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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-180824-B-L18L3P72	Test 1. Altitude Simulation	Pass
Date of test report	2018.08.24	Test 2. Thermal Test	Pass
Model name	L18L3P72	Test 3. Vibration	Pass
Type	Pouch	Test 4. Shock	Pass
Nominal voltage	11.55 V	Test 5. External Short Circuit	Pass
Capacity	51.00Wh	Test 6. Impact or Crush	Pass
Weight	203.07g	Test 7. Overcharge	Pass
Dimensions	242.00mmX86.57mmX5.10mm	Test 8. Forced Discharge	Pass

Approved By: Yuan Xu
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UN38.3 Test Report
- L18L3P72 (Nom. 51.00Wh, 11.55V) -

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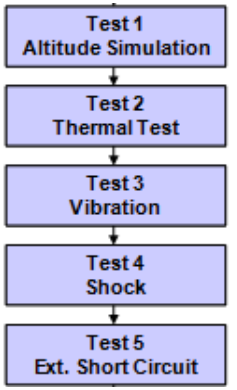
1. UN38.3 Test Condition

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] 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 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	12.9186	202.28	12.9042	202.25	99.89	0.015	Pass	12.7132	202.29	98.52	0.000	Pass	12.7115	202.30	99.99	0.000	Pass	12.7105	202.31	99.99	0.000	Pass
2	12.8830	201.99	12.8696	201.96	99.90	0.015	Pass	12.6893	202.01	98.60	0.000	Pass	12.6878	202.01	99.99	0.000	Pass	12.6865	202.01	99.99	0.000	Pass
3	12.8835	201.05	12.8693	201.00	99.89	0.025	Pass	12.6875	201.06	98.59	0.000	Pass	12.6861	201.06	99.99	0.000	Pass	12.6849	201.06	99.99	0.000	Pass
4	12.9410	201.66	12.9258	201.63	99.88	0.015	Pass	12.7282	201.67	98.47	0.000	Pass	12.7253	201.68	99.98	0.000	Pass	12.7248	201.68	100.00	0.000	Pass
B. 50th cycle fully charged state																						
5	12.9025	202.17	12.8913	202.13	99.91	0.020	Pass	12.7043	202.19	98.55	0.000	Pass	12.7028	202.18	99.99	0.005	Pass	12.7012	202.19	99.99	0.000	Pass
6	12.9035	202.43	12.8774	202.40	99.80	0.015	Pass	12.6958	202.45	98.59	0.000	Pass	12.6943	202.45	99.99	0.000	Pass	12.6929	202.46	99.99	0.000	Pass
7	12.9010	203.07	12.8784	203.04	99.82	0.015	Pass	12.6960	203.09	98.58	0.000	Pass	12.6945	203.10	99.99	0.000	Pass	12.6929	203.09	99.99	0.005	Pass
8	12.9090	202.49	12.8810	202.46	99.78	0.015	Pass	12.6961	202.51	98.56	0.000	Pass	12.6948	202.51	99.99	0.000	Pass	12.6932	202.51	99.99	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	12.7105	57.85	Pass
2	12.6865	57.30	Pass
3	12.6849	56.41	Pass
4	12.7248	56.01	Pass
B. 50th cycle fully charged state			
5	12.7012	58.20	Pass
6	12.6929	57.96	Pass
7	12.6929	56.78	Pass
8	12.6932	56.47	Pass

Overcharge (T7)			
NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully charged state			
9	12.9062	21.50	Pass
10	12.5893	21.70	Pass
11	12.8573	21.19	Pass
12	12.9670	21.54	Pass
B. 50th cycle fully charged state			
13	12.9683	20.39	Pass
14	12.9118	20.79	Pass
15	12.8978	19.84	Pass
16	12.9117	20.19	Pass

2-3. T6/T8 Test Result (P468073A1)

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Crush (T6)

NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle 50% charged state			
C-1	3.8468	21.41	**Pass**
C-2	3.8458	24.91	**Pass**
C-3	3.8468	25.40	**Pass**
C-4	3.8452	25.91	**Pass**
C-5	3.8450	24.98	**Pass**

Forced Discharge (T8)

NO.	Initial OCV(V)	Max. Temp (℃)	Result	NO.	Initial OCV(V)	Max. Temp (℃)	Result
A. 1st cycle fully discharged state				**B. 50th cycle fully discharged state**			
C-6	3.4259	83.27	**Pass**	**C-16**	3.5843	90.56	**Pass**
C-7	3.4090	83.54	**Pass**	**C-17**	3.5940	94.15	**Pass**
C-8	3.4187	85.99	**Pass**	**C-18**	3.5750	99.04	**Pass**
C-9	3.4148	86.49	**Pass**	**C-19**	3.5455	88.28	**Pass**
C-10	3.4159	92.66	**Pass**	**C-20**	3.5470	95.54	**Pass**
C-11	3.4190	87.37	**Pass**	**C-21**	3.5915	98.42	**Pass**
C-12	3.4250	89.10	**Pass**	**C-22**	3.5775	96.77	**Pass**
C-13	3.4202	66.55	**Pass**	**C-23**	3.5735	87.43	**Pass**
C-14	3.4192	90.48	**Pass**	**C-24**	3.5443	93.34	**Pass**
C-15	3.4166	88.19	**Pass**	**C-25**	3.5612	85.76	**Pass**

3. Sample Image