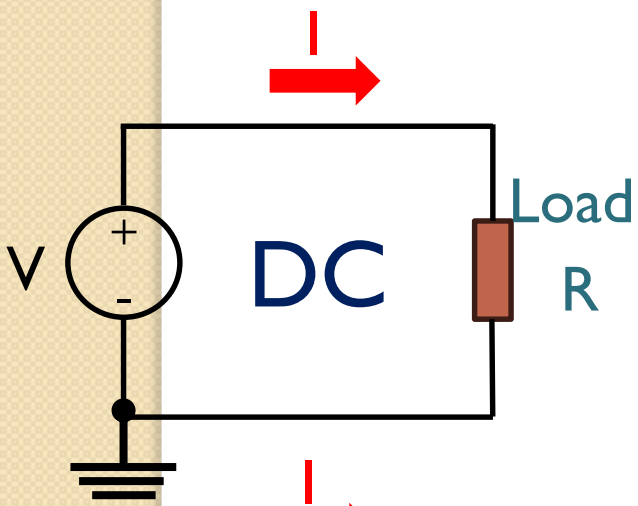
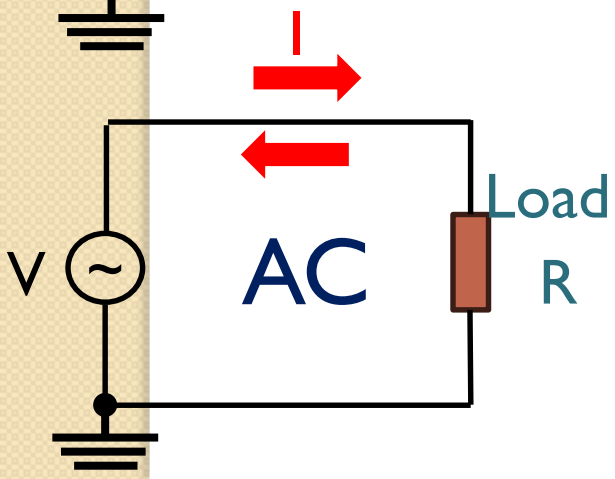
Tutorial 2: DC Regulation & Pulse Generation

Power Sources and Regulation

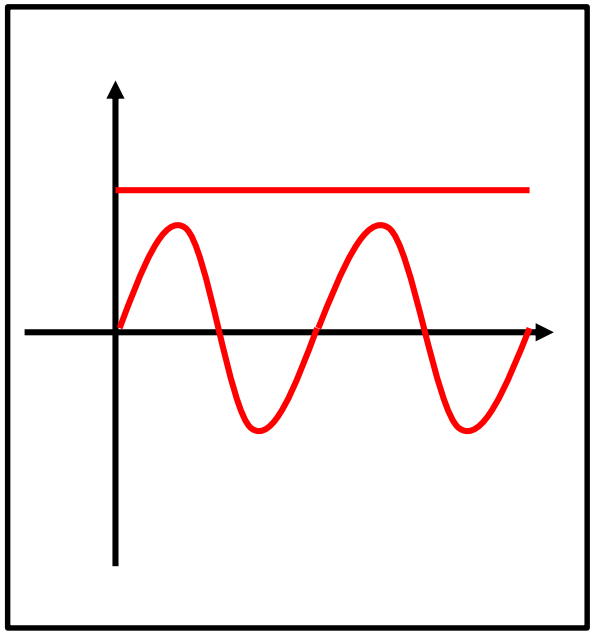


DC power supply



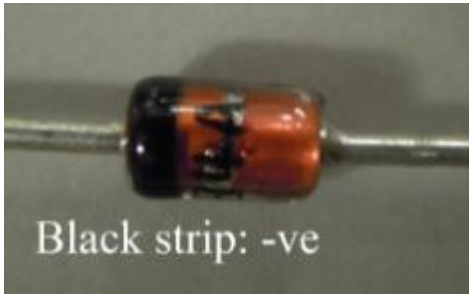
Signal generator

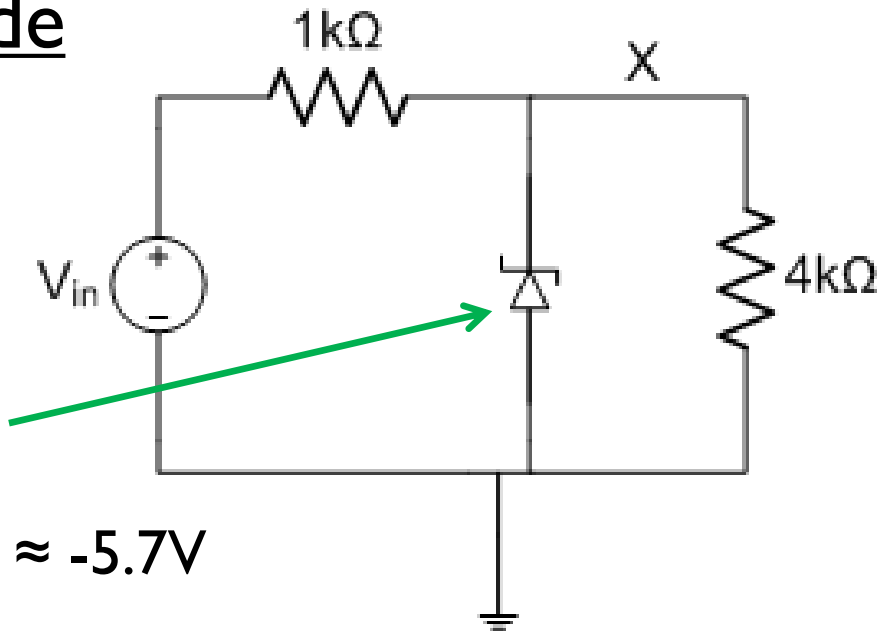
Draw waveforms here



DC to DC Conversion

- When do you need DC to DC?
  - Eg. Your phone needs 9V to operate, but the motion sensor only needs 5V; you don't want to insert two batteries!
- Version I: Zener Diode

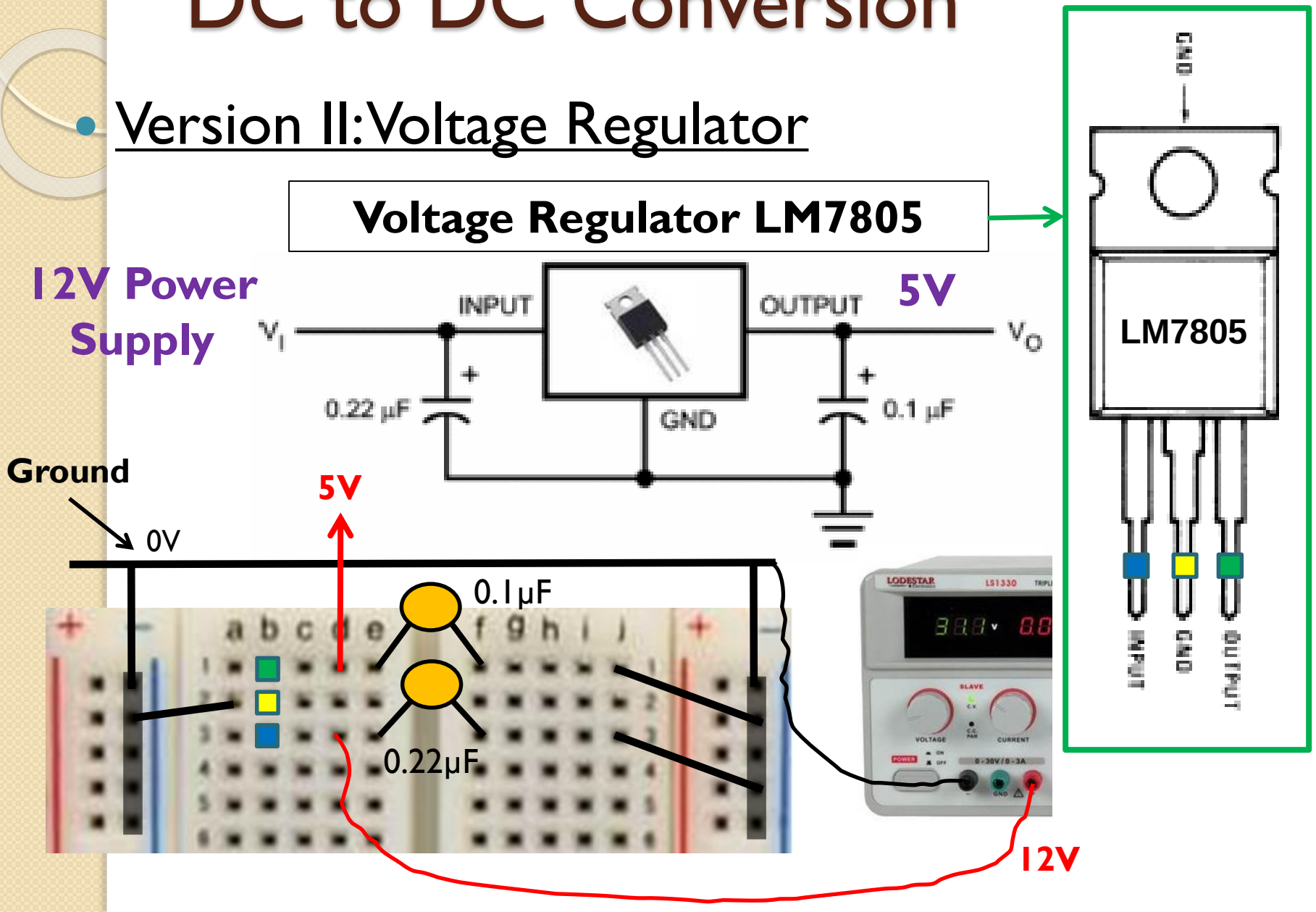




Zener Diode $V_{bd} \approx -5.7V$

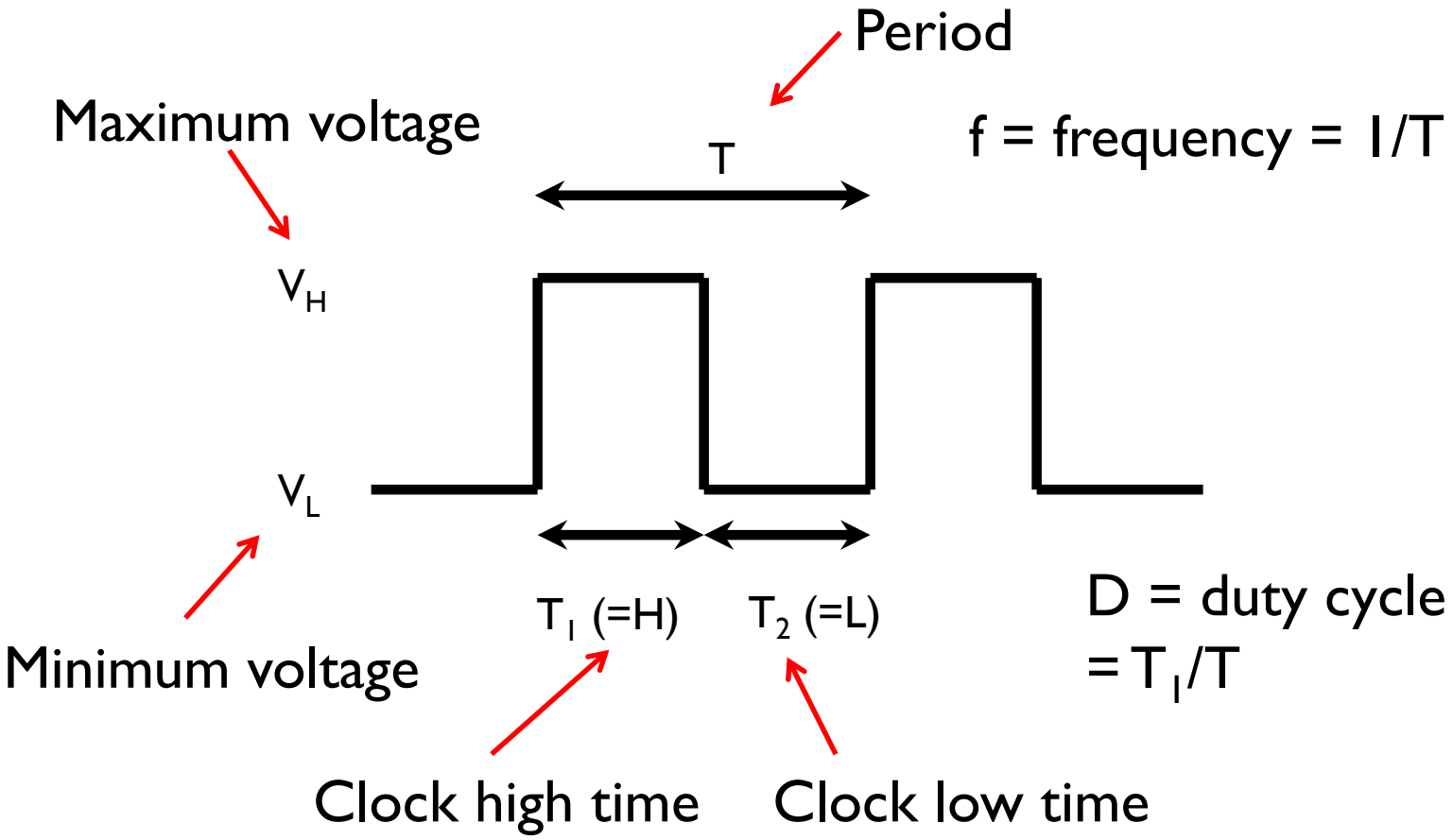
DC to DC Conversion

- Version II: Voltage Regulator



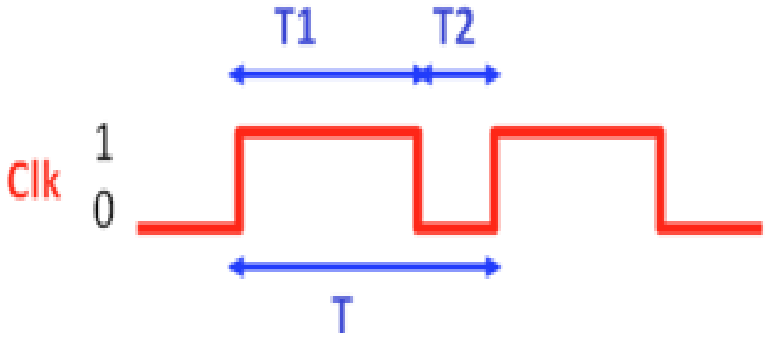
Let's learn about pulse

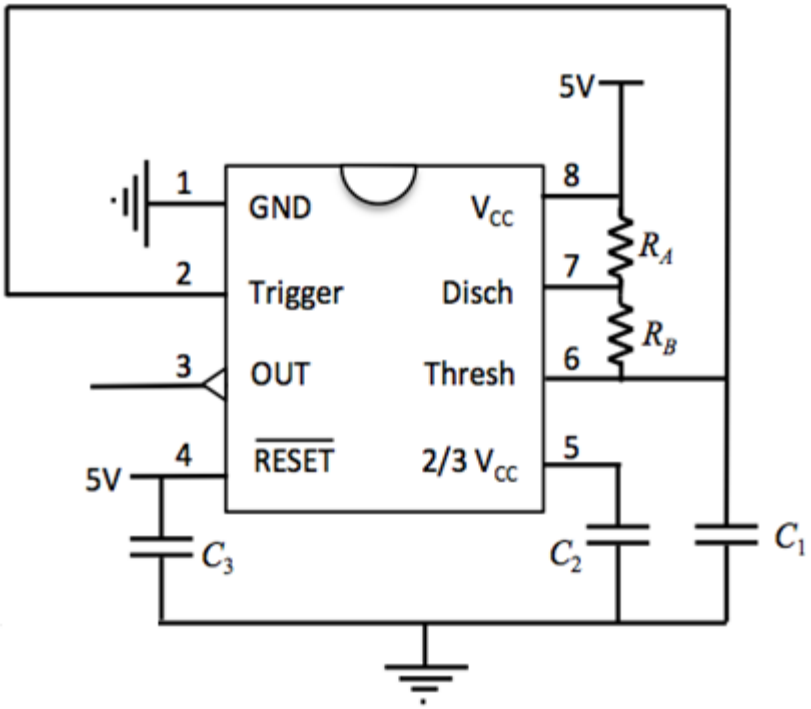
- A rectangular pulse looks like this.



Now let's build the actual circuit

- This is a NE555 timer. Equations given.





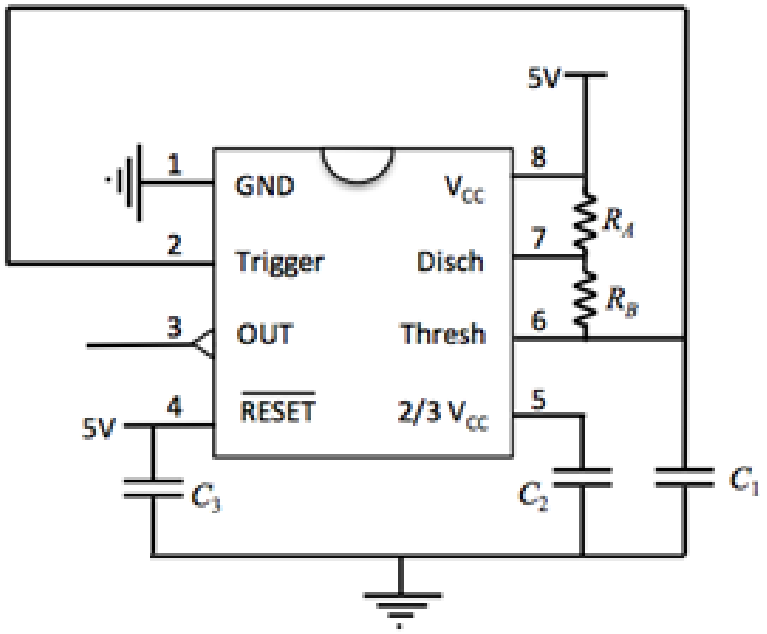
T1 = $0.7\,(R_A + R_B)\,C_1$

T2 = $0.7\,(R_B)\,C_1$

T = $0.7\,(R_A + 2R_B)\,C_1$

Observation:
Duty Cycle ≥ 50%

Lab#02: Experiment 3

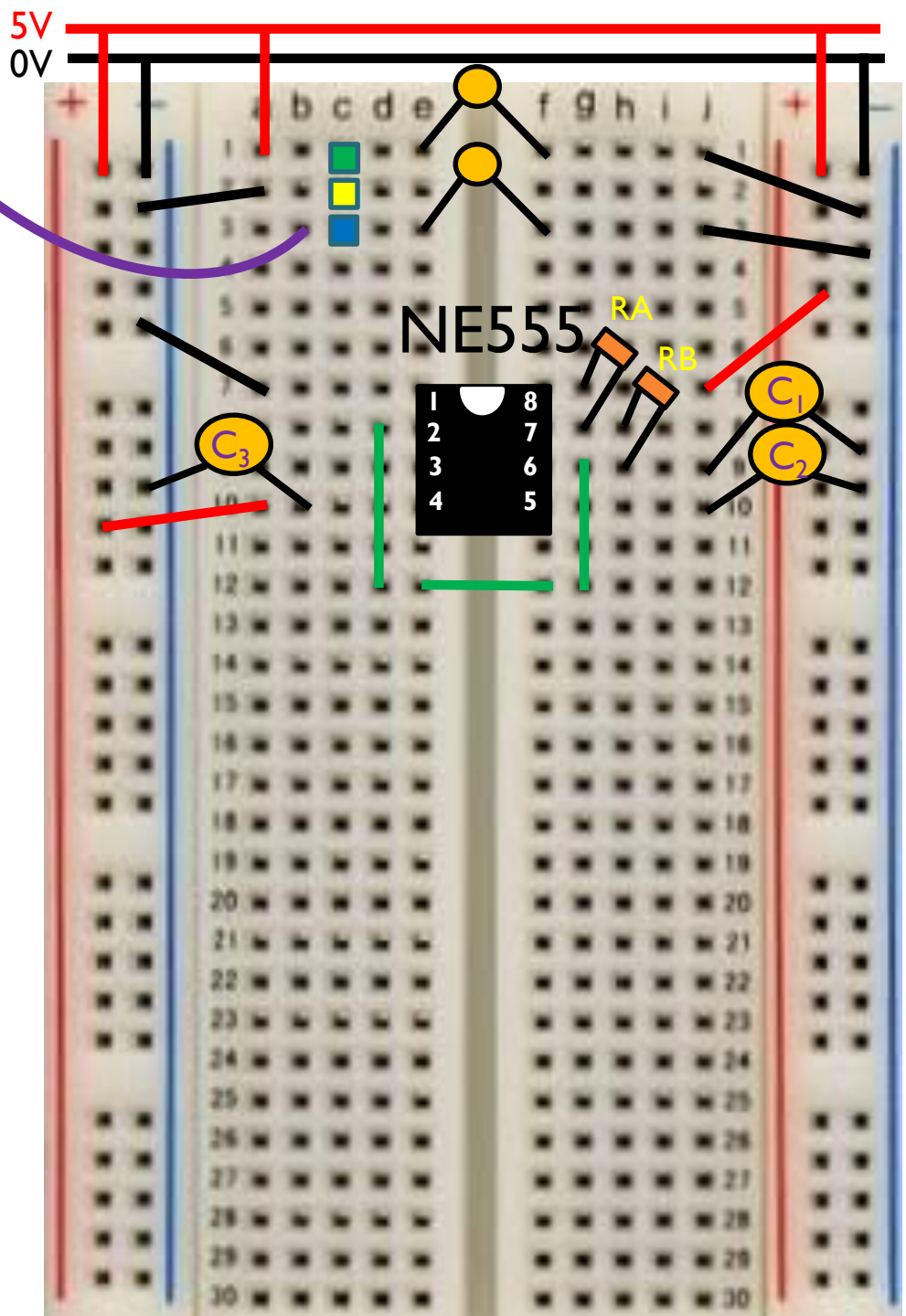


$R_A = 30k\Omega \quad R_B = 10k$

$C_1 = C_2 = C_3 = 0.1\mu F$

Frequency = ?

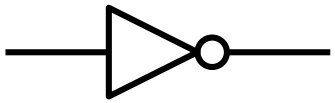
Duty cycle = ?



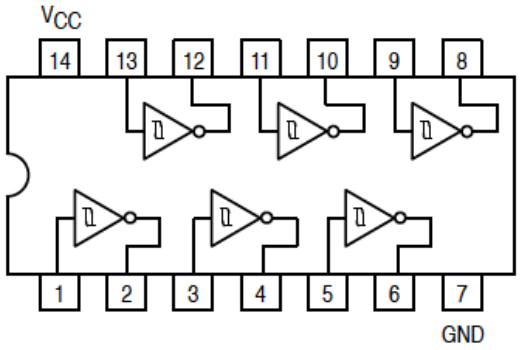
Schmitt Trigger 74HC14

- Practical output of timer:

- Solution: Schmitt Trigger



- Straighten up the pulse
  - There are 6 Schmitt Triggers and you only need to use one 14 pins, 6 pairs
  - The V_{CC} (positive supply) and GND has to be connected to power for proper function 1, 2, 7, 14



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****The output is inverted**

Lab#02: Experiment 4

Use a variable resistor to replace R_A and R_B