Using the constant current source

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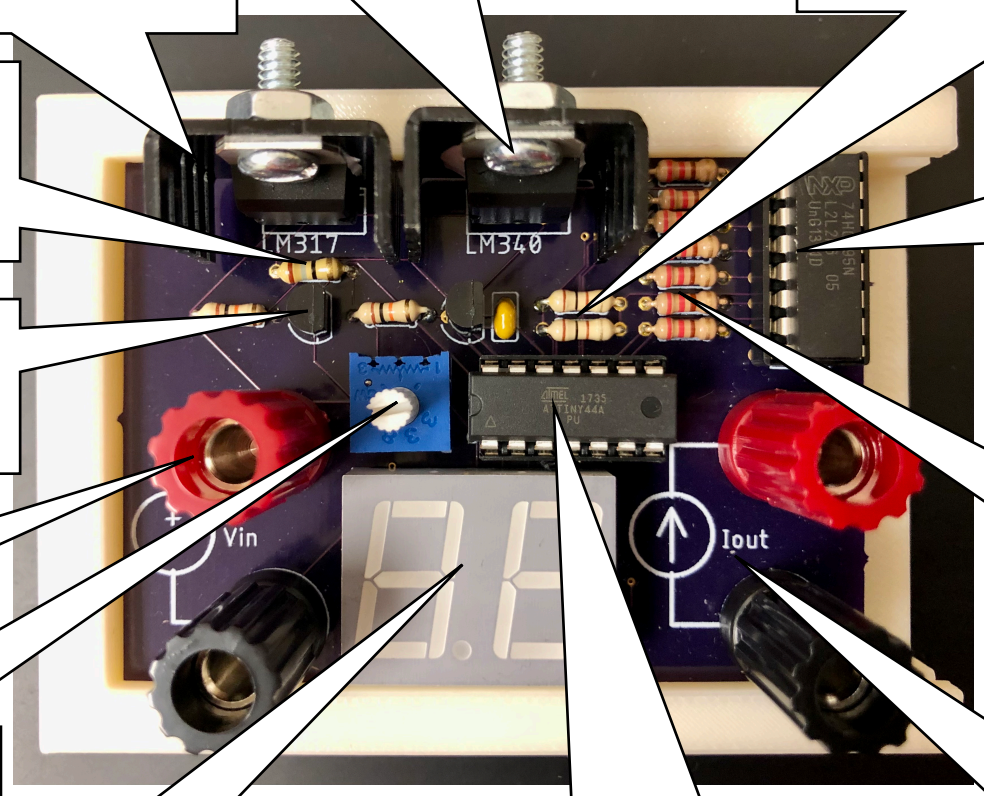
HOW IT WORKS

A voltage regulator maintains 1.25 V over a tunable resistance, creating a variable, but constant, output current that is independent of the load circuit.

COMPONENT VIEW



LM317 voltage regulator maintains 1.25 V over a tunable resistance.

LM340 voltage regulator maintains 5 V for the digital logic components.

Two 100 Ω resistors in parallel are in series with Iout to create a voltage proportional to current sent to the microcontroller to create a current readout.

18 Ω resistor provides a value for max output current.

74595 chip sends values to segmented display.

10 kΩ resistors + transistors to drive the display.

Current-limiting resistors for the segmented display LEDs.

DC voltage input.

1 kΩ pot used to adjust the current.

ATtiny44 microcontroller manages the current readout using an analog to digital converter.

Constant current output.

Segmented display shows the current to one's place precision (only when a load is connected.)

VOLTAGE

The voltage input must be >7.5 V to function.

Voltage needs to be larger (≥20 V) for large values of output current.

CURRENT

The current reading displays a value only when connected to a load.

Use an ammeter in series with the output to obtain a precise value.

$$I_{OUT} = \frac{1.25}{18 + R_{POT}}$$

POWER

The heat sinks will get hot for large currents!

Any load resistors in series must be small enough to satisfy…

$$R < \frac{0.25}{I^2}$$

…where R is in Ω and I in A.