

EE105 - Fall 2005
Microelectronic Devices and Circuits

Lecture 22

**Frequency Response of Common Drain/
Common Source Amplifiers**
Multistage Amplifiers

Announcements

- › **Homework 10 due on Tuesday**
- › **Lab 8 this week**
 - › Friday is a University holiday (no lab/discussion)
 - › Friday's lab 8 on November 18
 - › No new lab next week
- › **Midterm 2 next Thursday, Nov. 17, 6:30-8pm, Sibley**
 - › Review session on Tuesday, Nov. 15, 6:30-8pm, 277 Cory
- › **Reading: Chapter 9 (9.1, 9.3, 9.5)**

Lecture Material

- › Last lecture
 - › Time constants
- › This lecture
 - › Common drain, common gate frequency response
 - › Multistage amplifiers

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Gain-Bandwidth Product

Result from Miller:

$$\omega_{p1}^{-1} \approx (R_S) \{ C_{gs} + (1 + g_m R'_{out}) C_{gd} \}$$

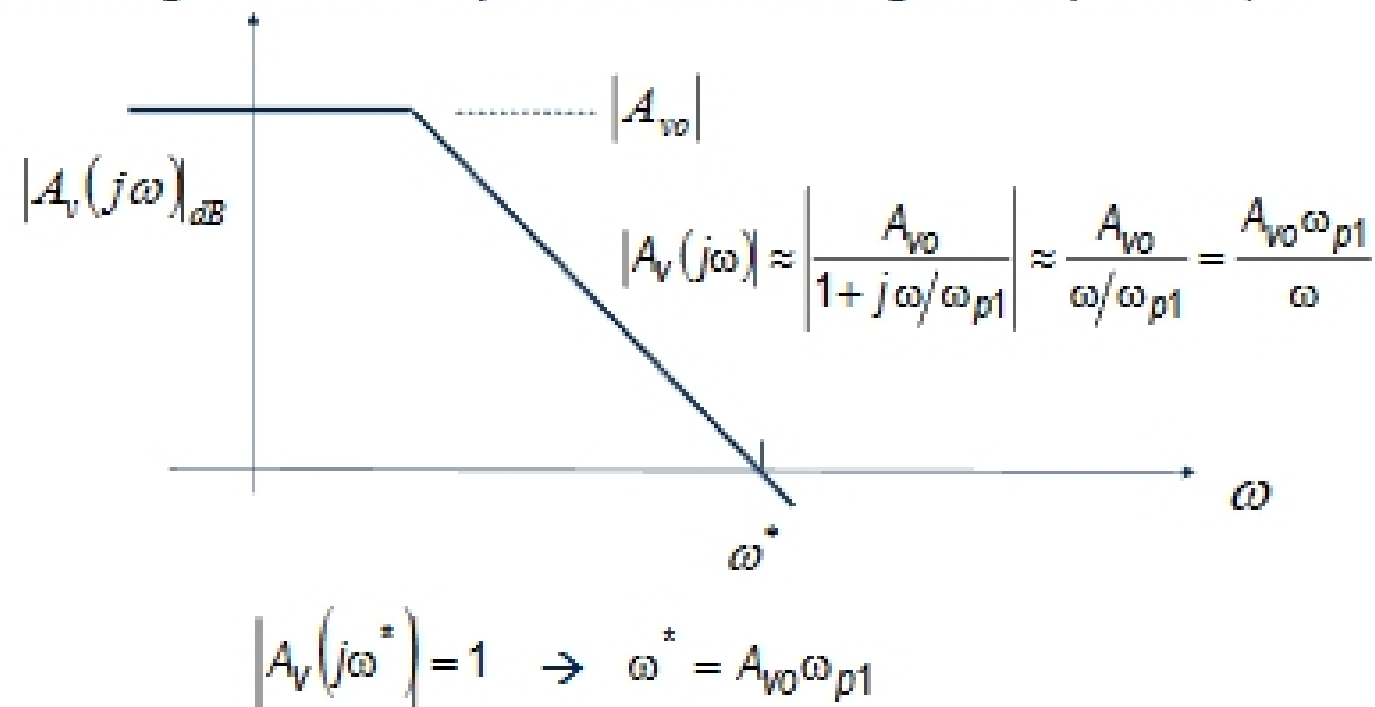
Low-frequency gain:

$$A_{vo} = \left. \frac{v_{out}}{v_s} \right|_{R_S, R_L} = -g_m R'_{out}$$

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Gain-Bandwidth Product

Considering only the first pole
(assuming zero and 2nd pole are at much higher frequencies):



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Gain-Bandwidth Product

For common-source amplifier:

$$|A_{vo}|_{\omega_{p1}} = \frac{g_m R'_{out}}{R_S C_{gs} + R_S (1 + g_m R'_{out}) C_{gd}}$$

Special case: $R_S \approx R_L < r_o, r_{oc}$

$$|A_{vo}|_{\omega_{p1}} \approx \frac{g_m R_L}{R_S (C_{gs} + g_m R_L C_{gd})} \ll \omega_T \leftarrow \text{not that great!}$$

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