




문서번호	QAE-EF02-131017-PKL13L4A01	
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UN 38.3 Test Report

- L13L4A01(32Wh, 14.4V) -

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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 and batteries.

<input type="checkbox"/> Lithium-ion cell <input checked="" type="checkbox"/> Lithium-ion battery	
Customer	Lenovo
Pack Model name	L13L4A01
Cell Model name	ICR18650S3
Pack Configuration	1P*4S
Nominal Voltage	14.4 V
Nominal Capacity	32 Wh
Test Duration	August 3, 2013 ~ October 7, 2013
Standard	UN Manual of Test and Criteria ST/SG/AC.10/11/Rev.5/Amendment1
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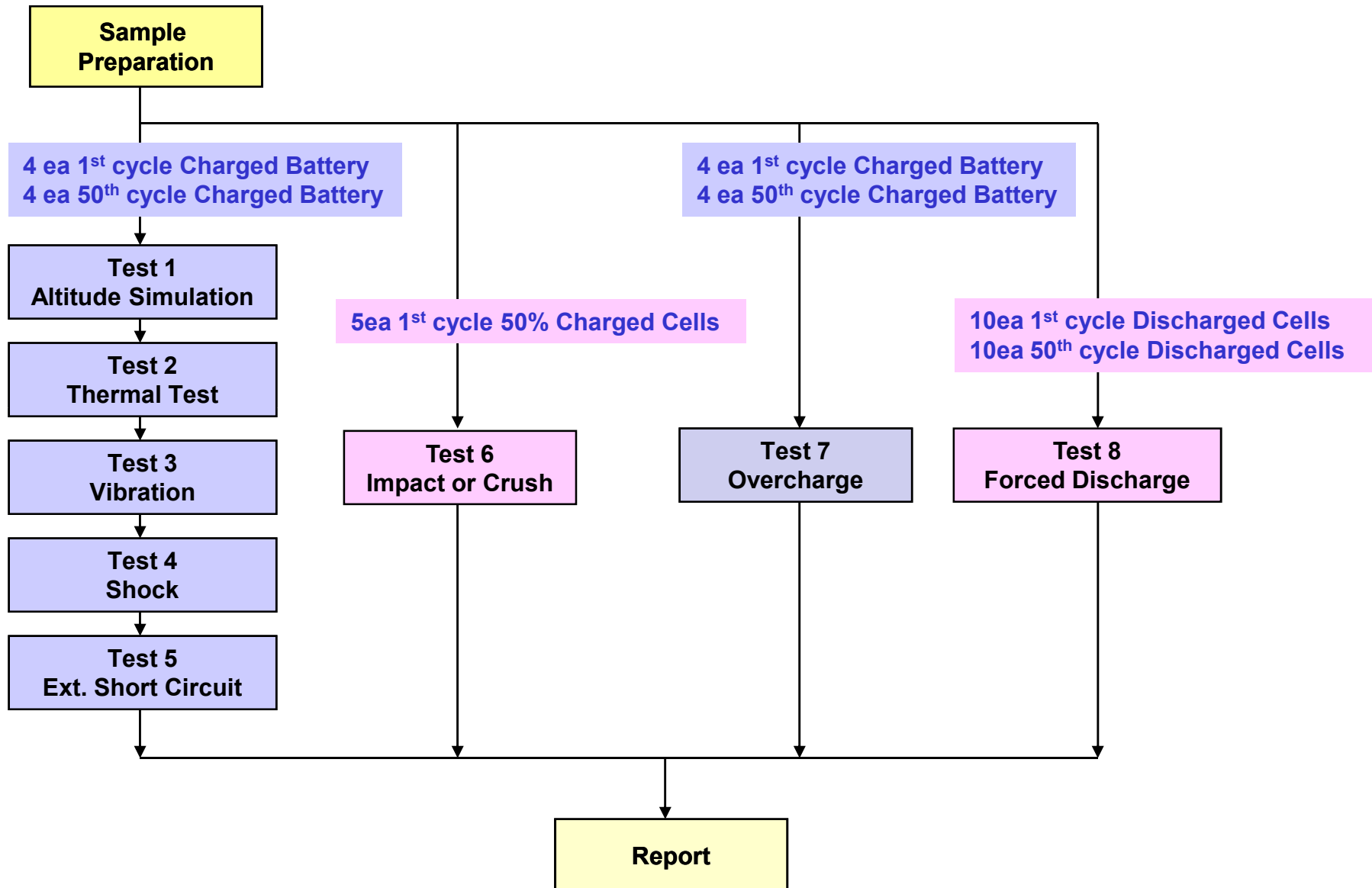
1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	
Test 2. Thermal Test	[72±2℃,6hr ↔ -40 ± 2℃,6hr,interval max. 30min] x 10cycle Storing at 20±5℃ for 24h	- Measuring mass before/ after each test (If M>5g, less than 0.1%)
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	- Measuring voltage before/ after each test (more than 90%) - No leakage, no venting, no disassembly, no rupture, no fire
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)
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	- Temp. monitoring (max. 170℃)
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	16.748	215.92	16.718	215.90	99.83	0.011	Pass	16.479	215.89	98.57	0.001	Pass	16.475	215.88	99.97	0.006	Pass	16.469	215.87	99.96	0.005	Pass
	2	16.741	215.44	16.711	215.42	99.83	0.010	Pass	16.474	215.41	98.58	0.007	Pass	16.468	215.39	99.97	0.008	Pass	16.465	215.37	99.98	0.008	Pass
	3	16.749	215.33	16.731	215.32	99.89	0.005	Pass	16.471	215.30	98.44	0.007	Pass	16.469	215.29	99.99	0.007	Pass	16.467	215.27	99.99	0.009	Pass
	4	16.748	215.53	16.727	215.51	99.87	0.010	Pass	16.489	215.50	98.57	0.008	Pass	16.485	215.48	99.98	0.006	Pass	16.481	215.47	99.97	0.003	Pass
	Ave.	16.746	215.55	16.722	215.54	99.85	0.009	-	16.478	215.52	98.54	0.006	-	16.474	215.51	99.98	0.007	-	16.470	215.49	99.97	0.007	-

B. 50th cycle fully state

Charge	5	16.747	215.02	16.726	214.99	99.87	0.011	Pass	16.479	214.99	98.52	0.002	Pass	16.474	214.98	99.97	0.005	Pass	16.473	214.97	99.99	0.003	Pass
	6	16.744	215.95	16.711	215.93	99.80	0.008	Pass	16.450	215.91	98.44	0.010	Pass	16.446	215.90	99.98	0.008	Pass	16.443	215.88	99.98	0.006	Pass
	7	16.742	215.13	16.716	215.11	99.85	0.007	Pass	16.469	215.09	98.53	0.011	Pass	16.467	215.08	99.98	0.005	Pass	16.464	215.06	99.98	0.011	Pass
	8	16.726	215.15	16.694	215.14	99.81	0.008	Pass	16.442	215.14	98.49	0.000	Pass	16.437	215.13	99.97	0.002	Pass	16.437	215.11	100.00	0.011	Pass
	Ave.	16.740	215.31	16.712	215.29	99.83	0.008	-	16.460	215.28	98.49	0.006	-	16.456	215.09	99.98	0.005	-	16.454	215.25	99.99	0.008	-

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	16.469	55.52	Pass
	2	16.465	55.08	Pass
	3	16.467	55.37	Pass
	4	16.481	55.21	Pass
	MAX.	16.481	55.52	-

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	16.757	25.00	Pass
	10	16.722	25.06	Pass
	11	16.716	25.33	Pass
	12	16.778	25.51	Pass
	MAX.	16.778	25.51	-

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	16.473	54.42	Pass
	6	16.443	54.47	Pass
	7	16.464	54.40	Pass
	8	16.437	54.24	Pass
	MAX.	16.473	54.47	-

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	16.634	25.26	Pass
	14	16.701	25.37	Pass
	15	16.701	25.29	Pass
	16	16.792	25.28	Pass
	MAX.	16.792	25.37	-

Requirement
- No disassembly, no fire within 7 day

3-3. T6 Test Result (ICR18650S3)

Crush (T6)				
	Pack NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle 50% charged state

Direction

Flat	1	3.660	27.83	Pass
	2	3.659	27.92	Pass
	3	3.662	27.77	Pass
	4	3.657	26.30	Pass
	5	3.658	27.47	Pass
MAX.		3.662	27.92	-

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

A. 1st cycle fully Discharged state

1	3.435	95.86	Pass
2	3.435	91.43	Pass
3	3.436	104.99	Pass
4	3.436	98.50	Pass
5	3.436	93.10	Pass
6	3.437	99.91	Pass
7	3.437	97.06	Pass
8	3.435	97.02	Pass
9	3.436	103.25	Pass
10	3.435	99.42	Pass
MAX.	3.437	104.99	-

B. 50th cycle fully discharged state

1	3.435	94.44	Pass
2	3.436	93.95	Pass
3	3.436	98.90	Pass
4	3.435	102.69	Pass
5	3.436	95.74	Pass
6	3.436	95.66	Pass
7	3.436	93.42	Pass
8	3.437	98.34	Pass
9	3.437	96.99	Pass
10	3.436	100.33	Pass
MAX.	3.437	102.69	-

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

