Relevant equations

$$t_{on} = 0.693(R_A + R_B)C \; ; \; t_{off} = 0.693 R_B C$$

$$\text{Duty cycle} = \frac{R_B}{R_A + 2R_B}$$

Calculations (ideal):

Totally arbitrary for calculation sake

- One second on, one second off

$$t_{on} = 0.693(R_A + R_B)C = 1s \Rightarrow (R_A + R_B)C = 1.44s$$

$$t_{off} = 0.693 R_B C = 1s \Rightarrow R_B C = 1.44s$$

- Duty cycle of 50%

Playing around with algebra and realizing the below statement

$$\frac{R_B}{R_A + 2R_B} = 0.5 \Rightarrow R_B = 0.5R_A + R_B$$

$$\Downarrow$$

$$\frac{2R_B}{R_A + 2R_B} = 1 \Rightarrow 2R_B = R_A + 2R_B$$

Basically, the Duty cycle approaches 50% as $R_A << R_B$. This means that we want the potentiometer to be R_B since it will probably have the highest resistance (due to my limited recources).

Since we want R_B (a.k.a the potentiometer) to be much larger than R_A, if we want t_{on} to be 1s and hence $(R_A + R_B)C = 1.44s$ then $R_B C \approx 1.44s$

I've opted to use a 44.3K resistor