Hayden Fuller
IE lab 7p3

Pre-Lab Exercise 3:

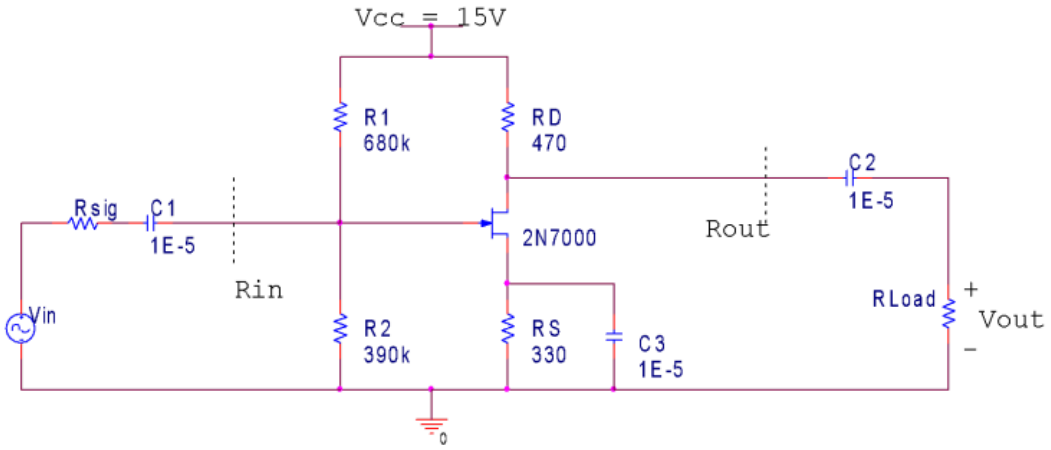
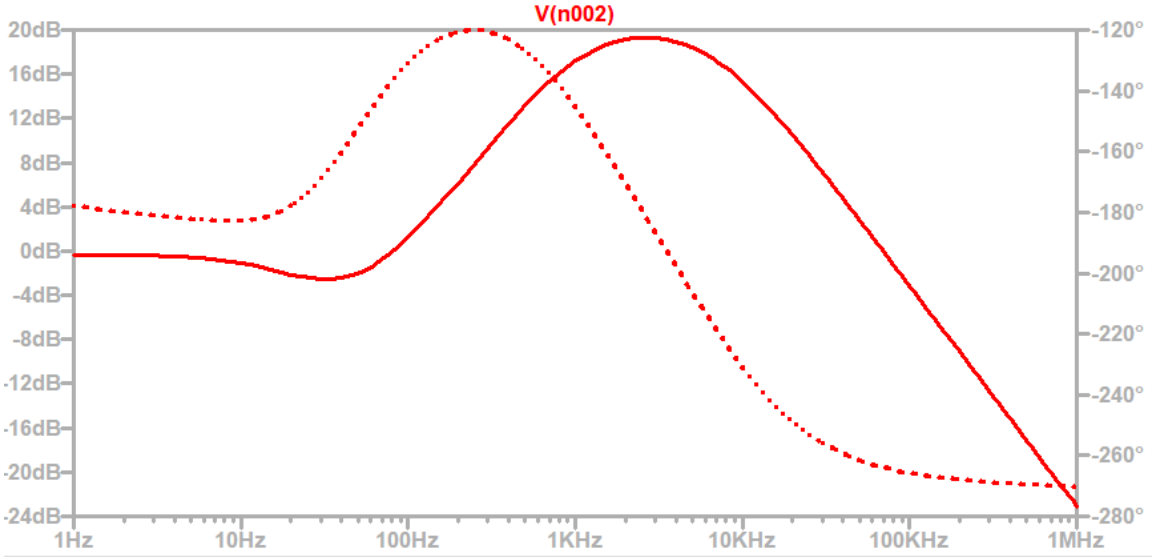


Figure 4: MOSFET circuit

Implement the Exercise 3/5 circuit in PSpice, setting Rsig to 100 kΩ and RLoad to 470 Ω, and run an AC sweep. Identify the low frequency and high frequency cutoff values (3 dB points).



Low cutoff at about 30Hz and high cutoff at about 100kHz

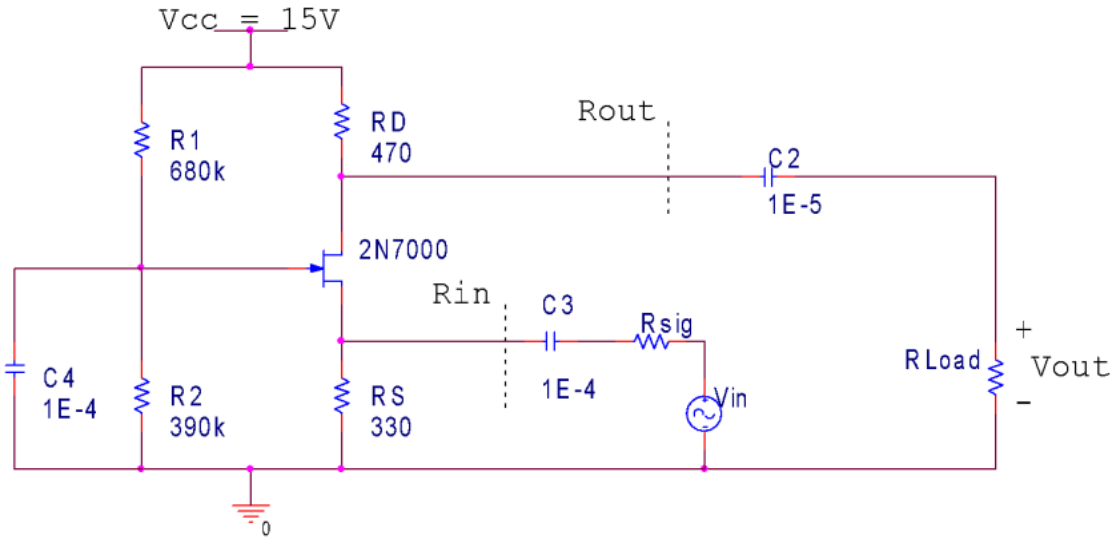
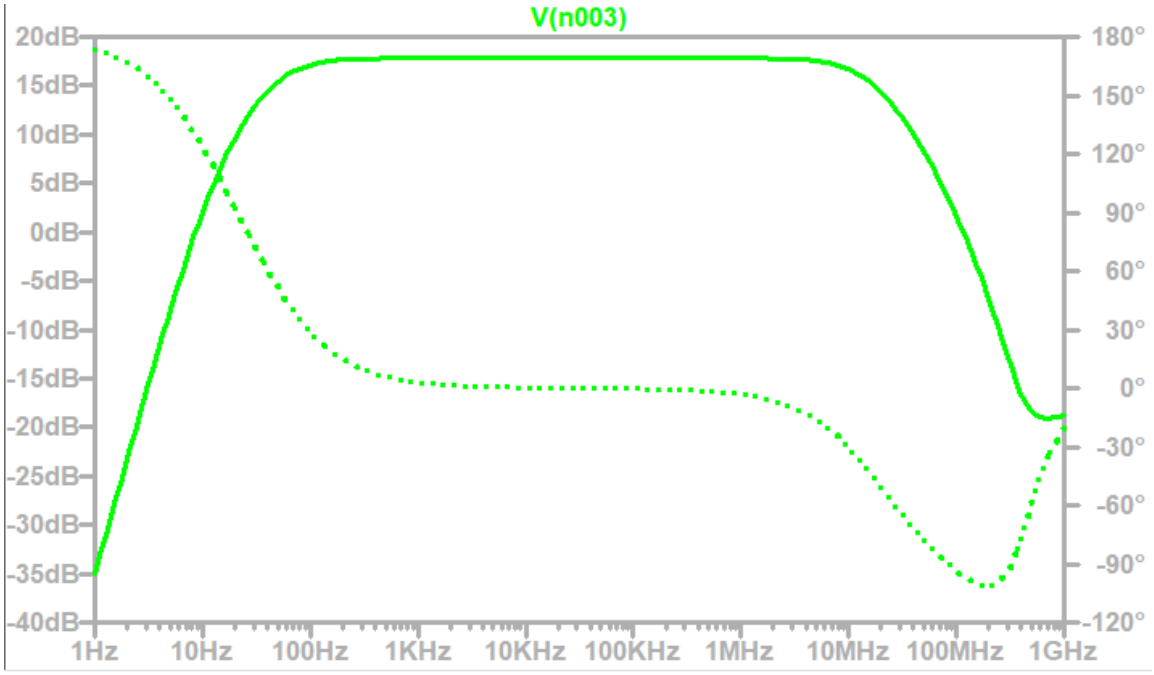


Figure 5: MOSFET circuit

Implement the Exercise 4/6 circuit in PSpice, setting Rsig to 22 Ω and RLoad to 1 kΩ, and run an AC sweep. Identify the low frequency and high frequency cutoff values (3 dB points).



Low cutoff at about 7Hz and high cutoff at about 150MHz

Exercise 5: Common source amplifiers

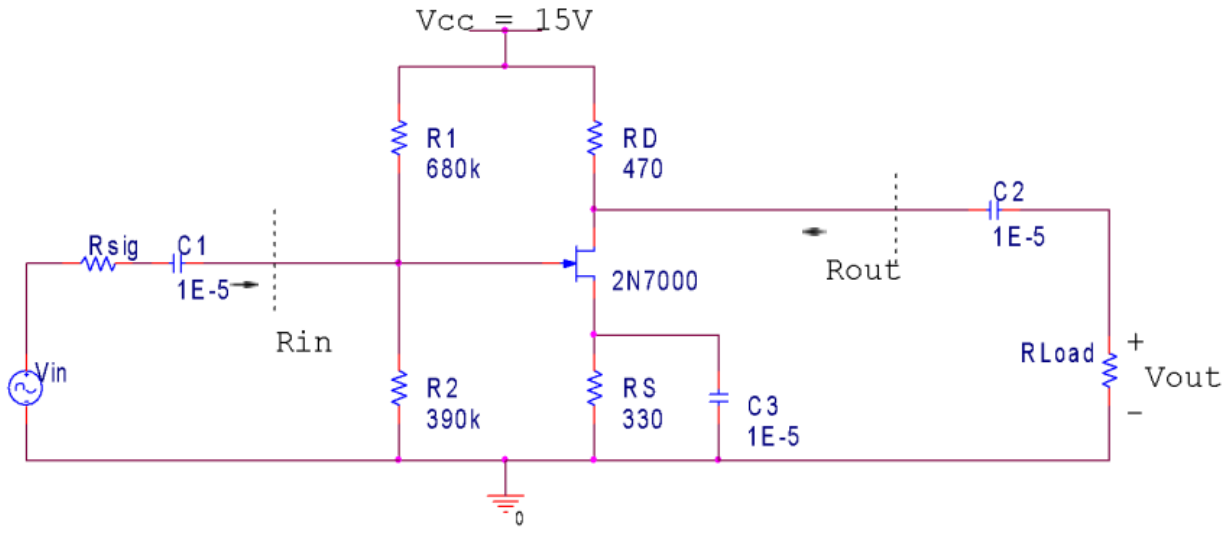


Figure 11: Common source amplifier (same circuit as Figure 9)

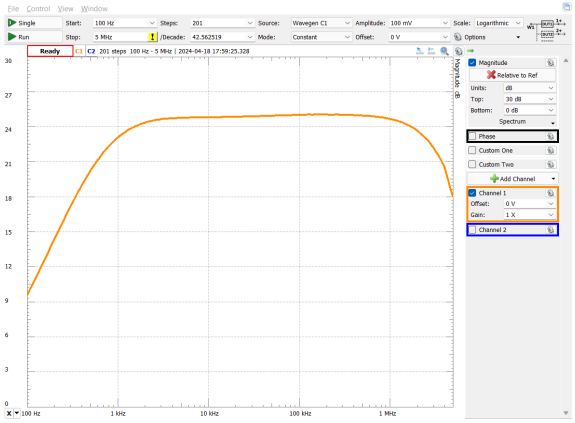
Implement the circuit in Figure 11 (the same circuit as Exercise 3). Set the AC source signal, Vin , to a 0.2Vpp sinusoidal signal.

1. 1. Using the 2N7000 spec sheet, identify the typical capacitances CGS , CDG and CDS associated with the N-channel MOSFET (by using the equations given on page 2).

Ciss ≈ CGS + CDG (given in Data Sheet) = 60pF
Coss ≈ CDG + CDS (given in Data Sheet) = 25pF
Crss ≈ CDG (given in Data Sheet) = 5pF

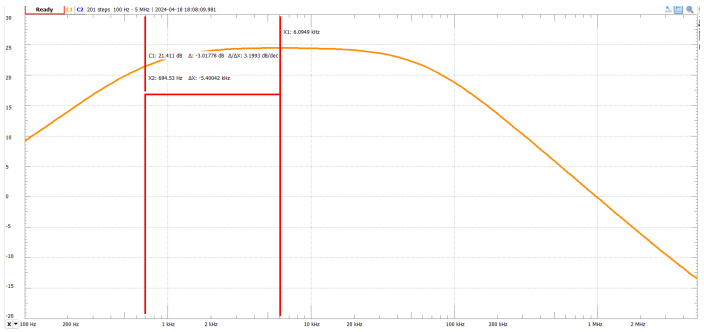
CGS = (CGS + CDG) – CDG = Ciss – Crss = 60pF - 5pF = 55pF
CDG ≈ Crss = 5pF
CDS = (CDG + CDS) – CDG = Coss – Crss = 25pF - ppF = 20pF

2. 2. Set Rsig to 100 Ω and RLoad to 100 kΩ. Sweep the frequency and determine the bandwidth characteristics of the amplifier. Identify the passband by finding the 3 dB low and high cutoff frequencies.
    a. Compare your results to calculated estimates. Include the circuits you used to calculate your estimates. Indicate which capacitors are associated with the dominant poles for the low and high cutoff frequencies.



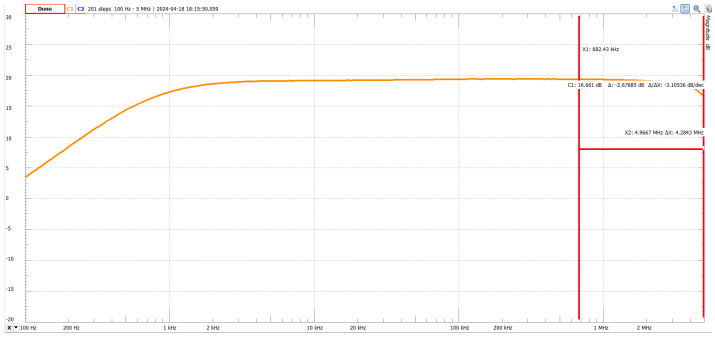
Low cutoff at about 685Hz
High cutoff at about 3.2MHz
Giving a passband range of 700Hz to 3.2MHz

    b. Would your results change significantly if you increased Rsig to 10 kΩ?



Yes, this lowers the high cutoff all the way down to about 62kHz, giving a smaller passband

    c. Would your results change significantly if you decreased RLoad to 470 Ω?



Yes, this raised the high cutoff to about 5MHz, giving a larger passband