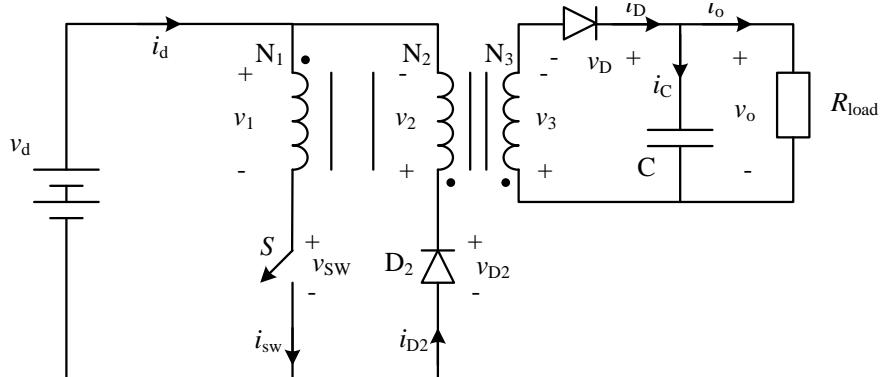


Assignment 3 - Flyback Converter

The questions marked HA are home assignments to be completed before the laboratory starts.



Nominal values

Source voltage	$v_d = 40V$
Turns ratio	$N_1 = N_2 = N_3$
Magnetizing inductance	$L_m = 200\mu H$
Snubber resistance	$R_{snub} = 470\Omega$
Snubber capacitance	$C_{snub} = 100nF$

Filter capacitance	$C = 40\mu F$
Load resistance	$R_{load} = 10\Omega$
Switching frequency	$f_{sw} = 25kHz$
Duty ratio	$D = 0.4$

Source file: *assignment_3.opj*

Tasks/Questions:

HA 1: Neglect winding N_2 of the transformer and the diode D_2 and assume a continuous magnetizing current in the transformer. Sketch the voltages and the currents in the flyback converter. Calculate the average output voltage and the average and the peak-to-peak ripple in the magnetizing current

1. Open the schematic *flyback with_snubber* and obtain the voltages and the currents in the circuit. Calculate the average output voltage and the average and ripple magnetizing current and compare the results with the home assignment. What is the maximum voltage over the switch?

HA 2: Derive the input-output voltage relation for continuous and discontinuous magnetizing current.

2. Change the load resistance to 15, 20, 50, 60 and 70 Ω (the smaller load resistances result continuous magnetizing current) and measure the average output voltage. Compare the results with the theoretical values and comment on the differences.
3. Study the maximum voltage over the switch and the shape of the magnetizing current for two study cases (i.e., $R_{load} = 100k\Omega$, $D = 0.4$ and $R_{load} = 10\Omega$, $D = 0.55$). From the study, can you explain the purpose of winding N_2 and diode D_2 ?
4. In the schematic *flyback_with_snubber*, a snubber circuit is implemented (C_s , R_s and D_s). Open the schematic *flyback_no_snubber*, simulate and study the voltage over the switch. Compare the result with task 1. Can you describe the purpose of the snubber circuit?