Project : Switched capacitor voltage regulator

Students:	Vadim Berdichevsky Id: 305887234	Avihay Zaguri Id: 300779881
		

Supervisor : Prof. Sam Ben-Yaakov

Year : 2009

Abstract

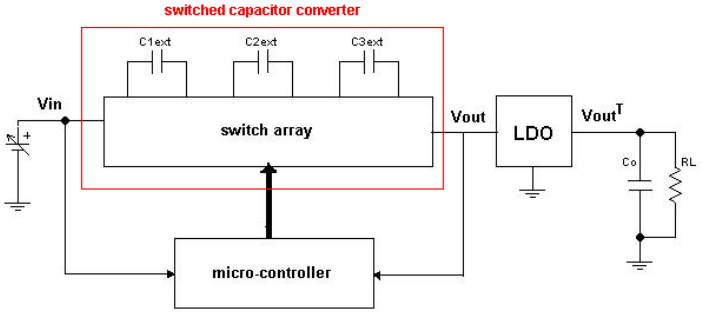
One of the trends in power electronics in recent years is the development of power converters based on switched capacitors (SCC) without magnetic components such as inductors or transformers. These converters are useful in low power mobile systems because of their light weight and their low EMI emissions.

At a fixed conversion ratio, the SCC usually works with high efficiency due to the almost constant dc voltages across the flying capacitors in the converter. Some SCC are able to work with several conversion ratios, what gives them the ability to work with high efficiency at large number of target voltages. One can use this to construct a switching inductorless regulator that works at high efficiency over wide range of input voltages.

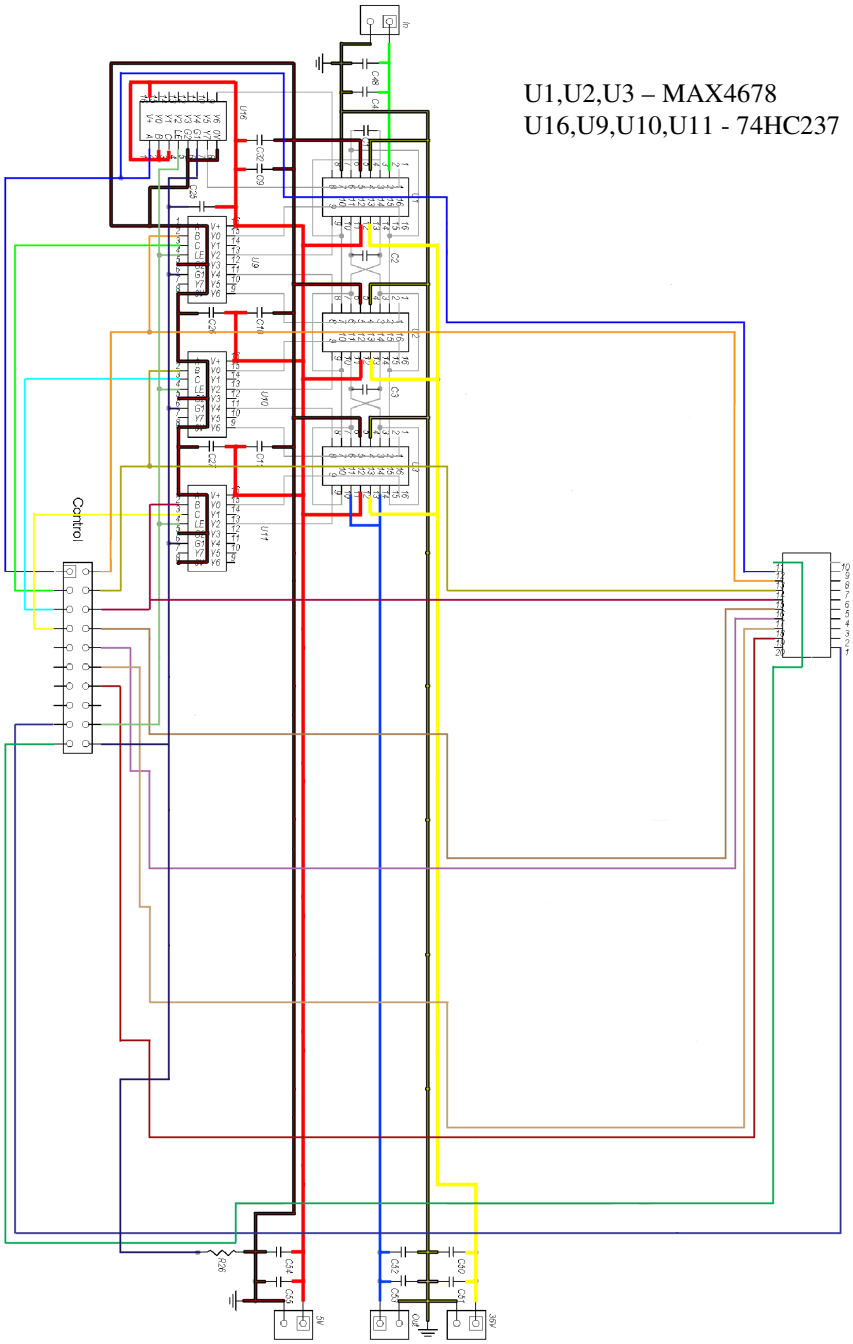
Model for voltage regulator based on switched capacitors converter has been derived and tested. The converter is based on a new method of generating EXB codes and translating them into SCC topologies. This method allows us to perform both step-up and step-down conversions, to increase the number of conversion ratios to 2^{n+1} and to work in high efficiency over wide range of input voltages.

The new regulator was tested and the theoretically predicted results were verified by experiments.

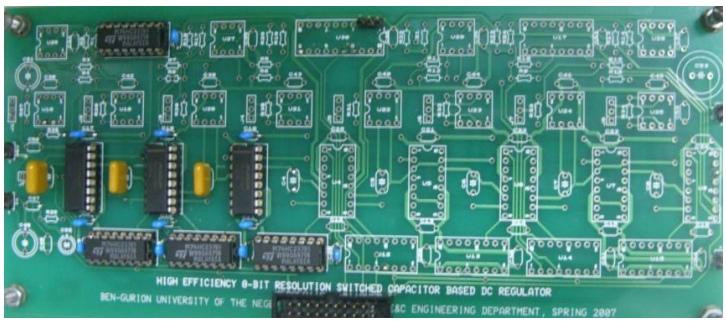
Scheme:



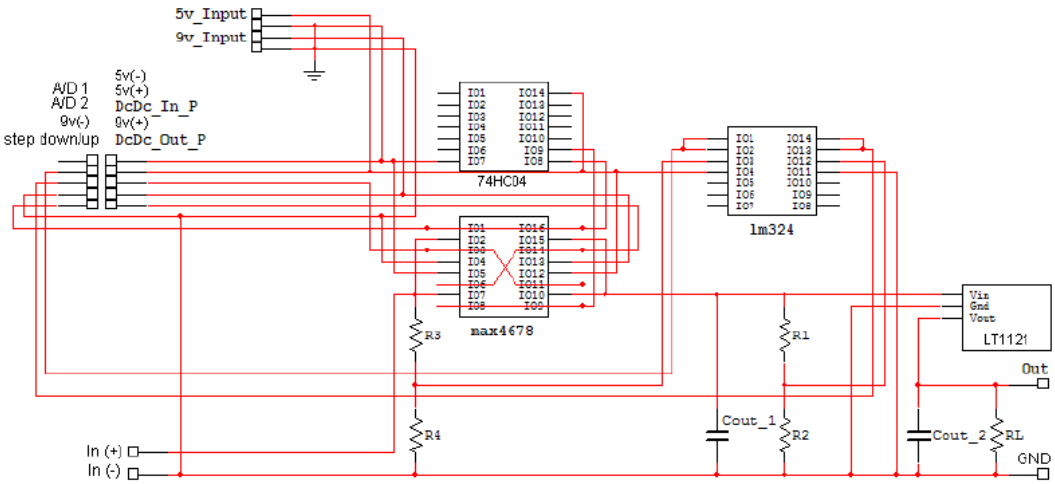
Layout of the converter:



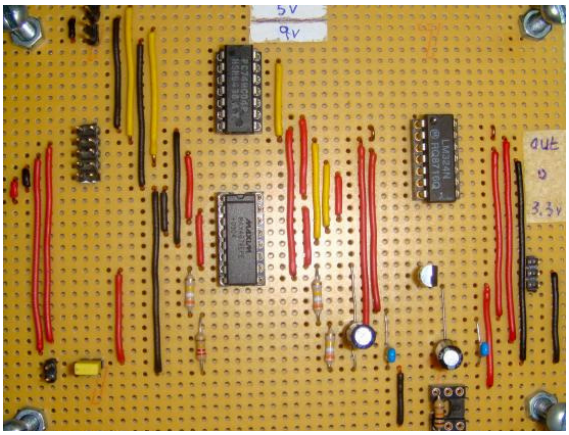
U1,U2,U3 – MAX4678
U16,U9,U10,U11 - 74HC237



Layout of the whole system:



1) The ports dcdc_in, dcdc_out represent the input and the output of the converter shown previously
2) A/D 1,2 connected to the micro-processor PIC18
3) The mark (-) is ground



Results: