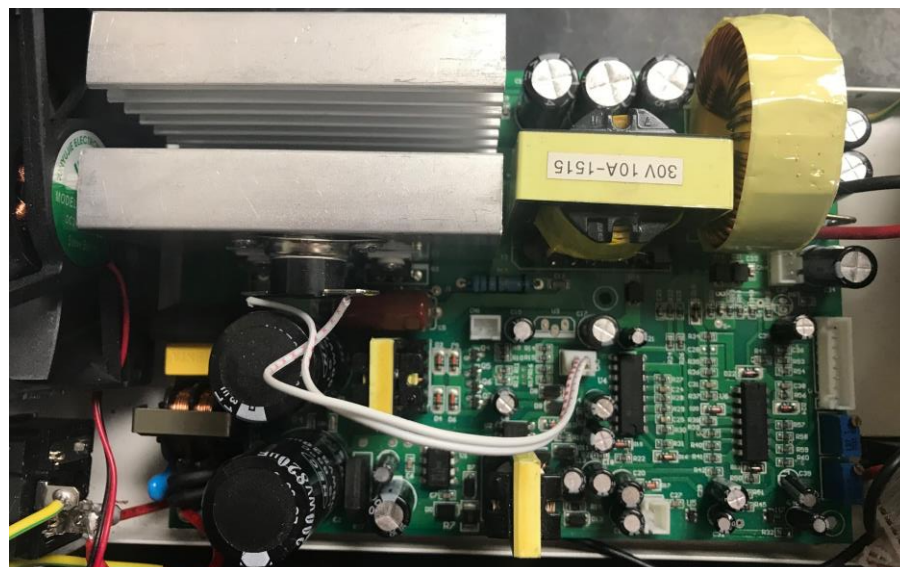


Integrated Circuits of the QW-MS3010D DC Power Supply

Team: 60X – Discobots NT Crossfire



The QW-MS3010D DC Power Supply is a bench top power unit for electronic hobbyists. This unit contains the most common components found on a circuit board such as capacitors, resistors, transformers, coils, and diodes. Rather than detailing out each and every one of those components, I have chosen to focus strictly on the integrated circuits used in this device.



Texas Instruments: TL084CN

The bench top power supply operates with two Texas Instruments TL084CN chips. The TL084 series are operational amplifiers that are devices designed to amplify voltage used with external feedback components such as resistors and capacitors between its output and input terminals. The external components determine the resulting operation by using various feedback configurations either resistive, capacitor based, or both. The TL084 can provide a variety of operations hence the term “Operational Amplifier”

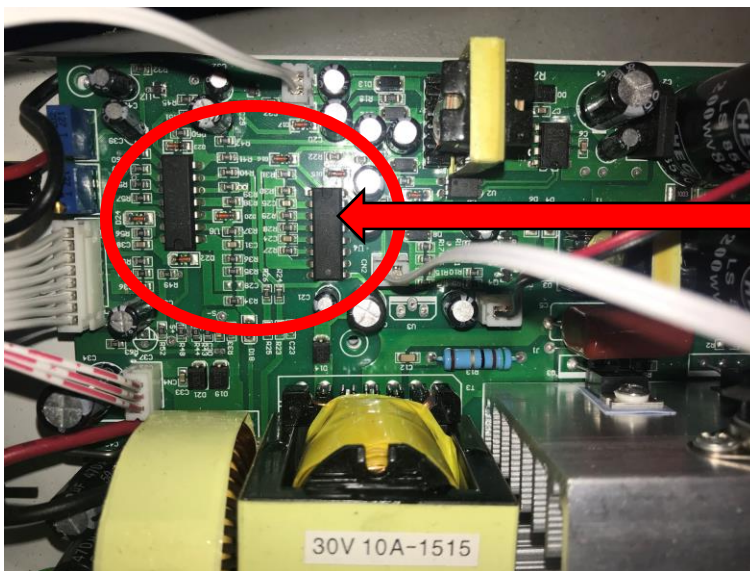


Figure 1:1 showing the location of the two TL084CN chips on the circuit board.

Figure 1:1

TL084 and TL084x D, J, N, NS and PW Package
14-Pin SOIC, CDIP, PDIP, SO, and TSSOP
Top View

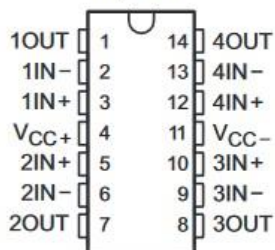


Figure 1:2

The TL084CN is a 14 pin option in the JFET TI-OP Amp series containing high voltage JFET amplifiers and bipolar transistors in a monolithic integrated circuit. Monolithic meaning **“resembling a monolith, or single huge black stone.”** (Courtesy of Merriam-Webster Dictionary).

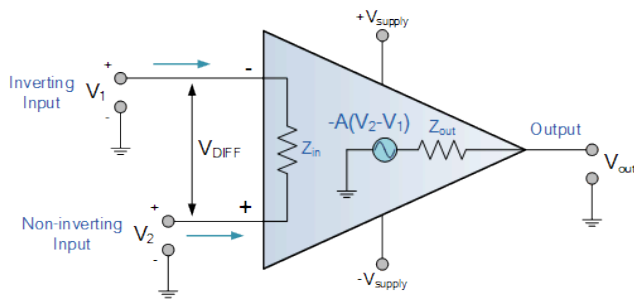


Figure 1:3

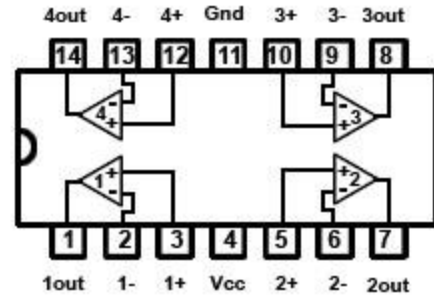


Figure 1:4

Figures 1:3 and 1:4 Courtesy of:

http://www.electronics-tutorials.ws/opamp/opamp_1.html

The OP AMP is a three terminal device that contains two high impedance inputs, one with a minus sign called an inverting input, and one with a positive sign called the non-inverting input. The third terminal is the output terminal. In figure 1:4 you can see that the TL084 14-pin series contains four sets of these three terminal devices. Operationally the third terminal can sink both source voltage and current. The output signal is the amplifiers gain multiplied by the input signal depending on the classification of the amp gain.

The power supply is using two of the TL084's as voltage amplifiers. These are very high gain DC differential amplifiers that use one or more external resistors or capacitors to the op-amp in various ways to form a basic foundation for most commonly used electronic kits and projects.

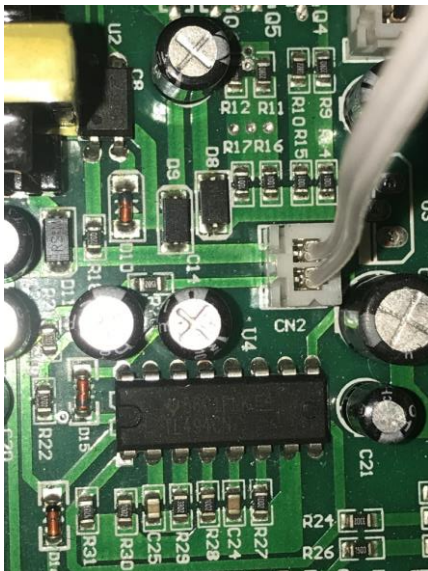


Figure 1:5 shows one of the TL084CN chips. You can see the various resistors and capacitors connected to the inputs and outputs. For example Output pins 14 and 8 both connect to 200 μf 35 volt capacitors. Pins 1-6 connect to external resistors or capacitors.

The feedback components also create an additional load for the op amp which flows through zener diodes at pins 3 and 10 for example.

Figure 1:5

Shenzhen Dongke Semiconductor Company: DK112

DK112 chip is a dedicated low-power switching power supply control chip, widely used in power adapter, LED power, Induction systems, air conditioning units, DVD and Blu-ray players and other small household electrical appliances.

The DK112 is specially design for low power switch mode control.

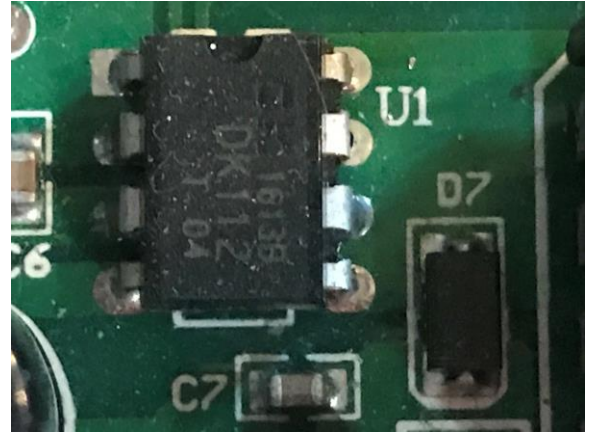


Figure 2:1

Main features:

- 85V—265V wide range AC power input.
- 65 KHz Oscillation Frequency.
- Double chip design with Bipolar Junction Transistor (BJT) to save cost.
- Large scale MOS digital circuit design with E class BJT driving, so that to enhance its High Voltage Resistance capability.

PIN FUNCTION

Pin NO.	Pin Name	Function
1	Test	Testing pin, suggested to be unloaded.(Prohibited to be connected to other circuits)
2	GND	Ground reference
3	Fb	Feedback control pin
4	Vcc	Power supply of the control circuits
5,6,7,8	Collector	Output pin. Connected with internal high voltage Collector point and switch mode transformer.

Figure 2:2



Figure 2:3

Images and data courtesy of:

<http://www.datasheetcafe.com/dk112-datasheet-switching-power-supply-control-chip/>

GC7137AD: LCD Driver Circuit

The GC7137AD circuit is described as a high performance, low cost 3 ½ A/D converter circuit, used to power LED display characters.

The circuit from power supply mirrors the schematic in figures 3:1 and 3:2.

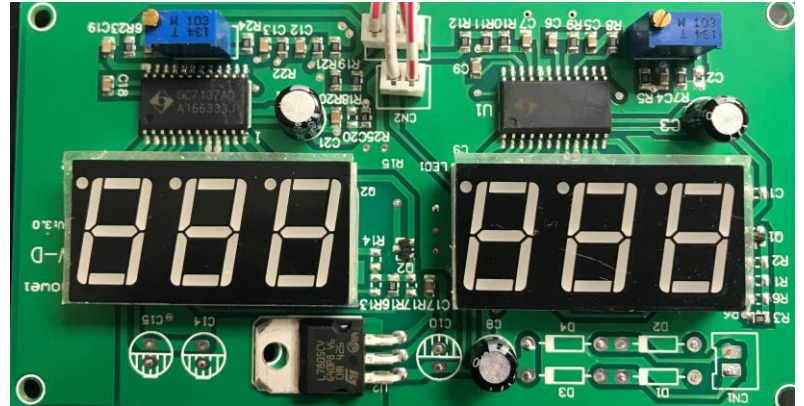


Figure 3:1

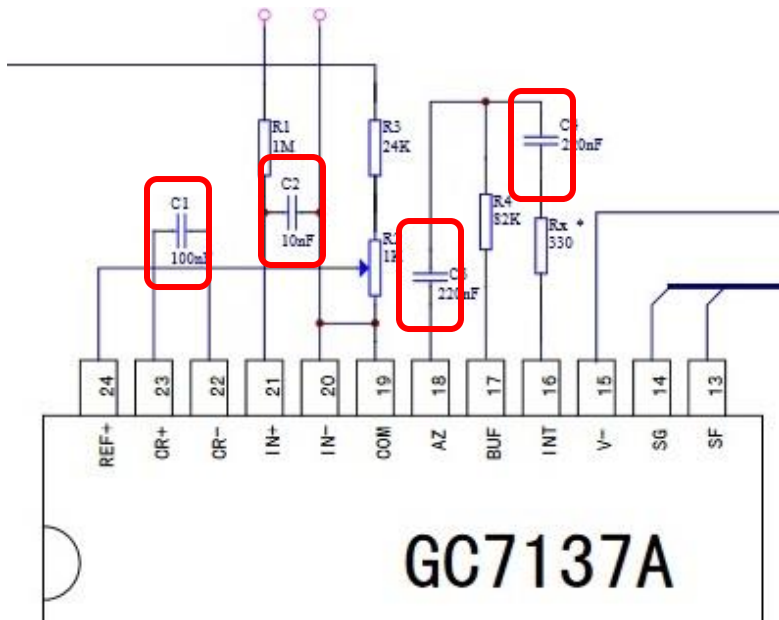


Figure 3:2

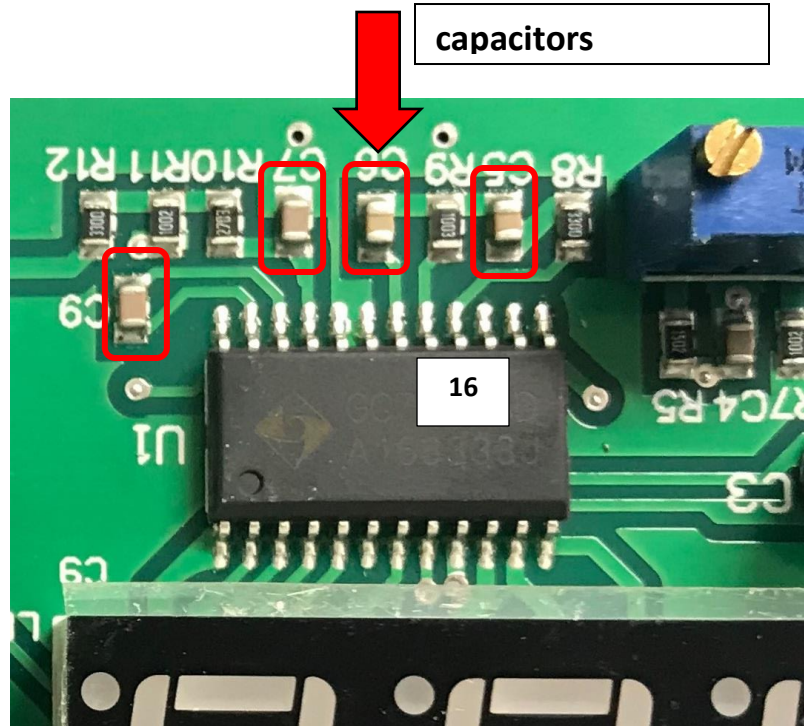
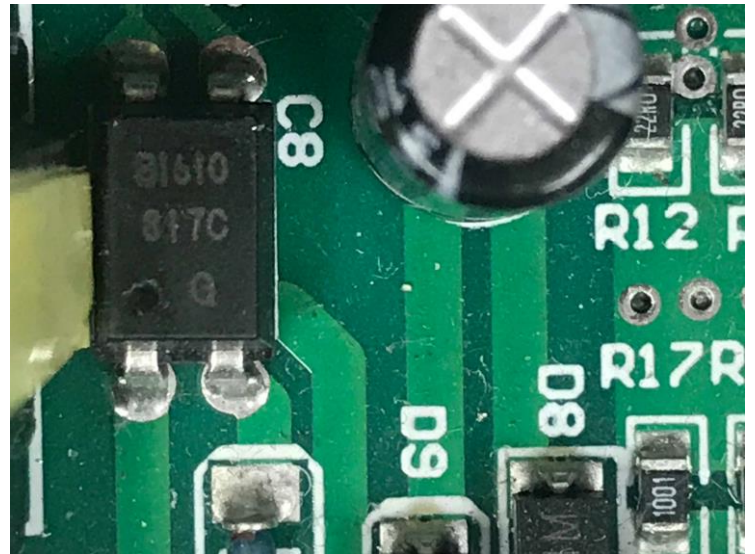


Figure 3:3

Example of matching schematic to actual circuit. Pin 16 (INT) is connected to an external resistor followed by a 200 μ f capacitor. In addition you can easily trace the path that each pin makes to either a resistor or capacitor.

S817C: CMOS Voltage Regulator

The S-817 Series is a 3-terminal positive voltage regulator, developed using CMOS technology. Small ceramic capacitors can be used as the output capacitor, and the S-817 Series provides stable operation with low loads down to 1 μ A.



Conclusion:

During this investigation I learned a little more about the types of integrated circuits found in most electronic equipment. Each of these circuits are widely used in industry and each of these components has a wide variety of uses. In addition it is interesting to see how the internal circuitry of the integrated circuits works with external components and how the actual circuit compares with schematic diagrams available on spec sheets.

Resources Used:

<http://grupoautcomp.com.br/wp-content/uploads/2016/11/Specification-IC-DK112.pdf>

<http://www.datasheetcafe.com/dk112-datasheet-switching-power-supply-control-chip/>

http://www.electronics-tutorials.ws/opamp/opamp_1.html

<http://www.ti.com/lit/an/sboa059/sboa059.pdf>

<http://www.ti.com/product/TL084/datasheet/specifications#SLOS0819843>

<http://pdf.datasheetbank.com/datasheet-download/843866/1/ETC/GC7137A>

<http://www.techcodesemi.com/datasheet/TD1507.pdf>