

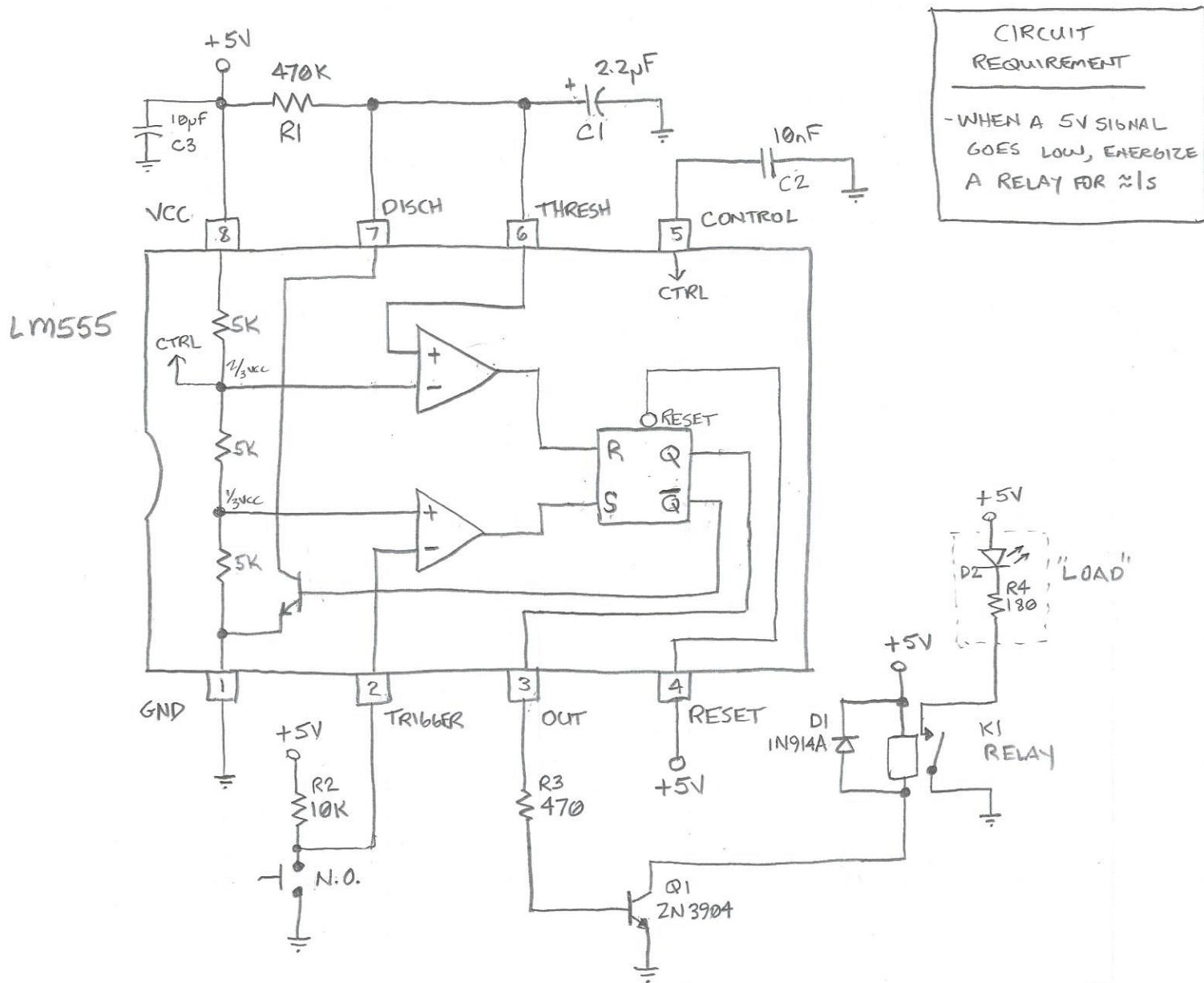
# BACK TO BASICS

W2AEW

## 555 BASED "ONE-SHOT"

### MONOSTABLE MULTIVIBRATOR

- OUTPUTS A SINGLE PULSE IN RESPONSE TO A TRIGGER



**CIRCUIT REQUIREMENT**  
 - WHEN A 5V SIGNAL GOES LOW, ENERGIZE A RELAY FOR ≈ 1S

- PULSE "ON" TIME IS:  $t_{ON} = 1.1 * R1 * C1$

THE TIME IT TAKES C1 TO CHARGE TO  $\frac{2}{3} VCC$

REMEMBER, A SIMPLE RC CIRCUIT CHARGES TO 63% IN ONE RC TIME CONSTANT. HERE, WE WANT 66.7%, SO IT MAKES SENSE THAT THE TIME IS JUST OVER 1 RC

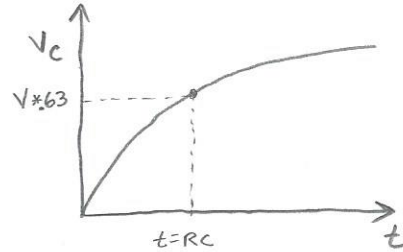
# BACK TO BASICS

W2AEW

## 555 ONE-SHOT MATH

- WHY IS THE TIME =  $1.1 * RC$

FOR RC CIRCUIT  
(CHARGING)



$$V_c(t) = V * (1 - e^{-t/RC})$$

RE-ARRANGE TO SOLVE FOR t

DIVIDE BY V :

$$\frac{V_c(t)}{V} = 1 - e^{-t/RC}$$

SUBTRACT/SWAP :

$$e^{-t/RC} = 1 - \frac{V_c}{V}$$

NATURAL LOG :

$$\frac{-t}{RC} = \ln\left(1 - \frac{V_c}{V}\right)$$

MULTIPLY BY -RC :

$$t = -RC * \ln\left(1 - \frac{V_c}{V}\right)$$

IN OUR CASE,  $\frac{V_c}{V} = \frac{2}{3}$

THUS

$$t = -RC * \ln\left(1 - \frac{2}{3}\right)$$

$$t = -RC * \ln\left(\frac{1}{3}\right)$$

$$t = 1.1 * RC$$