EE 660 VLSI Design Laboratory
Assignment VII
Submitted by: L Sri Sai Swathi (2414202)

1. **Plot the Supply Current vs. Supply Voltage characteristics of the LM386 amplifier and compare your results with Fig. 6-1 in the datasheet..**

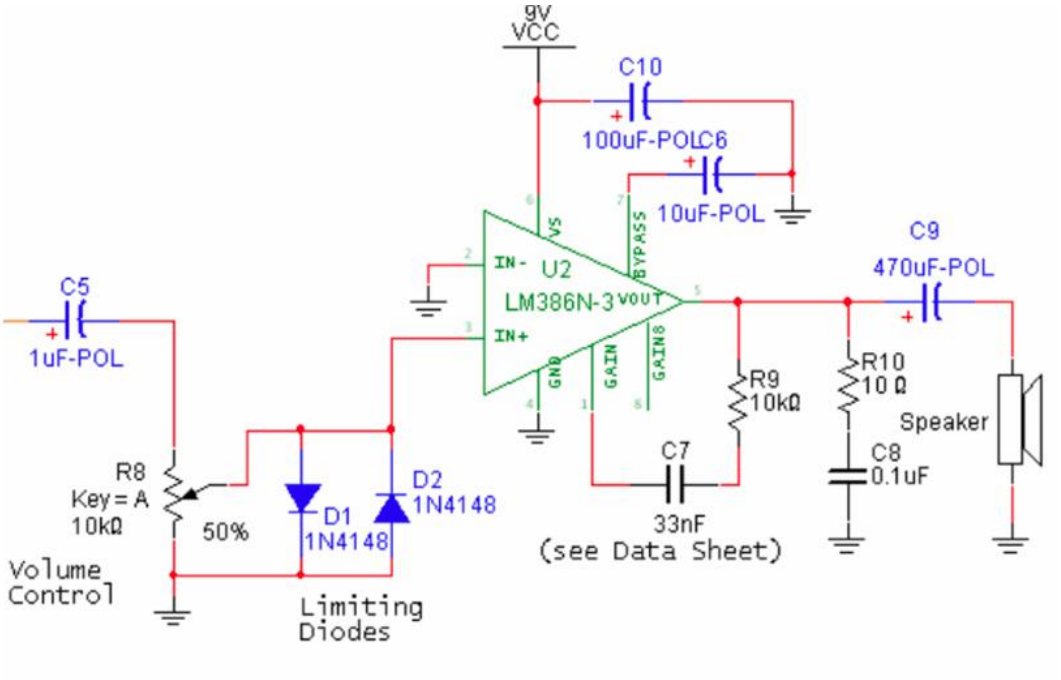

Fig: Circuit diagram of LM86 Amplifier

The LM386 is a low-power audio amplifier, designed for low power consumption, with a quiescent current drain of approximately 4 mA when operating from a 6V supply. This current remains relatively stable across the specified supply voltage range of 4V to 12V. The supply current and supply voltage characteristics can be plotted by measuring the current drawn by the LM386 as a function of the supply voltage.

Procedure :

1. Connected the Circuit as per the above provided circuit diagram.
2. Applied a signal with an input voltage of 0.5V and a frequency of 1kHz using a signal generator.
3. Using an oscilloscope, monitored the input voltage waveform and connected an ammeter in the circuit to measure the current.
4. Recorded Readings of input voltage values and the corresponding current values for analysis.
5. Plotted the recorded data on a graph with Vin (x-axis) and current (y-axis) to visualize the characteristics.

Observation Table:Input Voltage and measured current values of LM86

Voltage(V)	Current(mA)
4	**4.58**
5	4.53
6	4.49
7	4.51
8	4.53
9	4.57
10	4.63
11	4.71
12	4.76
13	4.82

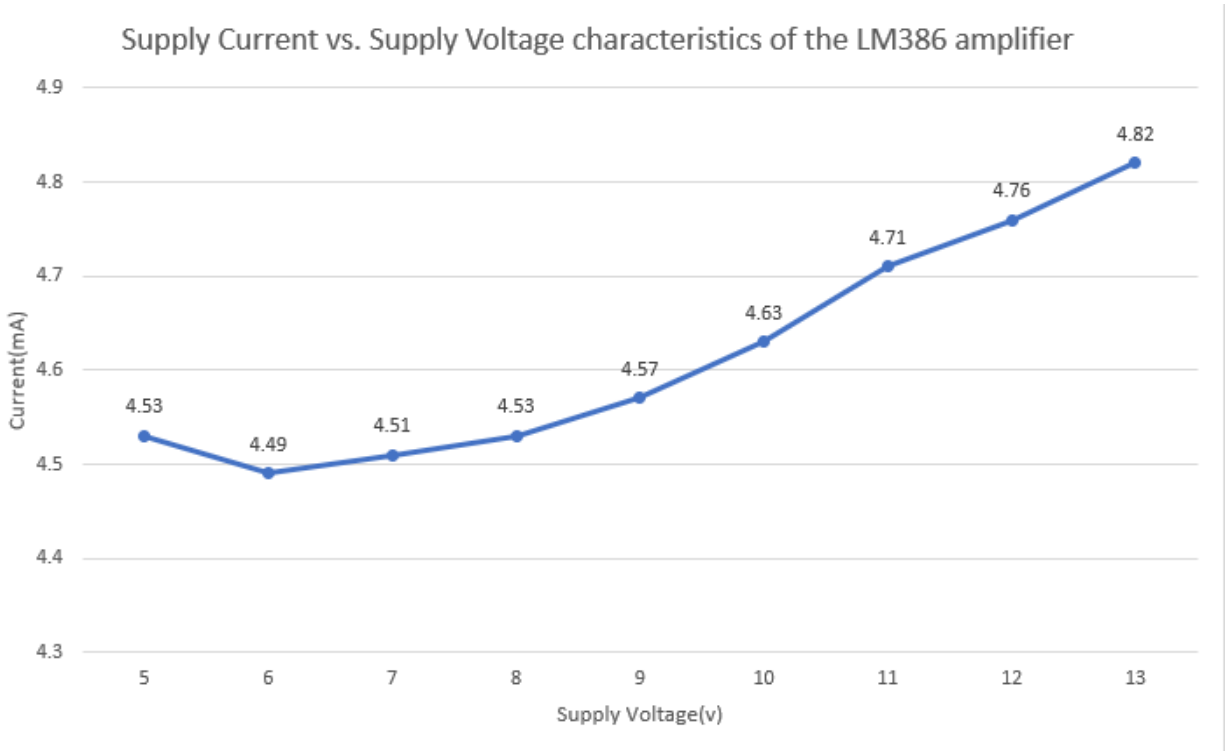

Fig: Supply Current vs Supply Voltage characteristics of LM386 amplifier

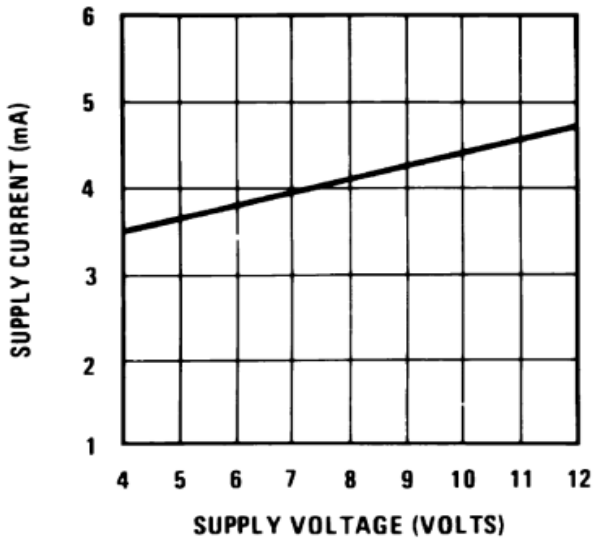

Figure 6-1. Supply Current vs Supply Voltage

Figure:VI characteristics from LM86 Datasheet

<u>Observation</u>: It is observed that the VI characteristics closely matched those outlined in the data sheet, confirming the circuit's performance aligns with the expected behavior.

2. Plot the Voltage Gain vs. Frequency characteristics of the LM386 amplifier and compare your results with Fig. 6-4 in the datasheet. Find out the 3 dB cut-off frequency of the amplifier for different values of capacitors mentioned in the datasheet

Procedure:

1. Connected the Circuit as per the above provided circuit diagram.
2. Used a signal generator to supply a sine wave input of 0.4V with an adjustable frequency range.
3. Using an oscilloscope, measured the output voltage at various frequencies while ensuring the input signal remained stable.
4. Calculated the gain for each frequency by dividing the output voltage by the input voltage and thereby calculated gain in dB.
5. Plotted Voltage Gain vs. Frequency graph to visualize the amplifier's performance and calculated 3dB cutoff frequency.

Observation Table: (C1,8=0uF)

Frequency (KHz)	Vin(mV)	Vout(mV)	Gain= Vout/Vin	Gain in dB
1	400	1013	2.5325	8.071
2	400	1005	2.5125	8.0021
5	400	1003	2.5075	7.9848
10	400	1003	2.5075	7.9848
20	400	1003	2.5075	7.9848
30	400	1003	2.5075	7.9848
40	400	1003	2.5075	7.9848
50	400	1003	2.5075	7.9848
60	400	1003	2.5075	7.9848
70	400	1003	2.5075	7.9848
80	400	1003	2.5075	7.9848
90	400	1003	2.5075	7.9848
100	400	1001	2.5025	7.9675
150	400	1001	2.5025	7.9675
200	400	980	2.45	7.7833
250	400	940	2.35	7.4214
300	400	920	2.3	7.2346
350	400	880	2.2	6.8485
400	400	820	2.05	6.2351
450	400	760	1.9	5.5751
500	400	700	1.75	4.8608
550	400	620	1.55	3.8066
600	400	580	1.45	3.2274
650	400	520	1.3	2.2789
700	400	480	1.2	1.5836
750	400	440	1.1	0.8279
800	400	400	1	0
850	400	360	0.9	-0.9151
900	400	320	0.8	-1.9382
950	400	300	0.75	-2.4988
1000	400	280	0.7	-3.098

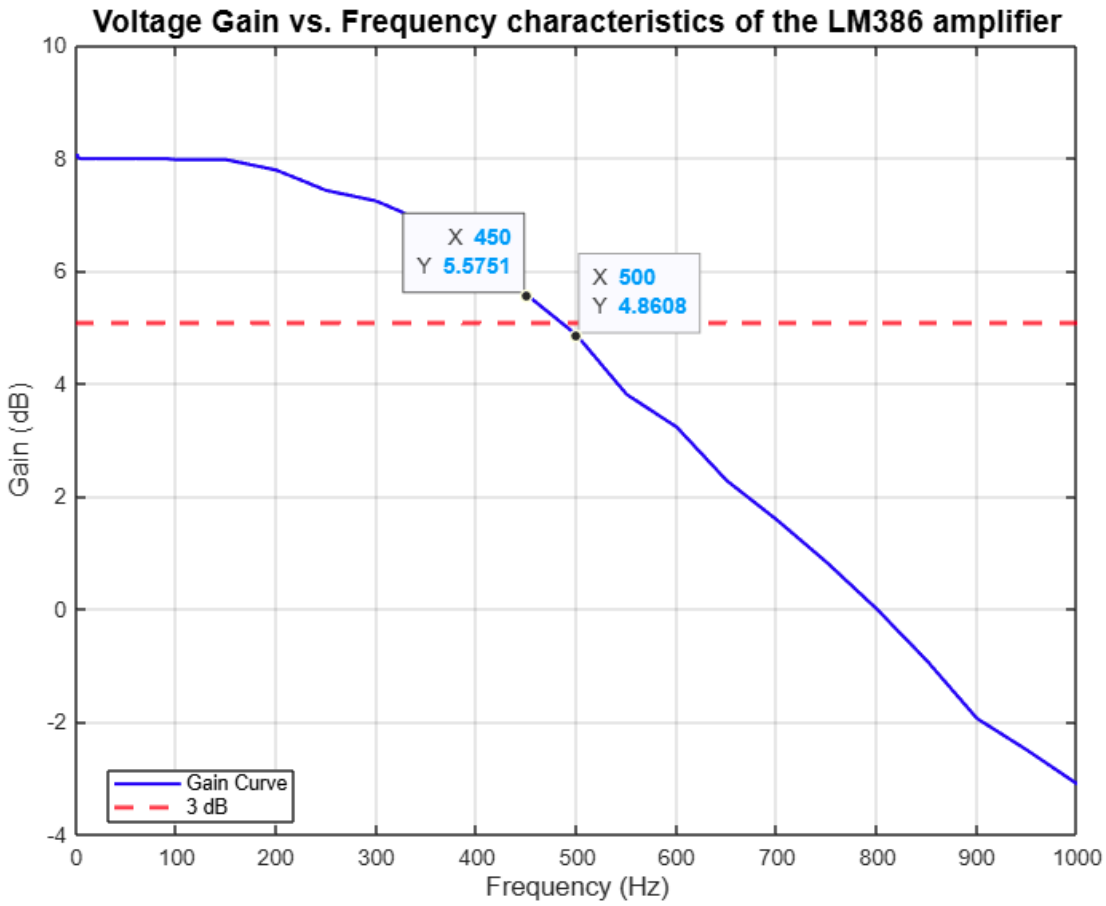

Figure: Voltage gain vs Frequency characteristics of LM386 amplifier

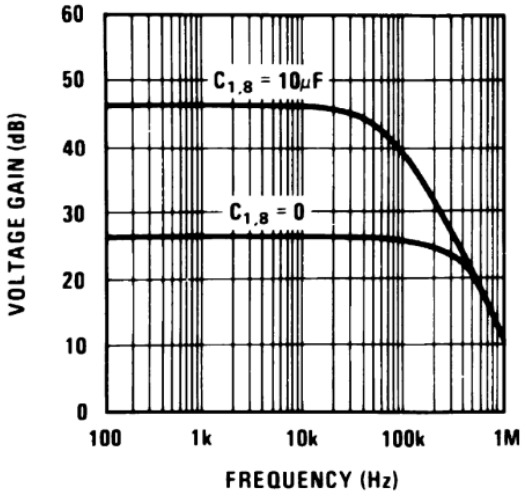

Figure 6-4. Voltage Gain vs Frequency

Observations:

1. Gain of the LM386 amplifier when vin is 0.4v is **8dB.**
2. 3dB cutoff frequency is **490KHz.**
3. With **C1,8 = 0uF**, It is observed that the 3dB cutoff frequency closely matched the values outlined in the datasheet (**Figure 6-4**), confirming that the circuit's performance aligns with the expected behavior.