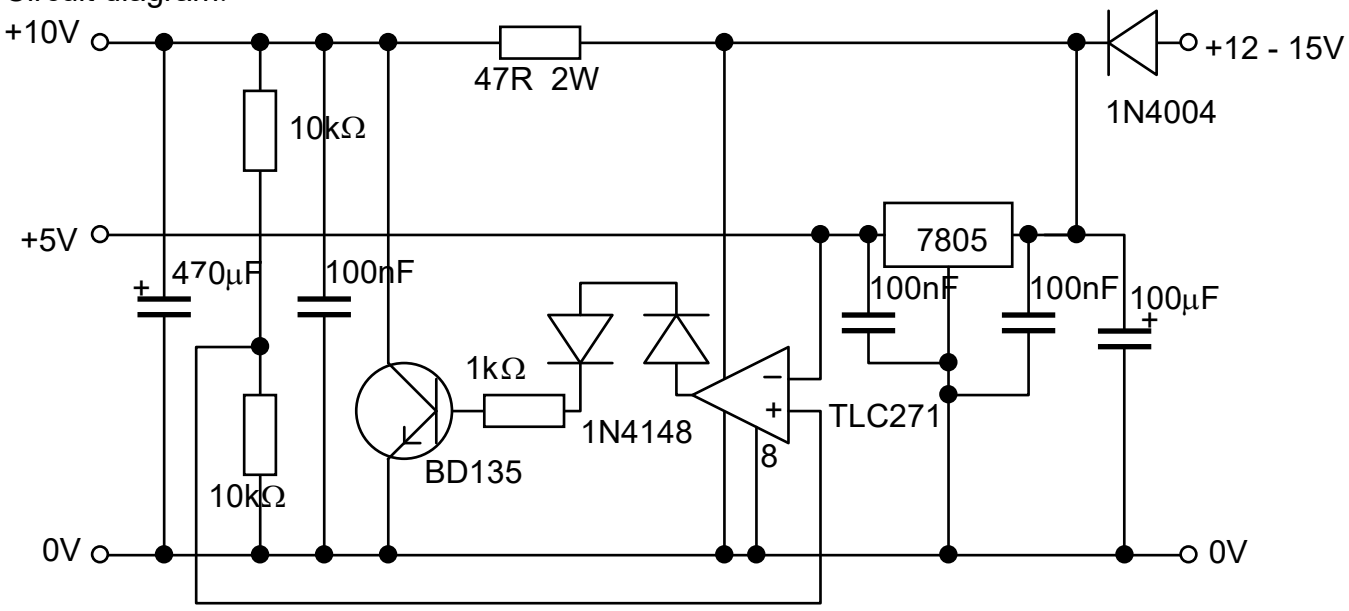
'Low Head' Regulator.

This circuit uses a standard shunt transistor to provide a stabilised voltage.
This circuit is best suited when there is only a small voltage difference (1 - 4V) between the input and output.
If the voltage difference is greater than ≈4V then the normal series transistor regulator is better suited as there may be less power wasted.

This circuit was designed to provides a 5V and 10V stabilised supply from a 12 - 15V supply. The 5V output is from a standard 7805 regulator and the 10V supply was only needed to supply a current of around 30mA. However, the principle of operation can be readily adopted for other currents and voltages.

Circuit diagram.



The BD135 and 7805 are both mounted on heatsinks.

The two 1N4148 diodes in series with the output of the TLC271 are included because the low output voltage of the op-amp is approximately 1.5V, which would keep the BD135 permanently conducting. The TLC bias is set high by connecting pin 8 to 0V.

The two 10kΩ resistors form a voltage divider. 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 BD135 conduct more and so causing a larger voltage drop across the 47Ω resistor, thus maintaining the output voltage at 10V.
The voltage loop gain of the op-amp and BD135 is very high and the circuit will oscillate at a low frequency if a large value capacitor is not placed across the output. A 470µF capacitor was found to be adequate for the circuit described above.

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.