

Battery Pack Test Report UN38.3

Customer: Lenovo Pack Model: L10C6Y12 Nominal voltage: 11.1V dc Nominal capacity: 4400mAh/48Wh Configuration: 3S2P Customer P/N: 121001127 Celxpert P/N: 921300042 Cell Type: LG S3 2.2Ah Jan. 29, 2018

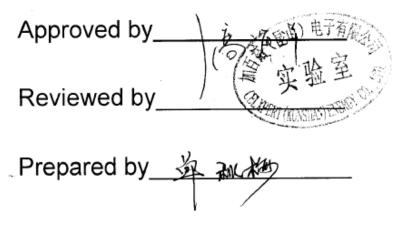
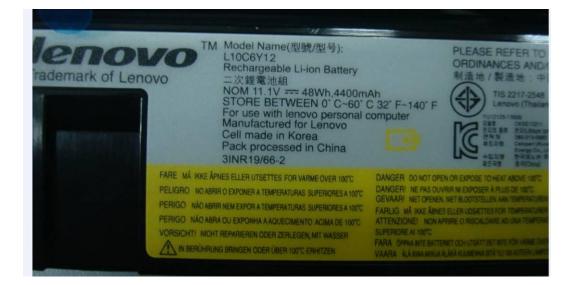




Figure photo of the pack.









1. UN38.3 Test Report										
Test Period	2010/11/22~2	2010/12/10	Test Spec.	ST/SG/AC.10/11/Rev.4						
Parts Name	Parts Name Battery Pack		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
Т3	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
Т6	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

No.	Pack S/N	Test item	No.	Cell Num.	Test item
1	Sample No:1/16	38.3.1~5	1	H3634100298	38.3.6
2	Sample No:2/16	38.3.1~5	2	H3634100257	38.3.6
3	Sample No:3/16	38.3.1~5	3	H3634103196	38.3.6
4	Sample No:4/16	38.3.1~5	4	H3634100503	38.3.6
5	Sample No:5/16	38.3.1~5	5	H3634100227	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

Test Item			Test specific	cation		Ju	udge crit	eria	Sample(s)			
Altitude Simulation (UN38.3-1)	1-3. ¹	batteries ending in batteries charged measure Batteries of 11.6K hours at C. Vacuum measure	are 1C cyc n fully charges weight is n batteries vo a and record s shall be st pa or less for ambient ter is released ad. The char	cled 50 t ged state neasure bltage a rded. ored at or at lea mperatu . All cell rged cel	imes, e. All d. The re a pressu st six ire 20+/- s weight I voltage	no leak no disa rupture Battery ire 10%. Battery change is	Battery resistance change < $\pm 10\%$.			4 packs are standard charged (Pack#1~4) 4 packs 50 cycled ending in fully charged states (Pack#5~8)		
iod						2						
•	赵11	- 电衣 ⊌	100, 具主	∽相 U	140,大							
		botter		000 14	- to -t							
nendation	ine	batter	у раскѕ р	ass the	e lest.							
				Altitu	de Simula	tion Test on	Charge	d Packs				
			Before			After			Difference			
	No.	OCV	Resistance	Weight	ocv	Resistance	Weight	Volt	Resistance	Weight	Result	
	1										Pass	
	2	12.4753	234.52	310.12	12.4642	234.62	310.13	0.09%		0.00%	Pass	
	3	12.4982	232.85	310.16	12.4691	232.94	310.18	0.23%	0.04%	0.01%	Pass	
	4	12.4865	232.97	310.09	12.4687	233.06	310.10	0.14%	0.04%	0.00%	Pass	
	5	12.4892	233.56	310.15	12.4672	233.66	310.15	0.18%	0.04%	0.00%	Pass	
	6										Pass	
											Pass Pass	
w Data												
	Altitude Simulation (UN38.3-1) iod nipment oblem Point nendation	Altitude Simulation (UN38.3-1) iod Star ipment 數位 oblem - Point - nendation The No.	Altitude Simulation (UN38.3-1) iod Start: 2010/ iipment Point Point Point Point 1-2.Batteries of 11.6K hours at °C. 1-3.Vacuum measure are mea start: 2010/ iipment Point Point 1-2.Batteries of 11.6K hours at °C. 1-3.Vacuum measure are mea start: 2010/ iipment Point 1-2.Batteries of 11.6K hours at °C. 1-3.Vacuum measure are mea start: 2010/ iipment Point 1-2.Batteries of 11.6K hours at °C. 1-3.Vacuum measure are mea start: 2010/ iipment 1-2.Batteries of 11.6K hours at °C. 1-3.Vacuum measure are mea start: 2010/ iipment 1-2.Batteries of 11.6K hours at °C. 1-3.Vacuum measure are mea start: 2010/ iipment 1-2.Batteries of 11.6K hours at °C. 1-3.Vacuum measure are mea start: 2010/ No. OCV (V) 1 12.4886 2 12.4753 3 12.4982 4 12.4865 5 12.4892 6 12.4902 7 12.4879 8 12.4823	Altitude 1-1.4 batteries are stand batteries are 1C cyc ending in fully charge batteries weight is n charged batteries vomeasured and reco 1-2. Batteries shall be st of 11.6Kpa or less for hours at ambient ter °C. iod 1-2. Batteries shall be st of 11.6Kpa or less for hours at ambient ter °C. iod Start: 2010/11/22 iod Start: 2010/11/22 ipment 數位電表Q153,真空 oblem - Point - nendation The battery packs p I 12.4886 233.95 2 12.4753 234.52 3 12.4982 232.85 4 12.4826 233.95 2 12.4982 233.66 6 12.4902 233.41 7 12.4823 234.09	Altitude 1-1.4 batteries are standard chabatteries are 1C cycled 50 tending in fully charged state batteries weight is measure charged batteries voltage a measured and recorded. 1-2.Batteries shall be stored at of 11.6Kpa or less for at lea hours at ambient temperatu °C. 1-3.Vacuum is released. All cell measured. The charged cel are measured and recorded. iod Start: 2010/11/22 End: 20 ipment 數位電表Q153,真空烘箱Q oblem - Point - nendation The battery packs pass the No. OCV Resistance Weight 1 12.4886 233.95 3 12.4982 232.85 310.04 2 12.4753 234.52 310.16 4 12.4865 232.97 310.09 5 12.4892 233.60 310.14 8 12.4823 234.09 310.10	Altitude Simulation (UN38.3-1) Altitude Simulation (UN38.3-1) Altitude Simulation (UN38.3-1) Altitude Simulation (UN38.3-1) Altitude Simulation (UN38.3-1) Altitude Simulation (UN38.3-1) Altitude Simulation (UN38.3-1) Altitude Start: 2010/11/22 Altitude Simulation Start: 2010/11/22 End: 2010/11/2465 End: 2010/11/2465 End: 2010/11/2	Altitude1-1.4 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.No mas no leak no disa rupture BatteryAltitude1-2. 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 and recorded.Battery the charged cell voltage are measured and recorded.iodStart: 2010/11/22End: 2010/11/22tipment數位電表 Q153, 真空烘箱 Q146, 天平 Q090oblem-Point-nendationThe battery packs pass the test.VoOCV (MQ) (g)112.488623.95310.04212.4753312.4982312.4982312.4982412.4865223.365310.16212.4879310.0912.4879233.60310.1012.4879233.60310.1012.4879233.60310.1012.4879233.60310.1012.4879233.60310.1012.4879233.60310.1012.4879233.60310.1012.4879233.60310.1012.4879233.60310.1012.4879233.09	Altitude1-1.4 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.No mass loss (no leakage, no no disassembly rupture and no Battery voltage 1-2. Batteries shall be stored at a pressure of 11.6Kpa or less for at least six hours at ambient temperature $20+/-5$ \mathbb{C} .No mass loss (no leakage, no no disassembly rupture and no Battery voltage are measured. The charged cell voltage are measured and recorded.iodStart: 2010/11/22 Start: 2010/11/22End: 2010/11/22ipment數位電表Q153, 真空烘箱Q146, 天平Q090oblem-Point-nendationThe battery packs pass the test.VVResistance (V) (mQ) (g)V(N (mQ) (g)112.4886233.95310.0412.4653312.492232.85310.1612.4627412.4865232.97310.0912.4687412.4823233.60310.1412.4652412.4879233.60310.1412.4626223.4.15310.14412.4823310.1012.4823234.09310.11	Altitude1-1.4 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.No mass loss (<0.1%), no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop < 10%.(UN38.3-1)1-2. Batteries shall be stored at a pressure of 11.6Kpa or less for at least six hours at ambient temperature 20+/-5 \odot .1-3. Vacuum is released. All cells weight is measured. The charged cell voltage are measured and recorded.Battery resistance change < $\pm 10\%$.iodStart: 2010/11/22End: 2010/11/22tipment數位電表 Q153, 真空烘箱 Q146, 天平 Q090oblem-Point-nendationThe battery packs pass the test.No.OCV (mO)QUV (g)QUV (g)1 1 2.4886233.953 10.0412.46532 12.4753234.523 12.4982233.653 10.0912.46673 12.4982233.653 10.1112.46873 12.4823234.033 10.1212.46872 12.4753234.623 10.1512.46722 12.4823234.033 10.1012.46872 12.4823234.033 10.110.11%3 12.4823234.093 10.110.17%3 12.4823234.093 10.110.17%3 12.4823234.093 10.1112.46553 10.110.17%3 12.4823234.09	Altitude 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. No mass loss (<0.1%), no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop < 4 packs charged packs ending in states (F 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 and recorded. Battery resistance change < ±10%.	Altitude Simulation (UN38.3-1)1-1.4 batteries are standard charged. 4 batteries weight is measured. The charged batteries voltage are measured and recorded.No mass loss (<0.1%), no leakage, no venting, no leakage, no venting, no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop < 12. Batteries shall be stored at a pressure of 11.6Kpa or less for at least six hours at ambient temperature 20+/-5 \mathbb{C} .No mass loss (<0.1%), no leakage, no venting, no leakage, no venting, no disassembly, no rupture and no fire. Battery voltage drop < 10%. Battery resistance charge < $\pm 10\%$. Battery resistance charge < $\pm 10\%$.4 packs are star charged (Pack# 4 packs 50 cycle ending in fully of states (Pack#5~ 10%. Battery resistance charge < $\pm 10\%$.4 packs (Pack#5~ hours at ambient temperature 20+/-5 \mathbb{C} .1.3. Vacuum is released. All cells weight is measured and recorded.Battery resistance charge < $\pm 10\%$.istates (Pack#5~ states (Pack#5~ 10%.iodStart: 2010/11/22 $\pm 000/11/22$ End: 2010/11/22End: 2010/11/22istates (Pack#6 states (Pack#5~PointPoint112486 (0)(mQ)(g)(v) (mQ)(g)(v) (g)112486 (0)230.40310.600.05%0.01%212.4763 (0)234.52310.1612.4661 (233.06310.160.04%0.00%312.4982 (233.56310.1612.4661 (233.66310.160.14% (0.05%0.00%4 <t< td=""></t<>	



Item	Test Item		Test specification Judge criteria Sample(s)										
nem	IEST ILEIT	2-1	Packs ar	e stored for		at 75+2°		mass loss		4 pooks	4 packs are standard		
T2	Thermal test (UN38.3-2)	2-2.F	followed The max tempe Repeat 2 packs at weight a	by storage imum time i rature extre -1 for 10 tim ambient for re measured are measured	for 6 hou interval b mes is 3 nes. The 24 hour d. The ch	urs at -40 between 30 minute n store th rs. All pao narged b	9±2°C - no test no es. rup Bat ne 109 cks Bat	leakage, r disasseml ture and r tery voltag	io venting oly, no o fire. ge drop < ance	^{I,} charged 4 packs fully cha	charged (Pack#1~4) 4 packs 50 cycled ending in fully charged states (Pack#5~8)		
Test Per	iod	Star	t: 2010	/11/23	End: 2	010/11	/30						
Test Equ	lipment	數位	電表(153, 冷素	熟衝擊相	幾 Q155	5, 天平(2090					
Major Pr	oblem	-											
Warning		-											
	nendation	The	packs	s pass the	e test.								
			<u> </u>	•									
						-							
		Thermal Test on Charged Packs Before After Difference											
		No.	OCV	Resistance	Weight	OCV	Resistanc	e Weight	Volt	Resistance	Weight	Result	
		1	(V) 12.4653	(mΩ) 234.06	(g) 310.06	(V) 12.3856	(mΩ) 234.36	(g) 310.03	(%) 0.64%	(%) 0.13%	(%) 0.01%	Pass	
		2	12.4642	234.62	310.00	12.3857	234.94	310.03	0.63%	0.13%	0.00%	Pass	
		3	12.4691	232.94	310.18	12.3869	233.33	310.15	0.66%	0.17%	0.01%	Pass	
		4	12.4687	233.06	310.10	12.3863	233.38	310.08	0.66%	0.14%	0.01%	Pass	
		5 6	12.4672 12.4686	233.66 233.48	310.15 310.07	12.3859 12.3860	233.92 233.72	310.12 310.05	0.65%	0.11%	0.01%	Pass Pass	
		7	12.4672	233.48	310.07	12.3858	233.97	310.03	0.65%	0.10%	0.01%	Pass	
		8	12.4655	234.15	310.11	12.3862	234.47	310.09	0.64%	0.14%	0.01%	Pass	
Rav	w Data												



Item	Test Item			Test	Ju	udge crite	eria	Sample(s)						
тз	Vibration test (UN38.3-3)	v a v la 7 7 3-2. 1 7 3-2. 1 7 2 3-3. 4	 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 and recorded. 									4 packs are standard charged (Pack#1~4) 4 packs 50 cycled ending in fully		
Test Per	iod	Sta	rt: 2010	/12/1	End: 20	10 /12/2	2	•						
Test Equ	uipment	數位	電表Q	153, 振動	測試機	Q300,	天平 Q09	0						
Major Pr	·	-		, ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,		. /								
Warning		-												
	nendation	The	nacks	pass the	test									
		No.	Vibration Test on Charge Before After No. OCV Resistance Weight OCV Resistance W							Differe		Weight	Result	
		1.0.	(V)	(mΩ)	Weight (g)	(V)	(mΩ)	Weight (g)	Volt (%)	(%)		(%)	result	
		1	12.3856	234.36	310.03	12.3659		310.04	0.16%	0.06		0.00%	Pass	
		2	12.3857	234.94	310.12	12.3648		310.13	0.17%	0.03		0.00%	Pass	
		3	12.3869 12.3863	233.33 233.38	310.15 310.08	12.3660 12.3644	233.34 233.41	310.15 310.09	0.17% 0.18%	0.00		0.00%	Pass Pass	
		5	12.3859	233.92	310.08	12.3652		310.03	0.17%	0.01		0.00%	Pass	
		6	12.3860	233.72	310.05	12.3648	233.92	310.05	0.17%	0.09		0.00%	Pass	
		7	12.3858	233.97	310.13	12.3652	234.08	310.13	0.17%	0.05	%	0.00%	Pass	
		8	12.3862	234.47	310.09	12.3655	234.62	310.10	0.17%	0.06	%	0.00%	Pass	
Rav	w Data													



11	Test Item												
Item	Test Item	1 1	Docka at	Iest sp all be secu	ecificatio		machine	Judg No mass l	e criteria		Sample(s) 4 packs are standard		
T4	Shock test (UN38.3-4)	t 4-2. 4-2. t t t 4-3. /	by means of a rigid mount, which will support all mounting surfaces. I-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. I-3. All batteries weight are measured. The charged cell voltage are measured and recorded.										<#1~4) cled charged
Test Per	iod	Star	t: 2010/	′12/3 I	End: 20)10 /12/	3						
Test Equ	uipment	數位	電表Q	153, 衝	擊測試	機 Q154	, 天平 C	2090					
Major Pr	oblem	-											
Warning		-											
	nendation	The	packs	pass th	e test.	1							
			Shock Test on Charged Packs										
		No.	OCV	Before Resistance	Weight	OCV	After Resistance	e Weight	Volt		rence stance	Weight	Result
		110.	(V)	(mΩ)	(g)	(V)	(mΩ)	(g)	(%)		%)	(%)	1 to Suit
		1	12.3659	234.51	310.04	12.3506	234.61	310.04	0.12%		4%	0.00%	Pass
		2	12.3648 12.3660	235.02 233.34	310.13 310.15	12.3511 12.3518	234.36 233.62	310.13 310.16	0.11%		8% 2%	0.00%	Pass Pass
		4	12.3644	233.41	310.09	12.3496	233.53	310.09	0.12%		5%	0.00%	Pass
		5	12.3652	234.05	310.12	12.3526	234.12	310.14	0.10%	0.0	3%	0.01%	Pass
		6	12.3648	233.92	310.05	12.3513	234.06	310.05	0.11%		6%	0.00%	Pass
		7	12.3652 12.3655	234.08 234.62	310.13 310.10	12.3520 12.3515	233.89 234.52	310.14 310.10	0.11%		8% 4%	0.00%	Pass Pass
Rav	w Data												



Itom	Toot Itom		Toot op opificatio	ritorio						
Item	Test Item	5-1 Pack	Test specifications are placed in to a $55\pm$		No	Judge o rupture,		nack	Sample(s)	
Τ5	Short Circuit Test (UN38.3-5)	exte 5-2.Whe show wire 5-4. The or th	rior packs temperature a n packs exterior reach 5 rted by connecting termin of resistance less than short was continued for he cell temperature retur ks are observed for a fur	assembly losion, r oke. Pac erior pea	y, no no fire, no ks ik in	harge pack fully	s are standard ed (Pack#1~4) s 50 cycled ending charged states #5~8)			
Test Per	iod	Start: 2	010/12/4 End: 20							
Test Equ	uipment	數位電	表 Q153, 資料收集	器 Q078, 烘箱	Q17	1				
Recomm	nendation	The pa	acks pass the test.							
		Sh	ort Circuit Test	on Charged	Pac	ks]			
		No.	Max. Temp.(°C)	Visual	Re	esult				
		1	55.68	OK	P	ass				
		2	55.78	OK	P	ass				
Bo	w Data	3	55.82	OK	P	ass				
Γď	w Dala	4	55.90	OK	P	Pass				
			56.12	OK	P	Pass				
		6	55.97	OK	P	Pass				
		7	56.07	OK	P	ass				
		8	55.93	OK	P	ass	J			
Item	Test Item		Test specifica	ation		Ju	udge criteria		Sample(s)	
Т6	Impact test (UN38.3-6)	15.8 cen droj sam 6-2. A cy	 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. External temperature of cell does not exceed 170°C and there is no disassembly and no fire within 6 hours of the test. 							
Test Per	iod	Start: 2	2010/11/26 End: 2	2010/11/27						
Test Equ	uipment	數位電	表 Q153, 資料收集	器 Q160, 撞擊	試驗>	機 Q23	1			
Recomm	nendation	The C	ells pass the test.							
		No.	Impact Test on 50% Charged Cells No. Max. Temp.(°C) Visual Result							
De	w Data	1	31.52	OK	F	Pass				
ка	w Data	2	29.66	OK	F	ass				
		3	30.15	OK	F	Pass				
			28.23	OK	P	ass				
		5	29.81	OK	F	Pass				



Item	Test Item		Те	st specification		Judge criteria	Sample(s)
Т7	Overcharge test (UN38.3-7)	red 7-2.The (a) W mo the ba (b) W tha tim 7-3. Tes	e charge current s commended maxir e minimum voltage /hen the Spec's re ore than 18V, the n e lesser of two time ttery or 22V. /hen the Spec's re an 18V, the minimu- ses the maximum of sts are to be condu- ration of the test s	hall be twice the S num continuous c of the test shall b commended char ninimum voltage o es the maximum c commended char um voltage of the t charge voltage. ucted at ambient t	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 Per	iod			ind: 2010/12/10	0	I	
Test Equ	uipment	數位電	記表 Q153, 資料	+收集器 Q151,	電源供應器 Q14	7	
Major Pi	roblem	-					
Warning		-					
	nendation	The p	acks pass the	e test.			
			(Charge	Overcharge T Charge	est on Charge		
		No.	Voltage(V)	Current(A)	Max. Temp.(°C) Visual		Result
		9	_		25.48	OK	Pass
		10			25.34	OK	Pass
		11 12			25.13 24.86	OK OK	Pass
		12	22.0 V	4.4 A	24.80	OK	Pass Pass
			14 15		25.13	OK	Pass
					24.97	OK	Pass
		16			24.87	OK	Pass
Ra	w Data						