

UN38.3 Test Summary

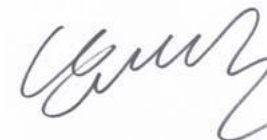
The following product has been evaluated according to the 5th revised edition Amendment 1 of the UN Manual of Tests and Criteria.
We, LG Chem, Ltd., hereby certify that this battery meets the requirements of the regulation for transportation of lithium-ion cells, batteries and single cell batteries.


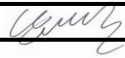

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Description		List of Test Completed	
Test Report Number	QAE-EF02-131114-PKL13L4P01	Test 1. Altitude Simulation	Pass
Date of test report	2013.11.14	Test 2. Thermal Test	Pass
Model name	L13L4P01	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	7.4 V	Test 5. External Short Circuit	Pass
Capacity	48.0 Wh	Test 6. Impact or Crush	Pass
Weight	264.0 g	Test 7. Overcharge	Pass
Dimensions	302.50mm X 61.00mm X 12.18mm	Test 8. Forced Discharge	Pass

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UN Test Report

- L13L4P01(48Wh, 7.4V) -

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2013. 11. 14

1. UN Transportation Regulation Test

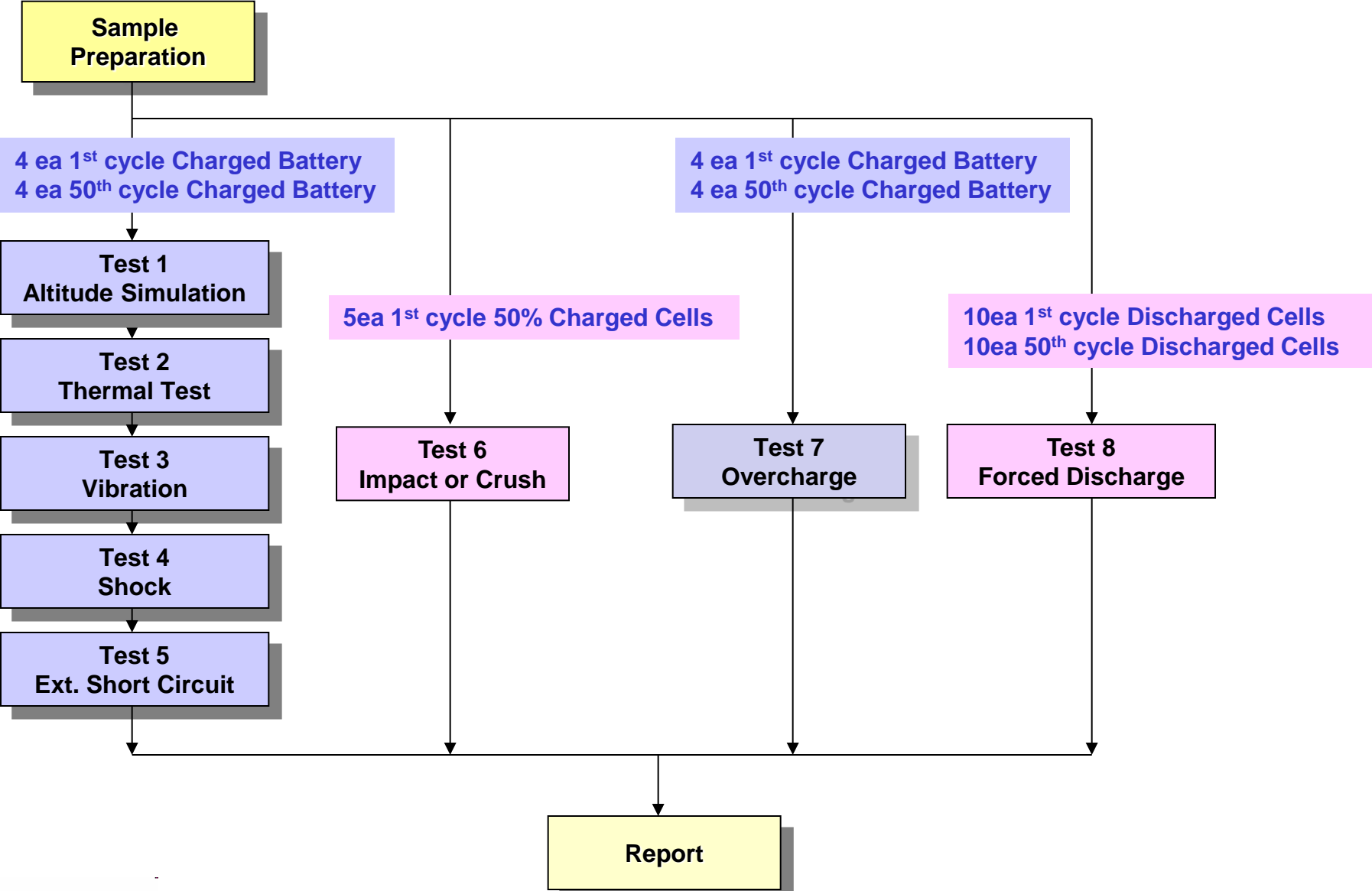
Rev.5 / Amd.1

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>5g, 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	
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℃	
Test 6. Impact for cylindrical cells (> 20mm diameter)	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	- No disassembly, no rupture, no fire (after 6 hours) - Temp. monitoring (max. 170℃)
Test 6. Crush for cylindrical cells (≤ 20mm diameter) for prismatic, pouch, coin/button cells	Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation	
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)	- No disassembly, no fire (after 7 days)
Test 8. Forced Discharge	Discharge at max. discharge current (with 12V DC power supply), Duration time = rated capacity/initial test current	- Appearance picture before/ after test (after 7 days) - Temp. monitoring (max. 170℃)

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

* 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.1)

2. Test Procedure



3-1. T1-T4 Test Result

Before			Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
Pack 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	8.376	264.22	8.367	264.20	99.89	0.007	Pass	8.286	264.18	99.03	0.007	Pass	8.284	264.16	99.98	0.006	Pass	8.281	264.15	99.96	0.006	Pass
	2	8.347	264.47	8.330	264.45	99.80	0.006	Pass	8.254	264.45	99.08	0.000	Pass	8.250	264.43	99.96	0.006	Pass	8.246	264.42	99.95	0.004	Pass
	3	8.341	264.18	8.331	264.16	99.88	0.006	Pass	8.250	264.15	99.03	0.003	Pass	8.249	264.14	99.99	0.007	Pass	8.245	264.12	99.96	0.007	Pass
	4	8.347	264.68	8.335	264.68	99.85	0.001	Pass	8.256	264.66	99.06	0.008	Pass	8.251	264.65	99.94	0.005	Pass	8.247	264.62	99.94	0.009	Pass
	Ave.	8.353	264.39	8.341	264.37	99.86	0.005	-	8.261	264.36	99.05	0.005	-	8.259	264.35	99.97	0.006	-	8.255	264.33	99.95	0.006	-

B. 50th cycle fully state

Charge	5	8.369	264.07	8.354	264.05	99.82	0.006	Pass	8.275	264.03	99.06	0.008	Pass	8.273	264.02	99.97	0.005	Pass	8.270	264.00	99.96	0.009	Pass
	6	8.359	264.60	8.343	264.59	99.81	0.006	Pass	8.260	264.58	99.02	0.004	Pass	8.256	264.55	99.95	0.008	Pass	8.252	264.55	99.95	0.001	Pass
	7	8.357	264.72	8.346	264.71	99.87	0.006	Pass	8.265	264.71	99.03	0.000	Pass	8.263	264.69	99.98	0.006	Pass	8.261	264.69	99.97	0.000	Pass
	8	8.359	264.13	8.347	264.11	99.85	0.008	Pass	8.265	264.10	99.01	0.002	Pass	8.264	264.10	99.99	0.002	Pass	8.260	264.09	99.95	0.001	Pass
	Ave.	8.361	264.38	8.347	264.36	99.84	0.006	-	8.266	264.35	99.03	0.004	-	8.264	310.63	99.97	0.005	-	8.261	264.33	99.96	0.003	-

Requirement

- Measuring mass before/after each test (If M>5g, less than 0.1%)
- Measuring voltage before/after each test (more than 90%, only charged samples)
- No leakage, no venting, no disassembly, no rupture, no fire

3-2. T5/T7 Test Result

EXT.Short Circuit (T5)				
	Pack NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully state

Charge	1	8.281	56.37	Pass
	2	8.246	55.96	Pass
	3	8.245	55.34	Pass
	4	8.247	54.80	Pass
	MAX.	8.049	56.37	-

Test Condition
- 100mΩ ext. short-circuit at 55±2°C

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully state

Charge	9	8.347	24.20	Pass
	10	8.341	25.03	Pass
	11	8.346	24.16	Pass
	12	8.348	24.99	Pass
	MAX.	8.348	25.03	-

Test Condition
- Max. Charge Current : 6486 mA - CC/CV 2Imax(12972mA) 16.8 V cut-off 24Hr

EXT.Short Circuit (T5)				
	Pack NO.	Initial OCV(V)	Max. Temp (°C)	Result

B. 50th cycle fully state

Charge	5	8.270	56.06	Pass
	6	8.252	54.89	Pass
	7	8.261	55.23	Pass
	8	8.260	55.03	Pass
	MAX.	8.042	56.06	-

Requirement
- Temperature < 170 (°C) - No disassembly, no rupture, no fire within 6 hours

Over Charge (T7)				
	Pack NO.	Initial OCV(V)	Max. Temp (°C)	Result

B. 50th cycle fully state

Charge	13	8.324	23.93	Pass
	14	8.328	24.73	Pass
	15	8.327	24.24	Pass
	16	8.326	23.64	Pass
	MAX.	8.328	24.73	-

Requirement
- No disassembly, no fire within 7 day

3-3. T6 Test Result (ICP3852120L1)

Crush (T6)

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

Direction

Direction		Initial OCV(V)	Max. Temp (°C)	Result
Flat	1	3.808	23.00	Pass
	2	3.809	22.99	Pass
	3	3.806	22.96	Pass
	4	3.808	22.98	Pass
	5	3.807	22.98	Pass
MAX.		3.809	23.00	-

Test Condition

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

Requirement

- Temperature < 170 (°C)
- No disassembly, no rupture, no fire within 6 hours

Forced Discharge (T8)

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

1	3.231	39.78	Pass
2	3.217	40.35	Pass
3	3.221	42.17	Pass
4	3.231	40.55	Pass
5	3.295	41.51	Pass
6	3.246	41.59	Pass
7	3.251	38.73	Pass
8	3.232	39.42	Pass
9	3.215	39.50	Pass
10	3.306	41.46	Pass
MAX.	3.306	42.17	-

B. 50th cycle fully discharged state

1	3.379	40.51	Pass
2	3.384	46.65	Pass
3	3.381	46.54	Pass
4	3.381	42.53	Pass
5	3.381	41.41	Pass
6	3.375	46.64	Pass
7	3.375	43.59	Pass
8	3.382	44.95	Pass
9	3.378	46.46	Pass
10	3.382	40.84	Pass
MAX.	3.384	46.65	-

Test Condition

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

Requirement

- No disassembly, no fire within 7 days

4. Sample Image



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(16 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(16 th) special provisions 188	0.614kg		Passed

B. Sample Description

Dimensions	37.0*16.0*3.6cm	Net Weight of Batteries	0.53kg	Battery Type	Rechargeable Li-ion Battery
Gross weight	0.614kg	Battery number	2PCS / 1Carton	** Description	Use the air PE bag

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(16 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(16 th) special provisions 188	7.626kg		Passed

B. Sample Description

Dimensions	42.2*35.3*18.8cm	Net Weight of Batteries	6.60kg	Battery Type	Rechargeable Li-ion Battery
Gross weight	7.626kg	Battery number	25PCS / 1Carton	** Description	Use the partition

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