43.21	Pass
C-19	3.220	44.56	Pass
C-20	3.217	45.26	Pass
C-21	3.225	45.52	Pass
C-22	3.219	46.79	Pass
C-23	3.220	44.52	Pass
C-24	3.222	44.82	Pass
C-25	3.216	42.69	Pass
MAX.	3.225	46.82	-

Test Condition

- Discharge at max. discharge current
(with 12V DC power supply) : 4500mA
Duration time: rated capacity (60.0min)

Requirement

- No disassembly, no fire within 7 days after the test

Appendix 1. 1.2m Drop Test Report

A. Test Result

No	Name of Test Items	Standard requirement or The Clause Number of Standard	Test Result		Conclusion
1	1.2m Drop Test	* UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS" Model Regulations(18 th) special provisions 188	Face	The package is not cracked, the contents are not damaged and not shifted.	Passed
			Edge	The package is not cracked, the contents are not damaged and not shifted.	
			Angle	The package is not cracked, the contents are not damaged and not shifted.	
2	Gross Weight Measure	* UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS" Model Regulations(18 th) special provisions 188	365.5 g		Passed

B. Sample Description

Dimensions	246x138x36 mm	Net Weight of Batteries	310.5 g	Battery Type	Rechargeable Li-Polymer Battery
Gross weight	365.5 g	Battery number	2pcs/Carton	** Description	Carton box

C. Image After Test



* Recommendations on the transport of dangerous goods as below
Each package of cells or batteries, or the completed package must be capable of withstanding a 1.2 m drop test in any orientation without:

- 1) damage to cells or batteries contained therein
- 2) shifting of the contents so as to allow battery to battery (or cell to cell) contact
- 3) release of contents.

** Description: Description about the protection of short-circuit

Appendix 2. 1.2m Drop Test Report

A. Test Result

No	Name of Test Items	Standard requirement or The Clause Number of Standard	Test Result		Conclusion
1	1.2m Drop Test	* UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS" Model Regulations(18 th) special provisions 188	Face	The package is not cracked, the contents are not damaged and not shifted.	Passed
			Edge	The package is not cracked, the contents are not damaged and not shifted.	
			Angle	The package is not cracked, the contents are not damaged and not shifted.	
2	Gross Weight Measure	* UNITED NATIONS "Recommendations on the TRANSPORT OF DANGEROUS GOODS" Model Regulations(18 th) special provisions 188	5.773 Kg		Passed

B. Sample Description

Dimensions	365x265x245 mm	Net Weight of Batteries	4.669 Kg	Battery Type	Rechargeable Li-Polymer Battery
Gross weight	5.773 Kg	Battery number	30Pcs/Carton	** Description	Carton box

C. Image After Test



* Recommendations on the transport of dangerous goods as below
Each package of cells or batteries, or the completed package must be capable of withstanding a 1.2 m drop test in any orientation without:

- 1) damage to cells or batteries contained therein
- 2) shifting of the contents so as to allow battery to battery (or cell to cell) contact
- 3) release of contents.

** Description: Description about the protection of short-circuit