# ECEN 405
# Lab 5: Power converters
# (Part 4 - Buck-Boost Converter) Submission

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## 1 Design

$V_d = 10V,\ R_L = 500\Omega,\ L = 4mH,\ C = 100\mu F,\ D = 0.6, D_{max} = 0.67$

**Switching Frequency**

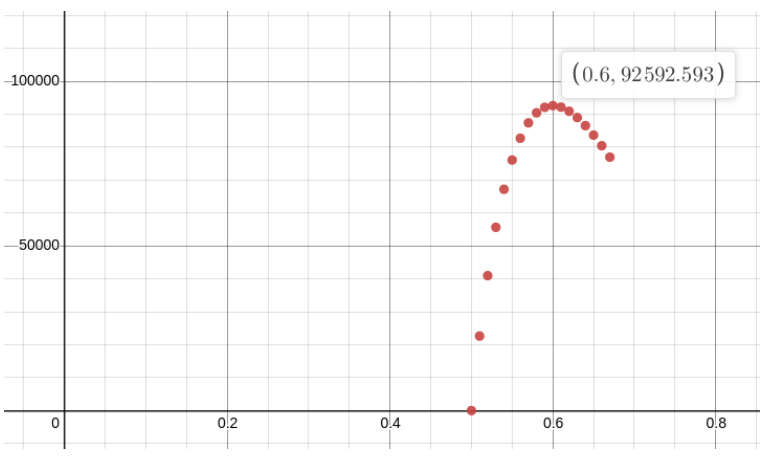
$$V_o = \frac{D}{1-D} V_d = 15V$$

$$I_o = \frac{V_o}{R_L} = 0.03A$$

$$I_{ripple} = 0.2 I_o \frac{V_o}{V_d} = 0.009A$$

$$I_{omax} = I_o + 0.5 I_{ripple} = 0.0345A$$

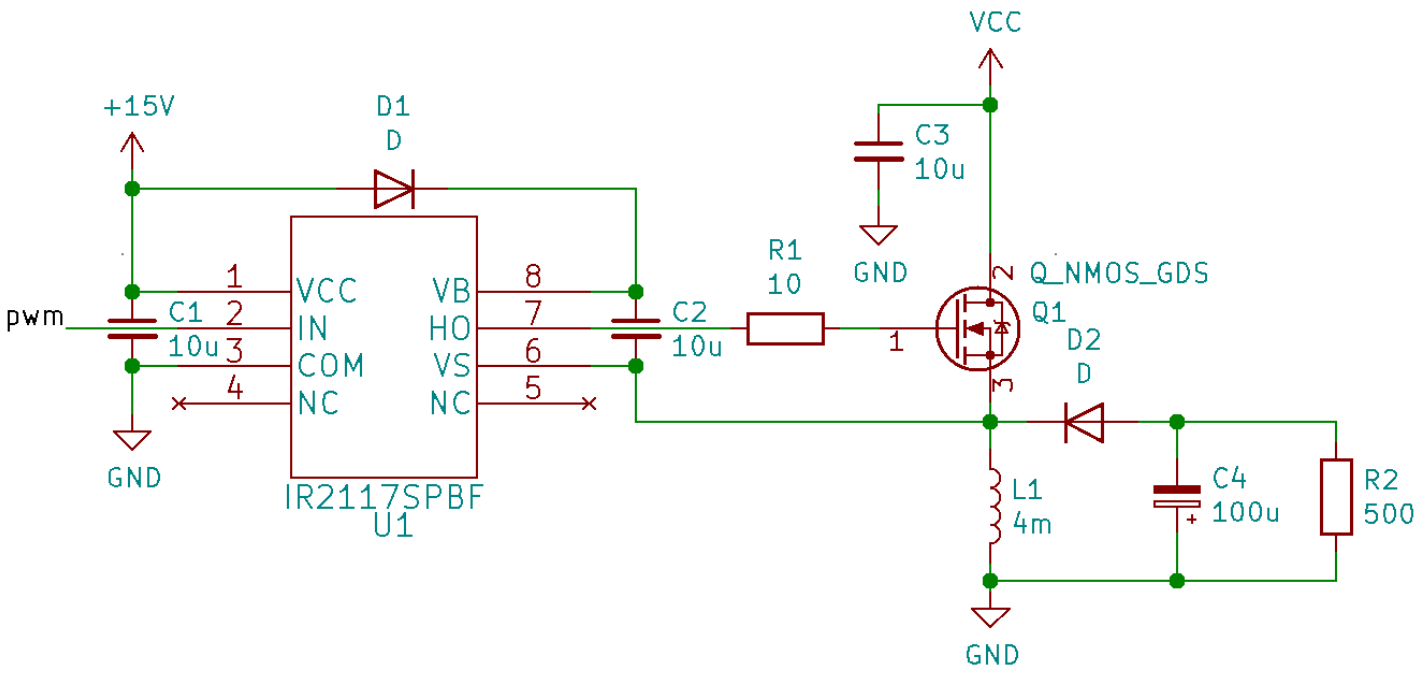
$$f_{sw} = \frac{V_d (V_o - V_d)}{L I_{ripple} V_o} = 92592.5925926Hz$$




*Duty Cycle vs Switching Frequency*

Note that a 60% duty cycle requires the highest switching frequency.

**Schematic**




**Output Voltage Ripple**

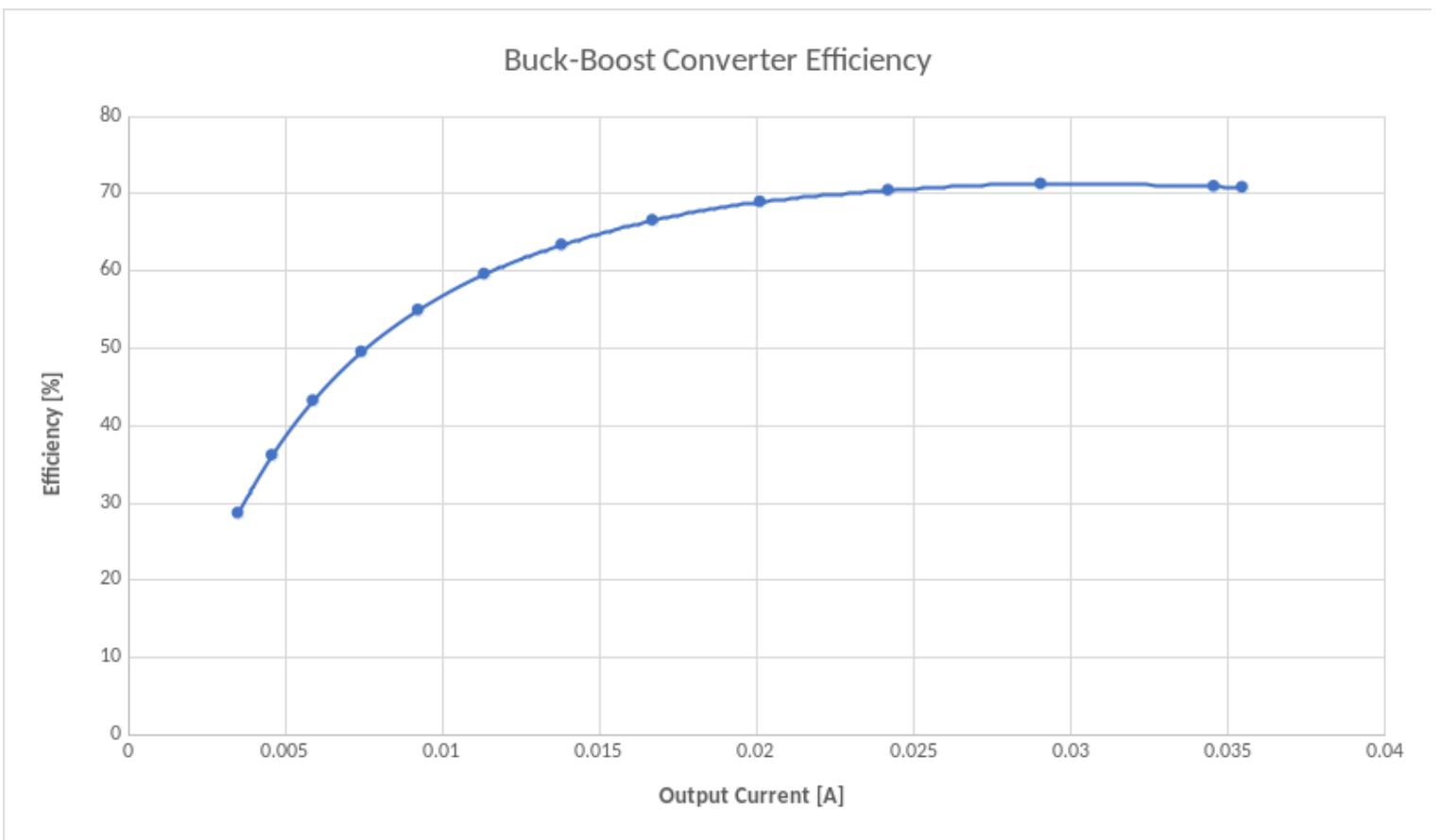
$$V_{ripple} = \frac{I_{omax} D_{max}}{f_{sw} C} = 0.00425V$$

## 2 Output

The USB drive with the "real" screenshots are still in the lab plugged into the computer with a half written report on it. So here is what it remember the signal looking like in paint.


From memory we had a ripple voltage or around 40mV to 80mV.

## 3 Efficiency

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