

# ***Battery Pack Test Report*** ***UN38.3***

Customer: Lenovo

Pack Model: L10C6Y02

Nominal voltage: 11.1V dc

Nominal capacity: 4400mAh / 48Wh

Configuration: 3S2P

Customer P/N: 121001071 / 121001072

Celxpert P/N: 921300001 / 921300003

Cell Type: SDI ICR18650 F 2200mAh

Jan. 27, 2018

Approved by \_\_\_\_\_

Reviewed by \_\_\_\_\_

Prepared by \_\_\_\_\_

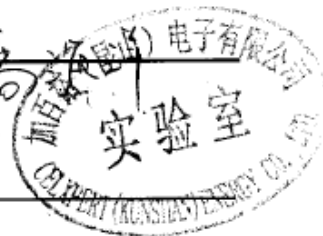
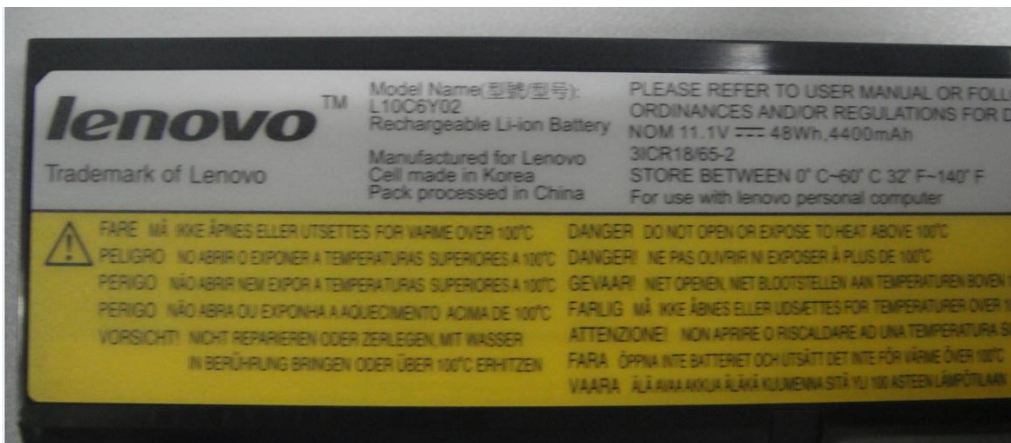


Figure photo of the pack.



# 1. UN38.3 Test Report

Test Period	2010/8/6 ~2010/9/6		Test Spec.	ST/SG/AC.10/11/Rev.4	
Parts Name	Battery Pack	Application	NB	Quantity	16PCS

## 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:1/16	38.3.1~5	1	SDI 841	38.3.6
2	Sample No:2/16	38.3.1~5	2	SDI 841	38.3.6
3	Sample No:3/16	38.3.1~5	3	SDI 841	38.3.6
4	Sample No:4/16	38.3.1~5	4	SDI 841	38.3.6
5	Sample No:5/16	38.3.1~5	5	SDI 841	38.3.6
6	Sample No:6/16	38.3.1~5	6		
7	Sample No:7/16	38.3.1~5	7		
8	Sample No:8/16	38.3.1~5	8		
9	Sample No:9/16	38.3.7	9		
10	Sample No:10/16	38.3.7	10		
11	Sample No:11/16	38.3.7			
12	Sample No:12/16	38.3.7			
13	Sample No:13/16	38.3.7			
14	Sample No:14/16	38.3.7			
15	Sample No:15/16	38.3.7			
16	Sample No:16/16	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 1C cycled 50 times, ending in fully charged state. All batteries weight is measured. The charged batteries voltage are measured and recorded. 1-2. Batteries shall be stored at a pressure of 11.6Kpa or less for at least six hours at ambient temperature 20+/-5 °C. 1-3. 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%.	4 packs are standard charged (Pack#1~4) 4 packs 50 cycled ending in fully charged states (Pack#5~8)								
Test Period		Start: 2010/8/6 End: 2010/8/6										
Test Equipment		數位電表 Q153, 真空烘箱 Q146, 天平 Q090										
Major Problem		-										
Warning Point		-										
Recommendation		The battery packs pass the test.										
Raw Data		<b>Altitude Simulation Test on Charged Packs</b>										
		No.	Before			After			Difference			Result
			OCV (V)	Resistance (mΩ)	Weight (g)	OCV (V)	Resistance (mΩ)	Weight (g)	Volt (%)	Resistance (%)	Weight (%)	
		1	12.548	101.94	301.55	12.541	102.11	301.57	0.06%	0.17%	0.01%	Pass
		2	12.544	99.64	301.51	12.438	100.02	301.51	0.85%	0.38%	0.00%	Pass
		3	12.547	100.76	301.62	12.542	100.94	301.63	0.04%	0.18%	0.00%	Pass
		4	12.546	100.25	301.63	12.540	100.85	301.63	0.05%	0.60%	0.00%	Pass
		5	12.544	101.37	301.57	12.539	101.53	301.58	0.04%	0.16%	0.00%	Pass
		6	12.543	100.48	301.59	12.535	100.53	301.59	0.06%	0.05%	0.00%	Pass
		7	12.548	99.86	301.56	12.541	100.20	301.55	0.06%	0.34%	0.00%	Pass
8	12.546	100.82	301.55	12.540	100.96	301.55	0.05%	0.14%	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.	No mass loss (<0.1%), no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop < 10%. Battery resistance change < ±10%.	4 packs are standard charged (Pack#1~4) 4 packs 50 cycled ending in fully charged states (Pack#5~8)								
Test Period		Start: 2010/8/7 End: 2010/8/14										
Test Equipment		數位電表 Q153, 冷熱衝擊機 Q155, 天平 Q090										
Major Problem		-										
Warning Point		-										
Recommendation		The packs pass the test.										
Raw Data		<b>Thermal Test on Charged Packs</b>										
			Before			After			Difference			
		No.	OCV (V)	Resistance (mΩ)	Weight (g)	OCV (V)	Resistance (mΩ)	Weight (g)	Volt (%)	Resistance (%)	Weight (%)	Result
		1	12.541	102.11	301.57	12.256	102.42	301.58	2.27%	0.30%	0.00%	Pass
		2	12.438	100.02	301.51	12.242	100.53	301.52	1.58%	0.51%	0.00%	Pass
		3	12.542	100.94	301.63	12.264	101.41	301.63	2.22%	0.47%	0.00%	Pass
		4	12.540	100.85	301.63	12.254	101.32	301.64	2.28%	0.47%	0.00%	Pass
		5	12.539	101.53	301.58	12.212	101.89	301.59	2.61%	0.35%	0.00%	Pass
		6	12.535	100.53	301.59	12.296	101.21	301.61	1.91%	0.68%	0.01%	Pass
		7	12.541	100.20	301.55	12.287	101.03	301.58	2.03%	0.83%	0.01%	Pass
8	12.540	100.96	301.55	12.291	101.47	301.56	1.99%	0.51%	0.00%	Pass		

Item	Test Item	Test specification	Judge criteria	Sample(s)								
T3	Vibration test (UN38.3-3)	<p>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.</p> <p>3-2. The logarithmic frequency sweep is as follows:            7-18 Hz → 1gn            18-50 Hz → 0.8mm amplitude            50-200 Hz → 8gn</p> <p>3-3. All packs weight are measured. The charged packs voltage are measured and recorded.</p>	<p>No mass loss (&lt;0.1%), no leakage, no venting, no disassembly, no rupture and no fire.            Battery voltage drop &lt; 10%.            Battery resistance change &lt; ±10%</p>	<p>4 packs are standard charged (Pack#1~4)            4 packs 50 cycled ending in fully charged states (Pack#5~8)</p>								
Test Period		Start: 2010/8/15 End: 2010 /8/16										
Test Equipment		數位電表 Q153, 振動測試機 Q156, 天平 Q090										
Major Problem		-										
Warning Point		-										
Recommendation		The packs pass the test.										
Raw Data		<b>Vibration Test on Charged Packs</b>										
		No.	Before			After			Difference			Result
			OCV (V)	Resistance (mΩ)	Weight (g)	OCV (V)	Resistance (mΩ)	Weight (g)	Volt (%)	Resistance (%)	Weight (%)	
		1	12.256	102.42	301.58	12.243	102.73	301.57	0.11%	0.30%	0.00%	Pass
		2	12.242	100.53	301.52	12.235	100.67	301.51	0.06%	0.14%	0.00%	Pass
		3	12.264	101.41	301.63	12.253	101.63	301.61	0.09%	0.22%	0.01%	Pass
		4	12.254	101.32	301.64	12.248	101.47	301.62	0.05%	0.15%	0.01%	Pass
		5	12.212	101.89	301.59	12.206	102.08	301.57	0.05%	0.19%	0.01%	Pass
		6	12.296	101.21	301.61	12.280	101.64	301.59	0.13%	0.42%	0.01%	Pass
		7	12.287	101.03	301.58	12.279	101.36	301.56	0.07%	0.33%	0.01%	Pass
8	12.291	101.47	301.56	12.285	101.62	301.55	0.05%	0.15%	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 < ±10%.	4 packs are standard charged (Pack#1~4) 4 packs 50 cycled ending in fully charged states (Pack#5~8)								
Test Period		Start: 2010/8/17 End: 2010 /8/17										
Test Equipment		數位電表 Q153, 衝擊測試機 Q154, 天平 Q090										
Major Problem		-										
Warning Point		-										
Recommendation		The packs pass the test.										
Raw Data		<b>Shock Test on Charged Packs</b>										
		No.	Before			After			Difference			Result
			OCV (V)	Resistance (mΩ)	Weight (g)	OCV (V)	Resistance (mΩ)	Weight (g)	Volt (%)	Resistance (%)	Weight (%)	
		1	12.243	102.73	301.57	12.240	102.90	301.56	0.02%	0.17%	0.00%	Pass
		2	12.235	100.67	301.51	12.231	100.84	301.52	0.03%	0.17%	0.00%	Pass
		3	12.253	101.63	301.61	12.248	101.77	301.62	0.04%	0.14%	0.00%	Pass
		4	12.248	101.47	301.62	12.243	101.58	301.63	0.04%	0.11%	0.00%	Pass
		5	12.206	102.08	301.57	12.201	102.22	301.58	0.04%	0.14%	0.00%	Pass
		6	12.280	101.64	301.59	12.274	101.75	301.58	0.05%	0.11%	0.00%	Pass
		7	12.279	101.36	301.56	12.271	101.51	301.57	0.07%	0.15%	0.00%	Pass
8	12.285	101.62	301.55	12.279	101.74	301.55	0.05%	0.12%	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 100m Ohm. 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 50 cycled ending in fully charged states (Pack#5~8)	
Test Period		Start: 2010/8/19 End: 2010/8/21			
Test Equipment		數位電表 Q153, 資料收集器 Q078, 烘箱 Q171			
Recommendation		The packs pass the test.			
Raw Data		<b>Short Circuit Test on Charged Packs</b>			
		No.	Max. Temp.(°C)	Visual	Result
		1	55.36	OK	Pass
		2	56.15	OK	Pass
		3	55.54	OK	Pass
		4	55.61	OK	Pass
		5	55.24	OK	Pass
		6	56.14	OK	Pass
		7	56.08	OK	Pass
8	55.82	OK	Pass		
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) For prismatic cell, 10 cells are 50% charged (Cell #1~10)	
Test Period		Start: 2010/9/2 End: 2010/9/3			
Test Equipment		數位電表 Q153, 資料收集器 Q160, 撞擊試驗機 Q231			
Recommendation		The Cells pass the test.			
Raw Data		<b>Impact Test on 50% Charged Cells</b>			
		No.	Max. Temp.(°C)	Visual	Result
		1	77.59	OK	Pass
		2	84.23	OK	Pass
		3	90.65	OK	Pass
		4	90.78	OK	Pass
5	81.36	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#9~12) 4 packs are 50 times cycled ending in fully charged state (Pack #13~16)		
Test Period		Start: 2010/8/30 End: 2010/9/6				
Test Equipment		數位電表 Q153, 資料收集器 Q151, 電源供應器 Q148				
Major Problem		-				
Warning Point		-				
Recommendation		The packs pass the test.				
Raw Data	<b>Overcharge Test on Charged Packs</b>					
	No.	Charge Voltage(V)	Charge Current(A)	Max. Temp.(°C)	Visual	Result
	9	22.0 V	6.2 A	25.23	OK	Pass
	10			25.41	OK	Pass
	11			24.86	OK	Pass
	12			24.39	OK	Pass
	13			24.64	OK	Pass
	14			25.32	OK	Pass
	15			25.16	OK	Pass
	16			24.73	OK	Pass