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# UN Test Report

## - L13L1P21(17.5Wh, 3.7V)-

### 목 차

1. UN Transportation Regulation Test
  2. Test Procedure
  3. Test Result
  4. Sample Image
- Appendix. Drop Test Report

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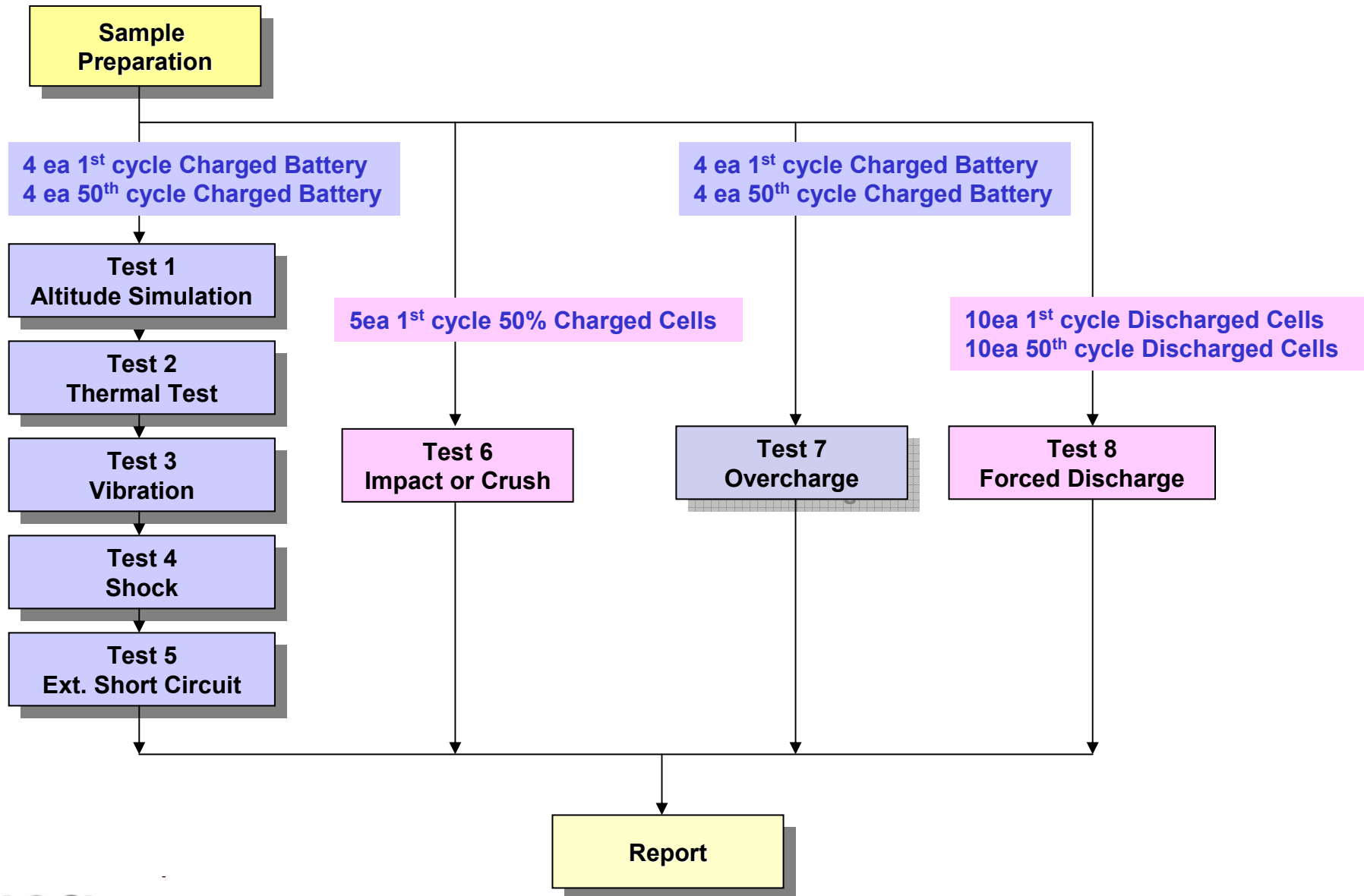
# 1. UN Transportation Regulation Test

Test	Condition	Requirements
Test 1. Altitude Simulation	Storing at (low pressure) 11.6kPa for 6hr at 20+/-5 °C	
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	- 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 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		- No disassembly, no rupture, no fire (after 6 hours) - Temp. monitoring (max. 170 °C)
Test 6. Impact for cylindrical cells (> 20mm diameter)	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height	- No disassembly, no rupture, no fire (after 6 hours) - Temp. monitoring (max. 170 °C)
Test 6. Crush for cylindrical cells (≤ 20mm diameter) for prismatic, pouch, coin/button cells	Crushing rate : 1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation	
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)	- No disassembly, no fire (after 7 days)
Test 8. Forced Discharge	Discharge at max. discharge current (with 12V DC power supply), Duration time = rated capacity/initial test current	- Appearance picture before/ after test (after 7 days) - Temp. monitoring (max. 170 °C)

\* 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/Amd.1)

## 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	4.144	92.266	4.136	92.266	99.81	0.000	Pass	4.096	92.245	99.04	0.023	Pass	4.091	92.227	99.88	0.019	Pass	4.086	92.214	99.87	0.014	Pass
	2	4.148	92.867	4.141	92.845	99.81	0.024	Pass	4.099	92.833	99.01	0.013	Pass	4.092	92.809	99.81	0.026	Pass	4.088	92.800	99.90	0.010	Pass
	3	4.142	92.207	4.138	92.188	99.89	0.021	Pass	4.100	92.165	99.08	0.024	Pass	4.091	92.147	99.80	0.020	Pass	4.086	92.132	99.87	0.016	Pass
	4	4.143	92.810	4.135	92.799	99.81	0.012	Pass	4.096	92.790	99.07	0.009	Pass	4.090	92.789	99.85	0.001	Pass	4.083	92.781	99.82	0.008	Pass
	Ave.	4.144	92.538	4.137	92.524	99.83	0.014	-	4.098	92.508	99.05	0.017	-	4.091	92.493	99.83	0.017	-	4.086	92.482	99.87	0.012	-

## B. 50th cycle fully state

Charge	5	4.135	92.216	4.128	92.214	99.84	0.002	Pass	4.089	92.209	99.05	0.005	Pass	4.083	92.187	99.84	0.024	Pass	4.077	92.174	99.88	0.014	Pass
	6	4.135	92.890	4.129	92.889	99.85	0.002	Pass	4.088	92.885	99.02	0.004	Pass	4.081	92.870	99.81	0.016	Pass	4.075	92.863	99.87	0.008	Pass
	7	4.127	92.284	4.121	92.270	99.84	0.015	Pass	4.080	92.249	99.01	0.023	Pass	4.073	92.237	99.82	0.013	Pass	4.067	92.219	99.87	0.019	Pass
	8	4.122	92.408	4.115	92.407	99.82	0.001	Pass	4.075	92.407	99.04	0.000	Pass	4.071	92.388	99.89	0.020	Pass	4.067	92.384	99.90	0.005	Pass
	Ave.	4.130	92.449	4.123	92.445	99.84	0.005	-	4.083	92.437	99.03	0.008	-	4.077	310.633	99.84	0.018	-	4.072	92.410	99.88	0.011	-

### Requirement

- 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	4.086	58.01	Pass
	2	4.088	57.90	Pass
	3	4.086	58.87	Pass
	4	4.083	57.77	Pass
	MAX.	4.088	58.87	-

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	9	4.139	24.61	Pass
	10	4.147	24.39	Pass
	11	4.143	24.38	Pass
	12	4.146	25.43	Pass
	MAX.	4.147	25.43	-

Test Condition
- Max. Charge Current : 2000mA - CC/CV 2Imax(4000mA) 8.4V cut-off 24Hr

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

## B. 50th cycle fully state

Charge	5	4.077	57.71	Pass
	6	4.075	57.45	Pass
	7	4.067	58.06	Pass
	8	4.067	58.78	Pass
	MAX.	4.077	58.78	-

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	13	4.138	25.95	Pass
	14	4.137	24.46	Pass
	15	4.132	24.98	Pass
	16	4.134	25.16	Pass
	MAX.	4.138	25.95	-

Requirement
- No disassembly, no fire within 7 day

# 3-3. T6 Test Result (ICP3565150L1)

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

**A. 1st cycle 50% charged state**

**Direction**

Flat	1	3.799	28.44	Pass
	2	3.379	28.98	Pass
	3	3.800	28.63	Pass
	4	3.799	29.54	Pass
	5	3.798	28.71	Pass
MAX.		3.649	29.54	-

Test Condition
- Crushing rate :1.5cm/s, until 13kN±0.78kN or 100mV drop or 50% deformation

Requirement
- Temperature < 170 (°C)
- No disassembly, no rupture, no fire within 6 hours

# 4. Sample Image

