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CERTIFICATE OF COMPLIANCE

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.

<input type="checkbox"/> Lithium-ion cell <input checked="" type="checkbox"/> Lithium-ion battery <input type="checkbox"/> Lithium-ion single cell battery	
Model name	L18L3PF2
Cell Model name	P594285A1
Nominal voltage	11.34V
Electric power capacity	36.00Wh

Approved By: Xuyuan



Assistant Manager

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Document Number	QDI-181015-B-L18L3PF2	
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UN38.3 Test Report

– L18L3PF2 (Nom. 36.00Wh, 11.34V) –

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2018. 10. 15

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°C		T1~T5 : Sequence Tests <pre> graph TD T1[Test 1 Altitude Simulation] --> T2[Test 2 Thermal Test] T2 --> T3[Test 3 Vibration] T3 --> T4[Test 4 Shock] T4 --> T5[Test 5 Ext. Short Circuit] </pre>
Test 2. Thermal Test	[72±2°C, 6hr ↔ -40±2°C, 6hr, interval max. 30min] x 10 cycle Storing at 20±5°C 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	<ul style="list-style-type: none"> - After OCV (%) ≥ 90% - No leakage, no venting, no disassembly, no rupture, no fire - Mass loss limit (leakage) <ol style="list-style-type: none"> 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% 	
Test 4. Shock	Half sine shock 1) Peak acceleration - For cells & single cell batteries : 150gn - For batteries (whichever is smaller) : 150gn or $\sqrt{\frac{100850}{\text{Mass}(kg)}} \text{ gn}$ 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°C in chamber (Measured on external case) 2) Less than 0.1Ω, ext. short-circuit at 57±4°C 3) 1hr continue after returning to 57±4°C	<ul style="list-style-type: none"> - No disassembly, no rupture, no fire within 6 hours after the test - Max. Temp ≤ 170°C 	
Test 6. Impact	Φ=15.8±0.1mm bar, 9.1±0.1kg mass, 61±2.5cm height	<ul style="list-style-type: none"> - No disassembly, no fire within 6 hours after the test - Max. Temp ≤ 170°C 	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)	<ul style="list-style-type: none"> - 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	<ul style="list-style-type: none"> - 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	12.9002	168.41	12.8960	168.38	99.97	0.018	Pass	12.6518	168.35	98.11	0.018	Pass	12.6456	168.36	99.95	0.000	Pass	12.6432	168.35	99.98	0.006	Pass
2	12.9056	168.38	12.9013	168.35	99.97	0.018	Pass	12.6531	168.31	98.08	0.024	Pass	12.6469	168.32	99.95	0.000	Pass	12.6445	168.32	99.98	0.000	Pass
3	12.8983	168.27	12.8941	168.23	99.97	0.024	Pass	12.6503	168.19	98.11	0.024	Pass	12.6441	168.19	99.95	0.000	Pass	12.6418	168.20	99.98	0.000	Pass
4	12.8984	168.13	12.8940	168.09	99.97	0.024	Pass	12.6485	168.06	98.10	0.018	Pass	12.6423	168.07	99.95	0.000	Pass	12.6399	168.07	99.98	0.000	Pass

B. 50th cycle fully charged state

5	12.9171	168.14	12.9131	168.10	99.97	0.024	Pass	12.6727	168.08	98.14	0.012	Pass	12.6665	168.08	99.95	0.000	Pass	12.6641	168.08	99.98	0.000	Pass
6	12.9142	168.41	12.9101	168.38	99.97	0.018	Pass	12.6692	168.35	98.13	0.018	Pass	12.6628	168.35	99.95	0.000	Pass	12.6603	168.35	99.98	0.000	Pass
7	12.9206	168.20	12.9167	168.18	99.97	0.012	Pass	12.6738	168.15	98.12	0.018	Pass	12.6675	168.14	99.95	0.006	Pass	12.6648	168.15	99.98	0.000	Pass
8	12.9195	168.30	12.9156	168.27	99.97	0.018	Pass	12.6747	168.23	98.13	0.024	Pass	12.6679	168.25	99.95	0.000	Pass	12.6653	168.23	99.98	0.012	Pass

2-2. T5/T7 Test Result

EXT.Short Circuit (T5)

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

1	12.6432	58.18	Pass
2	12.6445	58.04	Pass
3	12.6418	57.55	Pass
4	12.6399	57.13	Pass

B. 50th cycle fully charged state

5	12.6641	58.25	Pass
6	12.6603	58.13	Pass
7	12.6648	57.76	Pass
8	12.6653	57.31	Pass

Overcharge (T7)

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

9	12.8947	24.72	Pass
10	12.8944	24.62	Pass
11	12.9032	24.62	Pass
12	12.8946	24.55	Pass

B. 50th cycle fully charged state

13	12.9165	24.62	Pass
14	12.9279	24.52	Pass
15	12.9226	24.38	Pass
16	12.9179	24.21	Pass

2-3. T6/T8 Test Result (P594285A1)

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

A. 1st cycle 50% charged state

C-1	3.8246	24.34	Pass
C-2	3.8248	25.36	Pass
C-3	3.8240	23.96	Pass
C-4	3.8238	24.08	Pass
C-5	3.8244	24.17	Pass

Forced Discharge (T8)							
NO.	Initial OCV(V)	Max. Temp (°C)	Result	NO.	Initial OCV(V)	Max. Temp (°C)	Result

A. 1st cycle fully discharged state

C-6	3.2873	95.03	Pass
C-7	3.2909	84.72	Pass
C-8	3.2872	89.41	Pass
C-9	3.2842	88.08	Pass
C-10	3.2933	94.86	Pass
C-11	3.2858	92.11	Pass
C-12	3.2876	91.82	Pass
C-13	3.2858	85.91	Pass
C-14	3.2854	99.33	Pass
C-15	3.2863	90.32	Pass

B. 50th cycle fully discharged state

C-16	3.3485	83.75	Pass
C-17	3.3622	105.54	Pass
C-18	3.3468	113.60	Pass
C-19	3.3488	90.78	Pass
C-20	3.3482	94.48	Pass
C-21	3.3528	106.91	Pass
C-22	3.3468	87.58	Pass
C-23	3.3518	88.36	Pass
C-24	3.3462	85.90	Pass
C-25	3.3438	90.81	Pass

