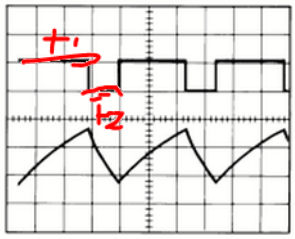
555 Timer

Astable Mode



$t_1 = 0.693(R_A + R_B)C$

$t_2 = 0.693(R_B)C$

$t_{total} = 0.693(R_A + R_B)C + 0.693(R_B)C$

$t_{total} = 0.693(R_A + 2R_B)C$

$$f = \frac{1}{T_{total}} = \frac{1}{0.693(R_A + 2R_B)C} = \frac{1.44}{(R_A + 2R_B)C}$$

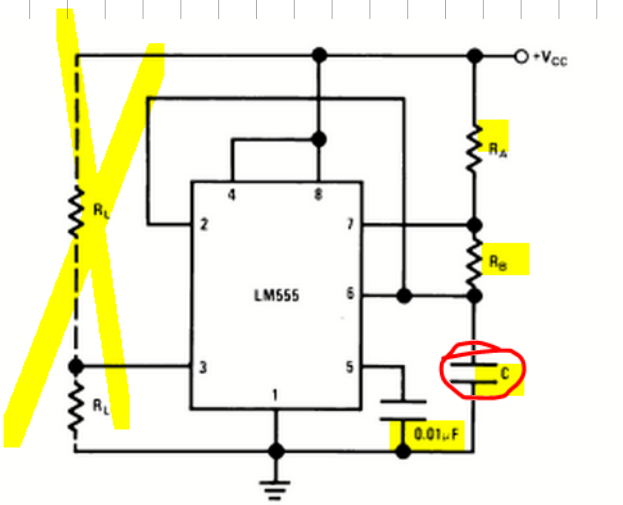


Figure 14. Astable

$$\text{Duty cycle} = \frac{t_{low}}{t_{low} + t_{high}} = \frac{t_{low}}{t_{total}} = \frac{0.693(R_B)C}{0.693(R_A + 2R_B)C} = \frac{R_B}{R_A + 2R_B}$$

$$10\,kHz = \frac{1.44}{(R_A + 2R_B)C} \quad C = 0.1\,\mu F$$

$$(R_A + 2R_B) = \frac{1.44}{10\,kHz \times 0.1\,\mu F} = 1440\,\Omega$$

$10\,kHz \times 0.1\,\mu F$: $10^3 \times 10^{-6}$

$10^4 \times 10^{-7} = 10^{-3}$