



Announcements

- Midterm Tuesday 08/08 12 to 1:30pm
 - 145 Dwinelle
 - Lectures 7-14, HW #4,5,6
 - Review Session Thursday 08/03 5-8pm in Cory 277
- HW #5 due tomorrow
- HW #6 online tomorrow and due next Monday at 6pm.



Lecture #14

OUTLINE

- Load Line and Small signal analyses of:
 - Common source amplifier
 - Source follower
 - Common gate amplifier

Reference Reading

- Hambley: Chapter 12.1-12.5

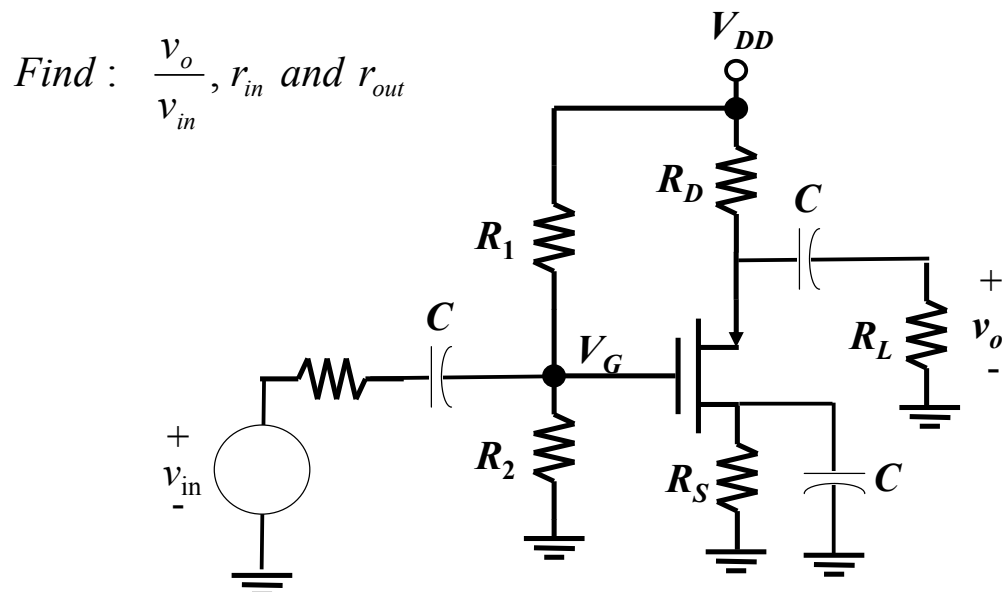


MOSFET Circuit

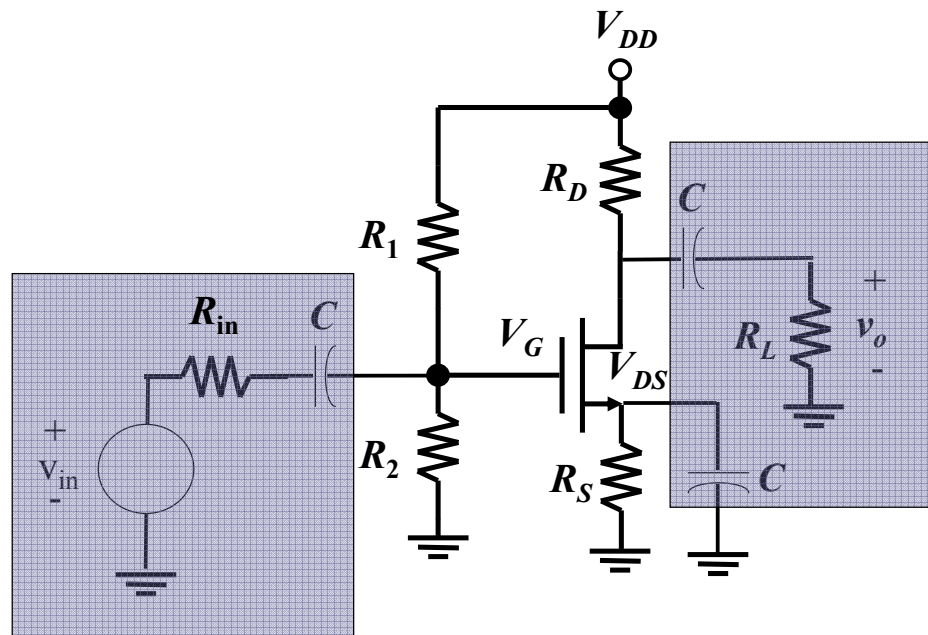
- First look at DC case to find Q point
 - Use load line technique
 - All capacitors are open circuit
 - From Q-point, get g_m and r_o for small signal AC model
- AC Small signal analysis
 - DC source is AC ground (because there is no AC signal variation).
 - All capacitors are short circuit (unless otherwise specified).



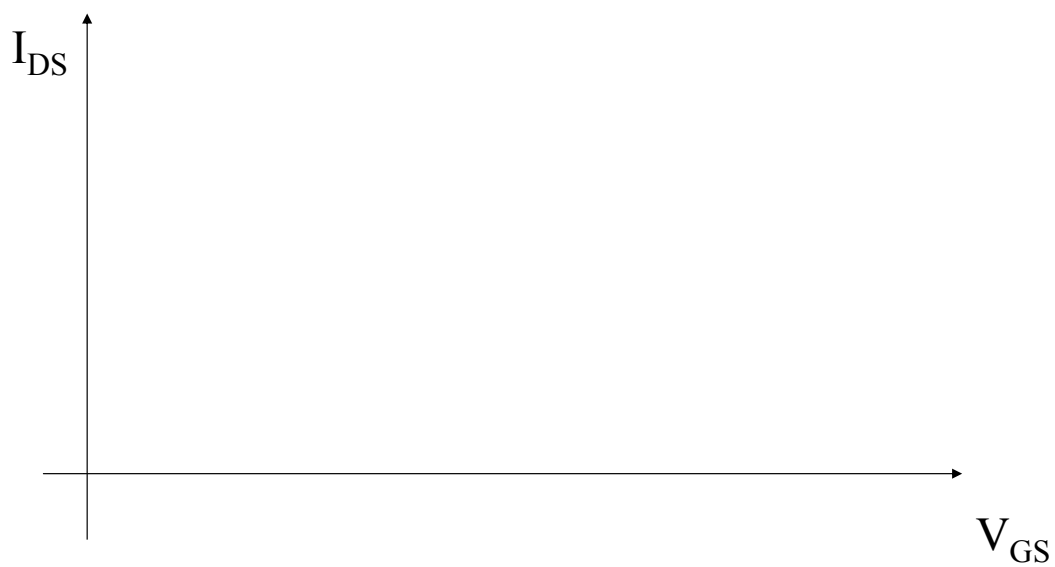
Common Source Amplifier



Step 1: find Q point



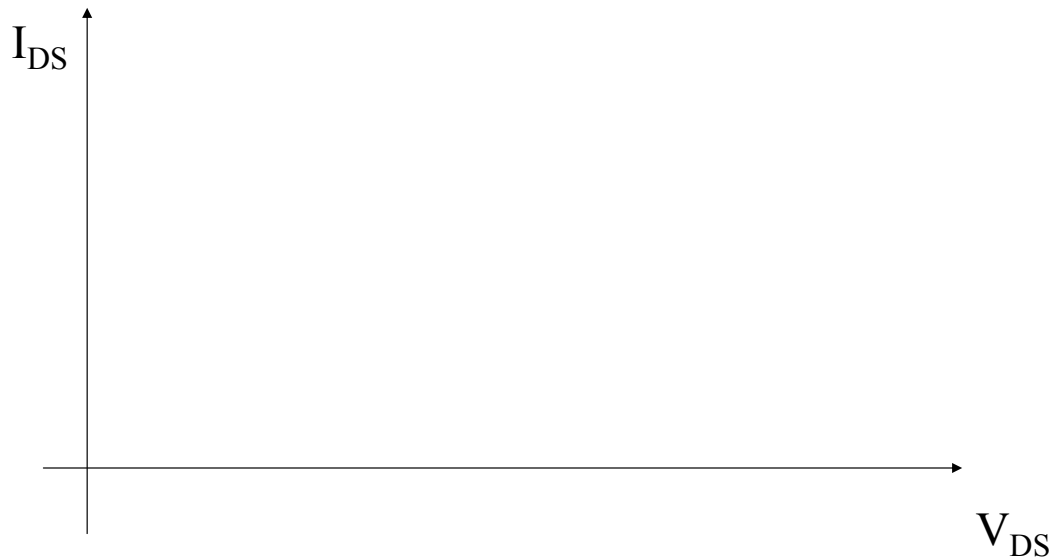
Load line:



From load lines, we get $I_D \rightarrow$ and hence g_m and r_o



Load line:



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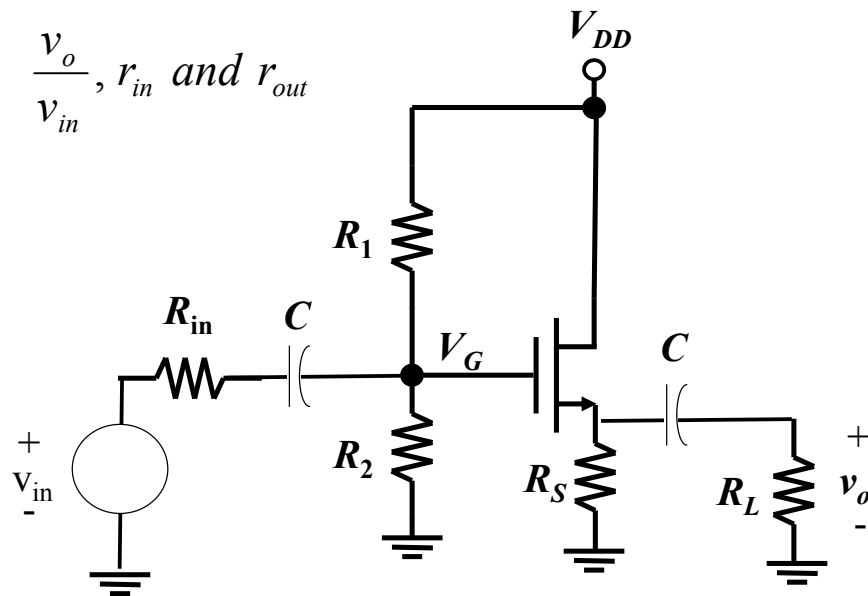
Step 2: Small Signal Model

For output impedance r_{out} :

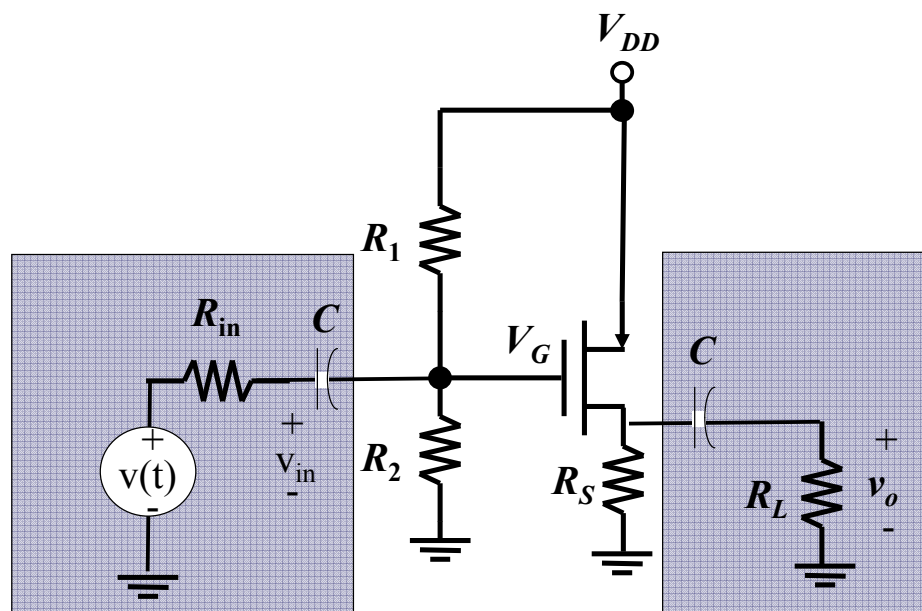
1. Turn off all independent sources.
2. Apply at V_t at the output and find i_t

Source Follower

Find : $\frac{v_o}{v_{in}}$, r_{in} and r_{out}

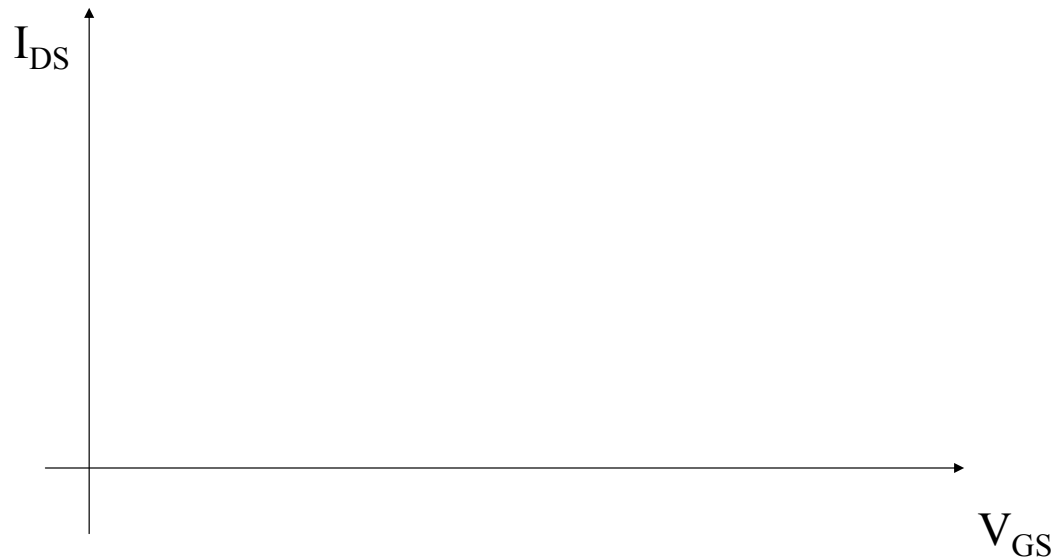


Step 1: find Q point





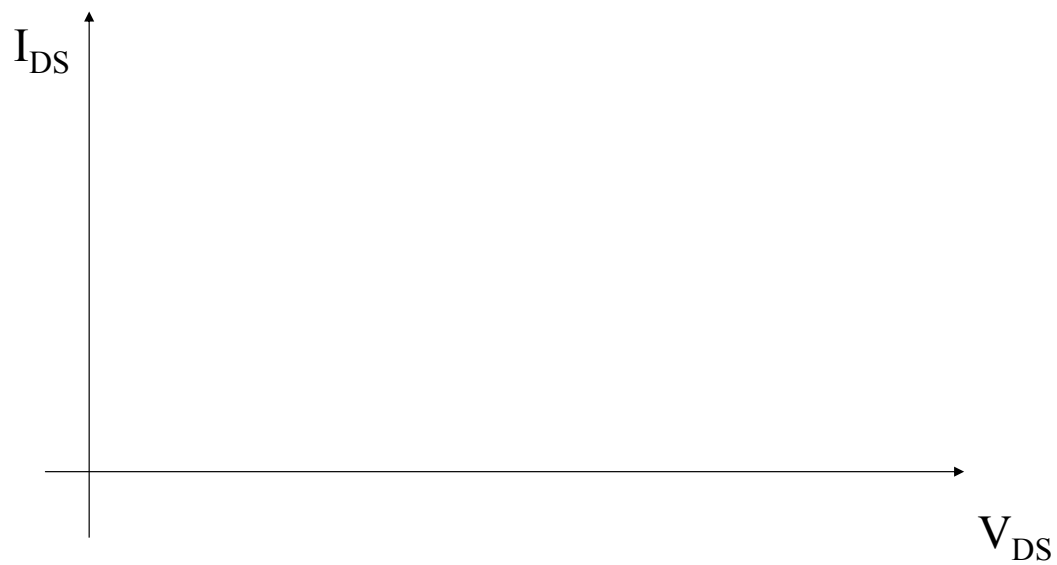
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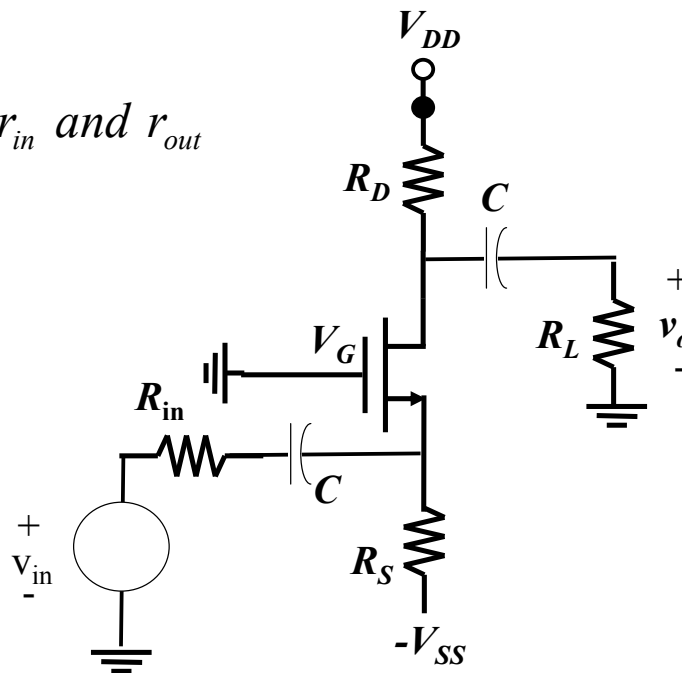
Step 2: Small Signal Model

For output impedance r_{out} :

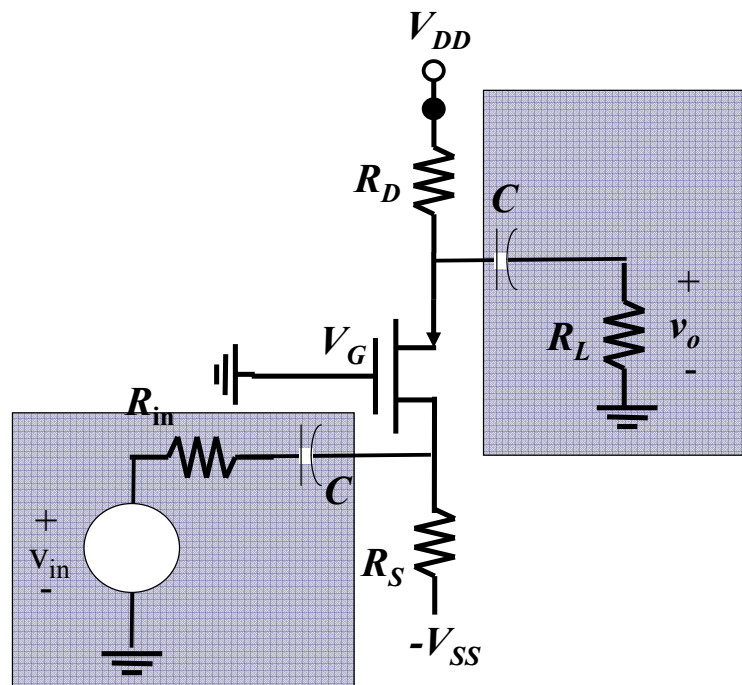
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2. Apply at V_t at the output and find i_t

Common Gate Amplifier

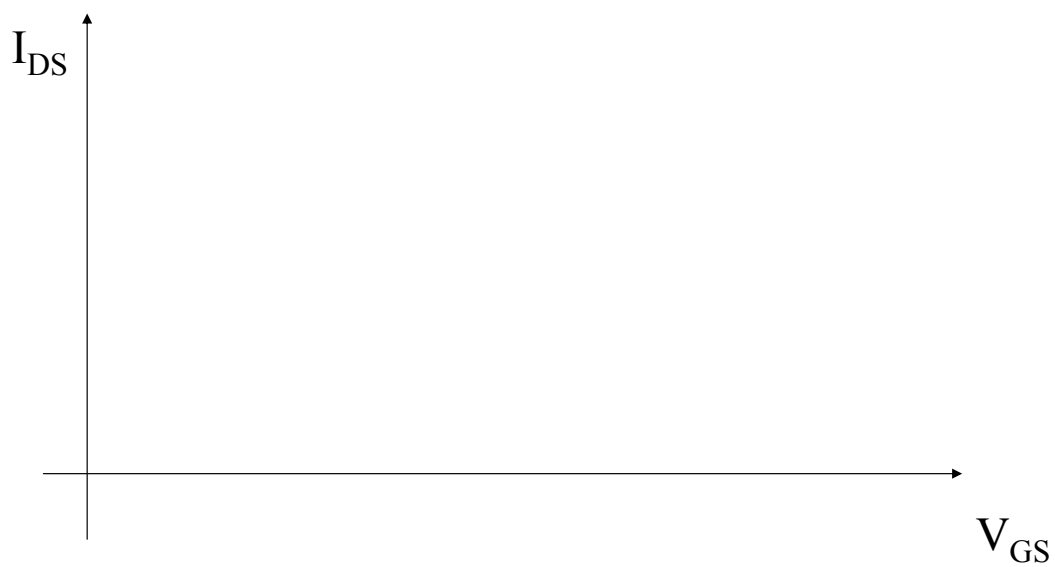
Find : $\frac{v_o}{v_{in}}$, r_{in} and r_{out}



Step 1: find Q point



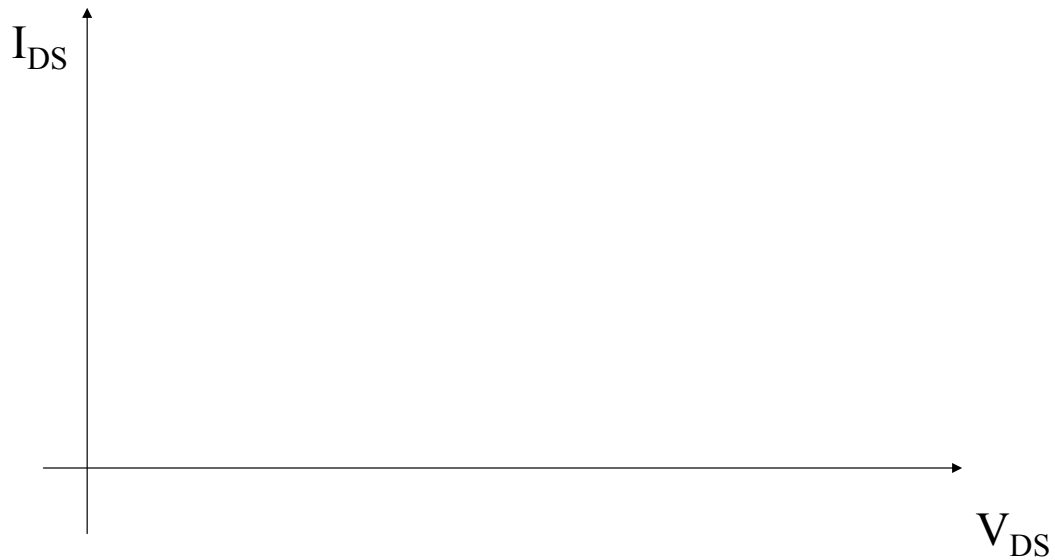
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From load lines, we get $I_D \rightarrow$ and hence g_m and r_o



Step 2: Small Signal Model

For output impedance r_{out} :

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