ECEN 405
Lab 1 PWM Submission

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Deliverables

1. Capacitance:

$$C_1 = \frac{10k}{4 \cdot 8.2k \cdot 1k \cdot 30kHz}$$
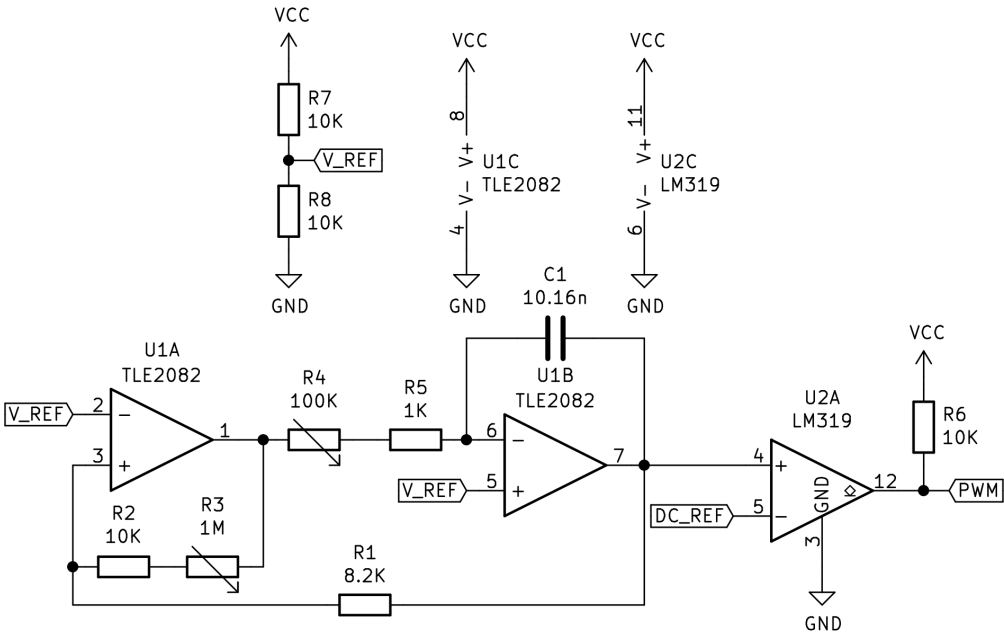$$= 1.016 \times 10^{-8}$$
$$C_1 = 10.16nF$$

2. Frequencies:
$R_1 = 8.2k,\ R_2 = 10k,\ ,R_5 = 1k, C_1 = 10.16nF$

$$F_t = \frac{(R_2 + R_3)}{4R_1(R_4 + R_5)C_1}$$
$$F_t\{R_3 = 1M,\ R_4 = 0\} = 3.03MHz$$
$$F_t\{R_3 = 0,\ R_4 = 100k\} = 297.1Hz$$
$$\text{to match lab value : } F_t\{R_3 = 0,\ R_4 = 1M\} = 29.97Hz$$

3. Schematic:

4. IRFBC40APBF: $R_{DS(on)} = 1.2$, $t_{c,on} = 13$, $t_{c,off} = 31$

$$\text{Conduction losses} = P_{cond} = R_{DS(on)}dI^2$$
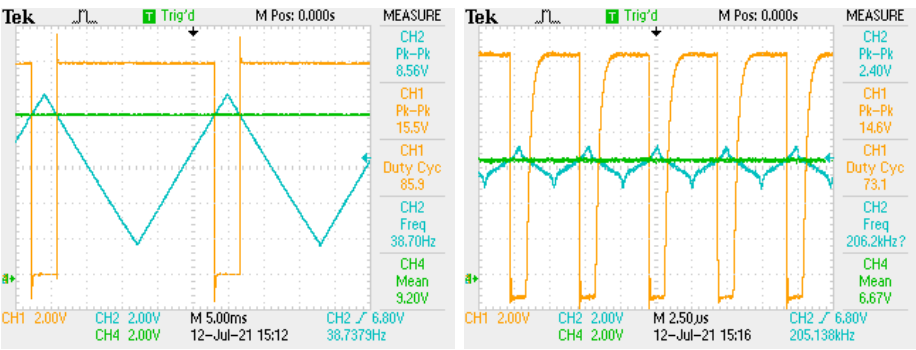$$= 1.2 \cdot 0.5 \cdot 1$$
$$= 0.6W$$

$$\text{Switching losses} = P_{sw} = \frac{1}{2}V_{in}I_o$$
$$@29.97Hz = 7.91\mu W$$
$$@297.1Hz = 78.4\mu W$$
$$@3.03MHz = 0.799W$$

5. Build it:

Danny B's approval of breadboarded circuit

6. Test it:

Lowest Frequency   *Highest Frequency*

7. Analog circuits funky

8. The LM319 is a duel chip, flip the input for the second and pull up its output to get an inverted signal

9. Sub-circuits: Gain Amp Oscillator and Integrator