

Improved 'Low Head' Regulator.

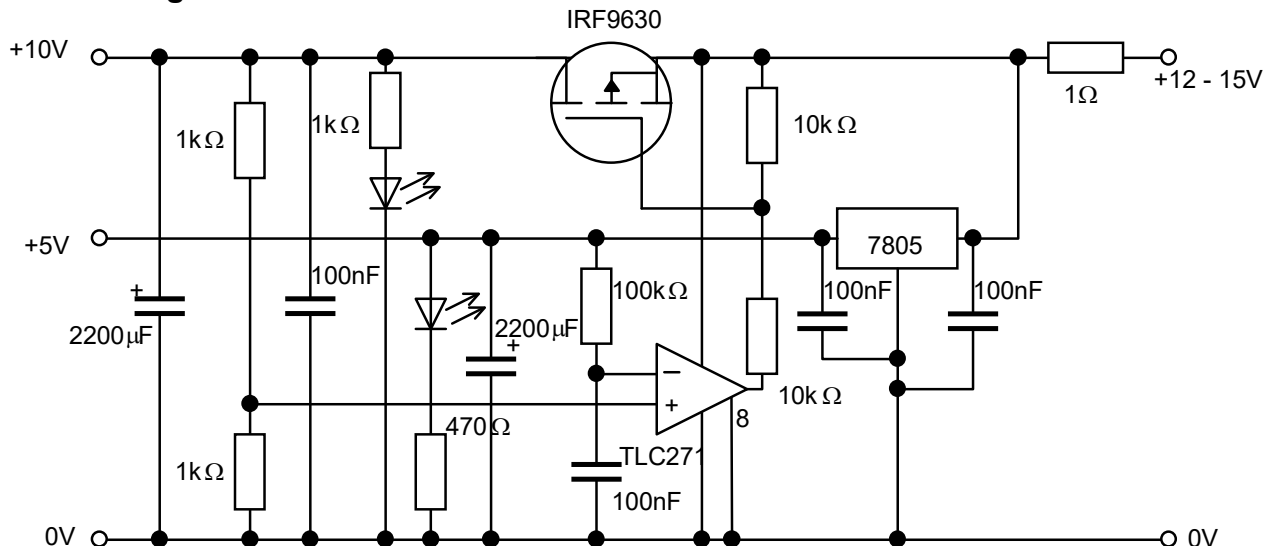
Specification

Provides a 5V and 10V stabilised power supply from a 12 - 15V supply

Provides a current of $\approx 0.5\text{A}$ at 5V and $\approx 0.2\text{A}$ at 10V

The 10V supply can be readily adjusted to other voltages (e.g. 9V).

Circuit diagram



How it works

The 7805 regulator provides a stable 5V supply and is used as a reference voltage for the comparator formed from the TLC271 op-amp. The other input to the comparator comes from a voltage divider connected across the '10V' output formed from two 1k Ω resistors. The output voltage from this divider circuit is compared with the 5V from the 7805 by the op-amp. If the potential divider output is greater than +5V, then the output of the op-amp increases, so making the IRF9630 conduct less, thus maintaining the output voltage at 10V. If the output from the potential divider is less +5V, then the output from the op-amp decreases so making the p-channel MOSFET conduct more, again maintaining the output voltage at 10V.

Notes

- This circuit is best suited when there is only a small voltage difference (1 - 5V) between the input and output. If the voltage difference is greater than $\approx 4V$ then the normal emitter follower transistor regulator is better suited as there may be less power wasted.
- The IRF9630 and 7805 should be mounted on heatsinks.
- Any other p-channel MOSFET should be suitable for use in this circuit e.g. IRF9530 etc
- The TLC271 bias is set high by connecting pin 8 to 0V.
- The voltage gain loop of the op-amp and the IRF9630 is very high and the circuit can oscillate at a low frequency if a large value capacitor is not placed across the output. The 2200 μF capacitors were only used because they were available. (Capacitors $\geq 470\mu F$ should be sufficient)
- BiFET op-amps are not suitable for this circuit since there is a tendency for the output to latch high or low if their inputs are near to the supply line voltages at any time.
- The 7805 could be replaced with a 5V zener diode and series resistor or 78L05 if there is only a small current requirement from the 5V supply.

Construction

The circuit is not fussy in the method of construction and has been built on both prototype board and strip board.

A picture of the stripboard version is shown below.

