




TEST REPORT UL 2089 STANDARD FOR SAFETY Vehicle Battery Adapters	
Report Number :	LTR23032366S01
Tested by(+ signature)	Lebron Wang
Witnessed by(+ signature) :	Vinci Yao
Approved by (+ signature)	Peter Zhu
Date of issue	Apr. 04, 2023
Total number of pages :	30 pages
	
Name of Testing Laboratory preparing the Report	Guangdong Lintek Certification Group Co., Ltd.
Address	302, Building B, Xunli Science and Technology Park, No.36 Zhangge Road, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, China
Applicant's name	Shenzhen lingyike technology co., ltd
Address	B127 Huitong Communication Market, Huaqiang North Street, Futian District, Shenzhen
Test specification:	
Standard	UL 2089, Edition 3
Test procedure :	Test Report
Non-standard test method :	N/A
Test Report Form No. :	UL 2089, Edition 3
Test Report Form(s) Originator :	Lintek-Lab
Master TRF	Dated 2019-05-07
Test item description :	Car Charger
Trade Mark :	N/A
Manufacturer	Shenzhen lingyike technology co., ltd
Address	B127 Huitong Communication Market, Huaqiang North Street, Futian District, Shenzhen
Model/Type reference :	BK359-1A2C, BK359-3A2C
Ratings :	Input :DC12-32V Output:USB-A:5V --- 3.5A 9V --- 3.5A 12V --- 2.8A(QC3.0) USB-C :5V --- 3.5 A9V --- 3.5A 12V --- 2.8A(PD3OW) USB-A+USB-B+Type-CTotalOutput5V --- 3.1AMax

List of Attachments (including a total number of pages in each attachment):

Attachment 1: Photo Documentation

Summary of testing:

The product covered by this report has been tested and complies with the applicable requirements of this standard.

Tests performed (name of test and test clause):

UL 2089, Edition 3
The submitted samples were found to comply with the requirements of above specification.

Testing location:

302, Building B, Xunli Science and Technology Park, No.36 Zhangge Road, Fucheng Street, Longhua District, Shenzhen, Guangdong Province, China

Summary of compliance with National Differences (List of countries addressed):

N/A

☒ **The product fulfils the requirements of**

UL 2089, Edition 3

Copy of marking plate

The artwork below may be only a draft.

Car Charger
Model: BK359-1A2C, BK359-3A2C
Input :DC12-32V
Output:USB-A:5V=== 3.5A 9V=== 3.5A
12V=== 2.8A(QC3.0)
USB-C :5V=== 3.5 A9V=== 3.5A 12V=== 2.8A(PD30W)
USB-A+USB-B+Type-CTotalOutput5V=== 3.1AMax



Shenzhen lingyike technology co., ltd
Made in China

Test item particulars :	
Operating condition..... :	[X] continuous [] rated operating / resting time:
Access location :	[X] operator accessible [] restricted access location
Pollution degree (PD) :	[] PD 1 [X] PD 2 [] PD 3
IP protection class :	IP20
Altitude during operation (m) :	<2000m
Altitude of test laboratory (m) :	<2000m
Mass of equipment (kg) :	0.03kg
Possible test case verdicts:	
- test case does not apply to the test object..... :	N/A (Not Applicable)
- test object does meet the requirement :	P (Pass)
- test object does not meet the requirement :	F (Fail)
Testing :	
Date of receipt of test item..... :	Mar. 25, 2023
Date(s) of performance of tests..... :	Mar. 25, 2023- Apr. 04, 2023
General remarks:	
<p>The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing testing laboratory. "(see Enclosure #)" refers to additional information appended to the report. "(see appended table)" refers to a table appended to the report.</p>	
Throughout this report a <input type="checkbox"/> comma / <input checked="" type="checkbox"/> point is used as the decimal separator.	
Manufacturer's Declaration.	
The application for obtaining a Test report includes more than one factory location and a declaration from the Manufacturer stating that the sample(s) submitted for evaluation is (are) representative of the products from each factory has been provided..... :	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> Not applicable
General disclaimer:	
<p>The test results presented in this report relate only to the object tested. This report shall not be reproduced, except in full, without the written approval of the Issuing Testing Laboratory. The authenticity of this Test Report and its contents can be verified by contacting the Lintek-Lab, responsible for this Test Report.</p> <p>The test results presented in this report relate only to the object tested. If you have any objection to the testing results, please advise us within 15 working days after publishing, otherwise your claims will not be accepted. The test report is valid for above tested sample only and shall not be reproduced in part without written approval of Lintek-Lab.</p> <p>This document is issued by the company under its General Conditions of Service accessible www.linteklab.com. Attention is drawn to the limitation of liability, indemnification and jurisdiction issues defined therein.</p> <p>Any unauthorized alteration, forgery or falsification of the content or appearance of this document is unlawful and offenders may be prosecuted to the fullest extent of the law.</p> <p>Unless otherwise stated: (a) the results shown in this document refer only to the sample(s) tested and (b) such sample(s) are retained for 3 months.</p>	

When differences exist; they shall be identified in the General product information section.	
Name and address of factory (ies)	Same as Manufacturer
General product information and other remarks: The product in this report is a Car Charger. All electronic components are mounted on PWB and housed in a plastic enclosure. All modes are the same except model name and color. All tests were performed on model BK359-3A2C to represent the other models.	

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
1	GENERAL		P
2	Components		P
2.1	General		P
	Comply with relevant component standard	(see appended table 2.1)	P
2.2	A component is not required to comply with a specific requirement		P
	a)Involves a feature or characterdstic not required in the application of the component in the product covered by this standard		P
	b)Is superseded by a requirement in this standard.		N/A
2.3	A component shall be used in accordance with its rating established		P
2.3	Specific components are incomplete in construction features or restricted in performance capabilities.		P
3	Units of Measurement		P
	Values stated without parentheses are the requirement		P
4	Undated References		P
4.1	Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard		P
6	Mechanical Assembly		P
6.1	A unit shall be formed and assembled so that it has the strength and rigidity necessary to resist the abuses to which it is likely to be subjected		P
6.2	A unit shall have all parts reliably secured in place		P
6.3	An enclosure, an opening, a frame, a guard, a knob, a handle, or the like shall not be sufficiently sharp to constitute a risk of injury to persons in normal maintenance or use		P
6.4	A unit shall be constructed so that it is not necessary to open or remove the enclosure when the unit is used as intended.		P
6.5	Each lampholder, switch, and similar component shall be mounted securely and shall be restrained from turning by more than friction between surfaces.	No such similar component	N/A

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
6.6	A replaceable lamp in a unit shall be replaceable without opening the enclosure.	No such similar component	N/A
6.7	A nonreplaceable pilot lamp	No such similar component	N/A
6.8	A switch or an overcurrent-protective device shall be located within the unit enclosure and protected in such a manner as not to be accessible or exposed to tampering nor subject to mechanical damage during normal use or as a result of abuse.		P
6.9	The requirements in 6.8 also apply to the actuating means — toggle, handle, or the like		N/A
6.10	The overall mass of the cigarette lighter connector shall not exceed 250 g (8.8 oz). The product of the total mass) and (the distance between the center of gravity and the input contact positioned to simulate full insertion into a power outlet) shall not exceed 13500 g-mm (18.7 oz-in).	<250g	P
7	Enclosure		P
7.1	A unit shall be provided with an enclosure that shall house all current-carrying parts that present a risk of electric shock. The enclosure shall have the strength and properties necessary to reduce the risk of mechanical damage to the various parts.		P
7.2	A unit shall have no openings larger than those complying with Section 16, Accessibility of Live Parts.		P
7.3	If an acceptable grade of vulcanized fiber is used as part of the enclosure for the support of parts (terminals and the like) that do not present a risk of fire or electric shock, the amount of fiber shall not be more than is necessary to support the parts in question. The fiber shall not be less than 1/32 in (0.8 mm) thick and shall not introduce a risk of fire, electric shock, or injury to persons as a result of abuse.		P
7.4	An enclosure constructed of sheet metal shall be formed from stock having a thickness not less than that specified in Table 7.1. The thickness of enclosure sheet metal other than steel or aluminum shall not be less than that specified in Table 7.1 for uncoated steel and shall have the necessary strength and rigidity.		P
7.5	In addition to the performance tests specified in this standard, the material of a polymeric enclosure shall have a minimum flammability classification of V-0, V-1, or V-2 and shall provide the level of performance specified in Table 7.2 for the corresponding electrical properties.	V-0	P

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
7.6	A conductive coating applied to a nonmetallic surface such as the inside surface of a cover, enclosure, and the like shall comply with the applicable requirements in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C, unless it can be determined that flaking or peeling of the coating does not result in a reduction of spacings or the bridging of live parts that may result in a risk of fire, electric shock, or injury to persons.		P
7.7	An adhesive used in the assembly of the enclosure shall be investigated as specified in the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C.		P
8	<i>Protection Against Corrosion</i>		N/A
8.1	Except as noted in 8.2, iron and steel parts shall be protected against corrosion by galvanizing, plating, enameling, or other equivalent means if the corrosion of such unprotected parts would be likely to result in a risk of fire, electric shock, or injury to persons	Plastic enclosure used	N/A
8.2	The requirement in 8.1 applies to all enclosing cases or to other parts upon which intended mechanical operation may depend. It does not apply to laminations and small minor parts of iron or steel, such as washers, screws, and bolts, that are not current carrying, if the corrosion of such unprotected parts would not be likely to result in a risk of fire, electric shock, or injury to persons, or result in the device not operating as intended. A part made of stainless steel does not require additional protection against corrosion.		N/A
9	<i>Switches</i>		N/A
9.1	The requirements in 9.2 and 9.3 apply to switches not in a Class 2 circuit, and to switches in a Class 2 circuit the breakdown of which electrically or mechanically is likely to result in a risk of fire or electric shock.	No switch used	N/A
9.2	A switch subjected to a temperature higher than 50°C (122°F) is to be investigated with respect to the temperature limits of the materials used.		N/A
9.3	A switch or other control device shall be acceptable for the application and shall have current and voltage ratings not less than those of the load that it controls.		N/A
10	<i>Protective Devices</i>		P

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
10.1	A protective device built into a unit shall comply with the requirements for that device.		P
10.2	Crossed or nicked (reduced) cross-section conductors shall not be employed as a protective device		P
10.3	Protective devices as mentioned in 10.1 include, but are not limited to, eutectic material, fuses, overtemperature and overcurrent protectors, thermal protectors, and similar devices intended to interrupt or limit the flow of current as a result of overload.		P
10.4	A manually reset thermostat shall be so constructed that automatic tripping of the thermostat is not precluded by any setting or position of the reset mechanism.	No such component used	N/A
10.5	An automatically or manually reset protective device or replaceable overcurrent-protective device shall not open when the unit is delivering its rated output. See Temperature Test, Section 25.		P
10.6	A fuse or protective device shall be located in or adjacent to the cigarette lighter connector in the positive side of the supply.		P
10.7	The fuse or protective device required by 10.6 shall have a current rating not greater than the ampacity of the interconnecting cord as specified in Table 13.1, and in no case greater than 20 A	Not greater than 20 A	P
10.8	If the fuse or protective device is not located within the cigarette lighter connector, the length of wire between the connecting means and the protective device shall not be greater than 5 in (127 mm).		N/A
10.9	A protective device shall be acceptable for the application and shall have voltage and current ratings not less than those of the circuit in which it is connected.		P

11	Components		P
11.1	A component – a fixed resistor, PTC or NTC resistor, diode, or the like – used to limit the output of a unit to within the required current or power levels, or otherwise used to obtain acceptable performance, shall have permanence and stability so as not to decrease its limiting capacities. Among the factors considered when determining the acceptability of a limiting component are:		P
	a)Effect of operating temperature,		P
	b)Electrical stress level, and		P
	c)Resistance to moisture.		P

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
12	<i>Coil Insulation</i>		N/A
12.1	Coil insulation, unless inherently moisture resistant, shall be treated so as to render it moisture resistant.		N/A
12.2	Film-coated magnet wire is considered moisture resistant.		N/A
13	<i>Flexible Cords</i>		N/A
13.1	A unit shall be provided with a flexible cord and shall be type SP-2, SPE-2, SPT-2, SV, SVE, SVT, S, SE, SO, SP-3, SPT-3, ST, STO, SJ, SJE, SJO, SJT, or SJTO.	NO such cord used	N/A
	The length of cord external to the unit and including the cigarette lighter connector shall not be less than 3 ft (0.9 m)		N/A
	Cord AWG size shall be in accordance with Table 13.1		N/A
14	<i>Input Contacts</i>		P
14.1	The diameter of the center (positive) contact shall not be less than 9/64 in (3.57 mm).	5.16mm	P
15	<i>Output Connections</i>		P
15.1	A unit shall be provided with means for connection of the output	USB terminal and output wire	P
15.2	Low voltage limited energy circuits	(see appended table 15.2)	P
15.3	Output connectors		P
15.3.1	Output connectors mounted on the enclosure and intended for direct connection of accessories		P
15.3.2	A fitting having female contacts shall be constructed so that it will not receive the blades of a standard attachment plug		N/A
15.4	Bushings		N/A
15.4.1	At a point where a flexible cord passes or is intended to pass through an opening in a metal wall, barrier, or enclosing case, there shall be a bushing or the equivalent that shall:		N/A
	a) Be secured in place, and		N/A
	b) Have a smooth, rounded surface against which the cord may bear		N/A
16	<i>Accessibility of Live Parts</i>		P
16.1	General	No risk of electric shock	P

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
16.1.1	A live part that presents a risk of electric shock shall be located or enclosed so that protection against contact is provided.		N/A
16.1.2	The input impedance of the voltmeter used to measure voltage in accordance with the requirements of 16.2.1 and 16.3.1 is to be a minimum of 1 MΩ. The input impedance of a meter with more than 1 MΩ input impedance can be lowered by using shunt impedance.		N/A
16.1.3	A guard, baffle, or cover that can be removed without using a tool is to be removed when determining if a live part is accessible to the user. A live part that can be contacted by the test pin, articulate probe, or accessibility probe illustrated in Figure 16.1, Figure 16.2, or Figure 16.4, is considered to be accessible.		N/A
16.2	Live parts other than exposed wiring terminals		N/A
16.2.1	The test pin and articulate probe illustrated in Figures 16.1 and 16.2, respectively, when applied as described in 16.2.3, shall not contact any live part with a voltage greater than that specified in 16.2.2 with respect to the vehicle chassis or any other live part simultaneously accessible, in a different location, to the test pin or articulate probe		N/A
16.2.2	The maximum voltages which may be accessible in accordance with 16.2.1 are:		N/A
16.2.3	The test pin and articulate probe referenced in 16.2.1 are to be applied with a force not exceeding 1 lbf (4.4 N) to determine whether the live parts are accessible. The test pin shall not be applied to fuseholders and the like.		N/A
16.3	Exposed wiring terminals		N/A
16.3.1	The accessibility probe illustrated in Figure 16.4, when applied as described in 16.3.3 shall not contact an exposed wiring terminal with a voltage greater than that specified in 16.3.2 with respect to the vehicle chassis or to any other terminal simultaneously accessible to the probe		N/A
16.3.2	The maximum voltages which may be accessible in accordance with 16.3.1 are:		N/A
16.3.3	The accessibility probe referenced in 16.3.1 is to be applied with a force not exceeding 5.62 lbf (25 N) to determine whether the exposed wiring terminals are accessible.		N/A
17	Live Parts		P

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
17.1	A current-carrying part shall be silver, copper, a copper alloy, plated iron or steel, stainless steel, or other corrosion-resistant alloys acceptable for the application		P
17.2	An uninsulated live part shall be secured to the base or mounting surface so that it will not turn or shift in position if such motion may result in a reduction of spacings below the minimum acceptable values.		P
17.3	Friction between surfaces is not acceptable as a means to prevent shifting or turning of a live part but a lock washer is acceptable.		P
18	<i>Strain Relief</i>		P
18.1	Strain relief shall be provided between the cigarette lighter connector and its adjacent cord, and shall be tested in accordance with the Strain Relief Test, Section 29.		P
18.2	Means shall be provided to prevent the cord or wiring from being pushed into the enclosure through the cord-entry hole when such displacement results in:		N/A
	a) Subjecting the cord or wiring to mechanical damage;		N/A
	b) Exposing the cord or wiring to a temperature higher than that for which it is rated;		N/A
	c) Reducing spacings (such as to a metal strain-relief clamp) below the minimum required values; or		N/A
	d) Damaging internal connections or components.		N/A
19	<i>Internal Wiring</i>		P
19.1	The internal wiring of a unit shall consist of insulated conductors having mechanical strength, dielectric properties, and ampacity for the application.		P
19.2	Each splice and connection shall be mechanically secure, shall provide reliable electrical contact, and shall be provided with insulation at least equivalent to that of the wire involved unless acceptable permanent spacing between the splice and all other metal parts will be maintained. When determining the required minimum thickness of splice insulation, the circuit voltage and interaction with other circuits shall be taken into consideration.		P

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
19.3	A wire connector for making a splice in a unit shall be a type that is applied by a tool in which the applicable force of the tool making the splice is independent of the force applied by the operator of the tool.		N/A
19.4	The connection between a lead, including a flexible cord, and the transformer winding or other part of the unit shall be soldered, welded, or otherwise securely connected within the enclosure. A soldered joint shall be mechanically secure before soldering.		N/A
19.5	If a lead is rigidly held in place without the use of solder, or if it is retained in place so as not to be subjected to any motion, no additional mechanical security is required. Mechanical securement of a lead is not required if separation of the connection does not result in a risk of fire or electric shock.		P
19.6	Unless it is to be considered as an uninsulated live part, insulated internal wiring – including an equipment-grounding conductor – shall consist of wire of a type or types acceptable for the applicable, when considered with respect to:		N/A
	a) The temperature and voltage to which the wiring is likely to be subjected;		N/A
	b) Exposure to oil, grease, cleaning fluid, or other substances likely to have a deleterious effect on the insulation; and		N/A
19.7	An insulated conductor shall be located or protected to reduce the risk of contact with any sharp edge, burr, fin, moving part, or the like, that can damage the conductor insulation.		P
20	<i>Insulating Materials</i>		P
20.1	Integral parts such as insulating washers and bushings, and bases or supports for mounting of live parts, shall be of moisture-resistant materials that will not be damaged by the temperatures and stresses to which they will be subjected under conditions of actual use	(see appended table 2.1)	P
20.2	An insulating material is to be investigated with respect to its acceptability for the application in accordance with the Standard for Polymeric Materials – Use in Electrical Equipment Evaluations, UL 746C. Materials		P
21	<i>Printed Wiring Boards</i>		P
21.1	A printed wiring board in a unit shall comply with the Standard for Printed-Wiring Boards	(see appended table 2.1)	P

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
22	PERFORMANCE		P
	General		P
22.1	The number of representative samples indicated in Table 22.1 shall be subjected to the tests described in Sections 23 – 29. Unless otherwise specified, all tests are to be conducted at the marked d-c voltage. The test supply of rated voltage shall have a minimum capacity of 30 A.		P
22.2	With respect to 22.1 and footnotes a and b of Table 22.1, a sample may be used for more than one test, provided that the previous test did not damage the sample.		P
22.3	The cheesecloth mentioned in this standard is to be bleached cheesecloth running 14 – 15 yd ² /lb (approximately 26 – 28 m ² /kg) and having what is known in the trade as a " count of 32 by 28," that is, for any square inch, 32 threads in one direction and 28 threads in the other direction (for any square centimeter, 13 threads in one direction and 11 in the other direction).		P
22.4	The tests described in Sections 23 – 29 are to be conducted in an ambient air temperature within the range of 21 – 30° C (70 – 86° F).		P
22.5	For tests which specify rated load conditions, a sample is to be connected to the load specified in Table 22.2.		P
22.6	With reference to Table 22.2, if an output is rated in watts or volt-amperes, the rated output current is considered to be the quotient of the watt or volt-ampere rating and the voltage rating.		P
23	Maximum Output Voltage Test		P
23.1	The maximum output voltage under any load condition (including no load) between any two output terminations of a unit shall not be more than the peak voltages specified in 16.2.2.	Max. voltage: 12Vdc	P
23.2	If a unit has more than one pair of output terminations, the output voltage mentioned in 23.1 is to be measured with any combination of interconnections of the output terminations.	Three output terminal	P
23.3	The maximum voltage between output terminations of a multiple output unit may exceed the values specified in 23.1 when the output terminations are interconnected, if the following conditions are met:		N/A
	a)... The maximum output voltage between any two terminations is not more than the values indicated in 16.2.2 when no connections are made between the output terminations; and		N/A
	b)The unit is marked in accordance with 32.6		N/A

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict

24	<i>Power Input Test</i>		P
24.1	The current or watts input to a vehicle battery adapter, when connected to a supply adjusted to the rated input voltage and supplying rated output into a load as described in Table 22.2, shall not be more than 110 percent of the rated value	(see appended table 24.1)	P
24.2	A battery charger intended for use with a specific battery pack shall be tested using the battery pack as its intended load.		N/A
24.3	If a vehicle battery adapter intended to charge batteries is to be tested using a lead-acid battery or batteries as the load, each battery is to be discharged to 1.75 V per cell – measured with the load connected – at a rate not to exceed the discharge rate assigned by the battery manufacturer, but in any case, the rate of the discharge is not to exceed one-sixth of the ampere-hour capacity of the battery. See Table 22.2.		N/A
24.4	If a battery charger is to be tested with a typical 1.2 V per cell nickel-cadmium battery or batteries as the load, each battery is to be discharged to 0.9 V per cell – measured with the load connected – at a rate not to exceed the discharge rate assigned by the battery manufacturer.		N/A
24.5	If a battery charger is to be tested with a battery or batteries other than those specified in 24.3 and 24.4, the battery is to be discharged in accordance with the battery manufacturer's maximum recommended discharge rate to an appropriate discharge voltage.		N/A

25	<i>Temperature Test</i>		P
25.1	The unit shall be mounted as in intended service and connected as described in 24.1. With the unit operating at its maximum marked duty cycle	(see appended table 25.1)	P
25.2	If the load specified in 24.1 includes a variable resistance, the load is to be adjusted after 15 min of operation, if necessary, to return the output to the original value. If the load consists of a battery, the battery shall be discharged as specified in 23.4 or 23.5 as applicable.		N/A
25.3	If a battery charger which is not likely to be used for consecutive charging of batteries is tested with a battery load, the test is to be continued until temperatures peak. The load is to be replaced by a second discharged battery. The test is terminated when temperatures peak, or temperatures stabilize, whichever occurs first during the second load condition.		N/A

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
25.4	A battery charger which is likely to be used for consecutive charging of batteries is to be tested with the intended battery load. The test is to be conducted in accordance with 25.5.	See below	P
25.5	With respect to 24.4, a consecutive charger is to be tested in accordance with the following:		P
	a)For a charger with no charge status indicator, the test is to be continued until temperatures peak. The load is to be replaced with another discharged battery. This sequence is to be repeated until maximum temperatures are obtained.		P
	b)For a charger with a visual charge status indicator, the test is to be continued until the visual indicator indicates that the charge cycle is complete. The load is to be replaced with another discharged battery. This sequence is to be repeated until maximum temperatures are obtained.		N/A
	c)For a charger with a charge time marking or instruction, the test is to be continued until the specified charge time has elapsed. The load is to be replaced with another discharged battery. This sequence is to be repeated until maximum temperatures are obtained.		N/A
	d)For a charger with both a visual charge status indicator and a charge time marking or instruction, the test is to be continued until the specified charge time has elapsed or until the visual indicator indicates that the charge cycle is complete, whichever occurs first. The load is to be replaced with another discharged battery. This sequence is to be repeated until maximum temperatures are obtained.		N/A
25.6	With reference to 25.1, a unit having voltage adjustment taps for intended use shall operate within the temperature limits at any setting including the maximum and intermediate positions.		N/A
25.7	A protective device shall not operate during the temperature test.		P
25.8	A unit intended for mounting or support in more than one position or in a confined location is to be tested in a manner representing the most severe conditions. An adjacent mounting or supporting surface is to consist of 1-in (25.4-mm) thick soft-pine boards.		P

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
25.9	Unless investigated and found acceptable, a supporting means formed of soft rubber or rubberlike material is to be removed prior to the temperature test. If the supporting means has a metal insert, such as a screw or rivet, the test is to be conducted with the power unit supported by the metal insert. At the request of the manufacturer, the test may be conducted without any means of support.		P
25.10	A thermocouple junction and the adjacent thermocouple lead wires are to be held securely in good thermal contact with the surface of which the temperature is being measured. Usually adequate thermal contact will result from securely taping or cementing the thermocouple in place but, if a metal surface is involved, brazing or soldering the thermocouple to the metal may be necessary.		N/A
25.11	Coil and winding temperatures are to be measured by thermocouples located on exposed surfaces, except that the resistance method may be used for a coil that is inaccessible for mounting thermocouples		—
25.12	The temperature rise of a winding is determined by the resistance method by comparing the resistance of the winding at a temperature to be determined with the resistance at a known temperature according to the formula $\Delta t = \frac{R}{r} (k + t_1) - (k + t_2)$		N/A
25.13	All values for temperature rises in Table 25.1 are based on an assumed ambient temperature of 25°C (77°F).		P
25.14	Thermocouples are to consist of wires not larger than 24 AWG and not smaller than 30 AWG. When thermocouples are used in determining temperatures in electrical equipment		P
25.15	A temperature is considered to be constant when three successive readings taken at intervals of 10 percent of the previously elapsed duration of the test, but not less than 15 min, indicate no further increase.		P
26	Dielectric Voltage-Withstand Test		N/A
26.1	General		N/A
26.1.1	While still in a heated condition, a unit shall withstand for 1 min without breakdown the application of a 60-Hz essentially sinusoidal potential of:		N/A

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
	a)500 V between a circuit operating at 60 V dc or less or 50 V ac rms (70 V peak) or less and dead metal parts; and		N/A
	b)1000 V plus twice the maximum circuit voltage between a circuit operating at more than 60 V dc or more than 50 V ac rms (70 V peak) and dead metal parts.		N/A
26.1.2	To determine whether a unit complies with the requirements in 25.1, the unit is to be tested using a 500 VA or larger capacity transformer, the output voltage of which can be varied. The applied potential is to be increased from zero until the required test level is reached, and is to be held at that level for 1 min. The increase in applied potential is to be at substantially uniform rate as rapid as is consistent with correct indication of its value by a voltmeter.		N/A

27	Abnormal Tests		P
27.1	General	(see appended table 27.1)	P
27.1.1	A unit shall not emit flame or molten metal or become a risk of fire or electric shock when subjected to the reverse polarity, component breakdown and battery-supply cord short circuit tests		P
27.1.2	A risk of fire or electric shock is considered to exist if any of the following occurs:		N/A
	a)Charring of cheesecloth;		N/A
	b)Emission of flame or molten material from the unit enclosure and output cord, if provided; or,		N/A
	c)Any condition that exposes live parts which present a risk of electric shock as specified in Section 16.		N/A
27.1.3	Each test is to be conducted on a separate sample unless the manufacturer requests that more than one test be conducted on the same sample.		P
27.1.4	A polarity-protection circuit provided to prevent output-current flow until a battery is connected as intended to the output is to be made inoperative so that the required output current will flow.		N/A
27.1.5	During all abnormal tests the unit is to be draped with a double layer of cheesecloth conforming to the outline of the unit.		P
27.2	Reverse polarity test		N/A

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
27.2.1	For a device intended for charging batteries and provided with nonpolarized output connections, the external output leads are to be connected in reverse polarity to a fully charged battery intended for the application. The unit is then to be connected to its maximum test voltage, and operated until the ultimate condition is observed, or 4h if cycling of an automatically reset protector occur		N/A
27.3	Component breakdown test		P
27.3.1	A unit having components – such as diodes, resistors, transistors, capacitors, and the like – with a single component fault of short or open,		P
27.4	Battery-supply cord short circuit test		P
27.4.1	The battery-supply cord shall be short-circuited at any point on the cord		P
27.5	Abnormal temperature test		P
28	<i>Resistance to Crushing Test</i>		P
28.1	One sample of the cigarette lighter connector shall withstand for 1 min a steady crushing force of 75 lbf (334 N).	No damage	P
29	Strain Relief Test		N/A
29.1	The strain relief means provided between the battery-supply cord and cigarette lighter connector shall withstand for 1 min without displacement a direct pull of 20 lbf (89 N) applied to the cord	No such cord	N/A
29.2	A 20-lb (9 kg) weight is to be suspended from the cord so that the strain relief means will be stressed from any angle the construction permits		N/A
30	Push-Back Relief Test		N/A
30.1	To determine compliance with 18.2, a product shall be tested in accordance with 30.2 without occurrence of any of the conditions specified in 18.2 (a) – (d).		N/A

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
30.2	The cord is to be held 1 inch (25.4 mm) from the point where the cord or lead emerges from the product and is then to be pushed back into the product. When a removable bushing which extends further than 1 inch is present it is to be removed prior to the test. When the bushing is an integral part of the cord, then the test is to be carried out by holding the bushing. The cord or lead is to be pushed back into the product in 1 inch (25.4 mm) increments until the cord buckles or the force to push the cord into the product exceed 6 pounds-force (26.7 N). The cord or lead within the product is to be manipulated to determine compliance with 18.2.		N/A

31	MARKING		P
31	General		P
31.1	A unit shall be legibly and permanently marked where it will be readily visible with the following:		P
	a)The manufacturer's name, trade name, or trademark.	See label	P
	b) A distinctive catalog number or the equivalent.	See label	P
	c)The input and output ratings in voltage, frequency, and amperes, watts, or volt-amperes	See label	P
	d)The date or other dating period of manufacture not exceeding any three consecutive months.	See label	P
31.2	With respect to the frequency marking mentioned in 31.1, the symbol illustrated in Figure 31.1 may be used for this marking.	See label	P
31.3	Unless specifically exempt, marking required by this standard shall be permanent.		P

32	Cautionary markings		P
32.1	A cautionary marking shall be prefixed by the word "CAUTION," "WARNING," or "DANGER" in letters not less than 1/8 in (3.2 mm) high. The remaining letters shall not be less than 1/16 in (1.6 mm) high.		P
32.2	There shall be a legible and durable marking for each interchangeable fuse as described in 10.8 indicating the ampere rating and the voltage rating of the fuse to be used for replacement. The marking shall be located so that it is understood as to which fuse or fuseholder the marking applies. A single marking is acceptable for a group of fuses. The marking shall consist of the word "CAUTION" and the following or the equivalent: "For continued protection against risk of fire, replace only with same type and ratings of fuse."		N/A

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
32.3	A battery charger shall be marked, where readily visible to the user when connecting batteries, with the word "CAUTION" and the following or equivalent: "Charge only ___ type rechargeable batteries. Other types of batteries may burst causing personal injury and damage."		N/A
32.4	A cautionary marking shall be permanent and shall be located on a part that cannot be removed without impairing the operation of the unit.		P
32.5	A cautionary marking to instruct the operator shall be visible and legible to the operator during the intended operation of the unit.		P
32.6	With reference to 23.3, a multi-output unit shall be marked, where readily visible after installation, with the word "WARNING" and the following or equivalent: "To reduce the risk of fire or electric shock, do not interconnect output terminations."		P

33	Instructions		P
33.1	A battery charger shall be provided with explicit important safety, operation, and maintenance instructions for the user; and if applicable, with assembly, moving and storage instructions.		P
33.2	The important safety instructions and instructions for user assembly, operation, maintenance, and moving and storage shall be in the same manual.		P
33.3	In an instruction manual intended for use with more than one model or type of battery charger, the instructions applicable to each model or type of battery charger shall be explicitly identified.		N/A
33.4	Instructions shall be legible, and shall contrast with the background.		N/A
33.5	The headings for the important safety instructions		P
33.6	There shall be no substitute for the word "CAUTION," "WARNING," or "DANGER" in the text of the instructions.		P
33.7	The text of the instructions required by 33.12 shall be verbatim, or in equally definitive terminology		P
33.8	An illustration may be used with a required instruction to clarify the intent, but shall not replace the instruction		P
33.9	Important safety instructions shall warn the user of reasonably foreseeable risks of fire, electric shock, or injury to persons; and shall state the precautions that should be taken to reduce such risks.		P
33.10	The important safety instructions shall include the appropriate items in 33.12 followed by the appropriate instructions in Sections 34 – 37.		P

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
33.11	The items in the list in 33.12 shall be numbered, and other instructions deemed necessary by the manufacturer to reduce the risk of fire, electric shock, or injury to persons may be included.		P
33.12	The important safety instructions shall include those items in the following list that are applicable to the particular battery charger		P
34	<i>Assembly Instructions</i>		P
34.1	The assembly instructions, if applicable, shall contain all information needed for proper assembly of parts, such as handles and shall be preceded by the heading "ASSEMBLY INSTRUCTIONS," or the equivalent.		P
35	<i>Operating Instructions</i>		P
35.1	The operating instructions shall contain all applicable information needed to operate a vehicle battery adapter in the intended manner, and shall be preceded by the heading "OPERATING INSTRUCTIONS," or the equivalent.		P
35.2	The operating instructions		P
	a) Warn that the unit must be properly assembled in accordance with the assembly instructions before it is used.		—
	b). Explain and describe the location, function, and operation of each control of the unit, including all user-operated devices intended to reduce the risk of fire, electric shock, or injury to persons; and warn against tampering with such devices.		—
	c) Explain any automatic features if the marking on the unit includes the word "Automatic" such as "Automatic Battery Charger" or "Automatic Circuit Protector."		—
35.3	The operating instructions for a unit rated greater than 100 VA input shall include the following or in equally definitive wording. The blanks shall be completed with appropriate current and voltage ratings based on the adapter input ratings.	<100VA	N/A
36	<i>Maintenance Instructions</i>		P

UL 2089			
Clause	Requirement + Test	Result - Remark	Verdict
36.1	The instructions for user maintenance shall include explicit instructions for all cleaning and minor servicing – lubrication, external adjustments, and the like – that should be performed by the user; and shall warn the user that all other servicing should be performed by qualified service personnel. User maintenance instructions shall be preceded by the heading “MAINTENANCE INSTRUCTIONS,” or the equivalent.		P
36.2	The user-maintenance instructions, as described in 36.1, shall not include operations that would require disassembly of the unit to accomplish		P
37	<i>Moving and Storage Instructions</i>		P
37.1	If moving or storage of a unit could result in damage to the unit that could create a risk of fire, electric shock, or injury to persons during subsequent use, the instruction manual shall include explicit instructions for proper moving and storage. Such instructions shall be preceded by the heading “MOVING AND STORAGE INSTRUCTIONS,” or the equivalent.		P

2.1	TABLE: List of critical components				P
Object/Part No.	Manufacturer/ Trademark	Type/Model	Technical Data	Standard	Mark(s) of Conformity ¹⁾
Plastic enclosure	Interchangeable	Interchangeable	V-0, 120°C, minimum 1.5 mm thick	--	--
PCB	Interchangeable	Interchangeable	V-0, 130°C	UL 94, UL796	UL

15.2	TABLE: Low Voltage Limited Energy Circuits				P
Circuit output tested:					
Components	Test condition (Single fault)	Uoc (V)	I _{sc} (A)		
			Meas.	Limit	
QC3.0 PORT					
5V	Normal	5.12	3.65	8	
5V	R3 sc	0	0	8	
9V	Normal	9.09	3.69	8	
9V	R3 sc	0	0	8	
12V	Normal	12.04	3.22	8	
12V	R3 sc	0	0	8	
PD PORT					
5V	Normal	5.12	3.65	8	
5V	R3 sc	0	0	8	
9V	Normal	9.10	3.72	8	
9V	R3 sc	0	0	8	
12V	Normal	12.07	3.24	8	
12V	R3 sc	0	0	8	
USB PORT					
5V	Normal	5.15	3.54	8	
5V	R3 sc	5.15	0	8	
Supplementary information: oc=open circuit, sc=short circuit					

24.1	TABLE: Power input test					P
U (V)	I _{rated} (A)	I (A)	P (W)	Fuse #	I _{fuse} (A)	Condition/status
12Vdc	8.0	3.12	37.44	F1	3.12	Condition: Output load with 12Vdc2.8A
32Vdc	8.0	1.20	38.40	F1	1.20	Condition: Output load with 12Vdc2.8A
Supplementary information:						

25.1	TABLE: Temperature Test			P
	Supply voltage (V)	See below		—
	Ambient T _{min} (°C)	--		—
	Ambient T _{max} (°C)	--		—
Maximum measured temperature T of part/at::		T (°C)		Allowed T _{max} (°C)
		12Vdc	32Vdc	
Condition: Output load with 12Vdc2.8A				
L1 coil		80.3	76.2	130

L2 coil	75.5	71.4	130				
C1 body	84.6	76.0	105				
C3 body	76.2	68.5	105				
PCB near U1	88.0	80.4	130				
PCB near U2	87.1	78.7	130				
Inside enclosure	52.6	47.3	95				
Outside enclosure	43.7	40.6	50				
Ambient	25.0	25.0	--				
Condition: Output load with 5Vdc3.5A							
L1 coil	50.7	47.0	130				
L2 coil	46.8	44.2	130				
C1 body	52.3	49.8	105				
C3 body	45.8	41.3	105				
PCB near U1	58.0	55.3	130				
PCB near U2	57.6	56.4	130				
Inside enclosure	40.4	38.6	95				
Outside enclosure	35.3	32.2	50				
Ambient	25.0	25.0	--				
Supplementary information:							
The maximum ambient temperature specified by manufacturer is 30°C.							
Temperature T of winding:	t ₁ (°C)	R ₁ (Ω)	t ₂ (°C)	R ₂ (Ω)	T (°C)	Allowed T _{max} (°C)	Insulation class
--	--	--	--	--	--	--	--
--	--	--	--	--	--	--	--
Supplementary information: Load condition							

27.1	TABLE: Abnormal tests					P
	Ambient temperature (°C) :				25.0	—
	Power source for EUT: Manufacturer, model/type, output rating :				--	—
Component No.	Fault	Supply voltage (V)	Test time	Fuse #	Fuse current (A)	Observation
C1	sc	32	1s	F1	0	All output shut down immediately, no damage, no hazard.
R3	sc	32	1s	F1	0	All output shut down immediately, no damage, no hazard.
QC3.0 port	sc	32	10min	F1	0.02	Output shut down immediately, no damage, no hazard.
USB port	sc	32	10min	F1	0.02	Output shut down immediately, no damage, no hazard.
PD port	sc	32	10min	F1	0.02	Output shut down immediately, no damage, no hazard.
Q3.0 port(5V)	ol	32	4h20min	F1	0.65	The maximum output load is 3.6A, when load add to 3.7A,. output shut down immediately. The maximum temperature were: Outside enclosure=42.8°C, Ambient= 25.0°C, no damage, no hazards.
Q3.0 port(12V)	ol	32	4h20min	F1	1.32	The maximum output load is 3.2A, when load add to 3.3A,. output shut down immediately, The maximum temperature were: Outside enclosure=48.5°C, Ambient= 25.0°C, no damage, no hazards.
PD port(5V)	ol	32	4h20min	F1	0.66	The maximum output load is 3.6A, when load add to 3.7A,. output shut down immediately. The maximum temperature were: Outside enclosure=43.1°C, Ambient= 25.0°C, no damage, no hazards.
PD port(12V)	ol	32	4h20min	F1	1.34	The maximum output load is 3.2A, when load add to 3.3A,. output shut down immediately, The maximum temperature were: Outside enclosure=50.4°C, Ambient= 25.0°C, no damage, no hazards.

USB port(5V)	ol	32	4h10min	F1	0.67	The maximum output load is 3.5A, when load add to 3.6A, output shut down immediately. The maximum temperature were: Outside enclosure=42.1°C, Ambient= 25.0°C, no damage, no hazards.
Supplementary information: sc=Short circuit, ol=Overload, oc=Open circuit						

Attachment 1: Photo Documentation

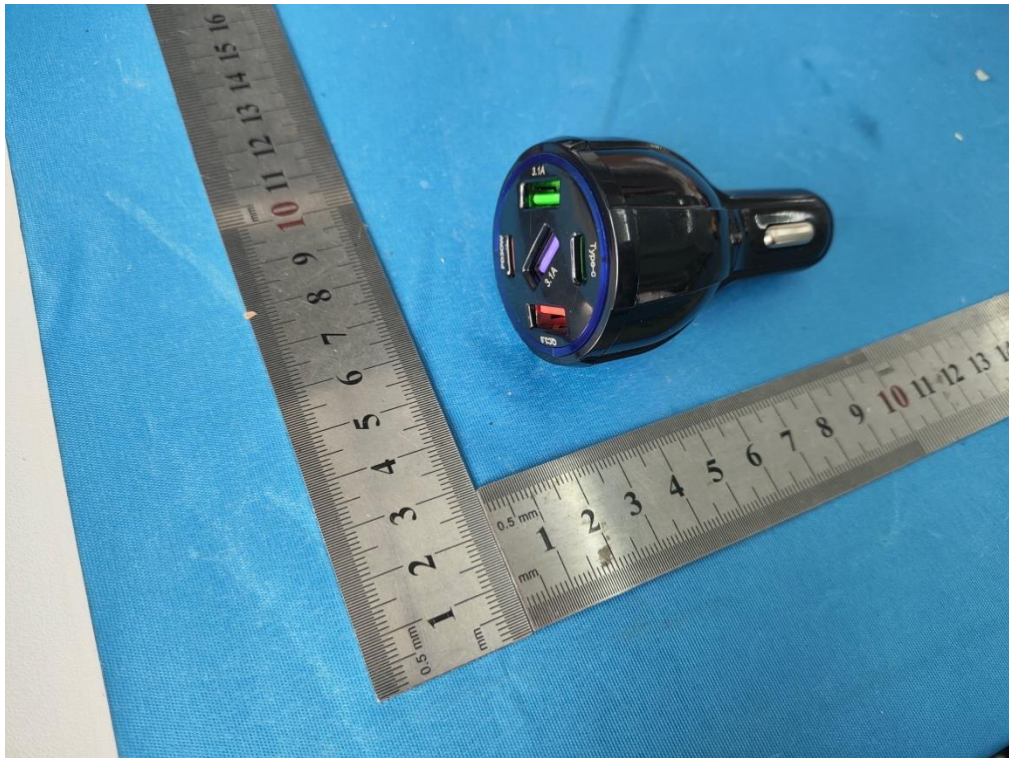


Fig. 1



Fig. 2

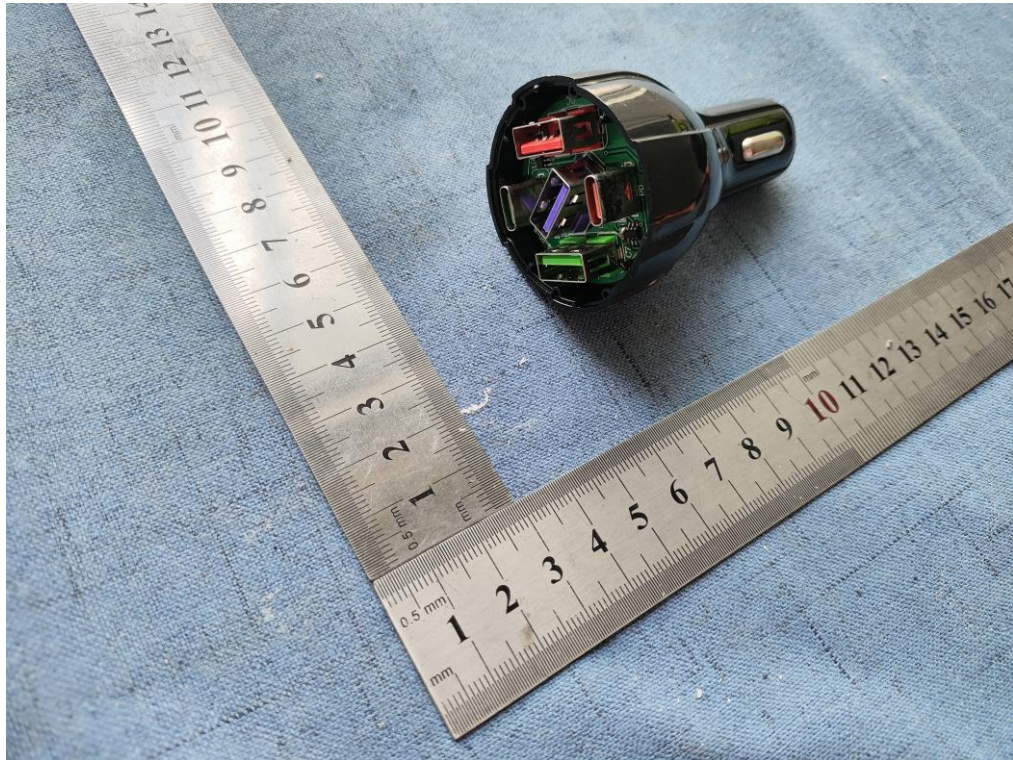


Fig. 3

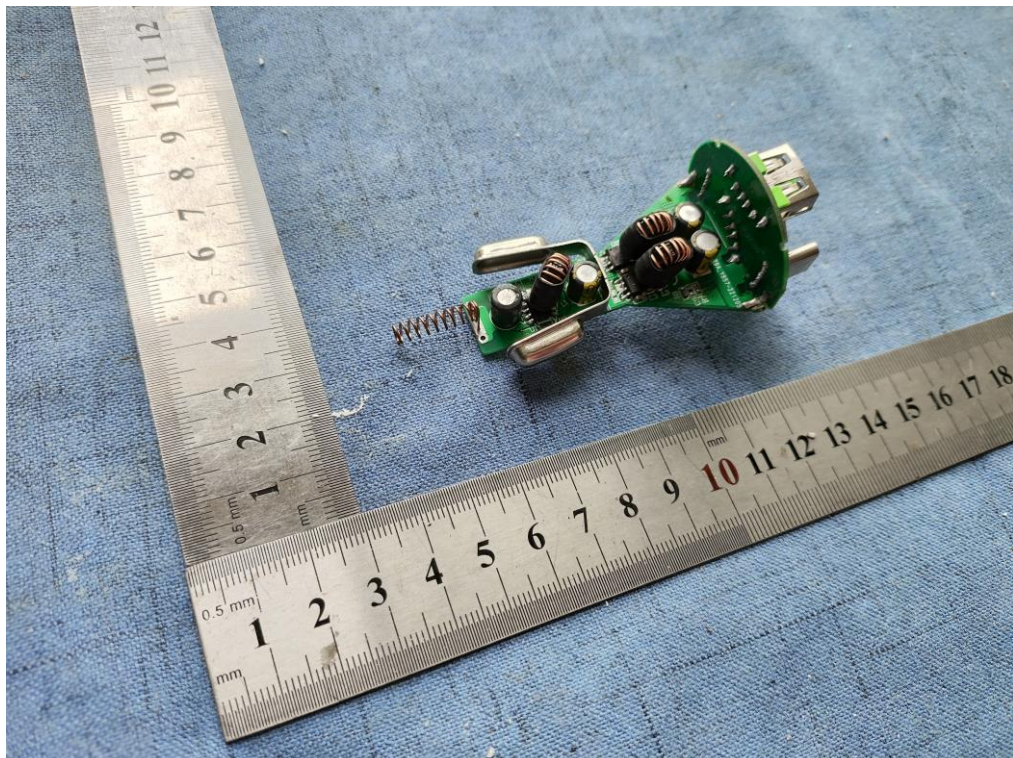


Fig. 4

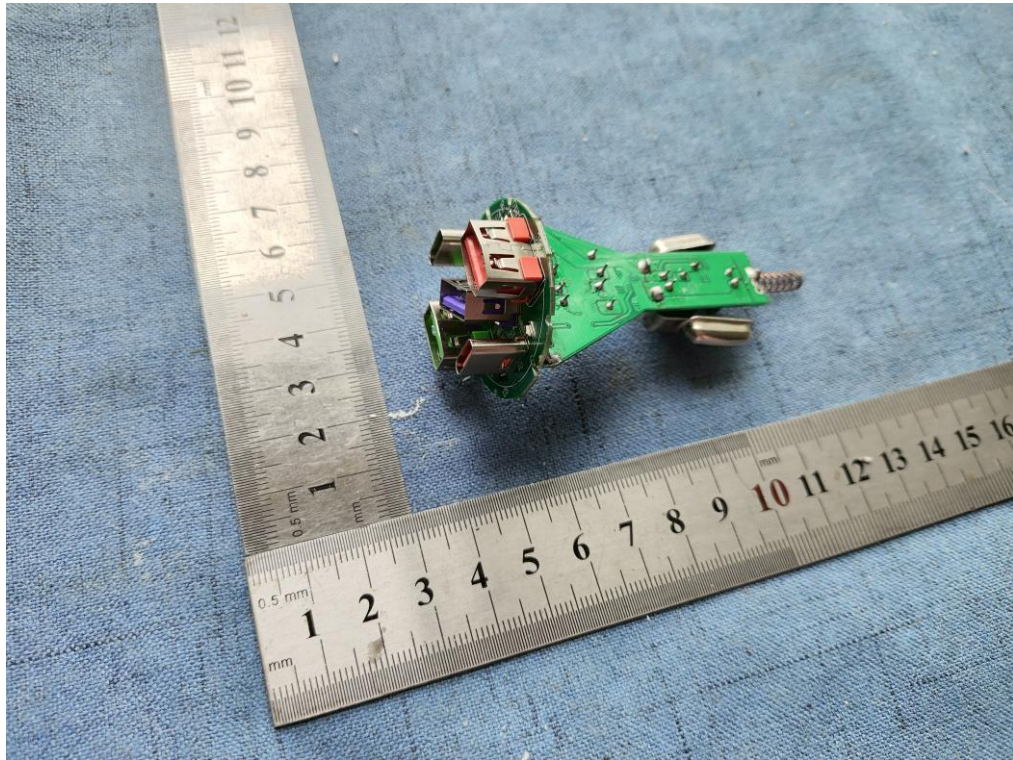


Fig. 5

-----THE END OF REPORT-----