Battery Pack Test Report (UN38.3)

Customer: Lenovo

Pack Model: L18C6PD2

Nominal voltage: 11.4V

Nominal capacity: 4120mAh 46Wh/
4220mAh 48Wh

Configuration: 3S2P

Customer P/N: SB10K97663

Celxpert P/N: 921300220

Cell Type: Coslight CA583864HV
2110mAh/2060mAh

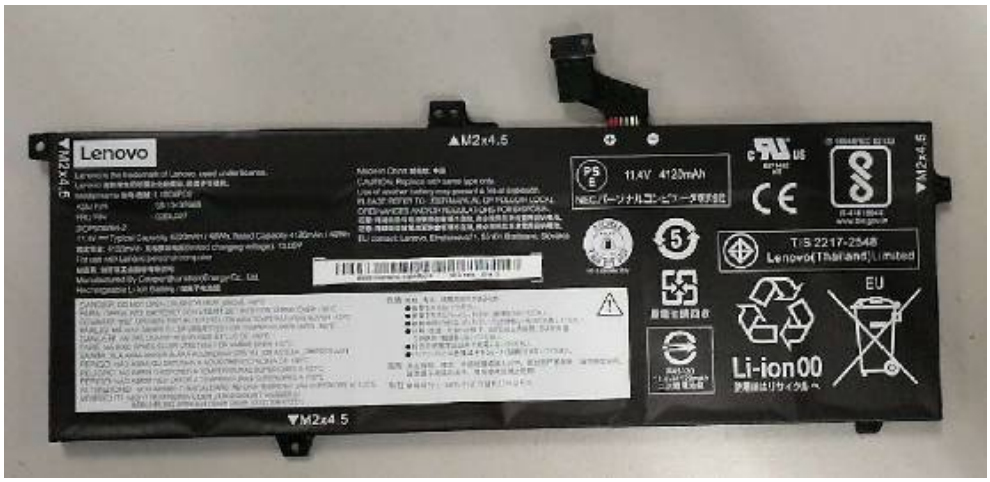
Dec.17 2018

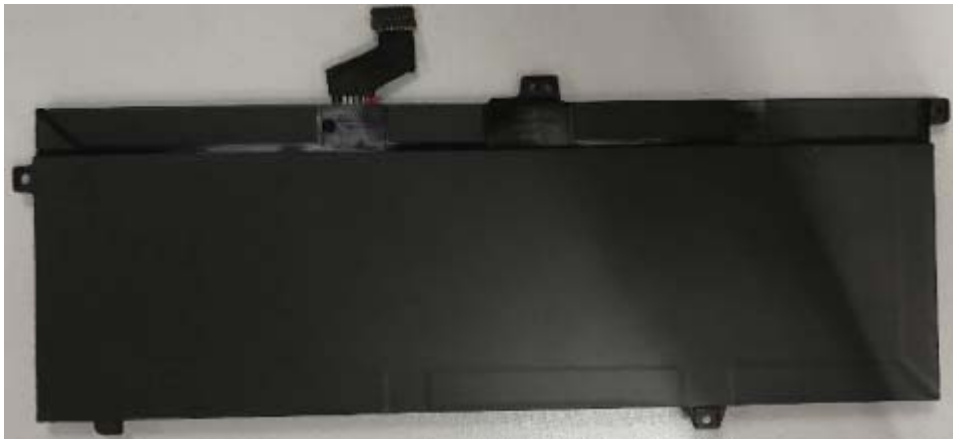
Approved by

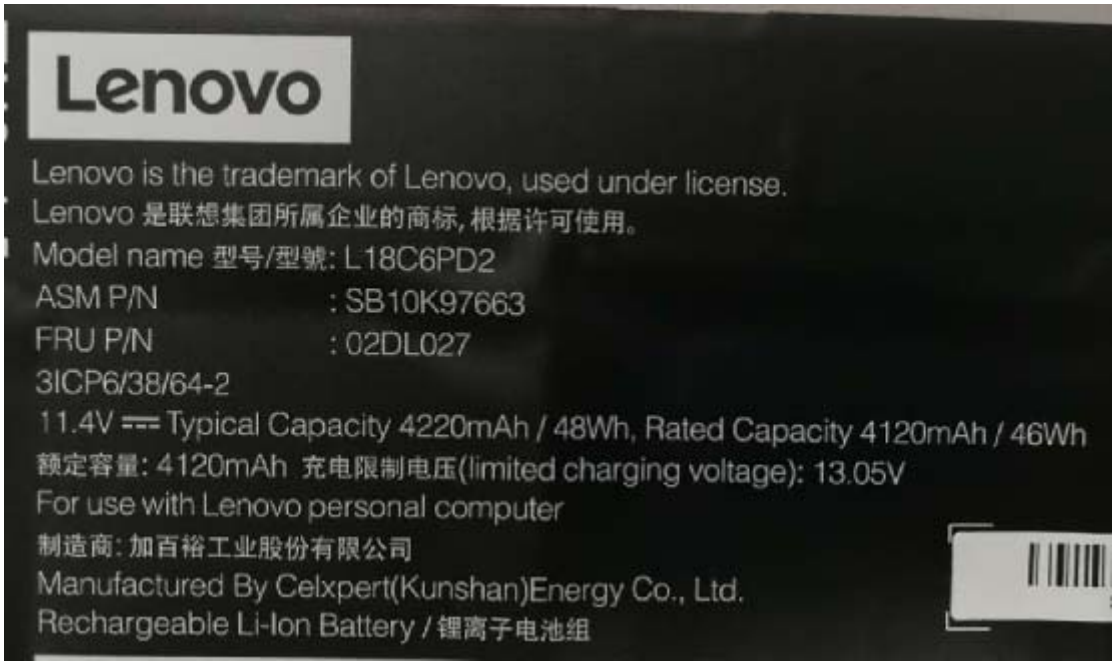
Reviewed by

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.

2. UN38.3 Test Report

Test Period	2018/07/06~2018/07/26		Test Spec.	ST/SG/AC.10/11/Rev.6/Amend.1	
Parts Name	Battery Pack	Application	NB	Quantity	Pack 16PCS/Cell 30pcs

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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

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 CA583864HV 4120mAh	38.3.6
2	Sample No:2/16	38.3.1~5	2	Coslight CA583864HV 4120mAh	38.3.6
3	Sample No:3/16	38.3.1~5	3	Coslight CA583864HV 4120mAh	38.3.6
4	Sample No:4/16	38.3.1~5	4	Coslight CA583864HV 4120mAh	38.3.6
5	Sample No:5/16	38.3.1~5	5	Coslight CA583864HV 4120mAh	38.3.6
6	Sample No:6/16	38.3.1~5	6	Coslight CA583864HV 4120mAh	38.3.6
7	Sample No:7/16	38.3.1~5	7	Coslight CA583864HV 4120mAh	38.3.6
8	Sample No:8/16	38.3.1~5	8	Coslight CA583864HV 4120mAh	38.3.6
9	Sample No:9/16	38.3.7	9	Coslight CA583864HV 4120mAh	38.3.6
10	Sample No:10/16	38.3.7	10	Coslight CA583864HV 4120mAh	38.3.6
11	Sample No:11/16	38.3.7	11	Coslight CA583864HV 4120mAh	38.3.8
12	Sample No:12/16	38.3.7	12	Coslight CA583864HV 4120mAh	38.3.8
13	Sample No:13/16	38.3.7	13	Coslight CA583864HV 4120mAh	38.3.8
14	Sample No:14/16	38.3.7	14	Coslight CA583864HV 4120mAh	38.3.8
15	Sample No:15/16	38.3.7	15	Coslight CA583864HV 4120mAh	38.3.8
16	Sample No:16/16	38.3.7	16	Coslight CA583864HV 4120mAh	38.3.8
			17	Coslight CA583864HV 4120mAh	38.3.8
			18	Coslight CA583864HV 4120mAh	38.3.8
			19	Coslight CA583864HV 4120mAh	38.3.8
			20	Coslight CA583864HV 4120mAh	38.3.8
			21	Coslight CA583864HV 4120mAh	38.3.8
			22	Coslight CA583864HV 4120mAh	38.3.8
			23	Coslight CA583864HV 4120mAh	38.3.8
			24	Coslight CA583864HV 4120mAh	38.3.8
			25	Coslight CA583864HV 4120mAh	38.3.8
			26	Coslight CA583864HV 4120mAh	38.3.8
			27	Coslight CA583864HV 4120mAh	38.3.8
			28	Coslight CA583864HV 4120mAh	38.3.8
			29	Coslight CA583864HV 4120mAh	38.3.8
			30	Coslight CA583864HV 4120mAh	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%.	4 packs are first cycle in fully charged (Pack#1~4) 4 packs are 25 times cycled ending in fully charged state (Pack #5~8)
Test Period		Start: 2018/07/06 End: 2018/07/06		
Test Equipment		數位電表 Q153, 電子天平 Q090, 真空烘箱 Q0443		
Major Problem		-		
Warning Point		-		
Recommendation		The 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	12.642	234.85	12.640	234.84	99.98%	0.00%	O
2	12.637	234.19	12.636	234.18	99.99%	0.00%	O
3	12.626	234.68	12.625	234.67	99.99%	0.00%	O
4	12.641	234.57	12.638	234.56	99.98%	0.00%	O
5	12.419	234.69	12.417	234.68	99.98%	0.00%	O
6	12.453	234.57	12.450	234.56	99.98%	0.00%	O
7	12.475	234.19	12.474	234.18	99.99%	0.00%	O
8	12.416	234.25	12.412	234.24	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 （72±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%.	4 packs are first cycle in fully charged (Pack#1~4) 4 packs are 25 times cycled ending in fully charged state (Pack #5~8)

Test Period	Start: 2018/07/09 End: 2018/07/16
Test Equipment	數位電表 Q153, 電子天平 Q090, 冷熱衝擊機 Q0446
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	12.640	234.84	12.571	234.82	99.45%	0.01%	O
2	12.636	234.18	12.560	234.16	99.40%	0.01%	O
3	12.625	234.67	12.550	234.65	99.41%	0.01%	O
4	12.638	234.56	12.564	234.55	99.41%	0.01%	O
5	12.417	234.68	12.346	234.66	99.43%	0.01%	O
6	12.450	234.56	12.375	234.54	99.40%	0.01%	O
7	12.474	234.18	12.406	234.16	99.45%	0.01%	O
8	12.412	234.24	12.337	234.22	99.40%	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%.	4 packs are first cycle in fully charged (Pack#1~4) 4 packs are 25 times cycled ending in fully charged state (Pack #5~8)

Test Period	Start: 2018/07/19 End: 2018/07/20
Test Equipment	數位電表 Q153, 電子天平 Q090, 振動測試機 Q300
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	12.571	234.82	12.564	234.80	99.94%	0.01%	O
2	12.560	234.16	12.553	234.14	99.94%	0.01%	O
3	12.550	234.65	12.542	234.64	99.94%	0.01%	O
4	12.564	234.55	12.556	234.53	99.94%	0.01%	O
5	12.346	234.66	12.338	234.64	99.94%	0.01%	O
6	12.375	234.54	12.369	234.52	99.95%	0.01%	O
7	12.406	234.16	12.397	234.13	99.93%	0.01%	O
8	12.337	234.22	12.330	234.20	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%.	4 packs are first cycle in fully charged (Pack#1~4) 4 packs are 25 times cycled ending in fully charged state (Pack #5~8)

Test Period	Start: 2018/07/23 End: 2018/07/23
Test Equipment	數位電表 Q153, 電子天平 Q090, 衝擊測試機 Q154
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	12.564	234.80	12.558	234.80	99.95%	0.00%	O
2	12.553	234.14	12.548	234.13	99.96%	0.00%	O
3	12.542	234.64	12.537	234.63	99.96%	0.00%	O
4	12.556	234.53	12.550	234.52	99.95%	0.00%	O
5	12.338	234.64	12.334	234.63	99.97%	0.00%	O
6	12.369	234.52	12.362	234.51	99.94%	0.00%	O
7	12.397	234.13	12.391	234.13	99.95%	0.00%	O
8	12.330	234.20	12.325	234.19	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 25 times cycled ending in fully charged state (Pack #5~8)
Test Period	Start: 2018/07/25 End: 2018/07/26			
Test Equipment	數位電表 Q153, 資料收集器 Q075, 烘箱 Q171			
Recommendation	The packs pass the test.			

Raw Data

Short Circuit Test on Charged Packs

No.	Max. Temp.(℃)	Other event
1	55.26	O
2	56.49	O
3	55.17	O
4	55.48	O
5	54.36	O
6	55.19	O
7	55.28	O
8	56.34	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 > 18mm, 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 < 18mm, 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 first cycle in charged states to 50%. (Pack#1~5) 5 cells are after 25 cycles ending in charged states to 50%. (Pack #6~10)
Test Period	Start: 2018/07/06 End: 2018/07/06			
Test Equipment	數位電表 Q153, 資料收集器 Q152, 擠壓試驗機 Q437/撞擊測試機 Q231			
Recommendation	The Cells pass the test.			

Raw Data

Crush Test on 50% Charged Cells

No.	Max. Temp.(℃)	Other event	No.	Max. Temp.(℃)	Other event
1	20.16	O	6	21.58	O
2	21.56	O	7	21.47	O
3	21.48	O	8	20.34	O
4	21.35	O	9	20.15	O
5	20.15	O	10	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 first cycle in fully charged (Pack#9~12) 4 packs are 25 times cycled ending in fully charged state (Pack #13~16)
Test Period		Start: 2018/07/16 End: 2018/07/18		
Test Equipment		數位電表 Q153, 資料收集器 Q078, 電源供應器 Q148/Q150/Q0236		
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	9.9	21.36	O
10			20.36	O
11			21.45	O
12			20.48	O
13			20.59	O
14			20.36	O
15			21.47	O
16			21.25	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#11~20) 10 cells are after 25 cycles ending in fully discharged states (Pack #21~30)
Test Period	Start: 2018/07/19 End: 2018/07/20			
Test Equipment	數位電表 Q153, 資料收集器 Q160, 電源供應器 Q0474/Q0475/Q0476			
Major Problem	-			
Warning Point	-			
Recommendation	The packs pass the test.			

Raw Data

Forced discharge are first cycle in fully discharged			Forced discharge are after 25 cycles ending in fully discharged		
No.	Max. Temp.(℃)	Other event	No.	Max. Temp.(℃)	Other event
11	49.36	O	21	50.26	O
12	51.36	O	22	54.86	O
13	48.53	O	23	49.28	O
14	52.36	O	24	48.25	O
15	51.48	O	25	52.36	O
16	49.75	O	26	53.48	O
17	48.25	O	27	51.47	O
18	50.36	O	28	49.25	O
19	51.27	O	29	48.16	O
20	47.06	O	30	52.15	O

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