

Battery Pack Test Report ***(Package Drop & UN38.3)***

Customer: Lenovo

Pack Model: L09C6Y11

Nominal voltage: 11.1V dc

Nominal capacity: 4400mAh / 48Wh

Configuration: 3S2P

Customer P/N:

Lenovo: 121000822 (W)/ 121000824(B)

Compal: GC02000XN00/ GC02000XN10 (W)

GC02000XM00/ GC02000XM10 (B)

Celxpert P/N: 91NLOLSLD4SE1 (W)/

91NLOLSLD4SE2 (B)

Cell Type: LG S3 2200mAh

Approved by _____

Reviewed by _____

Prepared by 卓秋梅



Figure photo of the pack.



1. UN38.3 Test Report

Test Period	2009/4/25 ~2009/5/8		Test Spec.	ST/SG/AC.10/11/Rev.4	
Parts Name	Battery Pack	Application	NB	Quantity	24PCS

1.1 Test Summary

Item	Test Item	Test Result	Details
T1	Altitude simulation test (UN38.3-1)	Pass	Page 9
T2	Thermal test (UN38.3-2)	Pass	Page 10
T3	Vibration test (UN38.3-3)	Pass	Page 11
T4	Shock test (UN38.3-4)	Pass	Page 12
T5	Short Circuit test (UN38.3-5)	Pass	Page 13
T6	Impact Test (UN38.3-6)	Pass	Page 13
T7	Overcharge test (UN38.3-7)	Pass	Page 14

The battery pack passes UN38.3 test.

1.2 Test sample list

N o.	Pack S/N	Test item	N o.	Cell Num.	Test item
1	Sample No:1/24	38.3.1~5	1	H3634100058	38.3.6
2	Sample No:2/24	38.3.1~5	2	H3634100120	38.3.6
3	Sample No:3/24	38.3.1~5	3	H3634100505	38.3.6
4	Sample No:4/24	38.3.1~5	4	H3634101736	38.3.6
5	Sample No:5/24	38.3.1~5	5	H3634100203	38.3.6
6	Sample No:6/24	38.3.1~5	6	H3634109189	38.3.6
7	Sample No:7/24	38.3.1~5	7	H3634100298	38.3.6
8	Sample No:8/24	38.3.1~5	8	H3634100257	38.3.6
9	Sample No:9/24	38.3.1~5	9	H3634103196	38.3.6
10	Sample No:10/24	38.3.1~5	10	H3634100503	38.3.6
11	Sample No:11/24	38.3.1~5	11		
12	Sample No:12/24	38.3.1~5	12		
13	Sample No:13/24	38.3.1~5	13		
14	Sample No:14/24	38.3.1~5	14		
15	Sample No:15/24	38.3.1~5	15		
16	Sample No:16/24	38.3.1~5	16		
17	Sample No:17/24	38.3.7	17		
18	Sample No:18/24	38.3.7	18		
19	Sample No:19/24	38.3.7	19		
20	Sample No:20/24	38.3.7	20		
21	Sample No:21/24	38.3.7			
22	Sample No:22/24	38.3.7			
23	Sample No:23/24	38.3.7			
24	Sample No:24/24	38.3.7			

1.3 Test result

Item	Test Item	Test specification	Judge criteria	Sample(s)							
T1	Altitude Simulation (UN38.3-1)	1-1. 4 batteries are standard charged. 4 batteries are 0.2C fully discharged. 4 batteries are 1C cycled 50 times, ending in fully charged state. 4 batteries are 1C cycled 50 times, ending in fully discharged state. 1-2. All batteries weight is measured. The charged batteries voltage are measured and recorded. 1-3. Batteries shall be stored at a pressure of 11.6Kpa or less for at least six hours at ambient temperature 20+/-5°C. 1-4. Vacuum is released. All cells weight is measured. The charged cell voltage are measured and recorded.	No mass loss (<0.1%), no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop < 10%. Battery resistance change < ±10%.(Charge)	4 packs are standard charged (Pack#1~4) 4 packs are discharged (Pack#5~8) 4 packs 50 cycled ending in fully charged states (Pack#9~12) 4 packs 50 cycled ending in fully discharged states (Pack#13~16)							
Test Period	Start: 2009/ 4/25 End: 2009/ 4/25										
Test Equipment	數位電表 Q022, 真空烘箱 Q103, 天平 Q087										
Major Problem	-										
Warning Point	-										
Recommendation	The battery packs pass the test.										
Raw Data	Altitude Simulation Test on Charged Packs										
	No.	Before			After			Difference			Result
		OCV (V)	Resistance(mΩ)	Weight (g)	OCV (V)	Resistance(mΩ)	Weight (g)	Volt (%)	Resistance(%)	Weight (%)	
	1	12.036	147	318.95	12.010	147	318.93	-0.22%	0.00%	0.01%	Pass
	2	12.035	147	318.62	12.009	146	318.60	-0.22%	-0.07%	0.01%	Pass
	3	12.034	148	318.72	12.008	146	318.70	-0.22%	-1.62%	0.01%	Pass
	4	12.030	149	318.46	12.004	148	318.44	-0.22%	-0.13%	0.01%	Pass
	9	12.500	149	318.77	12.448	148	318.77	-0.42%	-0.54%	0.00%	Pass
	10	12.493	149	318.55	12.440	148	318.55	-0.42%	-0.60%	0.00%	Pass
	11	12.496	151	318.60	12.443	159	318.60	-0.42%	5.31%	0.00%	Pass
	12	12.500	150	318.66	12.449	150	318.66	-0.41%	-0.40%	0.00%	Pass
	Altitude Simulation Test on Discharged Packs										
	No.	Before			After			Difference			Result
		OCV (V)	Resistance(mΩ)	Weight (g)	OCV (V)	Resistance(mΩ)	Weight (g)	Volt (%)	Resistance(%)	Weight (%)	
	5	-	-	318.37	0.000	0	318.35	0.000	0	0.01%	Pass
	6	-	-	318.87	0.000	0	318.86	0.000	0	0.00%	Pass
	7	-	-	318.87	0.000	0	318.86	0.000	0	0.00%	Pass
	8	-	-	319.09	0.000	0	319.08	0.000	0	0.00%	Pass
	13	-	-	318.86	0.000	0	318.86	0.000	0	0.00%	Pass
	14	-	-	318.44	0.000	0	318.44	0.000	0	0.00%	Pass
15	-	-	318.30	0.000	0	318.29	0.000	0	0.00%	Pass	
16	-	-	318.74	0.000	0	318.73	0.000	0	0.00%	Pass	

Item	Test Item	Test specification	Judge criteria	Sample(s)							
T2	Thermal test (UN38.3-2)	2-1. Packs are stored for 6 hours at 75±2°C, followed by storage for 6 hours at -40±2°C. The maximum time interval between test temperature extremes is 30 minutes. 2-2.Repeat 2-1 for 10 times. Then store the packs at ambient for 24 hours. All packs weight are measured. The charged battery voltage are measured and recorded.	2. No mass loss (<0.1%), no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop < 10%. Battery resistance change < ± 10%.(Charge)	4 packs are standard charged (Pack#1~4) 4 packs are discharged (Pack#5~8) 4 packs 50 cycled ending in fully charged states (Pack#9~12) 4 packs 50 cycled ending in fully discharged states (Pack#13~16)							
Test Period		Start: 2009/ 4/25 End: 2009/5/1									
Test Equipment		數位電表 Q022, 冷熱衝擊機 Q109, 天平 Q087									
Major Problem		-									
Warning Point		-									
Recommendation		The packs pass the test.									
Raw Data		Thermal Test on Charged Packs									
		No.	Before			After			Difference		
		OCV (V)	Resistance(mΩ)	Weight (g)	OCV (V)	Resistance(mΩ)	Weight (g)	Volt (%)	Resistance(%)	Weight (%)	
	1	12.010	147	318.93	11.824	148	318.88	-1.55%	0.82%	0.02%	Pass
	2	12.009	146	318.60	11.821	148	318.51	-1.57%	1.37%	0.03%	Pass
	3	12.008	146	318.70	11.827	147	318.64	-1.51%	1.03%	0.02%	Pass
	4	12.004	148	318.44	11.821	150	318.38	-1.52%	0.88%	0.02%	Pass
	9	12.448	148	318.77	12.268	153	318.65	-1.45%	3.44%	0.04%	Pass
	10	12.440	148	318.55	12.262	153	318.41	-1.43%	3.37%	0.04%	Pass
	11	12.443	159	318.60	12.262	156	318.34	-1.45%	-1.95%	0.08%	Pass
	12	12.449	150	318.66	12.269	154	318.54	-1.45%	2.74%	0.04%	Pass
Raw Data		Thermal Test on Discharged Packs									
		No.	Before			After			Difference		
		OCV (V)	Resistance(mΩ)	Weight (g)	OCV (V)	Resistance(mΩ)	Weight (g)	Volt (%)	Resistance(%)	Weight (%)	
	5	0.000	0	318.35	0.000	0	318.29	0.000	0	0.02%	Pass
	6	0.000	0	318.86	0.000	0	318.80	0.000	0	0.02%	Pass
	7	0.000	0	318.86	0.000	0	318.79	0.000	0	0.02%	Pass
	8	0.000	0	319.08	0.000	0	319.02	0.000	0	0.02%	Pass
	13	0.000	0	318.86	0.000	0	318.73	0.000	0	0.04%	Pass
	14	0.000	0	318.44	0.000	0	318.36	0.000	0	0.03%	Pass
	15	0.000	0	318.29	0.000	0	318.22	0.000	0	0.02%	Pass
	16	0.000	0	318.73	0.000	0	318.67	0.000	0	0.02%	Pass

Item	Test Item	Test specification	Judge criteria	Sample(s)							
T3	Vibration test (UN38.3-3)	3-1. Packs are firmly secured to the platform of the vibration machine without distorting the packs in such a manner as to faithfully transmit the vibration. The vibration shall be a sinusoidal waveform with a logarithmic sweep between 7 and 200 Hz and back to 7 Hz traversed in 15 minutes. This cycle shall be repeated 12 times for a total of 3 hours for each of 3 mutually perpendicular to the terminal face. 3-2. The logarithmic frequency sweep is as follows: 7-18 Hz → 1gn 18-50 Hz → 0.8mm amplitude 50-200 Hz → 8gn 3-3. All packs weight are measured. The charged packs voltage are measured and recorded.	No mass loss (<0.1%), no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop < 10%. Battery resistance change < ± 10%(Charge)	4 packs are standard charged (Pack#1~4) 4 packs are discharged (Pack#5~8) 4 packs 50 cycled ending in fully charged states (Pack#9~12) 4 packs 50 cycled ending in fully discharged states (Pack#13~16)							
Test Period	Start: 2009/ 5/1 End: 2009 / 5/1										
Test Equipment	數位電表 Q022, 振動測試機 Q112, 天平 Q087										
Major Problem	-										
Warning Point	-										
Recommendation	The packs pass the test.										
Raw Data	Vibration Test on Charged Packs										
		Before			After			Difference			Result
	No.	OCV (V)	Resistance(mΩ)	Weight (g)	OCV (V)	Resistance(mΩ)	Weight (g)	Volt (%)	Resistance(%)	Weight (%)	
	1	11.824	148	318.88	11.820	148	318.88	-0.03%	-0.27%	0.00%	Pass
	2	11.821	148	318.51	11.812	148	318.54	-0.08%	-0.34%	-0.01%	Pass
	3	11.827	147	318.64	11.811	147	318.66	-0.14%	-0.14%	-0.01%	Pass
	4	11.821	150	318.38	11.801	149	318.41	-0.17%	-0.73%	-0.01%	Pass
	9	12.268	153	318.65	12.257	159	318.64	-0.09%	3.46%	0.00%	Pass
	10	12.262	153	318.41	12.251	152	318.39	-0.09%	-0.59%	0.01%	Pass
	11	12.262	156	318.34	12.258	156	318.33	-0.03%	-0.06%	0.00%	Pass
	12	12.269	154	318.54	12.261	154	318.52	-0.07%	-0.26%	0.01%	Pass
	Vibration Test on Discharged Packs										
		Before			After			Difference			Result
	No.	OCV (V)	Resistance(mΩ)	Weight (g)	OCV (V)	Resistance(mΩ)	Weight (g)	Volt (%)	Resistance(%)	Weight (%)	
	5	0.000	0	318.29	0.000	0	318.33	0.000	0	-0.01%	Pass
	6	0.000	0	318.80	0.000	0	318.81	0.000	0	0.00%	Pass
	7	0.000	0	318.79	0.000	0	318.81	0.000	0	-0.01%	Pass
	8	0.000	0	319.02	0.000	0	319.04	0.000	0	-0.01%	Pass
	13	0.000	0	318.73	0.000	0	318.72	0.000	0	0.00%	Pass
	14	0.000	0	318.36	0.000	0	318.34	0.000	0	0.01%	Pass
15	0.000	0	318.22	0.000	0	318.20	0.000	0	0.01%	Pass	
16	0.000	0	318.67	0.000	0	318.66	0.000	0	0.00%	Pass	

Item	Test Item	Test specification	Judge criteria	Sample(s)							
T4	Shock test (UN38.3-4)	4-1. Packs shall be secured to the testing machine by means of a rigid mount, which will support all mounting surfaces. 4-2. Packs shall be subjected to a half-sine shock of peak acceleration 150gn and pulse duration of 6 milliseconds. Each pack shall be subjected to 3 shocks in the positive direction followed by three shocks in the negative direction of three mutually perpendicularly mounting positions of the pack for a total of 18 shocks. 4-3. All batteries weight are measured. The charged cell voltage are measured and recorded.	No mass loss (<0.1%), no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop < 10%. Battery resistance change < \pm 10%.(Charge)	4 packs are standard charged (Pack #1~4) 4 packs are discharged (Pack #5~8) 4 packs 50 cycled ending in fully charged states (Pack #9~12) 4 packs 50 cycled ending in fully discharged states (Pack #13~16)							
Test Period		Start: 2009/5/2 End: 2009 / 5/2									
Test Equipment		數位電表 Q022, 衝擊測試機 Q113, 天平 Q087									
Major Problem		-									
Warning Point		-									
Recommendation		The packs pass the test.									
Raw Data	Shock Test on Charged Packs										
	No.	Before			After			Difference			Result
		OCV (V)	Resistance(m Ω)	Weight (g)	OCV (V)	Resistance(m Ω)	Weight (g)	Volt (%)	Resistance(%)	Weight (%)	
	1	11.820	148	318.88	11.818	147	318.87	-0.02%	-0.14%	0.00%	Pass
	2	11.812	148	318.54	11.806	147	318.52	-0.05%	-0.41%	0.01%	Pass
	3	11.811	147	318.66	11.809	147	318.66	-0.02%	0.14%	0.00%	Pass
	4	11.801	149	318.41	11.800	149	318.40	-0.01%	0.07%	0.00%	Pass
	9	12.257	159	318.64	12.251	159	318.65	-0.05%	-0.13%	0.00%	Pass
	10	12.251	152	318.39	12.247	152	318.41	-0.03%	-0.20%	-0.01%	Pass
	11	12.258	156	318.33	12.250	156	318.34	-0.07%	0.00%	0.00%	Pass
	12	12.261	154	318.52	12.254	153	318.52	-0.06%	-0.07%	0.00%	Pass
	Shock Test on Discharged Packs										
	No.	Before			After			Difference			Result
		OCV (V)	Resistance(m Ω)	Weight (g)	OCV (V)	Resistance(m Ω)	Weight (g)	Volt (%)	Resistance(%)	Weight (%)	
	5	0.000	0	318.33	0.000	0	318.30	-	-	0.01%	Pass
	6	0.000	0	318.81	0.000	0	318.81	-	-	0.00%	Pass
	7	0.000	0	318.81	0.000	0	318.80	-	-	0.00%	Pass
	8	0.000	0	319.04	0.000	0	319.02	-	-	0.01%	Pass
	13	0.000	0	318.72	0.000	0	318.73	-	-	0.00%	Pass
	14	0.000	0	318.34	0.000	0	318.35	-	-	0.00%	Pass
15	0.000	0	318.20	0.000	0	318.21	-	-	0.00%	Pass	
16	0.000	0	318.66	0.000	0	318.67	-	-	0.00%	Pass	

Item	Test Item	Test specification	Judge criteria	Sample(s)																																																																																
T5	Short Circuit Test (UN38.3-5)	5-1.Packs are placed in to a 55±2°C oven, and exterior packs temperature are monitored 5-2.When packs exterior reach 55±2°C, they are shorted by connecting terminals with a copper wire of resistance less than 100 mOhm. 5-4. The short was continued for more than 1hour or the cell temperature return to 55°C. The packs are observed for a further 6 hours.	No rupture, no disassembly, no explosion, no fire, no smoke. Packs exterior peak temperature <170°C.	4 packs are standard charged (Pack #1~4) 4 packs are discharged (Pack #5~8) 4 packs 50 cycled ending in fully charged states (Pack #9~12) 4 packs 50 cycled ending in fully discharged states (Pack #13~16)																																																																																
Test Period		Start: 2009/ 5/2 End: 2009/ 5/5																																																																																		
Test Equipment		數位電表 Q022, 資料收集器 E133, 烘箱 Q105																																																																																		
Recommendation		The packs pass the test.																																																																																		
Raw Data	<table border="1"> <thead> <tr> <th colspan="4">Short Circuit Test on Charged Packs</th> <th colspan="4">Short Circuit Test on Discharged Packs</th> </tr> <tr> <th>No.</th> <th>Max. Temp.(°C)</th> <th>Visual</th> <th>Result</th> <th>No.</th> <th>Max. Temp.(°C)</th> <th>Visual</th> <th>Result</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>58.2</td> <td>OK</td> <td>Pass</td> <td>5</td> <td>56.9</td> <td>OK</td> <td>Pass</td> </tr> <tr> <td>2</td> <td>58.6</td> <td>OK</td> <td>Pass</td> <td>6</td> <td>57.8</td> <td>OK</td> <td>Pass</td> </tr> <tr> <td>3</td> <td>57.2</td> <td>OK</td> <td>Pass</td> <td>7</td> <td>58.9</td> <td>OK</td> <td>Pass</td> </tr> <tr> <td>4</td> <td>58.5</td> <td>OK</td> <td>Pass</td> <td>8</td> <td>56.7</td> <td>OK</td> <td>Pass</td> </tr> <tr> <td>9</td> <td>55.3</td> <td>OK</td> <td>Pass</td> <td>13</td> <td>54.9</td> <td>OK</td> <td>Pass</td> </tr> <tr> <td>10</td> <td>56.6</td> <td>OK</td> <td>Pass</td> <td>14</td> <td>56.8</td> <td>OK</td> <td>Pass</td> </tr> <tr> <td>11</td> <td>55.6</td> <td>OK</td> <td>Pass</td> <td>15</td> <td>57.2</td> <td>OK</td> <td>Pass</td> </tr> <tr> <td>12</td> <td>58.4</td> <td>OK</td> <td>Pass</td> <td>16</td> <td>59.0</td> <td>OK</td> <td>Pass</td> </tr> </tbody> </table>				Short Circuit Test on Charged Packs				Short Circuit Test on Discharged Packs				No.	Max. Temp.(°C)	Visual	Result	No.	Max. Temp.(°C)	Visual	Result	1	58.2	OK	Pass	5	56.9	OK	Pass	2	58.6	OK	Pass	6	57.8	OK	Pass	3	57.2	OK	Pass	7	58.9	OK	Pass	4	58.5	OK	Pass	8	56.7	OK	Pass	9	55.3	OK	Pass	13	54.9	OK	Pass	10	56.6	OK	Pass	14	56.8	OK	Pass	11	55.6	OK	Pass	15	57.2	OK	Pass	12	58.4	OK	Pass	16	59.0	OK	Pass
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T6	Impact test (UN38.3-6)	6-1. The test sample is to be placed on a flat surface. A 15.8mm diameter bar is to be placed across the center of the sample. A 9.1 Kg mass is to be dropped from a height of 61±2.5cm onto the sample. 6-2. A cylindrical or prismatic cell is to be impacted with its longitudinal axis parallel to the flat surface.	External temperature of cell does not exceed 170°C and there is no disassembly and no fire within 6 hours of the test.	5 cells are 50% charged (Cell #1~5) 5 cells are 50 times cycled ending in fully discharged state (Cell #6~10)																																																																																
Test Period		Start: 2009/ 5/6 End: 2009/ 5/7																																																																																		
Test Equipment		數位電表 Q022, 資料收集器 E133, 撞擊試驗機 Q114																																																																																		
Recommendation		The Cells pass the test.																																																																																		
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	Impact Test on 50% Charged Cells				Impact Test on Discharged Cells																																																																															
	No.	Max. Temp.(°C)	Visual	Result	No.	Max. Temp.(°C)	Visual	Result																																																																												
	1	74.58	OK	Pass	6	21.35	OK	Pass																																																																												
	2	23.51	OK	Pass	7	22.68	OK	Pass																																																																												
	3	20.29	OK	Pass	8	23.49	OK	Pass																																																																												
	4	22.48	OK	Pass	9	25.17	OK	Pass																																																																												
5	31.25	OK	Pass	10	23.11	OK	Pass																																																																													

Item	Test Item	Test specification	Judge criteria	Sample(s)		
T7	Overcharge test (UN38.3-7)	7-1. The charge current shall be twice the Spec's recommended maximum continuous charge current. 7-2. The minimum voltage of the test shall be as follows: (a) When the Spec's recommended charge voltage is not more than 18V, the minimum voltage of the test shall be the lesser of two times the maximum charge voltage of the battery or 22V. (b) When the Spec's recommended charge voltage is more than 18V, the minimum voltage of the test shall be 1.2 times the maximum charge voltage. 7-3. Tests are to be conducted at ambient temperature. The duration of the test shall be 24 hours.	No disassembly, no fire within seven days of the test.	4 packs are fully charged (Pack#17~20) 4 packs are 50 times cycled ending in fully charged state (Pack #21~24)		
Test Period		Start: 2009/4/29 End: 2009/5/8				
Test Equipment		數位電表 Q022, 資料收集器 E133, 電源供應器 Q141				
Major Problem		-				
Warning Point		-				
Recommendation		The packs pass the test.				
Raw Data	Overcharge Test on Charged Packs					
	No.	Charge Voltage(V)	Charge Current(A)	Max. Temp.(°C)	Visual	Result
	17	22.0 V	6.0 A	24.7	OK	Pass
	18			24.8	OK	Pass
	19			24.2	OK	Pass
	20			24.4	OK	Pass
	21			28.3	OK	Pass
	22			28.3	OK	Pass
	23			28.0	OK	Pass
	24			27.7	OK	Pass