Exp. No. Date:

FREQUENCY RESPONSE OF DIFFERENTIAL AMPLIFIER

OBJECTIVE

The purpose of the experiment is to analyze the performance of differential amplifier and to plot the frequency response thereby, determining the CMRR.

EQUIPMENT AND COMPONENTS USED

30 MHz Dual Channel Digital Storage Oscilloscope (DSO)
3 MHz Function Generator
0-30 V dc regulated power supply
4 ½ digit Digital Multimeter
MOSFET 2N7000
Resistors ¼W
Breadboard and Connecting wires
BNC Cables and Probes

PRE-LAB

1. Comment on the mid-band gain and bandwidth of the differential amplifier. Determine the CMRR.

2. Increase the value of source resistor R_S and observe the response of the amplifier.

CIRCUIT DIAGRAM

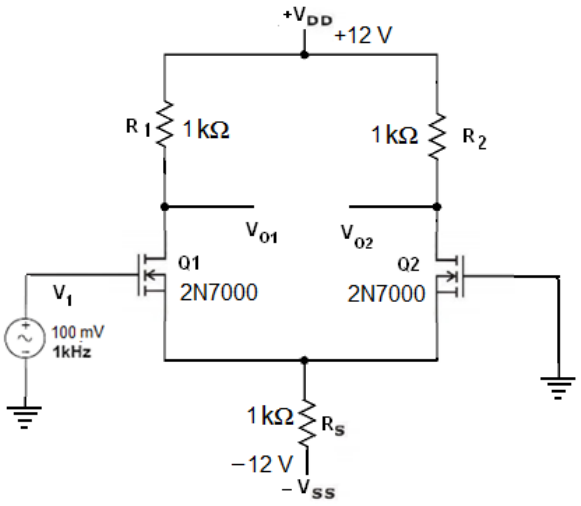

Figure 1: MOS Differential pair in differential mode

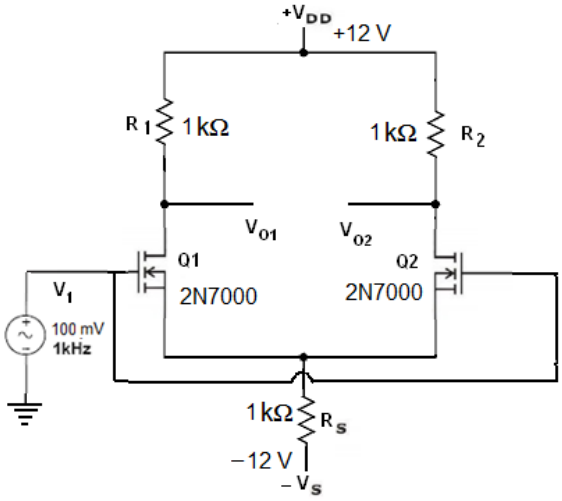

Figure 2: MOS Differential pair in common mode

PRACTICE PROCEDURE

Differential Amplifier Gain Measurements

1. Connect the circuit as shown in Figure 1.
2. Apply an input sine wave signal of 100mV, 1 kHz from the function generator.
3. Observe the output in DSO. Calculate the corresponding gain.

Table2: Amplifier gain measurements

	Amplitude (V)	Frequency (kHz)	Voltage gain, A_V (V/V)
Small signal Input voltage, Vs			
Amplified output voltage, Vo			

Inference

Differential Mode Gain

1. Keeping the magnitude of the input same, ie.,100mV, vary the frequency of the input signal and tabulate the output voltage for different frequencies.
2. Compute the gain and plot the Frequency versus Gain (dB) using semi-log sheet.
3. From the plot, determine the values of (a) Mid band voltage gain, A_V(mid), (b) Lower cut-off frequency, (c) Upper cut-off frequency and (d) Bandwidth.

Table3: Frequency response

Input voltage, Vs = mV

Input frequency (Hz)	**Output voltage, Vo = V_{O1} - V_{O2} (Volts)**	**Gain = $\frac{Vo}{V_1}$**	**Ad = 20 log Gain (dB)**
10			
20			
50			
100			
200			
500			
1k			
2k			
5k			
10k			
20k			
50k			
100k			
200k			
500k			
1M			
2M			

Inference

Common Mode Gain

1. Connect the circuit as shown in Figure 2.
2. Apply an input sine wave signal of 100mV, 10 kHz from the function generator.
3. Observe the output in DSO. Calculate the corresponding gain.

Table2: Input voltage, $V_1 = V_2 =$ mV

Input frequency (Hz)	**Output voltage, $Vo = V_{O1} - V_{O2}$ (volts)**	**Gain = $\frac{Vo}{V_1}$**	**Acm = 20 log Gain (dB)**
10 kHz			

Inference

UNDERSTANDING & LEARNING

RESULTS AND CONCLUSION

Prepared by:
Name: _____ Reg. No.: _____

Date of Experiment: ……

Date of Report Submission: ……

Signature

ASSESSMENT

Student Task	Max. Marks	Graded Marks
Pre-lab Preparation / Conduction	10	
Results & Inference	10	
Post-lab / Viva-voce	10	
Total	30	