

Prelab 9 and 10

7/10/22

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Part 1: Lab 9

Table

Also added was the V1 and V2 values for reference

To note actual values of V_{GS} in simulation were: 0 was 0.091, -0.5 was -0.545, and -1 was exactly -1.

Table 1. Output Characteristics

	$V_{GS} = 0$	$V_{GS} = -0.5$	$V_{GS} = -1$
V_{DS}	I_d (mA)	I_d (mA)	I_d (mA)
0	0.04	0.037	0.033
0.5	0.891	0.595	0.395
1	1.538	0.979	0.567
2	2.175	1.119	0.572
4	2.213	1.131	0.578
8	2.26	1.155	0.59
12	2.306	1.178	0.602
16	2.352	1.204	0.615
20	2.398	1.226	0.629

Table 2. Transfer Characteristics

V_{GS}	$V_{DS} = 6$
0	2.236
-0.5	1.142
-1	0.584
-1.5	0.159
-2	0

Observations

V_p looks to be $V_{ds} = 3$, the green line on the plot marks the V_p . V_{th} is around -1.5.

For the transfer characteristics, the star marks V_p at -2 and the green line marks the network, with the Q point being around (-0.75, 0.75).

Multisim

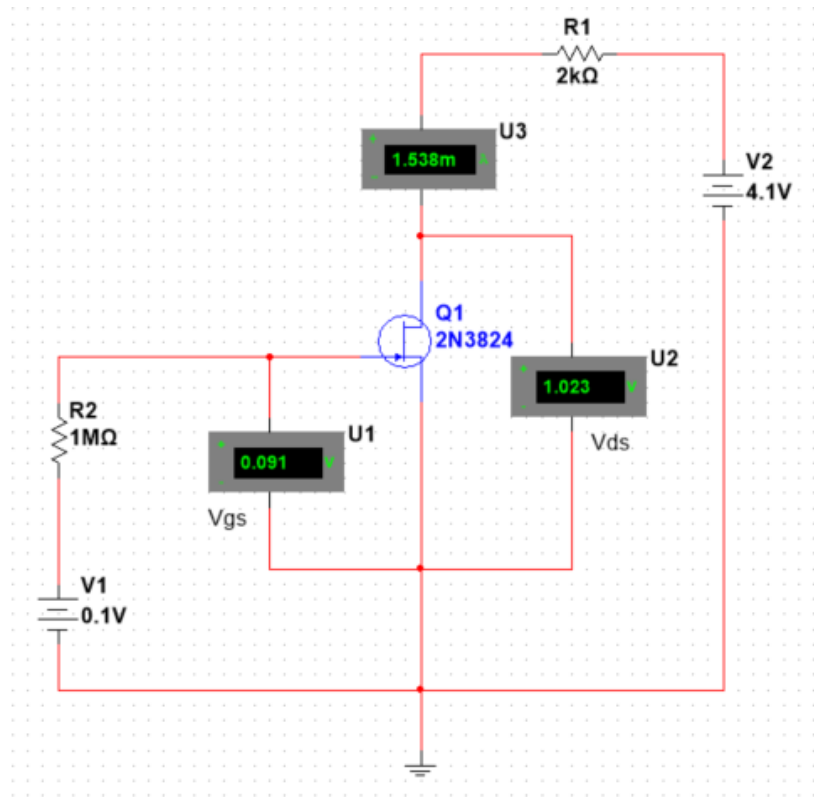


Figure 1. Lab 9 circuit

Plot

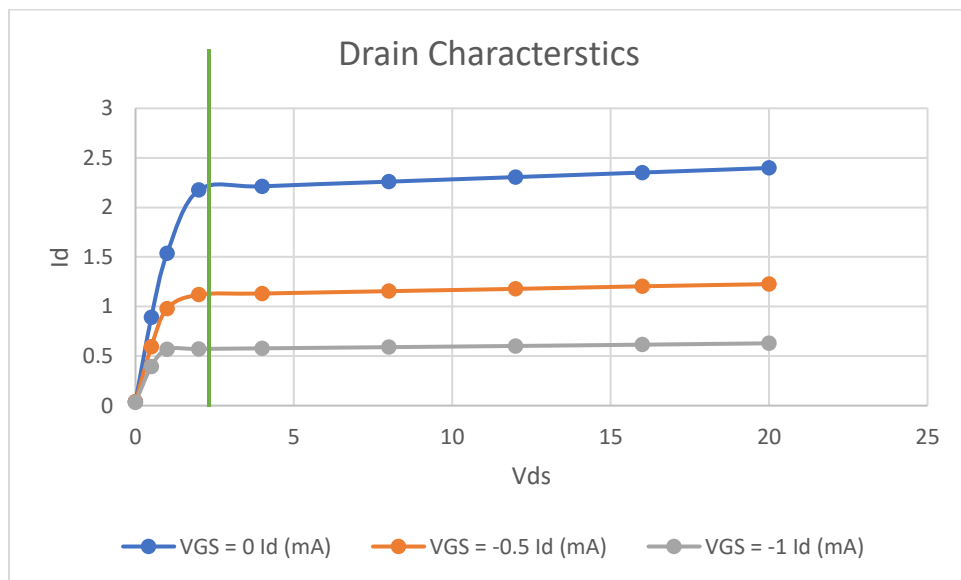


Figure 2. Drain Characteristic curves

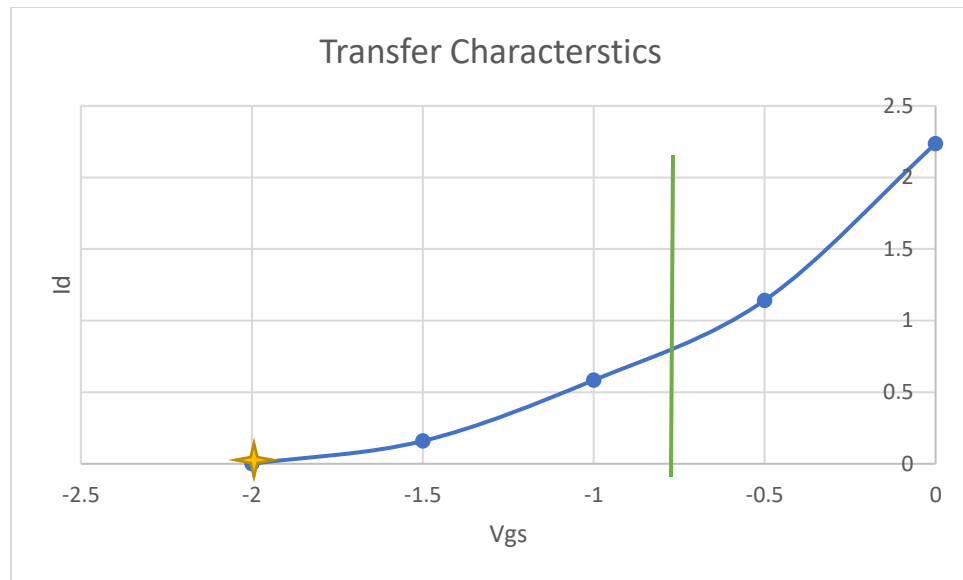


Figure 3. Transfer Characteristics

Part 2: Lab 10

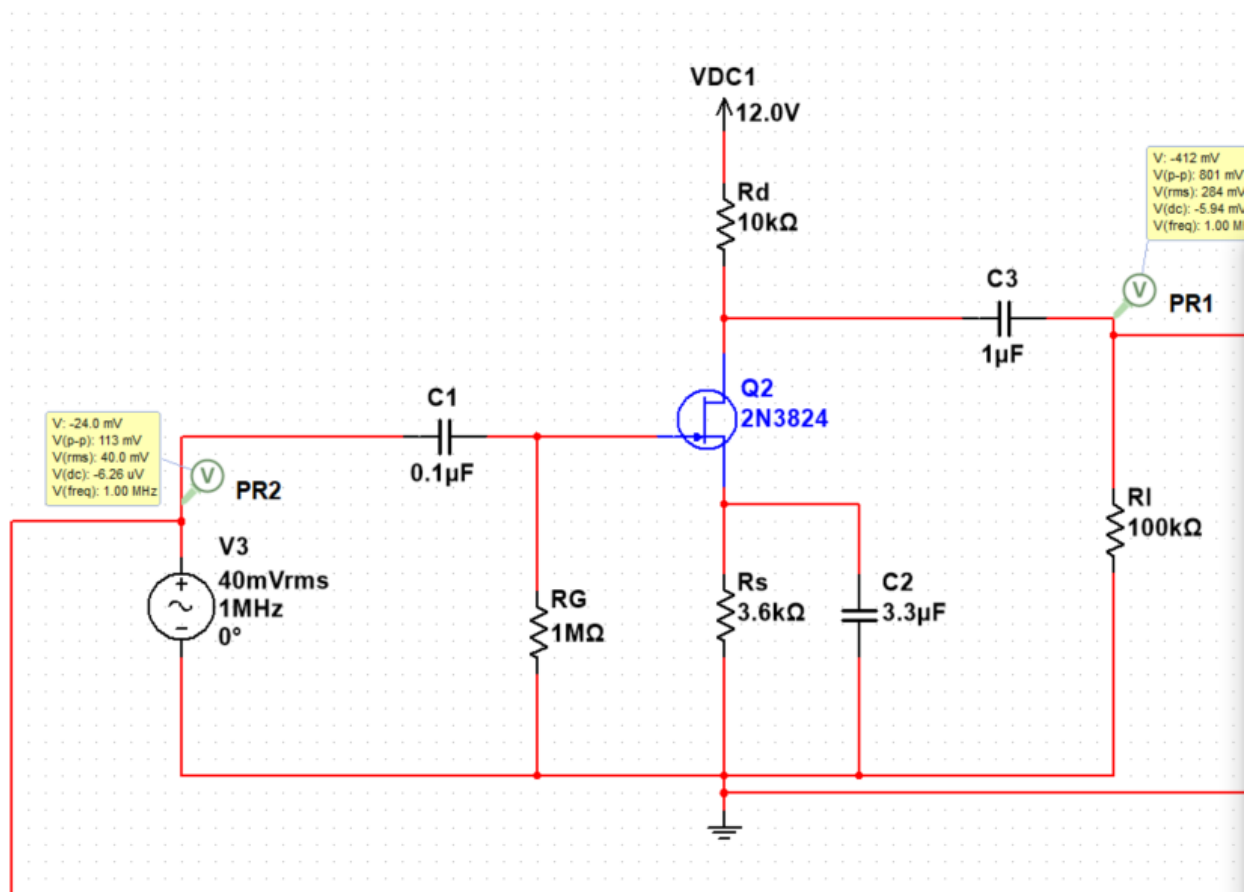


Figure 3. JFET Amplification

Table

Used the V(p-p) value that the probes gave. Vin was 0.113.

Table 3. Output and Gain

F(HZ)	V _{OUT}	Gain(db)
30	0.443	11.86651
45	0.553	13.79293
60	0.627	14.88378
100	0.723	16.1212
200	0.781	16.79145
500	0.8	17.00023
1k	0.804	17.04355
10k	0.804	17.04355
100k	0.805	17.05435
500k	0.804	17.04355
1M	0.802	17.02192
1.5M	0.798	16.97849
2M	0.792	16.91293
3M	0.774	16.71325
4M	0.754	16.48586
5M	0.732	16.22865
7M	0.68	15.58861
10M	0.596	14.44336
11M	0.57	14.05593
12M	0.545	13.66636
15M	0.481	12.58133
16M	0.461	12.21245

Observations

Out of phase waveforms. The higher the frequency the more the waveforms become more or less than (depending on how you want to say it) 180 degrees out of phase. Looked to be getting closer to 180 again if we looked at frequencies beyond 16M. Around 1k to 1M Hz the waveforms were closer to exactly 180 degrees out of phase. Low frequencies, the waveforms look like lines. At 10k you start to be able to see a bit of a wave.

The amplifier must maintain a gain ≥ 12.05 found by dividing the highest gain by square root of 2. It is marked by the green line on the plot. This makes the bandwidth between 45 Hz and 15M Hz.

Plot

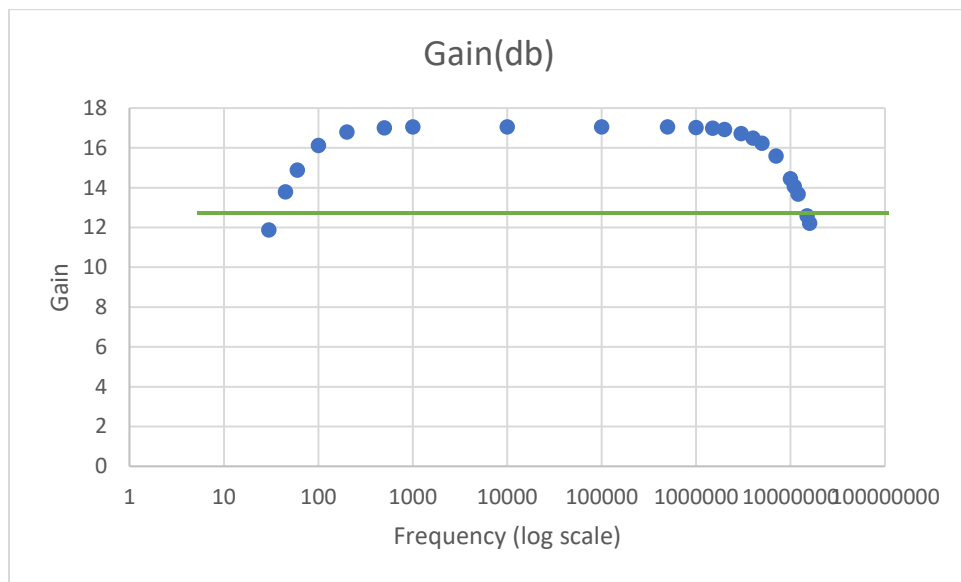


Figure 4. Plot of Gain

Output Waveforms

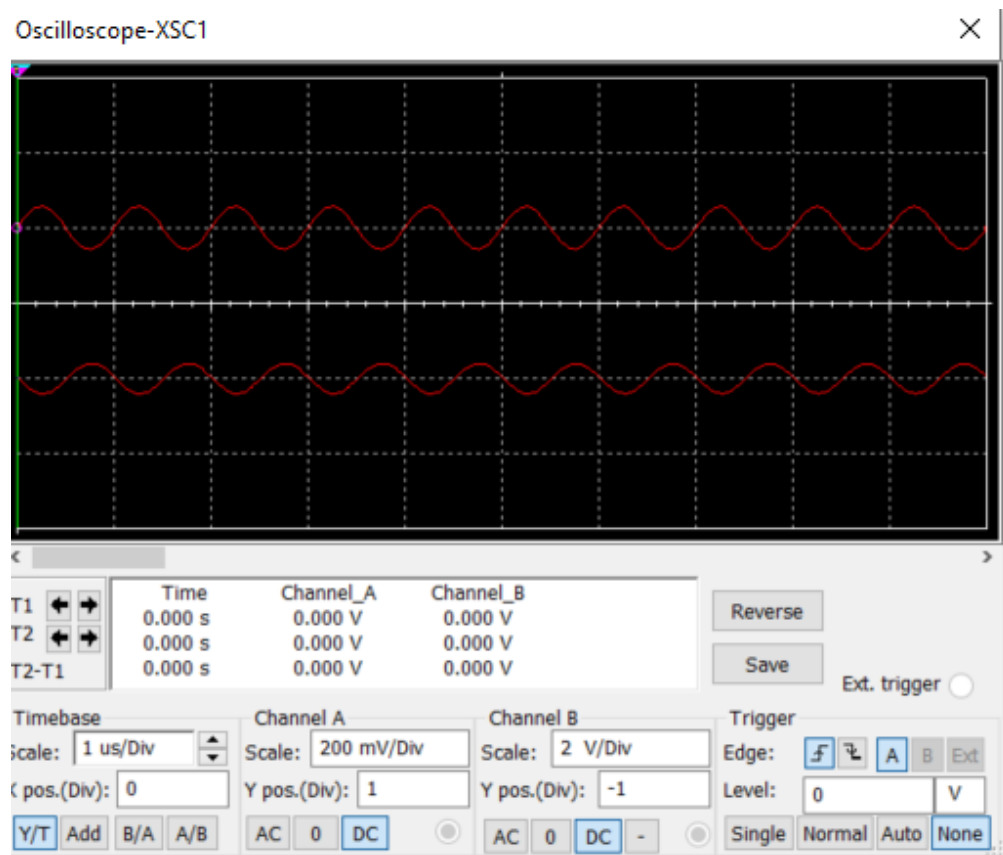


Figure 5. 1M Hz waveform Output