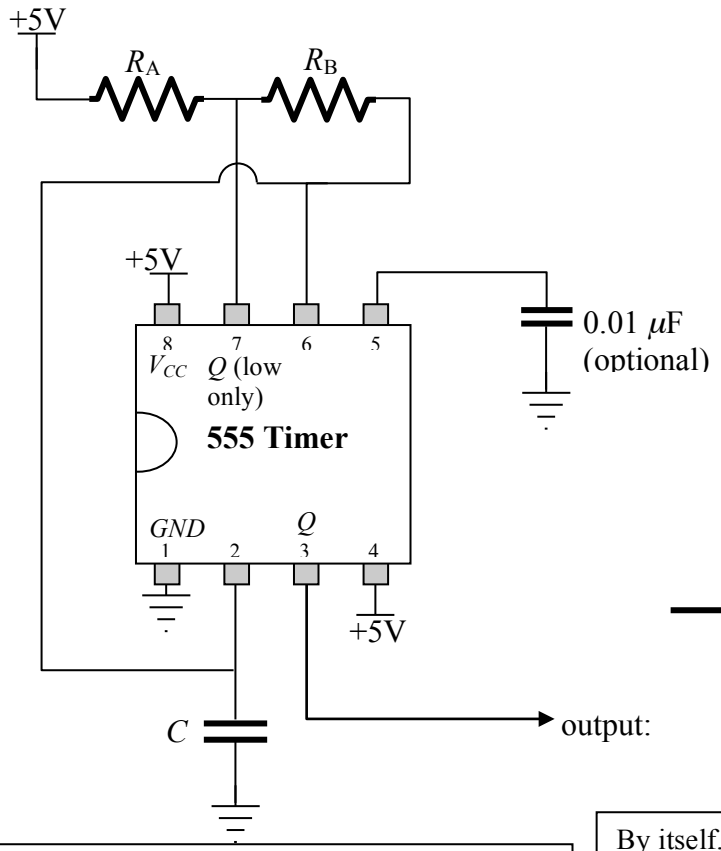
Use of the 555 Timer Chip



Restrictions:

$C \geq 500$ pF $= 500 \times 10^{-12}$ F

$R_A \geq 1$ kΩ $= 1000$ Ω

$R_A + R_B \leq 6.6$ MΩ $= 6.6 \times 10^6$ Ω

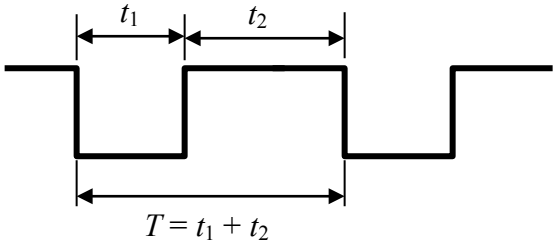
Results:

$t_1 = 0.693 R_B C$

$t_2 = 0.693(R_A + R_B)C$

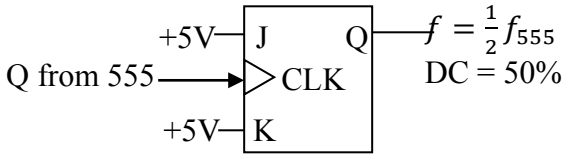
$T = 0.693(R_A + 2R_B)C$

$$f = \frac{1}{T} = \frac{1.443}{(R_A + 2R_B)C}$$



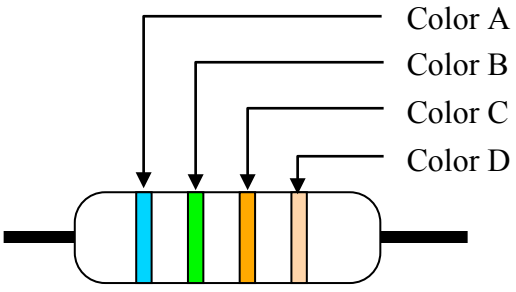
Example: We want $T = 1$s ($f = 1$Hz).
Try R_B = 1MΩ, and C = 0.47 μF.
Then t_1 =0.3257s, and need R_A = 1.07MΩ.
The closest R we have to this is R_B = 1MΩ.
So, the actual T = 0.977 s.

By itself, the 555 timer can ***never*** generate a pulse train with a 50% duty cycle. However, if you connect the output to the CLK of a toggling JK flip-flop, the flip flop output will be a pulse train with a 50% duty cycle and half the frequency of the 555 timer.



Determining Resistor Values

Color	Value
Black	0
Brown	1
Red	2
Orange	3
Yellow	4
Green	5
Blue	6
Violet	7
Gray	8
White	9



Color D is usually silver or gold, and indicates how close the actual resistance will be to the expected value. This is usually not impressive (5% or 10%).

$$R = (10A + B) \times 10^C \ \Omega$$

Examples: (Colors given in order A, B, and C):
Blue Green Orange: $R = (10 \cdot \mathbf{6} + \mathbf{5}) \times 10^{\mathbf{3}}$ Ω = 65000Ω = 65 kΩ
Blue Blue Violet: $R = (10 \cdot \mathbf{6} + \mathbf{6}) \times 10^{\mathbf{7}}$ Ω = 660000000Ω = 660 MΩ
Brown Black Red: $R = (10 \cdot \mathbf{1} + \mathbf{0}) \times 10^{\mathbf{2}}$ Ω = 1000 Ω