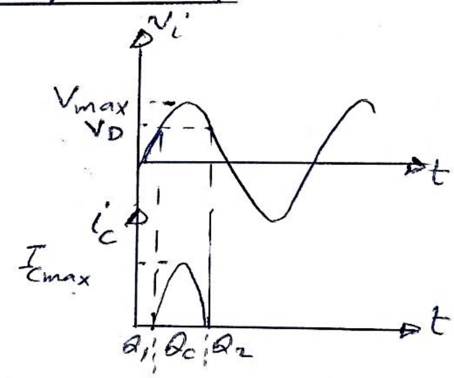
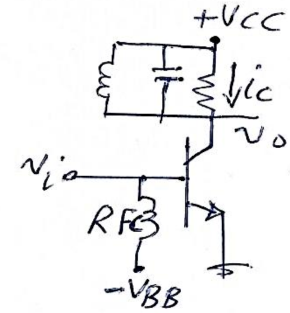
Class - C Amplifier:





The amplifier conducts for angle less than 180°. This mode can have a great efficiency than class B but it creates more distortion than class A or B amplifiers. This class is used in high frequencies applications and high power. The RFC (Radio-Frequency - Chock) has a high impedance at high frequency input and thereby prevents the dc source from Shorting the ac input. The input must reach the level sufficient to overcome both the negative bias and V_{BE} drop.

$$V_{D\,drop} = |V_{BB}| + 0.7V$$

A resonance network (LC tuning cct) is used at the output to obtain only the fundamental frequency at the output and remove the other harmonics which have much smaller gain than the fundamental.

$$f_o = \frac{1}{2\pi\sqrt{LC}}$$

$$i_C = \begin{cases} I_{max} \sin\omega t - I_D & \theta_1 \le \omega t \le \theta_2 \\ 0 & \text{otherwise} \end{cases}$$

$$I_D = I_{C max} \sin\theta_1$$

Direct current is:

$$I_{C(dc)} = \frac{1}{T}\int_{\theta_1/\omega}^{\theta_2/\omega} (I_{max}\sin\omega t - I_D)\, dt$$

$$= \frac{2 I_{max} \cos\theta_1 - I_D(\theta_2 - \theta_1)}{2\pi}$$

$$\theta_C = 2\theta = \theta_2 - \theta_1$$

$$I_D = I_{C max}\sin\theta_1 = I_{C max}\sin(\pi/2 - \theta) = I_{C max}\cos\theta$$

$$I_{Cdc} = \frac{I_{C max}}{\pi}(\sin\theta - \theta\cos\theta)$$

$$P_{CC} = V_{CC} I_{Cdc}$$

If the output tuned to the fundamental frequency current pulse, than output power:

$$P_L = \frac{I_{1max}^2 R_L}{2} = \left(\frac{I_{1\,max}}{\sqrt{2}}\right)^2 R_L$$

Where I_{1max} is the amplitude of the fundamental current component $I_1 = \frac{4}{T}\int_0^{\theta/\omega} (I_{C max}\cos\omega t - I_D)\cos\omega t\, dt$

$$I_1 = \frac{I_{C max}}{2\pi}[2\theta - \sin 2\theta]$$

$$\eta = \frac{P_L}{P_{CC}} = \frac{I_{1max}^2 R_L/2}{V_{CC}\, I_{C(dc)}}$$

$$\eta_{max}\Big| = \frac{V_{CC} I_1}{2V_{CC} I_{Cdc}} = \frac{2\theta - \sin 2\theta}{4(\sin\theta - \theta\cos\theta)}$$

$$I_{1max} = \frac{V_{CC}}{R_L}$$

$$P_C = P_{CC} - P_L$$

$$P_C = \frac{V_{CC} I_{Cmax}}{\pi}(\sin\theta - \theta\cos\theta) - \frac{V_{CC}^2}{2R_L}$$

for max. output power

$$\frac{P_C}{P_L} = R_L\left(\frac{4(\sin\theta - \theta\cos\theta)}{2\theta - \sin 2\theta} - 1\right)$$