ECE 1895 - ASSIGNMENT 1 REPORT

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If pictures are obscure, they can be found from /LATEX. Calculation source codes can be found under /MATLAB. Schematics can be found under /LTSPICE.

Values selected:

According to the data sheet and and the relationships between resistors and periods, minimizing R_A yields $t_h = t_l$. I selected the following values because such resistors are common, and making sure R_A is very small compared to R_B:

$$R_A = 100\Omega$$

$$R_B = 10K\Omega$$

```
%Inputs:
val_RA = 0.1e3;
val_RB = 10e3;
val_pRan = [20e-6,500e-6]; %period range
%Calculations:
val_CRan = val_pRan/(0.693*(val_RA+2*val_RB))
```

$$C \subset (1.4358\mu F, 35.8956\mu F)$$

Picking a common capacitance values:

$$C = 10\mu F$$

All other capacitors and resistors have no effect on the period, so I'll leave them unchanged from the data sheet. For the source voltage,however, since no peak voltages are specified as per the requirements, I'll select an arbitrary source voltage:

$$V_{CC} = 10V$$

All other required calculations are as follows:

```
val_C = 10e-9;
val_peri = 0.693*(val_RA+2*val_RB)*val_C %period
val_freq = 1.44/((val_RA+2*val_RB)*val_C) %frequency
val_oddc = val_RB/(val_RA+2*val_RB) %output driver duty cycle
val_owdc = 1 - val_RB/(val_RA+2*val_RB) %output waveform duty cycle
val_lthr = val_RB/(val_RA+val_RB) %low-to-high ratio
```

Results:

$$\text{Period} = 139.293\mu s$$

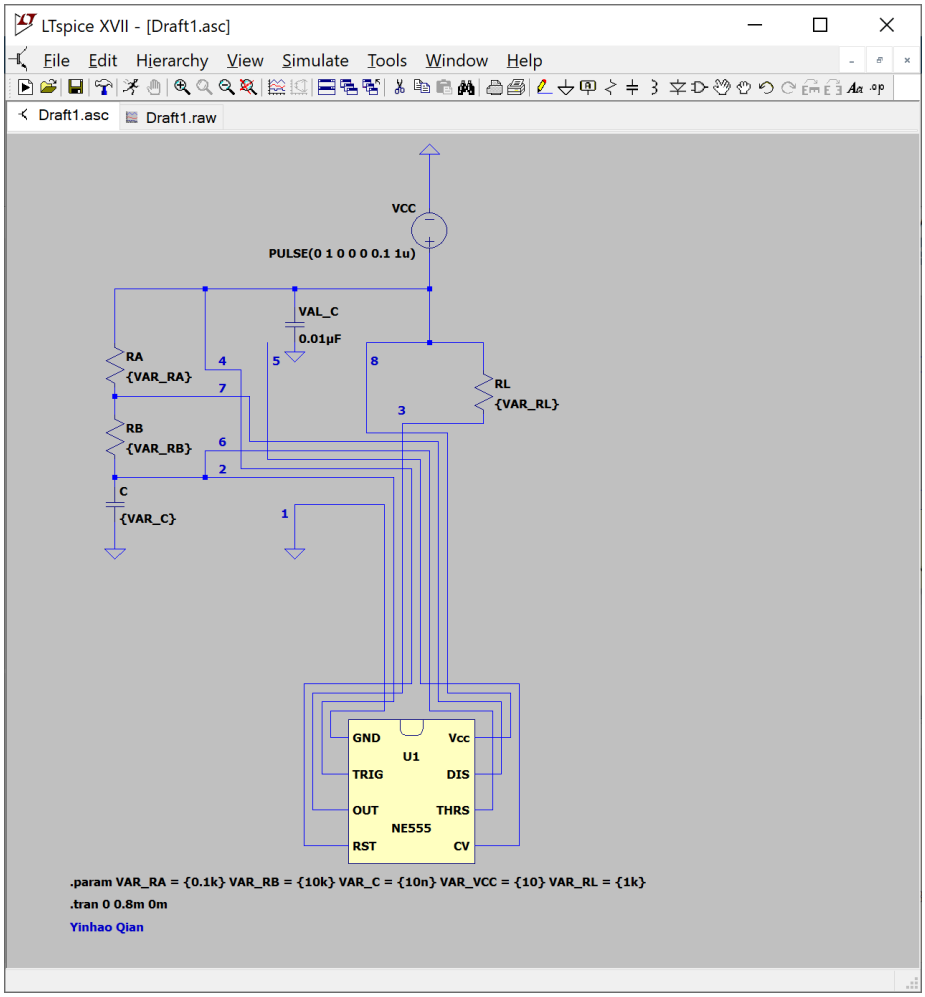
$$\text{Frequency} = 7.164KHz$$

$$\text{Output Driver Duty Cycle} = 49.75\%$$

$$\text{Output Waveform Duty Cycle} = 50.25\%$$

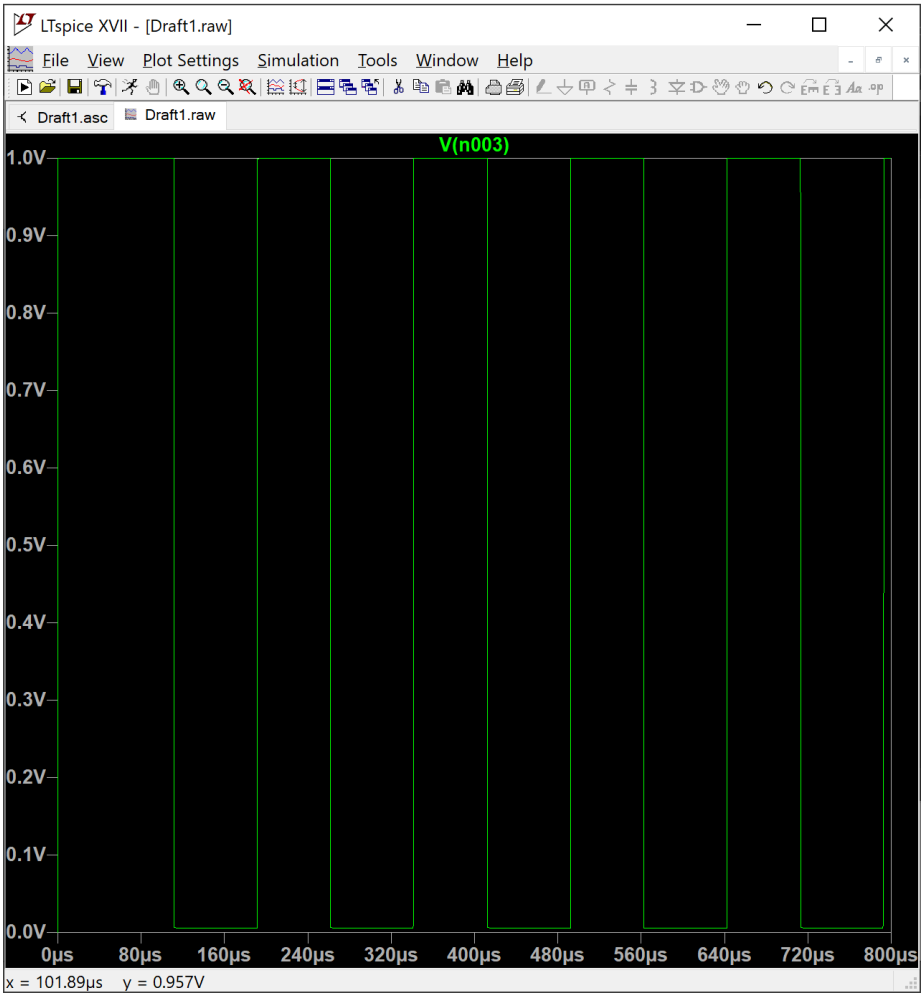
$$\text{Low-to-high Ratio} = 99.01\%$$

Schematics



Simulations

Note that the period corresponds with what we desires.


LTspice XVII - [Draft1.raw]
File View Plot Settings Simulation Tools Window Help
Draft1.asc Draft1.raw
V(n003)
1.0V
0.9V
0.8V
0.7V
0.6V
0.5V
0.4V
0.3V
0.2V
0.1V
0.0V
0µs 80µs 160µs 240µs 320µs 400µs 480µs 560µs 640µs 720µs 800µs
x = 101.89µs y = 0.957V