

UL TEST REPORT AND PROCEDURE

| | |
|------------------------------------|---|
| Standard: | UL 60950-1, 2nd Edition, 2011-12-19 (Information Technology Equipment - Safety - Part 1: General Requirements) CAN/CSA C22.2 No. 60950-1-07, 2nd Edition, 2011-12 (Information Technology Equipment - Safety - Part 1: General Requirements) |
| Certification Type: | Listing |
| CCN: | NWGQ, NWGQ7 (Information Technology Equipment Including Electrical Business Equipment) |
| Product: | Desktop 3D Printer |
| Model: | KT-PR0035-XXXX (where X can be any numeric character or blank) |
| Rating: | 100-240V~, 50-60Hz, 3.2A |
| Applicant Name and Address: | ALEPH OBJECTS INC 626 WEST 66TH STREET LOVELAND CO 80538 UNITED STATES |

This is to certify that representative samples of the products covered by this Test Report have been investigated in accordance with the above referenced Standards. The products have been found to comply with the requirements covering the category and the products are judged to be eligible for Follow-Up Service under the indicated Test Procedure. The manufacturer is authorized to use the UL Mark on such products which comply with this Test Report and any other applicable requirements of UL LLC ('UL') in accordance with the Follow-Up Service Agreement. Only those products which properly bear the UL Mark are considered as being covered by UL's Follow-Up Service under the indicated Test Procedure.

The applicant is authorized to reproduce the referenced Test Report provided it is reproduced in its entirety.

Any information and documentation involving UL Mark services are provided on behalf of UL LLC (UL) or any authorized licensee of UL.

Prepared by:

Reviewed by:

Supporting Documentation

The following documents located at the beginning of this Procedure supplement the requirements of this Test Report:

- A. Authorization - The Authorization page may include additional Factory Identification Code markings.
- B. Generic Inspection Instructions -
 - i. Part AC details important information which may be applicable to products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of this Test Report.
 - ii. Part AE details any requirements which may be applicable to all products covered by this Procedure. Products described in this Test Report must comply with any applicable items listed unless otherwise stated in the body of each Test Report.
 - iii. Part AF details the requirements for the UL Certification Mark which is not controlled by the technical standard used to investigate these products. Products are permitted to bear only the Certification Mark(s) corresponding to the countries for which it is certified, as indicated in each Test Report.

Product Description

Model KT-PR0035-XXXXXX is a high performance desktop 3D printer employing an R/C (QQGQ2) Power Supply, various SELV circuitries, motors, gears, fans, extruders and movable heat table.


Model Differences


All models are the same except for model designation. KT-PR0035-XXXXXX (where X represents Serial Number and it could be any numeric character or blank)

Technical Considerations

- Equipment mobility : movable
- Connection to the mains : pluggable A
- Operating condition : continuous
- Access location : operator accessible
- Over voltage category (OVC) : OVC II
- Mains supply tolerance (%) or absolute mains supply values : +10%, -10%
- Tested for IT power systems : No
- IT testing, phase-phase voltage (V) : N/A
- Class of equipment : Class I (earthed)
- Considered current rating of protective device as part of the building installation (A) : 20
- Pollution degree (PD) : PD 2
- IP protection class : IP X0
- Altitude of operation (m) : 3000m
- Altitude of test laboratory (m) : 189
- Mass of equipment (kg) : 8.55kg
- The product was submitted and evaluated for use at the maximum ambient temperature (T_{ma}) permitted by the manufacturer's specification of: TBD
- The means of connection to the mains supply is: Pluggable A, Detachable power cord
- The product is intended for use on the following power systems: TN
- The equipment disconnect device is considered to be: Appliance inlet
- The product was investigated to the following additional standards: EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 (which includes all European national differences, including those specified in this test report).

- The following circuit locations (with circuit/schematic designation) were investigated as a limited power source (LPS): USB port
- The following are available from the Applicant upon request: Installation (Safety) Instructions / Manual
- The power supply in this equipment was: Not investigated. A test report for the power supply may be required when submitting this CB Report to a National Certification Body (NCB) to obtain a national mark.
- LEDs provided in the product are considered low power devices: Yes

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| Additional Information | |
| N/A | |
| Additional Standards | |
| The product fulfills the requirements of: EN 60950-1:2006 + A11:2009 + A1:2010 + A12:2011 (which includes all European national differences, including those specified in this test report). | |
| Markings and instructions | |
| Clause Title | Marking or Instruction Details |
| Power rating - Ratings | Ratings (voltage, frequency/dc, current) |
| Power rating – Company identification | Listee's or Recognized company's name, Trade Name, Trademark or File Number |
| Power rating - Model | Model Number |
| Symbols - On/Off switch | <p>All other controls to be marked with</p> <p style="text-align: center;"> </p> <p style="text-align: center;">○</p> <p>symbol for "ON" (60417-2-IEC-5007) and</p> <p style="text-align: center;">○</p> <p>symbol for "OFF" (60417-2-IEC-5008)</p> |
| Marking of hot parts | <p>Parts inside the equipment that are hot and may be touched are marked with</p> <p style="text-align: center;"></p> <p>(60417-2-IEC-5041) adjacent to the part.</p> |
| See Installation Instructions | The symbol |

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|  (exclamation mark in a triangle) or the words "See Instruction Manual" located adjacent to document feed opening to alert the User to the presence of important operating, maintenance and servicing instructions. (Marking) |
| Special Instructions to UL Representative N/A |

| Production-Line Testing Requirements <u>Electric Strength Test Special Constructions - Refer to Generic Inspection Instructions, Part AC for further information.</u> | | | | | | |
|---|-----------|-----------------|---------------------|-----------|----------------|--------------|
| Model | Component | Removable Parts | Test probe location | V rms | V dc | Test Time, s |
| N/A | | | | | | |
| <u>Earthing Continuity Test Exemptions - This test is not required for the following models:</u> | | | | | | |
| <u>Electric Strength Test Exemptions - This test is not required for the following models:</u> | | | | | | |
| <u>Electric Strength Test Component Exemptions - The following solid-state components may be disconnected from the remainder of the circuitry during the performance of this test:</u> | | | | | | |
| <u>Sample and Test Specifics for Follow-Up Tests at UL</u> | | | | | | |
| Model | Component | Material | Test | Sample(s) | Test Specifics | |
| N/A | | | | | | |

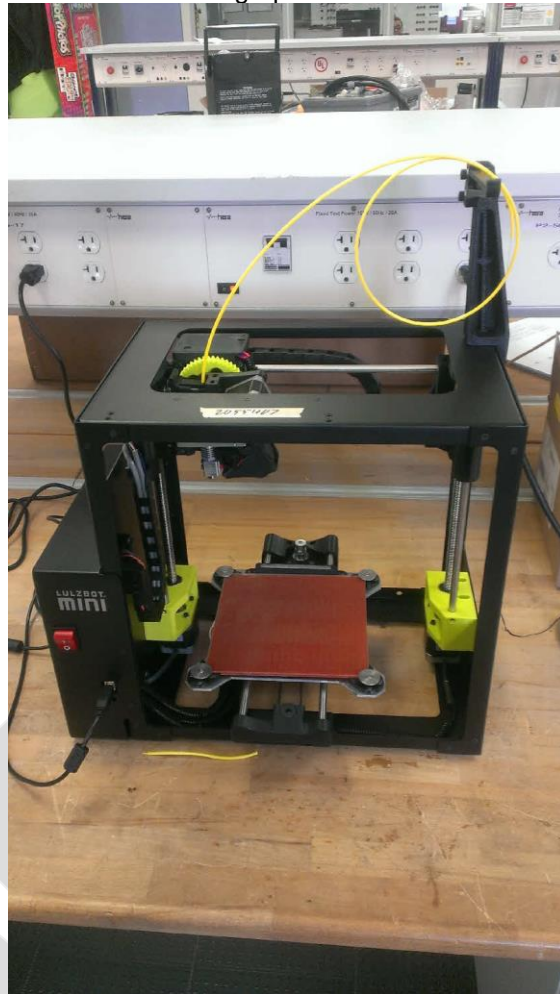
| 1.5.1 | TABLE: list of critical components | | | | | Pass |
|----------------------------|---|---------------|---------------------|-------------------------|------------------------------|---------------|
| Object/part or Description | Manufacturer/ trademark | type/model | technical data | Product Category CCN(s) | Required Marks of Conformity | Supplement ID |
| Appliance Inlet | Bulgin | PF0030/63 | 250Vac, 10A | | | |
| Fan | Runda Electronics Co | RSH8015B24N30 | 24Vdc, 0.14A, 35cfm | | | |

| | | | | | | |
|--|--|---------------------------|--|--------------|----|--|
| Label | Interchangeable | Interchangeable | Laser engraved | -- | -- | |
| Power supply | Delta Electronics | PMC-24V150W1AA | Input 100-240V~, 3.2A, 50-60Hz; Output 24Vdc, 6.25A | QQGQ2 | UR | |
| Switch, (power) | E-Switch | R5BBLKREDF2 (R5 series) | 125 V, 20A, 3/4HP, 10K cycles. | WOYR2 | UR | |
| Wiring, internal secondary (PSU to USB board) | Interchangeable | Interchangeable | Style 1007, VW-1; min 300V, 80°C, 16AWG | AVLV2 | | |
| Wiring, internal secondary (USB board to heat pad) | Interchangeable | Interchangeable | Style 1007, VW-1; min 300V, 80°C, 16AWG | AVLV2 | | |
| Heat shrink (on motor wiring) | | | | | | |
| Wiring, internal primary | Interchangeable | Interchangeable | Style 1007, VW-1; min 300V, 80°C, 16AWG | AVLV2 | UR | |
| Bonding Conductor | Interchangeable | Interchangeable | Style 1007, VW-1; min 300V, 80°C, 16AWG | AVLV2 | UR | |
| Bonding Terminal | Interchangeable | Interchangeable | self-clinching stud type, 3mm diameter, 10mm length. | -- | -- | |
| Crimp Connectors | Interchangeable | Interchangeable | 300V, 22-16AWG | ZMVV | UL | |
| Internal Thermoplastics | Interchangeable | Interchangeable | V-2 minimum | QMFZ2 | UR | |
| Motors (5 provided) | Changzhou Songyang Machinery & Electronics | SY42STH47-1504A | 2.8V, 1.2A | | | |
| Heater | | | | | | |
| Extrusion fan | Kysan Electronics | 69829 | 24Vdc, 0.06A, 40x40x10mm | | | |
| Micro Blower | PTi Technologies (Pelonis) | RBS2218 | 24Vdc, 0.06A, 22x26x7.5mm | | | |
| Switch (6 provided) | Omron | SS-01 series | 30Vdc, 3A | WOYR2 | UR | |
| Printed wiring board | Interchangeable | Interchangeable | Min V-1, 105°C | ZPMV2 | UR | |
| Connectors Secondary | Interchangeable | Interchangeable | Copper pins in thermoplastic material rated V-2 minimum. | ECBT2, QMFZ2 | UR | |
| Fuseholder (F1-F3) | | | | | | |
| Fuse F1-F2 | Littelfuse | 287 series (0287005.PXCN) | 32Vdc, 5A | FHXT | UL | |
| Fuse F3 | Littelfuse | 287 series (0287015.PXCN) | 32Vdc, 15A | FHXT | UL | |
| Fuse F5 | Eaton/Bussman | PTS181233V075 | 33V, 0.75A Suitable for providing LPS | XGPU2 | UR | |
| Thermoplastic material (printing area) | Interchangeable | Interchangeable | HB minimum | QMFZ2 | UR | |

Enclosures

| <u>Type</u> | <u>Supplement Id</u> | <u>Description</u> |
|------------------|----------------------|----------------------|
| Photographs | 3-01 | Mini Printer |
| Photographs | 3-02 | Mini Printer |
| Photographs | 3-03 | USB board |
| Photographs | 3-04 | Internal View |
| Photographs | 3-05 | Fan |
| Photographs | 3-06 | Motor |
| Diagrams | 4-01 | Stepper Motor |
| Schematics + PWB | 5-01 | USB Board Schematics |

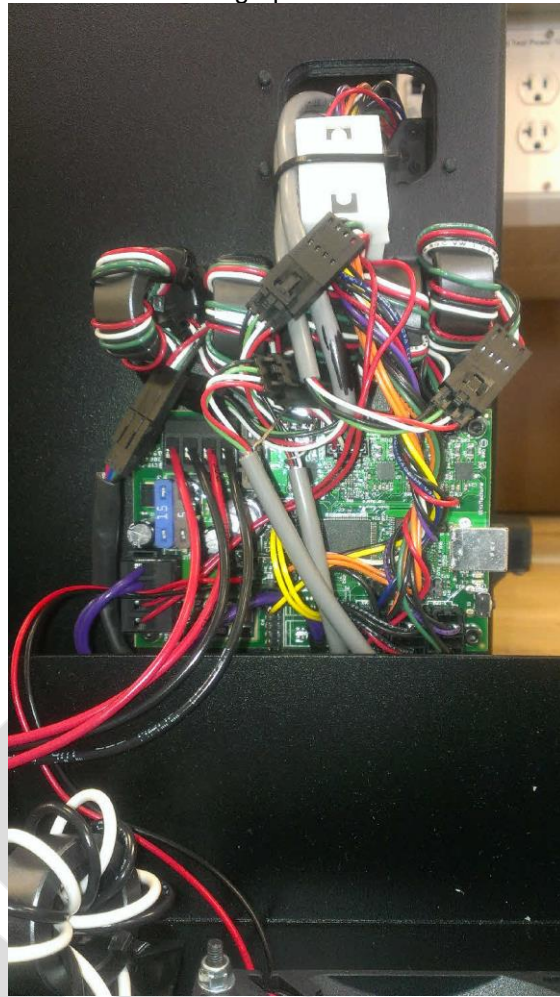
Photographs ID 3-01



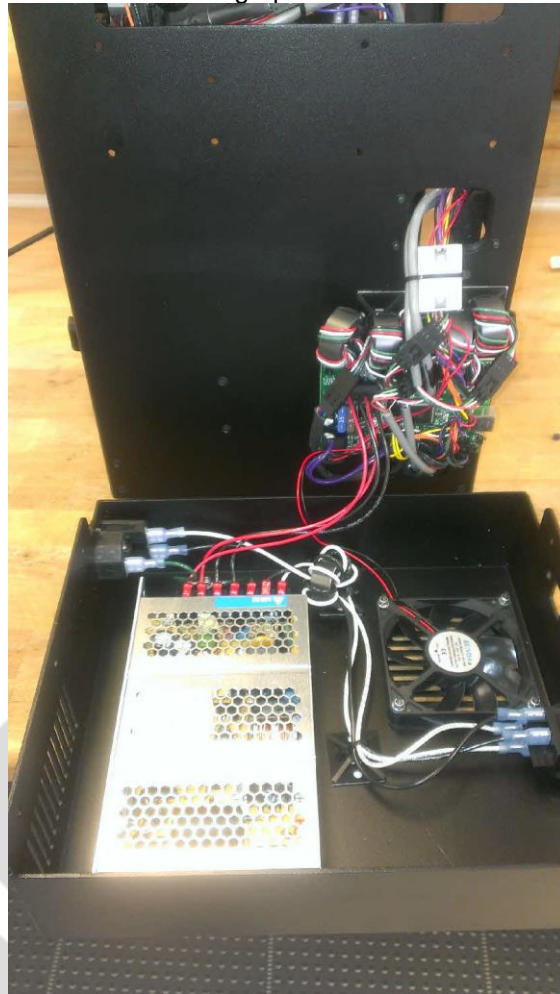
Photographs ID 3-02



Photographs ID 3-03



Photographs ID 3-04



Photographs ID 3-05



Photographs ID 3-06



Diagrams ID 4-01

HIGH TORQUE HYBRID STEPPING MOTOR SPECIFICATIONS

| General specifications | | Electrical specifications | |
|----------------------------|------------------------------------|---------------------------------------|-----------|
| Step Angle (°) | 1.8 | Rated Voltage (V) | 2.8 |
| Temperature Rise (°C) | 80 Max (rated current, 2 phase on) | Rated Current (A) | 1.5 |
| Ambient Temperature (°C) | -20 ~ +50 | Resistance Per Phase ($\pm 10\%$ Ω) | 2.8(25°C) |
| Number of Phase | 2 | Inductance Per Phase ($\pm 20\%$ mH) | 4.8 |
| Insulation Resistance (MΩ) | 100 Min (500VDC) | Holding Torque (N.cm) | 55 |
| Insulation Class | Class B | Detent Torque (N.cm) | 2 |
| Max.radial force (N) | 28 (20mm from the flange) | Rotor Torque (N.cm) | 68 |
| Max.axial force (N) | 10 | | |

● Pull out torque curve :
VOLTAGE: 30VAC, CONSTANT CURRENT: 1.5A, HALF STEP

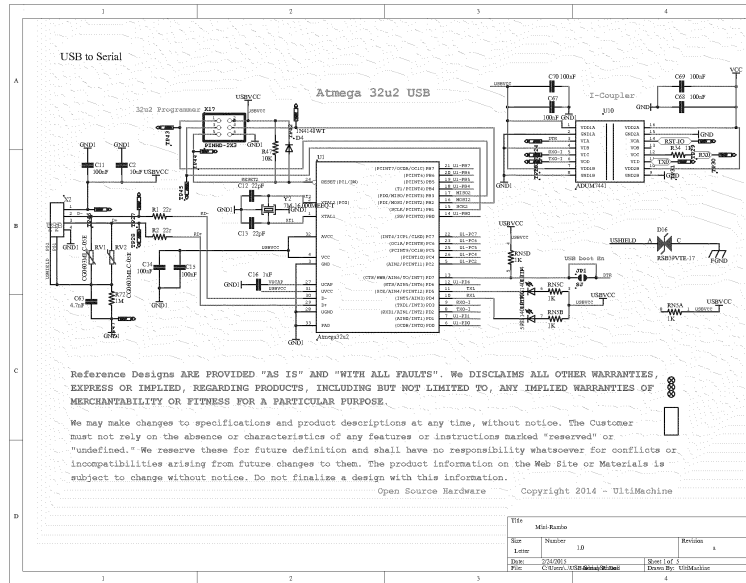
● Wiring Diagram :

● Dimensions:
(unit:mm)

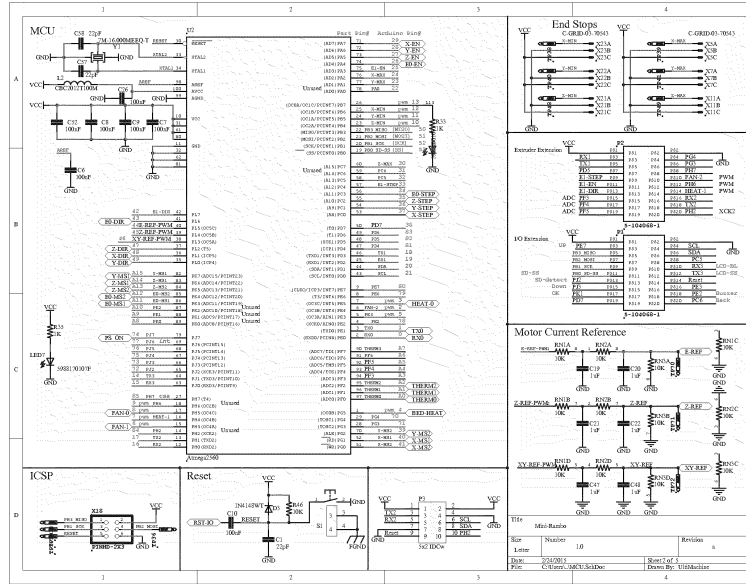
| | | | |
|---|-----------|-----------------|----------------------|
| | | SY42STH47-1504A | TECHNICAL CONDITIONS |
| REV | REVISIONS | DESCRIPTION | BY DATE |
| DRAW | | | |
| CHECK | | | |
| APPROVE | | | |
| CHANGZHOU SONGYANG MACHINERY & ELECTRONICS NEW TECHNIC INSTITUTE | | | 060047067 |

2015-03-11

Schematics + PWB ID 5-01

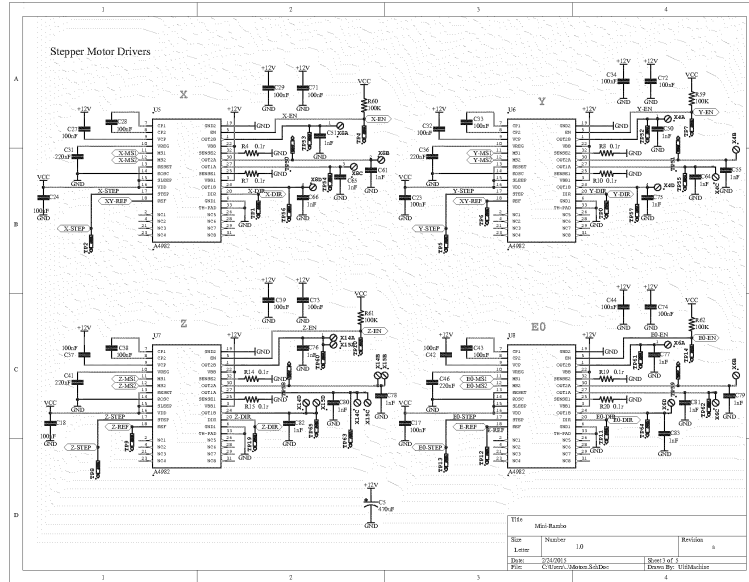


Schematics + PWB ID 5-01



2015-03-11

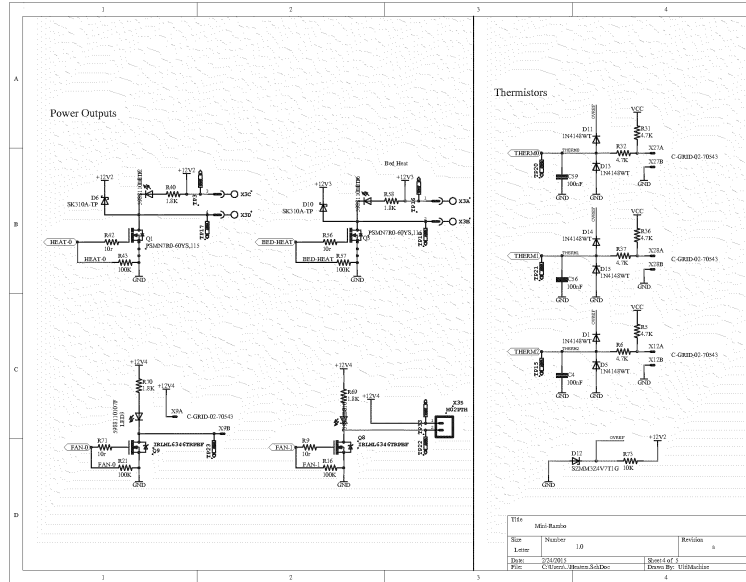
Schematics + PWB ID 5-01



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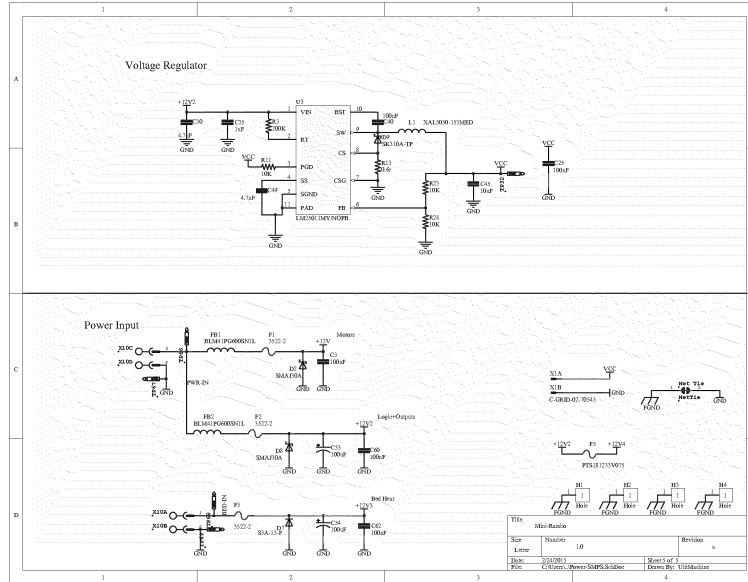
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Schematics + PWB ID 5-01



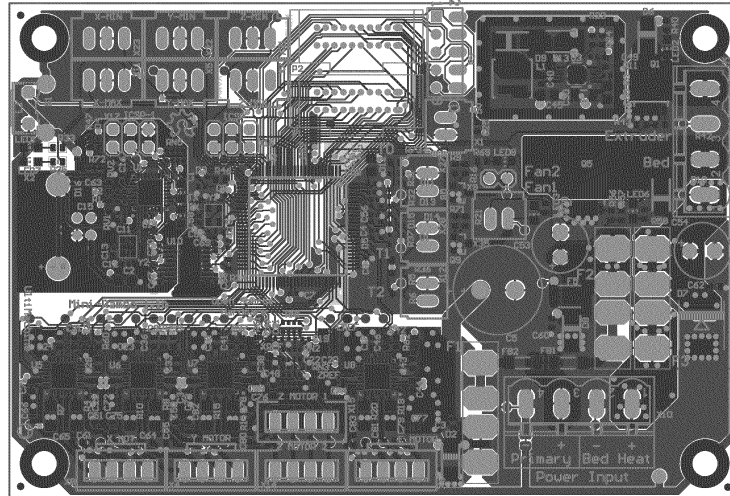
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Schematics + PWB ID 5-01



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Schematics + PWB ID 5-01



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Schematics + PWB ID 5-01

| Reference Designator | Manufacturer | Part Number | Value | Notes |
|----------------------|--------------|-------------|-------|-------|
| U1 | TI | LM7805 | 5.0V | |
| U2 | TI | LM7805 | 5.0V | |
| U3 | TI | LM7805 | 5.0V | |
| U4 | TI | LM7805 | 5.0V | |
| U5 | TI | LM7805 | 5.0V | |
| U6 | TI | LM7805 | 5.0V | |
| U7 | TI | LM7805 | 5.0V | |
| U8 | TI | LM7805 | 5.0V | |
| U9 | TI | LM7805 | 5.0V | |
| U10 | TI | LM7805 | 5.0V | |
| U11 | TI | LM7805 | 5.0V | |
| U12 | TI | LM7805 | 5.0V | |
| U13 | TI | LM7805 | 5.0V | |
| U14 | TI | LM7805 | 5.0V | |
| U15 | TI | LM7805 | 5.0V | |
| U16 | TI | LM7805 | 5.0V | |
| U17 | TI | LM7805 | 5.0V | |
| U18 | TI | LM7805 | 5.0V | |
| U19 | TI | LM7805 | 5.0V | |
| U20 | TI | LM7805 | 5.0V | |
| U21 | TI | LM7805 | 5.0V | |
| U22 | TI | LM7805 | 5.0V | |
| U23 | TI | LM7805 | 5.0V | |
| U24 | TI | LM7805 | 5.0V | |
| U25 | TI | LM7805 | 5.0V | |
| U26 | TI | LM7805 | 5.0V | |
| U27 | TI | LM7805 | 5.0V | |
| U28 | TI | LM7805 | 5.0V | |
| U29 | TI | LM7805 | 5.0V | |
| U30 | TI | LM7805 | 5.0V | |
| U31 | TI | LM7805 | 5.0V | |
| U32 | TI | LM7805 | 5.0V | |
| U33 | TI | LM7805 | 5.0V | |
| U34 | TI | LM7805 | 5.0V | |
| U35 | TI | LM7805 | 5.0V | |
| U36 | TI | LM7805 | 5.0V | |
| U37 | TI | LM7805 | 5.0V | |
| U38 | TI | LM7805 | 5.0V | |
| U39 | TI | LM7805 | 5.0V | |
| U40 | TI | LM7805 | 5.0V | |
| U41 | TI | LM7805 | 5.0V | |
| U42 | TI | LM7805 | 5.0V | |
| U43 | TI | LM7805 | 5.0V | |
| U44 | TI | LM7805 | 5.0V | |
| U45 | TI | LM7805 | 5.0V | |
| U46 | TI | LM7805 | 5.0V | |
| U47 | TI | LM7805 | 5.0V | |
| U48 | TI | LM7805 | 5.0V | |
| U49 | TI | LM7805 | 5.0V | |
| U50 | TI | LM7805 | 5.0V | |
| U51 | TI | LM7805 | 5.0V | |
| U52 | TI | LM7805 | 5.0V | |
| U53 | TI | LM7805 | 5.0V | |
| U54 | TI | LM7805 | 5.0V | |
| U55 | TI | LM7805 | 5.0V | |
| U56 | TI | LM7805 | 5.0V | |
| U57 | TI | LM7805 | 5.0V | |
| U58 | TI | LM7805 | 5.0V | |
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| U60 | TI | LM7805 | 5.0V | |
| U61 | TI | LM7805 | 5.0V | |
| U62 | TI | LM7805 | 5.0V | |
| U63 | TI | LM7805 | 5.0V | |
| U64 | TI | LM7805 | 5.0V | |
| U65 | TI | LM7805 | 5.0V | |
| U66 | TI | LM7805 | 5.0V | |
| U67 | TI | LM7805 | 5.0V | |
| U68 | TI | LM7805 | 5.0V | |
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| U70 | TI | LM7805 | 5.0V | |
| U71 | TI | LM7805 | 5.0V | |
| U72 | TI | LM7805 | 5.0V | |
| U73 | TI | LM7805 | 5.0V | |
| U74 | TI | LM7805 | 5.0V | |
| U75 | TI | LM7805 | 5.0V | |
| U76 | TI | LM7805 | 5.0V | |
| U77 | TI | LM7805 | 5.0V | |
| U78 | TI | LM7805 | 5.0V | |
| U79 | TI | LM7805 | 5.0V | |
| U80 | TI | LM7805 | 5.0V | |
| U81 | TI | LM7805 | 5.0V | |
| U82 | TI | LM7805 | 5.0V | |
| U83 | TI | LM7805 | 5.0V | |
| U84 | TI | LM7805 | 5.0V | |
| U85 | TI | LM7805 | 5.0V | |
| U86 | TI | LM7805 | 5.0V | |
| U87 | TI | LM7805 | 5.0V | |
| U88 | TI | LM7805 | 5.0V | |
| U89 | TI | LM7805 | 5.0V | |
| U90 | TI | LM7805 | 5.0V | |
| U91 | TI | LM7805 | 5.0V | |
| U92 | TI | LM7805 | 5.0V | |
| U93 | TI | LM7805 | 5.0V | |
| U94 | TI | LM7805 | 5.0V | |
| U95 | TI | LM7805 | 5.0V | |
| U96 | TI | LM7805 | 5.0V | |
| U97 | TI | LM7805 | 5.0V | |
| U98 | TI | LM7805 | 5.0V | |
| U99 | TI | LM7805 | 5.0V | |
| U100 | TI | LM7805 | 5.0V | |



Test Record No. 1

The following tests were conducted:

| Test | Testing Location/Comments |
|---|---------------------------|
| End Product Reference Page | |
| General Guidelines | |
| Input: Single-Phase (1.6.2) | |
| Durability of Marking (1.7.11) | |
| Limited Power Source Measurements (2.5) | |
| Protective Bonding I (2.6.3.4, 2.6.1).7) | |
| Drop (4.2.6, 4.2.1) | |
| Stress Relief (4.2.7, 4.2.1) | |
| Heating (4.5.1, 1.4.12, 1.4.13) | |
| Touch Current (Single-Phase; TN/TT System) (5.1, Annex D) | |
| Electric Strength (5.2.2) | |
| Abnormal Operation (5.3.1 - 5.3.9) | |

Test results are valid only for the tested equipment. These tests are considered representative of the products covered by this Test Report. The test methods and results of the above tests have been reviewed and found to be in accordance with the requirements in the Standard(s) referenced at the beginning of this Test Report.