FOLLOW-UP SERVICE PROCEDURE
(TYPE R)

ELECTRICAL SYSTEMS FOR PERSONAL E-MOBILITY DEVICES
(FKIS,FKIS7)

Manufacturer: SEE ADDENDUM FOR MANUFACTURER LOCATIONS

2282148 (Party Site)
Applicant: Shenzhen Kixin Electronics Co Ltd
No201, Building B, Gangshen Innovation Park, No40 Huaning Road, Dalang Street, Longhua District
Shenzhen CHINA

2282148 (Party Site)
Listee: SAME AS APPLICANT

Use of the Mark

This Follow-Up Service Procedure authorizes the above Manufacturer(s) to use the marking specified by UL LLC, or any authorized licensee of UL LLC, including the UL Contracting Party, only on products when constructed, tested and found to be in compliance with the requirements of this Follow-Up Service Procedure and in accordance with the terms of the applicable service agreement with UL Contracting Party. The UL Contracting Party for Follow-Up Services is listed in the addendum to this Follow-Up Service Procedure ("UL Contracting Party"). UL Contracting Party and UL LLC are referred to jointly herein as "UL."

It is the responsibility of the Applicant, Manufacturer(s), and Listee/Classified Co. to make sure that only the products meeting the aforementioned requirements bear the authorized Marks of UL LLC, or any authorized licensee of UL LLC.

Additional Responsibilities

Additional responsibilities, duties and requirements for the Applicant and Manufacturers are defined under Additional Resources at the following web-site: http://www.ul.com/fus . Manufacturers without Internet access may obtain the current version of these documents from their local UL customer service representative or UL field representative. For assistance, or to obtain a paper copy of these documents or the Follow-Up Service Terms referenced below, please contact UL's Customer Service at http://www.ul.com/aboutul/locations/ , select a location and enter your request, or call the number listed for that location.

Acceptance of Follow-Up Services

The Applicant and the specified Manufacturer(s) and any Listee/Classified Co. in this Follow-Up Service Procedure must agree to receive Follow-Up Services from UL Contracting Party. If your applicable service agreement is a Global Services Agreement ("GSA"), the Applicant, the specified Manufacturer(s) and any Listee/Classified Co. will be bound to a Service Agreement for Follow-Up Services upon the earliest by any Subscriber of a) use of the prescribed UL Mark, b) acceptance of the factory inspection, or c) payment of the Follow-Up Service fees. The Service Agreement incorporates such GSA, this Follow-Up Service Procedure and the Follow-Up Service Terms which can be accessed by clicking the following link: http://services.ul.com/fus-service-terms. In all other events, Follow-Up Services will be governed by and incorporate the terms of your applicable service agreement and this Follow-Up Service Procedure.

Use and Ownership of the Follow-Up Service Procedure

This Follow-Up Service Procedure, and any subsequent revisions, is the property of UL and is not transferable. This Follow-Up Service Procedure contains confidential information for use only by the Applicant, the specified Manufacturer(s), and representatives of UL and is not to be used for any other purpose. It is provided to the Subscribers with the understanding that it is not to be copied, either wholly or in part unless specifically allowed, and that it will be returned to UL, upon request.

Definition of Terms

Capitalized terms used but not defined herein have the meanings set forth in the GSA and the applicable Service Terms or any other applicable UL service agreement.

No Third Party Liability

UL shall not incur any obligation or liability for any loss, expense or damages, including incidental, consequential or punitive damages arising out of or in connection with the use or reliance upon this Follow-Up Service Procedure to anyone other than the above Manufacturer(s) as provided in the agreement between UL LLC or an authorized licensee of UL LLC, including UL Contracting Party, and the Manufacturer(s).

Certification Body

UL LLC has signed below solely in its capacity as the certification body to indicate that this Follow-Up Service Procedure fulfills the requirements for certification documentation issued by the certification body.

Bruce A. Mahrenholz
Director
Conformity Assessment Programs (CPO)
UL LLC

LOCATION

2282148 (Party Site)
Shenzhen Kixin Electronics Co Ltd
No#201, Building B, Gangshen Innovation Park, No#40 Huaning Road, Dalang Street, Longhua District
Shenzhen CHINA
Factory ID: None
UL Contracting Party for above site is: UL GmbH

ISSUED: 2016-12-21

STANDARDIZED APPENDIX PAGES
Subject 2272

ELECTRICAL SYSTEMS FOR E-MOBILITY DEVICES(FKIS, FKIS7)

STANDARDIZED APPENDIX PAGES

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APPENDIX A - FIELD REPRESENTATIVE'S RESPONSIBILITIES AND INSTRUCTIONS FOR EXAMINATION OF THE PRODUCT

GENERAL

The Field Representative’s general responsibilities, as part of the Follow-Up Services Procedure, are as noted in the published document titled, “UL Mark Surveillance Requirements”, and is available through UL’s secure customer portal MyHome@UL.com and/or through UL’s internet site www.UL.com. Manufacturers that do not have Internet access may obtain the current version of these requirements from their local UL Customer Service Representative or UL Field Representative.

PROCEDURE IN THE EVENT OF NONCONFORMANCE

When a product does not comply with the Follow-Up Service Procedure, it is required that the manufacturer implement appropriate action as outlined in the “UL Variation Notice and Corrective Action Requirements” document.

If there is evidence of issues related to nonconformance, the manufacturer may be placed in the Customer Corrective Action Plan (C-CAP) program, in order to be brought into compliance. Manufacturers entered into the C-CAP program may be subjected to additional inspections of production as part of that program.

CONSTRUCTION CONSIDERATIONS

The Field Representative is required to examine production bearing, or intended to bear, the UL Mark or Markings, to determine compliance with the construction requirements referenced in the “Construction Considerations” section of Appendix D, as well as the following requirement:

> Holographic UL Mark – The Certification Mark for this category requires the use of a holographic label. The Certification Mark for these products includes the UL symbol, the words “CERTIFIED” and “SAFETY”, the geographic identifier(s) (US), the File number, the Outline of Investigation reference, “UL2272” and a unique serial number. “.

ELECTRICAL SYSTEMS FOR E-MOBILITY DEVICES(FKIS, FKIS7)

Critical and Supervisory Software Components and Critical Microelectronic Hardware Components –

Critical and supervisory software components and critical microelectronic hardware components are identified in the individual reports as a result of the functional safety investigation of the battery management system and other controls relied upon for safety. Production is to be reviewed to ensure that the correct components are being used.

- The software versions listed in the reports are verifiable with technician assistance by connecting to the battery management system (BMS) through the controller area network (CAN)bus and reading back the reported software version. The software version reported back is as noted in Table 1 of Special Appendix A. See also Appendix D Construction.

PRODUCTION QUALITY CONTROL

The manufacturer is to have a production quality control system that addresses the supply chain control, the assembly process and has a corrective/preventative action process in place as outlined in Appendix D. This production quality control system is to be reviewed by the follow up representative during the quarterly follow up inspections at the factory.

ELECTRICAL SYSTEMS FOR E-MOBILITY DEVICES(FKIS, FKIS7)

APPENDIX B - INSTRUCTIONS FOR FIELD REPRESENTATIVE'S SAMPLE SELECTION

(RESERVED)

ELECTRICAL SYSTEMS FOR E-MOBILITY DEVICES(FKIS, FKIS7)

APPENDIX C - INSTRUCTIONS FOR FOLLOW-UP TESTS AT UL

(RESERVED)

ELECTRICAL SYSTEMS FOR E-MOBILITY DEVICES(FKIS, FKIS7)

APPENDIX D - MANUFACTURER'S RESPONSIBILITIES, CONSTRUCTION CONSIDERATIONS, AND REQUIREMENTS FOR FACTORY TESTS

The Follow-Up Service Procedure covering the product is loaned to the manufacturer and constitutes the basis on which the product is judged for compliance with the applicable requirements.

MANUFACTURER' S RESPONSIBILITIES

GENERAL

The Manufacturer’s general responsibilities, as part of the Follow-Up Services Procedure, are as noted in the published document titled, “UL Mark Surveillance Requirements”, and is available through UL’s secure customer portal MyHome@UL.com and/or through UL’s internet site www.UL.com. Manufacturers that do not have Internet access may obtain the current version of these requirements from their local UL Customer Service Representative or UL Field Representative.

Specific responsibilities include the following:

PRODUCTION QUALITY CONTROL

The Manufacturer is required to have Process Controls in place that continually monitor the following key elements of the manufacturing process:

- Supply Chain Control: On-going monitoring over the procurement and receipt of the materials/components utilized in the construction of the electrical system components including the cells and batteries covered by this Procedure to ensure the requirements defined in this document are maintained.

- Assembly Process: On-going monitoring/validation of all construction elements, including production testing, to ensure the requirements defined in this document are maintained

- Corrective/Preventative Action: A defined process shall exist to ensure that items of nonconformance are identified and resolved, and that corrective actions including root cause analysis, are implemented to reduce the likelihood of re-occurrence. This would also apply to nonconformance items identified during UL visits.

ELECTRICAL SYSTEMS FOR E-MOBILITY DEVICES(FKIS, FKIS7)

CONSTRUCTION CONSIDERATIONS

The manufacturer shall verify compliance with the applicable descriptions and requirements contained in this Procedure. Consideration shall also be given to the general requirements described below, which also apply to products covered in this Procedure. It is the manufacturer's responsibility to assure that production complies with these requirements.

Holographic UL Certification Mark - These products require the use of a Holographic UL Certification Mark as identified in Appendix A.

Production Quality Control – There shall be a production quality control system in place in accordance with Appendix A. The manufacturer is to have a process that includes the key elements outlined in Appendix A. The production quality control system is to be maintained by the manufacturer.

Critical and Supervisory Software Components and Critical Microelectronic hardware Components – The manufacturer shall assist the UL Field Representative with identification of these components as noted in Appendix A.

Electrical Spacings – When specified in the Procedure, minimum through air and over surface spacings are to be met.

Internal Wiring - Conductors shall be routed away or protected from sharp edges and moving parts.

Markings – Required information shall be legibly marked on the product, in the manner and minimum height specified.

Security of Parts - Parts shall be secured to prevent any rotation or shifting that could result in a reduction of electrical spacings.

Special requirements that may also apply to some or all of the products covered by this Procedure include the following:

Accessories Parts and Accessories - Such items packaged with the product including chargers shall be specifically described in the Procedure.

Adapters - Three to two wire grounding type adapters shall not be furnished with the product unless specifically authorized by the Procedure.

Connectors - Connectors shall be applied so as to insure that all bare strands are contained and insulated.

Multiple Voltage - Cord-connected multiple voltage products shall be provided with an attachment plug that is suitable for the voltage for which the product is set.

Usage Markings - There shall be no marking in the instruction manual, or on the carton or package that is, or could be construed to be, in conflict with or an extension of the use covered in the Procedure.

Internal Plastic Parts - For each type of plastic material, the manufacturer shall review the Online Certification Directory in order to verify that the plastic material in question meets all the material characteristics specified (i.e. – flammability rating, Relative Thermal Index, color, etc.) at the thickness specified.

Protection of Wiring - All wire and wire insulation in the product shall be protected from damage. This is commonly achieved by securement, segregation, and routing to keep the wire away from parts or assemblies that can damage the wire or insulation. Internal wiring that might make contact with metal parts shall be protected from sharp metal edges. This can be accomplished this by rounding or de-burring the metal, using a UL Certified Component bushing, or through other construction features described in the Procedure.

If the wiring is located where it may be in proximity to combustible material, it shall be protected by the method(s) described in the individual Procedure section.

Conductors shall be examined for evidence of damage. Faulty practices that can cause damage to conductors and/or insulation include:

1. Improper application of crimped connectors, including but not limited to the use of crimping tools and dies not recommended by the manufacturer of the connector.
2. Improper insulation removal.
3. Over-heating of conductor insulation because of routing or contact with hot surfaces during or after installation.
4. Use of wire in which the insulation has been cut, cracked, crushed, abraded, etc.

Constructions that may cause damage to conductors and/or insulation include:

1. Moving parts such as rotating or reciprocating cams, shafts, and the like, as well as removable or sliding covers, hinged doors.
2. Sharp edges and corners (including screw threads, burrs, points, stamped metal edges).
3. Heat sources (including lamps, heating elements, etc.).

4. Assemblies that clamp or squeeze wire insulation, unless described in the Procedure.

A switch, a lampholder, an attachment plug receptacle, a motor attachment plug cap, or other component subject to handling by the user shall be mounted securely and prevented from rotating.

Exception: Based on engineering considerations certain constructions of securely mounted push button or plunger type switches, and lampholders of the type in which the lamp cannot be replaced (such as a neon pilot or indicator light in which the lamp is sealed in a non-removable jewel) may be excluded from the above. These constructions are described in the Procedure. However, in no case will nonconforming spacings be allowed.

Some means commonly used to prevent rotation are:

1. Lock washer.
2. Matched keying of the component and its mounting.
3. Two or more fasteners (screws, rivets, pins, etc.).
4. Strap, clip, or pin fitted into an adjacent part.
5. Physical barrier (molded boss, side of enclosure, adjacent component, etc.) that bears against the component.

Casualty Considerations - Except as described, or as necessary for normal operation of the equipment, there shall be no sharp edges, burrs, points, or spikes inside or outside the device that may cause injury during use or cleaning operations.

Lampholder Connections - All screw shells of lampholders shall be connected to the same conductor of the supply circuit.

Batteries – The e-mobility device batteries shall be secured within compartments that prevent damage to cells and other parts of the batteries in accordance with the individual procedures.

ELECTRICAL SYSTEMS FOR E-MOBILITY DEVICES(FKIS, FKIS7)

Grounding – The following guidelines shall be observed:

Non-Detachable Cord Connected Appliance - The equipment-grounding conductor of the flexible cord:

1. Shall be either (1) finished to show a green color with or without one or more yellow stripes; or (2) covered by a green braid with or without one or more yellow tracers;

2. Shall be connected to the grounding member of the attachment-plug cap; and

3. Shall be conductively connected to (1) all exposed dead-metal parts of the product and (2) all dead-metal parts within the enclosure that are specified in the description as being connected to the grounding conductor. The grounding-conductor shall be connected by either (1) a screw or other reliable means that serves no other purpose and that is not liable to be removed during any servicing operation, or (2) a threaded grounding stud on which a closed ring connector secured to the ground conductor is the first conductor mounted and secured by a nut and split ring lock washer. Solder alone shall not be used for securing this conductor.

Notes:
1. The grounding member of the attachment-plug mentioned in Item 2 of the preceding paragraph shall be fixed in position with respect to the cap.

. The screw or stud and nut combination mentioned in Item 3 of the preceding paragraph shall (1) be provided with a means to penetrate nonconductive coatings, such as paint or enamel, (2) be of a corrosion-resistant metal or shall be protected against corrosion, and (3) be green colored or marked on or adjacent with "G", "GR", "Ground", "Grounding", or the IEC417 Grounding Symbol 5019 ⏚. If the Grounding Symbol alone is used, the installation instructions shall identify the meaning of the symbol.

Detachable Cord Connected Appliance - Polarization shall be maintained through the load fitting of the cord (appliance coupler) and the mating connector (appliance inlet) on the product. The load fitting shall be a three wire ANSI configuration.

Exception: The load fitting need not be an ANSI configuration provided it is wired as follows (the description applies when viewing the face of the connector on the product, with the center contact down):

1. The right contact shall be connected to the grounded conductor (neutral) of the cord, and

2. The center contact shall be connected to the grounding conductor of the cord.

The equipment-grounding terminal or grounding lead shall be connected to the frame or enclosure by a positive means, such as by a bolted or screwed connection. The grounding connection shall reliably penetrate nonconductive coatings, such as paint or vitreous enamel. The grounding point shall be so located that it is unlikely that the grounding means will be removed during normal servicing.

A wire-binding screw intended for the connection of an equipment-grounding conductor shall have a green-colored head that is hexagonal shaped, slotted, or both. A pressure wire connector intended for connection of an equipment grounding conductor shall be identified by the marking "G", "GR", "GND", "Ground", "Grounding", or the IEC417 Grounding Symbol 5019. Or, if authorized in the Procedure, it may be identified by a suitable marking on a wiring diagram on the appliance. If the Grounding Symbol alone is used, the installation instructions shall identify the meaning of the symbol.

The wire-binding screw or pressure wire connector shall be so located that it is unlikely to be removed during normal servicing of the unit.

The surface of an insulated lead intended solely for the connection of an equipment-grounding conductor shall be either (1) green with or without one or more yellow stripes, or (2) covered by a green braid with or without one or more yellow tracers.

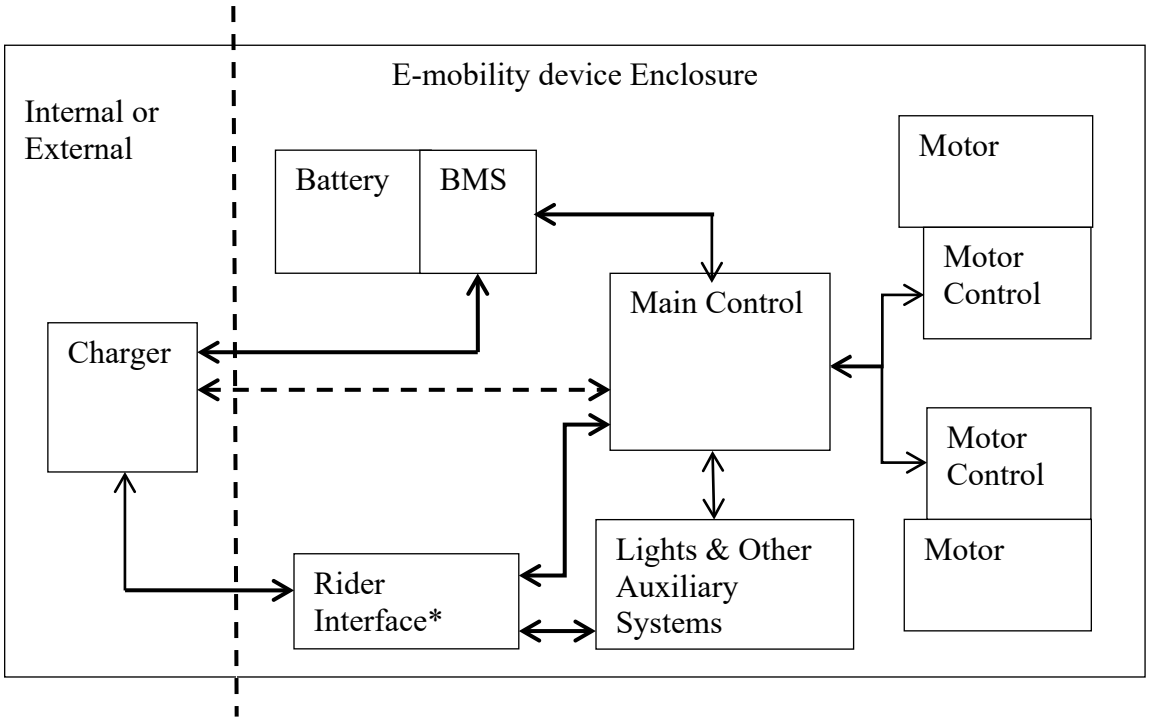
Bonding - Except where specifically noted in the Procedure, bonding of internal dead-metal parts to the enclosure for grounding purposes shall be accomplished by a positive means such as clamping, riveting, bolting or screwed connection. The bonding connection shall reliably penetrate any nonconductive coatings such as paint or vitreous enamel.

ELECTRICAL SYSTEMS FOR E-MOBILITY DEVICES(FKIS, FKIS7)

MANUFACTURER'S 100% PRODUCTION-LINE TEST PROGRAM

The Production-Line Tests described below shall be conducted on the products covered by this Procedure. The Continuity Test shall always be conducted prior to the Dielectric Voltage-Withstand Test or Isolation Resistance Test.

See Figure 1 in Appendix D for a generic example of a typical block diagram for an e-mobility device electrical system.



* - Interface include switches, terminals operator access controls, etc. that the rider can contact.

Figure 1 – Generic example of a e-mobility device electrical block diagram

ELECTRICAL SYSTEMS FOR E-MOBILITY DEVICES(FKIS, FKIS7)

A. Production-Line Grounding Continuity Test

General - The manufacturer shall subject 100% of all products containing hazardous voltages (i.e. ≥ 60Vdc or ≥ 30 Vrms/42.4 Vpeak) that have a power supply cord with a grounding conductor to a routine Production-Line Grounding Continuity Test in accordance-with the following.

Test Equipment - Any suitable continuity indicating device (such as an ohmmeter, a battery and buzzer combination, or the like) may be used to determine compliance with the Grounding Continuity Test requirements.

Method - Grounding continuity shall be determined between the grounding conductor of the attachment plug cap, or the designated grounding point, and dead metal parts of the product, using the test equipment indicated above.

Exception: This test need not be conducted on products intended for permanent connection by fixed wiring means if the design does not employ bonding jumpers or grounding wiring to remote units.

A single test is sufficient if the accessible metal selected is conductively connected by design to all other accessible metal.

Basis of Acceptability - Grounding continuity shall be verified between the parts specified.

B. Production-Line Dielectric Voltage-Withstand Test (E-Mobility Devices with voltages ≥ 60Vdc or 30 Vrms/42.4V peak)

General – the manufacturer shall subject 100% of production of all products, except those noted as exceptions to this testing in the Table of Special Appendix D as they contain no hazardous voltages, to a routine Production-Line Dielectric Voltage-Withstand Test in accordance with UL Requirements for Dielectric Voltage Withstand (Test Equipment) Used for UL/C-UL/ULC Mark Follow-Up Services which is available through UL's secure customer portal MyHome@UL.com and/or through UL's internet site www.UL.com. Manufacturers that do not have Internet access may obtain the current version of these requirements from their local UL Customer Service Representative or UL Field Representative.

The manufacturer may conduct an isolation resistance test as an alternate to the dielectric voltage withstand test.

Test Definitions - For the purpose of the dielectric voltage withstand or an isolation resistance test, the following definitions apply:

Basic Insulation - The insulation applied to live parts to provide basic protection against the risk of electric shock.

Supplementary Insulation - An independent insulation provided, in addition to the basic insulation, to protect against the risk of electric shock in case of breakdown of the basic insulation. An enclosure of insulating material may form a part or all of the supplementary insulation.

Live Part - A part consisting of electrically conductive material conductively connected to (a) the power supply circuit or (b) to a secondary circuit that operates at more than 42.4 volts peak with reference to ground or accessible metal under conditions of normal use of the product.

Dead Metal Part - A metal part, accessible or inaccessible, not conductively connected to the power supply circuit under conditions of normal use of the product.

Accessible Part - A part located so that it can be contacted by a person, either directly or by means of a 6.4 mm diameter probe with a 3.2 mm long pointed end or by a tool during user servicing, or that is not recessed the required distance behind an opening.

Grounding Conductor - A conductor employed to connect noncurrent-carrying parts of equipment, raceways, and enclosure to a grounding electrode. The grounding electrode is, in turn, connected to earth ground or to some conducting body that serves in place of earth ground.

Value of Test Potential - Unless a maximum test potential is specifically stated, the test potential shall not exceed 120% of the minimum value specified.

The production-line test shall be in accordance with either Condition A or Condition B of Table 1. The full test potential is to be applied for the full time specified in Table 1. The test potential may be applied gradually until the full test potential is attained; however, for the 1 second test the full test potential shall be applied at the beginning of the test.

The product may be in a heated or unheated condition for the test.

The test shall be conducted when the product is complete (fully assembled). It is not intended that the product be unwired, modified, or disassembled for the test.

Exception No. 1: A part, such as a snap cover or a friction-fit knob, that would interfere with conducting the test need not be in place.

Exception No. 2: The test may be conducted before final assembly if the test represents that for the completed product.

ELECTRICAL SYSTEMS FOR E-MOBILITY DEVICES(FKIS, FKIS7)

TABLE 1 – PRODUCTION-LINE TEST POTENTIAL

Product with circuits that have:	Condition A			Condition B		
	Minimum test potential		Time, secs	Minimum test potential		Time, secs
	V DC	V AC		V DC	V AC	
DC Voltages[a]: Greater than or equal to 60 Vdc	2 x Voltage	2 x Voltage	60	2.4 x (Condition A voltage)	2.4 x (Condition A voltage)	1
AC Voltages[a]: Greater than or equal to 30 Vrms/42.4 Vpeak ac	(2.828 x Voltage) + 1000	(2 x Voltage) + 1000	60	(2.4 x Condition A voltage) + 1200	(2.4 x Condition A voltage) + 1200	1
a – DC voltages are applied to those circuits of the e-mobility device supplied by the battery system and isolated from hazardous AC circuits. AC Voltages apply to all other circuits.						

A product employing a solid-state component that is not relied upon to reduce a risk of electric shock and that can be damaged by the dielectric potential may be tested before the component is electrically connected provided that a random sampling of each day's production is tested at the potential specified in Table 1. The circuitry may be rearranged for the purpose of the test to reduce the likelihood of solid-state component damage while retaining representative dielectric stress of the circuit.

During the test, the primary switch is to be in the on position, both sides of the primary circuit of the product are to be connected together and to one terminal of the test equipment, and the second test-equipment terminal is to be connected to accessible dead metal.

Exception No. 1: A product (resistive, high-impedance winding, or the like) having circuitry not subject to excessive secondary voltage buildup in case of electrical breakdown during the test may be tested (1) with a single-pole primary switch, if used, in the off position, or (2) with only one side of the primary circuit connected to the test equipment when the primary switch is in the on position or when a primary switch is not used.

Exception No. 2: The primary switch is not required to be in the on position if the testing means applies full test potential between the primary wiring and dead metal parts with the switch not in the on position.

Basis of Acceptability

All products shall withstand the applied potential(s) without electrical breakdown.

ELECTRICAL SYSTEMS FOR E-MOBILITY DEVICES(FKIS, FKIS7)

C. Isolation Resistance Test (E-Mobility Devices with voltages ≥ 60Vdc or 30 Vrms/42.4V peak)

General - This test may be conducted on 100% production in lieu of the dielectric voltage withstand test.

Test Method

A e-mobility device is to be subjected to an insulation resistance test between the positive terminal and accessible dead metal parts accessible parts. If the accessible parts of the e-mobility device are covered with insulating material that may become live in the event of an insulation fault, then the test voltages are applied between each of the live parts and metal foil in contact with the accessible parts as shown in and Figure 2.

The insulation resistance is to be measured after a 60-s application with a high resistance voltmeter using a 500 Vdc potential applied for at least 1 min to the locations under test.

Basis of Acceptability

The measured insulation resistance between the positive terminals and accessible parts of the e-mobility device is to be at least 50,000 Ω.

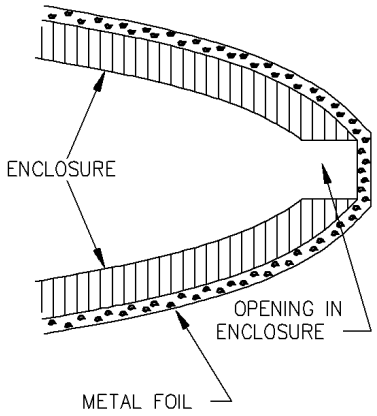


Figure 2 - Method of covering enclosures with foil for measurement and tests

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USL – United States Standard, Listed
CNL – CAS Listed

ELECTRICAL SYSTEMS FOR SELF-BALANCING SCOOTERS (FKIS)

EXCEPTIONS

Dielectric Voltage Withstand Test or Isolation Resistance Test

Based on engineering judgment, the dielectric voltage withstand test or isolation resistance test are not required to be performed on the following products:

Product Name	Catalog Number	Procedure Section
Electrical System for Personal E-Mobility Devices	X7	1
Electrical System for Personal E-Mobility Devices	X8	2

Production-Line Grounding Continuity Test

Based on engineering judgment, this test is not required to be performed on the following products:

Product Name	Catalog Number	Procedure Section
Electrical System for Personal E-Mobility Devices	X7	1
Electrical System for Personal E-Mobility Devices	X8	2

GENERAL

PRODUCT COVERED:

Electrical System for Self-Balancing Scooter

MARKING:

All required markings shall be legible and permanent such as ink stamped, etched, adhesive labels, etc. All adhesive labels shall be R/C (PGDQ2) component marking and labeling systems or printed on R/C (PGJI2) Component Printing Materials.

The manufacturer's name or trademark, catalog number, and the holographic UL Listed Mark.

Additional marking requirements are outlined in the individual sections describing the scooter.

DATE OF MANUFACTURE MARKING

The scooter shall be marked with the manufacturer’s date of manufacture, which may be abbreviated; or may be in a nationally accepted conventional code; or in a code that does not repeat in less than 10 years.

The manufacturer’s date code is as follows for models X8:
‘YYYYQ’ in code ‘KXYYYYQxxxxxxx’,
‘YYYY’ represents year of manufacture, e.g, 2020 represents year 2020, 2021 represents year 2021, 2022 represents year 2022, ……;
‘Q’ represents quarter of manufacture, A=Quarter 1, B=Quarter 2, C=Quarter 3, D=Quarter 4;

Example: 2020A means Quarter 1, 2020

CERTIFICATE OF COMPLIANCE

Certificate Number	E515369
Report Reference	E515369-20200730
Issue Date	2020-AUGUST-03
Issued to:	Shenzhen Kixin Electronics Co Ltd No201, Building B, Gangshen Innovation Park, No40 Huaning Road, Dalang Street, Longhua District Shenzhen CHINA
This certificate confirms that representative samples of	ELECTRICAL SYSTEMS FOR PERSONAL E-MOBILITY DEVICES Electrical System for Personal E-Mobility Devices, Model(s) X7.
	Have been investigated by UL in accordance with the Standard(s) indicated on this Certificate.
Standard(s) for Safety:	ANSI/CAN/UL-2272 - Standard For Safety For Electrical Systems for Personal E-Mobility Devices
Additional Information:	See the UL Online Certifications Directory at https://iq.ulprospector.com for additional information.

This *Certificate of Compliance* does not provide authorization to apply the UL Mark. Only the UL Follow-Up Services Procedure provides authorization to apply the UL Mark.

Only those products bearing the UL Mark should be considered as being UL Certified and covered under UL's Follow-Up Services.

Look for the UL Certification Mark on the product.

Bruce Mahrenholz, Director North American Certification Program

UL LLC

File E515369
Project 4789468738

July 30, 2020

REPORT

on

Electrical Systems for Personal E-Mobility Devices
(FKIS/7)

Shenzhen Kixin Electronics Co.,LTD

DESCRIPTION

PRODUCT COVERED:

USL, CNL – Electrical System for Personal E-Mobility Devices, Model(s) X7.

GENERAL:

These products are personal E-mobility devices including Model(s) X7, which use lithium ion batteries as their Power sources.

ELECTRICAL AND OTHER RATINGS AND SPECIFICATIONS OF E-MOBILITY DEVICE:

Device Model	Device Type	Minimum Rider Age	Input Voltage (Rated) Vdc	Input Current (Max) A	Maximum and Minimum Rider Weight lbs/kg	Maximum speed mph / km/h	Charge Temperature Range °C	Operating Temperature Range °C	Enclosure IP Rating
X7	Personal E-Mobility Devices	14	42	2	Max: 220lbs /100kg Min: 44lbs/ 20kg	20/32	0~25	0~35	IPX4

POWER SUPPLIES FOR CHARGING

		Power Supply Input, (ac)			Output (dc)		Maximum operating Temperature
Device Model	Power Supply Manufacturer/Model	V	A	Hz	V	A	°C
X7	SHENZHEN XIN HENG TYCO ELECTRONICS CO.,LTD (QQGQ/7.E481608)/ XHK-800-4220	100-240	2.0	50/60	42.0	2.0	25

BATTERY PACK

Device Model	Battery pack Manufacturer/ Model	UL File Information	Nominal Voltage Nominal Vdc	Capacity (Nominal) Ah	User Removable or detachable, Y / N
X7	Shenzhen Lithium Source Tech Co.,Ltd / X7BDH	E515370	36	5	Y

CELL INFORMATION AND BATTERY CONFIGURATION:

Device Model	Battery pack model	Cell Manufacturer / Model	Cell File Information	Cell Chemistry/ type #	Battery Configuration	
					Number of Cells	Configura-tion*: X-S/Y-P
X7	X7BDH	JIANGXI BETTERY WAY NEW ENERGY TECHNOLOGY CO LTD / BTW INR 18650-25EC	MH64157	lithium-ion/ cylindrical	20	10-S/2-P

* - X = No. of cells in series; Y = Number of parallel strings
# - e.g. lithium ion / cylindrical, Lithium ion /prismatic, lithium ion /polymer (soft pouch), Ni-mH/prismatic, Ni-Cad/cylindrical, etc.

MOTOR

Device Model	Motor Manufacturer/ Model	Motor Type/No. of Motors Used	Input Voltage (Rated), Vdc	Input Current, A	Input Power, W	Rated Speed, rpm
X7	Taizhou Wanbo mechanical and Electrical Technology Co., Ltd. / 8.5-inch electronic brake motor	DC brushless motor/one Motor Used	36	10 (Rated); 11 (Max.)	Rated: 350	650±20
	Taizhou Wanbo mechanical and Electrical Technology Co., Ltd. / 10-inch electronic brake motor	DC brushless motor/one Motor Used	36	10 (Rated); 11 (Max.)	Rated: 350	530±20

BATTERY MANUFACTURER'S RECOMMENDED CHARGING PARAMETERS:

Battery Pack Model	Temperature Range, °C	Normal Charging Voltage, Vdc	Normal Charging Current, A	Maximum Charging Voltage, Vdc	Maximum Charging Current, A
X7BDH	@	42.0	1.0	42.0	2.5
@: The temperature was evaluated with the X7 from 0 to 40 °C.					

BATTERY MANUFACTURER'S RECOMMENDED DISCHARGING PARAMETERS:

Battery Pack Model	Temperature Range, °C	End of discharge Voltage, Vdc	Normal Continuous Discharging Current, A	Maximum Continuous Discharging Current, A
X7BDH	@@	27.5	2.5	15
@@: The temperature was evaluated with the X7 from 0 to 40 °C.				

MANUFACTURER'S SPECIFIED OPERATING REGION FOR CELL:

Battery Pack Model	Cell Mfg/ Model	Operating Ambient Temperature Range, °C	Upper Limit of Charging Voltage, Vdc	Upper Limit of Charging Current, A	Maximum Discharge Current A	Discharge Voltage Cutoff, Vdc	Upper Limit of Cell Temperature, °C
X7BDH	JIANGXI BETTERY WAY NEW ENERGY TECHNOLOGY CO LTD/ BTW INR 18650-25EC	Charge: 0 to 45°C Discharging: -20 to 60°C	#	2.5	7.5	*	80
#: Upper Limit of Charging Voltage was evaluated to 4.3V. *: Discharge Voltage Cutoff was evaluated to 2.6V.							

TECHNICAL CONSIDERATIONS (NOT FOR FIELD REPRESENTATIVE'S USE):

1. Products indicated as USL have been investigated using requirements contained in the First Edition of ANSI/CAN/UL 2272 Standards for Safety for Electrical Systems for Self-Balancing Scooter, dated November 21, 2016, including revisions through February 25, 2019.

2. Products covered have been evaluated for its safety of the electrical system including the electrical drive train system and battery and charger combination for fire, explosion and if applicable electrical shock hazards. No evaluation for physical hazards associated with the use of the personal e-mobility devices has been conducted.

3. Unless noted otherwise in this report, the electrical control system has not been evaluated for its performance or reliability (e.g. performance of speed, stop/start, etc. controls) of these devices.

4. The battery model X7BDH for electronic circuits for the Scooters were replied upon as the primary safety protection, which had been evaluated in accordance with the standard for Tests for Safety-Related Controls Employing solid-State Devices, UL991.

5. Battery cover, Vertical stem, Silicone plug, Stem safety latch, side covers of front wheel, are considered as fire and mechanical enclosure of the personal e-mobility devices.

6. The personal e-mobility devices were submitted and evaluated for use at the maximum charging and operating ambient temperature permitted by the manufacturer's specification.

7. The personal e-mobility device has charger connect-interlock so that the unit cannot be activated when the charger is plugged in.

MARKINGS:

All markings identified in this report shall be legible and permanent such as ink stamped, etched, adhesive labels, etc. Adhesive labels shall be (PGDQ2) component marking and labeling systems or printed on (PGJI2) Component Printing Materials suitable for surface adhered to, or required in the construction detail.

Nameplate Marking:

1. The listed Company, trade name, trademark or other descriptive marking;
2. Part number or model number;
3. Electrical rating in Volts dc, and Ah or Wh;
4. Listed Holographic Marking;
5. Date of Manufacturer Marking that does not repeat within 10 years; refer to section general for details;
6. Maximum weight in lbs or kg and speed in mph or km/h;

All external terminals and connections are marked with polarity or applicable identification.

The personal e-mobility devices are marked with charging instructions; an example of such markings would be the following or equivalent “Use Only with specified charger in instruction”.

The personal e-mobility devices are marked “WARNING – To reduce the risk of injury, user must read instruction manual” or are marked with the sign M002 of the Standard for Graphical Symbols Safety Colours and Safety Signs, Safety Signs Used in Workplaces and Public Area, ISO 7010 (person with a book in circle), and ISO 7010,No. W001 (exclamation point in triangle).

In the United States:

In English: "WARNING - To reduce the risk of injury, user must read instruction manual".

In Canada:

In English: "WARNING - To reduce the risk of injury, user must read instruction manual"; and

In French: «AVERTISSEMENT - Pour prévenir les blessures, l’utilisateur doit lire le manuel d’utilisation»

INSTRUCTIONS:

See Also Section General for details.

The personal e-mobility devices are provided with instructions for the proper use including charging and operating, storage and disposal, instructions for temperature limits, appropriate charger and weight limits, see electrical ratings of this report for detailed values.

The personal e-mobility devices are provided with the information on water and other environmental exposures limitation as following or equivalent:

Prolonged Exposure to UV Rays, Rain and the Elements May Damage the Enclosure Materials, Store Indoors When Not in Use.

The following or equivalent marking shall be provided in the instructions:

In Canada:

In English: "WARNING - Risk of Fire - No User Serviceable Parts"; and

In French: «AVERTISSEMENT - Risque d'incendie - Aucune des pièces ne peut être réparée par l'utilisateur»

In the United States:

In English: "WARNING - Risk of Fire - No User Serviceable Parts".

Contact information for servicing the personal e-mobility devices.

The device may be or may not be marked with the minimum required IPX4 rating.

CONSTRUCTION DETAILS:

Spacings – These scooters only involve maximum working voltage of 42 Vdc, which is considered as non-hazardous voltage circuit, thus no spacings is required for these scooters.

GENERAL CONSTRUCTION REQUIREMETN:

Printed Wiring Board – Unless otherwise noted, R/C (ZPMV2/8), rated min. V-1, 105°C.

Insulation Tube – Unless otherwise noted, R/C (YDPU2/8), located power and single wire, minimum 300 V, 125 °C, VW-1.

Signal Connectors – Unless otherwise noted, R/C (ECBT2/8), rated 60V, min. 85 °C, or copper pin housed in plastic base of R/C (QMFZ2/8), rated min. V-2, 80 °C.

Internal Plastic Part Materials - Unless otherwise noted, R/C (QMFZ2/8 or QMTS2/8), rated minimum V-2, minimum 80 °C. Except for less than or equal to 1750 mm^3.

Illustrations - The following illustrations and Figures are included in this Report.

Model No.	Parts	Nos.	Description
X7	External View	Fig.1 to 6	Overall View of scooter
		Fig. 7,8	Overall View of 8.5-inch electronic brake motor
		Fig. 9,10	Overall View of 10-inch electronic brake motor
		ILL. 1,2	Overall Dimension View (NORMAL)
		ILL. 3,4	Overall Dimension View (FOLDED)
	Internal View	Fig. 11	Internal View of 8.5-inch electronic brake motor
		Fig. 12	Internal View of 10-inch electronic brake motor
		Fig. 13 to 15	Overall View for Mainboard
		Fig. 16 to 17	Overall View for dashboard
		ILL. 5	Chassis Dimension
		ILL. 6	Battery cover Dimension
		ILL. 7	Vertical Stem Dimension
		ILL. 8	Stem safety latch Dimension
		ILL. 9	Silicone plug 1 and plug 2 Dimension
		ILL. 10	Handle bar Dimension
		ILL. 11	Middle bar Dimension
		ILL. 12	Dashboard top cover Dimension
		ILL. 13	Dashboard bottom cover Dimension
		ILL. 14	Hooks Dimension
		ILL. 15	LED cover Dimension
		ILL. 16	Fork dimension
		ILL. 17	Fender Dimension
		ILL. 18	8.5-inch electronic brake motor Spec
		ILL. 19	10-inch electronic brake motor Spec
		ILL. 20	Rear wheel Dimension
		ILL. 21	Dimension Drawing of 8.5-inch electronic brake motor
		ILL. 22	Dimension Drawing of 10-inch electronic brake motor
		ILL. 23	Circuit diagram and Layout for mainboard
		ILL. 24	Circuit diagram and Layout for dashboard PWB
		ILL. 25	Heat-Sink Dimension
		ILL. 26	Dimension Drawing for enclosure of mainboard
		ILL. 27	Label Marking for X7
		ILL. 28	Power input connector structure
XHK-800-4220	Charger	Fig. 18 to 19	Overall view of Charger

Personal E-Mobility Devices - Model X7, Figure(s) 1 to 19

1. Overall Dimensions – L*W*H: 1074.5mm*405mm*1163.5mm (8.5-inch, normal) and L*W*H: 1083.8mm*405mm*1170.4mm (10-inch, normal), See ILL. 1, ILL. 2, ILL. 3 and ILL. 4 for detailed dimensions.

2. Battery Pack – See tables and information noted above regarding ratings and specifications as well as information noted below.

Battery Pack Model	Battery Pack Manufacturer	File No	Voltage (Nominal), Vdc	Capacity (Nominal), Ah	Maximum Charging Voltage, Vdc	Maximum Charging Current, A
X7BDH	Shenzhen Lithium Source Tech Co., Ltd	E515370	36	5.0	42.0	2.5

The battery pack is placed inside Vertical Stem.

3. Cells – See tables and information above:

Battery Pack Model	Cell Mfg.	File No	Cell Model	Nominal Voltage, Vdc	Nominal Capacity, Ah
X7BDH	Jiangxi Bettery Way New Energy Technology Co.,LTD	MH64157	BTW INR 18650-25EC	3.7	2.5
Note: See Cell Chemistry and Configuration Table at beginning of report for information on type of cells, number of cells and their configuration in the battery pack circuit.					

Cells are secured in the enclosure of battery pack by plastic cell holder and plastic cover, all components were fixed inside metal enclosure of battery pack.

Cells are connected to each other through nickel-plated iron tabs of width 5 mm and thickness 0.15 mm by laser welding. The cells were connected to the Printed Wiring Board with nickel plated copper tabs.

4. Fire and mechanical enclosure shown as below:

   Battery cover - R/C (QMFZ2/8). Rated V-1, minimum 1.5 mm thick, RTI Electric = 85 °C, RTI Impact = 80 °C, RTI Strength = 85 °C. See ILL. 6 for detailed.

   Vertical Stem - Made of aluminum. Minimum thickness 1.5 mm. See ILL. 7 for details.

   Stem safety latch – Material same as Vertical Stem. See ILL. 8 for details.

   Silicone plug – R/C (QMFZ2/8), rated min. V-1, 80 °C, See ILL. 9 for details.

5. No opening in entire enclosure.

6. Handlebar – Two provided, made of aluminum, min. thickness 1 mm, used for direction manipulation. See ILL. 10 for details.

   Handlebar casing – Two provided, made of Silica gel, sheathed both side of the handlebar for antiskid.

7. Middle bar – Made of aluminum, min. thickness 1 mm, used for fixing the handlebar, brake lever, throttle and dashboard covers. See ILL. 11 for details.

8. Throttle (Hall) – Included in the plastic enclosure (QMFZ2/8), min. HB, min. rated 80 °C, used to control the speed of device. The enclosure of the throttle was fixed on the right side of Middle bar.

9. Brake Lever – Included in the plastic enclosure (QMFZ2/8), min. HB, min. rated 80 °C, secured to the left side of middle bar by screws, used to control the disc brake for device deceleration.

10. Dashboard cover is mounted in the center of the middle bar.

    Dashboard top cover - R/C (QMFZ2/8, E56070), min. V-1, min rated 80 °C, type PA-765A(+) by CHI MEI CORPORATION. See ILL. 12 for details.

    Dashboard bottom cover - R/C (QMFZ2/8, E56070), min. V-1, min. rated 80 °C, type PA-765A(+) by CHI MEI CORPORATION. See ILL. 13 for details.

11. Hooks - R/C (QMFZ2/8), min. HB, min. rated 80 °C. Fixed the long pole to rear fender when folding the device. See ILL. 14 for details.

12. LED cover - R/C (QMFZ2/8, E56070), min. V-1, min. rated 80 °C, type PA-765A(+) by CHI MEI CORPORATION. LED cover is fixed to vertical pole by 4 screws. See ILL. 15 for details.

13. LED – 1 light provided, the headlights are mounted on the vertical Stem, maximum power 1.0 W.

14. Stem Folding Wrench – Made of aluminum, min. thickness is 2mm, used to switch E-Mobility Devices between upright and folded states.

15. Fork – Made of steel, min thickness is 3mm, used for fixing the front wheel, see ILL. 16 for details.

16. Fender - R/C (QMFZ2/8), min. HB, min. rated 80 °C. Front fender fixed on front fork by screws. Rear fender fixed on the main frame by screws. See ILL. 17 for detailed.

17. Rear wheel - The rear wheel is mounted on the Chassis by screws. See ILL. 20 for details.

18. Chassis – Made of aluminum. See ILL. 5 for details.

19. Charger - R/C (QQGQ/7, E481608), type XHK-800-4220, Mfr. SHENZHEN XIN HENG TYCO ELECTRONICS CO., LTD.

    See below table for ratings.

Charge model	Input			Output		Maximum operating Temperature °C
	V ac	A	Hz	V dc	A	
XHK-800-4220	100-240	2.0	50/60	42.0	2.0	25

20. Charging power Wiring – R/C (AVLV2/8), rated min. 20 AWG, 200 °C, 60V.

21. Discharge power wiring - R/C (AVLV2/8), rated min. 16 AWG, 105 °C, 600V, VW-1.

22. Power Connector – R/C (ECBT2/8), connected with battery pack for discharging, rated minimum 60 V, 20 A, temperature range of 80 °C.

23. Power Input Connector – connected with battery pack for charging, terminal constructed of copper alloy and R/C (QMFZ2/8, E56070) plastic, type PA-765A(+) by CHI MEI CORPORATION, min. thickness 1.5mm, RTI Electric = 85°C, RTI Impact = 80°C, RTI Strength = 85°C, See ILL. 28 for details.

24. Heat-Sink – Located on the main board, made of Aluminum, min. thickness is 3.5 mm. See ILL. 25 for detailed dimensions.

25. Kickstand - One provided, made of steel or aluminum, fixed at the side of Chassis.

26. Glue - R/C (QMFZ2/8), Rated minimum V-2, 105°C.
    Applied on the junction of the power wires and connectors on the main board, and keep the power wires and connectors fixed.

27. Motor –1 employed, non R/C Motor, Manufactured by Taizhou Wanbo mechanical and Electrical Technology Co., Ltd model type 8.5-inch electronic brake motor, DC brushless motor, output rated 36 Vdc, rated. 350W, insulation Class of A. See ILL. 21 for details. Consist of the following items.

27-1. Complete Assembly – Overall dimension show as below:

Motor Lamination (Stack) Dimensions, mm			
Rotor		Stator	
Internal Diameter	Height	Outside Diameter	Height
112	47	105	30

27-2. Side Cover – Aluminum alloy, integrated with motor housing, min. 1 mm thick, 150.0 mm OD, provided the 19.7mm ID opening for Axle.

27-3. Motor Winding - R/C (OBMW2. E327855), Mfr. ZHEJIANG SANXING ELECTRICAL TECHNOLOGY CO., LTD, type xPEW/155, QZ-x/155, Temp Class 155[#], winding diameter 0.500±0.005 mm, winding DC resistance 0.20 ohms.

27-4. End Spider - R/C (QMFZ2/8), min. rated V-2, 105 °C, min. thickness 1.0 mm, Located between winding and magnetic sheets.

27-5. Slot Wedge – R/C (QMFZ2/8) rated V-2, min. 105 °C.

27-6. Printed Wiring Board – R/C (ZPMV2/8), rated V-0, maximum temperature 105 °C.

27-7. Power wiring– R/C (AVLV2/8), rated minimum 16 AWG, 105 °C, 60 V. connecting to windings by twist and soldering method.

27-8. Signal Wiring - R/C (AVLV2/8), rated minimum 24 AWG, 105 °C, 60 V.

27-9. Motor Axle –One provided, made of Steel, measured 15.0 mm out diameter, M12*1.25 thread was provided on both sides.

27-10. White insulation sheet – R/C (QMFZ2/8), rated V-2 flame rating, min. 105 °C. Locate between PWB and windings.

27-11. Glue – R/C (QMFZ2/8), rated min. 105 °C, used to secure the PWB on the Insulation sheet.

27-12. Motor Connector – R/C (ZMVV2), with heat-shrinkable tubing out of the connector, rated minimum 60 V, 20 A, 80 °C, and secured by cable ties or tube.

Cable ties – R/C (ZODZ2/8), min. 80°C.

Tube – R/C (YDPU2/8), min. 80°C.

28. Alternate Motor-1 employed, non R/C Motor, Manufactured by Taizhou Wanbo mechanical and Electrical Technology Co., Ltd model type 10-inch electronic brake motor, DC brushless motor, output rated 36 Vdc, rated. 350W, insulation Class of A. See ILL. 22 for details. Consist of the following items.

28-1. Complete Assembly – Overall dimension show as below:

Motor Lamination (Stack) Dimensions, mm			
Rotor		Stator	
Internal Diameter	Height	Outside Diameter	Height
112	53.8	105	30

28-2. Side Cover – Aluminum alloy, integrated with motor housing, min. 1 mm thick, 128 mm OD, provided the 25mm ID opening for Axle. Refer to Ill.25 for details.

28-3. Motor Winding - R/C (OBMW2. E327855), Mfr. ZHEJIANG SANXING ELECTRICAL TECHNOLOGY CO., LTD, type xPEW/155, QZ-x/155, Temp Class 155[#], winding diameter 0.500±0.005 mm, winding DC resistance 0.14 ohms.

28-4. End Spider - R/C (QMFZ2/8), min. rated V-2, 105 °C, min. thickness 1.0 mm, Located between winding and magnetic sheets.

28-5. Slot Wedge – R/C (QMFZ2/8) rated V-2, min. 105 °C.

28-6. Printed Wiring Board – R/C (ZPMV2/8), rated V-0, maximum temperature 105 °C.

28-7. Power wiring– R/C (AVLV2/8), rated minimum 16 AWG, 105 °C, 60 V. connecting to windings by twist and soldering method.

28-8. Signal Wiring - R/C (AVLV2/8), rated minimum 24 AWG, 105 °C, 60 V.

28-9. Motor Axle –One provided, made of Steel, measured 15.0 mm out diameter, M12*1.25 thread was provided on both sides.

28-10. White insulation sheet – R/C (QMFZ2/8), rated V-2 flame rating, min. 105 °C. Locate between PWB and windings.

28-11. Glue – R/C (QMFZ2/8), rated min. 105 °C, used to secure the PWB on the Insulation sheet.

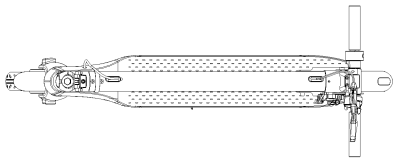
28-12. Motor Connector – R/C (ZMVV2/8), with heat-shrinkable tubing out of the connector, rated minimum 60 V, 20 A, 80 °C, and secured by cable ties or tube.

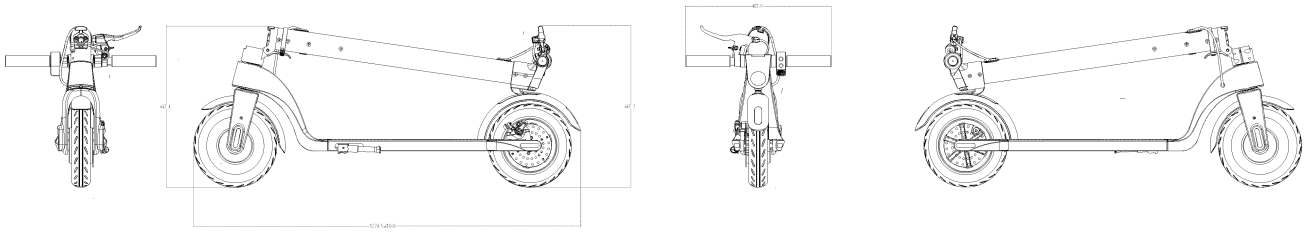
Cable ties – R/C (ZODZ2/8), min. 80°C.

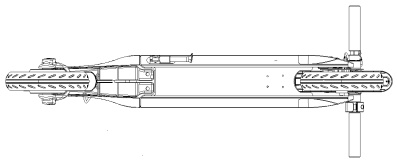
Tube – R/C (YDPU2/8), min. 80°C.

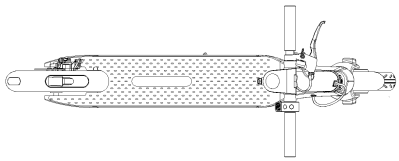
29. Control Circuitry and device on the main control board, type E5, fixed inside the cylinder, manufactured by Shenzhen Lianzhao Electronics Co., Ltd, See ILL. 23, Fig. 14, Fig. 15 for details. Each board consists of the following critical Components:

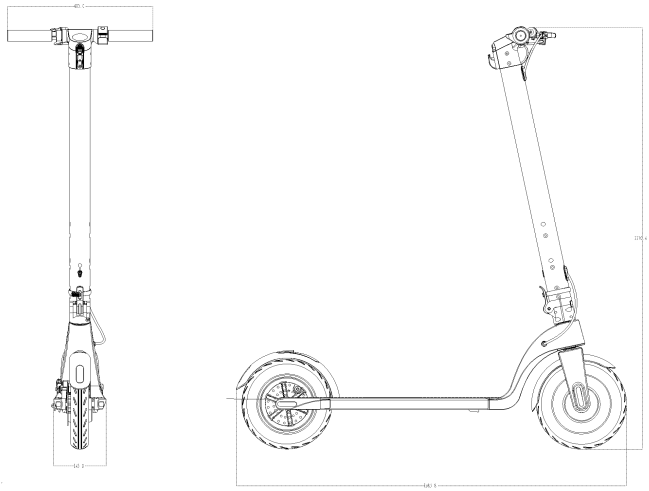
Scooter Model	Type of Protective Component	Identifier of Component	Component Manufacturer	Component File No.	Component Part No.	Component Ratings
X7	Control IC	U8	Xindingsheng	N/A	TX4139	4.5~75V
	Control IC	U10	ST	N/A	L78L05ABUTR	3.0~30V
	Control IC	U1, U3, U7	N/A	N/A	FD2103	Vcc= -0.3-25V
	Control IC	U2	N/A	N/A	MM32SPIN05PF	Vdd= 2.0-5.5V
	MOSFET for Motor Current Control	Q1, Q5, Q8, Q9, Q10, Q11	CR MICRO	N/A	CRST055N07N(SKD514T)	70V/120A
	Motor Current Sensing Resistor	R25	N/A	N/A	N/A	2 mΩ, 2 W

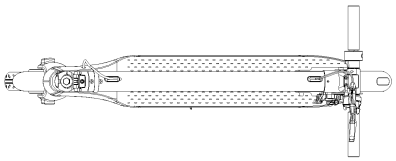


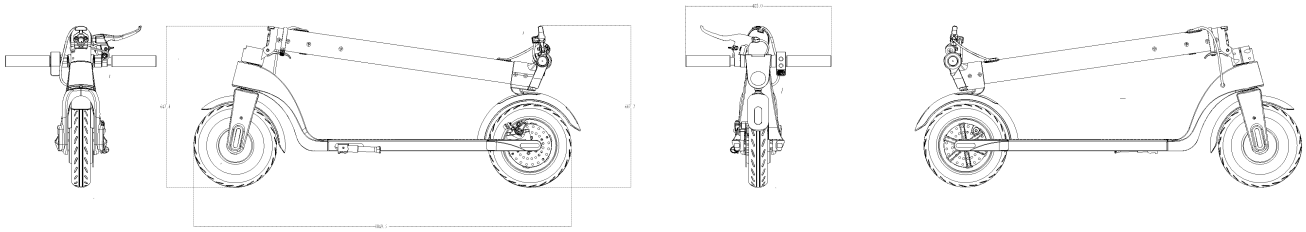


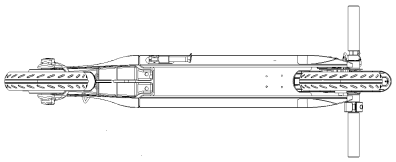


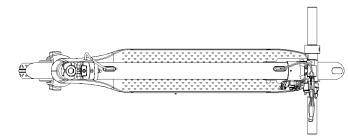


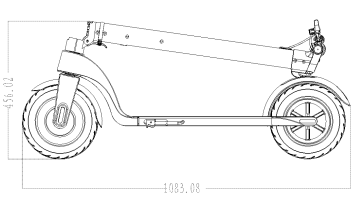








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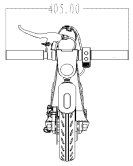
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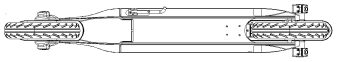
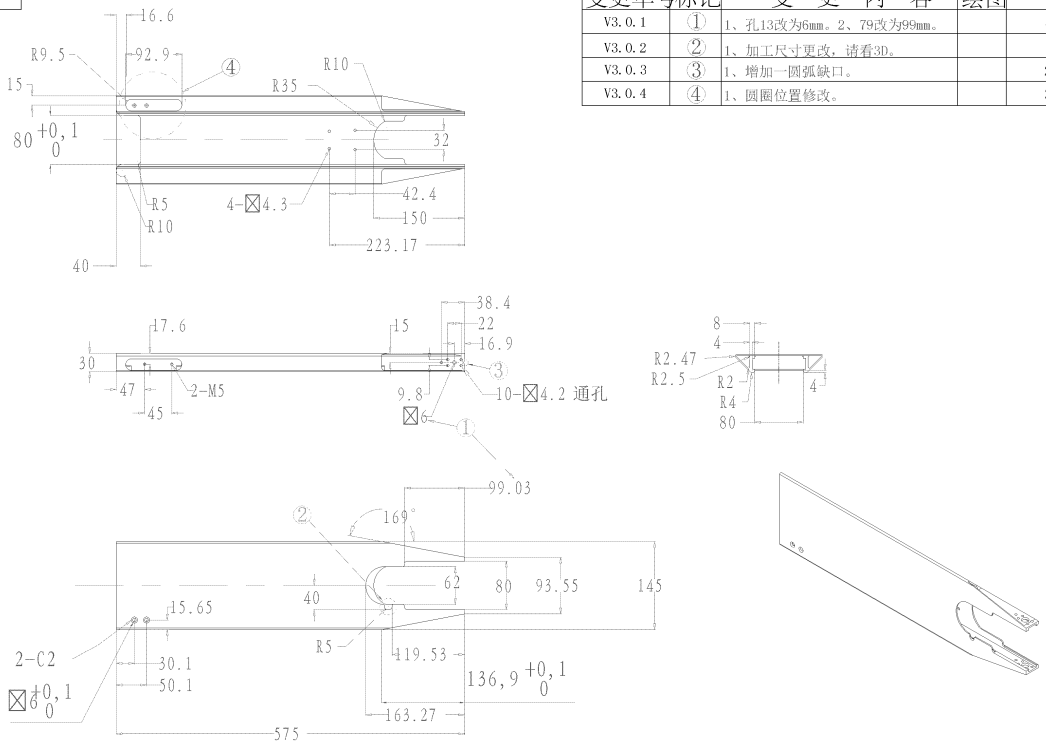


料　号

变更单号	标记	变　更　内　容	绘图	日期
V3.0.1	①	1、孔13改为6mm。2、79改为99mm。		20181005
V3.0.2	②	1、加工尺寸更改，请看3D。		20181030
V3.0.3	③	1、增加一圆弧缺口。		20181031
V3.0.4	④	1、圆圈位置修改。		20190814



注：标柱公差的尺寸为重点检验尺寸

技术要求

1. 材质：铝合金6061-T6;
2. 表面处理打磨喷粉;
3. 未注公差按GB/T1804-2000-M级;
4. 产品表面不可有，披风、刮伤和变形等缺陷;
5. 未注尺寸按照3D图纸尺寸;
6. 未注倒角为：C0.3;

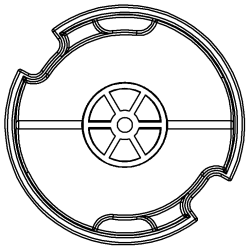
底图总号：

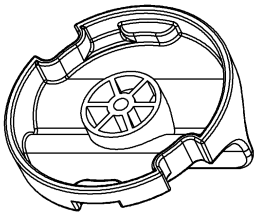
文件编号

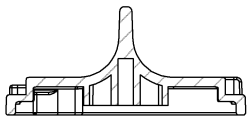
深圳市开心电子有限公司

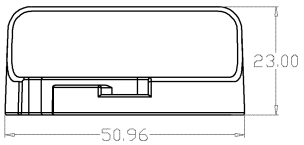
项目	X7	材 质	铝合金6061-T6	用量	1	图框尺寸	A4	
物料名称	X7踏板	制造工艺	型材+CNC	比例	1:8	制 图		
版本号	V3.0.4	表面处理	打磨喷粉	单位	mm	部 门	研发部	
日期	20190814	净 重	1161g	视图		审 核		

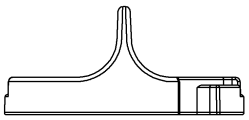
料　号



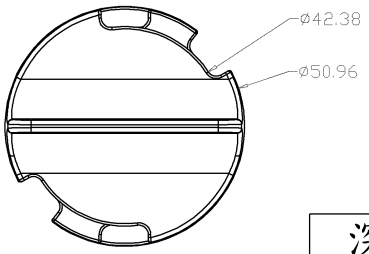








SECTION B-B



技术要求

1. 材质：塑胶PC;
2. 表面处理晒纹;
3. 未注公差按GB/T1804-2000-M级；
4. 所有尺寸均为表面处理后的尺寸；
5. 产品表面不可有，披风、刮伤和变形等缺陷；
6. 未注尺寸按照3D图纸尺寸；
7. 未注倒角为：C0.3;

深圳市开心电子有限公司

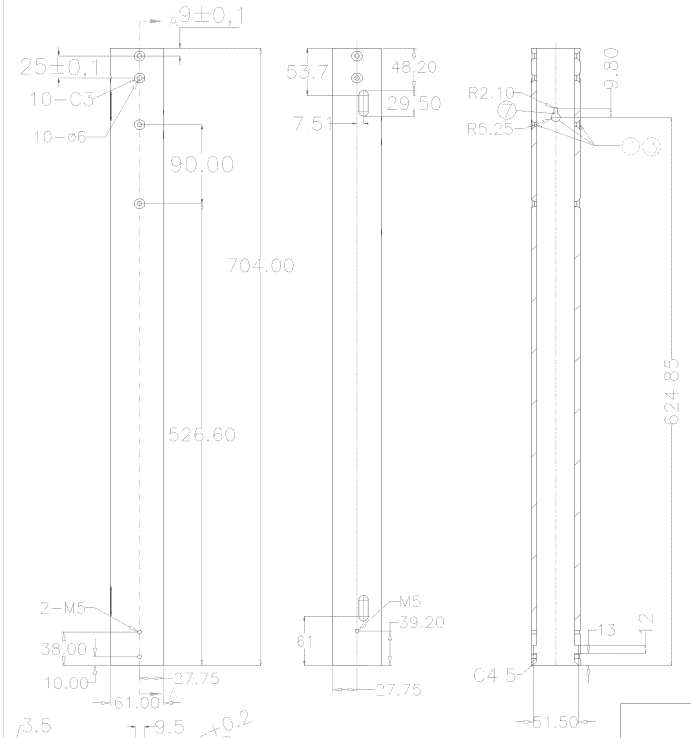
项目	X7	材 质	塑胶pc	用量	1	图框尺寸	A4
物料名称	X7电池固定盖	制造工艺		比例	1:1	制 图	
版本号	1.1.17	表面处理	表面晒纹	单位	mm	部 门	研发部
日期	20190407	净 重	9g	视图		审 核	

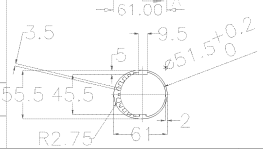
底图总号：

文件编号

料 号	

变更单号	标记	变 更 内 容	绘图		日期





注：标注公差的尺寸为重点检验尺寸

技术要求

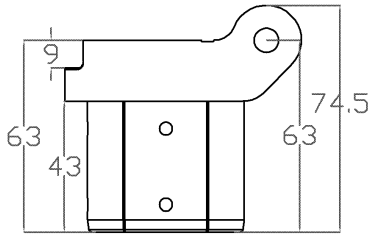
1. 材质：铝合金A6061-T6;
2. 表面处理打磨喷砂;
3. 未注公差按GB/T1804-2000-M级;
4. 所有尺寸均为表面处理后的尺寸;
5. 产品表面不可有，披风、刮伤和变形等缺陷;
6. 未注尺寸按照3D图纸尺寸;
7. 未注倒角为：C0.3;

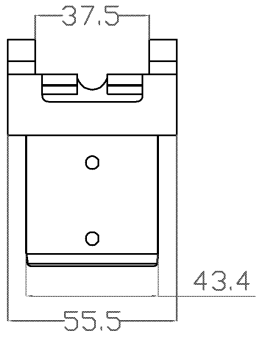
项目	X7	材 质	铝合金A6061-T6	用量	1	图纸尺寸	A4	
物料名称	X7-B支杆	制造工艺	型材+CNC	比例	1:5	制 图		
版本号	V4.0.1	表面处理	氧化喷砂	单位	mm	部 门	研发部	
日期	20200320	净 重	1069g	视图		审 核		

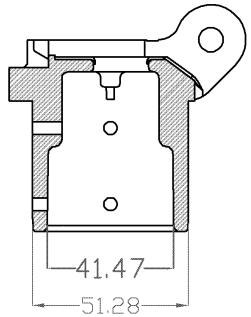
底图总号：

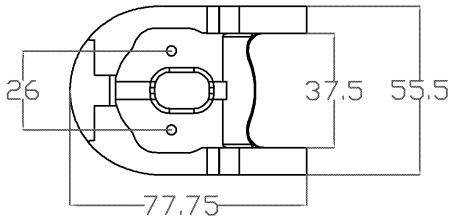
文件编号

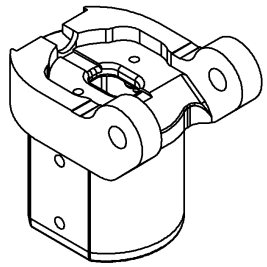
料　号











技术要求

1. 材质：A6061-T6;
2. 表面处理打磨喷80#砂氧化;
3. 未注公差按GB/T1804-2000-M级;
4. 所有尺寸均为表面处理后的尺寸;
5. 产品表面不可有，披风、刮伤和变形等缺陷;
6. 未注尺寸按照3D图纸尺寸;
7. 未注倒角为：C0.3;

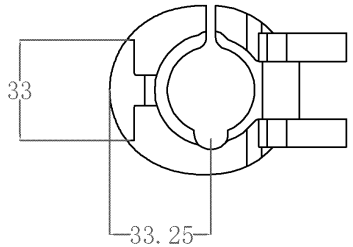
底图总号：

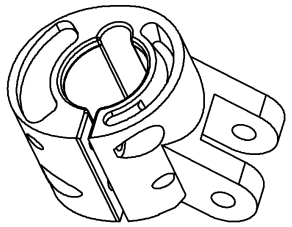
文件编号

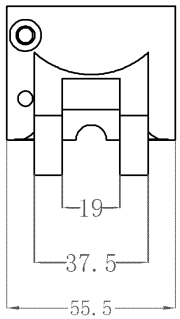
深圳市开心电子有限公司

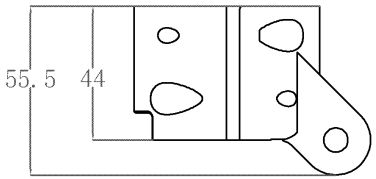
项目	X7	材 质	A6061-T6	用量	1	图框尺寸	A4
物料名称	x7折叠器头上	制造工艺	锻造+cnc	比例	1:2	制 图	
版本号	1.1.15	表面处理	喷80#砂氧化	单位	mm	部 门	研发部
日期	20190407	净 重	219g	视图		审 核	

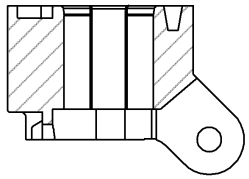
料　号	



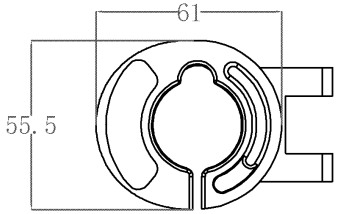








截面　A-A



技术要求

1. 材质：A6061-T6;
2. 表面处理打磨喷80#砂氧化;
3. 未注公差按GB/T1804-2000-M级;
4. 所有尺寸均为表面处理后的尺寸;
5. 产品表面不可有，披风、刮伤和变形等缺陷;
6. 未注尺寸按照3D图纸尺寸;
7. 未注倒角为：C0.3;

底图总号：

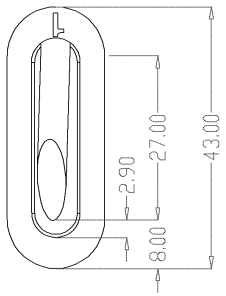
深圳市开心电子有限公司

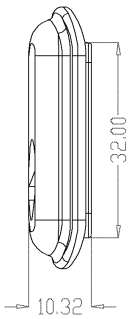
项目	X7	材 质	A6061-T6	用量	1	图框尺寸	A4	
物料名称	x7折叠器头下	制造工艺	锻造+cnc	比例	1:2	制 图		
版本号	1.1.16	表面处理	喷80#砂氧化	单位	mm	部 门	研发部	
日期	20190407	净 重	219g	视图		审 核		

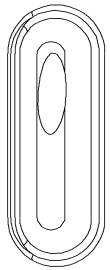
文件编号	

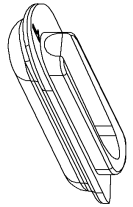
料　号	

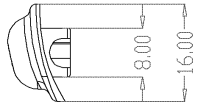
变更单号	标记	变　更　内　容	绘图		日期











技术要求

1.材质：70度硅胶;
2.表面处理晒纹;
3.未注公差按GB/T1804-2000-M级;
4.所有尺寸均为表面处理后的尺寸;
5.产品表面不可有披风，刮伤和变形等缺陷;
6.未标注尺寸按照3D图纸尺寸;
7.未注倒角为：C0.3;

底图总号:

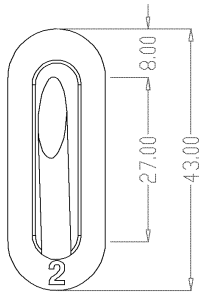
深圳市开心电子有限公司

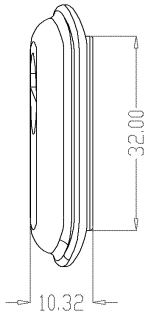
项目	X7	材 质	70度硅胶	用量	1	图框尺寸	A4	
物料名称	X7刹车线上硅胶	制造工艺		比例	1:1	制 图		
版本号	1.1.13	表面处理	表面晒纹	单位	mm	部 门	研发部	
日期	20190407	净 重	2g	视图		审 核		

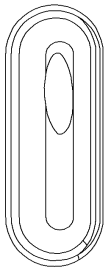
文件编号

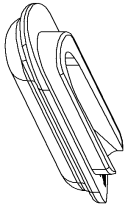
料　号	

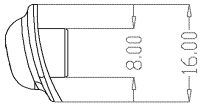
变更单号	标记	变　更　内　容	绘图		日期











技术要求

1.材质：70度硅胶;
2.表面处理晒纹;
3.未注公差按GB/T1804-2000-M级;
4.所有尺寸均为表面处理后的尺寸;
5.产品表面不可有披风，刮伤和变形等缺陷;
6.未标注尺寸按照3D图纸尺寸;
7.未注倒角为：C0.3;

底图总号:

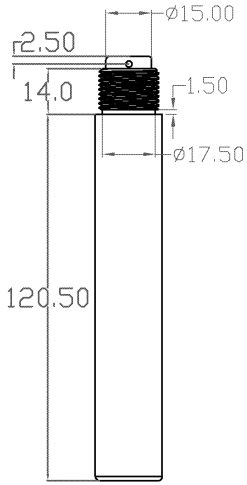
深圳市开心电子有限公司

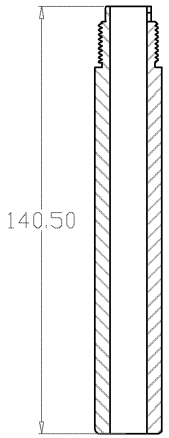
项目	X7	材 质	70度硅胶	用量	1	图框尺寸	A4	
物料名称	X7刹车线下硅胶	制造工艺		比例	1:1	制 图		
版本号	1.1.14	表面处理	表面晒纹	单位	mm	部 门	研发部	
日期	20190407	净 重	2g	视图		审 核		

文件编号

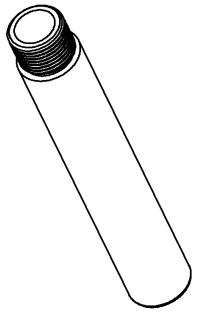
料　号	

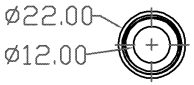
变更单号	标记	变　更　内　容	绘图		日期





截面　A-A





技术要求

1. 材质：铝合金6061-T6;
2. 表面处理打磨喷80#砂氧化;
3. 未注公差按GB/T1804-2000-M级；
4. 所有尺寸均为表面处理后的尺寸；
5. 产品表面不可有，披风、刮伤和变形等缺陷；
6. 未注尺寸按照3D图纸尺寸；
7. 未注倒角为：C0.3;

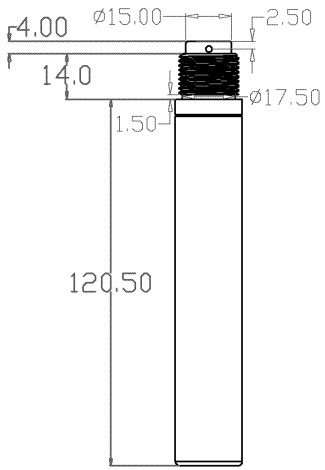
底图总号：

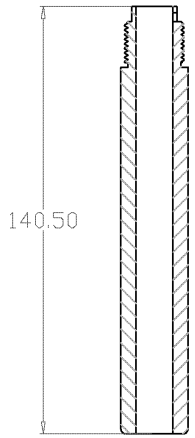
深圳市开心电子有限公司

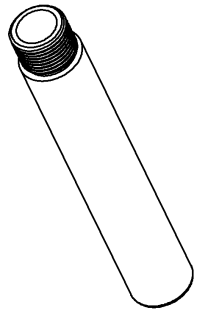
项目	X7	材 质	铝合金6061-T6	用量	1	图框尺寸	A4	
物料名称	X7握把左	制造工艺	型材+CNC	比例	1:2	制 图		
版本号	1.1.6	表面处理	喷80#砂氧化	单位	mm	部 门	研发部	
日期	20190407	净 重	78g	视图		审 核		

文件编号	

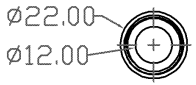
料　号







截面　A-A



技术要求

1. 材质：铝合金6061-T6;
2. 表面处理打磨喷80#砂氧化;
3. 未注公差按GB/T1804-2000-M级;
4. 所有尺寸均为表面处理后的尺寸;
5. 产品表面不可有，披风、刮伤和变形等缺陷;
6. 未注尺寸按照3D图纸尺寸;
7. 未注倒角为：C0.3;

底图总号：

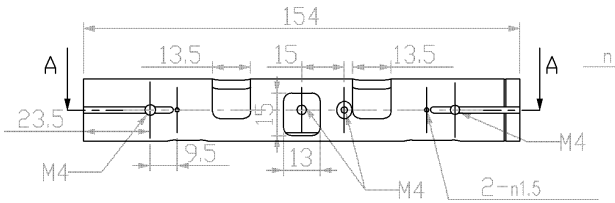
深圳市开心电子有限公司

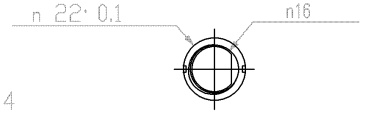
项目	X7	材 质	铝合金6061-T6	用量	1	图框尺寸	A4
物料名称	X7握把右	制造工艺	型材+CNC	比例	1:2	制 图	
版本号	1.1.7	表面处理	喷80#砂氧化	单位	mm	部 门	研发部
日期	20190407	净 重	78g	视图		审 核	

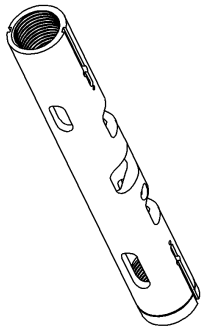
文件编号

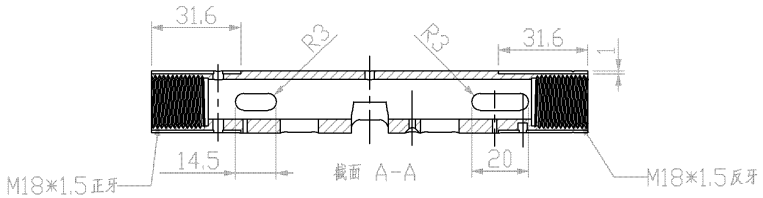
料 号	

变更单号	标记	变更内容	绘图		日期









技术要求

1.材质AL-6061;

2.表面处理:氧化黑色;

3.未注公差按GB/T1804-2000-M级;

4.产品表面不可有，披风、刮伤和变形等缺陷;

5.未注尺寸按照3D图纸尺寸;

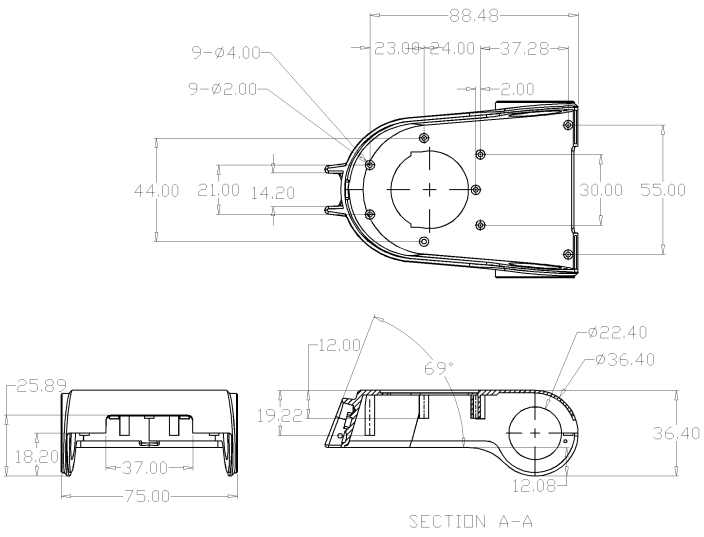
6.未注倒角为:C0.3。

深圳市开心电子有限公司							
项 目	X7	材 质	AL-6061	周 量	1	图纸尺寸	A4
物料名称	X7模型	制造工艺	型材+CNC	比 例	1:2	制 图	
版本号	V1.0.0	表面处理	喷80目砂氧化	单 位	mm	部 门	研发部
日 期	20200701	净 重		视 图		审 核	

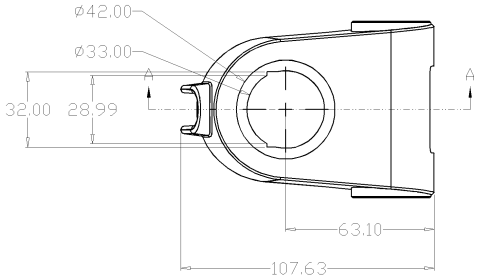
底图总号	
文件编号	

料　号	

变更单号	标记	变　更　内　容	绘图		日期



SECTION A-A



技术要求

1.材质：塑胶ABS;
2.表面处理晒纹;
3.未注公差按GB/T1804-2000-M级;
4所有尺寸均为表面处理后的尺寸;
5.产品表面不可有，披风、刮伤和变形等缺;
6.未注尺寸按照3D图纸尺寸;
7.未注倒角为：C0.3;

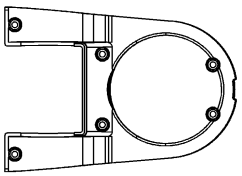
深圳市开心电子有限公司

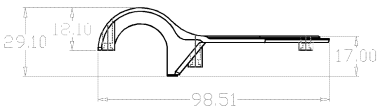
项目	X7	材 质	塑胶ABS	用量	1	图框尺寸	A4	
物料名称	X7仪表上盖	制造工艺		比例	1:2	制 图		
版本号	V3.0.0	表面处理	表面晒纹	单位	mm	部 门	研发部	
日期	20200717	净 重	24g	视图		审 核		

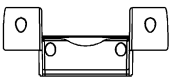
底图总号：

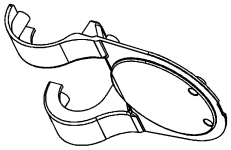
文件编号

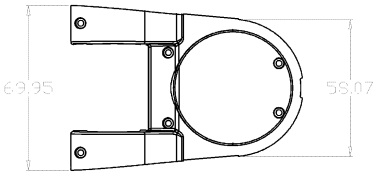
料　号











技术要求
1. 材质：塑胶ABS;
2. 表面处理哂纹;
3. 未注公差按GB/T1804-2000-M级；
4. 所有尺寸均为表面处理后的尺寸；
5. 产品表面不可有，披风、刮伤和变形等缺陷；
6. 未注尺寸按照3D图纸尺寸；
7. 未注倒角为：C0.3;

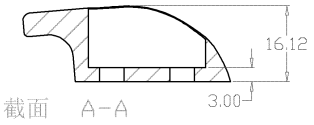
深圳市开心电子有限公司

项目	X7	材 质	塑胶ABS	用量	1	图框尺寸	A4	
物料名称	X7 仪表下盖	制造工艺		比例	1:2	制 图		
版本号	1.1.10	表面处理	表面哂纹	单位	mm	部 门	研发部	
日期	20190407	净 重	12g	视图		审 核		

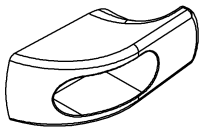
底图总号：

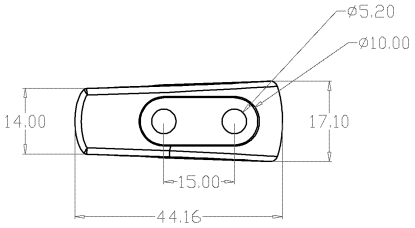
文件编号

料　号



截面　A-A





技术要求

1. 材质：塑胶PC;
2. 表面晒纹;
3. 未注公差按GB/T1804-2000-M级；
4. 所有尺寸均为表面处理后的尺寸；
5. 产品表面不可有，披风、刮伤和变形等缺陷；
6. 未注尺寸按照3D图纸尺寸；
7. 未注倒角为：C0.3;

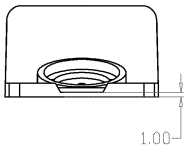
底图总号：

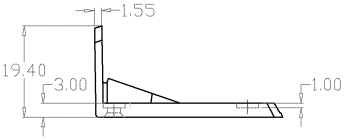
深圳市开心电子有限公司

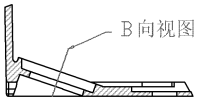
项目	X7	材 质	塑胶PC	用量	1	图框尺寸	A4
物料名称	X7挂钩	制造工艺		比例	1:1	制 图	
版本号	1.1.11	表面处理	表面晒纹	单位	mm	部 门	研发部
日期	20190407	净 重	5g	视图		审 核	

文件编号

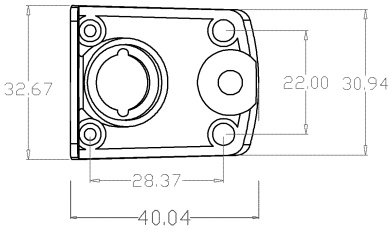
料　号

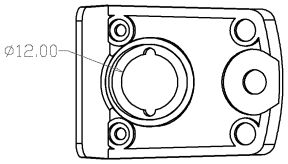






截面　A-A





B向视图

技术要求

1. 材质：塑胶ABS;
2. 表面处理晒纹;
3. 未注公差按GB/T1804-2000-M级；
4. 所有尺寸均为表面处理后的尺寸；
5. 产品表面不可有，披风、刮伤和变形等缺陷；
6. 未注尺寸按照3D图纸尺寸；
7. 未注倒角为：C0.3;

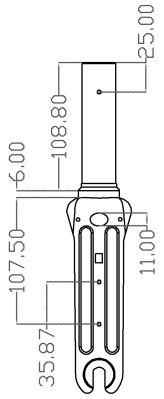
底图总号：

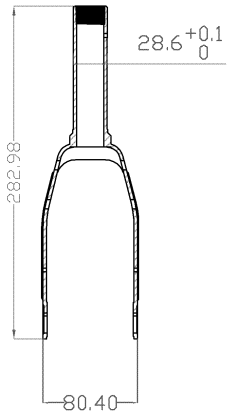
文件编号

深圳市开心电子有限公司

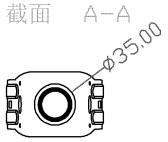
项目	X7	材 质	塑胶ABS	用量	1	图框尺寸	A4	
物料名称	X7灯架	制造工艺		比例	1:1	制 图		
版本号	1.1.12	表面处理	表面晒纹	单位	mm	部 门	研发部	
日期	20190407	净 重	3g	视图		审 核		

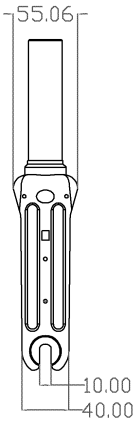
料　号

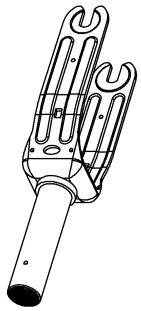




截面　A-A







技术要求

1. 材质：易削铁和Q235钢；
2. 未注公差按GB/T1804-2000-M级；
3. 产品表面不可有，披风、刮伤和变形等缺陷；
4. 未注尺寸按照3D图纸尺寸；
5. 所有尺寸均为表面处理后的尺寸；

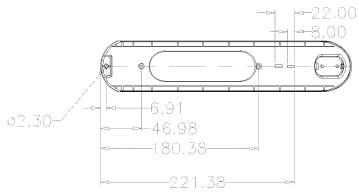
底图总号：

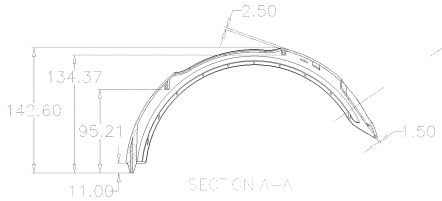
深圳市开心电子有限公司

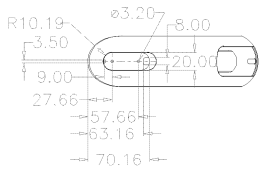
项目	X7	材 质	易削铁和Q235	用量	1	图框尺寸	A4
物料名称	X7前叉	制造工艺	冲压加焊接	比例	1:4	制 图	
版本号	1.1.8	表面处理	电咏	单位	mm	部 门	研发部
日期	20190407	净 重	609g	视图		审 核	

文件编号

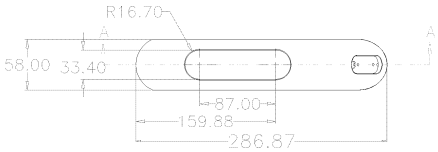
料 号								
变更单号	标记	变 更 内 容			绘图		日期







B向视图



技术要求

1. 材质：塑胶ABS;
2. 表面处理哑纹;
3. 未注公差按GB/T1804-2000-M级;
4. 所有尺寸均为表面处理后的尺寸;
5. 产品表面不可有，披风、刮伤和变形等缺陷;
6. 未注尺寸按照3D图纸尺寸;
7. 未注倒角为：C0.3;

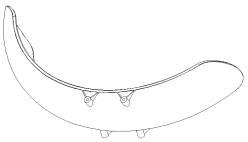
项目		材 质	塑胶ABS	用量	1	图纸尺寸	A4
物料名称	8.5寸后挡泥板	制造工艺		比例	1:5	制 图	
版本号	V3.0.0	表面处理	表面哑纹	单位	mm	部 门	研发部
日期	20181018	净 重	69g	视图		审 核	

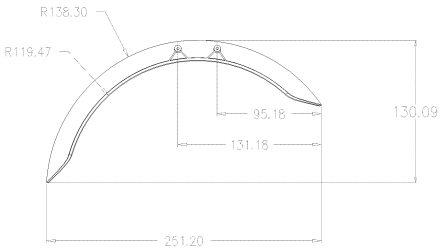
底图总号：

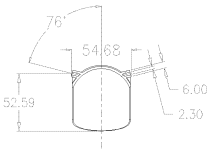
文件编号

料　号	

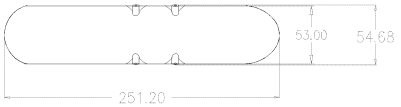
变更单号	标记	变 更 内 容	绘图		日期







截面　A—A



技术要求

1. 材质：塑胶ABS;
2. 表面处理磨纹;
3. 未注公差按GB/T1804—2000—M级；
4. 所有尺寸均为表面处理后的尺寸；
5. 产品表面不可有，披风、刮伤和变形等缺陷；
6. 未注尺寸按照3D图纸尺寸；
7. 未注倒角为：C0.3;

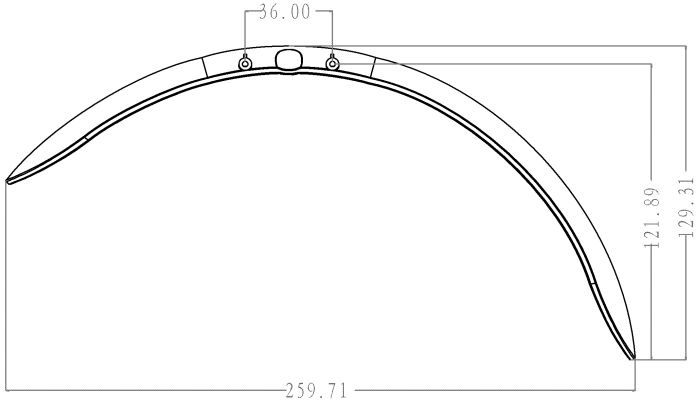
项目		材 质	塑胶ABS	用量	1	图纸尺寸	A4	
物料名称	8.5寸前挡泥板	制造工艺		比例	1:4	制 图		
版本号	V3.0.0	表面处理	表面磨纹	单位	mm	部 门	研发部	
日期	20181018	净 重	44g	视图		审 核		

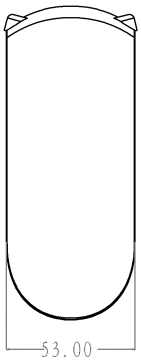
底图总号：

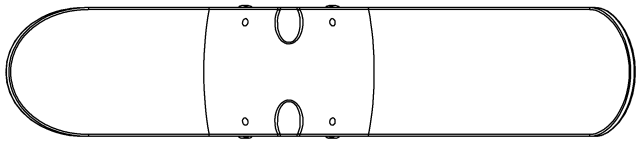
文件编号

料　号	

变更单号	标记	变　更　内　容	绘图		日期







技术要求
1. 材质：AL 6061-T6
2. 未注公差按GB/T1804-2000-M级；
3. 产品表面不可有，披风、刮伤和变形等缺陷；
4. 未注尺寸按照3D图纸尺寸；

深圳市开心电子有限公司

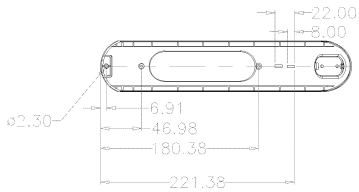
项目		材 质	AL 6061-T6	用量	1	图框尺寸	A4	
物料名称	10寸前档泥板	制造工艺	剂型材	比例	1:2	制 图		
版本号	V1.0.0	表面处理	氧化	单位	mm	部 门	研发部	
日期	20200624	净 重	92g	视图		审 核		

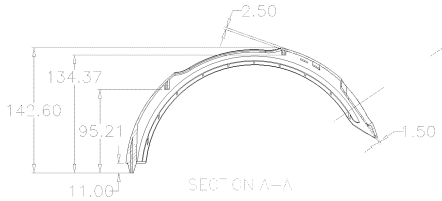
底图总号：

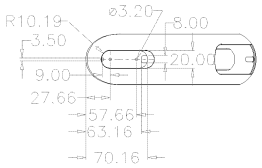
注：带“★”的尺寸为重点检验尺寸

文件编号

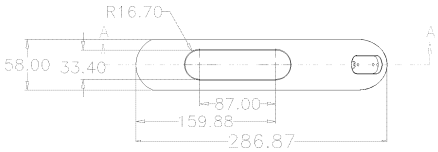
标 号		变更单号	标记	变 更 内 容	绘图		日期







B向视图



技术要求

1. 材质：塑胶ABS;
2. 表面处理哑纹;
3. 未注公差按GB/T1804-2000-M级;
4. 所有尺寸均为表面处理后的尺寸;
5. 产品表面不可有，披风、刮伤和变形等缺陷;
6. 未注尺寸按照3D图纸尺寸;
7. 未注倒角为：C0.3;

项目		材 质	塑胶ABS	用量	1	图纸尺寸	A4	
物料名称	10寸后挡泥板	制造工艺		比例	1:5	制 图		
版本号	V3.0.0	表面处理	表面哑纹	单位	mm	部 门	研发部	
日期	20181018	净 重	69g	视图		审 核		

底图总号：

文件编号

万博机电
WANBO ELECTROMECHANICAL

版本号：WB-202005-007-350W

台州万博机电科技有限公司

Taizhou Wanbo mechanical and Electrical Technology Co. , Ltd.

产品规格书

Product specification

编制：

审核：

批准：

日期：

产品名称：滑 板 车 轮 毂 电 机

Product name: Wheel hub motor for scooters

规格型号：8.5 寸电子刹电机

Motor size: 8.5-inch electronic brake motor

电机型号：105-36V-350W

Motor version: 105-36V-350W

万博机电
WANBO ELECTROMECHANICAL

版本号：WB-202005-007-350W

关键零部件清单

序号 /NO.	零部件名称 /Item Name	是否必须 UL 认证 (Y/N)	厂家 /Manufacture	型号名称 /Model	UL 标准及要求	技术参数示例 /Technical data exsample	UL 档案号 /UL file number
1	转子/Rotor	N		10 寸连体轮毂		内径 112mm	
2	定子/Stator	N				外径 105mm, 高度 30mm	
3	电机前盖 /Front Motor Enclosure	N				铝压铸	
4	漆包线/Motor Winding	Y	浙江湖州洪波	QZ-X/155	ANSI TYPE: MW 5-C		E221719
5	绝缘套管 /Insulation tube	Y	深圳市沃尔核材股份有限公司	RSFR-HT	VW-1	600V, 150° C	E316016
7	印刷线路板 /PCB	Y	亨新电子工业有限公司	235723		12 135C	E131242
8	槽楔/Slot wedge	Y	常州华腾	PA66-B	UL94	V-0	E212271
9	电机轴/Axle	N				40Cr, 16mm OD	
10	扎带/CABLE TIE	Y	浙江红星电业	11	UL 62275	rated min 85° C	E228500
11	电机相线引出端/power wires	Y	台州飞达			rated minimum 250 V, 5.5 A, 85° C	E492380
12	信号连接器外壳/hall wires connector	Y		DU-105		V-2, 80° C	E228500

1.1 电机性能参数/Motor performance parameter

Detailed parameters are listed as follows:

序号	项目	Projects	规格	备注
1	磁钢极数	Number of poles	15 对极	30PCS
2	磁钢规格	Size of magnetic steel	30x11.2x3mm	
3	漆包线规格	Size of enamelled wire	Ø0.51 铜线	
4	铁芯规格	Size of stator core	105-30H	
5	定子槽数	Number of solts	27	
6	霍尔角度	Degree of phases	120°	
7	额定电压	Rated voltage	36V	
8	额定电流	Rated current	10±1A	
9	额定转速	Rated rotating speed	650±20rpm	
10	额定功率	Rated power	350W	
11	最大扭矩	Max torque	限流 17A ≥15Nm	
12	空载电流	No-load current	≤1.2A	
13	相线电阻	Stater resistance	185±10MΩ	
14	三相电阻平衡度	Resistance balance degree of three phases	≤3%	
15	最大效率点	Max efficiency point	≥82%	
16	引线规格	Size of lead wire	$3x1.5^2+5x0.2^2$	
17	端子规格	Size of connectors	子弹头/51005 小排插	
18	耐压	Withstand voltage degree	0.85KV ≤10mA	
19	绝缘	Insulation degree	≥200MΩ	
20	电机绕组	Coil winding	7（根）x9（圈）	
21	纤维管	Insulation tube	Φ4mm 长 30mm	
22	温控开关	Temperature control switch	125℃	
23	轮胎	Tires	10*2.125 充气胎	
24	轴	Axles	100-66	总长 100；开档 66 不含垫片

1.2 8.5 寸滑板车电机生产日期的编码规则：

Coding Rules for Motor Production Date of 8.5 - inch Scooter Car

例/Example：**WB36V30HA2005XXXXX**

WB — 厂家代码 Code of manufacturer

36V — 电机电压 Voltage

30HA — 磁钢代码 Magnet Code

20 — 生产年份 Year of manufacture

05 — 生产月份 Month of manufacture

XXXXX— 流水号 Serial number

万博机电
WANBO ELECTROMECHANICAL

版本号：WB-202005-007-350W

产品说明书
Product manual

一、产品介绍/Introduction

1）产品名称：电动车用永磁直流无刷电动机、减速差速电动机。

Production name: Electric permanent magnet brush-less DC motor, differential motor used by electric vehicles.

2）产品用途：用作滑板车驱动电机（轮毂电动机和减速差速电动机）。

Product use: Used as scooter driving motor (hub motor and deceleration differential motor)

3）绝缘等级：B 级。

Insulation class: Class B

4）防护等级：IP54。

Protection grade: IP54

5）电气原理：

Electrical principle:

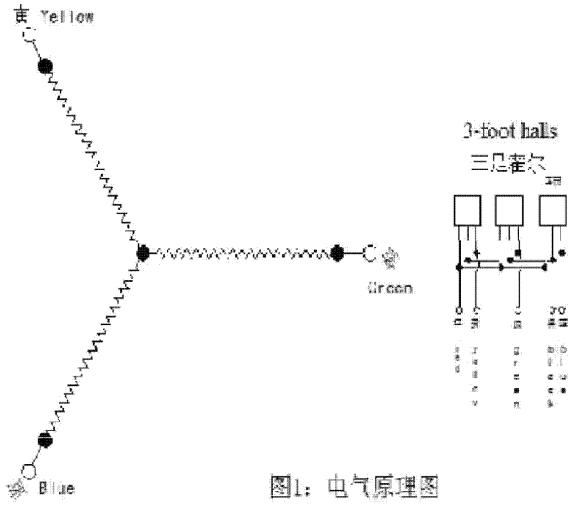


图1：电气原理图

The Electrical Principle Diagram

Notice:

1、引出线颜色由客户确定，以保持与控制器一致；

The color of leading wires are determined by customer, make sure to keep same with that on controller.

2、电动机（外）转子为永磁体，与轮毂一体。

Motor rotor(outside) is permanent magnet, combining with wheel hub as a whole.

3、电源线三根与绕组相连接，一般采用 1.0-4.0mm²高温线，霍尔元件上的信号线则采用 0.2-0.3mm² 高温线。

Three power wires are connected with winding and regularly using 1.0-4.0mm² high temperature wire. The signal line on halls are connected by 0.2-0.3mm² high temperature wire.

4、原理图中"●"为内部节点，由制造工厂完成接线，"○"为外部节点，由顾客完成接线。

In the electrical principle diagram, the marks "●" are internal nodes which are connected by manufacturer, the marks "○" are external nodes which should be connected by customers.

5、本产品适用的电源为：24VDC~60VDC 电动车用专用电池或锂电池。

The application voltage for this product is 24VDC-60VDC(specific battery for electric vehicles).

二、安装须知

Installation instructions

1）按照控制器上接线图，将电动机与控制器、电源（电动车用专用电池）连接。

According to Wire-Connection diagram on the controller, connect motor with controller and power(specific battery for electric vehicles).

2）外转子轮毂外安装轮胎。

Install tire on the outside of rotor hub.

3）电源线穿过金属件，应用非金属制品进行保护。

Power wires pass through metal parts, so these wires should be protected by nonmetal parts.

三、常见故障与排除

Common faults & removal

1）时转时不转：电源线未安装牢固——重新接线；

Sometimes work and sometimes not work: power wires were not installed tightly —— install again.

2）异声：霍尔元件坏——更换。

Abnormal sound: Hall broken —— change halls.

公司名称：台州万博机电科技有限公司
Company name: Taizhou Wanbo mechanical and Electrical Technology Co. , Ltd.
公司地址：浙江省台州市路桥区螺洋街道岙王工业区
Company address: Ao Wang Industrial Zone, Luyang Street, Luqiao District, Taizhou, Zhejiang Province

万博机电
WANBO ELECTROMECHANICAL

版本号：WB-202005-006-350W

台州万博机电科技有限公司

Taizhou Wanbo mechanical and Electrical Technology Co. , Ltd.

产品规格书

Product specification

编制：

审核：

批准：

日期：

产品名称：滑 板 车 轮 毂 电 机

Product name: Wheel hub motor for scooters

规格型号：10 寸电子刹电机

Motor size: 10-inch electronic brake motor

电机型号：105-36V-350W

Motor version: 105-36V-350W

万博机电
WANBO ELECTROMECHANICAL

版本号：WB-202005-006-350W

关键零部件清单

序号 /NO.	零部件名称 /Item Name	是否必须 UL 认证 (Y/N)	厂家 /Manufacture	型号名称 /Model	UL 标准及要求	技术参数示例 /Technical data exsample	UL 档案号 /UL file number
1	转子/Rotor	N		10 寸连体轮毂		内径 112mm	
2	定子/Stator	N				外径 105mm, 高度 30mm	
3	电机前盖 /Front Motor Enclosure	N				铝压铸	
4	漆包线/Motor Winding	Y	浙江湖州洪波	QZ-X/155	ANSI TYPE: MW 5-C		E221719
5	绝缘套管 /Insulation tube	Y	深圳市沃尔核材股份有限公司	RSFR-HT	VW-1	600V, 150° C	E316016
7	印刷线路板 /PCB	Y	亨新电子工业有限公司	235723		12 135C	E131242
8	槽楔/Slot wedge	Y	常州华腾	PA66-B	UL94	V-0	E212271
9	电机轴/Axle	N				40Cr, 16mm OD	
10	扎带/CABLE TIE	Y	浙江红星电业	11	UL 62275	rated min 85° C	E228500
11	电机相线引出端/power wires	Y	台州飞达			rated minimum 250 V, 5.5 A, 85° C	E492380
12	信号连接器外壳/hall wires connector	Y		DU-105		V-2, 80° C	E228500

1.1 电机性能参数/Motor performance parameter

Detailed parameters are listed as follows:

序号	项目	Projects	规格	备注
1	磁钢极数	Number of poles	15 对极	30PCS
2	磁钢规格	Size of magnetic steel	30x11.2x3mm	
3	漆包线规格	Size of enamelled wire	Ø0.51 铜线	
4	铁芯规格	Size of stator core	105-30H	
5	定子槽数	Number of solts	27	
6	霍尔角度	Degree of phases	120°	
7	额定电压	Rated voltage	36V	
8	额定电流	Rated current	10±1A	
9	额定转速	Rated rotating speed	530±20rpm	
10	额定功率	Rated power	350W	
11	最大扭矩	Max torque	限流 17A ≥16Nm	
12	空载电流	No-load current	≤1.2A	
13	相线电阻	Stater resistance	135±10MΩ	
14	三相电阻平衡度	Resistance balance degree of three phases	≤3%	
15	最大效率点	Max efficiency point	≥82%	
16	引线规格	Size of lead wire	$3x1.2^2+5x0.2^2$	
17	端子规格	Size of connectors	子弹头/51005 小排插	
18	耐压	Withstand voltage degree	0.85KV ≤10mA	
19	绝缘	Insulation degree	≥200MΩ	
20	电机绕组	Coil winding	6（根）x10（圈）	
21	纤维管	Insulation tube	Φ4mm 长 30mm	
22	轮胎	Tires	10*2.125 充气胎	
23	轴	Axles	108-68	总长 108；开档 68 不含垫片

1.2 10 寸滑板车电机生产日期的编码规则：

Coding Rules for Motor Production Date of 10 - inch Scooter Car

例/Example：**WB36V30HA2004XXXXX**

WB — 厂家代码 Code of manufacturer

36V — 电机电压 Voltage

30HA — 磁钢代码 Magnet Code

20 — 生产年份 Year of manufacture

04 — 生产月份 Month of manufacture

XXXXX— 流水号 Serial number

万博机电
WANBO ELECTROMECHANICAL

版本号：WB-202005-006-350W

产品说明书
Product manual

一、产品介绍/Introduction

1）产品名称：电动车用永磁直流无刷电动机、减速差速电动机。

Production name: Electric permanent magnet brush-less DC motor, differential motor used by electric vehicles.

2）产品用途：用作滑板车驱动电机（轮毂电动机和减速差速电动机）。

Product use: Used as scooter driving motor (hub motor and deceleration differential motor)

3）绝缘等级：B 级。

Insulation class: Class B

4）防护等级：IP54。

Protection grade: IP54

5）电气原理：

Electrical principle:

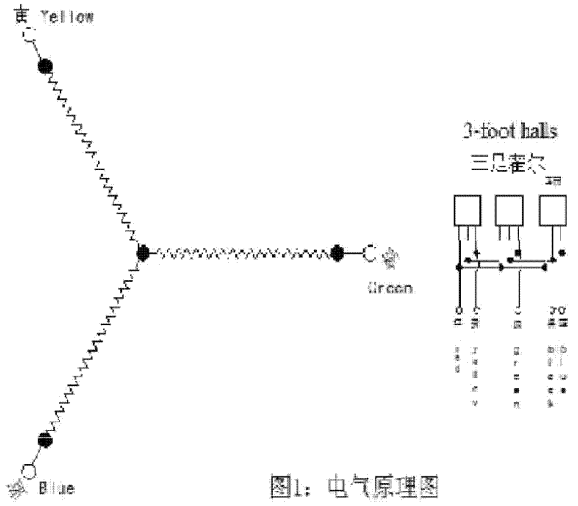


图1：电气原理图

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2、电动机（外）转子为永磁体，与轮毂一体。

Motor rotor(outside) is permanent magnet, combining with wheel hub as a whole.

3、电源线三根与绕组相连接，一般采用 1.0-4.0mm²高温线，霍尔元件上的信号线则采用 0.2-0.3mm² 高温线。

Three power wires are connected with winding and regularly using 1.0-4.0mm² high temperature wire. The signal line on halls are connected by 0.2-0.3mm² high temperature wire.

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二、安装须知

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Install tire on the outside of rotor hub.

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Common faults & removal

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Abnormal sound: Hall broken —— change halls.

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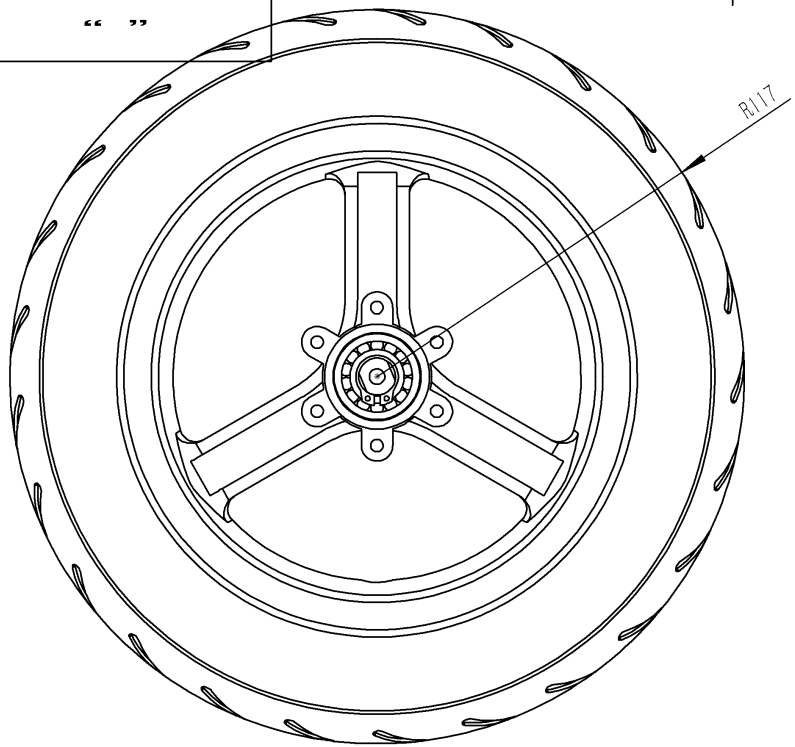

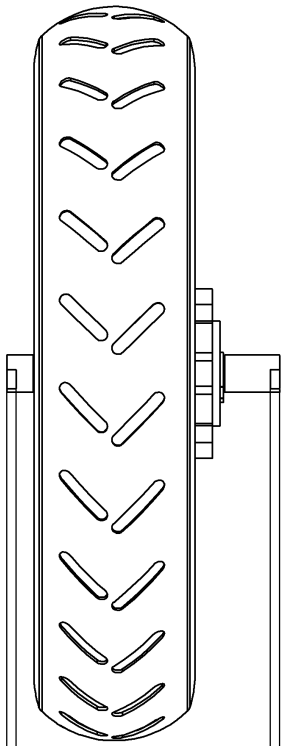

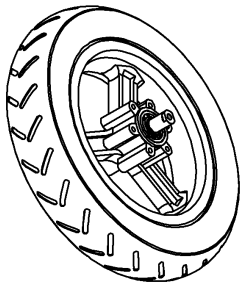

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					20.04.08			
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主管设计			审核					
			批准			共1 张 第1 张	版本	替代

10寸开心辅助轮

“图样代号”

零件代号

借(通)用件登记

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底 图 总 号

签 字

日 期

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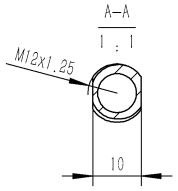

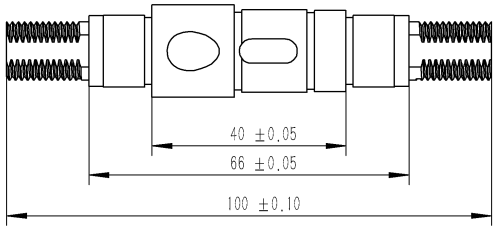

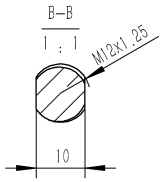

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主管设计			审核						
			批准			共1 张 第1 张	版本		替代

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借(通)用件登记
旧底图总号
底 图 总 号
签 字
日 期

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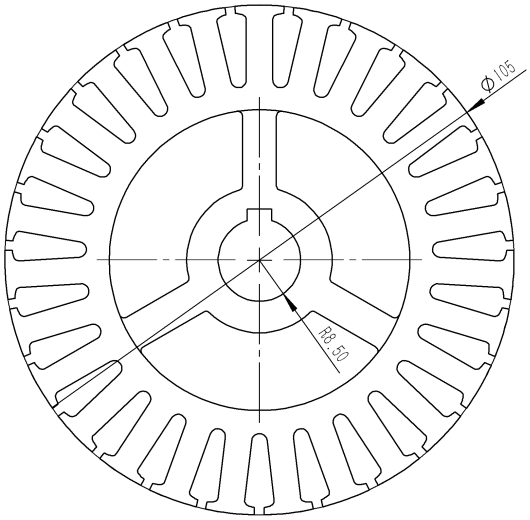

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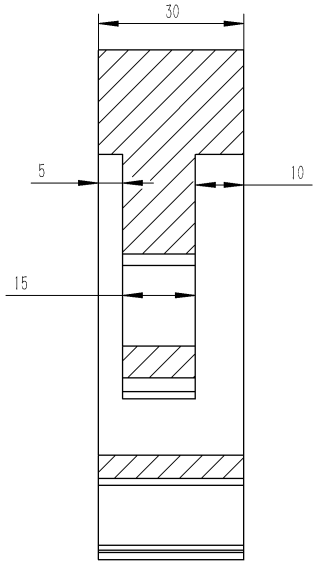

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主管设计			审核						
			批准			共1 张 第1 张	版本		替代

零件代号

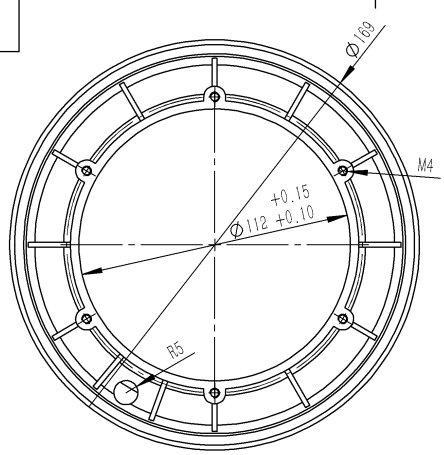
借(通)用件登记

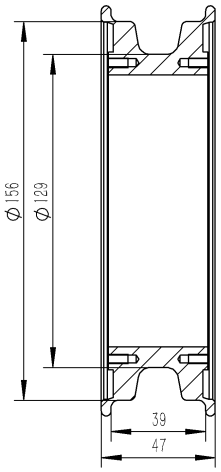
旧底图总号

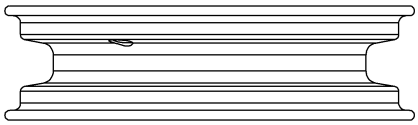
底 图 总 号

签 字

日 期







1 : 2

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校核			工艺					
主管设计			审核					“图样代号”
			批准			共1张 第1张	版本	替代

零件代号

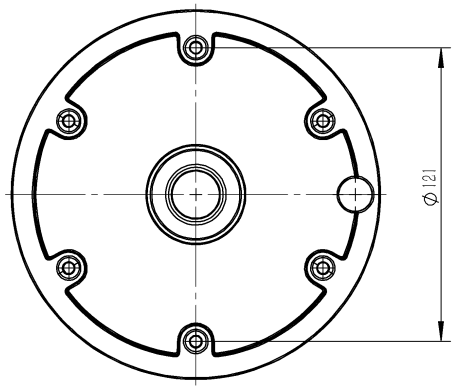
借(通)用件登记

旧底图总号

底图总号

签字

日期



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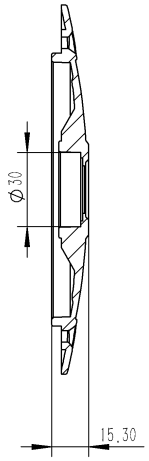

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设计			标准化					1:5
校核			工艺					
主管设计			审核					
			批准			共 张 第 张	版本	替代

零件代号

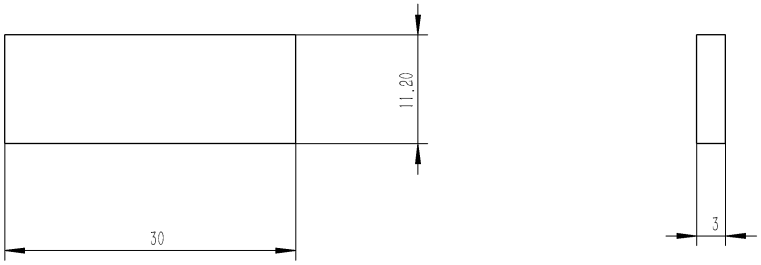
借(通)用件登记

旧底图总号

底 图 总 号

签 字

日 期



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校核			工艺					
主管设计			审核					
			批准			共1 张 第1 张	版本	

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	“图样代号”
	替代

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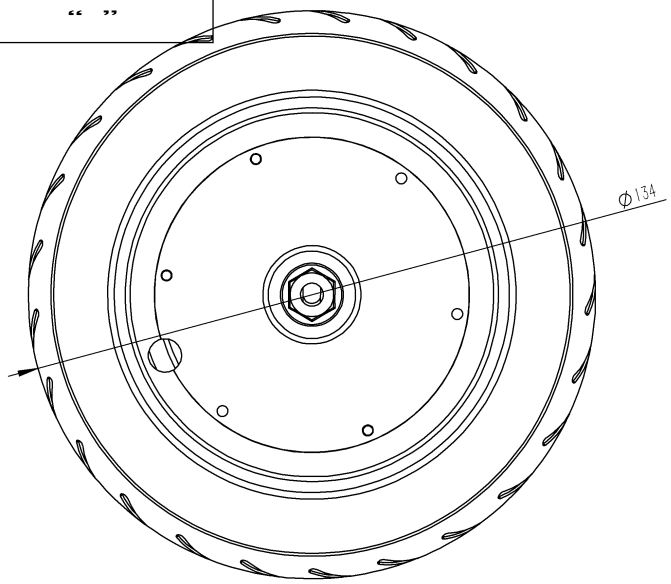
借(通)用件登记

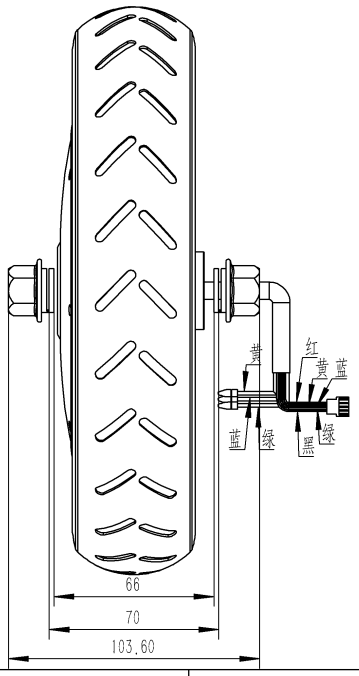
旧底图总号

底 图 总 号

签 字

日 期





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校核			工艺				开心8.5寸电机
主管设计			审核				“图样代号”
			批准			共1张 第1张	版本 替代

零件代号
借(通)用件登记
旧底图总号
底 图 总 号
签 字
日 期

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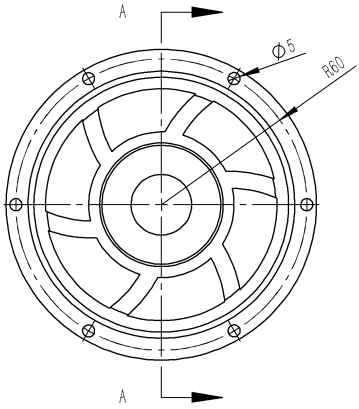

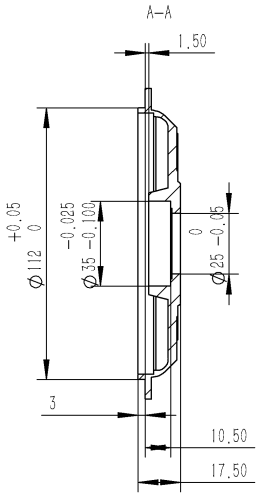

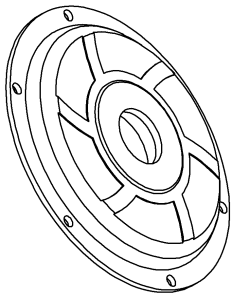

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校核			工艺						
主管设计			审核						
			批准			共1张 第1张		版本	

“图样名称”

“图样代号”

替代

零件代号

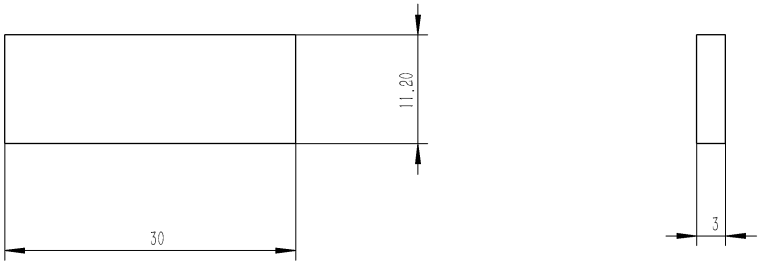
借(通)用件登记

旧底图总号

底图总号

签字

日期



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设计			标准化				0.001	2:1
校核			工艺					
主管设计			审核					
			批准			共1 张 第1 张	版本	

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	替代

零件代号

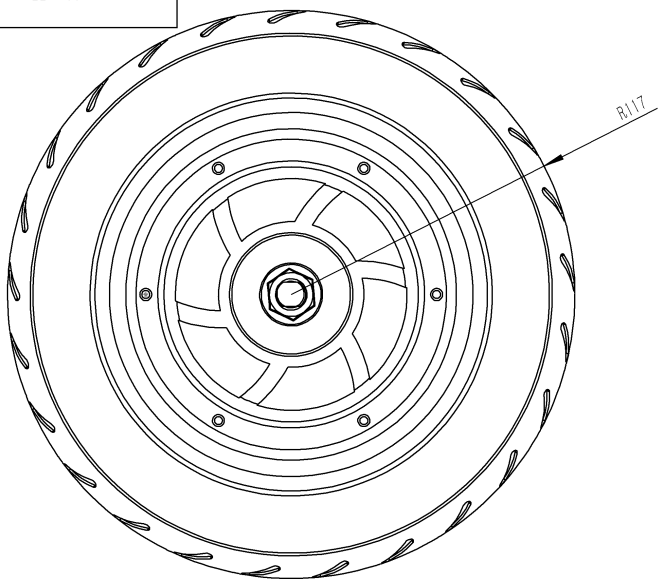
借(通)用件登记

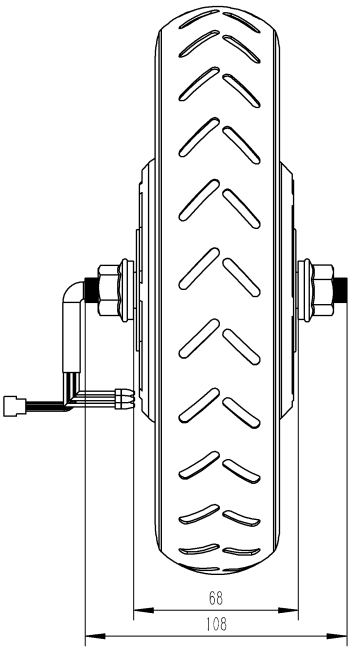
旧底图总号

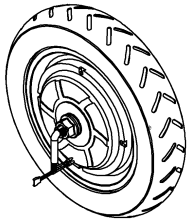
底 图 总 号

签 字

日 期







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校核			工艺					
主管设计			审核					
			批准			共1 张 第1 张	版本	

开心10寸

“图样代号”

替代

零件代号

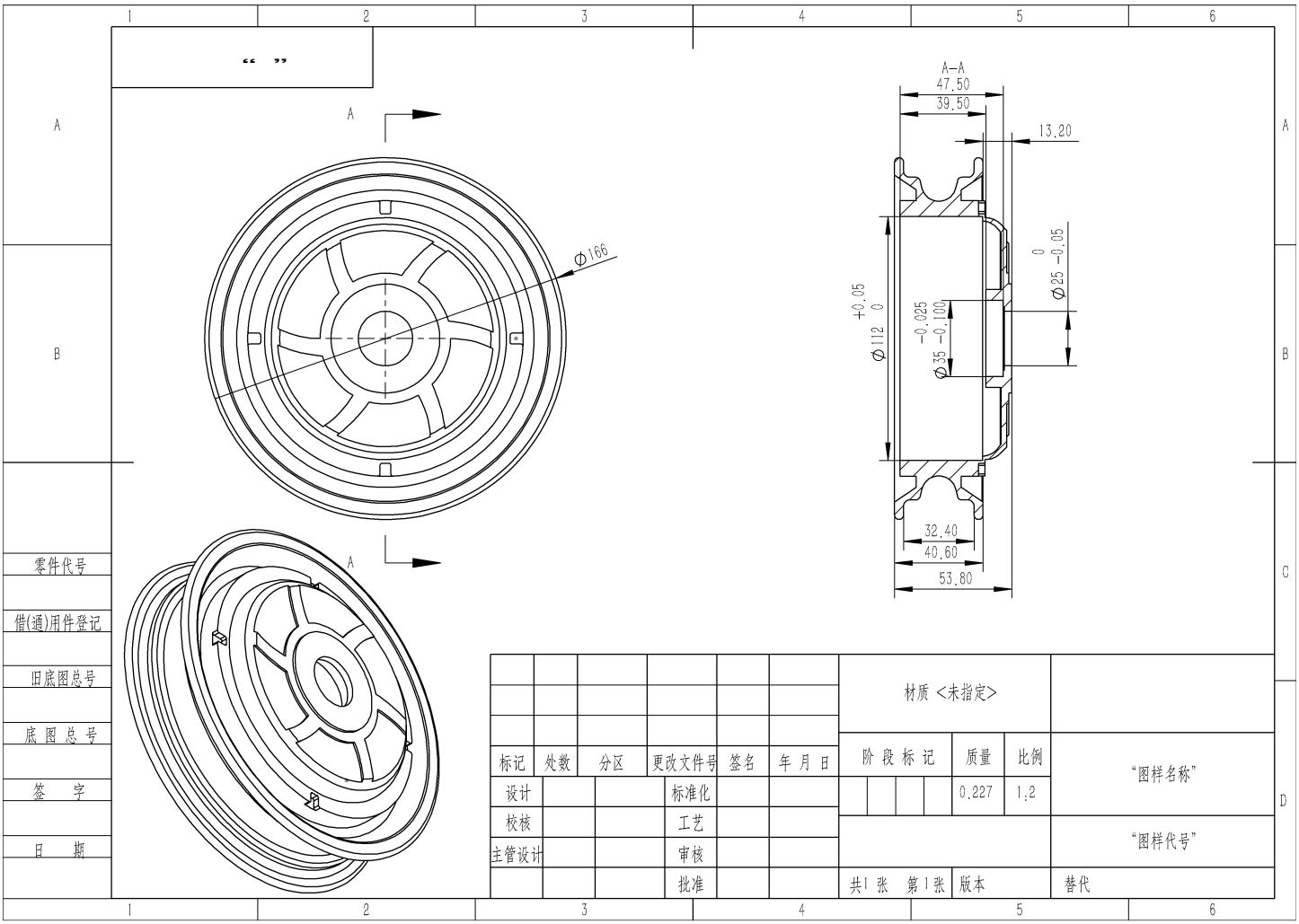
借(通)用件登记

旧底图总号

底 图 总 号

签 字

日 期



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校核			工艺						“图样代号”
主管设计			审核						
			批准			共1张 第1张	版本		替代

零件代号

借(通)用件登记

旧底图总号

底图总号

签字

日期

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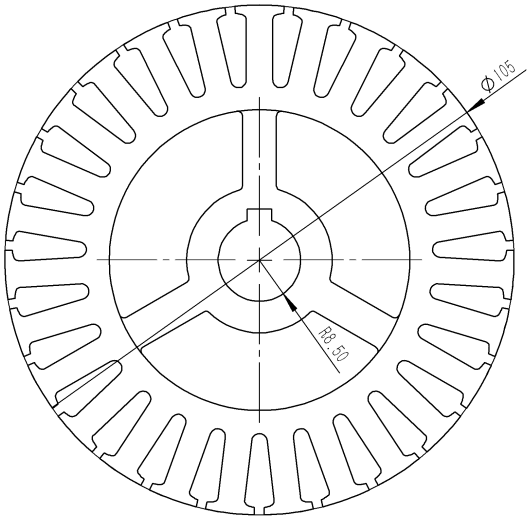

A–A
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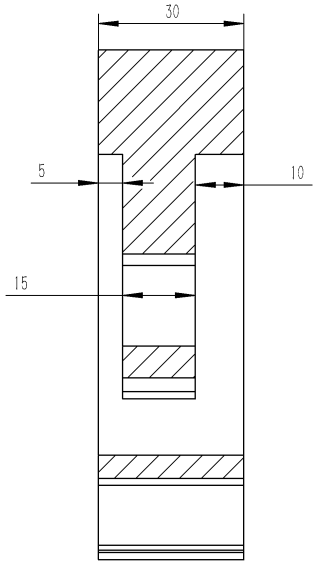

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校核			工艺						“图样代号”
主管设计			审核						
			批准			共1 张 第1 张	版本		替代

零件代号

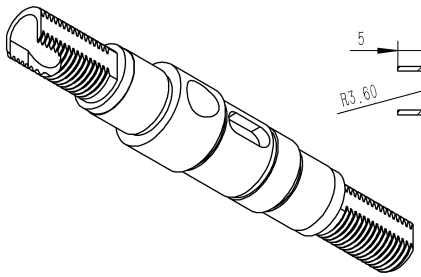
借(通)用件登记

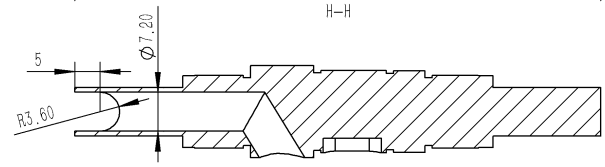
旧底图总号

底 图 总 号

签 字

日 期





						40cr		万搏机电
					20.03.22			
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校核			工艺			108–64–36		
主管设计			审核			“图样代号”		
			批准			共1 张 第1 张	版本	替代

零件代号

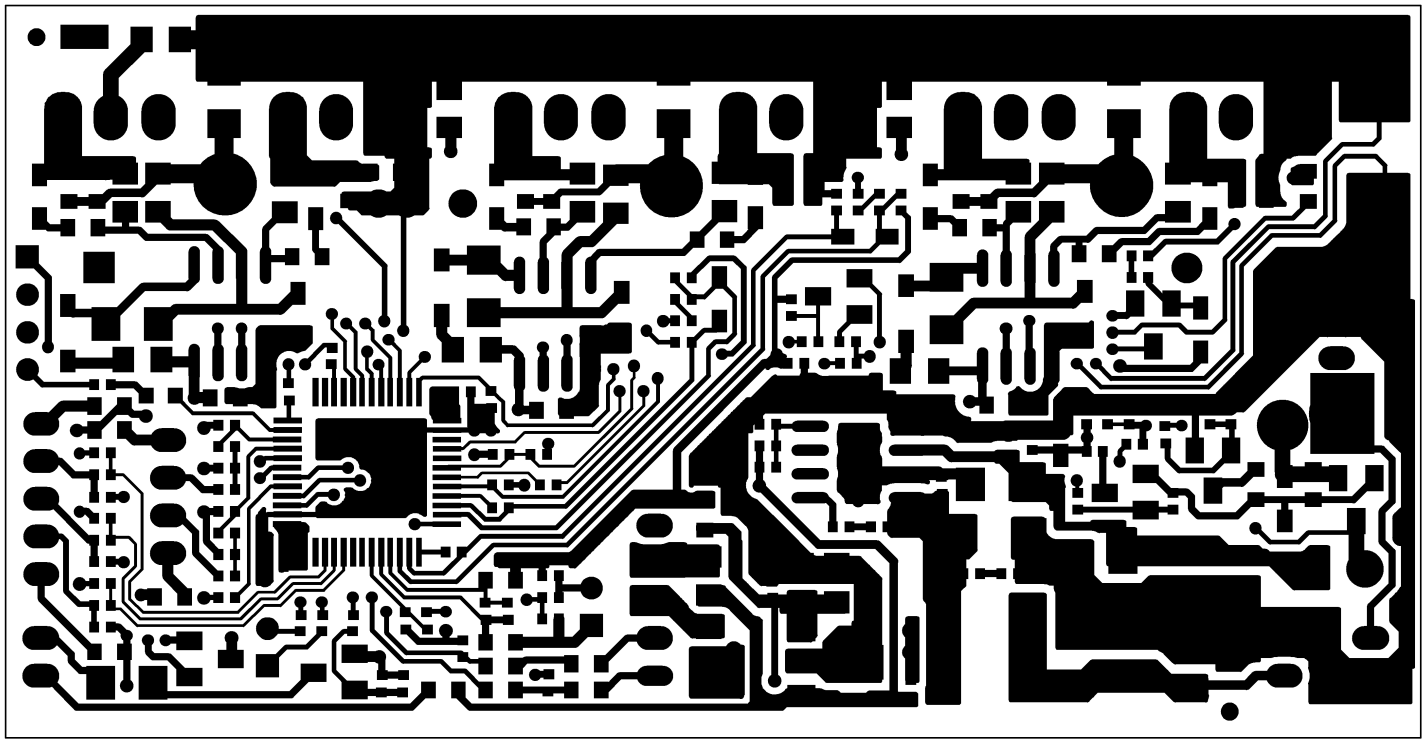
借(通)用件登记

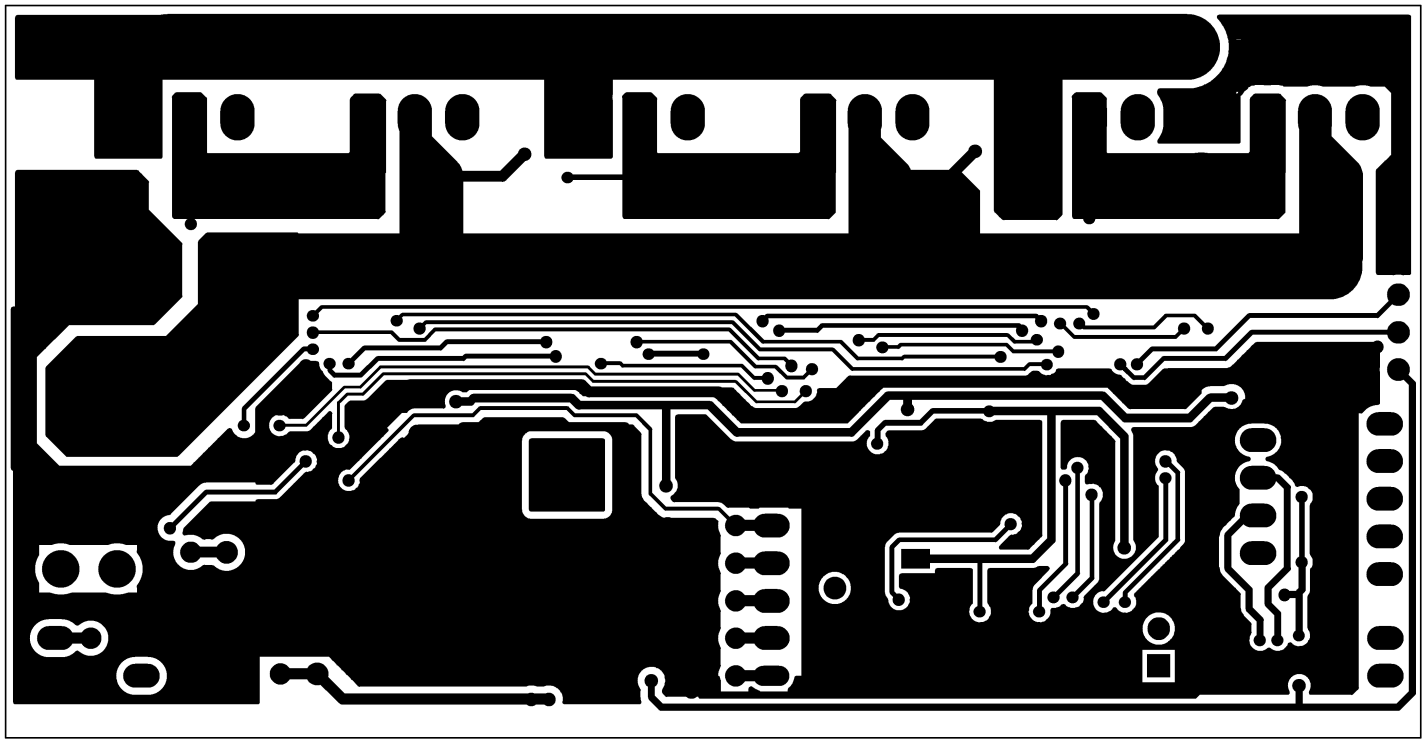
旧底图总号

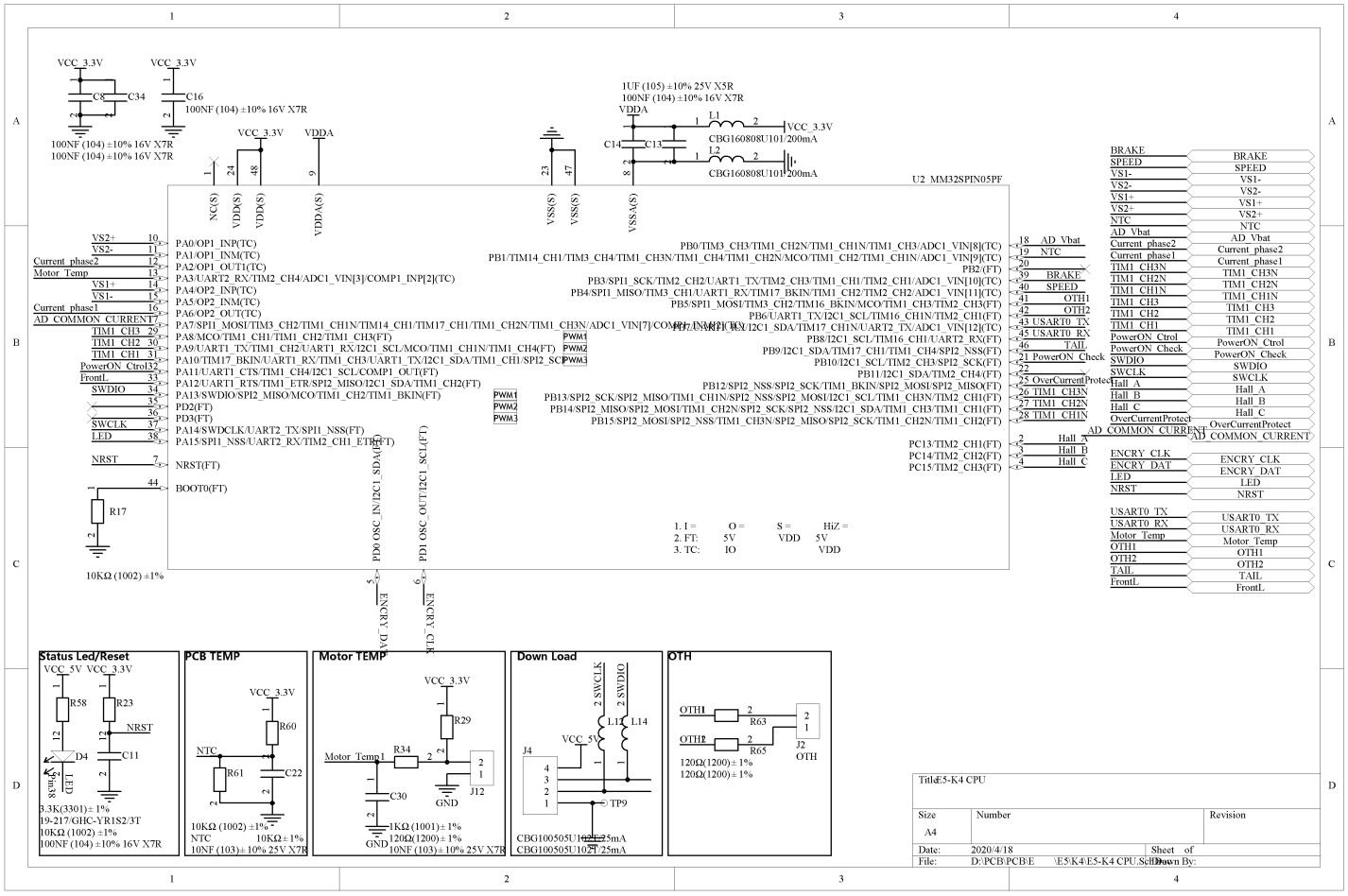
底 图 总 号

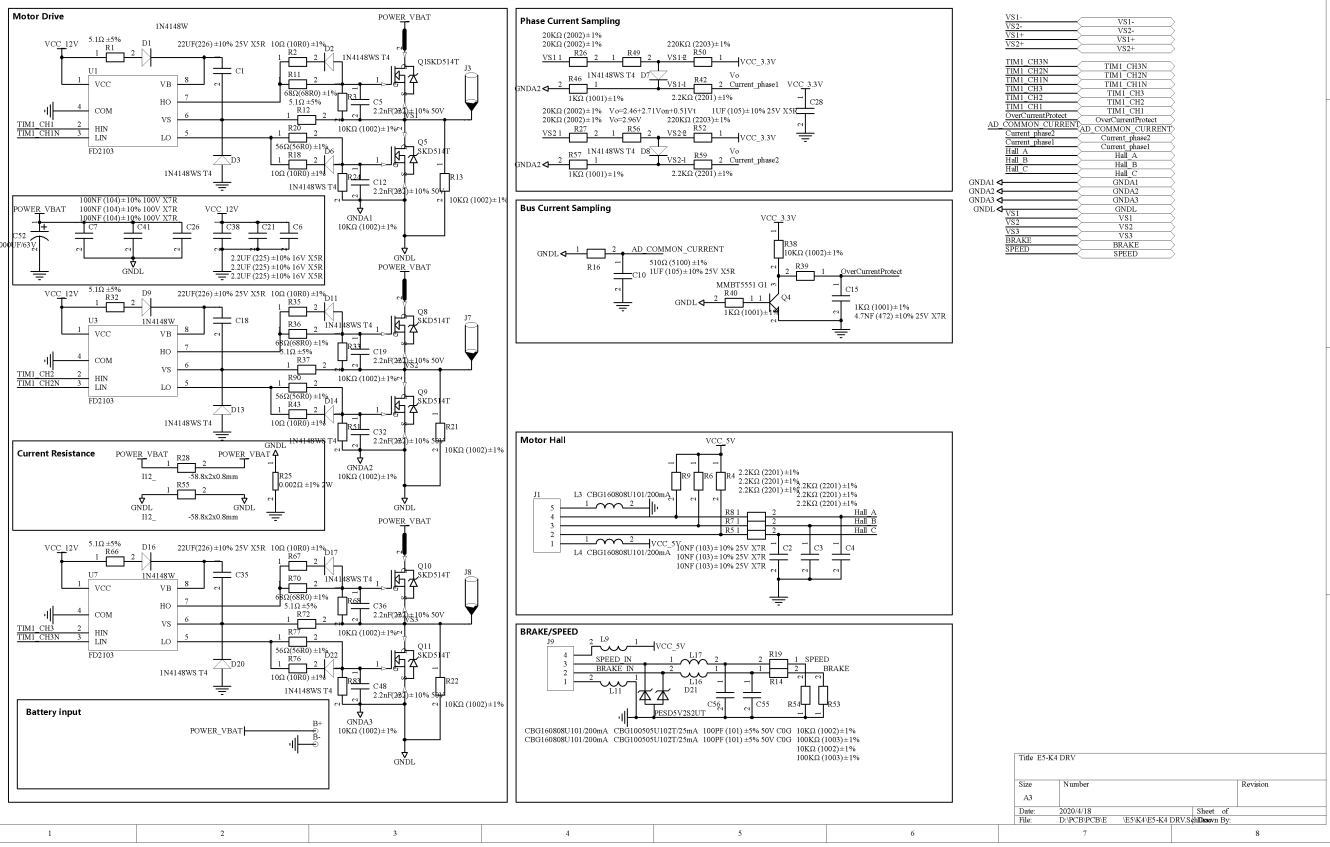
签 字

日 期

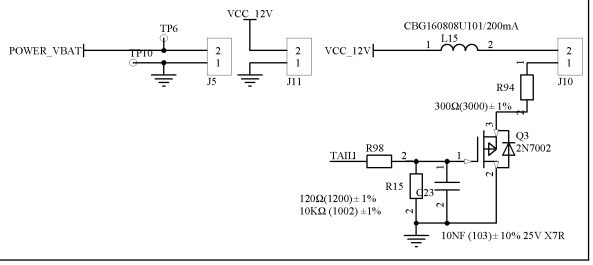




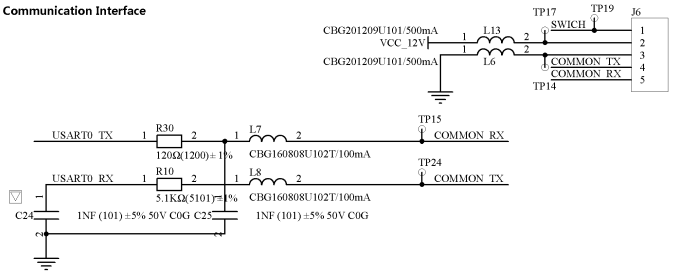

VCC_3.3V
C8
C34
C16
100NF (104) ±10% 16V X7R
100NF (104) ±10% 16V X7R
100NF (104) ±10% 16V X7R
VDDA
1UF (105) ±10% 25V X5R
100NF (104) ±10% 16V X7R
L1
CBG160808U101/200mA
L2
CBG160808U101/200mA
C14
C13
U2_MM32SPIN05PF
NC(S)
VDD(S)
VDDA(S)
VSS(S)
VSS-A(S)
PA0/OP1_INP(TC)
PA1/OP1_INM(TC)
PA2/OP1_OUT(TC)
PA3/UART2_RX/TIM2_CH4/ADC1_VIN[3]/COMP1_INP[2](TC)
PA4/OP2_INP(TC)
PA5/OP2_INM(TC)
PA6/OP2_OUT(TC)
PA7/SPI1_MOSI/TIM3_CH2/TIM1_CH1N/TIM14_CH1/TIM17_CH1/TIM1_CH2N/TIM1_CH3N/ADC1_VIN[7]/COMP1_INM[1](TC)
PA8/MCO/TIM1_CH1/TIM1_CH2/TIM1_CH3(FT)
PA9/UART1_TX/TIM1_CH2/UART1_RX/I2C1_SCL/MCO/TIM1_CH1N/TIM1_CH4(FT)
PA10/TIM17_BKIN/UART1_RX/TIM1_CH3/UART1_TX/I2C1_SDA/TIM1_CH1/SPI2_SCK(FT)
PA11/UART1_CTS/TIM1_CH4/I2C1_SCL/COMP1_OUT(FT)
PA12/UART1_RTS/TIM1_ETR/SPI2_MISO/I2C1_SDA/TIM1_CH2(FT)
PA13/SWDIO/SPI2_MISO/MCO/TIM1_CH2/TIM1_BKIN(FT)
PD2(FT)
PD3(FT)
PA14/SWDCLK/UART2_TX/SPI1_NSS(FT)
PA15/SPI1_NSS/UART2_RX/TIM2_CH1_ETR(FT)
NRST(FT)
BOOT0(FT)
PB0/TIM3_CH3/TIM1_CH2N/TIM1_CH1N/TIM1_CH3/ADC1_VIN[8](TC)
PB1/TIM14_CH1/TIM3_CH4/TIM1_CH3N/TIM1_CH4/TIM1_CH2N/MCO/TIM1_CH2/TIM1_CH1N/ADC1_VIN[9](TC)
PB2(FT)
PB3/SPI1_SCK/TIM2_CH2/UART1_TX/TIM2_CH3/TIM1_CH1/TIM2_CH1/ADC1_VIN[10](TC)
PB4/SPI1_MISO/TIM3_CH1/UART1_RX/TIM17_BKIN/TIM1_CH2/TIM2_CH2/ADC1_VIN[11](TC)
PB5/SPI1_MOSI/TIM3_CH2/TIM16_BKIN/MCO/TIM1_CH3/TIM2_CH3(FT)
PB6/UART1_TX/I2C1_SCL/TIM16_CH1N/TIM2_CH1(FT)
PB7/UART1_RX/I2C1_SDA/TIM17_CH1N/UART2_TX/ADC1_VIN[12](TC)
PB8/I2C1_SCL/TIM16_CH1/UART2_RX(FT)
PB9/I2C1_SDA/TIM17_CH1/TIM1_CH4/SPI2_NSS(FT)
PB10/I2C1_SCL/TIM2_CH3/SPI2_SCK(FT)
PB11/I2C1_SDA/TIM2_CH4(FT)
PB12/SPI2_NSS/SPI2_SCK/TIM1_BKIN/SPI2_MOSI/SPI2_MISO(FT)
PB13/SPI2_SCK/SPI2_MISO/TIM1_CH1N/SPI2_NSS/SPI2_MOSI/I2C1_SCL/TIM1_CH3N/TIM2_CH1(FT)
PB14/SPI2_MISO/SPI2_MOSI/TIM1_CH2N/SPI2_SCK/SPI2_NSS/I2C1_SDA/TIM1_CH3/TIM1_CH1(FT)
PB15/SPI2_MOSI/SPI2_NSS/TIM1_CH3N/SPI2_MISO/SPI2_SCK/TIM1_CH2N/TIM1_CH2(FT)
PC13/TIM2_CH1(FT)
PC14/TIM2_CH2(FT)
PC15/TIM2_CH3(FT)
VS2+
VS2-
Current_phase2
Motor_Temp
VS1+
VS1-
Current_phase1
AD_COMMON_CURRENT
TIM1_CH3
TIM1_CH2
TIM1_CH1
PowerON_Ctrol
FrontL
SWDIO
SWCLK
LED
NRST
R17
10KΩ (1002) ±1%
PWM1
PWM2
PWM3
PD0/OSC_IN/I2C1_SDA(FT)
PD1/OSC_OUT/I2C1_SCL(FT)
ENCRY_DAT
ENCRY_CLK
1. I = O = S = HiZ =
2. FT: 5V VDD 5V
3. TC: IO VDD
BRAKE
SPEED
VS1-
VS2-
VS1+
VS2+
NTC
AD_Vbat
Current_phase2
Current_phase1
TIM1_CH3N
TIM1_CH2N
TIM1_CH1N
TIM1_CH3
TIM1_CH2
TIM1_CH1
PowerON_Ctrol
PowerON_Check
SWDIO
SWCLK
Hall_A
Hall_B
Hall_C
OverCurrentProtect
AD_COMMON_CURRENT
ENCRY_CLK
ENCRY_DAT
LED
NRST
USART0_TX
USART0_RX
Motor_Temp
OTH1
OTH2
TAIL
FrontL
Status Led/Reset
VCC_5V
VCC_3.3V
R58
R23
NRST
D4
C11
LED
3.3K(3301)± 1%
19-217/GHC-YR1S2/3T
10KΩ (1002) ±1%
100NF (104) ±10% 16V X7R
PCB TEMP
R60
NTC
R61
C22
10KΩ (1002) ±1%
NTC 10KΩ± 1%
10NF (103)± 10% 25V X7R
Motor TEMP
R29
Motor_Temp1
R34
J12
C30
GND
1KΩ (1001)± 1%
120Ω(1200)± 1%
10NF (103)± 10% 25V X7R
Down Load
SWCLK
SWDIO
L13
L14
J4
TP9
CBG100505U102T/25mA
CBG100505U102T/25mA
OTH
OTH1
OTH2
R63
R65
J2
120Ω(1200)± 1%
120Ω(1200)± 1%
Title:E5-K4 CPU
Size A4
Number
Revision
Date: 2020/4/18
Sheet of
File: D:\PCB\PCB\E5\K4\E5-K4 CPU.SchDoc
Drawn By:


Motor Drive
Phase Current Sampling
Bus Current Sampling
Motor Hall
BRAKE/SPEED
Current Resistance
Battery input
POWER_VBAT
VCC_12V
VCC_3.3V
VCC_5V
GNDL
GNDA1
GNDA2
GNDA3
AD_COMMON_CURRENT
OverCurrentProtect
Hall_A
Hall_B
Hall_C
SPEED
BRAKE
VS1
VS2
VS3
TIM1_CH1N
TIM1_CH2N
TIM1_CH3N
TIM1_CH1
TIM1_CH2
TIM1_CH3
FD2103
1N4148WS T4
Q5KD514T
Q8KD514T
Q9KD514T
Q10KD514T
Q11KD514T
Q1SKD514T
Title E5-K4 DRV
Size A3
Number
Revision
Date: 2020/4/18
Sheet of
File: D:\PCB\PCB\E5-K4 DRV.SchDoc
Drawn By:

Tail

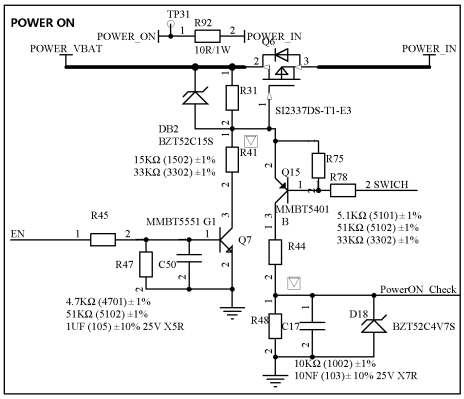


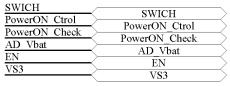
Communication Interface

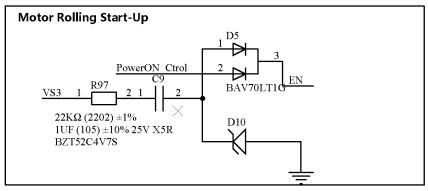


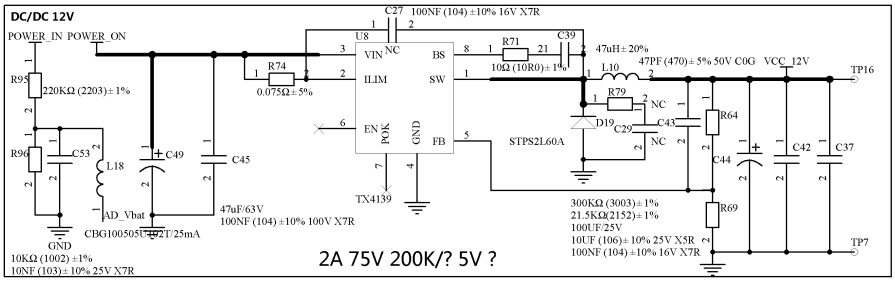
SWICH
USART0_TX
COMMON_RX
USART0_RX
COMMON_TX
TAIL
FrontL

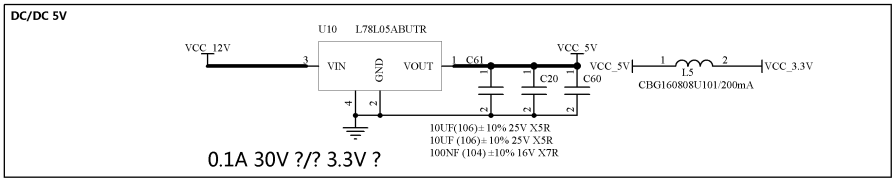
Title E5-K4 OTH		
Size A4	Number	Revision
Date: 2020/4/18		Sheet of
File: D:\PCB\PCB\E\E5\K4\E5-K4 OTH.SchDoc		Drawn By:











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Date: 2020/4/18	Sheet of	
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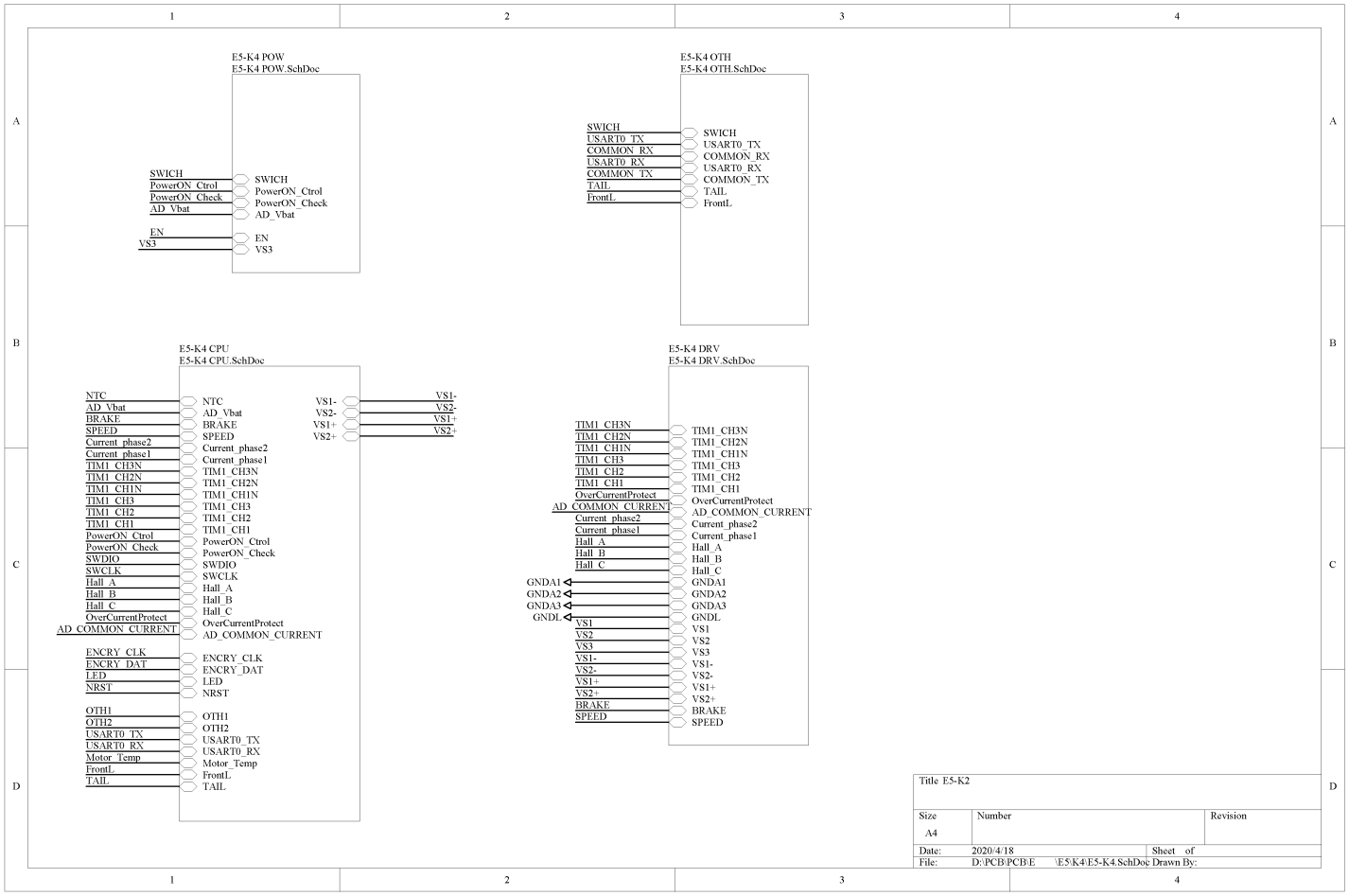
E5-K4 POW
E5-K4 POW.SchDoc
SWICH
PowerON_Ctrol
PowerON_Check
AD_Vbat
EN
VS3
SWICH
PowerON_Ctrol
PowerON_Check
AD_Vbat
EN
VS3
E5-K4 OTH
E5-K4 OTH.SchDoc
SWICH
USART0_TX
COMMON_RX
USART0_RX
COMMON_TX
TAIL
FrontL
SWICH
USART0_TX
COMMON_RX
USART0_RX
COMMON_TX
TAIL
FrontL
E5-K4 CPU
E5-K4 CPU.SchDoc
NTC
AD_Vbat
BRAKE
SPEED
Current_phase2
Current_phase1
TIM1_CH3N
TIM1_CH2N
TIM1_CH1N
TIM1_CH3
TIM1_CH2
TIM1_CH1
PowerON_Ctrol
PowerON_Check
SWDIO
SWCLK
Hall_A
Hall_B
Hall_C
OverCurrentProtect
AD_COMMON_CURRENT
ENCRY_CLK
ENCRY_DAT
LED
NRST
OTH1
OTH2
USART0_TX
USART0_RX
Motor_Temp
FrontL
TAIL
VS1-
VS2-
VS1+
VS2+
NTC
AD_Vbat
BRAKE
SPEED
Current_phase2
Current_phase1
TIM1_CH3N
TIM1_CH2N
TIM1_CH1N
TIM1_CH3
TIM1_CH2
TIM1_CH1
PowerON_Ctrol
PowerON_Check
SWDIO
SWCLK
Hall_A
Hall_B
Hall_C
OverCurrentProtect
AD_COMMON_CURRENT
ENCRY_CLK
ENCRY_DAT
LED
NRST
OTH1
OTH2
USART0_TX
USART0_RX
Motor_Temp
FrontL
TAIL
VS1-
VS2-
VS1+
VS2+
E5-K4 DRV
E5-K4 DRV.SchDoc
TIM1_CH3N
TIM1_CH2N
TIM1_CH1N
TIM1_CH3
TIM1_CH2
TIM1_CH1
OverCurrentProtect
AD_COMMON_CURRENT
Current_phase2
Current_phase1
Hall_A
Hall_B
Hall_C
GNDA1
GNDA2
GNDA3
GNDL
VS1
VS2
VS3
VS1-
VS2-
VS1+
VS2+
BRAKE
SPEED
TIM1_CH3N
TIM1_CH2N
TIM1_CH1N
TIM1_CH3
TIM1_CH2
TIM1_CH1
OverCurrentProtect
AD_COMMON_CURRENT
Current_phase2
Current_phase1
Hall_A
Hall_B
Hall_C
GNDA1
GNDA2
GNDA3
GNDL
VS1
VS2
VS3
VS1-
VS2-
VS1+
VS2+
BRAKE
SPEED
Title E5-K2
Size
A4
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Revision
Date: 2020/4/18
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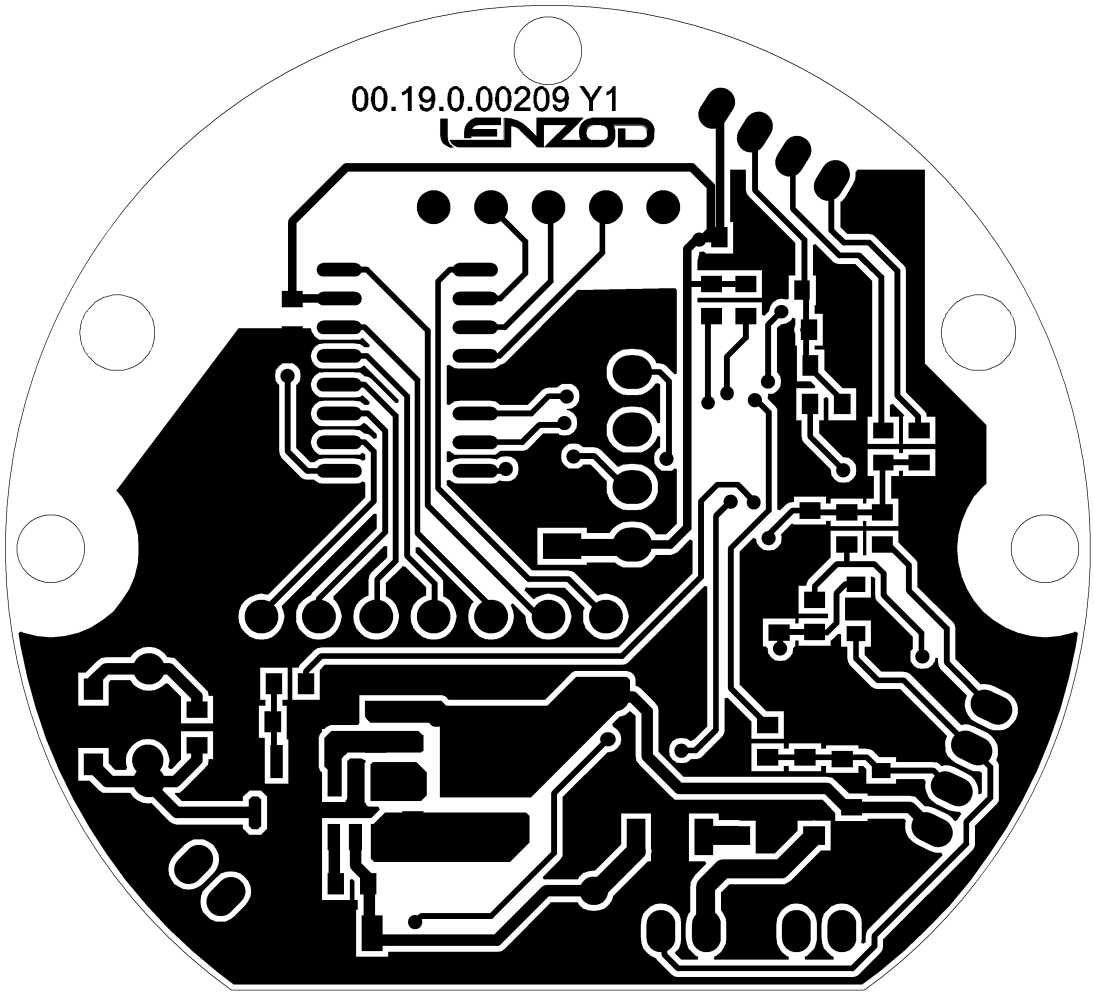
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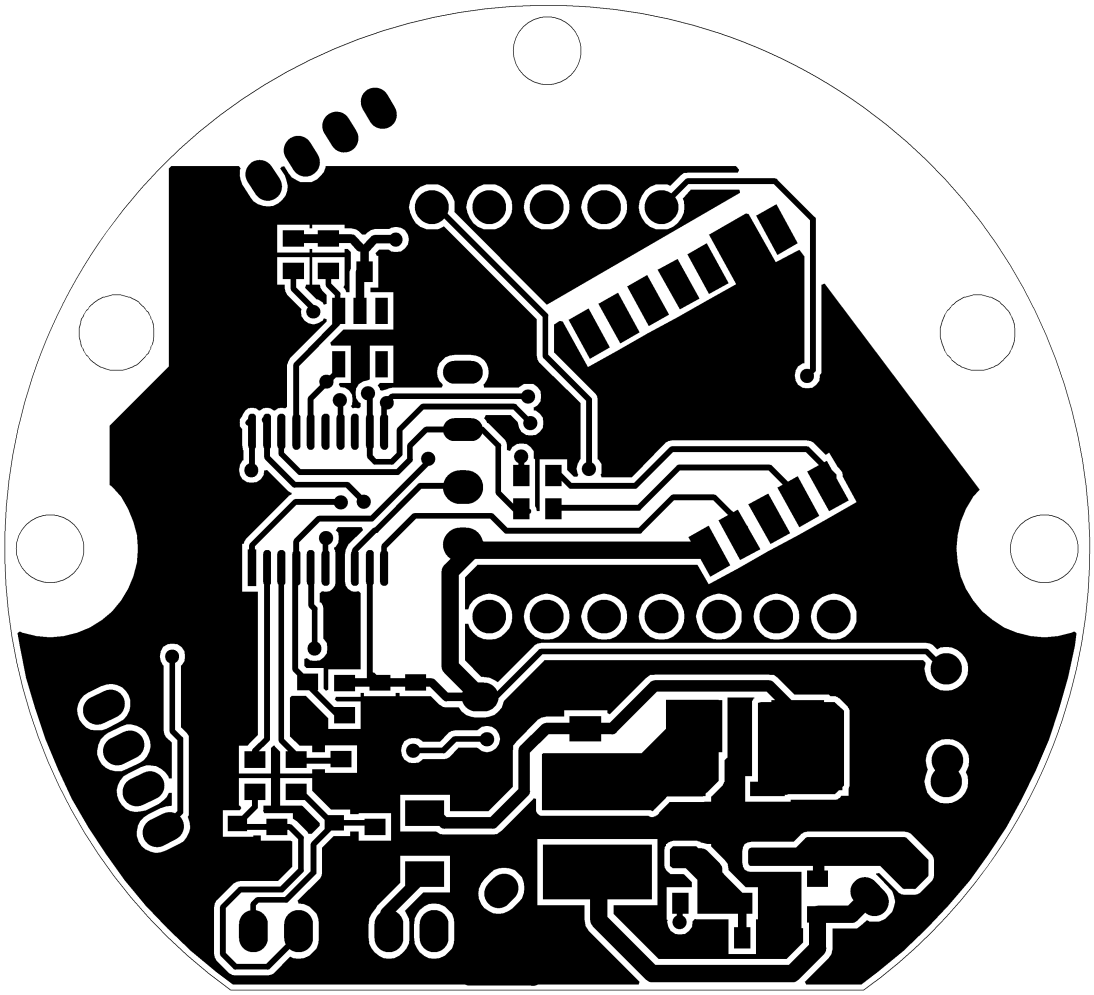
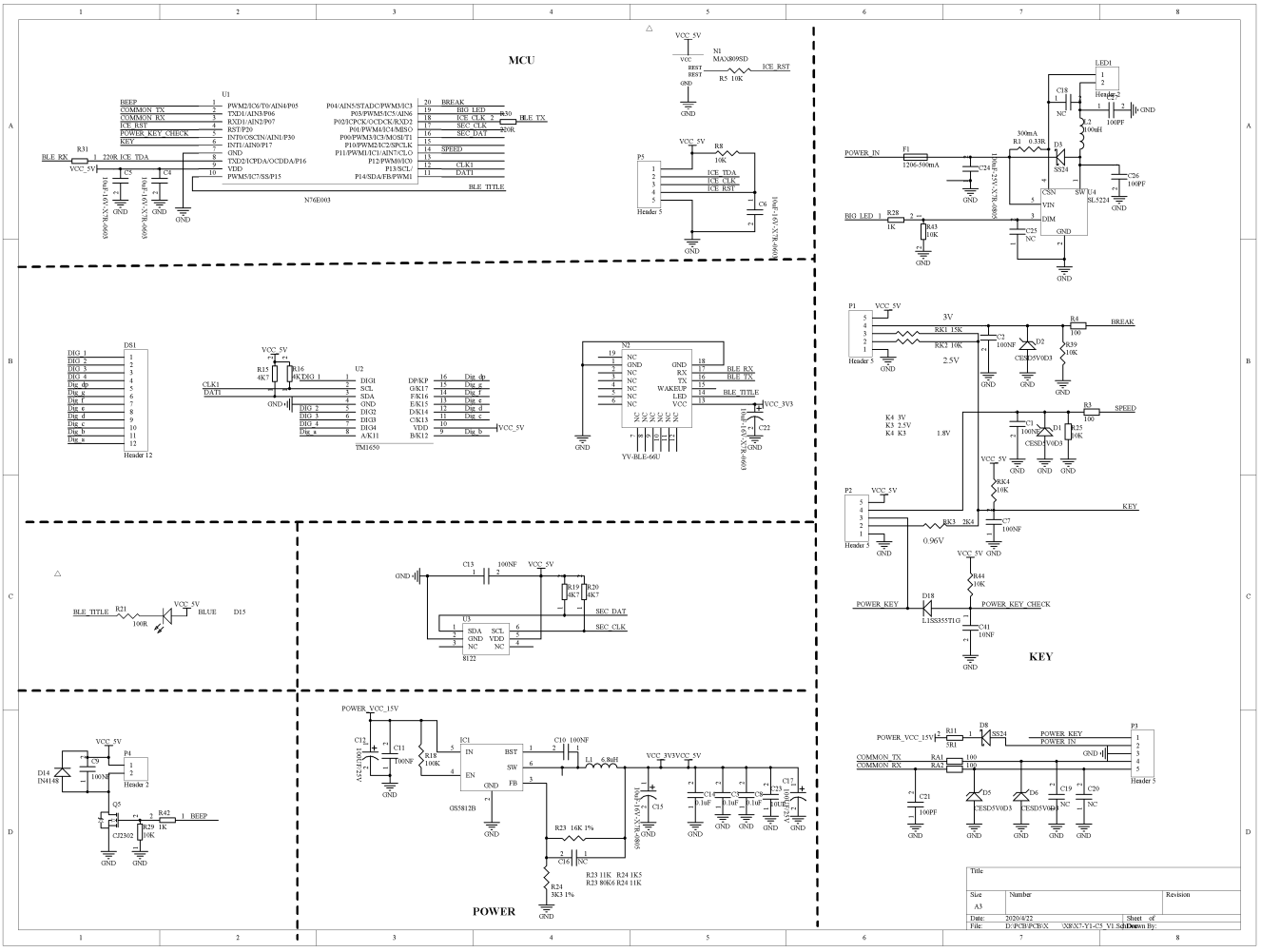
LENZOD




MCU
U1
N76E003
BEEP
COMMON_TX
COMMON_RX
ICE_RST
POWER_KEY_CHECK
KEY
BLE_RX
BLE_TX
BLE_TITLE
R31 220R
R30 220R
C5 100NF
C4 100NF
P5
Header 5
ICE_TDA
ICE_CLK
ICE_RST
R8 10K
C6 100NF
N1 MAX809SD
R5 10K
LED1
Header 2
C18 NC
C2 100nH
C3 100PF
POWER_IN
F1 1206-500mA
C24 100NF
R1 0.33R
D3 SS24
300mA
C26 100PF
SW 1/4 SL5224
CSN
VIN
DIM
BIG_LED
R28 1K
R43 10K
C25 NC
DS1
Header 12
DIG_1
DIG_2
DIG_3
DIG_4
Dig_dp
Dig_g
Dig_f
Dig_e
Dig_d
Dig_c
Dig_b
Dig_a
U2
TM1650
R15 4K7
R16 4K7
CLK1
DAT1
DIG1
DIG2
DIG3
DIG4
A/K11
DP/KP
G/K17
F/K16
E/K15
D/K14
C/K13
VDD
B/K12
N2
YV-BLE-66U
BLE_RX
BLE_TX
BLE_TITLE
WAKEUP
LED
VCC
C22 100NF
P1
Header 5
3V
RK1 15K
RK2 10K
R4 100
BREAK
C2 100NF
D2 CESD5V0D3
R39 10K
2.5V
K4 3V
K3 2.5V
K4 K3
1.8V
R3 100
SPEED
C1 100NF
D1 CESD5V0D3
R35 10K
P2
Header 5
RK4 10K
RK3 2K4
0.96V
KEY
C7 100NF
R44 10K
D18 LISS355T1G
POWER_KEY
POWER_KEY_CHECK
C41 10NF
KEY
BLE_TITLE
R21 100R
D15
C13 100NF
R19 4K7
R20 4K7
U3
8122
SEC_DAT
SEC_CLK
P4
Header 2
D14 IN4148
C9 100NF
Q5
C22302
R29 10K
R42 1K
BEEP
POWER_VCC_15V
C12 470UF/35V
C11 100NF
R18 100K
IC1
G85812B
C10 100NF
L1 6.8uH
VCC_3V3
VCC_5V
C15 470UF/16V
C14 0.1uF
C16 NC
R23 16K 1%
R24 8K3 1%
R23 11K R24 1K5
R23 8/6K6 R24 11K
POWER
D8 SS24
POWER_KEY
POWER_IN
P3
Header 5
R11 5R1
RA1 100
RA2 100
COMMON_TX
COMMON_RX
C21 100PF
D5 CESD5V0D3
D6 CESD5V0D3
C19 NC
C20 NC
Title
Size A3
Number
Revision
Date: 2020/4/22
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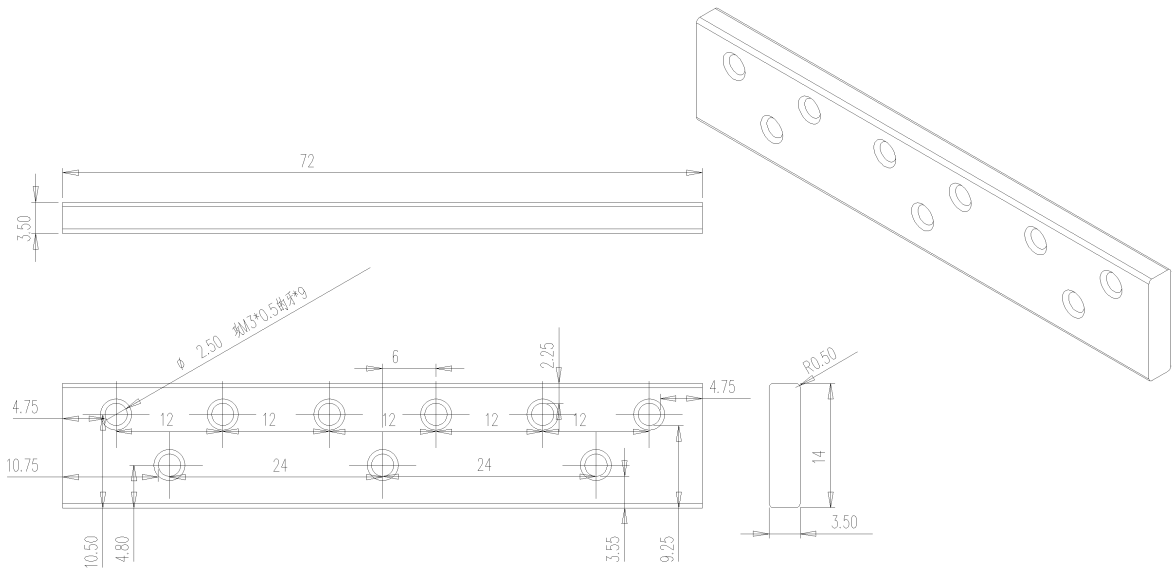


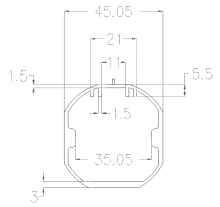
标注无特定公差 尺寸按规格书 表面粗糙度: 公差 线性: 角度:	表面处理:氧化					焊接后倒角 毛刺和手刺角	不同意工艺图纸比例 / 修订
	名称	姓名	日期				检测
绘制			2018-10-04				
检查							
复审							
标准							
检验				材料:			工程图号
				6063-T6			最新款散热条
				重量: 0.009			比例 2:1

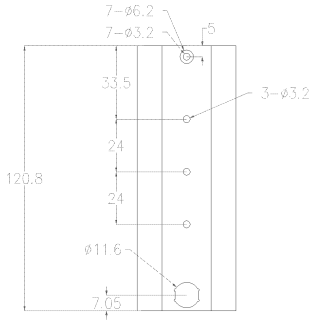
A4

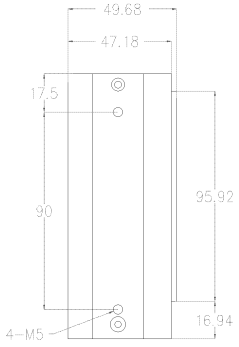
页码: 1 (共1)

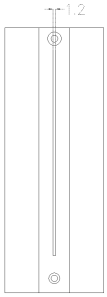
料　号	

变更单号	标记	变 更 内 容	绘图		日期









技术要求

1. 材质：AL 6061-T6
2. 未注公差按GB/T1804-2000-M级；
3. 产品表面不可有，披风、刮伤和变形等缺陷；
4. 未注尺寸按照3D图纸尺寸；

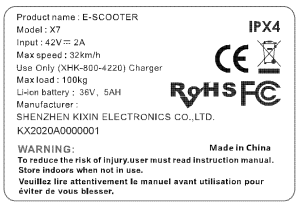
注：带“ ”的尺寸为重点检验尺寸

底图总号：

文件编号

深圳市开心电子有限公司

项目	X7	材 质	AL 6061-T6	用量	1	图纸尺寸	A4	
物料名称	X7-8控制器铝壳	制造工艺	型材	比例	1:2	制 图		
版本号	V1.0.1	表面处理	氧化	单位	mm	部 门	研发部	
日期	20200320	净 重	113g	视图		审 核		



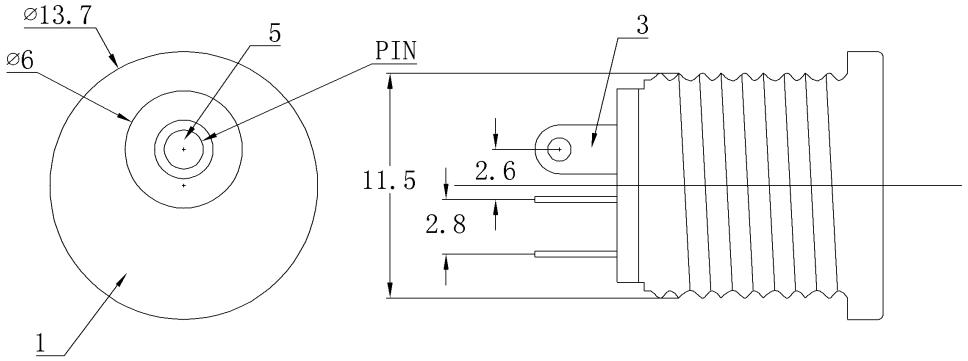
KX2020A0000001

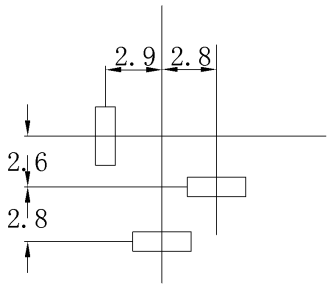
KX	公司代码
2020	生产年份
A	生产第几季度，分别有ABCD
0000001	生产序列号

英文

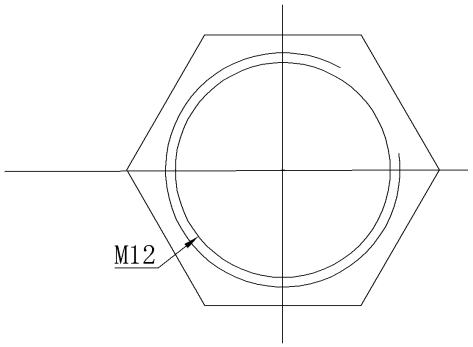
尺寸：60x40mm
材质：合成纸 字体黑色+红色
红色线为刀模线

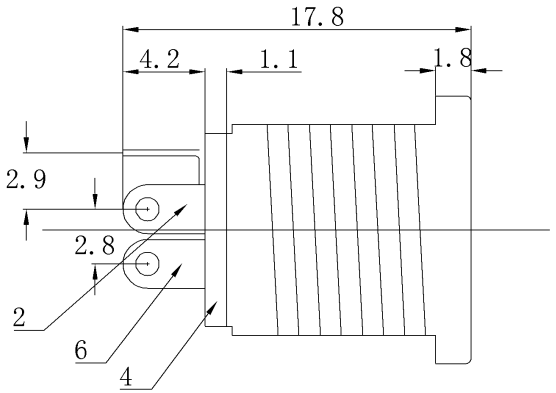
一般尺寸公差MM	.Xx	.X	L	一般精度公差(°)	.X	L
	±0.05	±0.10	±0.20		±0.5	±1



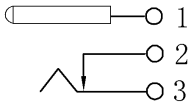


线路板开孔尺寸





电路原理图



主要技术性能

1. 额定电负荷： 30V•0.5A;
2. 接 触 电 阻：≤0.03Ω;
3. 绝 缘 电 阻：≥100MΩ;
4. 耐　　压：AC500V(50Hz)/min;
5. 插　拔　力：3～20N;
6. 寿　　命：5,000次。

序号	名 称	数量	材 料	备 注
6	弯 片	1	H62黄铜带(Y) δ=0.30mm	铜锡
5	插 针	1	H62黄铜棒	铜锡
4	后 盖	1	PBT	黄
3	平 片	1	H62黄铜带(Y) δ=0.30mm	铜锡
2	簧 片	1	65Mn 锰钢带 δ=0.20mm	锡锑
1	基 座	1	PBT	黑

单 位	绘 图		产品名称	DC-022
MM	核 对		图 号	
比 例	核 准		电源插座系列	
1：1	日 期			