






# TEST REPORT

<b>Report No.:</b>	DGCTL202208180004A
<b>Product:</b>	POWER BANK
<b>Model No.:</b>	GP48 AIR
<b>Applicant:</b>	Shenzhen Merpower Electronic Co., Ltd.
<b>Issued by:</b>	Dongguan CTL Electromagnetic Technology Co., Ltd.
<b>Lab Location:</b>	Room 107, No.2, Block 1, Area 1, Headquarters Road No.2, Songshanhu Hi-tech Development Zone, Dongguan, Guangdong, P.R. China.
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<b>TEST REPORT UL 2056 Outline of Investigation for Safety of Lithium-ion Power Banks</b>	
<b>Report Number</b> .....	DGCTL202208180004A
<b>Date of issue</b> .....	2022-11-17
<b>Total number of pages</b> .....	23 pages
<b>Applicant's name</b> .....	Shenzhen Merpower Electronic Co., Ltd.
<b>Address</b> .....	715A, Building 8, 1970 Science Park, Mingkang Road, Longhua, Shenzhen
<b>Test specification:</b>	
<b>Standard</b> .....	UL 2056 No. 3 (20-08-2020)
<b>Test procedure</b> .....	Test report
<b>Non-standard test method</b> .....	N/A
<b>Testing Laboratory</b> .....	Dongguan CTL Electromagnetic Technology Co., Ltd.
<b>Testing location/ address</b> .....	Room 107, No.2, Block 1, Area 1, Headquarters Road No.2, Songshanhu Hi-tech Development Zone, Dongguan, Guangdong, P.R. China.
<b>List of Attachments (including a total number of pages in each attachment):</b>	
Attachment NO.1: 3 pages of Photo Documentation	
<b>Tested by (name + signature)</b> .....	Leo chen 
<b>Reviewed by (name + signature)</b> .....	Troy huang 
<b>Approved by (name + signature)</b> .....	Cantic peng 



<b>Test item particulars:</b>	
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 .....	: GP48 AIR
Trade mark.....	: /
Nominal voltage .....	: 5.0Vdc
Rated capacity .....	: 10Ah
Output capacity.....	: 23.5Ah for 3.0A Each of USB-C port; 23.5Ah for 3.0A Each of USB port; 9500mAh for 5.0A Each of DC OUT port.
Maximum charge voltage.....	: 24Vdc
Maximum charge current .....	: 3.0A
Final voltage.....	: 3.0V
Max Ambient Temperature .....	: 45°C
Manufacturer's charge method .....	: Charging via USB port: 24V, 3A until LED screen displayed 100%.
<b>Possible test case verdicts:</b>	
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)
<b>Testing:</b>	
Date of receipt of test item .....	: 2022-08-18
Date(s) of performance of tests .....	: 2022-08-18 to 2022-11-17
<b>General remarks:</b>	
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.	

**Summary of testing:**

<u>Clause(s)</u>	<u>Test(s)</u>
7	General
7.2.1	Rated capacity
7.2.2	Specified operating region and temperature tests
7.2.3	Limited power source
7.2.4	Vibration and mechanical shock
7.3.1	External short-circuit and overload
7.3.2	Overcharge

**General information:**

The product covered in this report is a power bank which consists of twelve li-ion cells inside (3S4P), the cells inside the power bank is UL1642 approved, see component list table for details and protection circuit provided in the power bank.

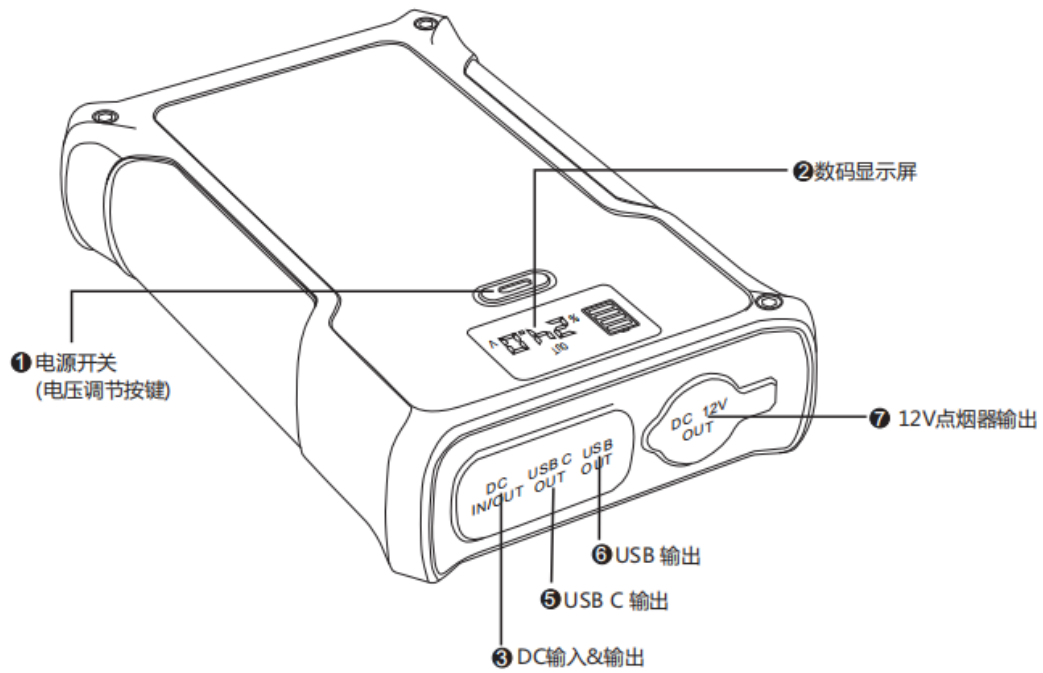
See below table for the power bank's parameter.

Model	Nominal capacity	Nominal voltage	Nominal Charge Current	Nominal Discharge Current	Maximum Charge Current	Maximum Discharge Current	Maximum Charge Voltage	Cut-off Voltage
<b>GP48 AIR</b>	10000mAh	5V	3.0A	3.0 A	3.0A	5.0A	24V	3.0V

**Marking label:**

POWER BANK  
 GP48 AIR  
 Li-ion Batttery: 14.8V/10Ah/148Wh  
 DC IN: 12-24V/3A  
 USB-C OUT: DC5V/3A 9V/3A 12V/2.5A 23.5Ah  
 USB Output: 5V/3A 9V/2A 12V/1.5A 23.5Ah  
 DC OUT: 12V/5A 16.5V/4A 20V/3.5A 24V/3.5A 9.5Ah  
 Cigar lighter OUT: DC12-16V/10A(MAX)  
 CAUTION: Risk of fire and burns. Do not open, crush or incinerate. Follow manufacturer's instructions.  
 Date code: YYYYMMDD  
 Made in China  
 Dongguan Yihang Electronic Co., Ltd

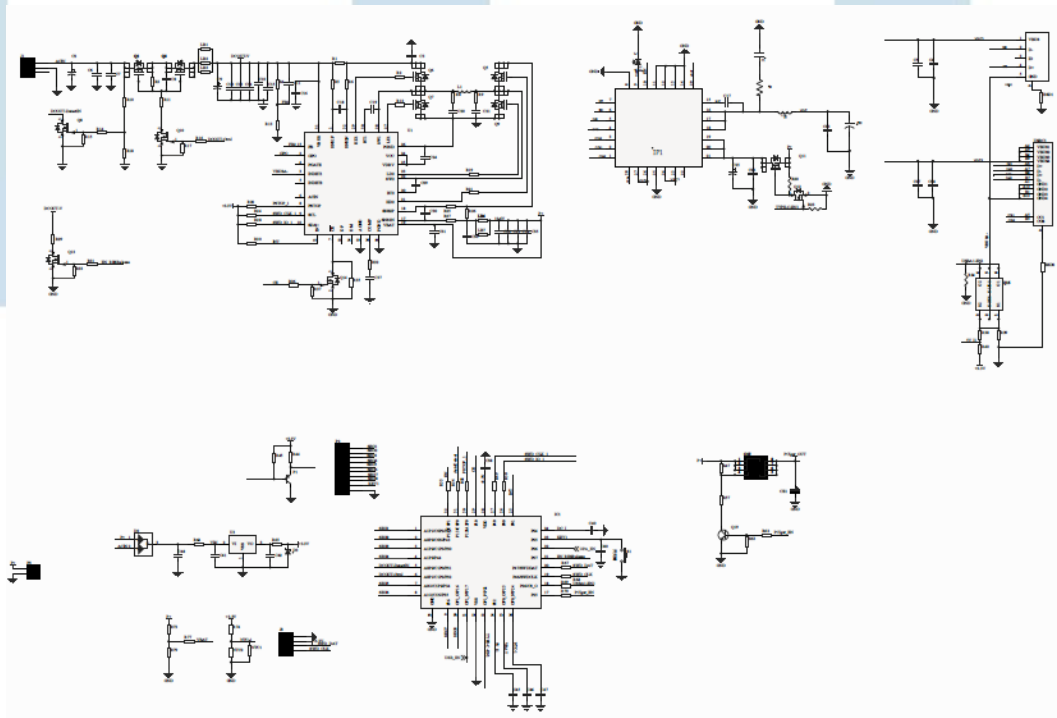
**Construction:**



Unit: 39.5mm × 114mm × 177mm

**Circuit diagram:**

**Power Bank:**



**Name and address of factory (ies)..... :** Dongguan Yihang Electronic Co., Ltd  
Room 301, Building 10, No.9, JinShaGang 1st Road,  
DaLang Town, Dongguan, Guangdong

<b>UL 2056</b>			
Clause	Requirement + Test	Result - Remark	Verdict
<b>6</b>	<b>Construction</b>		<b>P</b>
<b>6.1</b>	<b>General</b>		<b>P</b>
	Power banks shall be so designed and constructed so as to reduce the risk of fire, electric shock or injury hazards.	No fire, no electric shock, no injury hazards.	<b>P</b>
	Compliance is checked by the requirements of 6.2 to 6.8.		<b>P</b>
	For removable power banks integrated into luggage, carrying cases, bags, packs, etc., the power bank shall also be designed and constructed to allow for installation and removal from the luggage, carrying case, bag, pack, etc. without the use of a tool and without damaging the power bank. Appropriate means of securing the power bank shall be provided in the luggage, carrying case, bag, pack, etc. without damaging the power bank or interfering with the safe operation of the power bank. Compliance is checked by inspection.	The power bank is not a removable power bank integrated in luggage, carrying cases, bags, packs, etc.	<b>N/A</b>
<b>6.2</b>	<b>Electrical insulation</b>		<b>P</b>
	Electrical insulation shall withstand the electrical stress likely to occur during intended use.		<b>P</b>
	Compliance is checked by the following tests: The insulation resistance of a power bank electrical housing shall not be less than 5 MΩ when measured 60 s after application of DC voltage of approximately 500 V applied between any terminal and – Externally accessible metal surfaces of the housing, excluding electrical contact surfaces; – Metal foil which is in contact with accessible surfaces of insulating materials, having the largest area possible on the housing under test without exceeding the housing dimensions. The insulation shall withstand without breakdown an AC voltage having a frequency of 50 Hz or 60 Hz or DC voltage applied between current carrying parts and accessible parts, non-metallic parts being covered with metal foil. The values of the test voltages are specified in Table 6.1.	No metal surfaces.	<b>N/A</b>
	The insulation voltage rating of cable(s) supplied with the power bank and of internal wiring shall not be less than 60 V as evidenced by a marking on the insulation or in the cable / wiring manufacturer's specification.		<b>P</b>
	Electrical insulation shall not exceed its marked temperature rating or, if not marked, the Relative Thermal Index (RTI) for the material in question. Compliance is checked by the test of 7.2.2.		<b>P</b>

<b>UL 2056</b>			
Clause	Requirement + Test	Result - Remark	Verdict
<b>6.3</b>	<b>Electrical conductors</b>		P
	Wires within a power bank housing, or those integral with luggage, carrying cases, etc., and not in a low power circuit shall be protected so that they do not come into contact with burrs or similar edges which may cause damage to their insulation.		P
	A low power circuit is considered to be points closest to the battery or any power input source at which the maximum power delivered to an adjustable resistor, connected between the point to be investigated and the opposite pole of the battery or power input source, does not exceed 15 W at the end of 5 s. The part of the circuit farther from the battery or power input source than a low-power point is considered to be a lowpower circuit.		P
	Wireways shall be smooth and free from sharp edges. Holes in metal through which insulated wires pass shall have smooth well-rounded surfaces or be provided with bushings. Wiring shall be effectively prevented from coming into contact with moving parts. Compliance is checked by inspection.		P
	Bare internal wiring or other current-carrying parts shall be rigid and fixed so that, in normal use, electrical short-circuit is unlikely to occur.		P
	Except for integral traces of a printed circuit or terminals forming an integral part of a cell or battery, compliance is checked by the following test: Bare current carrying parts are subjected to a steady force of 10 N $\pm$ 1 N, applied by the test probe 11 of IEC 61032. Such parts shall not come loose, into contact with each other or accessible conductive parts after application of the force.	Tested and complied.	P
<b>6.4</b>	<b>Internal electrical connections</b>		P
	The mechanical integrity of internal electrical connections shall be sufficient to accommodate conditions of intended use. Solder alone is not considered a reliable means of connection. Screws used for electrical connections shall screw into metal. Screws and nuts that make a mechanical connection between different parts of a power bank shall be secured against loosening if they also make electrical connections. Compliance is checked by inspection and manual test.	Tested and complied.	P
<b>6.5</b>	<b>External electrical connections</b>		P

<b>UL 2056</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	External electrical connectors shall comply with the physical specification for one of the types of USB connectors (USB types A, B, micro A, micro B, or C) as described in the IEC 62680 series of standards. Compliance is checked by inspection.	Tested and complied.	P
<b>6.6</b>	<b>Terminal contacts and other electrical connections</b>		P
	Terminal contacts and other electrical connections shall be arranged so as to minimize the risk of shortcircuits, such as using keyed connectors. Compliance is checked by inspection, and if necessary, by applying a steady force of $10 \pm 1$ N, by the test probe 11 of IEC 61032.	Tested and complied.	P
<b>6.7</b>	<b>Housings</b>		P
	The housing of a power bank shall have adequate mechanical strength and be constructed to provide mechanical protection for cells, cell connections and electronic circuits. It shall additionally withstand such rough handling that may be expected in normal use without exposing sharp edges of broken glass or otherwise impairing compliance with the requirements of this outline of investigation. The housing shall not be capable of being opened by simple tools, such as a screwdriver. It shall be ultrasonically welded, secured by single use or tamper-proof screws, or secured by adhesives complying with the adhesive requirements of UL 746C. Compliance is checked by inspection and the tests of 7.2.4 and as follows. Each of five fully charged power banks is dropped three times from a height of 1.0 m onto a flat concrete floor or metal floor. The test samples are dropped so as to obtain impacts in random orientations. Each sample is then placed on a flat horizontal surface for a minimum of 1 h.	Tested and complied.	P
	If the power bank is still operational, one charge and discharge cycle is conducted on the operational sample in accordance with the method declared by manufacturer. The power bank housing and any internal compartments for the cells shall be designed to accommodate cell dimensional tolerances during charging and discharging as specified by the cell manufacturer. Compliance is checked by inspection.	Tested and complied.	P



<b>UL 2056</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>The non-metallic housing of a power bank shall be resistant to heat. Compliance is checked by inspection, and for polymeric materials, the following test. Fully charged power banks are placed for 7 h in an air circulating oven at a temperature of +70°C ±2°C, according to the procedure in 7.1. After conditioning, the samples are removed from the oven and allowed to return to room temperature when the housings are examined for evidence of distortion, separation of sections or openings that impair compliance with this outline of investigation.</p> <p>The non-metallic housing of a power bank shall be resistant to fire. Compliance is checked by the 20 mm (3/4 inch) Flame Test in UL 746C. The 20 mm (3/4 inch) Flame Test is not carried out if the housing is comprised of material classified for flammability as minimum V-1 according to UL 94.</p>	Tested and complied.	P
<b>6.8</b>	<b>Temperature/voltage/current management</b>		P
	<p>Power banks shall be designed to operate such that the temperature, voltage and current limits as specified by cell manufacturer (specified operating region) are not exceeded. See the definition for cell operating region (lithium ion systems) of UL 1642, or the operating region requirements and examples in the Annex for Charging and Discharging Range of Secondary Lithium Ion Cells for Safe Use of UL 62133-2.</p>	Complied.	P
	<p>Batteries shall have an independent control and protection for current, voltage, temperature and any other parameter required for safety and shall maintain the cells within their operating region. Batteries designed for the selective discharge of a portion of their series connected cells shall incorporate circuitry to prevent operation of cells outside the limits specified by the cell manufacturer. Compliance is checked by reviewing the protection circuit module (PCM) of the battery and the test of 7.2.2.</p>	Complied.	P
	<p>The voltage of each cell or each cell block, shall not exceed the upper limit of the charging voltage specified by cell manufacturer, excepting the case where the portable electronic devices or similar devices have the equivalent function.</p>	Complied.	P

<b>UL 2056</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>Compliance is checked by reviewing the protection circuit module (PCM) of battery, and by the test of 7.2.2.</p> <p>The power bank shall not exhibit a risk of fire, electric shock or mechanical hazard when subjected to foreseeable misuse conditions.</p> <p>Compliance is checked by the test of 7.3.</p> <p>Electronic circuits shall be designed and applied so that a fault condition will not render the power bank unsafe with regard to electric shock, fire hazard, or mechanical hazard.</p> <p>If a thermal cutout functions to interrupt charging or discharging, or if its functioning is necessary for the power bank to comply with the requirements of 7.3, the thermal cutout shall comply with UL 60730-1.</p> <p>Electronic circuits are checked by evaluation of the fault conditions that are likely to occur and result in electric shock, fire hazard, or mechanical hazard, such as short circuit or open circuit of MOSFET (metal oxide semiconductor field-effect transistor), fuse, thermostat or positive temperature coefficient (PTC) thermistor.</p>	Complied.	P
<b>7</b>	<b>PERFORMANCE</b>		<b>P</b>
<b>7.1</b>	<b>General</b>		<b>P</b>
	<p>Some lithium batteries are capable of exploding when the tests described in this outline of investigation are conducted. It is important that personnel be protected from the flying fragments, explosive force, sudden release of heat, and noise that results from such explosions. The test area shall be well ventilated to protect personnel from possible harmful fumes or gases.</p>		P
	<p>Unless otherwise specified, tests are carried out under the most unfavorable conditions of intended use in an ambient temperature of 20 ±5°C.</p> <p>However, if the manufacturer recommends charging at temperatures outside the range of 10 – 40°C, the ambient temperature for testing is as follows:</p> <ul style="list-style-type: none"> <li>– If the battery is recommended to be charged at a minimum ambient temperature lower than 10°C, the test is also conducted at that minimum temperature +0/-5°C;</li> <li>– If the battery is recommended to be charged at a maximum ambient temperature greater than 40°C, the test is also conducted at that maximum temperature +0/-5°C.</li> </ul>	Complied.	P
	<p>Unless otherwise specified, samples of power banks shall be fully discharged and then charged in accordance with the manufacturer's instructions prior to any testing. The sequence shall be repeated at least two hours after the battery was charged.</p>	Complied.	P

<b>UL 2056</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	The charging procedure is the method declared by the manufacturer to charge the battery to the maximum state of charge permitted by the battery management system.	Complied.	P
	The discharging procedure is to discharge the power bank at a steady rate of current to attain the end of discharge condition specified by the power bank manufacturer.	Complied.	P
<b>7.2</b>	<b>Operating conditions</b>		
<b>7.2.1</b>	<b>Rated capacity</b>		
	The capacity of power bank shall not be less than 90% or exceed 110% of the marked capacity rating.		P
	Compliance is checked by the following test: A sample of a fully charged power bank is stored for not less than 1 h and not more than 4 h. The power bank is then discharged, at a constant current equal to the rated current of the output port, until its voltage reaches to the end-of-discharge voltage of the output port specified by the manufacturer. The test may be repeated up to 4 additional times, as necessary to satisfy this requirement.	See table 7.2.1	P
<b>7.2.2</b>	<b>Specified operating region and temperature tests</b>		P
	Power banks shall operate within the specified operating region of the batteries / cells. For each cell: – The upper limit of charging voltage; – The maximum charging current; and – The surface temperature; shall not exceed that specified by the cell manufacturer, and the power bank components and materials shall not exceed the temperatures for which they are suitable.	The upper limit of charging voltage: 24V – The maximum charging current: 3.0A – The surface temperature: 45°C	P
	For batteries where the cells are configured in series, the test shall be repeated with the charge in one battery deliberately imbalanced. The imbalance is introduced by having all cells with the exception of one cell/cell block discharged from fully charged condition to the specified fully discharged condition. The undischarged cell is discharged to approximately 50% of its specified state of charge (SOC).		P
	During charging and discharging, the measured temperatures shall not exceed the values in Table 7.2.	See table 7.2.2	P
<b>7.2.3</b>	<b>Limited power source</b>		P

<b>UL 2056</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	The output available from any port shall comply with the limits of limited power output as noted in Table 7.3 or Table 7.4. Compliance is checked by the following test: The open circuit output voltage and short-circuit output current from a fully charged power bank shall be measured. If more than one port is provided, the output from each port shall be measured one at a time with the others unloaded.	See table 7.2.3	P
<b>7.2.4</b>	<b>Vibration and mechanical shock</b>		P
	Vibration and mechanical shock encountered during transportation and use shall not cause fire, explosion, rupture, leakage or venting. Compliance is checked by the following tests: Three fully charged power bank samples are firmly secured to the platform of a vibration machine without distorting them in such a manner as to faithfully transmit the vibration. Each sample is then subjected to sinusoidal vibration sweep cycle according to the conditions of Table 7.5. The sweep cycle shall be repeated 11 additional times for each of three mutually perpendicular mounting positions. One of the directions shall be perpendicular to the power bank face with the most ports or where an adjustable control is located.	See table 7.2.4	P
<b>7.3</b>	<b>Abnormal operation</b>		P
<b>7.3.1</b>	<b>External short-circuit and overload</b>		P
	Short-circuiting of positive and negative terminals of the power bank shall not cause fire or explosion from the power bank or ignite the external fire indicators. Compliance is checked by the following tests: Two samples of a fully charged power bank are short-circuited for a period of 24 h by connecting the positive and negative terminals of a port with a total external resistance of $80 \pm 20 \text{ m}\Omega$ . If the enclosure temperature of power bank declines by 20% of the maximum temperature rise measured after the manufacturer's recommended charging period or 3 h if no charging period is specified, the test may terminated sooner. However, in case of a rapid decline in the short-circuit current, the power bank shall remain on test for an additional one hour after the current reaches a low-end steady state condition.		P

<b>UL 2056</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	For a power bank integrated in luggage, a nominal 1 m length of USB cable, having 0.3211 mm diameter conductors and mating connector, shall be attached to one sample of the power bank port providing the maximum output current. The cable shall have a short circuit made by any convenient means at approximately its mid-point and shall then be placed on a softwood surface that is covered by a single layer of white tissue paper and the cable draped with a single layer of cheesecloth. The test is conducted until ultimate results are observed.	See table 7.3.1	P
<b>7.3.2</b>	<b>Overcharge</b>		P
	A power bank shall tolerate without fire or explosion an overcharging condition outside the cell manufacturer's specified operating region. Compliance is checked by the following test: Two power bank samples are discharged to fully discharged state. They are then charged at a constant current of 2.0 It A, using a steady supply voltage which is: – 1.4 times the upper limit charging voltage of the cell (but not to exceed 6.0 V), for single cell/cell block construction; or – 1.2 times the upper limit charging voltage per cell, for series connected multi-cell batteries	See table 7.3.2	P
<b>8</b>	<b>MARKINGS</b>		<b>P</b>
<b>8.1</b>	<b>Electrical rating marking</b>		<b>P</b>
	The following electrical rating shall be permanently and legibly marked on the power bank: – Input rating in Vdc or Vac and A for each port; – Output rating in Vdc and A for each port and a combined ampere rating (if not equal to the summation of all ports); – Electrical capacity in Ah or mAh of the power bank. A capacity rating shall additionally be specified for each port if it is not equal to the rating of the power bank.	See marking plate on page 4	P
<b>8.2</b>	<b>Identification marking</b>		P
	The following marking shall be permanently and legibly marked on the power bank: – Manufacturer's name or trademark or identification mark; – Manufacturer's model identification or type reference; – Date of manufacture (which may be in code).	See marking plate on page 4	
<b>8.3</b>	<b>Cautionary marking</b>		

<b>UL 2056</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	<p>The following or equivalent wording shall be permanently and legibly marked on the power bank: “CAUTION: Risk of Fire and Burns. Do Not Open, Crush, Heat Above (manufacturer’s specified maximum temperature) or Incinerate. Follow Manufacturer’s Instructions.”</p> <p>This wording or equivalent shall also be included in the instructions supplied with the power bank. Compliance is checked by inspection.</p> <p>For removeable power banks integrated into luggage, carrying cases, bags, packs, etc., the following or equivalent shall be permanently and legibly marked on the power bank and the luggage, carrying cases, bags, packs, etc.:</p> <p>“For use only with _____”</p> <p>Where the underlined space is completed with the manufacturer’s name or trademark, catalog number, series identification, or the equivalent, of the power bank or of the luggage, carrying case, bag, pack etc. as applicable.</p>	See marking plate on page 4	P
<b>8.4</b>	<b>Other information</b>		
<b>9</b>	<b>INSTRUCTIONS</b>		<b>P</b>
<b>9.1</b>	<b>General</b>		<b>P</b>
	<p>The following instructions shall be supplied with the power bank in the form of a manual, stuffer sheet or on packaging. The instructions may additionally be repeated via marking provided directly on the power bank. See also Annex A.</p> <ul style="list-style-type: none"> <li>– Storage and disposal instructions; and</li> <li>– Recommended charging instructions.</li> </ul> <p>For removeable power banks integrated into luggage, carrying cases, bags, packs, etc., the following instructions shall also be supplied in the form of a manual, stuffer sheet. These instructions may additionally be repeated via marking provided directly on the power bank and/or the luggage, carrying case, bag, pack etc.:</p> <ul style="list-style-type: none"> <li>– Installation and removal instructions, including when storing the luggage, carrying case, bag, pack, etc. in a cargo area of an airplane;</li> </ul> <p>Compliance is checked by inspection</p>		P

<b>UL 2056</b>			
Clause	Requirement + Test	Result - Remark	Verdict
	<b>APPENDIX A</b>		<b>P</b>
	<p>The following represents a typical, but not exhaustive list of advice to be provided to the end-user.</p> <p>a) Do not drop, disassemble, open, crush, bend, deform, puncture, shred, microwave, incinerate, paint, submerge in a liquid, or insert foreign objects into the power bank.</p> <p>b) Keep power banks out of the reach of children. Children should be supervised when a power bank is in use.</p> <p>c) Do not expose power banks to heat or fire. Do not store in direct sunlight or in a vehicle.</p> <p>d) Do not use or charge a damaged power bank. In the event of a power bank leaking, keep away from skin and eyes. Wash any affected area with large amounts of water and seek medical attention.</p> <p>e) Power banks need to be charged before use. Always use the correct cable and refer to the power bank manufacturer's instructions for proper charging instructions.</p> <p>f) Do not use any cable other than that specifically provided or recommended by the power bank manufacturer.</p> <p>g) Do not use a damaged cable to charge or discharge a power bank.</p> <p>h) Do not leave a power bank on prolonged charge when not in use. Disconnect the power bank from the charging source once full.</p> <p>i) Observe the dedicated input and output ports for receiving and providing power on the power bank and the device to be charged to ensure correct use.</p> <p>j) Do not use any power bank which is not designed for use with the device you wish to charge. Refer to the device's manual for proper charging instructions.</p> <p>k) When possible, detach cable(s) from power bank when not in use.</p> <p>l) Only use the power bank in the application for which it was intended.</p> <p>m) Store the power bank in a cool, dry place when not in use. When a power bank is not used for prolonged periods, the power bank should be charged periodically in order to maintain power bank life.</p> <p>n) Dispose of power bank properly.</p> <p>o) Keep all instructions provided with the power bank for future reference.</p>		P

TABLE: Critical components information					P
Object/part no.	Manufacturer/ trademark	Type/model	Technical data	Standard	Mark(s) of conformity <sup>1)</sup>
Plastic enclosure	SABIC INNOVATIVE PLASTICS US L L C	PDX-PCA- 98553, NX98553	ABS/PC, min. 2.0mm thickness, V- 0, 120° C	UL94 UL746C	UL E121562
Plastic enclosure (Alternate)	Interchangeable	Interchangeable	ABS/PC, min. 2.0mm thickness, V- 0, 120° C	UL94 UL746C	UL Approved
PCB	GOLDENMAX INTERNATIONA L TECHNOLOGY (ZHUHAI) LTD	GDM-R1	FR-4.0, thickness: min.1.40mm, V-0, 130°C	UL 94	UL E330731
PCB (Alternate)	Interchangeable	Interchangeable	V-0, 130°C	UL 94	UL Approved
IC(U1)	SOUTHCHIP SEMICONDUCT OR	SC8812A	VBUS: 2.7-36V, VBAT: 2.7-26V, TJ: - 40~125°C	--	--
IC(IC1)	CMSEMICON	CMS32F033	Operating voltage: 2.1V-5.5V, Operating temperature: - 40~105°C	--	--
MOSFET(Q1,Q2, Q3,Q4,Q11)	HUAHONG GROUP	HMP3012AD3	VDSS: -30V, VGSS: ±20V, ID: -24A, Tstg: -55 to +150°C	--	--
MOSFET(Q5,Q6, Q7,Q9)	VERGIGA SEMICONDUCT OR	VSP007N04MS- G	VDSS: 40V, VGSS: ±20V, ID: 80A, Tstg: - 55 to +150°C	--	--
MOSFET(Q8,Q1 0,Q12)	Leshan Radio Company, Ltd	2N7002	VDS: 60V, VGS: 30V, ID: 0.3A, Tstg: - 55 to +150°C	--	--
MOSFET(Q15,Q 16)	DEVELOPER MICROELECTR ONICS	8205A	VDS: 20V, VGS: 4.5V, ID: 6A, Tstg: - 55 to +150°C	--	--
Wiring	SHEN ZHEN HENGDIAN ELECTRIC CO LTD	1015	24AWG, 600Vac, 105°C	UL 758	UL E252861
Wring (Alternate)	Interchangeable	Interchangeable	24AWG, 600Vac, 105°C	UL 758	UL approved
Cell	LG CHEM, LTD	INR18650F1L	3.63V, 3350mAh	UL 1642	UL MH19896
<b>Supplementary information:</b>					
<sup>1)</sup> Provided evidence ensures the agreed level of compliance. See OD-CB2039.					



<b>7.2.1</b>	<b>Rated capacity</b>		P
	A sample of a fully charged power bank is stored for not less than 1 h and not more than 4 h	The power bank is then discharged, at a constant current equal to the rated current of the output port, until its voltage reaches to the end-of-discharge voltage of the output port specified by the manufacturer.	P
	The capacity (Ah) delivered above was not less than 90 % or exceed 110%of the rated capacity declared by the manufacturer (Ah) ..... :	Capacity declared by manufacturer: - 23.5Ah for 3.0A Each of USB-C port; - 23.5Ah for 3.0A Each of USB port; - 9500mAh for5.0A Each of DC OUT port	P
	The test may be repeated up to 4 additional times, as necessary to satisfy this requirement:		P

<b>7.2.2</b>	<b>Specified operating region and temperature tests</b>						<b>P</b>
<b>USB: Battery Pack Component Temperature Test</b>							
Sample No.	001		002		Limited T		
Testing Process	Charging	Discharging	Charging	Discharging	Charging	Discharging	
Inside surface of internal plastic enclosure (Bottom of cell)	24.8	25.6	24.5	25.0	115	115	
Inside surface of internal plastic enclosure (Side of USB port)	45.8	47.8	49.0	48.3	85	85	
Internal cell Case , Tmax	25.4	25.4	27.9	26.5	100	100	
Printed wiring board near U1	63.4	60.7	65.8	64.1	125	125	
Printed wiring board near IC1	42.12	48.1	48.5	51.5	125	125	
Printed wiring board near IP1	58.2	61.5	63.6	66.7	125	125	
Internal wiring	26.5	25.5	24.5	25.8	105	105	
Ambient	23.8	24.1	23.6	23.7	--	--	

External accessible plastic surface of the power bank (Top)	24.7	25.8	24.5	25.5	75	75
External accessible plastic surface of the power bank (Bottom)	24.9	25.3	24.4	25.3	75	75
External accessible plastic surface of the power bank (Side of USB port)	26.1	27.4	25.2	26.5	75	75
Ambient	23.8	24.1	23.6	23.7	--	--
Supplementary information: Charging: 24V, 3.0A; Discharge: 5V, 3.0A						

<b>7.2.3</b>	<b>Limited power sources</b>					<b>P</b>
<b>USB:</b> Circuit output tested:						
Note: Measured Uoc (V) with all load circuits disconnected:						
Components	Sample No.	Uoc (V)	I <sub>sc</sub> (A)		VA	
			Meas.	Limit	Meas.	Limit
Normal	013	5.22	5.0	8.0	17.89	100
U1 pin 19 to pin 31	014	4.17	5.5	8.0	16.96	100
IC1 pin 21 to pin 29	015	5.19	5.0	8.0	17.84	100
Q16 pin 1 to pin 6	016	5.20	5.0	8.0	17.85	100
supplementary information:						
Sc=Short circuit						

<b>7.2.4</b>	<b>Vibration and mechanical shock</b>				<b>P</b>
<b>Vibration</b>					
<b>USB:</b> Ambient temperature: 22.6°C					
No.	Pre-test Mass (g)	Pre-test Voltage (V)	After test Mass (g)	After test Voltage (V)	Results
007	851.5	5.22	851.4	5.22	P
008	850.7	5.23	850.7	5.22	P
<b>Mechanical shock</b>					

<b>USB: Ambient temperature: 22.5°C</b>					
No.	Pre-test Mass (g)	Pre-test Voltage (V)	After test Mass (g)	After test Voltage (V)	Results
009	849.3	5.20	849.3	5.20	P
010	850.4	5.20	850.3	5.20	P

Supplementary information:  
No cause fire, no explosion, no rupture, no leakage and no venting.

7.3.1	<b>External short-circuit and overload</b>					<b>P</b>
<b>External short-circuit</b>						
<b>USB: Ambient temperature: 22.7°C</b>						
Sample No.	011	012	013	014	015	
Cell Case temp. (°C)	68.8	66.3	67.2	72.3	71.4	
Power bank surface temp. (°C)	57.7	55.2	55.9	60.3	60.0	
Failure Mode	Short circuit	Short circuit	Short circuit	Short circuit	Short circuit	
Faulted Protective Device	U1 pin 19 to pin 31 + Q16 pin 1 to pin 6					
Supplementary information: The Charge Circuit is bypassed (i.e. test is conducted at the input point of Battery).						
<b>overload</b>						
<b>USB: Ambient temperature: 22.2°C</b>						
Component No.	Fault	Supply voltage (V)	Test time	Current drawn (A)	Observation	
3.0A USB-C output	Overload	5.19	1h	5.0	NC, NT	
3.0A USB output	Overload	5.21	1h	5.0	NC, NT	
5.0A DC output	Overload	5.20	1h	5.0	NC, NT	
Test results:					Verdict	
- Chemical leaks			No		P	
- Explosion of the battery			No		P	
- Emission of flame or expulsion of molten metal			No		P	
- Electric strength tests of equipment after completion of tests			No		P	
- cheesecloth and tissue paper shall remain intact			NC, NT		P	

Supplementary information:  
 NC = Cheesecloth remain intact  
 YC = Cheesecloth charred or flamed  
 NT = Tissue paper remained intact  
 YT = Tissue paper charred or flamed  
 \* Voltage when power bank fully charged

7.3.2	Overcharge					P
<b>USB:</b> Ambient temperature: 22.8°C						
Sample No.	020	021	022	023	024	
Ic(A)	20	20	20	20	20	
Charing voltage(V)	6	6	6	6	6	
Cell Case temp. (°C)	67.2	66.7	67.5	76.2	75.8	
Power bank surface temp. (°C)	56.6	55.9	56.6	60.9	60.5	
Failure Mode	Short circuit	Short circuit	Short circuit	Short circuit	Short circuit	
Faulted Protective Device	U1 pin 19 to pin 31 + Q16 pin 1 to pin 6					
Supplementary information: The Charge Circuit is bypassed (i.e. test is conducted at the input point of Battery).						

### Attachment 1: Photo documentation



Fig.1-Front view of battery



Fig.2-Back view of battery

### Attachment 1: Photo documentation



Fig.3-Battery disassembled-1



Fig.4-Battery disassembled-2

### Attachment 1: Photo documentation



Fig.5- Front view of PCM



Fig.6- Back view of PCM

--End of Test Report--