



Electrical Measurement (1)

Variable Voltage Power Supply Report

Discussing the manufacturing and designing process



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Measuring tools used

Electrical

- Multi-range 3 port multimeter
- Digital oscilloscope

Other (Case)

- T-shaped 80 cm ruler
- Ruler
- Level
- Protractor

Manufacturing tools used

Electrical

- Ceramic soldering iron
- Desoldering pump
- Automatic wire stripper

Other (Case)

- Angle grinder
- Electrical drill
- Sanding disc for angle grinder
- Wood cutting circular blade for angle grinder

Materials and Components

Electrical

- (7812) voltage regulator with built-in heat sink (figure 1)
- (7809) voltage regulator with built-in heat sink (figure 2)
- (7805) voltage regulator with built-in heat sink (figure 3)
- 3x 78XX mountable heatsinks (figure 4)
- 1000 micro-Farad 25-volt capacitor (figure 5)
- 6x (1 micro-Farad 50-volt capacitors) (figure 6)
- 9x 15 cm Perforated printed circuit board (figure 7)
- 12-volt fan 60 x 60 x 15 mm (figure 8)
- 12-volt AC center-tapped transformer (1 Amp) (figure 9)
- Standard On/Off switch (figure 10)
- 2x Speaker red/black ports (figure 11)
- Approx. 50 cm 0.5 mm single strand wire (figure 12)
- 2x diode

Other

- Pressed wood
- 8x 90-degree metal angles with 4 holes each
- 34 bolts with their nuts + 16 more nuts

Manufacturing Process

First

Components were placed in their positions as shown in figure

Second

Single strand wires were used to connects the terminals of each component as shown in figure

Third

The wires and the terminals were soldered together and with the 12-volt transformer

Forth

Pieces of wood of sizes present in figure were cut with the angle grinder (with wood cutting circular blade attached)

Fifth

Electrical drill was used to drill holes into the wood to fit the bolts and the fan

Lastly

All bolts were screwed with their nuts and the fan were screwed in with additional screws and the case was sealed

Other steps

This includes the drilling of holes for the ac input wires, the On/Off switch and the speaking inputs and fitting them into the case.

Operation

- The variable power supply has 3 available voltages that are:
- 12-volt, 9-volt, and 5-volt.
- The transformer produces 12 Watt.
- When the 12-volt connection is used, power is fed to the output without losses (excluding the fan).
- When the 9-volt connection is used, power is divided between power diffused in the (7809) voltage regulator as heat and 9 watts are delivered to the output.
- When the 5-volt connection is used, power is divided between power diffused in the (7805) voltage regulator as heat and 5 watts (max) are delivered to the output.
- (Fan uses 2.88 watt but can operate at lower wattage)
- (This means that no matter what the connection of the power is supply the current remains relatively constant)

- The fan is used to dissipate heat generated in the voltage regulators in addition to heat sinks that are screwed to them.
- When using all three voltages at the same time the power is divided accordingly between the loads and loss in the voltage regulators.

Advantages

- Voltage is regulated thoroughly

Disadvantages

- Severe heating
- Inferior to power supplies that use variable tapped transformer as the current in such transformers are variable rather than constant eliminating heating in voltage regulators

Included figures



Figure 1) 7812 voltage regulator



Figure 2) 7809 voltage regulator



Figure 3) 7805 voltage regulator



Figure 4) 78XX Mountable heatsink



Figure 5) 1000 micro-Farad
25-volt capacitor



Figure 6) 1 micro-Farad
50-volt capacitor



5×7cm, 7×9cm, 9×15cm, 12×18cm

Figure 7) Perforated PCBs



Figure 8) 12-volt fan



Figure 9) 12-volt 1000ma center-tapped transformer



Figure 10) Standard black switch



Figure 11) Red/Black speaker port

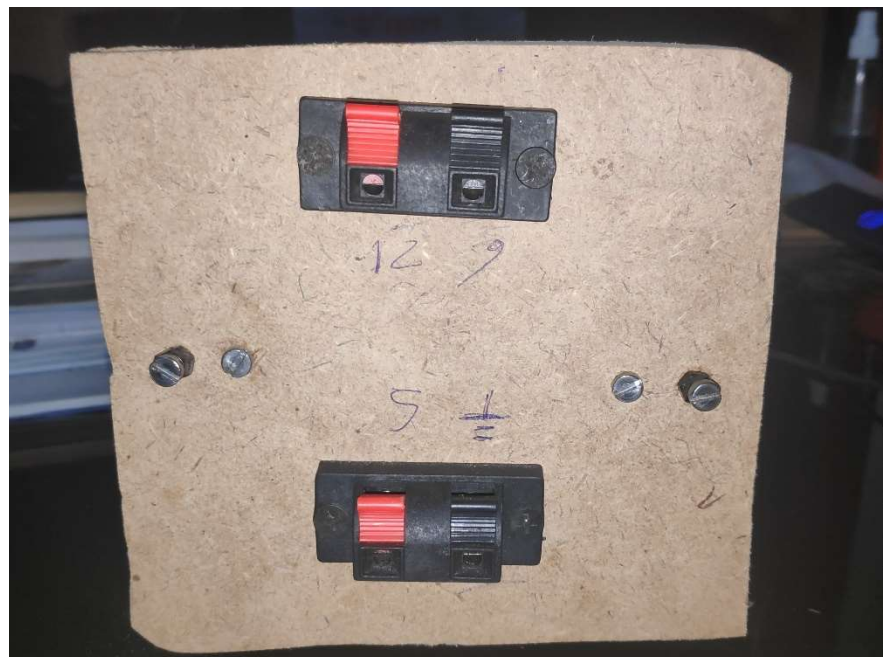


Figure 12) One strand 5mm wire

Device Images



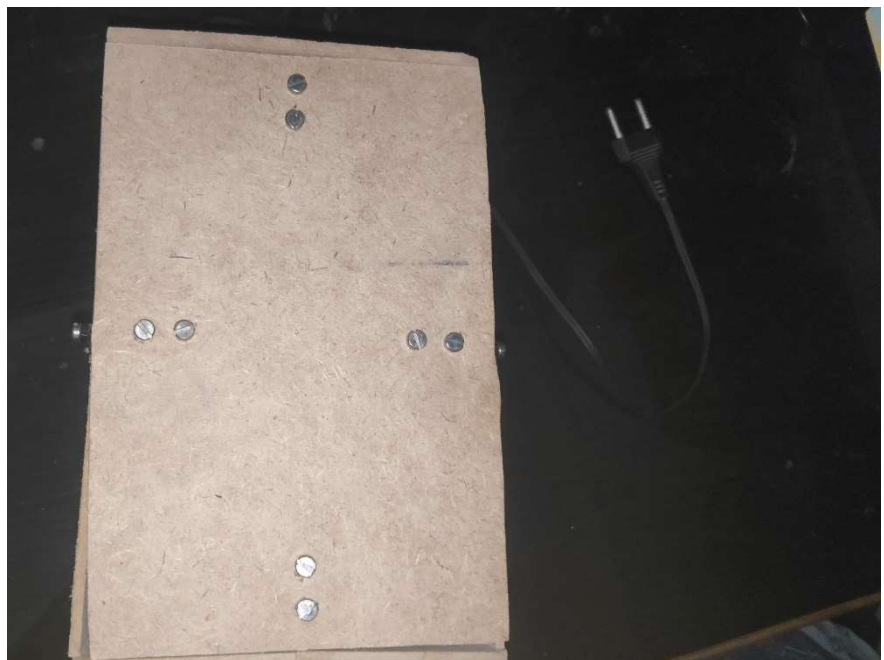
Back side



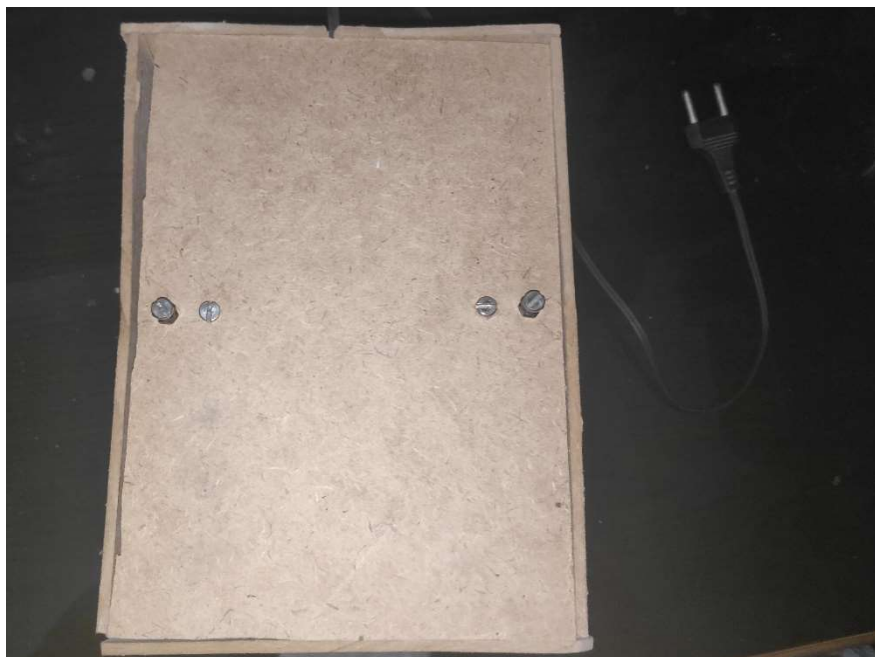
Front side



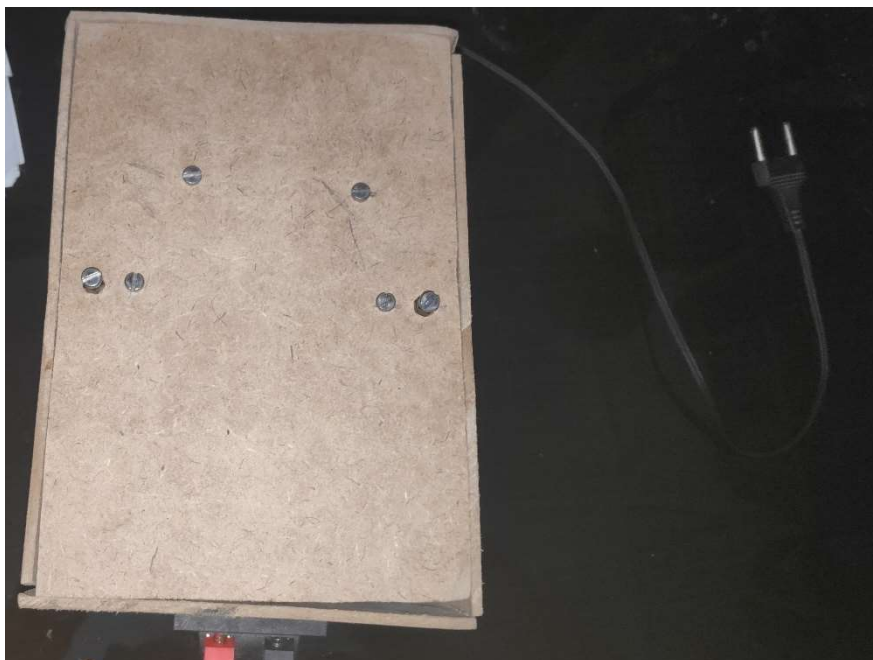
Right side (Removable)



Left side

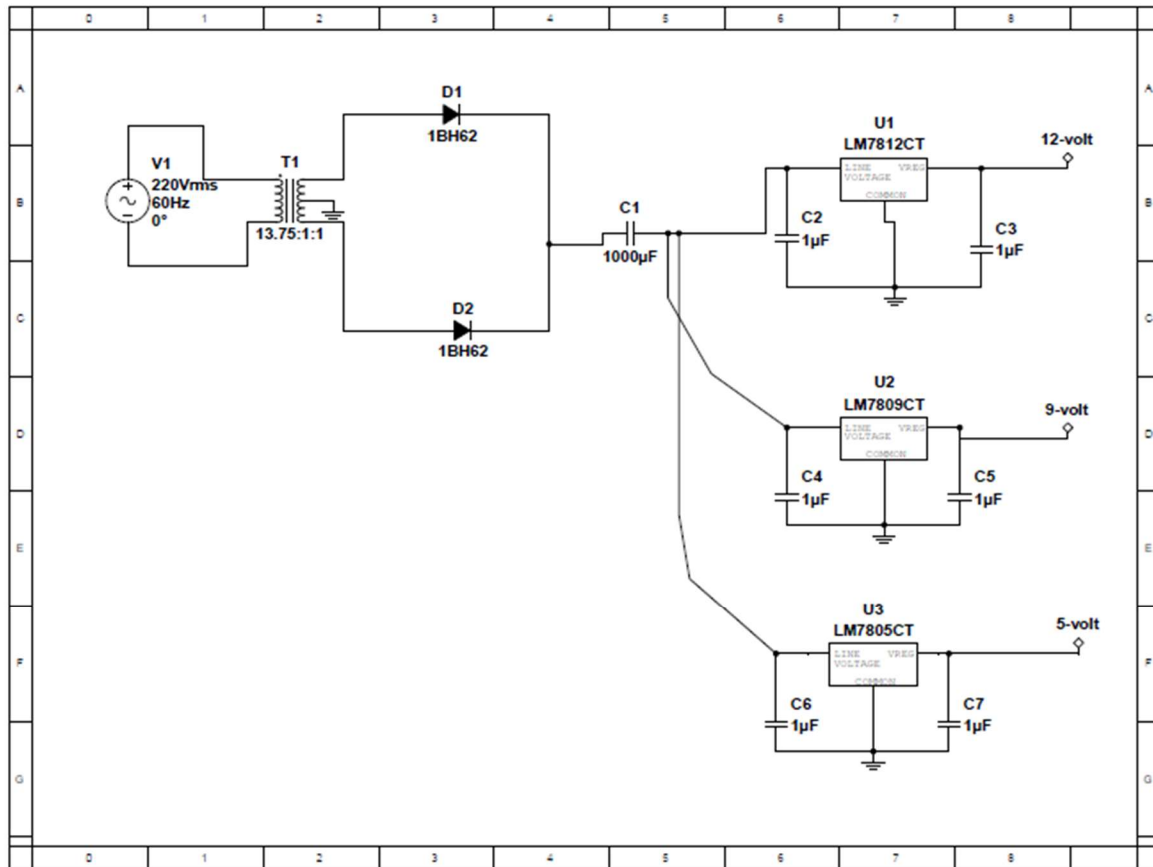


Bottom side

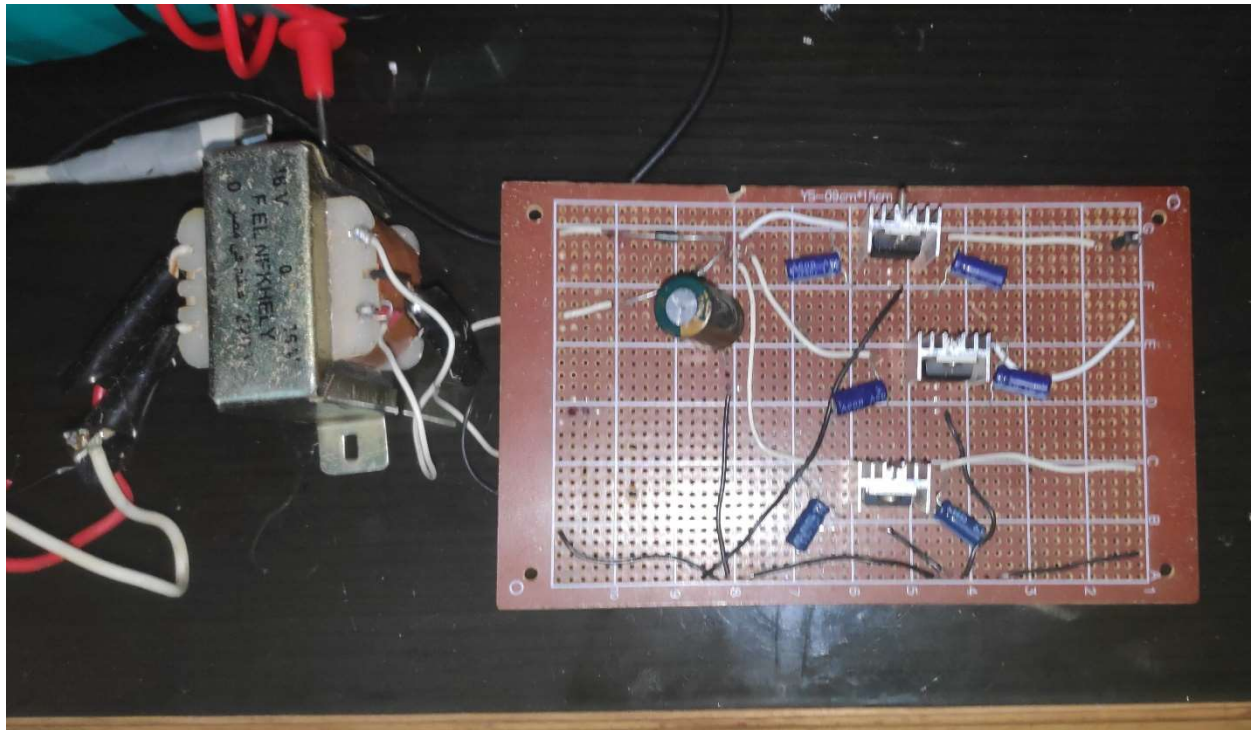


Top side

Schematic



PCB



- على أحمد إبراهيم عبدالغفار
- أحمد جمال السيد ابو الخير
- يوسف إبراهيم عبدالعزيز السيد ندا
- هشام محمد بدير المرسي
- معاذ وائل علي عبيد
- عمر كمال محمد كمال
- حسن سليمان حسن محمد
- محمد احمد السيد أحمد منسي
- احمد إبراهيم عبدالحميد أحمد
- محمود مصطفى عطية مصطفى
- محمد حسن عبدالعزيز سالم
- محمد عمرو أحمد فوزي