Battery Pack Test Report (UN38.3)

Customer: Lenovo

Pack Model: L18C3P51

Nominal voltage: 11.25V

Nominal capacity: 3735mAh/42Wh

Configuration: 3S1P

Customer P/N: SB10K97641

Celxpert P/N: 921300190

Cell Type: Coslight CA485490HV 3735mAh

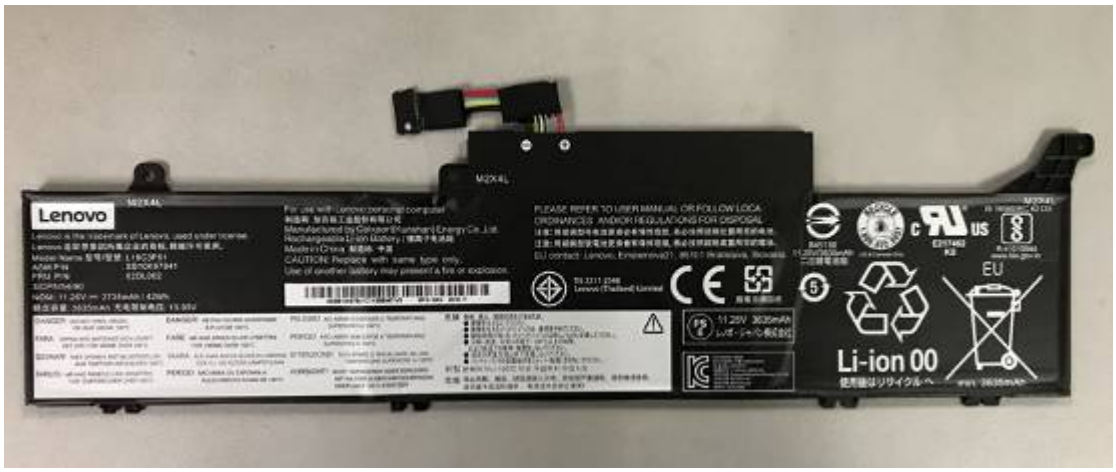
Dec.28 . 2018

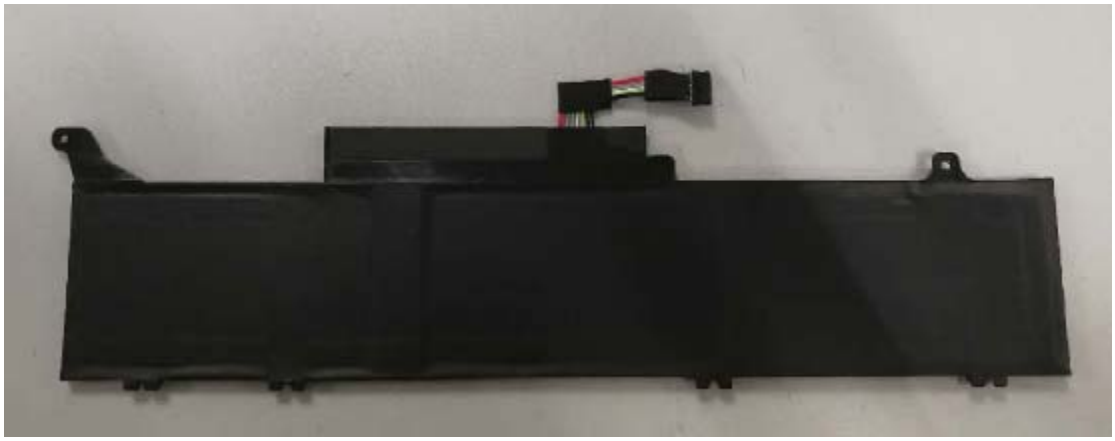
Approved by_____

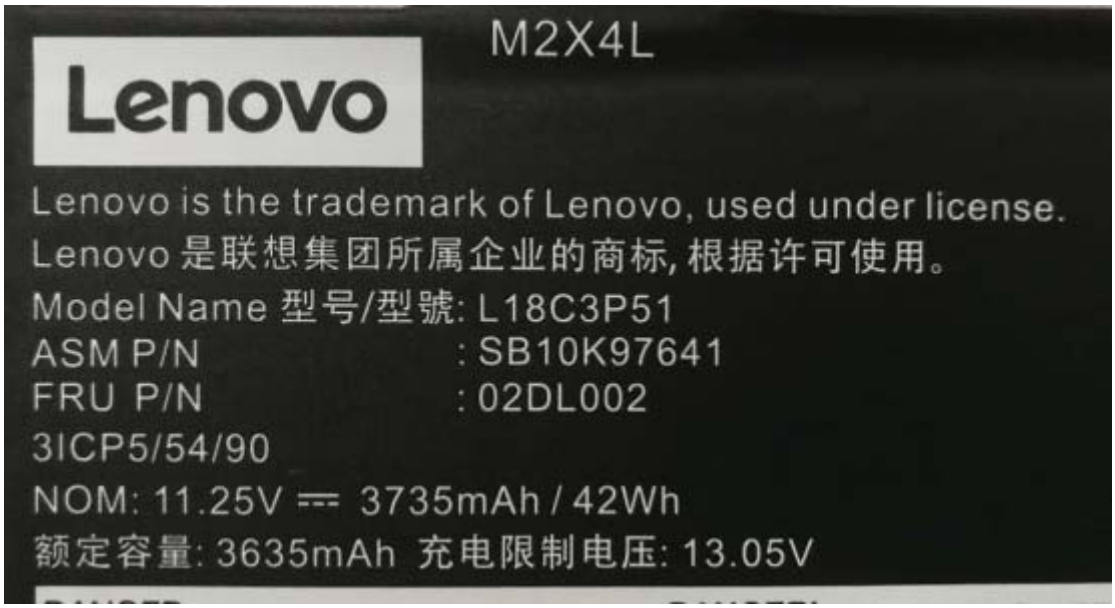
Reviewed by_____

Prepared by_____

1.Figure photo of the pack







PS:此報告僅針對送檢樣品有效

The test report is valid for the tested samples only.

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2. UN38.3 Test Report

Test Period	2018/03/09~2018/03/27		Test Spec.	ST/SG/AC.10/11/Rev.6	
Parts Name	Battery Pack	Application	NB	Quantity	Pack 16PCS/Cell25pcs

2.1 Test Summary

Item	Test Item	Test Result	Details
T1	Altitude simulation test (UN38.3-1)	Pass	Page 5
T2	Thermal test (UN38.3-2)	Pass	Page 6
T3	Vibration test (UN38.3-3)	Pass	Page 7
T4	Shock test (UN38.3-4)	Pass	Page 8
T5	Short Circuit test (UN38.3-5)	Pass	Page 9
T6	Impact Test (UN38.3-6)	Pass	Page 9
T7	Overcharge test (UN38.3-7)	Pass	Page 10
T8	Forced discharge test (UN38.3-8)	Pass	Page 11

The battery pack passes UN38.3 test.

2.2 Test sample list

No.	Pack S/N	Test item	No.	Cell Num.	Test item
1	Sample No:1/16	38.3.1~5	1	Coslight CA485490HV 3735mAh	38.3.6
2	Sample No:2/16	38.3.1~5	2	Coslight CA485490HV 3735mAh	38.3.6
3	Sample No:3/16	38.3.1~5	3	Coslight CA485490HV 3735mAh	38.3.6
4	Sample No:4/16	38.3.1~5	4	Coslight CA485490HV 3735mAh	38.3.6
5	Sample No:5/16	38.3.1~5	5	Coslight CA485490HV 3735mAh	38.3.6
6	Sample No:6/16	38.3.1~5	6	Coslight CA485490HV 3735mAh	38.3.8
7	Sample No:7/16	38.3.1~5	7	Coslight CA485490HV 3735mAh	38.3.8
8	Sample No:8/16	38.3.1~5	8	Coslight CA485490HV 3735mAh	38.3.8
9	Sample No:9/16	38.3.7	9	Coslight CA485490HV 3735mAh	38.3.8
10	Sample No:10/16	38.3.7	10	Coslight CA485490HV 3735mAh	38.3.8
11	Sample No:11/16	38.3.7	11	Coslight CA485490HV 3735mAh	38.3.8
12	Sample No:12/16	38.3.7	12	Coslight CA485490HV 3735mAh	38.3.8
13	Sample No:13/16	38.3.7	13	Coslight CA485490HV 3735mAh	38.3.8
14	Sample No:14/16	38.3.7	14	Coslight CA485490HV 3735mAh	38.3.8
15	Sample No:15/16	38.3.7	15	Coslight CA485490HV 3735mAh	38.3.8
16	Sample No:16/16	38.3.7	16	Coslight CA485490HV 3735mAh	38.3.8
			17	Coslight CA485490HV 3735mAh	38.3.8
			18	Coslight CA485490HV 3735mAh	38.3.8
			19	Coslight CA485490HV 3735mAh	38.3.8
			20	Coslight CA485490HV 3735mAh	38.3.8
			21	Coslight CA485490HV 3735mAh	38.3.8
			22	Coslight CA485490HV 3735mAh	38.3.8
			23	Coslight CA485490HV 3735mAh	38.3.8
			24	Coslight CA485490HV 3735mAh	38.3.8
			25	Coslight CA485490HV 3735mAh	38.3.8

2.3 Test result

Item	Test Item	Test specification	Judge criteria	Sample(s)
T1	Altitude Simulation (UN38.3-1)	1-1. batteries are standard charged. 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)℃. 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 first cycle in fully charged (Pack#1~4) 4 packs are 50 times cycled ending in fully charged state (Pack #5~8)

Test Period	Start: 2018/03/09 End: 2018/03/09
Test Equipment	Digital Meter Q153, Vacuum Oven Q0443, Scales Q090
Major Problem	-
Warning Point	-
Recommendation	The battery packs pass the test.

Raw Data

Altitude Simulation Test on Charged Packs

No.	Before		After		voltage residue	mass loss	other event
	OCV (V)	Weight (g)	OCV (V)	Weight (g)	Volt (%)	Weight (%)	
1	12.892	186.51	12.890	186.50	99.98%	0.00%	O
2	12.884	186.95	12.883	186.94	99.99%	0.00%	O
3	12.893	186.59	12.892	186.58	99.99%	0.00%	O
4	12.898	186.72	12.895	186.71	99.98%	0.00%	O
5	12.756	187.32	12.754	187.31	99.98%	0.00%	O
6	12.759	186.94	12.756	186.93	99.98%	0.00%	O
7	12.743	186.73	12.742	186.72	99.99%	0.00%	O
8	12.732	187.29	12.728	187.28	99.97%	0.00%	O

Note: L-Leakage ; V-Venting ; D-Disassembly ; R-Rupture ; F-Fire
O-No Leakage , No Venting , No Disassembly , No Rupture , No Fire

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）℃, followed by storage for 6 hours at -40±2℃. 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 first cycle in fully charged (Pack#1~4) 4 packs are 50 times cycled ending in fully charged state (Pack #5~8)

Test Period	Start: 2018/03/12 End:2018/03/19
Test Equipment	Digital Meter Q153, Programmable Thermal Tester Q0446, Scales Q090
Major Problem	-
Warning Point	-
Recommendation	The packs pass the test.

Raw Data

Thermal Test on Charged Packs

No.	Before		After		voltage residue	mass loss	other event
	OCV (V)	Weight (g)	OCV (V)	Weight (g)	Volt (%)	Weight (%)	
1	12.890	186.50	12.821	186.48	99.46%	0.01%	O
2	12.883	186.94	12.807	186.92	99.41%	0.01%	O
3	12.892	186.58	12.817	186.56	99.42%	0.01%	O
4	12.895	186.71	12.821	186.70	99.43%	0.01%	O
5	12.754	187.31	12.683	187.29	99.44%	0.01%	O
6	12.756	186.93	12.681	186.91	99.41%	0.01%	O
7	12.742	186.72	12.674	186.70	99.47%	0.01%	O
8	12.728	187.28	12.653	187.26	99.41%	0.01%	O

Note: L-Leakage ; V-Venting ; D-Disassembly ; R-Rupture ; F-Fire
O-No Leakage , No Venting , No Disassembly , No Rupture , No Fire

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%	4 packs are first cycle in fully charged (Pack#1~4) 4 packs are 50 times cycled ending in fully charged state (Pack #5~8)

Test Period	Start:2018/03/20 End:2018/03/22
Test Equipment	Digital Meter Q153, Vibration Tester Q300, Scales Q090
Major Problem	-
Warning Point	-
Recommendation	The packs pass the test.

Raw Data

Vibration Test on Charged Packs

No.	Before		After		voltage residue	mass loss	other event
	OCV (V)	Weight (g)	OCV (V)	Weight (g)	Volt (%)	Weight (%)	
1	12.821	186.48	12.814	186.46	99.95%	0.01%	O
2	12.807	186.92	12.800	186.90	99.95%	0.01%	O
3	12.817	186.56	12.809	186.55	99.94%	0.01%	O
4	12.821	186.70	12.813	186.68	99.94%	0.01%	O
5	12.683	187.29	12.675	187.27	99.94%	0.01%	O
6	12.681	186.91	12.675	186.89	99.95%	0.01%	O
7	12.674	186.70	12.665	186.67	99.93%	0.01%	O
8	12.653	187.26	12.646	187.24	99.94%	0.01%	O

Note: L-Leakage ; V-Venting ; D-Disassembly ; R-Rupture ; F-Fire
O-No Leakage , No Venting , No Disassembly , No Rupture , No Fire

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 first cycle in fully charged (Pack#1~4) 4 packs are 50 times cycled ending in fully charged state (Pack #5~8)

Test Period	Start:2018/03/23 End:2018/03/23
Test Equipment	Digital Meter Q153, Shock Tester Q154, Scales Q090
Major Problem	-
Warning Point	-
Recommendation	The packs pass the test.

Raw Data

Shock Test on Charged Packs

No.	Before		After		voltage residue	mass loss	other event
	OCV (V)	Weight (g)	OCV (V)	Weight (g)	Volt (%)	Weight (%)	
1	12.814	186.46	12.808	186.46	99.95%	0.00%	O
2	12.800	186.90	12.795	186.89	99.96%	0.00%	O
3	12.809	186.55	12.804	186.54	99.96%	0.00%	O
4	12.813	186.68	12.807	186.67	99.95%	0.00%	O
5	12.675	187.27	12.671	187.26	99.97%	0.00%	O
6	12.675	186.89	12.668	186.88	99.94%	0.00%	O
7	12.665	186.67	12.659	186.67	99.95%	0.00%	O
8	12.646	187.24	12.641	187.23	99.96%	0.00%	O

Note: L-Leakage ; V-Venting ; D-Disassembly ; R-Rupture ; F-Fire
O-No Leakage , No Venting , No Disassembly , No Rupture , No Fire

Item	Test Item	Test specification	Judge criteria	Sample(s)
T5	Short Circuit Test (UN38.3-5)	5-1.Packs are placed in to a（57±4）℃ oven, and exterior packs temperature are monitored 5-2.When packs exterior reach (57±4)℃, 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 57℃. The packs are observed for a further 6 hours.	No rupture, no disassembly, no explosion, no fire, no smoke. Packs exterior peak temperature <170℃.	4 packs are first cycle in fully charged (Pack#1~4) 4 packs are 50 times cycled ending in fully charged state (Pack #5~8)
Test Period	Start:2018/03/26 End:2018/03/27			
Test Equipment	Digital Meter Q153, Data Logger Q075, Oven Q171			
Recommendation	The packs pass the test.			

Raw Data

Short Circuit Test on Charged Packs

No.	Max. Temp.(℃)	Other event
1	57.59	O
2	57.49	O
3	56.28	O
4	56.49	O
5	57.81	O
6	55.94	O
7	57.69	O
8	56.17	O

Note: D-Disassembly ; R-Rupture ; F-Fire
O- No Disassembly , No Rupture , No Fire

Item	Test Item	Test specification	Judge criteria	Sample(s)
T6	Impact test (UN38.3-6)	6-1.Cell's diameter > 20mm, Execution impact test. (A 9.1 Kg mass is to be dropped from a height of (61±2.5)cm onto the sample.) 6-2.Cell's diameter < 20mm, Execution crush test (The cells are crushed with a 13 KN with the crush tester. Once the force is obtained it is to be released.)	External temperature of cell does not exceed 170℃ and there is no disassembly and no fire within 6 hours of the test.	5 cells are 50% charged (Cell #1~5)
Test Period	Start:2018/03/12 End: 2018/03/12			
Test Equipment	Digital Meter Q153, Data Logger Q152, Impact tester Q231			
Recommendation	The Cells pass the test.			

Raw Data

Crush Test on 50% Charged Cells

No.	Max. Temp.(℃)	Other event
1	20.36	O
2	21.49	O
3	20.48	O
4	20.73	O
5	21.58	O

Note: D-Disassembly ; F-Fire / O-No Disassembly , No Fire

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:2018/03/13 End: 2018/03/16
Test Equipment	Digital Meter Q153, Data Logger Q078, Power Supply unit Q147
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)	Other event
9	22.0 V	9.7	21.36	O
10			20.49	O
11			21.76	O
12			20.86	O
13			21.76	O
14			21.83	O
15			21.59	O
16			20.49	O

Note: D-Disassembly ; F-Fire / O-No Disassembly ,No Fire

Item	Test Item	Test specification	Judge criteria	Sample(s)
T8	Forced discharge test (UN38.3-8)	Cell shall be forced discharged at ambient temperature by connecting it in series with a 12 V D.C. power supply at an initial current equal to the maximum discharge current Specified by the manufacturer.	No disassembly, no fire within seven days after the test.	10 cells are first cycle in fully discharged states (Pack#6~15) 10 cells are after 50 cycles ending in fully discharged states (Pack #16~25)
Test Period	Start:2018/03/19 End: 2018/03/21			
Test Equipment	Digital Meter Q153, Data logger Q160, Power Supply unit Q236/Q237			
Major Problem	-			
Warning Point	-			
Recommendation	The packs pass the test.			

Raw Data

Forced discharge are first cycle in fully discharged			Forced discharge are after 50 cycles ending in fully discharged		
No.	Max. Temp.(℃)	Other event	No.	Max. Temp.(℃)	Other event
6	50.16	O	16	52.69	O
7	48.69	O	17	53.48	O
8	47.36	O	18	50.86	O
9	61.25	O	19	61.17	O
10	59.48	O	20	59.86	O
11	53.76	O	21	58.49	O
12	54.86	O	22	52.64	O
13	51.81	O	23	51.26	O
14	48.69	O	24	53.24	O
15	47.26	O	25	52.71	O

Note:D-Disassembly ; F-Fire / O-No Disassembly , No Fire