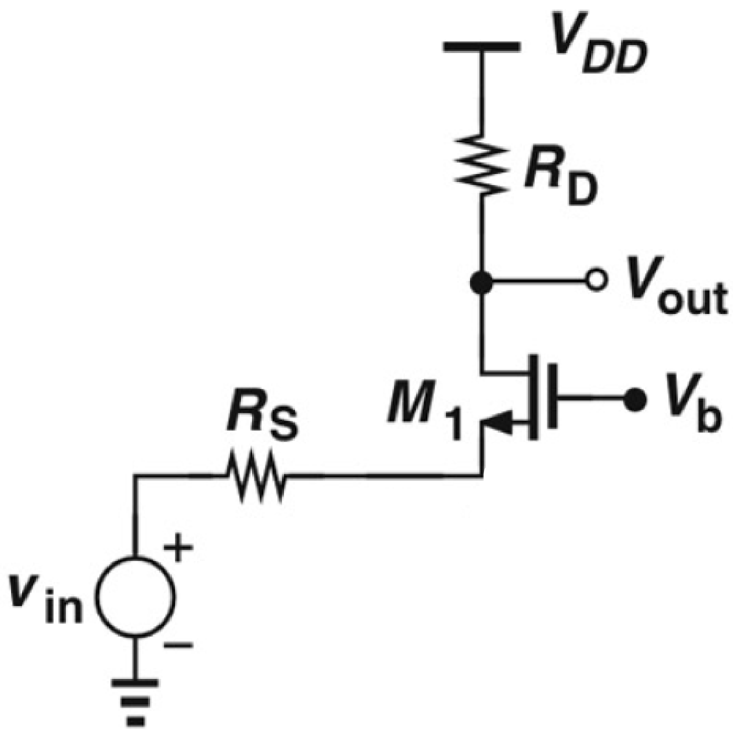
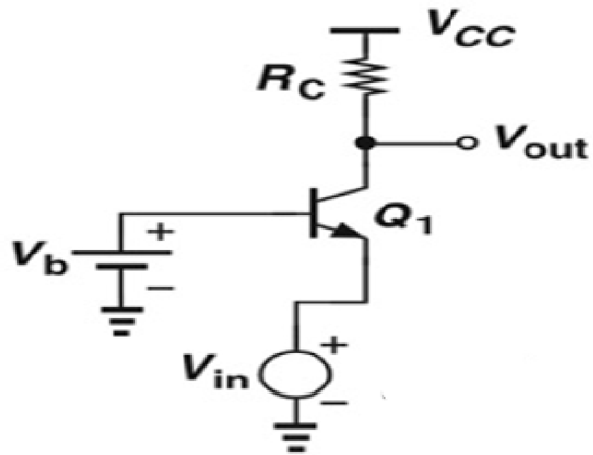
Lect. 25: CG Amplifier

Common-Gate Amplifier



Remember BJT CB in Test #1 Prob. 3



Small R_{in} ($r_\pi/(\beta+1)$), Large R_{out} (R_C)
Unit short-ckt current gain ($\beta/(\beta+1)$)

➔ Current buffer

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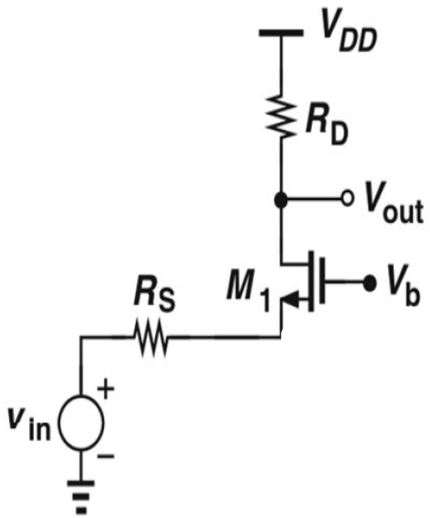

(Ignore r_o , Body effect)

$R_{in} = 1/g_m$

$R_{out} = R_D$

Short-ckt current gain = 1

Voltage gain (without R_s) $= g_m R_D$

Voltage gain (with R_s) $= g_m R_D / (1 + g_m R_S)$

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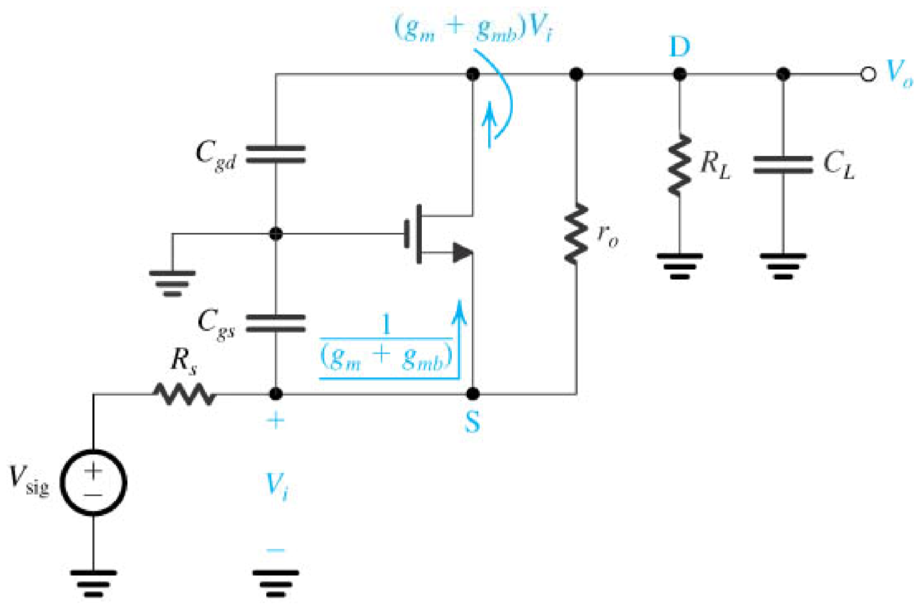
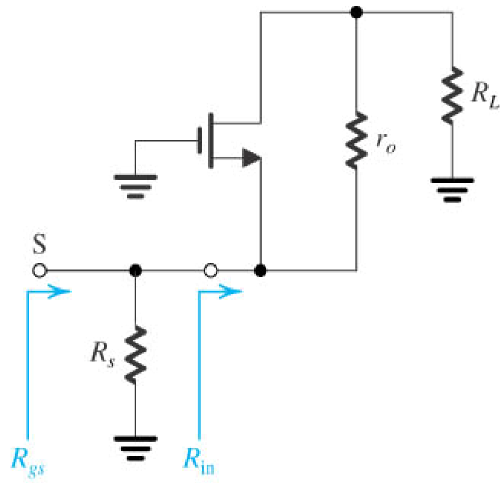
Frequency Response: Use open-circuit time constant method.



(a)

For C_{gs}



(a)

$R_{gs} = R_s || R_{in}$

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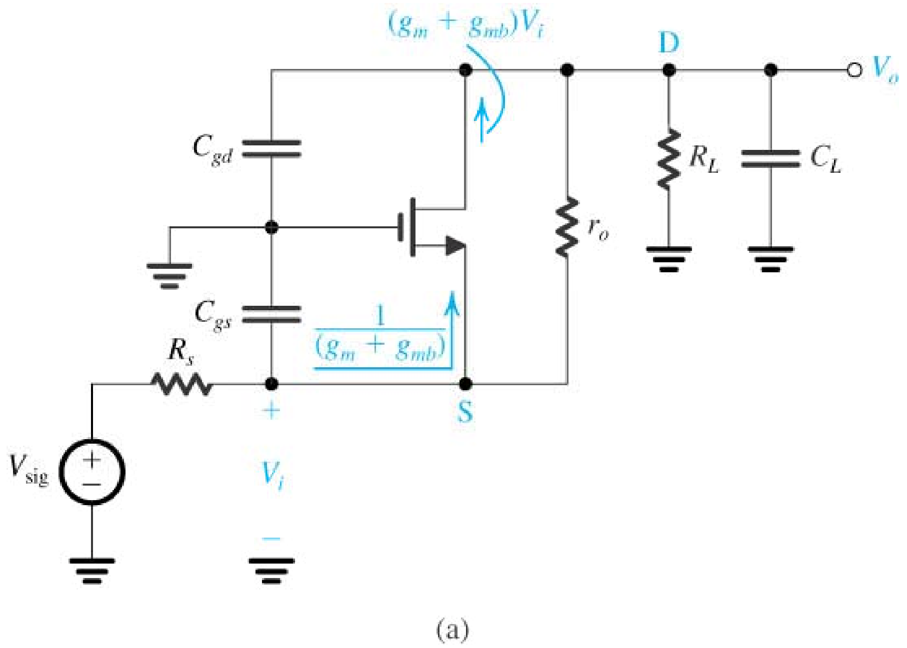
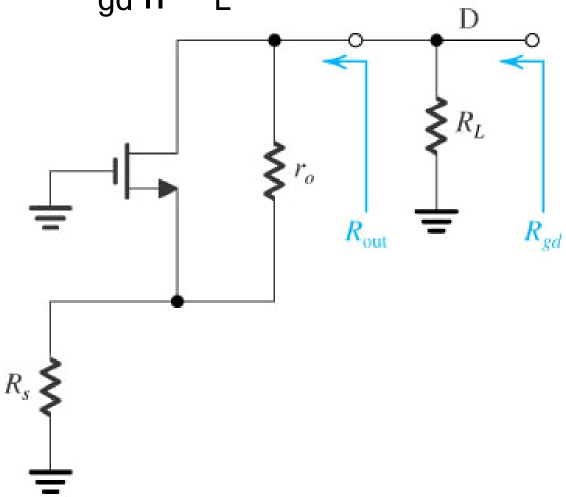
Frequency Response: Use open-circuit time constant method.



For C_{gd} || C_L



$R_{gd}= R_L || R_{out}$

$$f_H = \frac{1}{2\pi\left[C_{gs}(R_s \parallel R_{in}) + \left(C_{gd} + C_L\right)(R_L \parallel R_{out})\right]}$$

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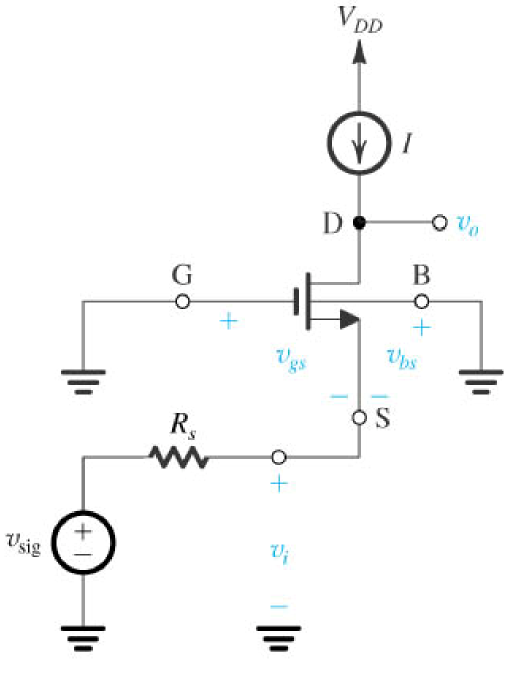
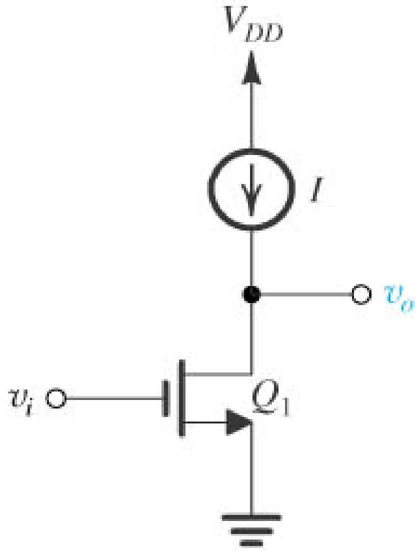
Comparison of CG with CS



(a)



$$f_H = \frac{1}{2\pi\left[C_{gs}(R_s \| R_{in}) + \left(C_{gd} + C_L\right)(R_L \| R_{out})\right]}$$

$$f_H = \frac{1}{2\pi\left[C_{gs}R_{sig} + C_{gd}[R_{sig}(1+g_m R_L') + R_L'] + C_L R_L'\right]}$$

Which is larger? Why? CG does not suffer from Miller effect