

1. Use composer and hspice to simulate the common source and source follower as shown at Fig. 1 with $V_{dd}=1.8V$. Every one of MOS's c_{gtot} , c_{stot} , c_{dtot} , and c_{btot} cannot have more than 100fF under your design. (70%)
 - (a) Design a common source with gain $A_1 > 120$ and plot the output noise's spectrum as shown at Fig. 1. (a). Identify the corner frequency and pole of thermal noise. (10%)
 - (b) Design a source follower with gain $A_2 > 0.8$ and plot the output noise's spectrum as shown at Fig. 1. (b). Identify the corner frequency and pole of thermal noise. (10%)
 - (c) Compare (a) with (b). Which one has higher output flicker noise? Which one has higher thermal noise's pole? Why? (10%)
 - (d) Find the total output noise power of CS and SF by integrating the spectrum. Which one is bigger? Why? (10%)
 - (e) Find the total input referred noise power of CS and SF based on the results of (a), (b), and (d). Which one is bigger? Why? (10%)

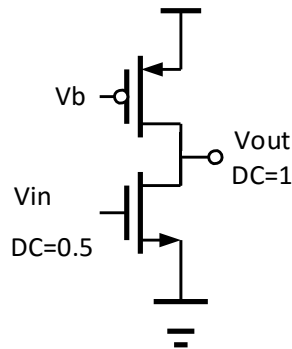


Fig. 1. (a)

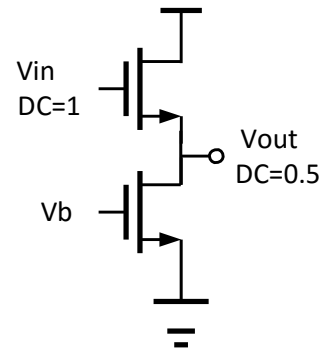


Fig. 1. (b)

- (f) Connect CS and SF as shown at Fig. 1. (c) and find the total input referred noise power. (You are allowed to "slightly" adjust the bias condition to make sure the overall gain equal to $A_1 \cdot A_2$.) (5%)
- (g) Connect SF and CS as shown at Fig. 1. (d) and find the total input referred noise power. (You are allowed to "slightly" adjust the bias condition to make sure the overall gain equal to $A_1 \cdot A_2$.) (5%)
- (h) Comment on what makes the difference between (f) and (g). (10%)



Fig. 1. (c)

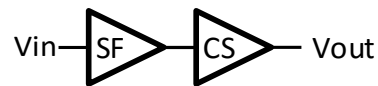


Fig. 1. (d)

✧ Before you start to simulate the .ac noise

1. Find the title "Flicker and Thermal noise Model Parameters" in "cic018.l".
2. Use the "replace all" to change value of the parameter into $KF=1E-29$.
3. Hint: use ".noise V(vout) vin 10000"

