Fakulti:	**FAKULTI KEJURUTERAAN ELEKTRIK**	
Nama Matapelajaran: MAKMAL TAHUN 3 Kod Matapelajaran : SKEE 3742		Semakan : 2 Tarikh Keluaran : 2007 Pindaan Terakhir : 2015 No. Prosedur :

SEE 3742

FAKULTI KEJURUTERAAN ELEKTRIK
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POWER ELECTRONIC LAB

STUDENT PACK
Boost Converter

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Layout Requirements

Boost Converter Power Stage:

For the boost converter power stage we have designed a PCB layout for you. You are required to make a finish PCB at the PCB lab. As such, your works include making PCB, drilling holes and soldering.

PWM Signal Generation on Proto-board:

How you build the circuit you want to test is as critical to its performance as the parts you choose. Properly placed and correctly interconnected your circuit components give you performance that closely follows your calculations and simulation. However, careless placement or poor wiring assures that the large signal from the output contaminates the input, causing oscillations everywhere. In short, to build a working circuit you must be able to:

(i) Define the mechanical requirement of the circuit
(ii) Identify the critical path
(iii) Place the component correctly
(iv) Select the correct inter-connector sizes and route signal, power, and circuit common connection.
(v) Discuss other concerns

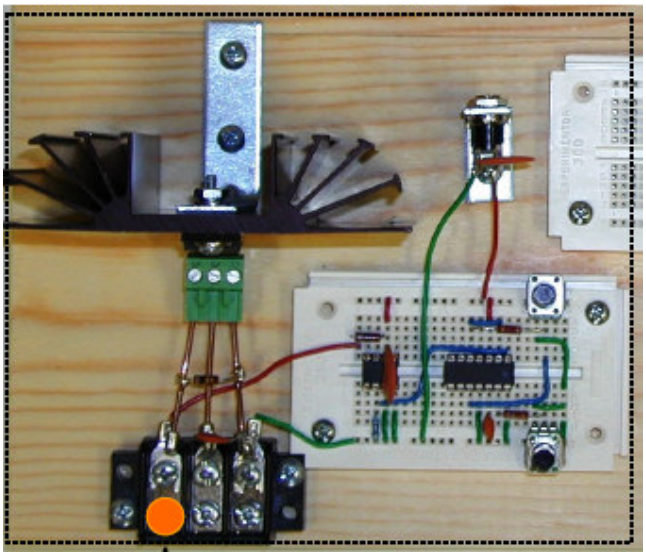

Figure 1: Picture of a proper layout and connections on proto-board

In your report don't forget to describe the various steps that were performed when building the circuit. Give information about the problems found and how the solutions were implemented.

PWM Waveform Generation

To generate PWM waveform using discrete components could be fairly extensive. Fortunately, because of the demand for such circuits, manufacturers have designed integrated circuit that performs the task. In this project, we will use SG3524 from Silicon General. The IC PWM controller has an op-amp, a comparator, a saw-tooth generator, a reference voltage and two output drivers. Details of this IC are given in the data sheets.

To generate a square wave using SG3524, you can construct the test circuit shown in Figure 2. From the data sheet you can find a value of RT and CT for your desired switching frequency. You can measure the frequency of the saw-tooth wave (it is the same as the switching frequency of the circuit) at CT (pin 7) to confirm your choice. To vary the duty cycle of the waveform, you can adjust the 10k potentiometer. By using Oscilloscope, you have to record the voltages at pin 9, pin 2, OUTA and OUTB.

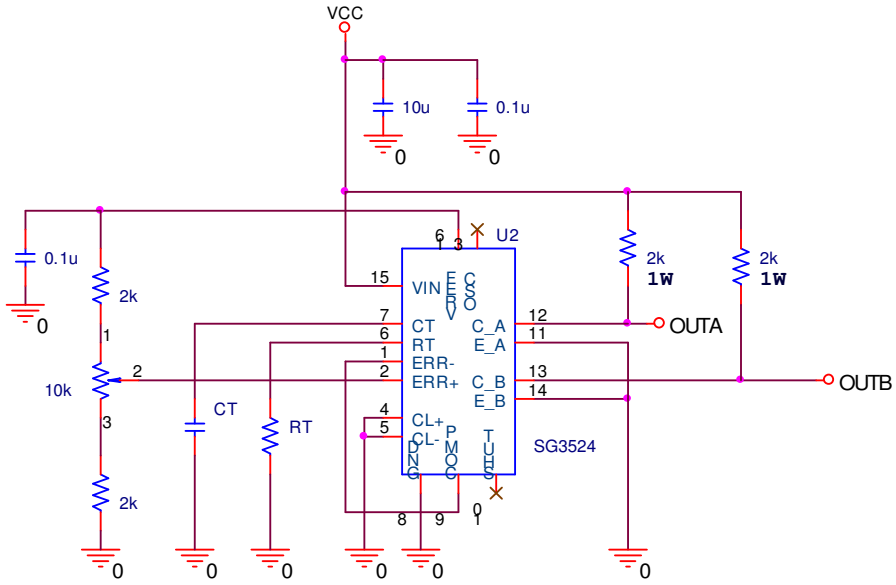

Figure 2: Test circuit for SG3524

The outputs of OUTA and OUTB have a maximum duty cycle of 50%. To vary the outputs through a full range of duty cycles, you have to connect the output together and tie them to the VCC as shown in Figure 3. The rest of the circuit is connected as above. You can verify the circuit works by checking the collector voltage of the chip.

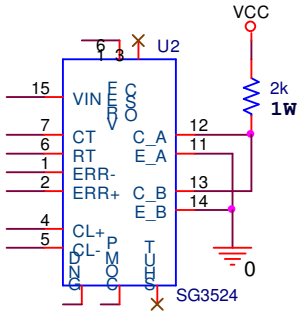

Figure 3: OUTA and OUTB tied together

Assembly of the dc-dc boost converter

To drive an N-channel MOSFET in the dc-dc boost converter circuit, you need a high side MOSFET driver such as IR2117. Figure 4 shows a complete circuit that combines a PWM signal generation, a MOSFET driver circuit, and a dc-dc boost converter. You have to build this circuit. To verify the operation, you have to adjust the potentiometer to change the duty cycle and observe the voltage across the diode. You have to record the output voltage and the inductor current ripple.

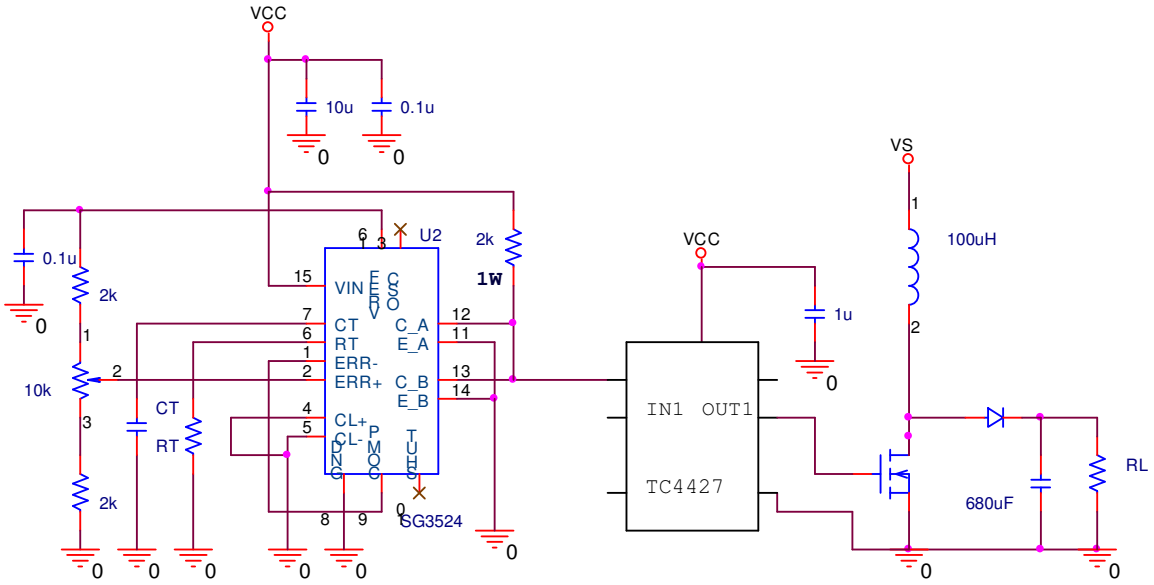

Figure 4: Boost converter and drive circuit

(a) Problem-solving Time-line

Activities	Week1	Week2	Week3
Study on the boost converter and PWM controller IC			
Making PCB, Drilling and Soldering of the PCB			
Calculation and simulation			
PWM signal generation on proto-board			
Assemble the Complete circuit			
Presentation			

(b) Report

The report should be very thorough and complete. Some things that might be included in the report are:

1) Waveforms from the various currents and voltages, not just the output current and voltage.
2) A comparison of the waveforms with the simulation
3) Descriptions of the functions of the various components and circuits.

Summarize what was done in the previous experiments and describe the steps you did to complete the construction in this experiment.

2 Equipments list:

(a) DC power supply
(b) PCB
(c) Proto-board

	(d) Jumper wire (e) Solder (f) Oscilloscope
4.	**Softwares:** Examples as follows
	(a) PSpice Student Version 9.1 (available in all PCs at the laboratory)
5.	**Additional resources:**
6.	**References:**
	(a) "Introduction to Power Electronics", Daniel W. Hart, Prentice Hall International Inc., 1997