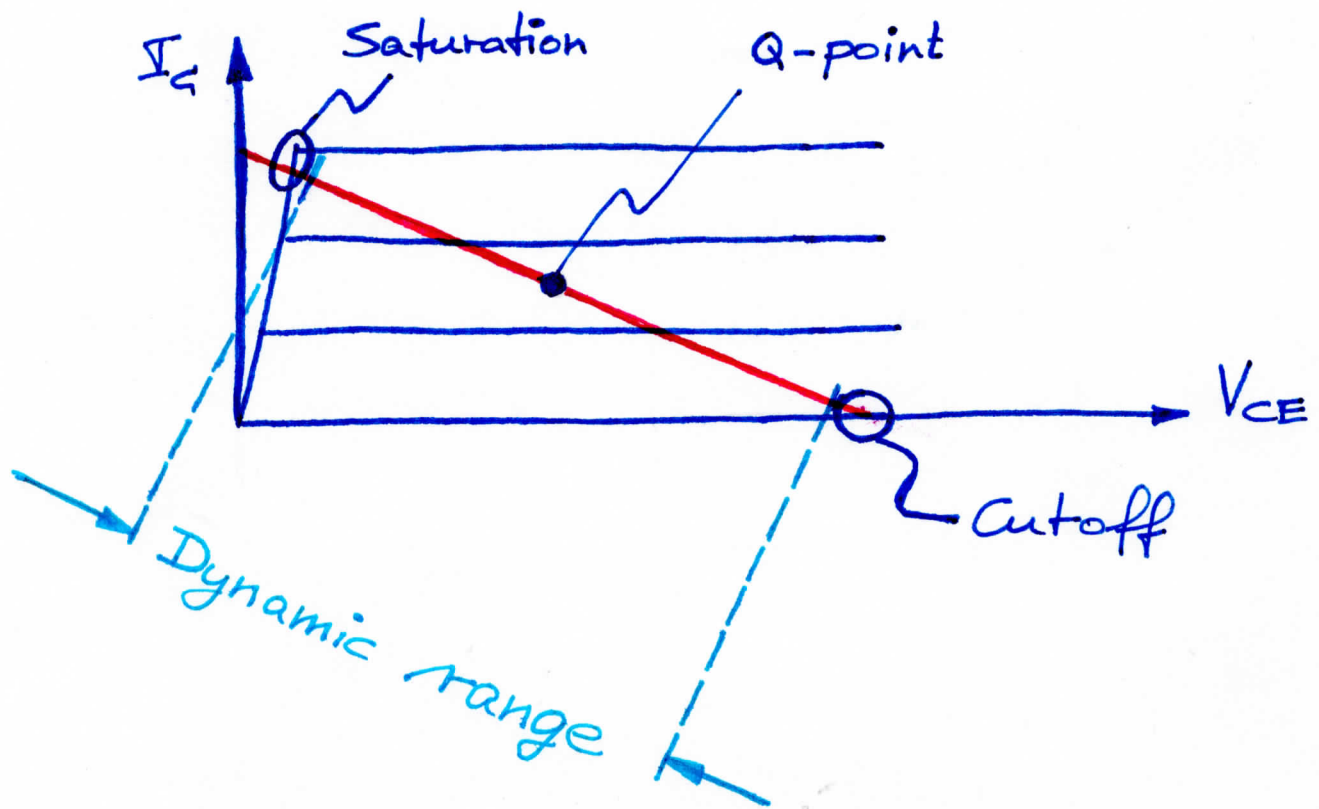


Class A amplifiers

So far, we discussed Class A amplifiers. Q-point of Class A amplifiers lies in the middle of output characteristic.



Power consumed without input signal ?

⇒ Power at Q-point: $P_Q = I_{C,Q} \times V_{CE,Q}$

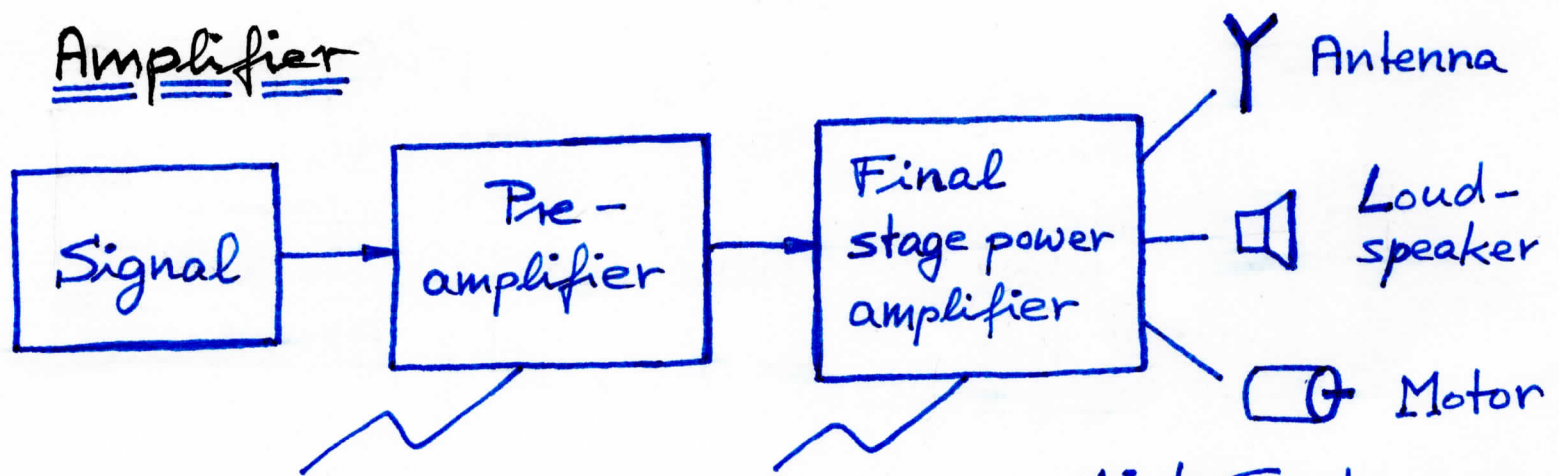
When there is an input signal the same average power, P_Q , is consumed.

Example: Consider a 40W audio amplifier.

⇒ Always consumes 40W even if there is no signal (e.g. music) ⇒

Not acceptable. Other examples?

Amplifier



Class A
acceptable
Why?

Class A ⇒ Not Good

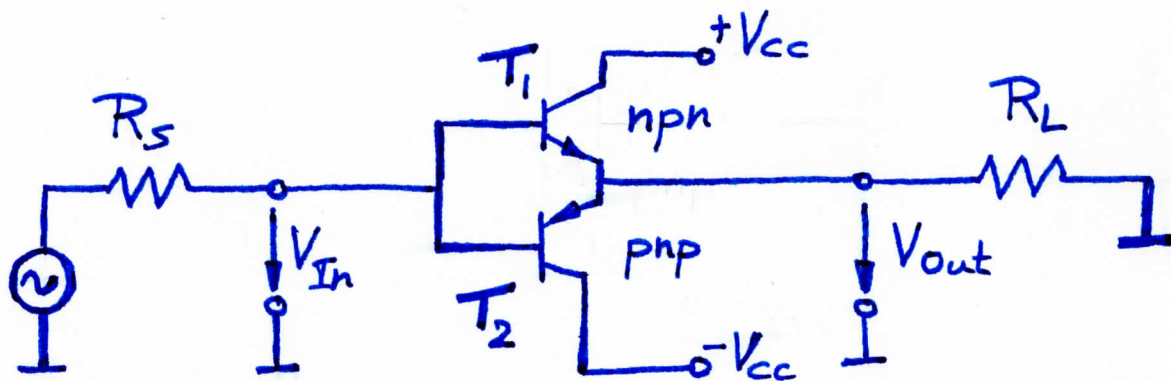
⇒ Class B ⇒ TBD

⇒ Class AB ⇒ TBD

↳ To be discussed

Class B amplifier \Rightarrow Push-pull amplifier

\Rightarrow Final - stage amplifier



\Rightarrow Two complementary transistors T_1 & T_2

$T_1 = \text{nnp}$

$T_2 = \text{pnp}$

Assume:

$$V_{In} = 0 \Rightarrow T_1 = \text{OFF} \quad T_2 = \text{OFF} \Rightarrow V_{out} = 0$$

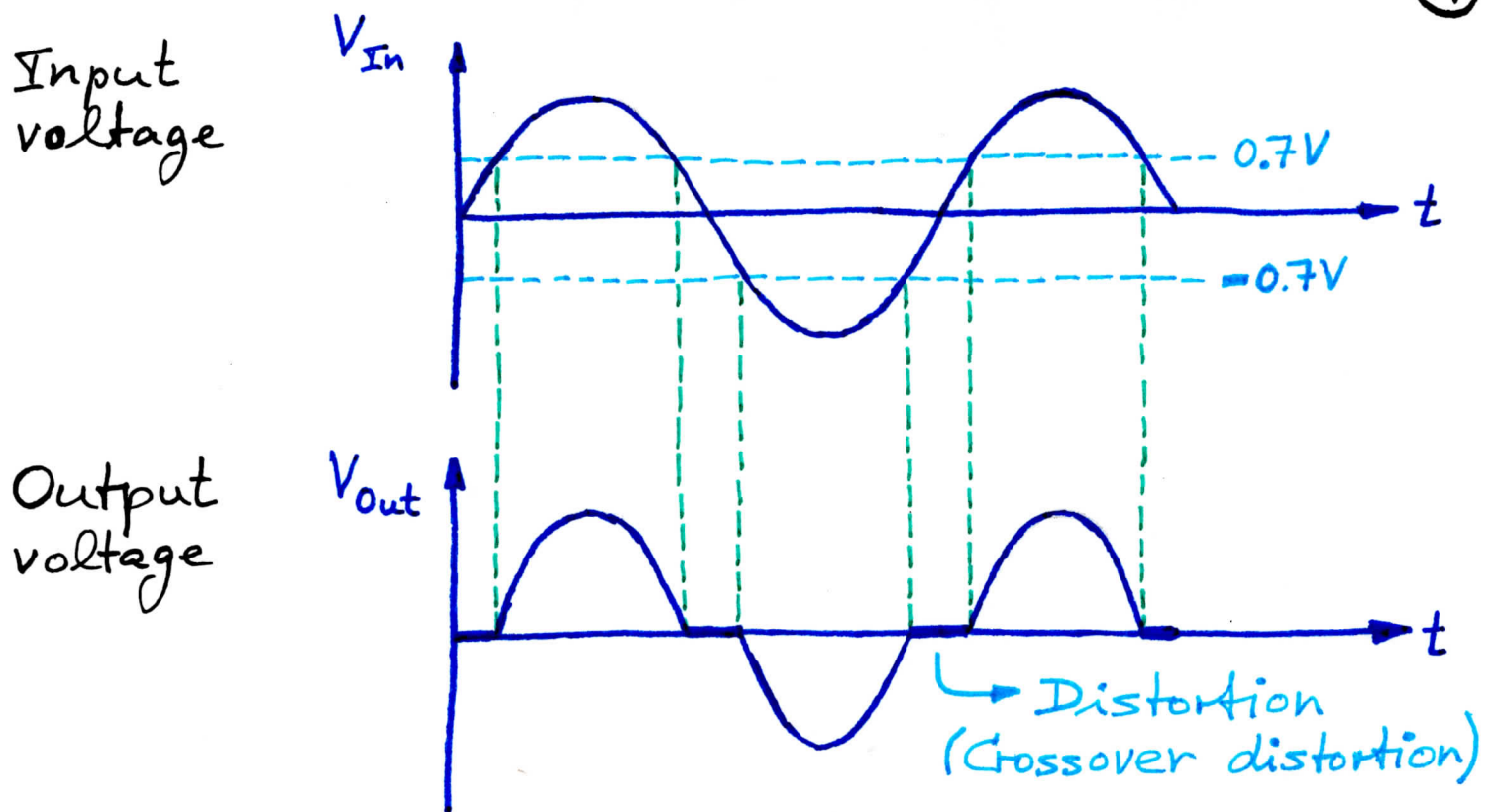
$$V_{In} = +1V \Rightarrow T_1 = \text{ON} \quad T_2 = \text{OFF} \Rightarrow V_{out} > 0$$

\hookrightarrow Forward active

$$V_{In} = -1V \Rightarrow T_1 = \text{OFF} \quad T_2 = \text{ON} \Rightarrow V_{out} < 0$$

$$\left. \begin{array}{l} V_{In} < +0.7V \\ V_{In} > -0.7V \end{array} \right\} T_1 = \text{OFF} \quad T_2 = \text{OFF} \Rightarrow V_{out} = 0$$

(4)



Q: What is the power consumed by amplifier at $V_{in} = 0$?

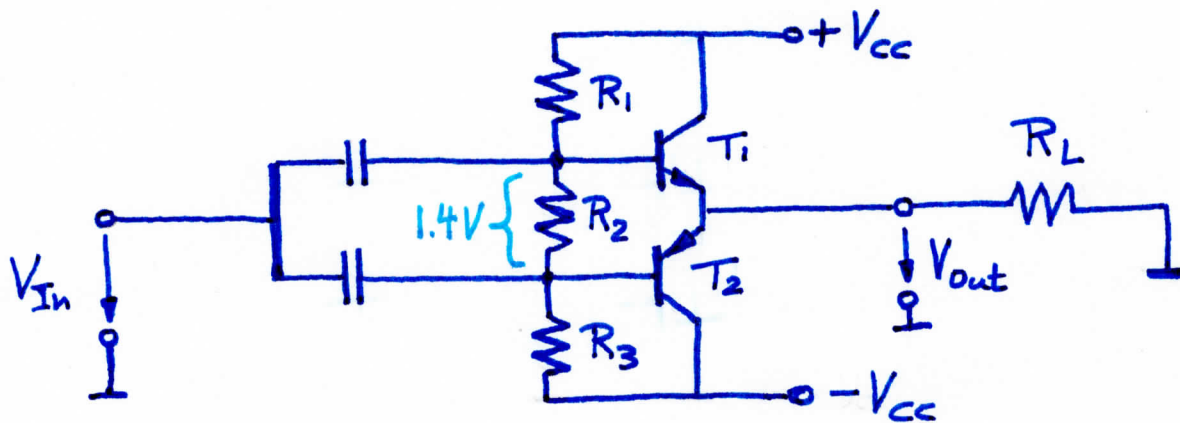
Q: Does the Class B amplifier have a Q-point?

Q: What is the power consumed by T_1 & T_2 at the Q-point?

Class AB amplifier \Rightarrow Push-pull amplifier

Let us develop an amplifier that does not suffer from crossover distortion.

We need a bias circuit that keeps T_1 & T_2 just below turn-on.

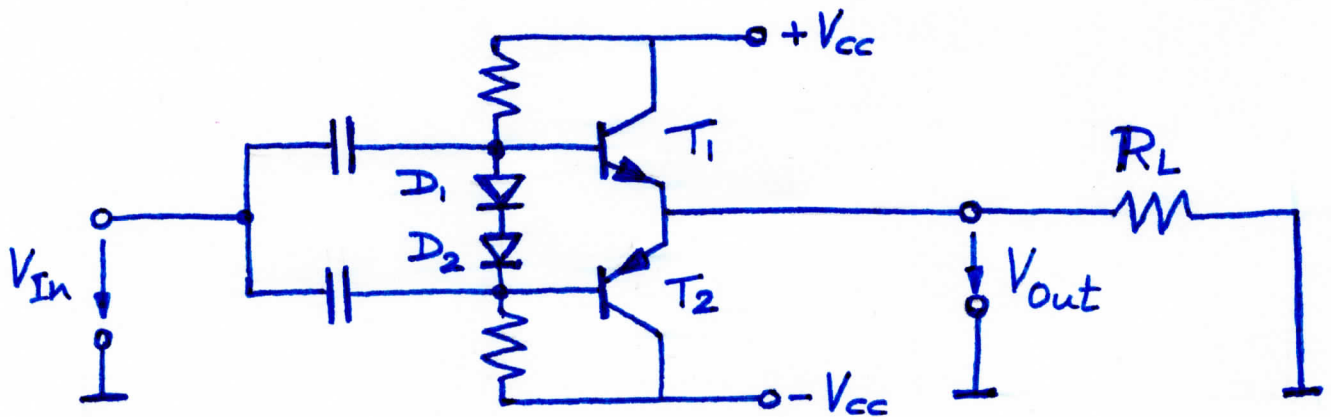


Base bias circuit is dimensioned to make voltage drop across R_2 to be $V_{R2} = 1.4V$

$$\Rightarrow T_1 \Rightarrow V_{BE} = 0.7V$$

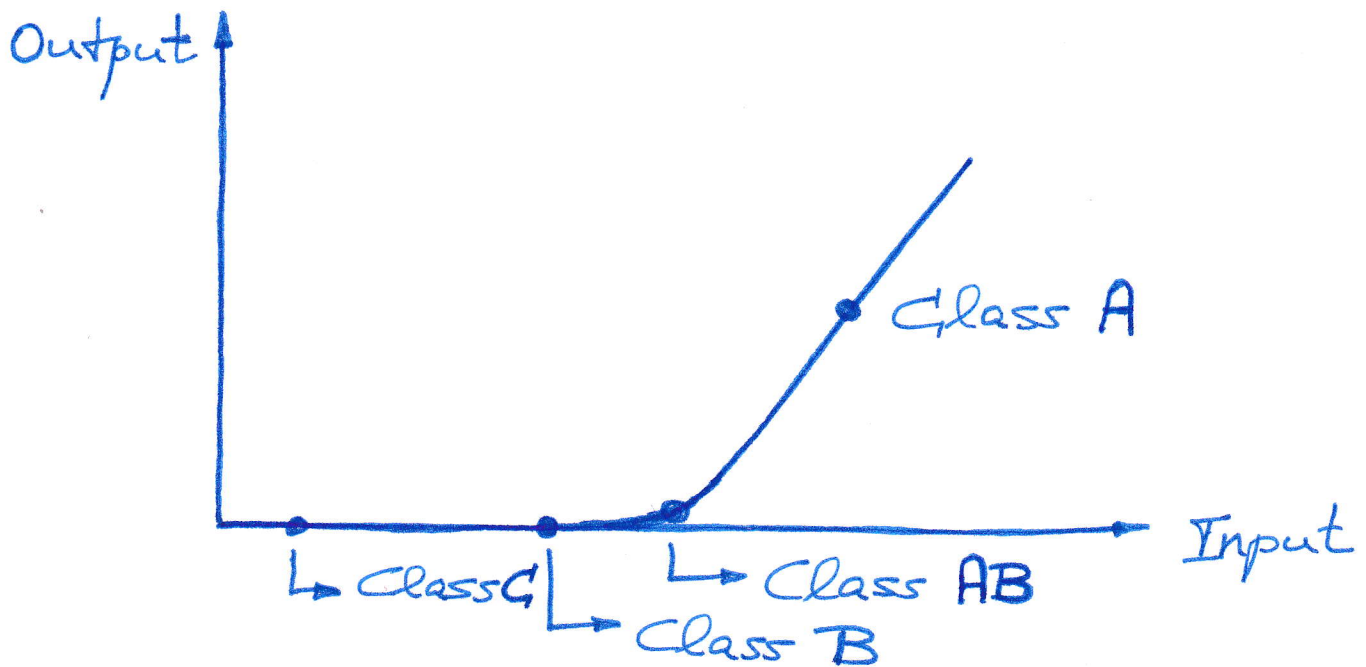
$$T_2 \Rightarrow V_{BE} = 0.7V$$

Alternative circuit



Diodes D_1 & D_2 have a voltage drop of $0.7V + 0.7V = 1.4V$. $\Rightarrow T_1$ & T_2 are at their turn-on threshold. \Rightarrow **No** cross-over distortion.

Class C amplifier



Class C amplifier \Rightarrow Pulse amplifier

