

Indian Institute of Technology, Delhi
ELL304 Analog Circuits
Tutorial 9, 1 October 2015

1. Figure 1 shows a BJT differential amplifier. Find a closed form expression for the differential input to differential output gain of the amplifier. For the BJT, use $I_C = I_S \exp V_{be}/v_T$.
2. Find expressions for the small signal differential mode and common mode gains of the circuits in Figures 2 and 3.
3. Consider the differential amplifier with an active load in Figure 4. Find an expression for the small signal output voltage in terms of the small signal input voltages, v_1 and v_2 . Assume there is a load R_L connected between the output and ground. Find the CMRR of the circuit when I_0 is an ideal current source with infinite source resistance.

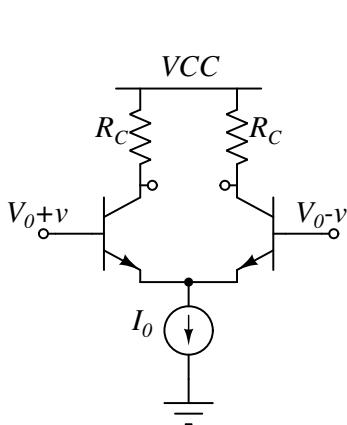


Figure 1

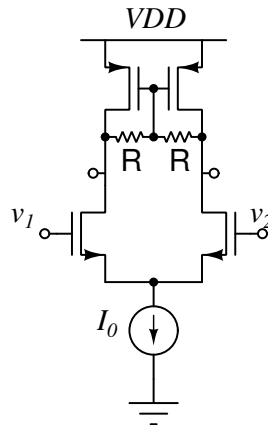


Figure 2

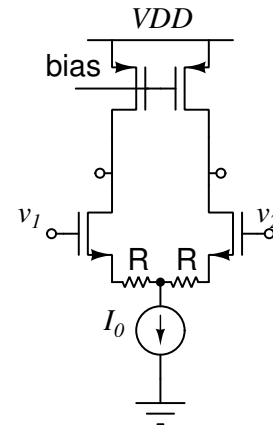


Figure 3

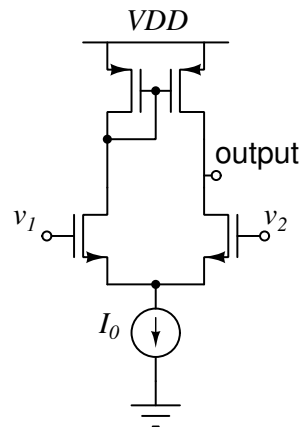


Figure 4