

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.


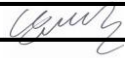

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Description		List of Test Completed	
Test Report Number	QAE-EF02-131114-PKL13L4E61	Test 1. Altitude Simulation	Pass
Date of test report	2013.11.14	Test 2. Thermal Test	Pass
Model name	L13L4E61	Test 3. Vibration	Pass
Type	Cylindrical	Test 4. Shock	Pass
Nominal voltage	7.44 V	Test 5. External Short Circuit	Pass
Capacity	41.6 Wh	Test 6. Impact or Crush	Pass
Weight	211.0 g	Test 7. Overcharge	Pass
Dimensions	267.65mm X 32.50mm X 20.60mm	Test 8. Forced Discharge	Pass

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UN Test Report

- L13L4E61(41.6Wh, 7.44V) -

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2013. 11. 14

1. UN Transportation Regulation Test

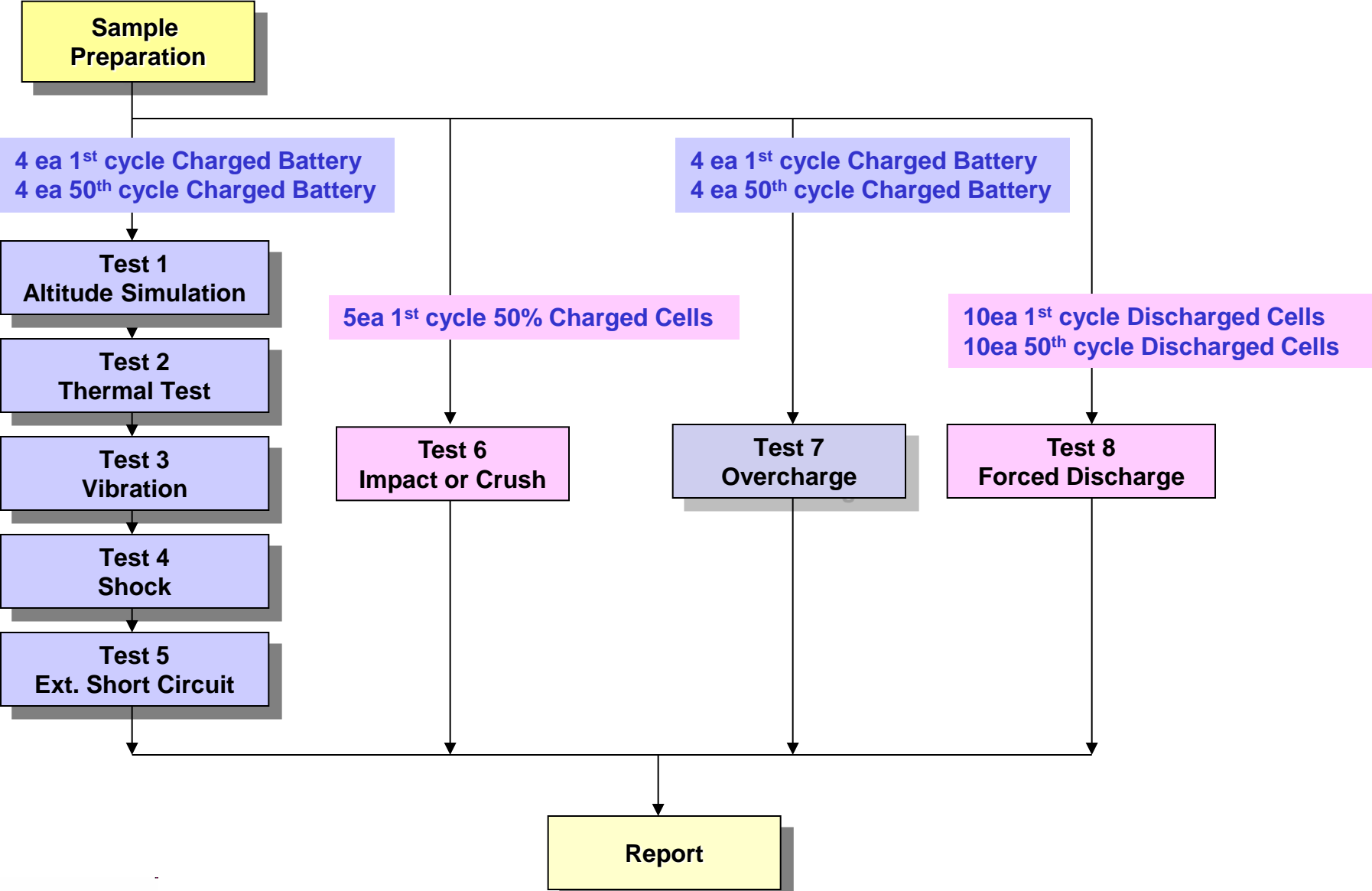
Rev.5 / Amd.1

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℃	- No disassembly, no rupture, no fire (after 6 hours) - Temp. monitoring (max. 170℃)
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	8.581	210.456	8.564	210.444	99.80	0.006	Pass	8.431	210.427	98.45	0.008	Pass	8.430	210.418	99.98	0.004	Pass	8.428	210.414	99.98	0.002	Pass
	2	8.542	210.900	8.531	210.893	99.87	0.003	Pass	8.417	210.879	98.66	0.007	Pass	8.416	210.857	99.99	0.010	Pass	8.412	210.846	99.96	0.005	Pass
	3	8.543	210.938	8.530	210.930	99.85	0.004	Pass	8.417	210.912	98.67	0.009	Pass	8.414	210.895	99.96	0.008	Pass	8.411	210.894	99.97	0.000	Pass
	4	8.548	210.686	8.536	210.685	99.86	0.000	Pass	8.424	210.674	98.69	0.005	Pass	8.422	210.663	99.98	0.005	Pass	8.421	210.658	99.99	0.002	Pass
	Ave.	8.554	210.745	8.540	210.738	99.85	0.003	-	8.422	210.723	98.62	0.007	-	8.420	210.708	99.98	0.007	-	8.418	210.703	99.98	0.002	-

B. 50th cycle fully state

Charge	5	8.562	210.111	8.551	210.102	99.87	0.004	Pass	8.441	210.102	98.72	0.000	Pass	8.438	210.084	99.96	0.009	Pass	8.437	210.071	99.99	0.006	Pass
	6	8.562	210.395	8.553	210.392	99.89	0.001	Pass	8.441	210.383	98.70	0.004	Pass	8.440	210.370	99.98	0.006	Pass	8.439	210.359	99.98	0.005	Pass
	7	8.557	210.574	8.544	210.570	99.85	0.002	Pass	8.430	210.554	98.66	0.008	Pass	8.428	210.531	99.98	0.011	Pass	8.425	210.516	99.96	0.007	Pass
	8	8.567	210.473	8.556	210.454	99.87	0.009	Pass	8.436	210.452	98.60	0.001	Pass	8.433	210.432	99.96	0.010	Pass	8.430	210.420	99.96	0.006	Pass
	Ave.	8.562	210.388	8.551	210.380	99.87	0.004	-	8.437	210.373	98.67	0.003	-	8.435	210.354	99.97	0.009	-	8.433	210.342	99.98	0.006	-

Requirement	<ul style="list-style-type: none"> - 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
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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	8.428	56.35	Pass
	2	8.412	55.27	Pass
	3	8.411	55.50	Pass
	4	8.421	56.56	Pass
	MAX.	8.428	56.56	-

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	8.542	24.66	Pass
	10	8.549	24.24	Pass
	11	8.548	25.00	Pass
	12	8.546	24.23	Pass
	MAX.	8.549	25.00	-

Test Condition
- Max. Charge Current : 2700 mA - CC/CV 2Imax(5400mA) 17.2 V cut-off 24Hr

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

B. 50th cycle fully state

Charge	5	8.437	56.65	Pass
	6	8.439	55.55	Pass
	7	8.425	55.15	Pass
	8	8.430	55.97	Pass
	MAX.	8.439	56.65	-

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	8.526	23.31	Pass
	14	8.528	24.22	Pass
	15	8.522	24.43	Pass
	16	8.521	23.42	Pass
	MAX.	8.528	24.43	-

Requirement
- No disassembly, no fire within 7 day

3-3. T6 Test Result (ICR18650C2)

Crush (T6)

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

Direction

Direction	1	Initial OCV(V)	Max. Temp (°C)	Result
Flat	1	3.777	27.36	Pass
	2	3.776	27.02	Pass
	3	3.775	27.34	Pass
	4	3.776	27.11	Pass
	5	3.776	27.09	Pass
MAX.	3.777	27.36	-	

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	3.271	75.59	Pass
2	3.281	72.54	Pass
3	3.269	71.53	Pass
4	3.281	73.29	Pass
5	3.278	71.78	Pass
6	3.291	76.31	Pass
7	3.231	73.57	Pass
8	3.233	75.00	Pass
9	3.233	73.99	Pass
10	3.238	73.90	Pass
MAX.	3.291	76.31	-

B. 50th cycle fully discharged state

1	3.354	73.47	Pass
2	3.352	70.88	Pass
3	3.366	74.03	Pass
4	3.359	69.94	Pass
5	3.365	72.75	Pass
6	3.371	74.64	Pass
7	3.354	74.05	Pass
8	3.354	74.47	Pass
9	3.355	70.81	Pass
10	3.388	74.03	Pass
MAX.	3.388	74.64	-

Test Condition

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

Requirement

- No disassembly, no fire within 7 days

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	0.484kg		Passed

B. Sample Description

Dimensions	31.5*13.8*3.6cm	Net Weight of Batteries	0.423kg	Battery Type	Rechargeable Li-ion Battery
Gross weight	0.484kg	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	5.98kg		Passed

B. Sample Description

Dimensions	345mm*205mm*300mm	Net Weight of Batteries	5.27kg	Battery Type	Rechargeable Li-ion Battery
Gross weight	5.98kg	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