

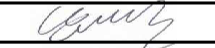




문서번호	QAE EF02 150313 CY18650MJ1	
Prepared	남익현	
	장승현	
Reviewed	남대호	
	이재승	
Approved	김병수	

SolutionPartner

UN Test Report

- ICR18650MJ1 (Nom. 3500 mAh)-

목 차

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

2020. 03. 13



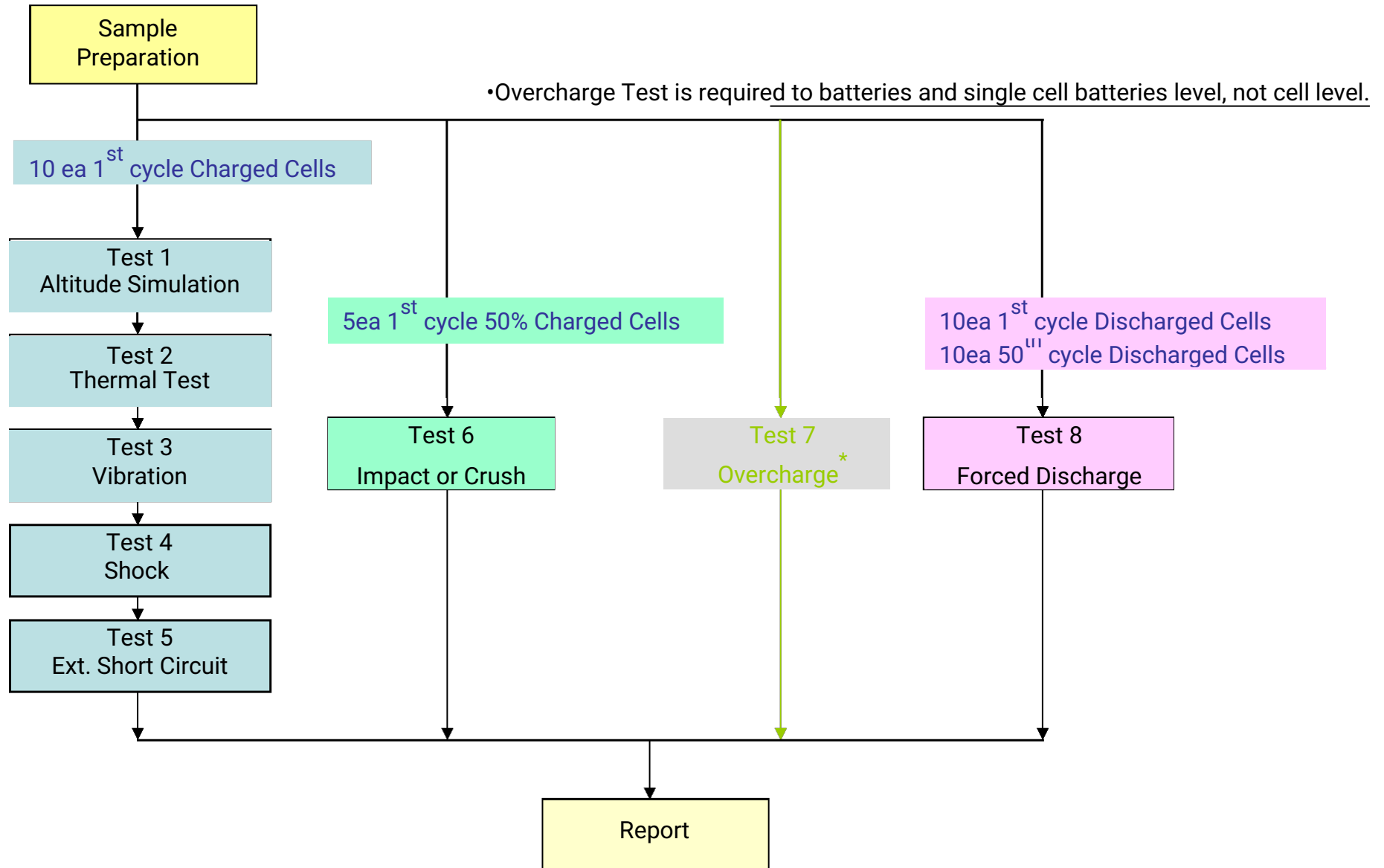
1. UN Transportation Regulation Test

Test	Condition	Requirements	
Test 1. Altitude Simulation	Storing at (low pressure) 11.6kPa for 6hr at 20+/- 5°C	Measuring mass before/ after each test (If $M < 1g$, less than 0.5%, If $1g \leq M \leq 75g$, less than 0.2%, If $M > 75g$, 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	[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		
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	100m ext. short circuit at 55±2°C 1hr continue after returning at 55±2°C		No disassembly, no rupture, no fire within 6 hours after the test Temp. monitoring (max. 170°C)
Test 6. Impact for cylindrical cells (> 18mm diameter)	Φ=15.8mm bar, 9.1kg mass, 61±2.5cm height		No disassembly, no fire within 6 hours after the test Temp. monitoring (max. 170°C)
Test 6. Crush for cylindrical cells (≤ 18mm 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	Only for battery, not cell.		Overcharge Test is required to pack battery level, not cell level.
Test 8. Forced Discharge	Discharge at max. discharge current (with 12V DC power supply), Duration time = rated capacity/initial test current	No disassembly, no fire within 7 days after the test	

5. Tests through T1 T5 shall be conducted in sequence with the same samples.

6. 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.2)

2. Test Procedure



3-1. T1-T4 Test Result

Before			Altitude (T1)					Thermal (T2)					Vibration (T3)					Shock (T4)				
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 charged state

1	4.192	46.661	4.190	46.661	99.95	0.000	Pass	4.121	46.650	98.35	0.024	Pass	4.120	46.647	99.98	0.006	Pass	4.120	46.647	100.00	0.000	Pass
2	4.193	46.498	4.190	46.497	99.93	0.002	Pass	4.121	46.488	98.35	0.019	Pass	4.121	46.486	100.00	0.004	Pass	4.120	46.486	99.98	0.000	Pass
3	4.193	46.593	4.193	46.592	100.00	0.002	Pass	4.121	46.581	98.28	0.024	Pass	4.121	46.578	100.00	0.006	Pass	4.121	46.578	100.00	0.000	Pass
4	4.193	46.741	4.190	46.740	99.93	0.002	Pass	4.121	46.732	98.35	0.017	Pass	4.120	46.730	99.98	0.004	Pass	4.120	46.730	100.00	0.000	Pass
5	4.193	46.744	4.190	46.743	99.93	0.002	Pass	4.121	46.734	98.35	0.019	Pass	4.121	46.732	100.00	0.004	Pass	4.120	46.732	99.98	0.000	Pass
6	4.193	46.527	4.190	46.527	99.93	0.000	Pass	4.120	46.515	98.33	0.026	Pass	4.120	46.513	100.00	0.004	Pass	4.119	46.513	99.98	0.000	Pass
7	4.193	46.560	4.190	46.559	99.93	0.002	Pass	4.119	46.550	98.31	0.019	Pass	4.119	46.550	100.00	0.000	Pass	4.119	46.550	100.00	0.000	Pass
8	4.192	46.811	4.190	46.811	99.95	0.000	Pass	4.121	46.799	98.35	0.026	Pass	4.121	46.797	100.00	0.004	Pass	4.121	46.797	100.00	0.000	Pass
9	4.192	46.550	4.190	46.548	99.95	0.004	Pass	4.120	46.539	98.33	0.019	Pass	4.119	46.534	99.98	0.011	Pass	4.119	46.534	100.00	0.000	Pass
10	4.192	46.552	4.190	46.552	99.95	0.000	Pass	4.120	46.543	98.33	0.019	Pass	4.119	46.540	99.98	0.006	Pass	4.119	46.540	100.00	0.000	Pass
Ave.	4.193	46.624	4.190	46.623	99.95	0.002		4.121	46.613	98.33	0.021		4.120	46.611	99.99	0.005		4.120	46.611	99.99	0.000	

Requirement	<p>Measuring mass before/after each test (If M>75g, less than 0.1%, 1g≤M≤75, less than 0.2%, M<1g, less than 0.5%)</p> <p>Measuring voltage before/after each test (more than 90%, only charged samples)</p> <p>No leakage, no venting, no disassembly, no rupture, no fire</p>
-------------	---

3-2. T5/T6/T8 Test Result

EXT.Short Circuit (T5)			
NO.	Initial OCV(V)	Max. Temp (°C)	Result
A. 1st cycle fully charged state			
1	4.120	94.24	Pass
2	4.120	99.14	Pass
3	4.121	107.09	Pass
4	4.120	91.88	Pass
5	4.120	106.93	Pass
6	4.119	97.77	Pass
7	4.119	88.29	Pass
8	4.121	96.45	Pass
9	4.119	93.29	Pass
10	4.119	95.03	Pass
MAX.	4.121	107.09	

Test Condition
100m ext. short circuit at 55±2°C

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

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

A. 1st cycle 50% charged state

Flat	11	3.573	111.58	Pass
	12	3.574	22.72	Pass
	13	3.571	103.07	Pass
	14	3.572	118.75	Pass
	15	3.504	23.40	Pass
MAX.		3.574	118.75	

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

Requirement
Temperature ≤ 170 (°C)
No disassembly, no fire within 6 hours after the test

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

A. 1st cycle fully Discharged state

16	3.120	101.98	Pass
17	3.122	113.68	Pass
18	3.127	114.90	Pass
19	3.133	100.89	Pass
20	3.104	110.99	Pass
21	3.126	112.91	Pass
22	3.129	84.53	Pass
23	3.133	112.68	Pass
24	3.122	109.24	Pass
25	3.122	112.60	Pass
MAX.	3.133	114.90	

B. 50th cycle fully discharged state

26	3.148	100.99	Pass
27	3.141	129.67	Pass
28	3.150	118.20	Pass
29	3.150	122.12	Pass
30	3.145	112.35	Pass
31	3.143	107.39	Pass
32	3.149	103.83	Pass
33	3.146	116.53	Pass
34	3.142	121.45	Pass
35	3.147	120.54	Pass
MAX.	3.150	129.67	

Test Condition
Discharge at max. discharge current (with 12V DC power supply) : 10000mA Duration time: rated capacity (21min)

Requirement
No disassembly, no fire within 7 days after the test