

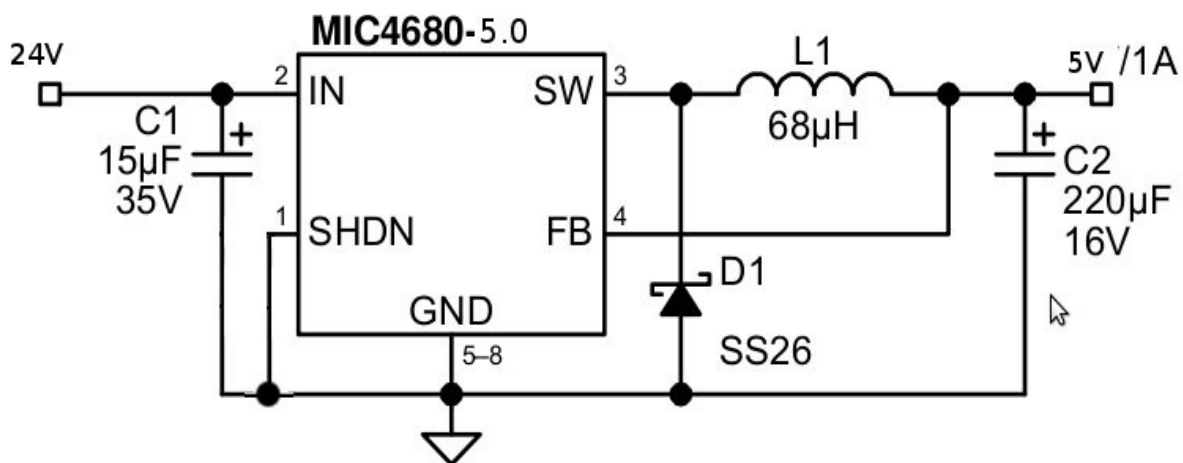
Changes in the power supply of the Laser 3D PIC PCB. RPascoal, January 2010.

voltage regulation was previously performed by a series regulator 7805, operating temperature up to 125°. Thermal junction to case 5°C/W, case to air 65°C/W. Unit price €0.53 from rs-components.

Regulation is from 24V → 5V. Consider air temperature 35°C (summer), with no heat sink, the maximum dissipated power is $(125^{\circ}\text{C}-35^{\circ}\text{C})/(70^{\circ}\text{C}/\text{W})$, which means 1.29W. In this case the regulator could supply a current of about $1.28\text{W}/(24\text{V}-5\text{V}) = 67\text{mA}$. This is not a good configuration to supply the PIC (~ 30mA), MAX232 (~10mA) and an LED (~20mA) without getting very hot. Though there was a heat sink, efficiency in this case is always roughly 20%.

A Buck regulator was equated. The main advantage is long term reliability and higher efficiency. For testing, a MIC4680-5.0Y was chosen because it supplies 1A with its integrated switch. Unit price €1.8 from rs-components (price of this component varies quite a lot with supplier). The efficiency of this circuit is between 60 and 75% (75% with currents above 0.2A).

The following circuit diagram was used:



To make the winding, a toroid nucleus was used and tested with an OPAMP oscillator but best option is to buy one. The capacitors are recommended to be solid tantalum, careful that prices vary a lot depending on maker and supplier. The circuit can fit into roughly the same space of the 7805.