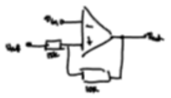
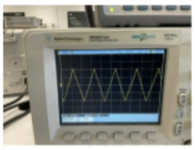
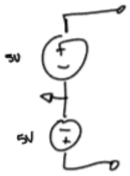
Schmitt Trigger

Tuesday, August 5, 2025 3:25 AM

LT6221





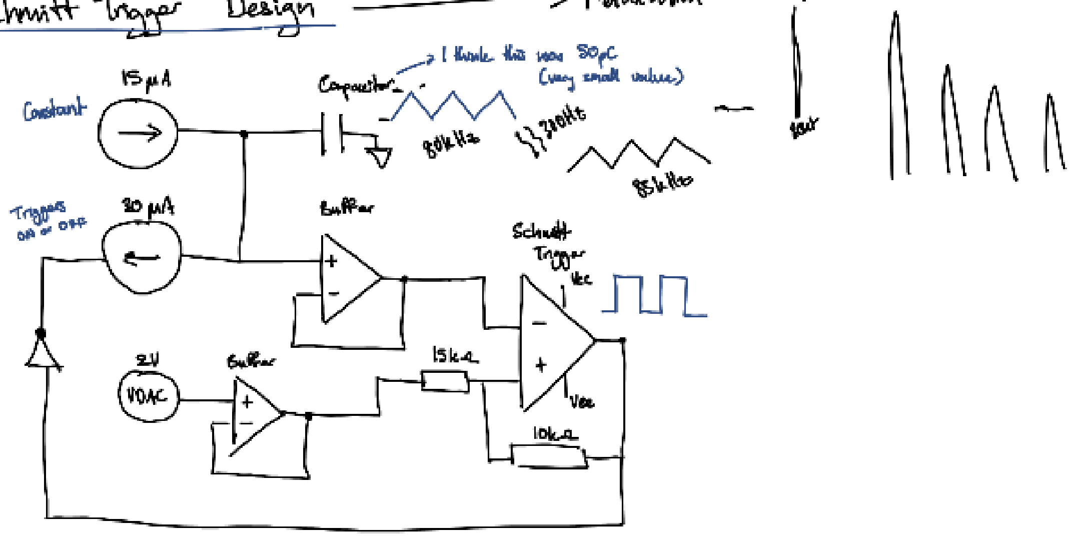


Ideas

- Differential measurement to reject supply, temp & drift

Hysteresis 0.5V – 3.5V ⟶ What happens if you reduce this?
↳ Use decoupling capacitors

Schmitt Trigger Design ⟶ Relaxation Oscillator



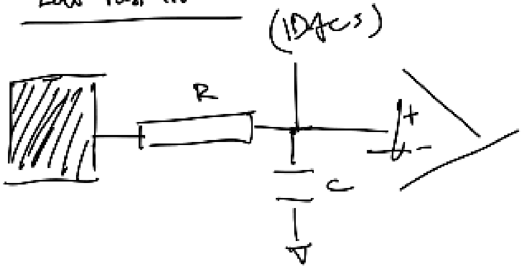
⟶ Observation : The schitt was going at around 180 kHz and any signal below it had no effect on it.

· My thoughts -- • What if we lower the frequency of the schmitt trigger? ⟶ can increase the capacitor

• What if we use a low pass filter type circuit?

↳ What happens if we put this into the design instead of a normal capacitor

Low Pass filter

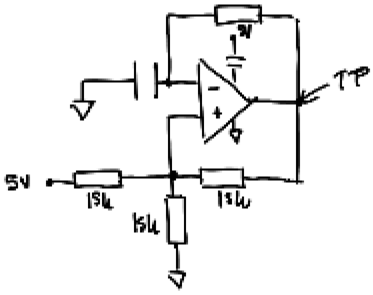


$$f_c = \frac{1}{2\pi RC} = 600Hz$$

$$RC = 0.000265$$

- IMD - Intermodulation frequencies

Relaxation Oscillator



TL082 — Slew Rate = 13 V/μs

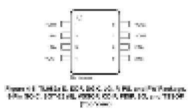
· Have 5V → $\frac{5V}{13V/\mu s} = 0.38\mu s$

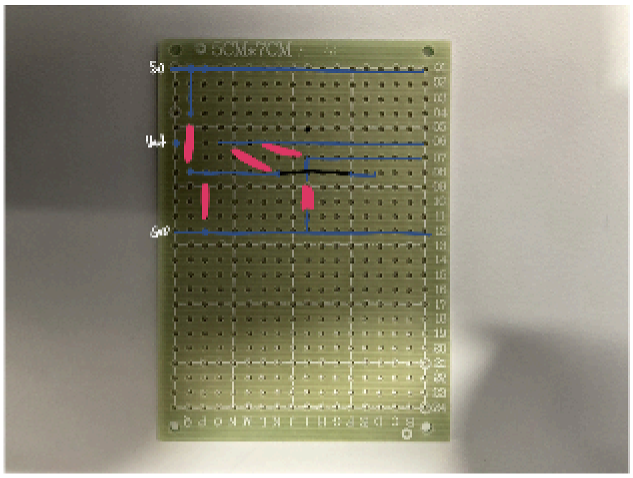
say capacitor value is 10pF

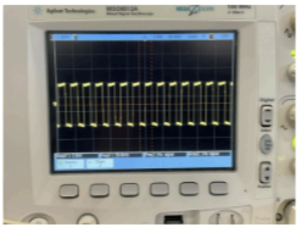
$\tau = RC$

$R = \frac{0.38\mu s}{10pF} = 38000\Omega$

$= 38k\Omega$



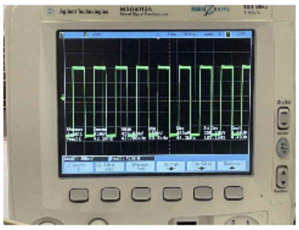


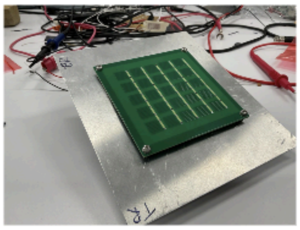


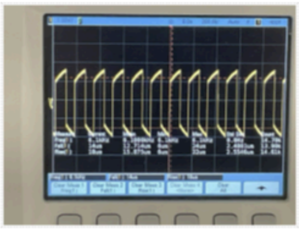
- 100 Hz

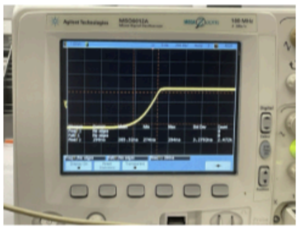
on : rise time = 232.3 ns

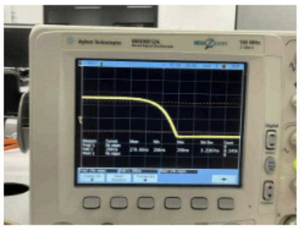
!on : rise time = 232.3 ns











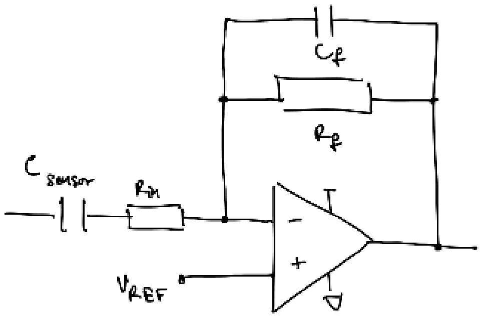
$\tau = RC$

$0.0001639993 = (10\times10^{6})$

$C = 1.639\times10^{-11}$

$= 16.39\ pF$

Charge Amplifier Circuit



$R_f = 10 M\Omega$

For low frequency cutoff of 10Hz,

$$C_f = \frac{1}{2\pi R_f f_{clow}} = \frac{1}{2\pi \cdot (10M\Omega)\cdot(10Hz)} = 1.59 \times 10^{-9} F$$

$$\cong 1.5\,nF \text{ (standard value)}$$

For high frequency cutoff of 10kHz,

$$R_{in} = \frac{1}{2\pi C_{sensor} f_{chigh}} = \frac{1}{2\pi \cdot (12\times10^{-12})\cdot(10\times10^{3})} = 1.326\times10^{6}\,\Omega$$

$$\cong 1.2 M\Omega \quad (\text{or } 1.5 M\Omega)$$

expected output,

$$V_{out} = \frac{Q}{}$$