ANALOG LAB 2022
EE2401

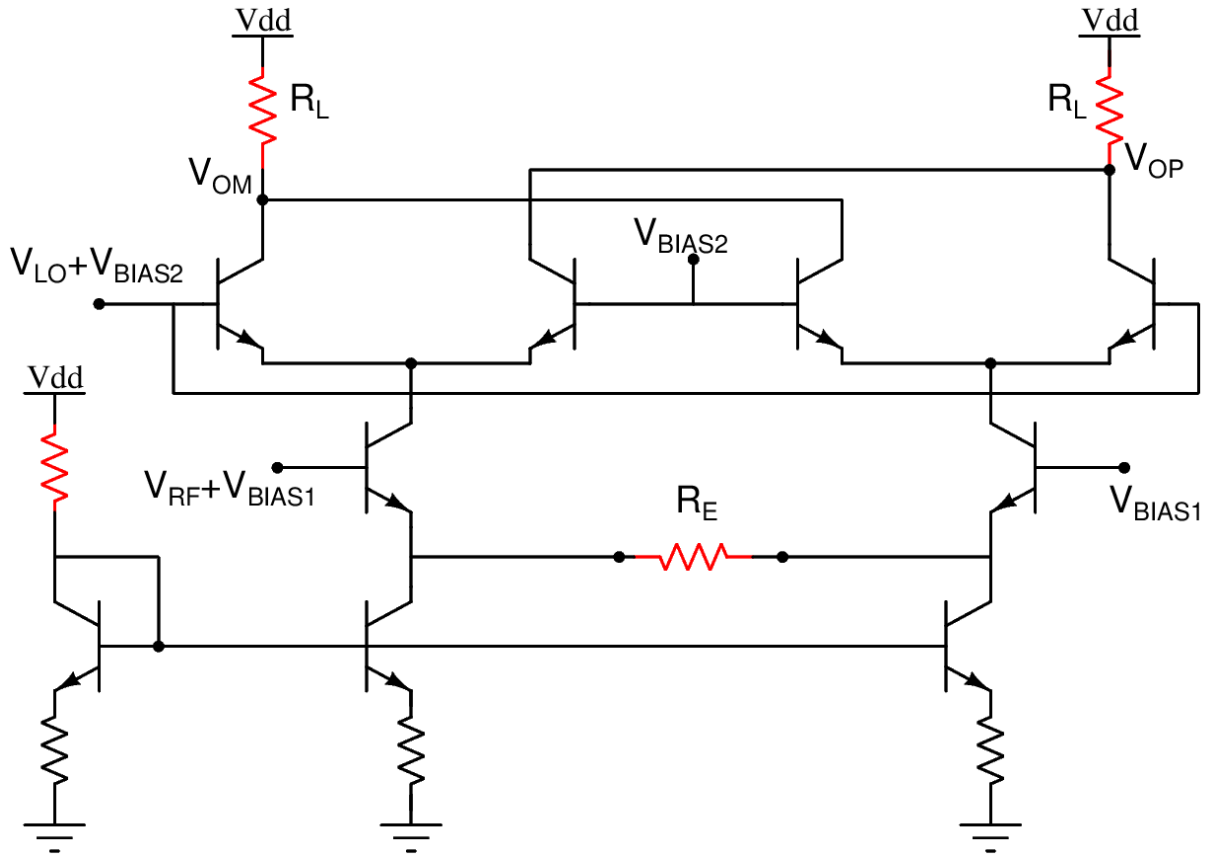## Experiment 11: Double balanced mixer

1. Below is the schematic of a double-balanced mixer present in MC1496 IC:

Components in RED are external to the IC.

- Input signal frequency (V_{RF}): $11\,\text{kHz}$
- V_{LO}: $10\,\text{kHz}$ output from the oscillator designed in Exp. 5

Plot transient simulation result and FFT of the output $V_O = V_{OP} - V_{OM}$. Connect appropriate value of capacitors across R_L to filter out undesired components. Generate bias voltages from the supply. Connect bypass capacitors for the bias voltages.

2. Differential output of the mixer can be converted into single-ended by using the following circuit:

What is the expression for the single-ended output in terms of supply voltage, i_1, i_2 and R_L?

Use the signal specs given in the previous problem and perform the following

- Plot single-ended output. (Transient and FFT)

$$V_o = (i_1 - i_2)R_L$$
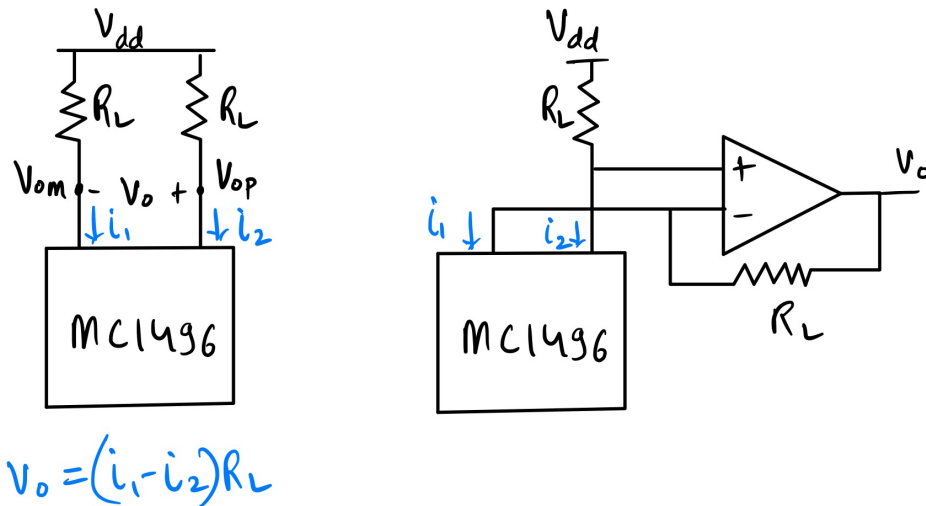
- Apply only V_{RF} and V_{LO} one at a time and make your observation regarding the output.

CAD info:

- LF347 https://www.ti.com/product/LF347#product-details

- MC1496 https://www.onsemi.com/products/audio-video-assp/audio-assp/mc1496

- PSPICE models can be used in LTspice using this procedure: https://www.analog.com/en/technical-articles/ltspice-simple-steps-to-import-third-party-models.html

Submit the following:

- Testbench snapshot, output plots

- Hand calculation

- Any unusual observation along-with comments