

Tutorial 1: Noise

Problem 1

In the amplifier schematic shown in Fig. 1.1, determine the input-referred noise voltage. Consider only the thermal noise sources and ignore the gate noise of the transistors. Neglect channel-length modulation and body effect.

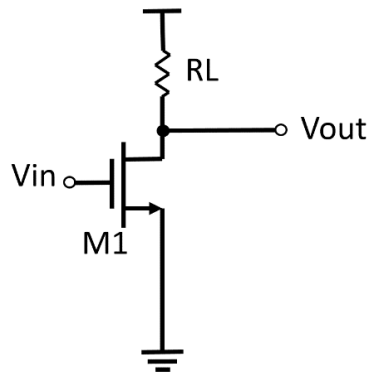


Fig. 1. Common-source amplifier

Problem 2

Determine the noise figure of the stages below with respect to a source impedance of R_S . Neglect body effect, but not channel-length modulation. Assume the current sources I_1 , I_2 are noiseless.

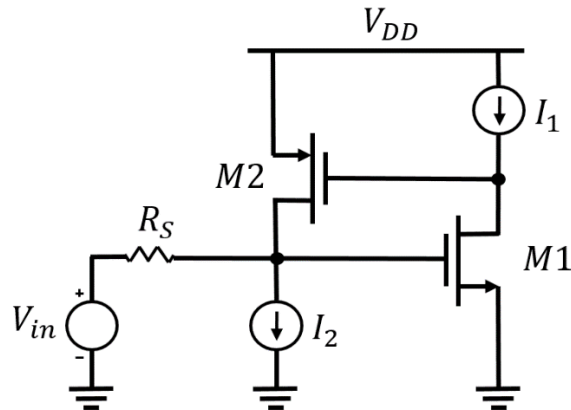


Fig. 2. Stages for NF calculation

Problem 3

A two-stage amplifier is shown below. Determine the noise factor of this amplifier. Consider only the thermal noise sources and ignore the gate noise of the transistors. Assume that R_1 and R_2 are noiseless and ignore all the parasitics. Furthermore assume that $\lambda = 0$.

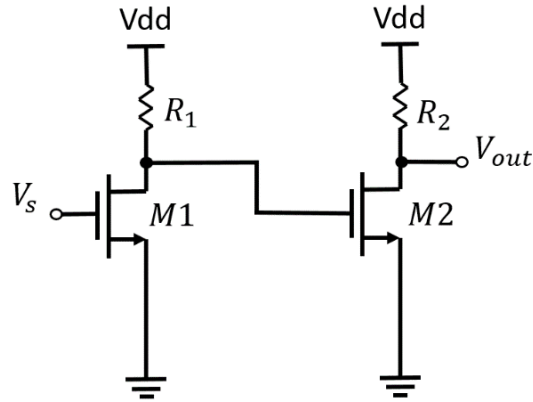


Fig. 3. A two-stage amplifier

Problem 4

A circuit exhibits a noise figure of 3 dB.

- What percentage of the output noise power is due to the source resistance, R_s ?
- Repeat the problem for $NF = 1$ dB.

Homework

Determine the noise figure of the stages below with respect to a source impedance of R_s . Neglect channel-length modulation and body effect.

