

# 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.



2. UN38	3.3 Test Re	port			
Test Period	2018/03/09~2	2018/03/27	Test Spec.	ST/S0	G/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
Т3	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 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

1-1. batteries are standard charged, ending in fully charged state. All batteries weight is measured. The charged batteries voltage are measured and recorded.	Item	Test Item		T	est specificati	on	Juc	lge criteria	Samp	ole(s)
Digital Meter Q153, Vacuum Oven Q0443, Scales Q090	T1	Simulation	i N t 1-2.E 0 4 1-3.\	n fully chain weight is monatteries von ecorded. Batteries slow 11.6 Kpa at ambient vacuum is measured.	rged state. A leasured. Th oltage are mo hall be stored or less for a temperature released. All The charged	Il batteries e charged easured and dat a pressure t least six hour (20±5)°C. cells weight is dicell voltage a	(<0.1%) no venti disasse rupture s Battery 10%. Battery	, no leakage, ng, no mbly, no and no fire. voltage drop <	in fully charg (Pack#1~4) 4 packs are cycled endir charged stat	ged 50 times
Digital Meter Q153, Vacuum Oven Q0443, Scales Q090	Test Per	iod	Star		8/09	Fnd: 2	018/03/09			
Major Problem								as 0000		
Altitude Simulation Test on Charged Packs	<u> </u>	<u> </u>	Ŭ	ai ivicici (	w 100, vacu	uiii Oveii Qu	TTO, OCAI	C3 Q030		
Recommendation   The battery packs pass the test.			ļ <del>-</del>							
No.   Before   After   Voltage residue   mass loss   OCV   Weight   (V)   (g)   (V)   (g)   (%	Warning	Point	-							
Raw Data    Before   After   Voltage residue   mass loss   other ever	Recomm	nendation	The	battery p	oacks pass	s the test.				
Raw Data    (V)			No.							other even
Raw Data    2				(V)	(g)	(V)	(g)	(%)	(%)	
Raw Data    3			1							
Raw Data    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				12 884	186.95	12.883	186.94	99.99%	0.00%	0
Raw Data    5					106.50	10.000	106.50	00.000/	0.000/	
Raw Data    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			3	12.893				-		
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			3 4	12.893 12.898	186.72	12.895	186.71	99.98%	0.00%	0
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			3 4 5	12.893 12.898 12.756	186.72 187.32	12.895 12.754	186.71 187.31	99.98% 99.98%	0.00%	0
	Rav	w Data	3 4 5 6	12.893 12.898 12.756 12.759	186.72 187.32 186.94	12.895 12.754 12.756	186.71 187.31 186.93	99.98% 99.98% 99.98%	0.00% 0.00% 0.00%	0 0
	Rav	w Data	3 4 5 6 7	12.893 12.898 12.756 12.759 12.743	186.72 187.32 186.94 186.73	12.895 12.754 12.756 12.742	186.71 187.31 186.93 186.72	99.98% 99.98% 99.98% 99.99%	0.00% 0.00% 0.00% 0.00%	0 0 0
	Rav	w Data	3 4 5 6 7 8	12.893 12.898 12.756 12.759 12.743 12.732	186.72 187.32 186.94 186.73 187.29	12.895 12.754 12.756 12.742 12.728	186.71 187.31 186.93 186.72 187.28	99.98% 99.98% 99.98% 99.99%	0.00% 0.00% 0.00% 0.00%	0 0 0
	Rav	w Data	3 4 5 6 7 8 Note:	12.893 12.898 12.756 12.759 12.743 12.732 L-Leakage; V-V	186.72 187.32 186.94 186.73 187.29	12.895 12.754 12.756 12.742 12.728 sembly; R-Rupture	186.71 187.31 186.93 186.72 187.28 F-Fire	99.98% 99.98% 99.98% 99.99% 99.97%	0.00% 0.00% 0.00% 0.00%	0 0 0
	Rav	w Data	3 4 5 6 7 8 Note:	12.893 12.898 12.756 12.759 12.743 12.732 L-Leakage; V-V	186.72 187.32 186.94 186.73 187.29	12.895 12.754 12.756 12.742 12.728 sembly; R-Rupture	186.71 187.31 186.93 186.72 187.28 F-Fire	99.98% 99.98% 99.98% 99.99% 99.97%	0.00% 0.00% 0.00% 0.00%	0 0 0
	Rav	w Data	3 4 5 6 7 8 Note:	12.893 12.898 12.756 12.759 12.743 12.732 L-Leakage; V-V	186.72 187.32 186.94 186.73 187.29	12.895 12.754 12.756 12.742 12.728 sembly; R-Rupture	186.71 187.31 186.93 186.72 187.28 F-Fire	99.98% 99.98% 99.98% 99.99% 99.97%	0.00% 0.00% 0.00% 0.00%	0 0 0
	Rav	w Data	3 4 5 6 7 8 Note:	12.893 12.898 12.756 12.759 12.743 12.732 L-Leakage; V-V	186.72 187.32 186.94 186.73 187.29	12.895 12.754 12.756 12.742 12.728 sembly; R-Rupture	186.71 187.31 186.93 186.72 187.28 F-Fire	99.98% 99.98% 99.98% 99.99% 99.97%	0.00% 0.00% 0.00% 0.00%	0 0 0
	Rav	w Data	3 4 5 6 7 8 Note:	12.893 12.898 12.756 12.759 12.743 12.732 L-Leakage; V-V	186.72 187.32 186.94 186.73 187.29	12.895 12.754 12.756 12.742 12.728 sembly; R-Rupture	186.71 187.31 186.93 186.72 187.28 F-Fire	99.98% 99.98% 99.98% 99.99% 99.97%	0.00% 0.00% 0.00% 0.00%	0 0 0
	Rav	w Data	3 4 5 6 7 8 Note:	12.893 12.898 12.756 12.759 12.743 12.732 L-Leakage; V-V	186.72 187.32 186.94 186.73 187.29	12.895 12.754 12.756 12.742 12.728 sembly; R-Rupture	186.71 187.31 186.93 186.72 187.28 F-Fire	99.98% 99.98% 99.98% 99.99% 99.97%	0.00% 0.00% 0.00% 0.00%	0 0 0
	Rav	w Data	3 4 5 6 7 8 Note:	12.893 12.898 12.756 12.759 12.743 12.732 L-Leakage; V-V	186.72 187.32 186.94 186.73 187.29	12.895 12.754 12.756 12.742 12.728 sembly; R-Rupture	186.71 187.31 186.93 186.72 187.28 F-Fire	99.98% 99.98% 99.98% 99.99% 99.97%	0.00% 0.00% 0.00% 0.00%	0 0 0
	Rav	w Data	3 4 5 6 7 8 Note:	12.893 12.898 12.756 12.759 12.743 12.732 L-Leakage; V-V	186.72 187.32 186.94 186.73 187.29	12.895 12.754 12.756 12.742 12.728 sembly; R-Rupture	186.71 187.31 186.93 186.72 187.28 F-Fire	99.98% 99.98% 99.98% 99.99% 99.97%	0.00% 0.00% 0.00% 0.00%	0 0 0
	Rav	w Data	3 4 5 6 7 8 Note:	12.893 12.898 12.756 12.759 12.743 12.732 L-Leakage; V-V	186.72 187.32 186.94 186.73 187.29	12.895 12.754 12.756 12.742 12.728 sembly; R-Rupture	186.71 187.31 186.93 186.72 187.28 F-Fire	99.98% 99.98% 99.98% 99.99% 99.97%	0.00% 0.00% 0.00% 0.00%	0 0 0
	Rav	w Data	3 4 5 6 7 8 Note:	12.893 12.898 12.756 12.759 12.743 12.732 L-Leakage; V-V	186.72 187.32 186.94 186.73 187.29	12.895 12.754 12.756 12.742 12.728 sembly; R-Rupture	186.71 187.31 186.93 186.72 187.28 F-Fire	99.98% 99.98% 99.98% 99.99% 99.97%	0.00% 0.00% 0.00% 0.00%	0 0 0



Item	Test Item		Т	est specificati	on			Judge criteria	Samp	ole(s)
T2	Thermal test (UN38.3-2)	2-2.F	followed by some find the maximu temperature Repeat 2-1 for packs at amily weight are m	ored for 6 houstorage for 6 houstorage for 6 hours re extremes is or 10 times. The bient for 24 houseasured. The measured and	nours at -40 al between to s 30 minute then store the burs. All pac charged ba	±2°C. eest s. e e	(<0. no v disa rupti Batti 10% Batti	1%), no leakage, renting, no ssembly, no ure and no fire. ery voltage drop <	4 packs are f fully charged 4 packs are 5 cycled ending charged state #5~8)	(Pack#1~4) 50 times g in fully
Test Per	iod	Star	t: 2018/03	/12	End	1:2018	/03/	/19		
Test Equ	ipment	Diai	tal Meter (	Q153. Prog	rammable	e Ther	mal	Tester Q0446,	Scales Q09	0
Major Pr	-	-								
Warning		-								
	nendation	The	nacks na	ass the tes	:t					
		No.	Be OCV	efore Weight		fter Weig		voltage residue  Volt	mass loss Weight	other event
			(V)	(g)	(V)	(g)		(%)	(%)	
		1	12.890	186.50	12.821	186.4		99.46%	0.01%	0
		3	12.883	186.94 186.58	12.807 12.817	186.9 186.5		99.41% 99.42%	0.01%	0
		4	12.895	186.71	12.821	186.7		99.43%	0.01%	0
		5	12.754	187.31	12.683	187.2	9	99.44%	0.01%	0
		6	12.756	186.93	12.681	186.9		99.41%	0.01%	0
		7 8	12.742	186.72 187.28	12.674 12.653	186.7 187.2		99.47% 99.41%	0.01%	0
Rav	v Data			/enting ; D-Disass				33.4170	0.0170	0
			O-No Leakage	, No Venting , No [	Disassembly ,	No Ruptui	re , No	Fire		



lt a van	Tackless			Toot on o	-ifiti			ludas seite	- wi -		la(a)
Item	Test Item	2 4 1	Packa ara fi	Test spec		orm of the		Judge crite No mass loss			ample(s)
Т3	Vibration test (UN38.3-3)	v a v ld	ibration made in manner as ibration sha ogarithmic so it raverse epeated 12 nutually perp. The logarithmic 7-18 Hz → 18-50 Hz → 18-50 Hz → 18-18 packs we	0.8mm a	t distorting to ransmit the poidal waveful on 7 and 20 utes. This coptal of 3 hout the terminary sweep is mplitude sured. The	he packs in vibration. Torm with a 0 Hz and baycle shall be urs for each al face. as follows:	The ack to e of 3	(<0.1%), no leakage, no venting, no disassembly, rupture and n Battery voltag drop < 10%. Battery resists change < ±10	no o fire. je ance	cycle in charged (Pack# 4 packs times c in fully o	ď
Test Per	iod	Sta	rt:2018/03	3/20	E	nd:2018/	03/22	2		JI.	
Test Equ	ipment	Digi	tal Meter (	Q153, Vibr	ation Tes	ter Q300,	Scal	es Q090			
Major Pr		-				,					
Warning		-									
	nendation	The	nacks na	ass the te	st						
			Be	fore		ter		ed Packs tage residue	ma	ss loss	
		No.	OCV (V)	Weight (g)	OCV (V)	Weight (g)		Volt (%)		eight (%)	other event
		1	12.821	186.48	12.814	186.46		99.95%	0	.01%	0
		2	12.807	186.92	12.800	186.90		99.95%		.01%	0
		3	12.817	186.56 186.70	12.809 12.813	186.55 186.68		99.94% 99.94%		.01%	0
		5	12.683	187.29	12.675	187.27		99.94%		.01%	0
		6	12.681	186.91	12.675	186.89		99.95%		.01%	0
		7	12.674	186.70	12.665	186.67		99.93%		.01%	0
Rav	w Data	8	12.653	187.26	12.646	187.24		99.94%	0	.01%	0
				/enting ; D-Disas , No Venting , No			No Fire				



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 during the both of 6 milliseconds. Each pack shall be subjected to 3 shocks in the positive direction followed by three shocks in the negative direction followed by three shocks in the negative direction followed by three shocks in the negative direction of the pack for a total of 18 shocks.   4-3. All batteries weight are measured. The charged cell voltage are measured and recorded.   2	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 8 battery voltage drop < 10%.  Shock test (UN38.3-4)  T4  T4  T4  T5  T6  T6  T6  T6  T6  T7  T6  T7  T7  T7	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 sassembly, no rupture and no fire battery voltage drop < 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.  Test Period  Start: 2018/03/23  End: 2018/03/23  End		Test Item			Test specific	ation		Ju	ıdge criteria	Sam	ple(s)
Test Equipment   Digital Meter Q153, Shock Tester Q154, Scales Q090	Shock Test on Charged Packs	Digital Meter Q153, Shock Tester Q154, Scales Q090	T4		4-2. I	by means of all mounting Packs shall lof peak accept 6 millisect to 3 shocks in three shocks mutually per the pack for All batteries charged cell	a rigid moun surfaces. De subjected eleration 150g onds. Each part the positive in the negat pendicularly a total of 18 sweight are m	to a half-sine sign and pulse diack shall be sue direction follotive direction of mounting positishocks.	shock uration bjected wed by three	no leak no disa rupture Battery 10%. Battery	age, no venting, ssembly, no and no fire. voltage drop < resistance	in fully cha (Pack#1~4 4 packs are cycled end charged s	arged 4) e 50 times ding in fully
Shock Test on Charged Packs   Shock Test on Charged Packs   Shock Test on Charged Packs	Shock Test on Charged Packs   Shock Test on Charged Packs   Shock Test on Charged Packs	Shock Test on Charged Packs   Shock Test on Charged Packs   Shock Test on Charged Packs	Test Per	iod	Star	t:2018/03/	/23	End:	2018/0	03/23		<u> </u>	
Shock Test on Charged Packs   Shock Test on Charged Packs   Shock Test on Charged Packs	Shock Test on Charged Packs   Shock Test on Charged Packs   Shock Test on Charged Packs	Shock Test on Charged Packs   Shock Test on Charged Packs   Shock Test on Charged Packs	Test Equ	ipment	Digi	tal Meter (	Q153, Sho	ck Tester Q	54, S	cales (	2090		
Shock Test on Charged Packs   Shock Test on Charged Packs   Shock Test on Charged Packs	Shock Test on Charged Packs   Shoc	Shock Test on Charged Packs   Shock Test on Charged Packs   Shock Test on Charged Packs	•	<u> </u>	-		-, -:-		, 3				
Shock Test on Charged Packs   Before   After   Voltage residue   mass loss   Other even   Other   Other even   Other eve	Shock Test on Charged Packs   Before   After   Voltage residue   mass loss   OCV   Weight   (V)   (g)   (V)   (g)   (%	Shock Test on Charged Packs   Before   After   voltage residue   mass loss   OCV   Weight   (V)   (g)   (V)   (g)   (%			-								
Shock Test on Charged Packs	Shock Test on Charged Packs	Shock Test on Charged Packs			The	packs pa	ass the te	st.					
Raw Data    OCV   Weight   OCV   Weight   Volt   Vo	Raw Data    OCV   Weight   OCV   Weight   Volt   Weight   Wei	Raw Data    OCV   Weight   OCV   Weight   Weight				Ве		Af	ter		voltage residue		
Raw Data    1   12.814   186.46   12.808   186.46   99.95%   0.00%   O	Raw Data    1   12.814   186.46   12.808   186.46   99.95%   0.00%   O	Raw Data    1   12.814   186.46   12.808   186.46   99.95%   0.00%   O			No.				1/1/01	iaht	\ / al+		d other event
Raw Data    3	Raw Data    3	Raw Data    3			No.					-		_	other event
Raw Data    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	Raw Data    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	Raw Data    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				(V)	(g)	(V)	(g	g)	(%)	(%)	
Raw Data    5	Raw Data    5	Raw Data    5			1 2	(V) 12.814 12.800	(g) 186.46 186.90	(V) 12.808 12.795	(g 186. 186.	.46 .89	(%) 99.95% 99.96%	(%) 0.00% 0.00%	0
Raw Data  6 12.675 186.89 12.668 186.88 99.94% 0.00% 0  7 12.665 186.67 12.659 186.67 99.95% 0.00% 0  8 12.646 187.24 12.641 187.23 99.96% 0.00% 0  Note: L-Leakage; V-Venting; D-Disassembly; R-Rupture; F-Fire	Raw Data  6 12.675 186.89 12.668 186.88 99.94% 0.00% 0  7 12.665 186.67 12.659 186.67 99.95% 0.00% 0  8 12.646 187.24 12.641 187.23 99.96% 0.00% 0  Note: L-Leakage; V-Venting; D-Disassembly; R-Rupture; F-Fire	Raw Data  6 12.675 186.89 12.668 186.88 99.94% 0.00% 0  7 12.665 186.67 12.659 186.67 99.95% 0.00% 0  8 12.646 187.24 12.641 187.23 99.96% 0.00% 0  Note: L-Leakage; V-Venting; D-Disassembly; R-Rupture; F-Fire			1 2 3	(V) 12.814 12.800 12.809	(g) 186.46 186.90 186.55	(V) 12.808 12.795 12.804	186. 186. 186.	.46 .89 .54	(%) 99.95% 99.96% 99.96%	(%) 0.00% 0.00% 0.00%	0 0
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	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	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			1 2 3 4	(V) 12.814 12.800 12.809 12.813	(g) 186.46 186.90 186.55 186.68	(V) 12.808 12.795 12.804 12.807	(g 186. 186. 186.	.46 .89 .54	(%) 99.95% 99.96% 99.96% 99.95%	(%) 0.00% 0.00% 0.00% 0.00%	0 0 0
Note: L-Leakage ; V-Venting ; D-Disassembly ; R-Rupture ; F-Fire	Note: L-Leakage ; V-Venting ; D-Disassembly ; R-Rupture ; F-Fire	Note: L-Leakage ; V-Venting ; D-Disassembly ; R-Rupture ; F-Fire	Pay	w Data	1 2 3 4 5	(V) 12.814 12.800 12.809 12.813 12.675	(g) 186.46 186.90 186.55 186.68 187.27	(V) 12.808 12.795 12.804 12.807 12.671	(g 186. 186. 186. 186.	.46 .89 .54 .67	(%) 99.95% 99.96% 99.96% 99.95% 99.97%	(%) 0.00% 0.00% 0.00% 0.00%	0 0 0 0
			Rav	w Data	1 2 3 4 5 6	(V) 12.814 12.800 12.809 12.813 12.675	(g) 186.46 186.90 186.55 186.68 187.27 186.89	(V) 12.808 12.795 12.804 12.807 12.671 12.668	(g 186. 186. 186. 186. 187.	.46 .89 .54 .67 .26 .88	(%) 99.95% 99.96% 99.96% 99.95% 99.97% 99.94%	(%) 0.00% 0.00% 0.00% 0.00% 0.00%	0 0 0 0 0
O-No Leakage , No Venting , No Disassembly , No Rupture , No Fire	O-No Leakage , No Venting , No Disassembly , No Rupture , No Fire	O-No Leakage , No Venting , No Disassembly , No Rupture , No Fire	Rav	w Data	1 2 3 4 5 6 7	(V) 12.814 12.800 12.809 12.813 12.675 12.675	(g) 186.46 186.90 186.55 186.68 187.27 186.89 186.67	(V) 12.808 12.795 12.804 12.807 12.671 12.668 12.659	(g 186. 186. 186. 187. 186.	.46 .89 .54 .67 .26 .88 .67	(%) 99.95% 99.96% 99.96% 99.95% 99.97% 99.94% 99.95%	(%) 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%	0 0 0 0 0 0
			Rav	w Data	1 2 3 4 5 6 7 8 Note:	(V) 12.814 12.800 12.809 12.813 12.675 12.665 12.646 L-Leakage; V-V	(g)  186.46  186.90  186.55  186.68  187.27  186.89  186.67  187.24  enting; D-Disas:	(V) 12.808 12.795 12.804 12.807 12.671 12.668 12.659 12.641 sembly; R-Rupture	(g 186. 186. 186. 187. 186. 187. 186. 187. ; F-Fire	3) .46 .89 .54 .67 .26 .88 .67	(%) 99.95% 99.96% 99.96% 99.95% 99.97% 99.94% 99.95%	(%) 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%	0 0 0 0 0 0
			Rav	w Data	1 2 3 4 5 6 7 8 Note:	(V) 12.814 12.800 12.809 12.813 12.675 12.665 12.646 L-Leakage; V-V	(g)  186.46  186.90  186.55  186.68  187.27  186.89  186.67  187.24  enting; D-Disas:	(V) 12.808 12.795 12.804 12.807 12.671 12.668 12.659 12.641 sembly; R-Rupture	(g 186. 186. 186. 187. 186. 187. 186. 187. ; F-Fire	3) .46 .89 .54 .67 .26 .88 .67	(%) 99.95% 99.96% 99.96% 99.95% 99.97% 99.94% 99.95%	(%) 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%	0 0 0 0 0 0
			Rav	w Data	1 2 3 4 5 6 7 8 Note:	(V) 12.814 12.800 12.809 12.813 12.675 12.665 12.646 L-Leakage; V-V	(g)  186.46  186.90  186.55  186.68  187.27  186.89  186.67  187.24  enting; D-Disas:	(V) 12.808 12.795 12.804 12.807 12.671 12.668 12.659 12.641 sembly; R-Rupture	(g 186. 186. 186. 187. 186. 187. 186. 187. ; F-Fire	3) .46 .89 .54 .67 .26 .88 .67	(%) 99.95% 99.96% 99.96% 99.95% 99.97% 99.94% 99.95%	(%) 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%	0 0 0 0 0 0
			Rav	w Data	1 2 3 4 5 6 7 8 Note:	(V) 12.814 12.800 12.809 12.813 12.675 12.665 12.646 L-Leakage; V-V	(g)  186.46  186.90  186.55  186.68  187.27  186.89  186.67  187.24  enting; D-Disas:	(V) 12.808 12.795 12.804 12.807 12.671 12.668 12.659 12.641 sembly; R-Rupture	(g 186. 186. 186. 187. 186. 187. 186. 187. ; F-Fire	3) .46 .89 .54 .67 .26 .88 .67	(%) 99.95% 99.96% 99.96% 99.95% 99.97% 99.94% 99.95%	(%) 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%	0 0 0 0 0 0
			Rav	w Data	1 2 3 4 5 6 7 8 Note:	(V) 12.814 12.800 12.809 12.813 12.675 12.665 12.646 L-Leakage; V-V	(g)  186.46  186.90  186.55  186.68  187.27  186.89  186.67  187.24  enting; D-Disas:	(V) 12.808 12.795 12.804 12.807 12.671 12.668 12.659 12.641 sembly; R-Rupture	(g 186. 186. 186. 187. 186. 187. 186. 187. ; F-Fire	3) .46 .89 .54 .67 .26 .88 .67	(%) 99.95% 99.96% 99.96% 99.95% 99.97% 99.94% 99.95%	(%) 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%	0 0 0 0 0 0
			Rav	w Data	1 2 3 4 5 6 7 8 Note:	(V) 12.814 12.800 12.809 12.813 12.675 12.665 12.646 L-Leakage; V-V	(g)  186.46  186.90  186.55  186.68  187.27  186.89  186.67  187.24  enting; D-Disas:	(V) 12.808 12.795 12.804 12.807 12.671 12.668 12.659 12.641 sembly; R-Rupture	(g 186. 186. 186. 187. 186. 187. 186. 187. ; F-Fire	3) .46 .89 .54 .67 .26 .88 .67	(%) 99.95% 99.96% 99.96% 99.95% 99.97% 99.94% 99.95%	(%) 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%	0 0 0 0 0 0
			Rav	w Data	1 2 3 4 5 6 7 8 Note:	(V) 12.814 12.800 12.809 12.813 12.675 12.665 12.646 L-Leakage; V-V	(g)  186.46  186.90  186.55  186.68  187.27  186.89  186.67  187.24  enting; D-Disas:	(V) 12.808 12.795 12.804 12.807 12.671 12.668 12.659 12.641 sembly; R-Rupture	(g 186. 186. 186. 187. 186. 187. 186. 187. ; F-Fire	3) .46 .89 .54 .67 .26 .88 .67	(%) 99.95% 99.96% 99.96% 99.95% 99.97% 99.94% 99.95%	(%) 0.00% 0.00% 0.00% 0.00% 0.00% 0.00%	0 0 0 0 0 0



Item	Test Item		Test specifica	tion		Judge cr	itoria		Sample(s)
Item	1631 116111	5-1.Pa	cks are placed in to a		oven, and			4 nac	ks are first cycle in
		ex	terior packs temperature	e are mo	nitored	disassembly,	no		harged
	Short Circuit		en packs exterior reach		•	explosion, no		_	#1~4)
T5	Test		orted by connecting terr re of resistance less tha			smoke. Pack exterior peak		4 pac	ks are 50 times
13	(UN38.3-5)	5-4. Th	e short was continued f	or more	than 1hour	temperature			d ending in fully
			the cell temperature ret cks are observed for a f					_	ed state (Pack
		ρa	cks are observed for a r	urtirier o	nours.			#5~8)	
Test Per	iod	Start:	2018/03/26	End	l:2018/03/2	<u> </u>			
Test Equ			l Meter Q153, Data						
	nendation		packs pass the tes						
			Short Circuit Test on		l Packs				
		No.	Max. Temp.(°C)		ner event				
		1	57.59		0				
		2	57.49		0				
		3	56.28		0				
	<b>D</b> (	4	56.49		0				
Rav	w Data	5	57.81		0				
		6	55.94		0				
		7	57.69		0				
		- 8	56.17		0				
		Note: E	D-Disassembly ; R-Ruptu	re ; F-Fir	е				
			O- No Disassembly , No	Rupture	, No Fire				
Item	Test Item		Test specifi	cation		Juc	dge criter	ia	Sample(s)
			ll's diameter > 20mm, E		-		tempera		5 cells are 50%
		1 -	Kg mass is to be droppe	ea from a	a neight of		s not exce nd there		charged
Т6	Impact test					disasser	mbly and	no fire	(Cell #1~5)
10	(UN38.3-6)		ll's diameter < 20mm, E ells are crushed with a 1			within 6 test.	hours of	the	
		`	. Once the force is obtai						
Test Per	iod		2018/03/12		2018/03/1				
Test Equ	ıipment	Digita	ll Meter Q153, Data	Logge	er Q152, Im	pact tester	Q231		
Recomm	nendation	The (	Cells pass the test						
			Crush Test on :						
		No.	Max. Temp.(°C	.)		event			
		1	20.36			0	-		
Day	м Data	2	21.49			0	-		
Nav	w Data	3	20.48			0	-		
		4	20.73			0	-		
		5	21.58		(	0	]		
		Note:	D-Disassembly ; F-Fire	/ O-N	o Disassemb	oly , No Fire			



rnergy	corporation						
Item	Test Item		Test	specification		Judge criteria	Sample(s)
Т7	Overcharge test (UN38.3-7)	recc 7-2.The (a) Wi mod the batt (b) Wi that time 7-3. Tes	ommended maximum minimum voltage of the her spec's recordered than 18V, the minimum the spec's recordered the specific that specific the specific that spec	ted at ambient temp	ge current. s follows: voltage is not e test shall be ge voltage of the voltage is more shall be 1.2	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		018/03/13	End: 2018/	03/16		
Test Equ	ipment	Digital	Meter Q153, Da	ata Logger Q078	B, Power Supp	oly unit Q147	
Major Pı	oblem	-					
Warning	Point	-					
Recomn	nendation	The pa	acks pass the	test.			
		No.	Charge	Charge	on Charg		Other event
		9	Voltage(V)	Current(A)	21.36	3	0
		10			20.49		0
Rav	w Data	11			21.76		0
		12	22.0 7/	0.7	20.86	3	0
		13	22.0 V	9.7	21.76	3	0
		14			21.83		0
		15			21.59		0
		16			20.49	9	0
		Note:	D-Disassembl	ly ; F-Fire / O-	No Disasse	mbly ,No Fire	



Item								
	Test Item		Т	est specification			e criteria	Sample(s)
Т8	Forced discharge test (UN38.3-8)	conne initial	ecting it in series w	charged at ambient tem vith a 12 V D.C. power ne maximum discharge acturer.	supply	no fire seven the tes at an	days after	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 Per	riod	Start	:2018/03/19	End: 2018/	03/21			
Test Equ	uipment		al Meter Q153,			Power Supply (	unit Q236	6/Q237
Major Pı		-			,			
Warning		-						
	nendation	The	packs pass th	ne test				
		Forc	ed discharge are first	cycle in fully discharged	Forced	discharge are after (	50 cycles end	ding in fully discharged
		Force	ed discharge are first  Max. Temp.(°C)	Cycle in fully discharged Other event	Forced No.	discharge are after to Max. Temp.(°C)	50 cycles end	ding in fully discharged Other event
		No.	Max. Temp.(°C) 50.16	Other event O	No. 16	Max. Temp.(°C) 52.69	50 cycles end	Other event O
		No. 6 7	Max. Temp.(°C) 50.16 48.69	Other event O O	No. 16 17	Max. Temp.(°C) 52.69 53.48	50 cycles end	Other event O
		No. 6 7 8	Max. Temp.(°C) 50.16 48.69 47.36	Other event O O O	No. 16 17 18	Max. Temp.(°C) 52.69 53.48 50.86	50 cycles end	Other event O O O
Pa	w Doto	No. 6 7 8 9	Max. Temp.(°C) 50.16 48.69 47.36 61.25	Other event O O O O O	No. 16 17 18 19	Max. Temp.(°C) 52.69 53.48 50.86 61.17	50 cycles end	Other event O O O O
Ra	w Data	No. 6 7 8	Max. Temp.(°C) 50.16 48.69 47.36	Other event O O O	No. 16 17 18	Max. Temp.(°C) 52.69 53.48 50.86	50 cycles end	Other event O O O
Ra	w Data	No. 6 7 8 9 10	Max. Temp.(°C)  50.16  48.69  47.36  61.25  59.48	Other event  O  O  O  O  O  O	No. 16 17 18 19 20	Max. Temp.(°C) 52.69 53.48 50.86 61.17 59.86	50 cycles end	Other event  O  O  O  O  O
Ra	w Data	No. 6 7 8 9 10 11	Max. Temp.(°C)  50.16  48.69  47.36  61.25  59.48  53.76	Other event	No. 16 17 18 19 20 21	Max. Temp.(°C) 52.69 53.48 50.86 61.17 59.86 58.49	50 cycles end	Other event  O O O O O O O O O
Ra	w Data	No. 6 7 8 9 10 11 12 13 14	Max. Temp.(°C)  50.16  48.69  47.36  61.25  59.48  53.76  54.86  51.81  48.69	Other event	No. 16 17 18 19 20 21 22 23 24	Max. Temp.(°C)  52.69  53.48  50.86  61.17  59.86  58.49  52.64  51.26  53.24	50 cycles end	Other event  O O O O O O O O O O O O O O O O O O
Ra	w Data	No. 6 7 8 9 10 11 12 13 14 15	Max. Temp.(°C)  50.16  48.69  47.36  61.25  59.48  53.76  54.86  51.81  48.69  47.26	Other event	No. 16 17 18 19 20 21 22 23 24 25	Max. Temp.(°C) 52.69 53.48 50.86 61.17 59.86 58.49 52.64 51.26	50 cycles end	Other event  O O O O O O O O O O O O O O O O O O