
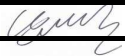



문서번호	QAE-EF02-130102-PKL12L4E01	
Prepared	김홍일	
	남익현	
Reviewed	장승현	
	남대호	
Approved	이재승	
	정준용	

SolutionPartner

UN Test Report

- L12L4E01(41Wh, 14.8V) -

목 차

1. UN Transportation Regulation Test
2. Test Procedure
3. Test Result
4. Sample Image

2013. 1. 2.



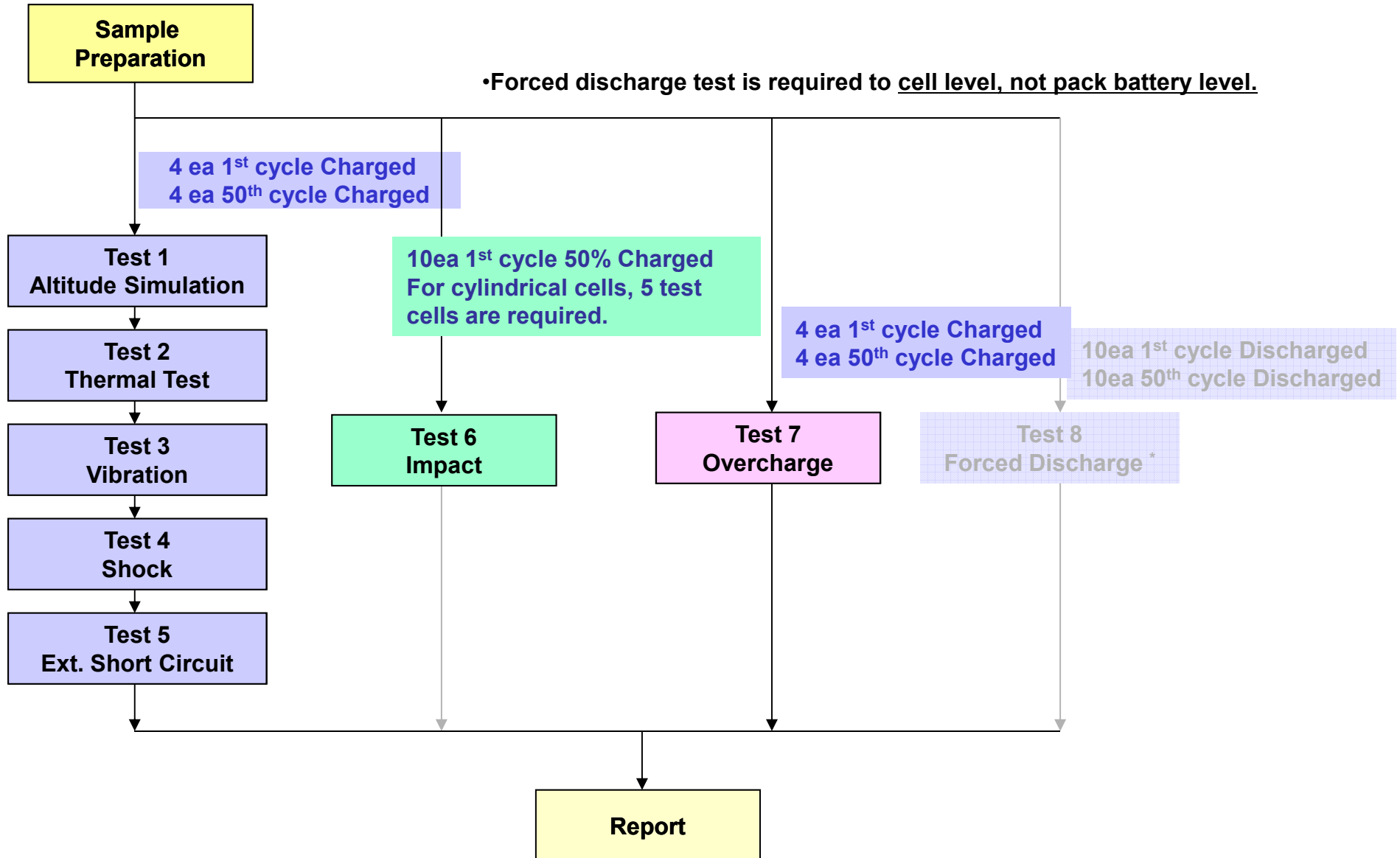
1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure) 11.6kPa for 6hr at 20+/-5°C	<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%) - No leakage, no venting, no disassembly, no rupture, no fire
Test 2. Thermal Test	[75±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	
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°C 1hr continue after returning at 55±2°C	<ul style="list-style-type: none"> - No disassembly, no rupture, no fire (after 6 hours) - Temp. monitoring (max. 170°C)
Test 6. Impact	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	
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)	<ul style="list-style-type: none"> - No disassembly, no fire (after 7 days)
Test 8. Forced Discharge	Only for Cell, not battery.	<ul style="list-style-type: none"> - No disassembly, no fire (after 7 days)

* 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)

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	17.112	224.347	17.109	224.340	99.98	0.003	Pass	16.901	224.337	98.78	0.001	Pass	16.899	224.335	99.99	0.001	Pass	16.896	224.331	99.98	0.002	Pass
	2	17.110	224.346	17.108	224.342	99.99	0.002	Pass	16.905	224.338	98.81	0.002	Pass	16.902	224.337	99.98	0.000	Pass	16.900	224.334	99.99	0.001	Pass
	3	17.111	224.354	17.107	224.351	99.98	0.001	Pass	16.911	224.340	98.85	0.005	Pass	16.911	224.339	100.00	0.000	Pass	16.910	224.336	99.99	0.001	Pass
	4	17.109	224.350	17.108	224.350	99.99	0.000	Pass	16.917	224.339	98.88	0.005	Pass	16.914	224.339	99.98	0.000	Pass	16.910	224.335	99.98	0.002	Pass
	Ave.	17.111	224.349	17.108	224.346	99.99	0.002	-	16.909	224.339	98.83	0.003	-	16.907	224.338	99.99	0.000	-	16.904	224.334	99.99	0.002	-

B. 50th cycle fully state

Charge	9	17.095	224.111	17.094	224.109	99.99	0.001	Pass	16.897	224.103	98.85	0.003	Pass	16.894	224.091	99.98	0.005	Pass	16.891	224.081	99.98	0.004	Pass
	10	17.094	224.145	17.092	224.139	99.99	0.003	Pass	16.895	224.129	98.85	0.004	Pass	16.892	224.128	99.98	0.000	Pass	16.891	224.124	99.99	0.002	Pass
	11	17.091	224.148	17.090	224.144	99.99	0.002	Pass	16.892	224.140	98.84	0.002	Pass	16.892	224.139	100.00	0.000	Pass	16.891	224.131	99.99	0.004	Pass
	12	17.100	224.144	17.090	224.141	99.94	0.001	Pass	16.890	224.130	98.83	0.005	Pass	16.799	224.127	99.46	0.001	Pass	16.794	224.120	99.97	0.003	Pass
	Ave.	17.095	224.137	17.092	224.133	99.98	0.002	-	16.894	224.126	98.84	0.003	-	16.869	310.633	99.86	0.002	-	16.867	224.114	99.99	0.003	-

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
--------------------	---

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	16.896	55.21	Pass
	2	16.900	55.39	Pass
	3	16.910	55.82	Pass
	4	16.910	55.79	Pass
	MAX.	16.910	55.82	-

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	17	17.100	25.32	Pass
	18	17.111	24.99	Pass
	19	17.099	25.32	Pass
	20	17.101	25.12	Pass
	MAX.	17.111	25.32	-

Test Condition
- Max. Charge Current : 2600 mA - CC/CV 2Imax(5200mA) 22V cut-off 24Hr

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

B. 50th cycle fully state

Charge	9	16.891	54.68	Pass
	10	16.891	57.32	Pass
	11	16.891	54.63	Pass
	12	16.794	55.32	Pass
	MAX.	16.891	57.32	-

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	21	17.091	25.89	Pass
	22	17.090	25.99	Pass
	23	17.087	26.53	Pass
	24	17.093	26.03	Pass
	MAX.	17.093	26.53	-

Requirement
- No disassembly, no fire within 7 day

3-3. T6 Test Result (ICR18650C2)

Impact (T6)			
Pack NO.	Initial OCV(V)	Max. Temp (°C)	Result
A. 1st cycle 50% charge state			
C-1	3.807	25.43	Pass
C-2	3.807	108.50	Pass
C-3	3.806	24.36	Pass
C-4	3.806	24.79	Pass
C-5	3.806	114.39	Pass
MAX.	3.807	114.39	-
B. 50th cycle fully discharge state			
C-6	3.351	24.83	Pass
C-7	3.362	46.43	Pass
C-8	3.387	49.26	Pass
C-9	3.369	49.90	Pass
C-10	3.353	47.55	Pass
MAX.	3.387	49.90	-
Test Condition			
- $\Phi=15.8\text{mm}$ bar, 9.1kg mass, $61 \pm 2.5\text{cm}$ height			
Requirement			
- Temperature < 170 (°C) - No disassembly, no rupture, no fire within 6 hours			

4. Sample Image

