

UN38.3 Test Summary

Product	Lithium-ion cells
Model	ICR18650HD2 (2.0Ah for (A)B439LA)
Product Description	<input checked="" type="checkbox"/> Lithium ion <input type="checkbox"/> Lithium polymer <input type="checkbox"/> Lithium metal <input type="checkbox"/> Large cell <input type="checkbox"/> Small cell <input type="checkbox"/> Battery <input type="checkbox"/> Large battery <input type="checkbox"/> Small battery <input type="checkbox"/> Single cell battery <input type="checkbox"/> Multi-cell battery <input type="checkbox"/> Battery assembly

Item:	Specification	Remark
Rated Voltage (Vdc):	3.65	
Rated capacity (Ah):	2.0	
End of discharge voltage (EODV) (Vdc):	2.5	
Standard charge voltage (Vdc):	4.2	
Maximum charge voltage (Vdc):	4.2	
Standard charge current (A):	1.0	
Maximum charge current (A):	4	
Standard discharge current (A):	0.4	
Maximum discharge current (A):	22	
Mass (kg):	Approx. 44.65g	Cylindrical
Watt-hour rating , or lithium content:	7.3Wh	

Test Report number	QDI-191107-C-ICR18650HD2
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Date of Test Report	2019-11-7
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Testing Laboratory

Certification & Evaluation Team.. LG Chem. Ltd
 188 Muniro, Yuseong-gu, Daejeon, 305-738, Republic of Korea
 Website: www.LGCHEM.com /E-mail: juhongpark@lgchem.com ; Tel: 82-10-3099-3724

Test Specification	The 6th revised edition Amendment 1 of the UN Manual of Tests and Criteria
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Tests Performed and Results	Test	Results		
		Pass	Fail	N/A
	T-1: Altitude simulation	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
T-2: Thermal Test	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-3: Vibration	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-4: Shock	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-5: External short circuit	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-6: Impact / crush	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-7: Overcharge	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
T-8: Forced discharge	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	<input type="checkbox"/> 38.3.3 (f) applied <input type="checkbox"/> 38.3.3 (g) applied			

Manufactures's contact information	Mobiletron Electronics Co.,Ltd No.85, Sec.4, Chung-Ching Rd., Ta-Ya District, Taichung, 428, Taiwan Website: www.durofix.com.tw / Email: Isaac@more.com.tw Tel: 886-4-25683366 Ext :1862
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Name and Title of Signatory	Safety Senior Supervisor Wen-Yao Chi
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UN38.3 Test Summary

The following product has been evaluated according to the 6th 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.

Manufacture's contact information	LG Chem, Ltd. 128 Yeoui-Daero, Yeongdeungpo-gu, SEOUL, 150-721, REPUBLIC OF KOREA Telephone : +86-10-7742-5427 E-mail : kkammy@lgchem.com Website : www.lgchem.com		
Test Laboratory information	LG Chem, Ltd. / RESEARCH PARK 188 Munjiro, Yuseong-gu, Daejeon, 305-738, REPUBLIC OF KOREA Telephone : +82-10-3099-3724 E-mail : juhongpark@lgchem.com Website : www.lgchem.com		
	LG Chem (Nanjing) I&E Materials Co., Ltd NO.17 Hengyi Road, Nanjing Economic & Technological Development Zone, Nanjing, Jiangsu, China Telephone : +86-025-85603000-8288 E-mail : xuyuannj@lgchem.com Website : www.lgchem.com		
Description		List of Test Completed	
Test Report Number	QDI-191107-C-ICR18650HD2	Test 1. Altitude Simulation	Pass
Date of test report	2019.11.07	Test 2. Thermal Test	Pass
Model name	ICR18650HD2	Test 3. Vibration	Pass
Type	Cylindrical	Test 4. Shock	Pass
Nominal voltage	3.65V	Test 5. External Short Circuit	Pass
Capacity	2000 mAh	Test 6. Impact or Crush	Pass
Weight	44.65 g	Test 7. Overcharge	N/A
Dimensions	18.5mm X 65.2mm	Test 8. Forced Discharge	Pass

Reviewed By: Joohong Park
 IT & New Application Part Leader
 Global Standard Certification Team
 LG Chem, Ltd.
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Document Number	QDI-191107-C-ICR18650HD2	
Prepared	Taecheon Kim	
Reviewed	Juhong Park	
Approved	DaeHo Nam	

UN38.3 Test Report

- ICR18650HD2 (Min. 2000mAh, 3.65V) -

Index

1. UN38.3 Test Condition
2. Test Result
3. Sample Image

2019. 11. 07



1. UN38.3 Test Condition

Rev.6 Amendment 1

Test item	Test Condition	Requirements	Etc.
Test 1. Altitude Simulation	Storing at (low pressure)11.6kPa for 6hr at 20+/-5℃	<ul style="list-style-type: none"> - After OCV (%) ≥ 90% - No leakage, no venting, no disassembly, no rupture, no fire - Mass loss limit (leakage) <ul 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% 	<p>T1~T5 : Sequence Tests</p> <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℃,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℃		
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℃ 	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 (g)	After OCV (V)	Mass (g)	After OCV(%)	Mass Loss(%)	Result	After OCV (V)	Mass (g)	After OCV(%)	Mass Loss(%)	Result	After OCV (V)	Mass (g)	After OCV(%)	Mass Loss(%)	Result	After OCV (V)	Mass (g)	After OCV(%)	Mass Loss(%)	Result

A. 1st cycle fully charged state

1	4.169	44.660	4.169	44.660	100.00	0.000	Pass	4.115	44.660	98.70	0.000	Pass	4.114	44.659	99.98	0.002	Pass	4.114	44.659	100.00	0.000	Pass
2	4.170	44.702	4.169	44.702	99.98	0.000	Pass	4.117	44.699	98.75	0.007	Pass	4.115	44.699	99.95	0.000	Pass	4.115	44.698	100.00	0.002	Pass
3	4.169	44.615	4.169	44.615	100.00	0.000	Pass	4.117	44.612	98.75	0.007	Pass	4.115	44.612	99.95	0.000	Pass	4.115	44.612	100.00	0.000	Pass
4	4.169	44.618	4.169	44.617	100.00	0.002	Pass	4.115	44.613	98.70	0.009	Pass	4.114	44.612	99.98	0.002	Pass	4.114	44.612	100.00	0.000	Pass
5	4.169	44.662	4.169	44.661	100.00	0.002	Pass	4.116	44.660	98.73	0.002	Pass	4.116	44.660	100.00	0.000	Pass	4.116	44.660	100.00	0.000	Pass

B. 25th cycle fully charged state

6	4.185	44.594	4.185	44.594	100.00	0.000	Pass	4.141	44.592	98.95	0.004	Pass	4.139	44.592	99.95	0.000	Pass	4.139	44.592	100.00	0.000	Pass
7	4.185	44.431	4.184	44.431	99.98	0.000	Pass	4.144	44.427	99.04	0.009	Pass	4.142	44.427	99.95	0.000	Pass	4.142	44.427	100.00	0.000	Pass
8	4.184	44.581	4.184	44.581	100.00	0.000	Pass	4.139	44.581	98.92	0.000	Pass	4.138	44.580	99.98	0.002	Pass	4.138	44.580	100.00	0.000	Pass
9	4.184	44.700	4.184	44.700	100.00	0.000	Pass	4.141	44.700	98.97	0.000	Pass	4.141	44.699	100.00	0.002	Pass	4.140	44.699	99.98	0.000	Pass
10	4.184	44.688	4.184	44.688	100.00	0.000	Pass	4.139	44.686	98.92	0.004	Pass	4.139	44.685	100.00	0.002	Pass	4.139	44.685	100.00	0.000	Pass

2-2. T5/T6/T8 Test Result

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

A. 1st cycle fully charged state

1	4.114	122.54	Pass
2	4.115	112.14	Pass
3	4.115	118.70	Pass
4	4.114	120.59	Pass
5	4.116	112.05	Pass

B. 25th cycle fully charged state

6	4.139	112.81	Pass
7	4.142	119.70	Pass
8	4.138	125.62	Pass
9	4.140	116.57	Pass
10	4.139	114.10	Pass

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

A. 1st cycle 50% charged state

11	3.680	22.27	Pass
12	3.679	22.43	Pass
13	3.679	22.06	Pass
14	3.681	21.84	Pass
15	3.679	21.69	Pass

B. 25th cycle 50% charged state

16	3.682	23.36	Pass
17	3.679	20.87	Pass
18	3.681	22.57	Pass
19	3.680	20.92	Pass
20	3.680	20.63	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

21	3.353	31.06	Pass
22	3.360	31.12	Pass
23	3.363	30.53	Pass
24	3.394	29.83	Pass
25	3.388	29.91	Pass
26	3.357	30.78	Pass
27	3.426	30.61	Pass
28	3.394	30.37	Pass
29	3.382	30.19	Pass
30	3.364	30.10	Pass

B. 25th cycle fully discharged state

31	3.194	31.38	Pass
32	3.192	31.09	Pass
33	3.200	30.88	Pass
34	3.203	30.90	Pass
35	3.190	32.30	Pass
36	3.166	31.85	Pass
37	3.170	31.79	Pass
38	3.190	32.07	Pass
39	3.190	31.58	Pass
40	3.242	31.43	Pass

