

Lab Assignment: LNA Design

Common source shunt feedback LNA

a) Design a Common source shunt feedback LNA as shown in figure:

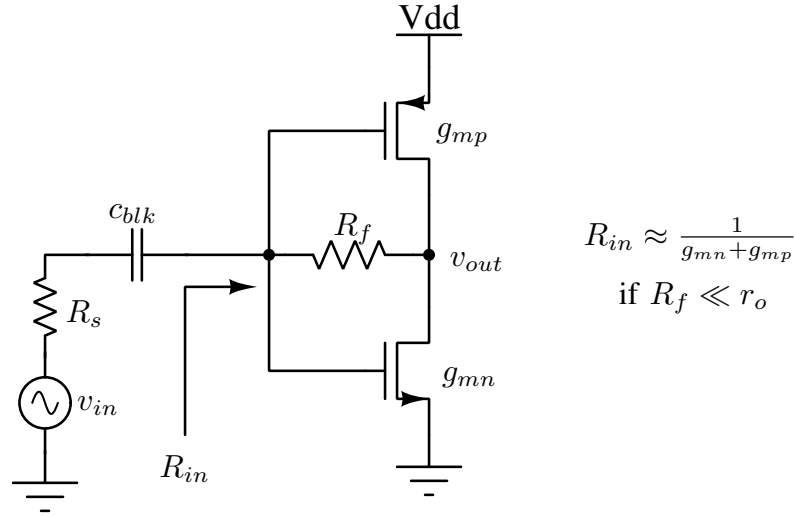


Fig. 1. Common source shunt feedback LNA

Steps:

1. To obtain input matching for $R_s = 50\Omega$, design the MOS to obtain $g_{mn} + g_{mp} = 20m$.
2. Run sp analysis and check real part of Z_{in} . If real part of Z_{in} is far away from 50Ω , change MOS dimensions to bring it closer to estimated 50Ω . Simultaneously, keep on checking the obtained S_{11} .
3. Gain of the circuit is $A_v \approx \frac{R_f}{R_s}$ if $R_f \ll r_o$
4. Once input match is obtained, run noise analysis to plot Noise Figure of the designed LNA.
5. Run ac analysis to estimate the ac gain of the LNA.

b) Design a source follower for 50Ω match and connect it at the output of the LNA to ensure output match.

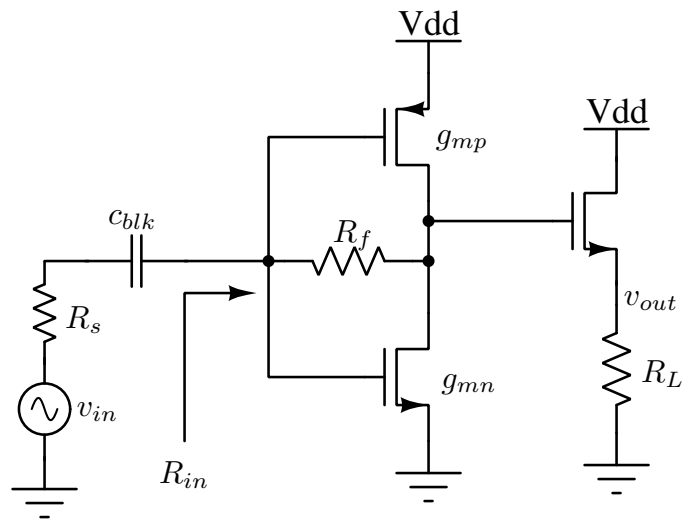


Fig. 2. Common source shunt feedback LNA with output match

Common Gate LNA

Design a Common gate LNA as shown in the figure:

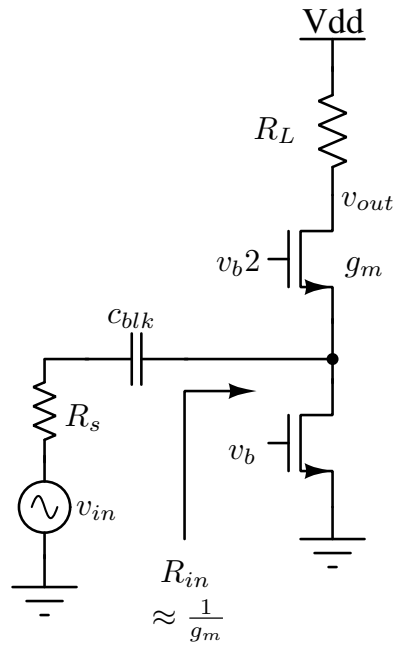


Fig. 3. Common gate LNA

Steps:

1. Bias the MOS in saturation for a g_m of 20 mS such that input match can be obtained.
2. Ensure that real part of Z_{in} is close to 50 Ω .
3. Gain of the circuit is $A_v \approx g_m R_L$
4. Once input match is obtained, do noise analysis.