

TEST REPORT	
UL 2056: 2015	
Outline of Investigation for Safety of Power Banks	
Report Number	TCT191010B006
Date of issue	2019-11-18
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Testing laboratory	Shenzhen TCT Testing Technology Co., Ltd.
Address	1B/F., Building 1, Yibaolai Industrial Park, Qiaotou, Fuyong, Bao'an District, Shenzhen, Guangdong, China
Testing location	As above
Applicant's name	SeriousPlayer.com DBA Voltaic Systems
Address	Voltaic Systems, New Lab, 19 Morris Avenue, Brooklyn, NY 11205
Manufacturer's name	XXXX REDACTED XXXX
Address	XXXX REDACTED XXXX
Test specification :	
Standard	UL 2056: 2015
Test procedure	Type approved
Test result	Pass
Non-standard test method	N/A
This test report is specially limited to the above client company and product model only, It may not be duplicated without prior written consent of Shenzhen TCT Testing Technology Co., Ltd.	
Test item description	Power Bank
Trade Mark	VOLTAIC
Model/type reference	V88
Ratings	DC Input: 18V/3A, 25V/3A(max) USB C Input: 5V/1A, 20V/2.25A(max) USB QC Output: 5V/3A, 12V/3A(max) USB C Output: 5V/3A, 20V/2.2A(max) DC Output: 12V/6A, 16V/5A, 19V/4.5A, 24V/3.5A Battery Capacity: 24000mAh, 88.8Wh; Power Bank Rated capacity (min): 1800mAh

Test item particulars:	
Information about the product needed to establish a correct test program, such as product mobility, type of power connections and similar.	(Test item particulars are selected by the TRF Originator base on the requirements in the standard)
Designation	Power Bank
Nominal voltage	5.0Vdc, 18.0Vdc, 20.0Vdc, 25.0Vdc
Rated capacity	24000mAh
Output capacity.....	1800mAh (for Minimum capacity by DC 24V/3.5A)
Maximum charge voltage.....	5.0Vdc, 18.0Vdc, 20.0Vdc, 25.0Vdc
Maximum charge current	3.0A
Final voltage.....	4.5Vdc
Max Ambient Temperature	45°C max(charge), 45°C max(discharge)
Manufacturer's charge method	Charging the power bank with 3A until the current reduces to 0.15A.
Possible test case verdicts:	
Test case does not apply to the test object:	N(/A)
Test object does meet the requirement	P(ass)
Test object does not meet the requirement	F(ail)
Testing:	
Date of receipt of test item	2019-10-21
Date(s) of performance of tests	2019-10-21 to 2019-11-15
General remarks:	
This report shall not be reproduced, except in full, without the written approval of the testing laboratory.	
The test results presented in this report relate only to the object tested.	
"(see remark #)" refers to a remark appended to the report.	
"(see appended table)" refers to a table appended to the report.	
Throughout this report a point is used as the decimal separator.	

Copy of marking plate:

VOLTAIC	LPS
Power Bank	Model: V88
DC Input: 18V/3A, 25V/3A(max)	
USB C Input: 5V/1A, 20V/2.25A(max)	
USB QC Output: 5V/3A, 12V/3A(max)	
USB C Output: 5V/3A, 20V/2.2A(max)	
DC Output: 12V/6A, 16V/5A, 19V/4.5A, 24V/3.5A	
Battery Capacity: 24000mAh, 88.8Wh;	
Power Bank Rated capacity (min): 1800mAh	
Date Code: 20191010	Made in China

Label on the power bank

WARNING: Do not put the battery into a fire or apply direct heat to it.
Do not attempt to disassemble or modify the battery in any way.
Do not use any chargers other than those recommended.

CAUTION: Risk of Fire and Burns. Do Not Open, Crush, Heat Above 45°C/113°F or Incinerate. Do not short circuit. If bulges severely, discontinue use. Follow Manufacturer's Instructions.

Label on the smallest unit package

Summary of testing:

<u>Clause(s)</u>	<u>Test(s)</u>
8	General
8.4	TABLE: Abnormal Charging Test
8.5	TABLE: Abusive Overcharge Test for model (battery)
8.7/8.8	TABLE: Battery Pack Component Temperature Test and Battery Pack Surface Temperature Test for model (battery)
8.9	TABLE: Limited power sources
8.10	TABLE: Evaluation of voltage limiting components in SELV circuits
9	Power Input Test
10	Overload of Output Ports Test
12	Capacity Verification Test

General information:

The product covered in this report is a power bank which consists of eight Li-ion cells (1S8P), the cell (6251100) inside the power bank is approved by TCT according to UL1642 (Report No.: TCT191023B012), see component list table for details and protection circuit provided in the power bank.

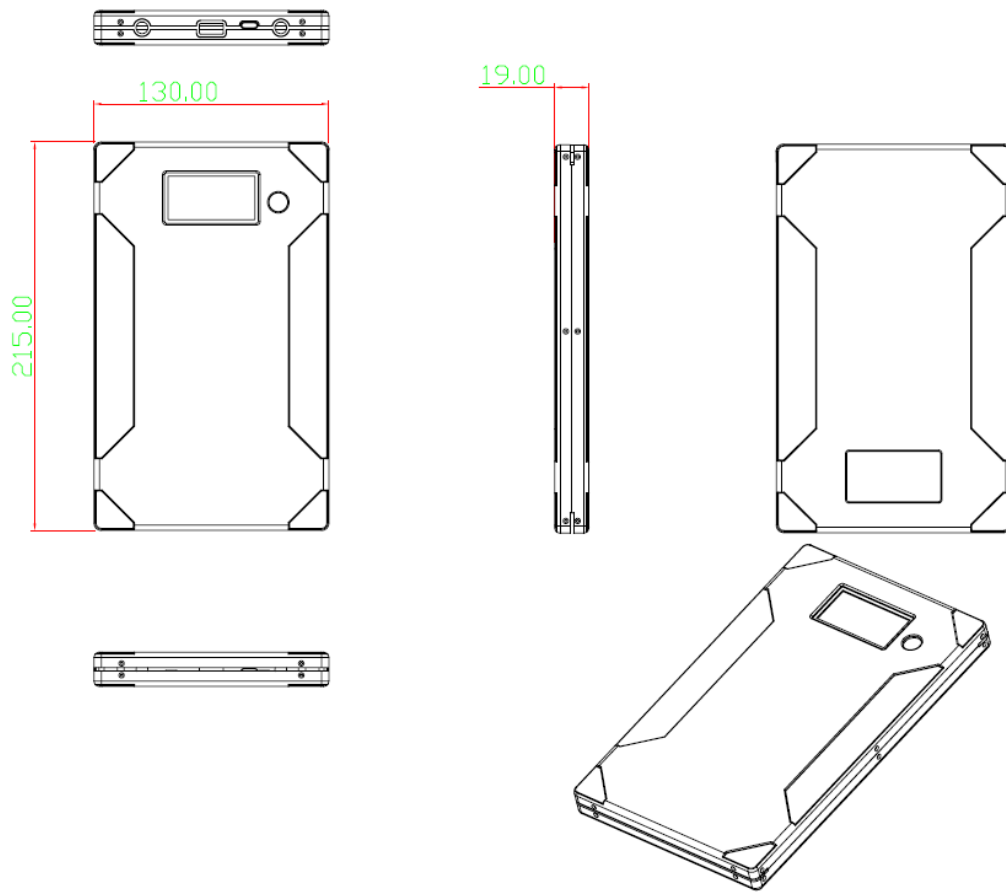
Power bank electrical parameter:

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
V88	1800mAh (for Minimum capacity by DC 24V/3.5A)	5V	USB C Input: 1A	USB QC Output: 3A, USB C Output: 3A	USB C Input: 1A	USB QC Output: 3A, USB C Output: 3A	5V	4.84V
		12V	N/A	USB QC Output: 3A, DC Output: 6A	N/A	USB QC Output: 3A, DC Output: 6A	12V	USB QC Output: 9.78V, DC Output: 9.93V
		16V	N/A	DC Output: 5A	N/A	DC Output: 5A	16V	9.93V
		18V	DC Input: 3A	N/A	DC Input: 3A	N/A	14V	N/A
		19V	N/A	DC Output: 4.5A	N/A	DC Output: 4.5A	19V	9.93V
		20V	USB C Input: 2.25A	USB C Output: 2.2A	USB C Input: 2.25A	USB C Output: 2.2A	20V	9.78V
		24V	N/A	DC Output: 3.5A	N/A	DC Output: 3.5A	24V	9.93V
		25V	DC Input: 3A	N/A	DC Input: 3A	N/A	25V	N/A

Built-in cell electrical parameter:

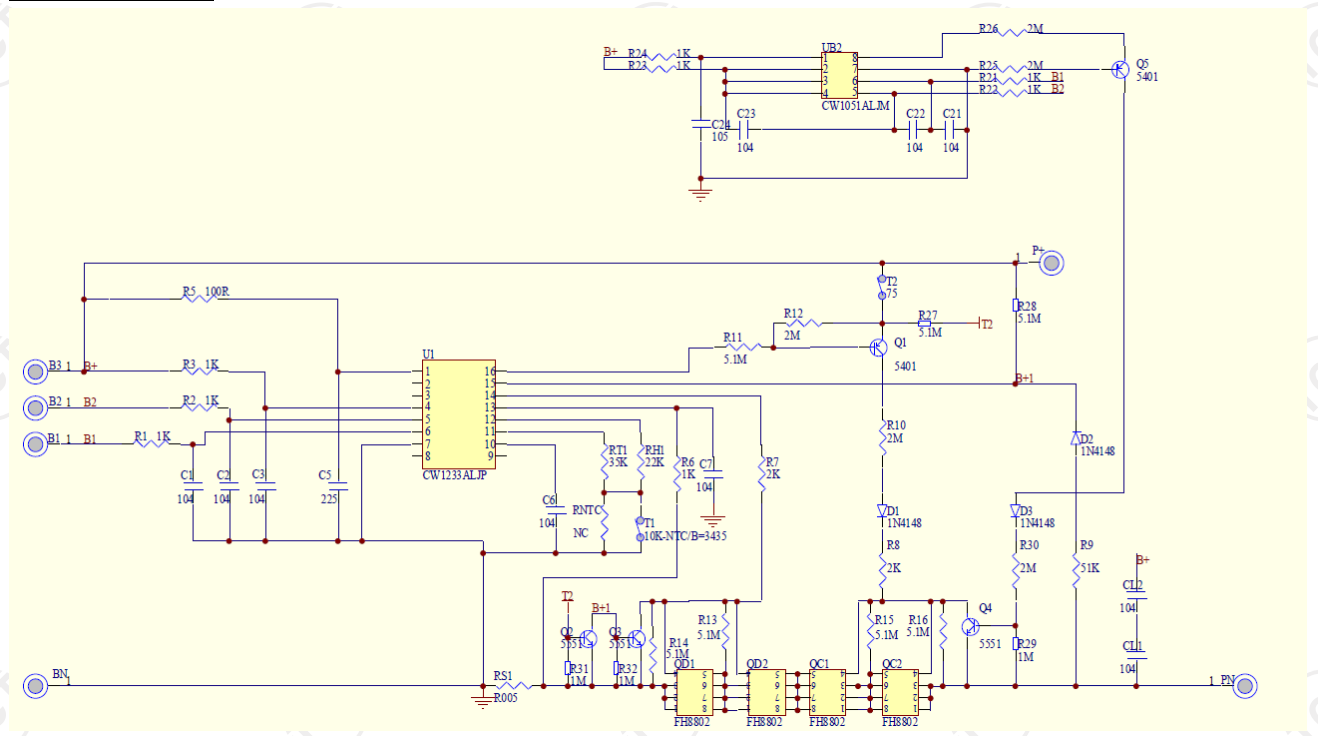
Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
6251100	4000mAh	3.7V	800mA	800mA	2000mA	2000mA	4.25V	3.0V

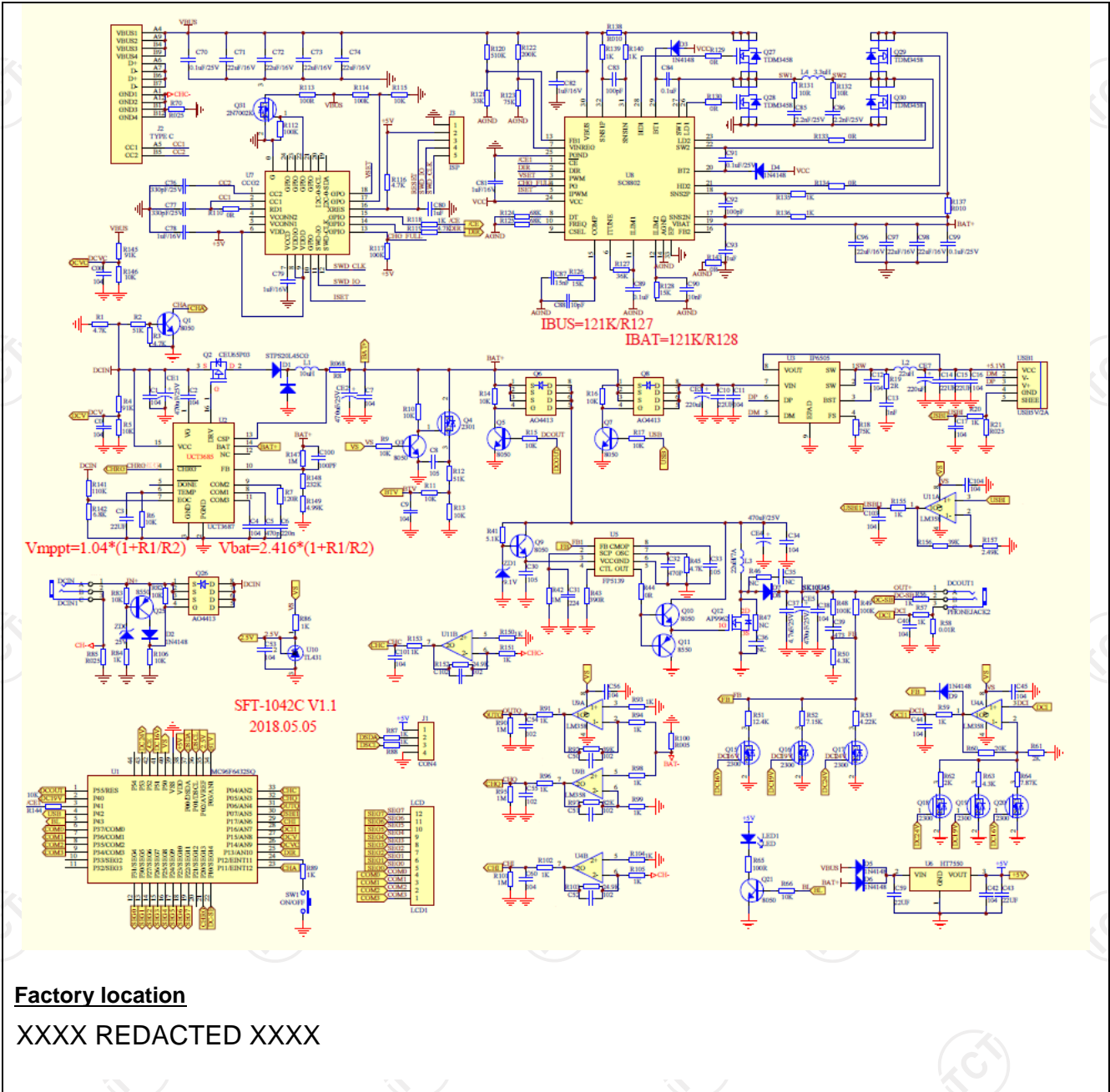
Construction:



Power bank (Unit: mm)

Circuit diagram:





Factory location

XXXX REDACTED XXXX

UL 2056			
Clause	Requirement + Test	Result - Remark	Verdict

CONSTRUCTION			P
7	General		P
7.1	Power banks shall comply with the requirements in the Standard for Household and Commercial Batteries, UL 2054.	Complied.	P
7.2	The input port from external power supply is in general dc jack or USB port, and shall not be of the types described in 1.3.	Complied.	P
7.3	If the built-in dc/dc converter circuitry generates voltage exceeding 42.4 Vac or 60 Vdc, this circuitry shall comply with the applicable requirements of either the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1 or the Standard for Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements, UL 62368-1.	No such voltage exceeding 42.4Vac or 60Vdc in the power bank.	N/A
7.4	For power banks with direct plug-in construction, the following shall be met.	Not direct plug-in construction.	N/A
	a) The power bank and its built-in ac/dc power supply shall comply with the applicable requirements of either the Standard for Information Technology Equipment-Safety-Part 1: General Requirements, UL60950-1 or the Standard for Audio/Video, Information and Communication Technology Equipment-Part 1: Safety Requirements, UL 62368-1.		N/A
	b) A barrier shall be provided between the built-in ac/dc power supply and built-in battery pack. The barrier shall comply with the requirements of electrical insulation and fire enclosure of either the Standard for Information Technology Equipment-Safety-Part 1: General Requirements, UL60950-1 or the Standard for Audio/Video, Information and Communication Technology Equipment-Part 1: Safety Requirements, UL 62368-1.		N/A

PERFORMANCE			P
8	General		P
8.1	Unless otherwise superseded by a requirement in this Outline, power banks shall comply with the requirements of battery packs in the Standard for Household and Commercial Batteries, UL 2054.	Complied.	P
8.2	For the Abnormal Charging Test and Abusive Overcharge Test in the Standard for Household and Commercial Batteries, UL 2054, 8.3 – 8.5 shall be followed.		P

UL 2056			
Clause	Requirement + Test	Result - Remark	Verdict
8.3	The tests shall be conducted at the input point of battery protecting circuit. Note – This means dc/dc converter circuitry will be bypassed to result in battery overcharging, which is required for the evaluation of protecting circuit.		P
8.4	For the Abnormal Charging Test in the Standard for Household and Commercial Batteries, UL 2054, the following shall be taken as maximum current I _c : Rated maximum charging current of the built-in battery (rather than the power bank).	See appended table 8.4	P
8.5	For the Abusive Overcharge Test in the Standard for Household and Commercial Batteries, UL 2054, the C5 amp rate of the built-in battery (rather than the power bank) shall be taken for the purpose of this test.	See appended table 8.5	P
8.6	For the Battery Pack Component Temperature Test and Battery Pack Surface Temperature Test in the Standard for Household and Commercial Batteries, UL 2054, 8.7 and 8.8 shall be followed.		P
8.7	For output loading temperature test, a fully charged power bank shall be discharged. Any load of the output ports that can be operated at the same time shall be considered to result in maximum temperature rise.		P
8.8	For input loading temperature test, a fully discharged power bank shall be charged in accordance with manufacturer's specifications. Any load of the output ports that can be operated at the same time shall be considered to result in maximum temperature rise.		P
8.9	Each output port shall be a limited power source in accordance with the Standard for Household and Commercial Batteries, UL 2054, the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1, or the Standard for Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements, UL 62368-1, or a Class 2 power source in accordance with the Standard for Class 2 Power Units, UL 1310.	See appended table 8.9	P
8.10	Each output port shall be a SELV circuit in accordance with the Standard for Information Technology Equipment – Safety – Part 1: General Requirements, UL 60950-1 or be an ES1 in accordance with the Standard for Audio/Video, Information and Communication Technology Equipment – Part 1: Safety Requirements, UL 62368-1.	SELV circuit, dc output rated less than 60Vdc.	P

UL 2056			
Clause	Requirement + Test	Result - Remark	Verdict

9 Power Input Test			
9.1	The current input to a power bank shall not exceed 110% of the marked input current rating of the power bank, when the power bank is operated under the conditions of maximum normal load.		P
9.2	Maximum normal load shall consist of the maximum current draw while the power bank is operating in all possible modes. This may include charging the built-in battery, and output ports unloaded or loaded at the rated maximum normal load. Any load that can be operated at the same time shall be considered in order to obtain the maximum normal load.		P

10 Overload of Output Ports Test			
10.1	Each power output pin of output port shall be overloaded in accordance with 10.2 – 10.5.	Tested as required	P
10.2	In accordance with manufacturer's specifications, fully charge the built-in battery of power bank.		P
10.3	The power bank is covered with one layer of cheesecloth and placed on a softwood board covered with one layer of tissue paper.		P
10.4	Each power output pin of output port shall then be loaded to draw the maximum current, for at least 1 h.		P
10.5	After this test, the cheesecloth and tissue paper shall remain intact.		P

11 Flammability of Photovoltaic Cells Test			
11.1	This test shall be conducted if the power bank is provided with integral photovoltaic cells as a power source.	No photovoltaic cells used.	N/A
11.2	In accordance with manufacturer's specifications, fully charge the built-in battery of the power bank.		N/A
11.3	The power bank is covered with one layer of cheesecloth and placed on a softwood board covered with one layer of tissue paper.		N/A
11.4	The power bank is subjected to single component fault that is likely to occur and which would result in flammability issue of the photovoltaic cells, such as back-feed of battery power, and is kept in this state for 1 h.		N/A
11.5	After this test, the cheesecloth and tissue paper shall remain intact.		N/A

12 Capacity Verification Test			
			P

UL 2056			
Clause	Requirement + Test	Result - Remark	Verdict
12.1	The marked electrical capacity of power bank, measured at the power output pin of output port, shall comply with the Standard for Secondary Cells and Batteries Containing Alkaline or Other Non-Acid Electrolytes – Secondary Lithium Cells and Batteries for Portable Applications, IEC 61960, Clause 7.3.1, Discharge Performance at 20 °C (Rated Capacity), and the modified test method in 12.2.	See table 12	P
12.2	The power bank is discharged at a constant current equals to rated current of the output port, until its voltage is equal to the end-of-discharge voltage of the output port, specified by the manufacturer.		P

MARKINGS			P
13	General		P
13.1	Unless otherwise superseded by a requirement in this Outline, power banks shall comply with the requirements in the Standard for Household and Commercial Batteries, UL 2054.	See marking plate on page 3	P
13.2	For electrical ratings, the following information shall be provided	See marking plate on page 3	P
	a) Input rating in Vdc and A. If there are more than one input ports, the rating of each port shall be provided;	Two input ports, Input rating in Vdc and A.	P
	b) Output rating in Vdc and A. If there are more than one output ports, it shall include rating of each port and the combined rating (if it is not equal to the summation of all ports); and	Output rating of each port and combined rating marked.	N/A
	c) Electrical capacity in Ah or mAh. If there are more than one output ports/output ratings, either the capacity of each port/rating shall be provided, or the minimum capacity of these ports/ratings shall be provided.	Capacity of Power bank output port marked (Minimum capacity).	P

INSTRUCTIONS			P
14	General		P
14.1	Power banks shall be provided with legible instructions pertaining to the proper selection and replacement of its power supply or charger.	User manual provided.	P
14.2	Power banks shall be provided with legible instructions pertaining to a risk of fire or injury to persons associated with the use of the product.	User manual provided.	P
14.3	An illustration is allowed with a required instruction to clarify the intent but shall not replace the written instruction.	No related illustration in the user manual	N/A
15	Instructions Pertaining to Risk of Fire or Injury to Persons		P

UL 2056			
Clause	Requirement + Test	Result - Remark	Verdict
15.1	Instructions pertaining to a risk of fire or injury to persons shall warn the user of reasonably foreseeable risks and state the precautions to be taken to reduce such risks. Such instructions shall be preceded by the heading "INSTRUCTIONS PERTAINING TO RISK OF FIRE OR INJURY TO PERSONS" or the equivalent.	User manual provided.	P
15.2	Unless otherwise indicated, the text of the instructions in 15.4 shall be in the words specified or words that are equivalent, clear, and understandable. Substitution of the signal word "DANGER" for "WARNING" is allowed when the risk associated with the product is such that a situation exists which, if not avoided, will result in death or serious injury.	User manual provided.	P
15.3	Numbering of the items in the list in 15.4 and including other instructions pertaining to a risk of fire or injury to persons that the manufacturer determines to be necessary and that do not conflict with the intent of the instructions are acceptable.	User manual provided.	P

UL 2056			
Clause	Requirement + Test	Result - Remark	Verdict
15.4	<p>The instructions pertaining to a risk of fire or injury to persons shall include those items in the following list that are applicable to the product. The statement "IMPORTANT SAFETY INSTRUCTIONS" or the equivalent shall precede the list, and the statement "SAVE THESE INSTRUCTIONS" or the equivalent shall either precede or follow the list. The word "WARNING" shall be entirely in upper case letters or shall be emphasized to distinguish it from the rest of the text.</p> <p>IMPORTANT SAFETY INSTRUCTIONS</p> <p>WARNING – When using this product, basic precautions should always be followed, including the following:</p> <ul style="list-style-type: none"> a) Read all the instructions before using the product. b) To reduce the risk of injury, close supervision is necessary when the product is used near children. c) Do not put fingers or hands into the product. d) Do not expose power bank to rain or snow. e) Use of a power supply or charger not recommended or sold by power pack manufacturer may result in a risk of fire or injury to persons. f) Do not use the power bank in excess of its output rating. Overload outputs above rating may result in a risk of fire or injury to persons. g) Do not use the power bank that is damaged or modified. Damaged or modified batteries may exhibit unpredictable behavior resulting in fire, explosion or risk of injury. h) Do not disassemble the power bank. Take it to a qualified service person when service or repair is required. Incorrect reassembly may result in a risk of fire or injury to persons. i) Do not expose a power pack to fire or excessive temperature. Exposure to fire or temperature above 100°C may cause explosion. The temperature of 100°C can be replaced by the temperature of 212°F. j) Have servicing performed by a qualified repair person using only identical replacement parts. This will ensure that the safety of the product is maintained. k) Switch off the power bank when not in use. <p>SAVE THESE INSTRUCTIONS</p>	User manual provided.	P

UL 2056			
Clause	Requirement + Test	Result - Remark	Verdict

APPENDIX A			P
	<p>Standards for Components</p> <p>Standards under which components of the products covered by this outline of investigation are evaluated include the following:</p> <p>Title of Standard – UL Standard Designation</p> <p>Automatic Electrical Controls for Household and Similar Use, Part 1: General Requirements – UL 60730-1</p> <p>Low-Voltage Fuses – Part 1: General Requirements – UL 248-1</p> <p>Low-Voltage Fuses – Part 14: Supplemental Fuses – UL 248-14</p> <p>Marking and Labeling Systems – UL 969</p> <p>Polymeric Materials – Use in Electrical Equipment Evaluations – UL 746C</p> <p>Printed-Wiring Boards – UL 796</p> <p>Tests for Flammability of Plastic Materials for Parts in Devices and Appliances – UL 94</p> <p>Thermal-Links – Requirements and Application Guide – UL 60691</p> <p>Thermistor-Type Devices – UL 1434</p>		P

TABLE: Critical components information					
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity
Cell	Dongguan Yongbang Amperex Technology Co., Ltd	6251100	3.7V, 4000mAh	UL 1642	TCT191023B0 12
Plastic Enclosure	FORMOSA CHEMICALS & FIBRE CORP PLASTICS DIV	AG15A1-H	HB min. thickness: 1.0mm, 60°C	UL 94 UL 746	UL E162823
Components used on PCB-1					
PCB	AISHENG EXACTITUDE CIRCUITRI CO LTD	RPCB	V-0, 130°C	UL 94 UL 796	UL E248037
PCB (Alternative)	Interchangeable	Interchangeable	V-0, 130°C	UL 94 UL 796	UL approved
USB Type-C Controller (U7)	CYPRESS PERFORM	CCG2	Operating voltage: 2.7V to 5.5V, T _A : -40°C ~85°C	--	Tested with appliance
Buck-Boost Charger Controller (U8)	SOUTHCHIP SEMICONDUCT OR	SC8802	Input voltage: 2.7V to 30V, Output voltage: 2.0V to 30V	--	Tested with appliance
Protective IC (U3)	INJONIC	IP6505	V _{IN} : 4V to 32V V _{OUT} : 3V to 12V	--	Tested with appliance
MOSFET (Q6, Q8, Q26)	Alpha and Omega Semiconductor	AO4413	V _{DS} : -30V, V _{GS} : ±25V, I _D : -70A	--	Tested with appliance
Charge management IC (U2)	Unisonic Technologies Company Limited	UCT3687	VDD: 1.8V to 5.5V T _A : -40°C ~ 85°C	--	Tested with appliance
MCU (U1)	ABOV Semiconductor Co., Ltd.	MC96F6432SQ	VDD: 7.5V to 28V T _A : -40°C ~85°C	--	Tested with appliance
LOW POWER DUAL OPERATIONAL AMPLIFIERS (U4, U9, U11)	STMicroelectroni cs GROUP OF COMPANIES	LM358	V _{CC} : ±16V or ±32V T _{stg} : 0°C ~ 70°C	--	Tested with appliance
BOOST CONVERT CONTROL IC (U5)	Feeling Technology Corp.	FP5139	Supply Voltage: 1.8V to 15V T _{OPR} : -10°C ~ 85°C	--	Tested with appliance
MOSFET (Q27, Q28, Q29, Q30)	Techcode Semiconductor Limited	TDM3458	V _{DS} : -30V, V _{GS} : ±20V, I _D : -60A	--	Tested with appliance

Components used on PCB-2(for battery charging/discharging)					
PCB	AISHENG EXACTITUDE CIRCUITRI CO LTD	RPCB	V-0, 130°C	UL 94 UL 796	UL E248037
PCB (Alternative)	Interchangeable	Interchangeable	V-0, 130°C	UL 94 UL 796	UL approved
Protective IC (U1)	CELLWise	CW1233ALJP	V _{CU} : 4.175V to 4.350V V _{DL} : 2.300V to 3.000V	--	Tested with appliance
Protective IC (UB2)	CELLWise	CW1051ALJM	Overcharge Protection: Threshold from 4.100V to 4.4500V, 5mV steps, ±25mV accuracy	--	Tested with appliance
Mosfet (QD1, QD2, QC1, QC2)	SHEN ZHEN XIN FEI HONG ELECTRONICS CO., LTD	FH8802	V _{DSS} : 30V, V _{GSS} : ±20V, I _D : 70A	--	Tested with appliance
Thermal Protector	YANGZHOU BAOHU ELECTRONIC TECHNOLOGY CO LTD	BH02-BB8D	75°C	UL 60730	UL E489615
Lead wire	JUNHAO WIRE TECHNOLOGY CO LTD (DONGGUAN)	3239	18AWG, 300V, 200°C	UL 758	UL E357447
Lead wire (Alternative)	Interchangeable	Interchangeable	18AWG, 300V, 200°C	UL 758	UL approved

Supplementary information:

¹⁾ Provided evidence ensures the agreed level of compliance.

8.4	TABLE: Abnormal Charging Test					P
Ambient temperature: 23.3°C						
Id	3.0			A		
Ue	4.5			V		
Ic	36			A		
Uc	25			V		
Sample No.	001	002	003	004	005	
Cell Case temp. (°C)	47.8	48.9	49.7	49.4	50.3	
Power bank surface temp. (°C)	39.4	40.4	41.2	40.8	42.0	
Faulted Protective Device	QC1 (pin1 to pin8) short circuit					
Supplementary information:						
1) The DC/DC converter circuit is bypassed with VBUS to VBAT+ was short circuit.						
2) Charging current is 3 x Ic=36A.						
3) Charge until the power bank fully charged plus additional 7hrs.						
-No explosion or fire, or chemical leak.						

8.5	TABLE: Abusive Overcharge Test					P
Ambient temperature: 23.5°C						
Sample No.	006	007	008	009	010	
Ic(A)	48	48	48	48	24	
Cell Case temp. (°C)	58.6	58.7	59.2	57.8	53.4	
Power bank surface temp. (°C)	49.7	49.3	40.2	48.9	45.6	
Faulted Protective Device	QC1 (pin1 to pin8) short circuit					
Supplementary information:						
1) The DC/DC converter circuit is bypassed with VBUS to VBAT+ was short circuit.						
2) Test current is 10 times C5 for 4pcs and 5 times C5 for 1pcs.						
3) The test was continued until the temperature of the internal cell casing returns to ambient.						
-No explosion or fire.						

8.7/8.8	TABLE: Battery Pack Component Temperature Test and Battery Pack Surface Temperature Test for model				P
Power bank Component Temperature Test (for Charging)					
Sample No.	011		012		Limited T
Testing Process	DC Input		USB C Input		
	18V	25V	5V	20V	
PCB near U1 (for PCB-2)	42.5	43.2	42.3	42.9	130-45+24=109
PCB near QD2	40.6	41.6	40.4	40.9	130-45+24=109
PCB near UB2	33.3	33.9	33.1	33.6	130-45+24=109
PCB near U1 (for PCB-1)	41.1	42.2	40.8	41.3	130-45+24=109
PCB near U2	35.9	36.7	35.8	36.2	130-45+24=109
PCB near U7	38.2	39.1	37.9	38.6	130-45+24=109
PCB near U8	36.8	37.6	36.7	37.2	130-45+24=109
Lead Wiring	33.8	34.7	33.6	34.2	200-45+24=179
Cell body	33.0	33.8	32.7	33.4	Ref.
PCB near USB port	38.3	39.1	38.0	38.7	130-45+24=109
Ambient (°C)	24.0*	24.0*	24.0*	24.0*	--
Power bank Component Temperature Test (for Charging)					
Sample No.	011		012		Limited T
Testing Process	DC Input		USB C Input		
	18V	25V	5V	20V	
Power bank surface (near USB port)	31.3	31.6	31.3	31.6	60-45+24=39
Power bank surface (near cell)	29.1	29.4	29.1	29.4	60-45+24=39
Ambient (°C)	24.0*	24.0*	24.0*	24.0*	--
Supplementary information:					
1) Charging at 18V/3A, 25V/3A using DC Input;					
2) Charging at 5V/3A, 20V/2.5A using USB C Input;					
Remark:					
- Component & surface temperature not exceed the limits.					
*The test temperature was actual test ambient temperature.					

8.7/8.8	TABLE: Battery Pack Component Temperature Test and Battery Pack Surface Temperature Test for model						P
Power bank Component Temperature Test (for Discharging)							
Sample No.	011						Limited T
Testing Process	USB QC Output		USB C Output		DC Output		
	5V/3A	12V/3A	5V/3A	20V/2.2A	12V/6A	24V/3.5A	
PCB near U1 (for PCB-2)	42.7	43.0	43.4	44.6	53.1	61.0	130-45+24=109
PCB near QD2	40.9	41.9	40.7	43.2	42.3	50.5	130-45+24=109
PCB near UB2	28.7	28.9	28.9	30.4	39.4	48.6	130-45+24=109
PCB near U1 (for PCB-1)	43.4	44.8	43.5	45.4	54.7	61.6	130-45+24=109
PCB near U2	33.9	34.6	34.2	35.8	44.8	50.7	130-45+24=109
PCB near U7	29.8	29.9	29.6	31.3	41.2	47.1	130-45+24=109
PCB near U8	30.1	30.8	30.2	32.3	41.2	47.9	130-45+24=109
Lead Wiring	28.1	28.4	28.2	29.8	38.8	45.8	200-45+24=179
Cell body	27.9	29.3	28.2	30.4	39.7	46.7	Ref.
PCB near USB port	41.2	42.2	41.3	42.9	50.4	53.3	130-45+24=109
Ambient (°C)	24.0*	24.0*	24.0*	24.0*	24.0*	24.0*	--
Power bank Component Temperature Test (for Discharging)							
Sample No.	011						Limited T
Testing Process	USB QC Output		USB C Output		DC Output		
	5V/3A	12V/3A	5V/3A	20V/2.2A	12V/6A	24V/3.5A	
Power bank surface (near USB port)	27.4	27.6	27.3	27.9	33.2	33.9	60-45+24=39
Power bank surface (near cell)	26.9	27.2	26.8	27.7	30.8	31.6	60-45+24=39
Ambient (°C)	24.0*	24.0*	24.0*	24.0*	24.0*	24.0*	--
Supplementary information: See table.							
*The test temperature was actual test ambient temperature.							
-Component & surface temperature not exceed the limits.							

8.7/8.8	TABLE: Battery Pack Component Temperature Test and Battery Pack Surface Temperature Test			P
Power bank Component Temperature Test (for Charging & Discharging at the same time)				
Sample No.	011	012	Limited T	
Testing Process	DC Input (25V/2.7A) & USB QC Output (12V/2.5A) & USB C Output (20V/2.5A) & DC Output (24V/3.5A)	USB C Input (20V/2.5A) & USB QC Output (12V/2.5A) & DC Output (24V/3.5A)		
PCB near U1 (for PCB-2)	56.4	64.9	130-45+24=109	
PCB near QD2	45.6	54.2	130-45+24=109	
PCB near UB2	43.9	51.5	130-45+24=109	
PCB near U1 (for PCB-1)	57.9	65.8	130-45+24=109	
PCB near U2	46.1	53.4	130-45+24=109	
PCB near U7	43.5	51.3	130-45+24=109	
PCB near U8	43.7	50.6	130-45+24=109	
Lead Wiring	41.3	49.7	200-45+24=179	
Cell body	42.9	50.2	Ref.	
PCB near USB port	51.7	55.6	130-45+24=109	
Ambient (°C)	24.0*	24.0*	--	
Power bank Component Temperature Test (for Charging & Discharging at the same time)				
Sample No.	011	012	Limited T	
Testing Process	DC Input (25V/2.7A) & USB QC Output (12V/2.5A) & USB C Output (20V/2.5A) & DC Output (24V/3.5A)	USB C Input (20V/2.5A) & USB QC Output (12V/2.5A) & DC Output (24V/3.5A)		
Power bank surface (near USB port)	34.7	35.4	60-45+24=39	
Power bank surface (near cell)	31.3	32.4	60-45+24=39	
Ambient (°C)	24.0*	24.0*	--	
Supplementary information: See table.				
*The test temperature was actual test ambient temperature.				
-Component & surface temperature not exceed the limits.				

8.9		TABLE: Limited power sources					P
Circuit output tested:							
Note: Measured Uoc (V) with all load circuits disconnected:							
Components	Sample No.	Uoc (V)	I _{sc} (A)		VA		
			Meas.	Limit	Meas.	Limit	
Normal (USB QC Output 5V)	013	5.20	3.110	8	15.230	≤100	
QD1 (pin1 to pin8) SC QD1 (pin1 to pin8) SC	013	5.21	3.142	8	15.337	≤100	
Normal (USB QC Output 12V)	014	12.13	3.072	8	15.274	≤100	
QD1 (pin1 to pin8) SC (USB QC Output 12V)	014	12.14	3.167	8	15.394	≤100	
Normal (USB C Output 5V)	015	5.23	3.011	8	14.270	≤100	
QD1 (pin1 to pin8) SC (USB C Output 5V)	015	5.23	3.075	8	15.822	≤100	
Normal (USB C Output 20V)	016	20.13	3.024	8	14.629	≤100	
QD1 (pin1 to pin8) SC (USB C Output 20V)	016	20.15	3.036	8	15.696	≤100	
Normal (DC Output 12V)	017	12.20	6.549	8	74.950	≤100	
QD1 (pin1 to pin8) SC (DC Output 12V)	017	12.25	6.715	8	76.671	≤100	
Normal (DC Output 24V)	018	24.26	3.463	8	88.509	≤100	
QD1 (pin1 to pin8) SC (DC Output 24V)	018	24.24	3.667	8	89.654	≤100	
supplementary information:							
SC =Short circuit							
- USB Output meet the limited power source requirements.							

9					TABLE: Power Input Test	P
U (V)	I (A)	I _{rated} (A)	P (W)	Condition/status		
18 (for DC Input)	2.88	3.0	--	Charging with internal cells discharged to end-of voltage		
25 (for DC Input)	2.89	3.0	--	Charging with internal cells discharged to end-of voltage		
5 (for USB C)	1.998	1.0	--	Charging with internal cells discharged to end-of voltage		
12 (for USB-C)	2.249	2.25	--	Charging with internal cells discharged to end-of voltage		
Supplementary information: -The input to power bank not exceeds 110% of the marked input current rating. Remark: When charging the sample can be supported simultaneous discharging.						

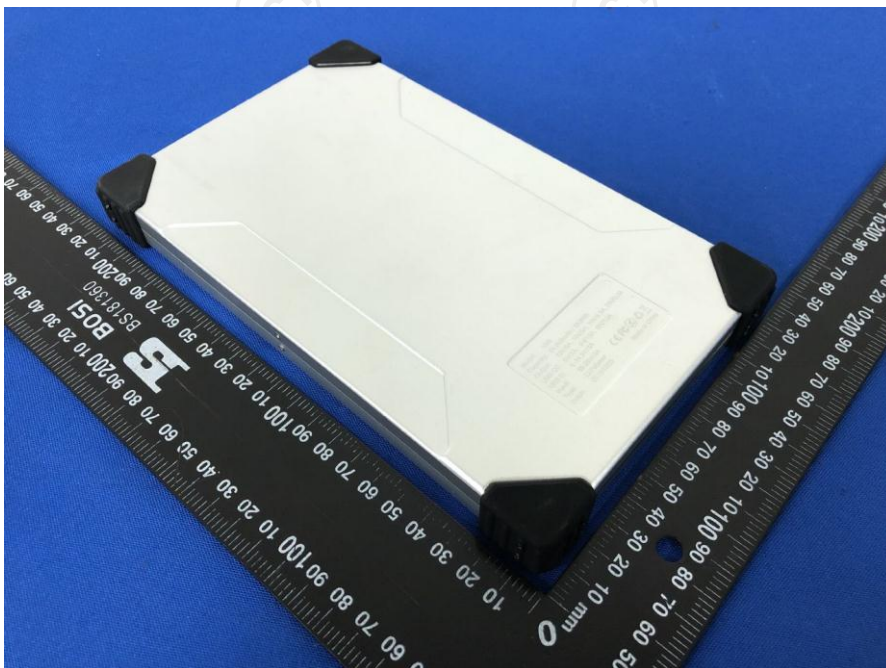
12							TABLE: Capacity Verification Test	P
Ambient temperature: 23.4°C								
USB QC Output Port								
Sample No.		026	027	028	029	030		
Discharge current (mA)	5V	3000	3000	3000	3000	3000		
	12V	3000	3000	3000	3000	3000		
Capacity (mAh)	5V	15047	15374	15098	15105	15241		
	12V	6816	6878	6897	6834	6877		
Rated capacity Min. (mAh)		1800						
USB C Output Port								
Sample No.		031	032	033	034	035		
Discharge current (mA)	5V	3000	3000	3000	3000	3000		
	20V	2200	2200	2200	2200	200		
Capacity (mAh)	5V	15275	15036	15064	15138	15167		
	20V	4230	4345	4651	4465	4354		
Rated capacity Min. (mAh)		1800						
DC Output Port								
Sample No.		024	025	026	027	028		
Discharge current (mA)	12V	6000	6000	6000	6000	6000		
	24V	3500	3500	3500	3500	3500		
Capacity (mAh)	12V	3941	4035	4124	3988	4065		
	24V	1863	1897	1864	1834	1868		
Rated capacity Min. (mAh)		1800						
Supplementary information: - Marked capacity verified and complied.								

Attachment 1

Photo Documentation

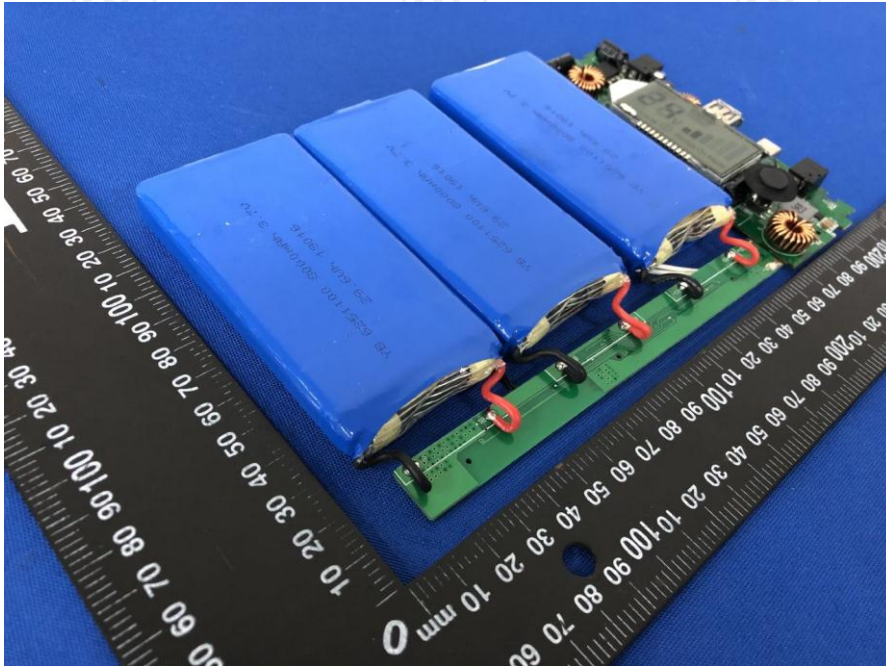


Picture 1 Battery view-1

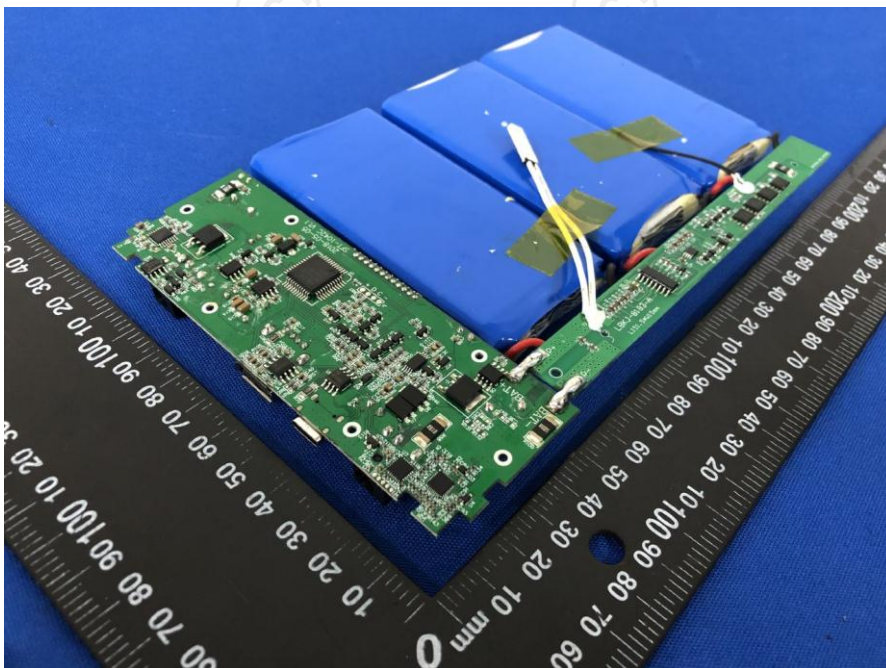


Picture 2 Battery view-2

Photo Documentation

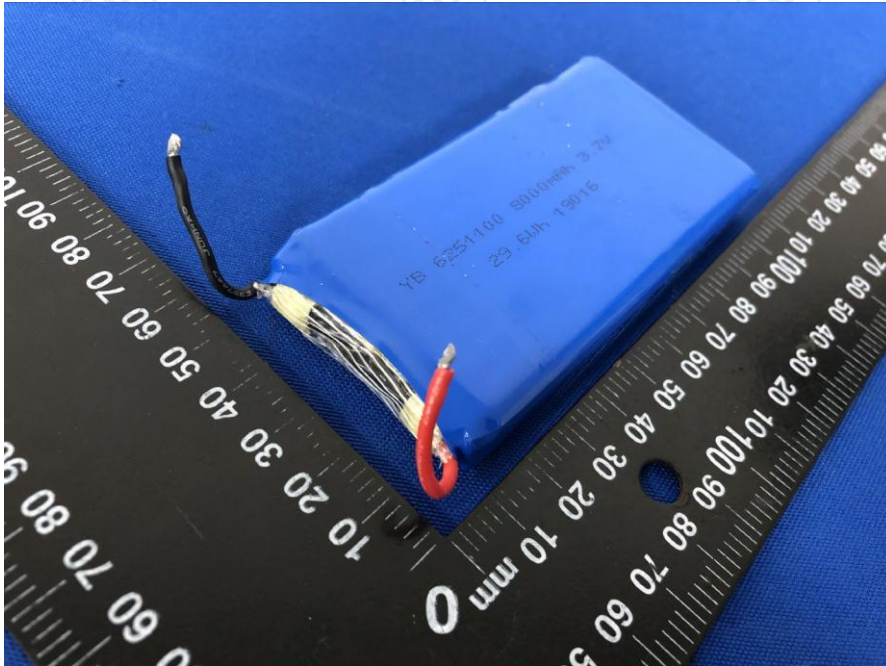


Picture 3 Battery view-3

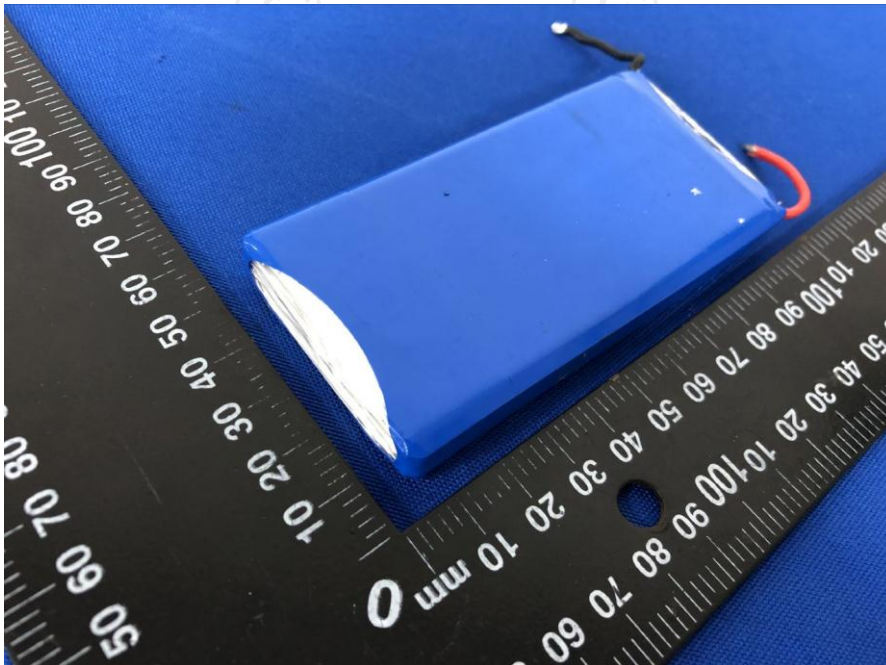


Picture 4 Battery view-4

Photo Documentation

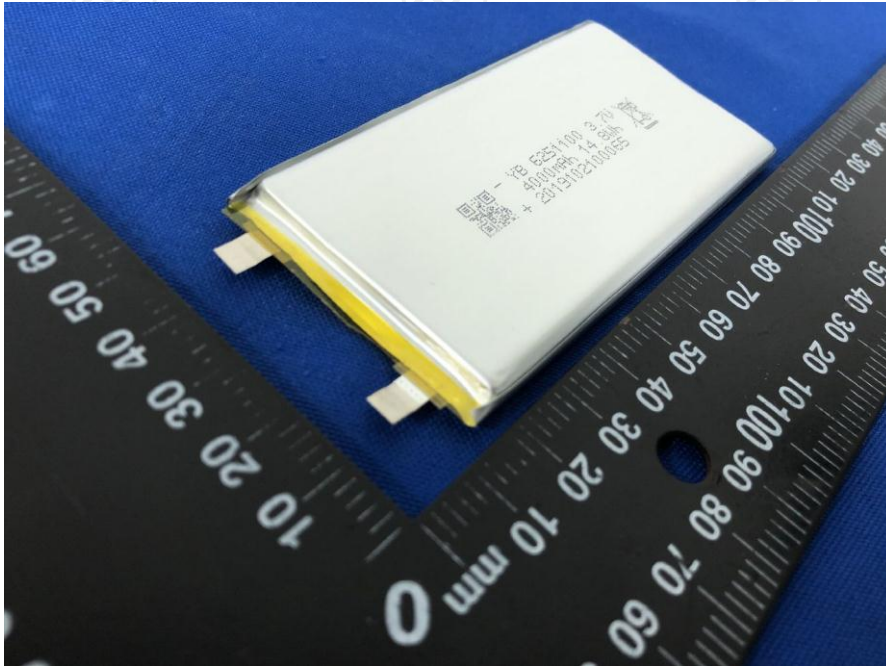


Picture 5 Cell view-1

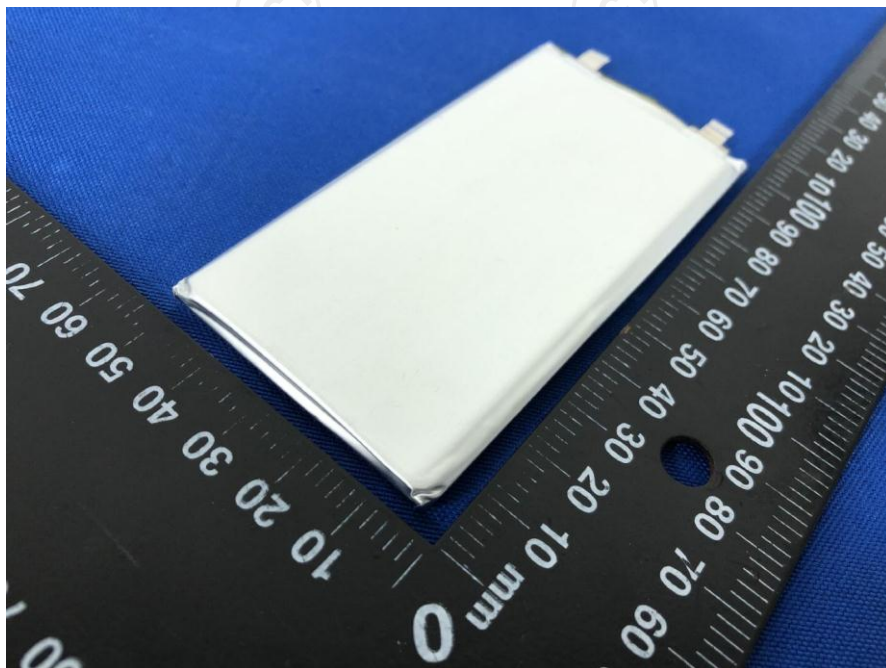


Picture 6 Cell view-2

Photo Documentation

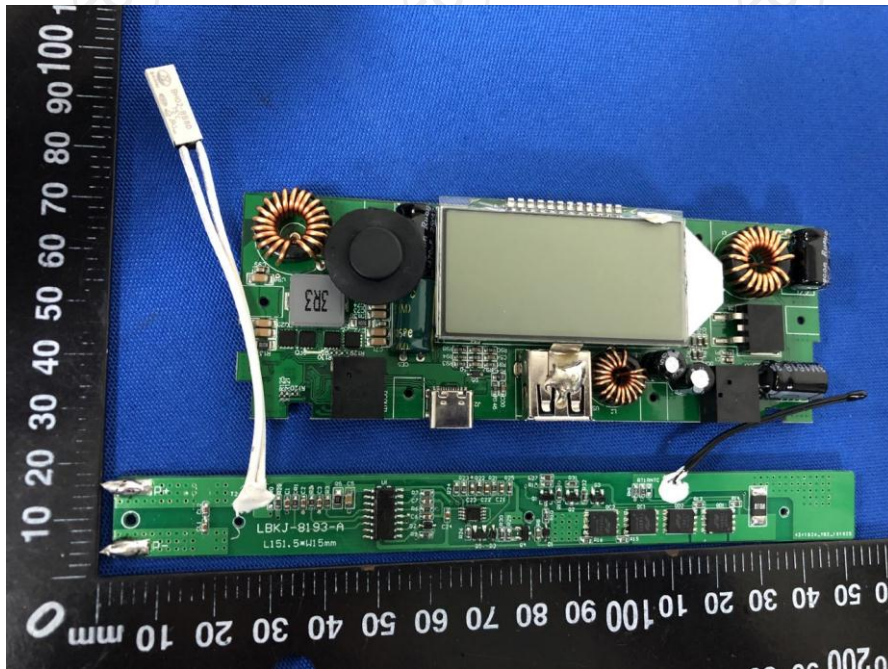


Picture 7 Cell view-3

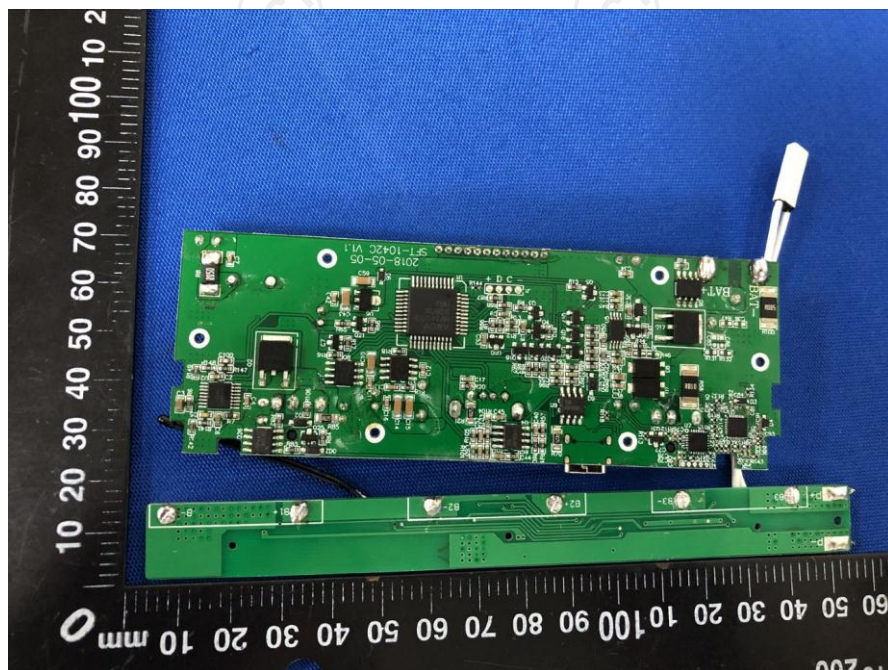


Picture 8 Cell view-4

Photo Documentation



Picture 9 Protection board view-1



Picture 10 Protection board view-2

***** End of Test Report *****