Home Work Assignment #2

Analog Integrated Circuit Design

University of Rhode Island, Kingston, RI 02881-0805, U.S.A.

---

1) Analyze, investigate, the single-ended folded cascode OTA with a p-channel input. This cell, named, $ota_f c_p chin_t smc180$ has been placed in the library $otaAmps_t smc180x$. The circuit simulation cell, named $Ota_p chin_G BWt_t smc180$, already created is what you will need to use to simulate this circuit.

   a) Plot the open loop gain and phase. Record the phase margin.

   b) Record the bandwidth, low frequency amplifier gain, unity gain bandwidth and the phase margin for each of the following loads: $20fF$, $100fF$, $500fF$, $1.0pF$, $2.5pF$, & $5pF$.

   c) Based upon your measurements, how is C_L related to the bandwidth, unity gain frequency and stability of the OTA ?

2) Using the same OTA, determine an amplifier configuration to measure the slew rate.

   a) Create the test set up for the slew rate measurement.

   b) Measure the slew rate of a pulse that starts at 0V and transitions from 0V to 1.8V for the following capacitive loads: $20fF$, $100fF$, $500fF$, $1.0pF$, $2.5pF$, & $5pF$.

   c) Since the slew rate is defined as I_o/C, find a relationship between this C & C_L, the load capacitor (hint, measure I_o).

   d) Measure the slew rate for pulse that transitions from 1.8V to 0V using the same C_L values used earlier.

   e) Are the slew rates different for a positive and negative transition ?

3) Construct a non-inverting amplifier test schematic using this amplifier. Use a $1K\Omega$ resistor for the connection between the inverting input and analog ground. Set $C_L = 2.5pF$.

a) Measure the gain, bandwidth and unity gain frequency for the following gains: 2, 4, 10.

b) Set up a transient analysis simulation. With the gain set to 2, determine the maximum input signal amplitude for a sinusoidal input.