

Battery Pack Test Report **(UN38.3)**

Customer: Lenovo

Pack Model: L18C3P71

Nominal voltage: 11.52V

Nominal capacity: 4255mAh 49Wh/

4385mAh 51Wh


Configuration: 3S1P

Cell Type: Coslight CA467973G-Q1

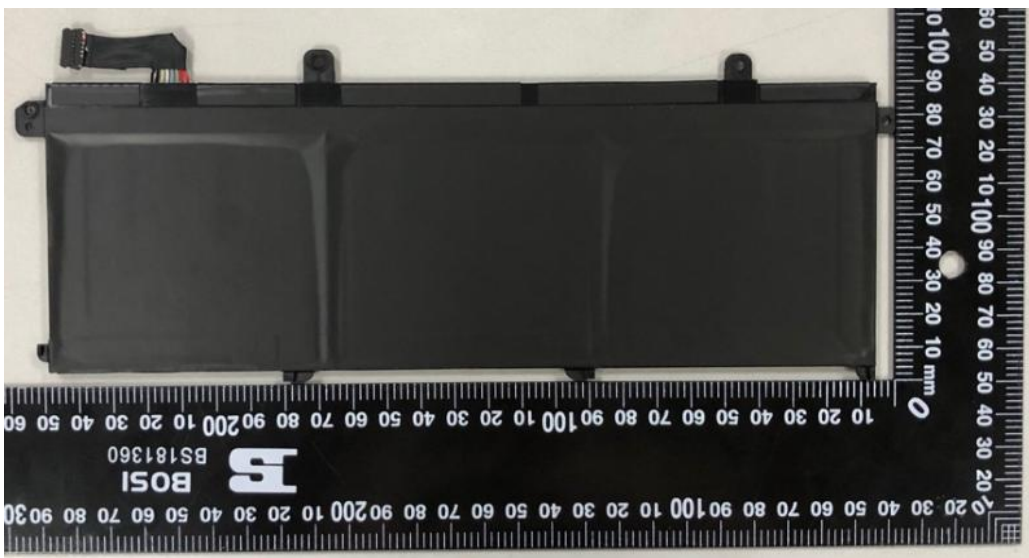
4255mAh/4385mAh

July 25 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	2018/07/06~2018/07/24		Test Spec.	ST/SG/AC.10/11/Rev.6/Amend.1	
Parts Name	Battery Pack	Application	NB	Quantity	Pack 16PCS/Cell 30pcs

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	Crush 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 CA467973G-Q1 4255mAh	38.3.6
2	Sample No:2/16	38.3.1~5	2	Coslight CA467973G-Q1 4255mAh	38.3.6
3	Sample No:3/16	38.3.1~5	3	Coslight CA467973G-Q1 4255mAh	38.3.6
4	Sample No:4/16	38.3.1~5	4	Coslight CA467973G-Q1 4255mAh	38.3.6
5	Sample No:5/16	38.3.1~5	5	Coslight CA467973G-Q1 4255mAh	38.3.6
6	Sample No:6/16	38.3.1~5	6	Coslight CA467973G-Q1 4255mAh	38.3.6
7	Sample No:7/16	38.3.1~5	7	Coslight CA467973G-Q1 4255mAh	38.3.6
8	Sample No:8/16	38.3.1~5	8	Coslight CA467973G-Q1 4255mAh	38.3.6
9	Sample No:9/16	38.3.7	9	Coslight CA467973G-Q1 4255mAh	38.3.6
10	Sample No:10/16	38.3.7	10	Coslight CA467973G-Q1 4255mAh	38.3.6
11	Sample No:11/16	38.3.7	11	Coslight CA467973G-Q1 4255mAh	38.3.8
12	Sample No:12/16	38.3.7	12	Coslight CA467973G-Q1 4255mAh	38.3.8
13	Sample No:13/16	38.3.7	13	Coslight CA467973G-Q1 4255mAh	38.3.8
14	Sample No:14/16	38.3.7	14	Coslight CA467973G-Q1 4255mAh	38.3.8
15	Sample No:15/16	38.3.7	15	Coslight CA467973G-Q1 4255mAh	38.3.8
16	Sample No:16/16	38.3.7	16	Coslight CA467973G-Q1 4255mAh	38.3.8
			17	Coslight CA467973G-Q1 4255mAh	38.3.8
			18	Coslight CA467973G-Q1 4255mAh	38.3.8
			19	Coslight CA467973G-Q1 4255mAh	38.3.8
			20	Coslight CA467973G-Q1 4255mAh	38.3.8
			21	Coslight CA467973G-Q1 4255mAh	38.3.8
			22	Coslight CA467973G-Q1 4255mAh	38.3.8
			23	Coslight CA467973G-Q1 4255mAh	38.3.8
			24	Coslight CA467973G-Q1 4255mAh	38.3.8
			25	Coslight CA467973G-Q1 4255mAh	38.3.8
			26	Coslight CA467973G-Q1 4255mAh	38.3.8
			27	Coslight CA467973G-Q1 4255mAh	38.3.8
			28	Coslight CA467973G-Q1 4255mAh	38.3.8
			29	Coslight CA467973G-Q1 4255mAh	38.3.8
			30	Coslight CA467973G-Q1 4255mAh	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)°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%.	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	13.152	204.27	13.150	204.26	99.98%	0.00%	O
		2	13.149	204.36	13.148	204.35	99.99%	0.00%	O
		3	13.156	204.36	13.155	204.35	99.99%	0.00%	O
		4	13.143	204.16	13.140	204.15	99.98%	0.00%	O
		5	12.924	204.56	12.922	204.55	99.98%	0.00%	O
		6	12.935	204.76	12.932	204.75	99.98%	0.00%	O
		7	12.946	204.85	12.945	204.84	99.99%	0.00%	O
8	12.945	204.17	12.941	204.16	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) °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%.	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	13.150	204.26	13.081	204.24	99.48%	0.01%	O
		2	13.148	204.35	13.072	204.33	99.42%	0.01%	O
		3	13.155	204.35	13.080	204.33	99.43%	0.01%	O
		4	13.140	204.15	13.066	204.14	99.44%	0.01%	O
		5	12.922	204.55	12.851	204.53	99.45%	0.01%	O
		6	12.932	204.75	12.857	204.73	99.42%	0.01%	O
		7	12.945	204.84	12.877	204.82	99.47%	0.01%	O
8	12.941	204.16	12.866	204.14	99.42%	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: 2018/07/17 End: 2018/07/18							
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	13.081	204.24	13.074	204.22	99.95%	0.01%	O
		2	13.072	204.33	13.065	204.31	99.95%	0.01%	O
		3	13.080	204.33	13.072	204.32	99.94%	0.01%	O
		4	13.066	204.14	13.058	204.12	99.94%	0.01%	O
		5	12.851	204.53	12.843	204.51	99.94%	0.01%	O
		6	12.857	204.73	12.851	204.71	99.95%	0.01%	O
		7	12.877	204.82	12.868	204.79	99.93%	0.01%	O
8	12.866	204.14	12.859	204.12	99.95%	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)			
T5	Short Circuit Test (UN38.3-5)	5-1.Packs are placed in a (57±4) °C oven, and exterior packs temperature are monitored 5-2.When packs exterior reach (57±4)°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 57°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 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: 2018/07/24					
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.(°C)	Other event			
		1	55.36	O			
		2	56.26	O			
		3	55.49	O			
		4	56.17	O			
5	54.59	O					
6	55.38	O					
7	55.18	O					
8	56.24	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	Crush 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°C 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.(°C)	Other event	No.	Max. Temp.(°C)	Other event
		1	21.36	O	6	20.48	O
		2	20.56	O	7	21.59	O
		3	21.35	O	8	20.66	O
		4	20.48	O	9	20.14	O
5	20.59	O	10	21.79	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: 2018/07/09 End: 2018/07/11		
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)
	9	22.0 V	8.5	20.36
	10			20.15
	11			21.49
	12			21.58
	13			20.38
	14			20.48
	15			20.19
	16			21.76
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: 2018/07/16 End: 2018/07/17																																																																											
Test Equipment		數位電表 Q153, 資料收集器 Q160, 電源供應器 Q0474/Q0475/Q0476																																																																											
Major Problem		-																																																																											
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Raw Data		<table border="1"> <thead> <tr> <th colspan="3">Forced discharge are first cycle in fully discharged</th> <th colspan="3">Forced discharge are after 25 cycles ending in fully discharged</th> </tr> <tr> <th>No.</th> <th>Max. Temp.(°C)</th> <th>Other event</th> <th>No.</th> <th>Max. Temp.(°C)</th> <th>Other event</th> </tr> </thead> <tbody> <tr><td>11</td><td>51.23</td><td>O</td><td>21</td><td>48.26</td><td>O</td></tr> <tr><td>12</td><td>52.48</td><td>O</td><td>22</td><td>43.56</td><td>O</td></tr> <tr><td>13</td><td>49.63</td><td>O</td><td>23</td><td>51.48</td><td>O</td></tr> <tr><td>14</td><td>47.25</td><td>O</td><td>24</td><td>52.48</td><td>O</td></tr> <tr><td>15</td><td>45.23</td><td>O</td><td>25</td><td>55.49</td><td>O</td></tr> <tr><td>16</td><td>52.25</td><td>O</td><td>26</td><td>53.76</td><td>O</td></tr> <tr><td>17</td><td>51.59</td><td>O</td><td>27</td><td>51.85</td><td>O</td></tr> <tr><td>18</td><td>52.36</td><td>O</td><td>28</td><td>49.26</td><td>O</td></tr> <tr><td>19</td><td>55.14</td><td>O</td><td>29</td><td>48.35</td><td>O</td></tr> <tr><td>20</td><td>49.36</td><td>O</td><td>30</td><td>43.58</td><td>O</td></tr> </tbody> </table>				Forced discharge are first cycle in fully discharged			Forced discharge are after 25 cycles ending in fully discharged			No.	Max. Temp.(°C)	Other event	No.	Max. Temp.(°C)	Other event	11	51.23	O	21	48.26	O	12	52.48	O	22	43.56	O	13	49.63	O	23	51.48	O	14	47.25	O	24	52.48	O	15	45.23	O	25	55.49	O	16	52.25	O	26	53.76	O	17	51.59	O	27	51.85	O	18	52.36	O	28	49.26	O	19	55.14	O	29	48.35	O	20	49.36	O	30	43.58	O
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