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UN38.3 Test Summary

The following product has been evaluated according to the 6th revised edition 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	QDI-181203-B-L18L3PF6	Test 1. Altitude Simulation	Pass
Date of test report	2018.12.03	Test 2. Thermal Test	Pass
Model name	L18L3PF6	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	11.34 V	Test 5. External Short Circuit	Pass
Capacity	52.50Wh	Test 6. Impact or Crush	Pass
Weight	219.49g	Test 7. Overcharge	Pass
Dimensions	202.00mmX112.00mmX6.60mm	Test 8. Forced Discharge	Pass

Approved By: Yuan Xu
Part Leader
Cyl NPI&CE lab part DQA Team
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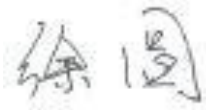

Document Number	QDI-181203-B-L18L3PF6	
Prepared	qianjunli	
Approved	Xuyuan	

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UN38.3 Test Report
- L18L3PF6 (Nom. 52.50Wh, 11.34V) -

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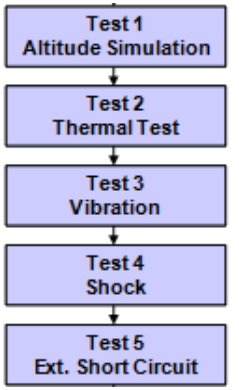
2018. 12. 03

LG Chem

1. UN38.3 Test Condition

Test item	Test Condition	Requirements	Etc.
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	- After OCV (%) ≥ 90% - No leakage, no venting, no disassembly, no rupture, no fire - Mass loss limit (leakage) 1) If M<1g, less than 0.5%, 2) If 1g≤M≤75g, less than 0.2%, 3) If M>75g, less than 0.1%)	T1~T5 : Sequence Tests 
Test 2. Thermal Test	[72±2℃,6hr↔-40±2℃,6hr, interval max. 30min]x10cycle 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 1) Peak acceleration - For cells & single cell batteries : 150gn - For batteries (whichever is smaller) : 150gn or $\sqrt{\frac{100850}{Mass(kg)}}$ gn 2) Pulse duration : 6msec 3) 6 direction (±x, y, z) x 3 cycle		
Test 5. External Short Circuit	1) Samples to be heated to 57±4℃ in chamber (Measured on external case) 2) Less than 0.1Ω, ext. short-circuit at 57±4℃ 3) 1hr continue after returning to 57±4℃	- No disassembly, no rupture, no fire within 6 hours after the test - Max. Temp ≤ 170℃	
Test 6. Impact	Φ=15.8±0.1mm bar, 9.1±0.1kg mass, 61±2.5cm height	- No disassembly, no fire within 6 hours after the test - Max. Temp ≤ 170℃	for cylindrical cells (not less than 18mm diameter)
Test 6. Crush	Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation		for cylindrical cells (less than 18mm diameter) for prismatic, pouch, coin/button cells
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 22V. 2.If charge voltage > 18V, V (min.) = 1.2 x (max. charge voltage)	- No disassembly, no fire within 7 days after the test	Only for Single Cell Battery / Battery
Test 8. Forced Discharge	Discharge at max. discharge current (connecting in series with 12V DC power supply), Duration time = rated capacity/initial test current	- No disassembly, no fire within 7 days after the test	Resistance of Electric Loader 1/Ω = (max. discharge current) / (12 + Initial OCV)

2-1. T1-T4 Test Result

Before			Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
NO.	OCV	Mass	OCV	Mass	After OCV(%)	Mass Loss(%)	Result	OCV	Mass	After OCV(%)	Mass Loss(%)	Result	OCV	Mass	After OCV(%)	Mass Loss(%)	Result	OCV	Mass	After OCV(%)	Mass Loss(%)	Result
A. 1st cycle fully charged state																						
1	12.4683	218.74	12.4662	218.73	99.98	0.005	**Pass**	12.2461	218.71	98.23	0.009	**Pass**	12.2450	218.70	99.99	0.005	**Pass**	12.2403	218.71	99.96	0.000	**Pass**
2	12.4539	218.67	12.4509	218.66	99.98	0.005	**Pass**	12.2316	218.65	98.24	0.005	**Pass**	12.2302	218.65	99.99	0.000	**Pass**	12.2228	218.65	99.94	0.000	**Pass**
3	12.4535	218.93	12.4506	218.92	99.98	0.005	**Pass**	12.2304	218.90	98.23	0.009	**Pass**	12.2282	218.90	99.98	0.000	**Pass**	12.2224	218.90	99.95	0.000	**Pass**
4	12.4496	218.64	12.4472	218.63	99.98	0.005	**Pass**	12.2262	218.61	98.22	0.009	**Pass**	12.2240	218.62	99.98	0.000	**Pass**	12.2180	218.61	99.95	0.005	**Pass**
B. 50th cycle fully charged state																						
5	12.4729	218.73	12.4716	218.72	99.99	0.005	**Pass**	12.2534	218.69	98.25	0.014	**Pass**	12.2513	218.70	99.98	0.000	**Pass**	12.2441	218.69	99.94	0.005	**Pass**
6	12.4894	219.49	12.4872	219.48	99.98	0.005	**Pass**	12.2696	219.45	98.26	0.014	**Pass**	12.2683	219.45	99.99	0.000	**Pass**	12.2606	219.45	99.94	0.000	**Pass**
7	12.4865	218.47	12.4845	218.44	99.98	0.014	**Pass**	12.2679	218.43	98.27	0.005	**Pass**	12.2607	218.43	99.94	0.000	**Pass**	12.2546	218.44	99.95	0.000	**Pass**
8	12.4822	218.35	12.4803	218.34	99.98	0.005	**Pass**	12.2638	218.33	98.27	0.005	**Pass**	12.2606	218.33	99.97	0.000	**Pass**	12.2580	218.33	99.98	0.000	**Pass**

2-2. T5/T7 Test Result

EXT.Short Circuit (T5)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
1	12.2403	58.35	Pass
2	12.2228	58.32	Pass
3	12.2224	57.71	Pass
4	12.2180	56.90	Pass
B. 50th cycle fully charged state			
5	12.2441	58.30	Pass
6	12.2606	58.38	Pass
7	12.2546	57.87	Pass
8	12.2580	57.39	Pass

Overcharge (T7)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
9	12.4573	24.42	Pass
10	12.4567	24.21	Pass
11	12.4529	24.32	Pass
12	12.4567	24.35	Pass
B. 50th cycle fully charged state			
13	12.4818	24.21	Pass
14	12.4839	23.81	Pass
15	12.4696	24.08	Pass
16	12.4864	23.81	Pass

2-3. T6/T8 Test Result (P595490B4)

Cell Document Number	QDI-180205-C-P595490B4

Crush (T6)

A. 1st cycle 50% charged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result
C-1	3.827	20.73	Pass
C-2	3.826	20.37	Pass
C-3	3.826	19.75	Pass
C-4	3.826	20.11	Pass
C-5	3.852	20.30	Pass

Forced Discharge (T8)

A. 1st cycle fully discharged state / B. 50th cycle fully discharged state

NO.	Initial OCV(V)	Max. Temp (℃)	Result	NO.	Initial OCV(V)	Max. Temp (℃)	Result
C-6	3.243	82.06	Pass	C-16	3.325	77.94	Pass
C-7	3.240	73.57	Pass	C-17	3.323	80.22	Pass
C-8	3.239	72.69	Pass	C-18	3.334	88.16	Pass
C-9	3.241	79.03	Pass	C-19	3.334	80.73	Pass
C-10	3.241	74.51	Pass	C-20	3.325	76.07	Pass
C-11	3.244	78.94	Pass	C-21	3.330	80.85	Pass
C-12	3.251	76.06	Pass	C-22	3.332	78.83	Pass
C-13	3.243	77.02	Pass	C-23	3.334	75.14	Pass
C-14	3.243	77.20	Pass	C-24	3.330	82.70	Pass
C-15	3.242	68.57	Pass	C-25	3.342	78.34	Pass

3. Sample Image