

# Battery Pack Test Report UN38.3

Customer: Lenovo Pack Model: L17C3PE0 Nominal voltage: 11.25V Nominal capacity: 4587mAh/51.5Wh Configuration: 3S1P Customer P/N: 5B10Q39196 Celxpert P/N: 921300164 Cell Type: ATL 595490N 4587mAh Jan. 20 . 2018





#### Figure photo of the pack





# ▲M2x4.5 Lenovo is the trademark of Lenovo, used under license. Lenovo是联想集团所属企业的商标,根据许可使用。 Model Name 型号/型號:L17C3PE0 3ICP6/54/90 Rating :11.25V == TYP 4587mAh/51.5Wh MIN 4453mAh/50Wh 额定容量:4453mAh 充电限制电压:13.05V For use with Lenovo personal computer 制造商:加百裕工业股份有限公司 Manufactured by Celxpert(Kunshan) Energy Co.,Ltd.

PS:此報告僅針對送檢樣品有效

The test report is valid for the tested samples only.



1. UN38.3 Test Report										
Test Period	2017/08/16~2	2017/09/01	Test Spec.	ST/SG/AC.10/11/Rev.5 Amend.2						
Parts Name	Battery Pack	Application	NB	Quantity	Pack 16PCS/Cell 25pcs					

## 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	Crush Test (UN38.3-6)	Pass	Page 13			
T7	Overcharge test (UN38.3-7)	Pass	Page 14			
Т8	Forced discharge test (UN38.3-8)	Pass	Page 15			

The battery pack passes UN38.3 test.

Cel>(pert Energy Corporation

## 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	ATL 595490N 4587mAh	38.3.6
2	Sample No:2/16	38.3.1~5	2	ATL 595490N 4587mAh	38.3.6
3	Sample No:3/16	38.3.1~5	3	ATL 595490N 4587mAh	38.3.6
4	Sample No:4/16	38.3.1~5	4	ATL 595490N 4587mAh	38.3.6
5	Sample No:5/16	38.3.1~5	5	ATL 595490N 4587mAh	38.3.6
6	Sample No:6/16	38.3.1~5	6	ATL 595490N 4587mAh	38.3.8
7	Sample No:7/16	38.3.1~5	7	ATL 595490N 4587mAh	38.3.8
8	Sample No:8/16	38.3.1~5	8	ATL 595490N 4587mAh	38.3.8
9	Sample No:9/16	38.3.7	9	ATL 595490N 4587mAh	38.3.8
10	Sample No:10/16	38.3.7	10	ATL 595490N 4587mAh	38.3.8
11	Sample No:11/16	38.3.7	11	ATL 595490N 4587mAh	38.3.8
12	Sample No:12/16	38.3.7	12	ATL 595490N 4587mAh	38.3.8
13	Sample No:13/16	38.3.7	13	ATL 595490N 4587mAh	38.3.8
14	Sample No:14/16	38.3.7	14	ATL 595490N 4587mAh	38.3.8
15	Sample No:15/16	38.3.7	15	ATL 595490N 4587mAh	38.3.8
16	Sample No:16/16	38.3.7	16	ATL 595490N 4587mAh	38.3.8
			17	ATL 595490N 4587mAh	38.3.8
			18	ATL 595490N 4587mAh	38.3.8
			19	ATL 595490N 4587mAh	38.3.8
			20	ATL 595490N 4587mAh	38.3.8
			21	ATL 595490N 4587mAh	38.3.8
			22	ATL 595490N 4587mAh	38.3.8
			23	ATL 595490N 4587mAh	38.3.8
			24	ATL 595490N 4587mAh	38.3.8
			25	ATL 595490N 4587mAh	38.3.8



#### 1.3 Test result

Item	Test Item		Те	st specificatio	n	Judg	je criteria	Sample(s)		
		1-1.4	4 batteries	are standard	d charged. 4	No mass	loss (<0.1%),	4 packs are s	standard	
		k	patteries ar	e 1C cycled	50 times,	no leakag	e, no venting,	charged (Pa	ck#1~4)	
		6	ending in fu	illy charged	state. All	no disass	embly, no	4 packs 50 cycled		
			barged ba	ttorios volta		rupture ar	nd no fire.	ending in fully charged		
	Altitude	r	measured a	and recorded		Battery voltage drop < states (Pack#5~8)				
T1	Simulation	1-2.6	Batteries sh	all be store	d at a pressure	10%.				
	(UN38 3-1)	0	of 11.6Kpa							
		ł	nours at an	nbient tempe	erature 20+/-5					
		c	Ċ.							
		1-3.\	Vacuum is i	released. All	cells weight is	5				
		r	measured.	The charged	d cell voltage					
Test Per	iod	Star	t. 2017/08	/16	End: 2017	/08/16				
Test Equ	ipment	數位	雷表 Q15	7. 雷平天-1 3. 雷平天-1	FQ090.直空	·////////////////////////////////////	6			
Maior Pr	oblem	-		, <u>.</u> , .			•			
Warning	Point	-								
Recomm	endation	The	battery p	acks pass	s the test.					
					Altitude Simulati	on Test on Ch	arged Packs			
			Be	fore	Afte	r	voltage residue	mass loss		
		No.	001	Weight	001	Weight	Volt	Weight	other event	
			(V)	(q)	(V)	(a)	(%)	(%)		
		1	12.493	236.08	12.489	236.06	99.97%	0.01%	0	
		2	12.487	236.11	12.484	236.08	99.98%	0.01%	0	
		3	12.469	236.18	12.465	236.15	99.97%	0.01%	0	
		4	12.481	236.02	12.476	236.01	99.96%	0.00%	0	
		5	12.486	236.16	12.483	236.13	99.98%	0.01%	0	
		6	12.487	236.23	12.484	236.22	99.98%	0.00%	0	
		/	12.498	230.15	12.494	236.15	99.97%	0.01%	0	
		0	12.471	250.11	12.407	250.10	55.5770	0.0176	0	
		Note:	L-Leakage ; V-\ O-No Leakage	/enting ; D-Disas: No Venting No	sembly ; R-Rupture	; F-Fire Rupture - No Fire				
Rav	v Data		O-NO Leakage	, NO VEHIING , NO	Disassembly, No I	Nuplure, No File	•			



Item	Test Item		Те	st specificatio	n		J	udge criteria	Samp	le(s)
T2	Thermal test (UN38.3-2)	<ul> <li>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.</li> <li>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.</li> <li>Start: 2017/08/17 End: 2017/08/17</li> </ul>			No ma no leal no disa rupture Batter 10%.	ss loss (<0.1%), kage, no venting, assembly, no e and no fire. / voltage drop <	4 packs are standard charged (Pack#1~4) 4 packs 50 cycled ending in fully charged states (Pack#5~8)			
Test Per	iod	Star	t: 2017/08	/17	End: 20	)17/0	)8/23			
lest Equ	lipment	數位	.電表 Q15	3, 電子天平	² Q090, ∦	令熱行	衝擊梭	& Q336		
Major Pr	oblem	-								
Warning	Point	-								
Recomm	nendation	The	packs pa	ass the tes	t.					
			Thermal Test on Charged Packs							
		No	0. Before		Aft	ter		voltage residue	mass loss	other event
		10.	OCV	Weight	OCV	We	eight	Volt (%)	Weight	other event
		1	12.489	236.06	12.420	236	g) 5.06	99.45%	0.00%	0
		2	12.484	236.08	12.408	236	5.05	99.39%	0.01%	0
		3	12.465	236.15	12.390	236	5.12	99.40%	0.01%	0
		4	12.476	236.01	12.402	235	.99	99.41%	0.01%	0
		5	12.483	236.13	12.412	236	5.11	99.43%	0.01%	0
		6	12.484	236.22	12.409	236	5.19	99.40%	0.01%	0
		/	12.494	236.13	12.426	236	0.12 1.09	99.46%	0.00%	0
		8	12.487	236.10	12.412	236	5.08	99.40%	0.01%	0
Rav	w Data	Note:	L-Leakage ; V-V O-No Leakage ;	/enting ; D-Disassa No Venting , No I	embly ; R-Ruptu Disassembly , N	IIII IIII IIII	Fire ture , No	Fire		



Item	Test Item			Test spe	cification			Judge crit	eria	Sa	imple(s)
ТЗ	Vibration test (UN38.3-3)	3-1.   v i 7 7 3-2 3-3. /	Packs are fin vibration many a manner as vibration sha ogarithmic s 7 Hz traverse repeated 12 nutually perp The logarithm 7-18 Hz → 18-50 Hz → 18-50 Hz → 18-50 Hz → 18-50 Hz →	mly secured chine without to faithfully t Il be a sinuso weep betwee ed in 15 minu times for a to bendicular to mic frequenc 1gn 0.8mm an 8gn ight are mea neasured an	No mass loss (<0.1%), no leakage, no venting, no disassembly, rupture and r Battery voltag drop < 10%.	no no fire. ge	4 packs charged 4 packs ending ir charged (Pack#5	are standard (Pack#1~4) 50 cycled n fully states ~8)			
Test Per	iod	Sta	art: 2017/0	8/24	End: 2	2017/08/2	25	•		1	
Test Equ	ipment	數位	1 電表 Q15	3, 電子天	平 Q090,	振動測試	、機 Q	300			
Maior Pr	oblem	-									
Warning	Point	-									
Pocomr		The	nacks n	ass the te	et						
		Vibration Test on Charged Packs									
			Be	fore	Af	ter	volt	age residue	mas	ss loss	
		No.	ocv S	Weight (a)		Weight (a)		Volt (%)	Weight (%)		other event
		1	12.420	236.06	12.416	236.04		99.97%	0.01%		0
		2	12.408	236.05	12.401	236.04		99.94%	0.01%		0
		3	12.390	236.12	12.383	236.11		99.94%	0.01%		0
		4	12.402	235.99	12.396	235.97		99.95%	0.	01%	0
		5	12.412	236.11	12.404	236.08		99.94%	0.	01%	0
		7	12.405	236.12	12.403	236.09		99.93%	0.	01%	0
		8	12.412	236.08	12.405	236.07		99.94%	0.	00%	0
		Note:	L-Leakage ; V-\	/enting ; D-Disas	sembly ; R-Ru	pture ; F-Fire					
			O-No Leakage	, No Venting , No	Disassembly	, No Rupture ,	No Fire				
Rav	v Data										



Item	Test Item			Test specific	ation		J	udge criteria	Sample(s)	
T4	Shock test (UN38.3-4)	<ul> <li>4-1. Packs shall be secured to the testing machine by means of a rigid mount, which will support all mounting surfaces.</li> <li>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.</li> <li>4-3. All batteries weight are measured. The charged cell voltage are measured and recorded.</li> <li>Start: 2017/08/28 End: 2017/08/29</li> </ul>					ss loss (<0.1%), cage, no venting, ussembly, no e and no fire. v voltage drop <	4 packs are charged (Pa 4 packs 50 ending in fu states (Pacl	standard ack#1~4) cycled lly charged k#5~8)	
Test Per	iod	Star	t: 2017/08	/28	End: 201	7/08/2	29			
Test Equ	uipment	數位	電表 Q15	3, 電子天-	平 Q090, 衝	擊測註	₹機 Q1	54		
Major Pr	oblem	-								
Warning	Point	-								
Recomm	nendation	The	packs pa	ass the te	st.					
	Iondation		1							
					Shock I	est on C	harged	Packs		
		No	Bet	fore	Af	ter		voltage residue	mass loss	other event
		140.	OCV	Weight	OCV	Wei	ight	Volt	Weight	other event
		1	12.416	236.04	12.411	236.	)) .04	99.96%	0.00%	0
		2	12.401	236.04	12.397	236.	.01	99.97%	0.01%	0
		3	12.383	236.11	12.378	236.08		99.96%	0.01%	0
		4	12.396	235.97	12.393	235.94		99.98%	0.01%	0
		5	12.404	236.08	12.400	236.	.07	99.97%	0.00%	0
		6	12.403	236.17	12.399	236.	.14	99.97%	0.01%	0
		8	12.417	236.09	12.413	236	05	99.98%	0.01%	0
		Note:	Lal eakage : V-V	enting : D-Disas	sembly : R-Rupture	· E-Eiro		55.5070	0.0170	<u> </u>
		Note.	O-No Leakage, V-V	No Venting , No	Disassembly , No	Rupture , I	No Fire			
Rav	w Data									



Item	Test Item		Test specification		Jud	ge criteria		Sample(s)
Τ5	Short Circuit Test (UN38.3-5)	5-1.Pac exi 5-2.Wh shi wir 5-4. Th or pa	cks are placed in to a $55\pm2^{\circ}$ C terior packs temperature are en packs exterior reach $55\pm2^{\circ}$ orted by connecting terminals re of resistance less than 100 e short was continued for mo the cell temperature return to cks are observed for a furthe	oven, and monitored $2^{\circ}C$ , they are s with a copper om Ohm. ore than 1 hour o $55^{\circ}C$ . The r 6 hours.	No ruptu disasser explosio smoke. exterior tempera	rre, no nbly, no n, no fire, no Packs peak ture <170℃.	4 pack charge 4 pack in fully (Pack	ks are standard ed (Pack#1~4) ks 50 cycled ending v charged states #5~8)
Test Per	iod	Start	: 2017/08/30 E	nd: 2017/09/0	)1			
Test Equ	ipment	數位電	電表 Q153, 資料收集器 (	Q075,烘箱 C	2171			
Recomm	nendation	The p	acks pass the test.					
			Short Circuit Test on (					
		No.	Max. Temp.(°C)	Other ev	ent	1		
		1	55.43	0	0			
		2	55.76	0		1		
		3	54.39	0		1		
		4	54.28	0		1		
Raw Data		5	55.17	0		1		
		6	55.71	0		1		
		7	55.93	0		1		
		8	54.82	0		1		
		Note:	D-Disassembly ; R-Ruptur O- No Disassembly , No	-				
Item	Test Item		Test specificatio	n		Judge criteri	ia	Sample(s)
Т6	Crush test/ Impact test (UN38.3-6)	6-1.Ce (A 9.1 61±2.5 6-2.Ce (The co tester	II's diameter > 20mm, Execu Kg mass is to be dropped fro cm onto the sample.) II's diameter < 20mm, Execu ells are crushed with a 13 KN . Once the force is obtained i	tion impact test. m a height of tion crush test I with the crush t is to be release	Ext cell 170 disa with test	ernal temperations not except does not except $^{\circ}$ and there assemb ly and thin 6 hours of t	ture of eed is no no fire the	5 cells are 50% charged (Cell #1~5)
Test Per	iod	Start:	2017/08/15 En	d: 2017/08/16	6			•
Test Equ	ipment	數位電	電表 Q153, 資料收集器	Q152, 擠壓計	忧驗機 €	437/撞擊測	試機	Q231
Recomm	nendation	The (	Cells pass the test.					
			Crush Test on 50%	Charged Cells				
		No.	Max. Temp.(°C)	Other e	event			
		1	21.46	0				
Dat	M Data	2	20.68	0				
r.d.	w Dald	3	20.49	0				
		4	20.39	0				
		5	21.76	0				
		Note: [	D-Disassembly ; F-Fire / O-	No Disassembly	y , No Fir	e		



Item	Test Item		Test	specification		Judge cr	riteria	Sample(s)				
Τ7	Overcharge test (UN38.3-7)	7-1. The rec 7-2.The (a) W mo the bat (b) W tha time 7-3. Tes dur	e charge current sha ommended maximu minimum voltage of hen the Spec's reco re than 18V, the min lesser of two times tery or 22V. hen the Spec's reco n 18V, the minimum es the maximum ch ts are to be conduc ation of the test sha	all be twice the Spe im continuous char of the test shall be a commended charge of the maximum char ommended charge of the the maximum char on voltage of the test arge voltage. ted at ambient tem all be 24 hours.	c's ge current. is follows: voltage is not ie test shall be ge voltage of the voltage is more shall be 1.2 perature. The	No disasse no fire with seven day the test.	∍mbly, ìin s after	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	Start: 2	2017/08/17	End: 2017	/08/21	1		<u> </u>				
Test Equ	iipment	數位電	數位電表 Q153, 資料收集器 Q078, 電源供應器 Q148/Q149/Q150									
Major Pr	oblem	-										
Warning	Point	-										
Recomm	nendation	The p	The packs pass the test.									
			Ove	ercharge Tes	t on Char	jed Pa	cks					
		No.	Voltage(V)	Cnarge Current(A)	Max. Temp	p.(℃)	Other event					
		9			20.13	3.		0				
		10			20.46	6		0				
		11			21.59		0					
	12	12 13 22.0 V		9.2	20.74		0					
					20.59		0					
		14			21.43	5		0				
		15			20.00	5		0				
		10			,		0					
Rav	w Data	Note:	D-Disassembl	ly;F-Fire / O	No Disasse	mbly ,No	) Fire					



Item	Test Item			Test specification			Judge criter	ria Sample(s)			
Т8	Forced discharge test (UN38.3-8)	Cell s conne initial Speci	Cell shall be forced discharged at ambient temperature by onnecting it in series with a 12 V D.C. power supply at an nitial current equal to the maximum discharge current Specified by the manufacturer. (Pack #6~15) 10 cells are first cycle in fully discharged states (Pack #6~15) 10 cells are after 5 cycles ending in fully discharged states (Pack #16~25)								
Test Per	iod	Start	t: 2017/08/23	End: 2017	/08/24	4					
Test Equ	ipment	數位	電表 Q153,	資料收集器 Q160,	電源	供應器Q	147/Q236/	Q237			
Maior Pr	oblem	-									
Warning	Point	-									
Pocomr		The	nacks nass	the test							
Recomm	lendation	me									
		Ford	ed discharge are fi	rst cycle in fully discharged	d discharde a	re after 50 cvcle	s ending in fully discharged				
		No.	Max. Temp.(°C)	Other event	No.	Max. Ter	np.(°C)	Other event			
		6	31.26	0	16	33.1	6	0			
		7	35.49	0	17	30.4	9	0			
		8	39.26	0	18	32.7	'5	0			
		9	34.75	0	19	30.6	5	0			
		10	35.16	0	20	35.6	1	0			
		11	34.86	0	21	32.4	6	0			
		12	35.61	0	22	30.1	2	0			
		13	34.70	0	23	33.7	0 'Q	0			
		15	35.68	0	25	34.7	6	0			
						•	-				
Ra	w Data	Note:D	-Disassembly ; F-Fir	re / O-No Disassembly , No Fi	ire						