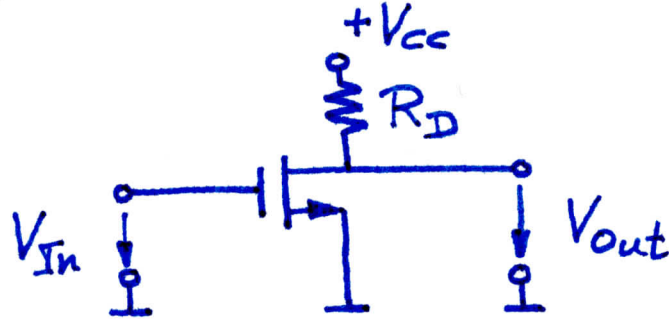


Please keep in mind...

①

There are inverting amplifiers (A_{voc} is negative)

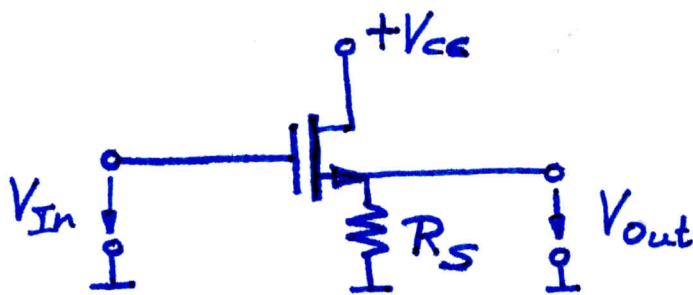


$$V_{In} \uparrow \Rightarrow V_{out} \downarrow$$

$$A_{voc} < 0$$

Sometimes minus sign ($A_{voc} = -\dots$) has been omitted due to our interest in the absolute value of A_{voc} .

There are non-inverting amplifiers (A_{voc} is positive)



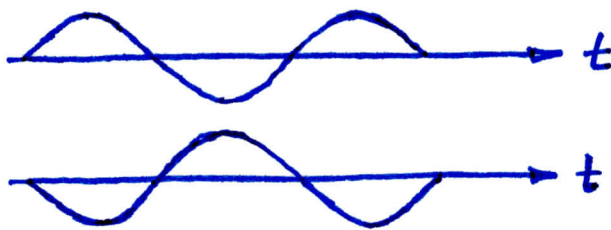
$$V_{In} \uparrow \Rightarrow V_{out} \uparrow$$

$$A_{voc} > 0$$

②

Q: For an audio amplifier, do we care if the output signal is inverted?

Q: Consider the two audio signals:



} Can we hear a difference?

Smaller is better !

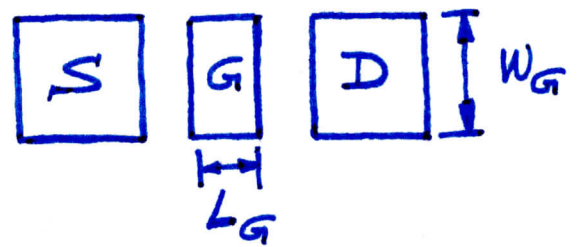
③

Recall FET

$$\begin{aligned} I_D &= \frac{1}{2} \underbrace{k' \frac{W_G}{L_G}}_k (V_{GS} - V_{th})^2 \\ &= \frac{1}{2} k (V_{GS} - V_{th})^2 \end{aligned}$$

L_G = Gate length

W_G = Gate width



$$\text{Amplification} = g_m \propto k' \frac{W_G}{L_G} \propto \frac{1}{L_G}$$

$$\Rightarrow L_G \downarrow \Rightarrow g_m \uparrow$$

\Rightarrow Smaller is better
 \rightarrow Shorter L_G

This has significant implications for Si IC technology. \Rightarrow Scaling down spatial dimensions improves Si IC technology.