EE236: Experiment No. 8
P Channel MOSFET Characteristics

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1 Overview of the experiment

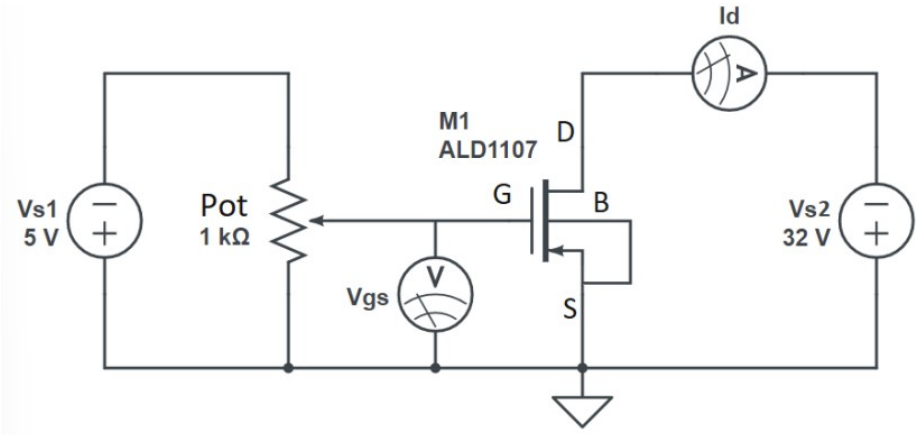
1.1 Aim of the experiment

The aim of the experiment is to measure output and transfer characteristics of a PMOS transistor. To also investigate the effect of body bias on the characteristics of the PMOS.

2 Lab Experiment

2.1 Part 1 - Transfer Characteristics (Linear)

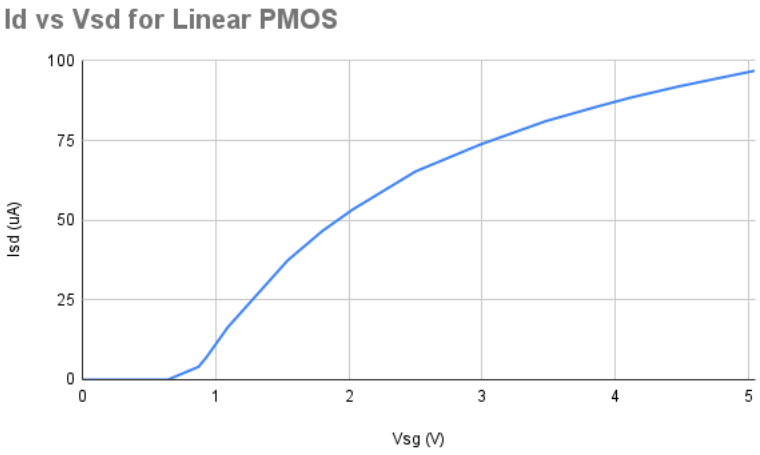
2.1.1 Circuit Used for Part 1



2.1.2 Readings Obtained

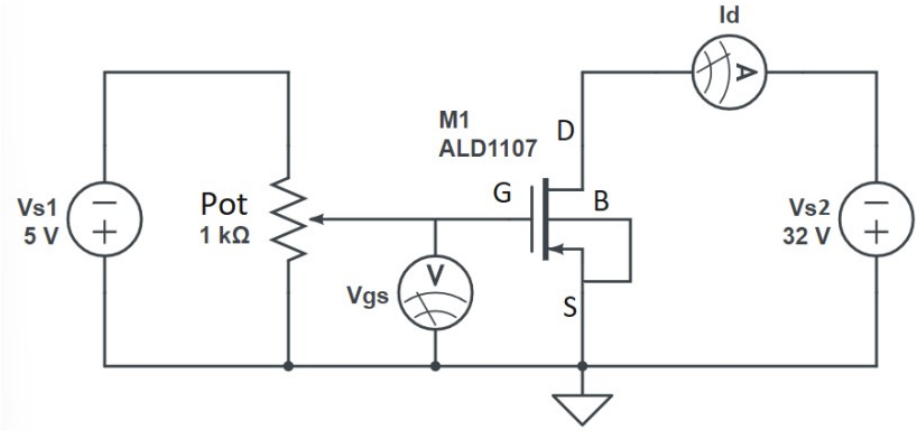
V_{sg}	Isd (uA)
0	0
0.3	0
0.5	0
0.64	0
0.87	4
0.93	7
1.09	16.4
1.54	37.4
1.8	46.6
2.03	53.4
2.5	65.3
2.99	73.8
3.48	81.1
3.87	85.7
4.12	88.5
4.47	91.9
4.84	95.1
5.05	96.9

2.1.3 Plot Obtained



2.2 Part 1 - Transfer Characteristics (Saturation)

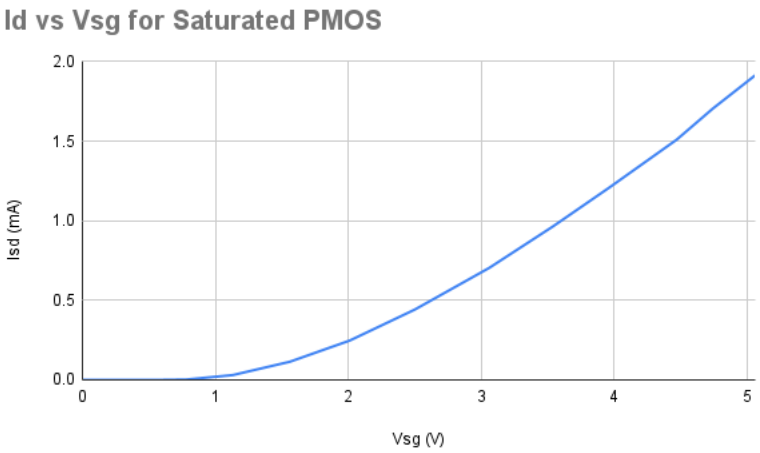
2.2.1 Circuit Used for Part 1



2.2.2 Readings Obtained

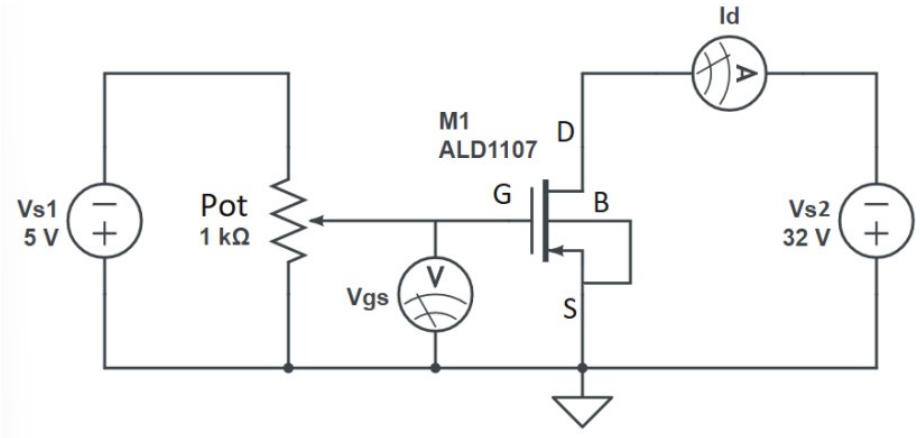
V_{sg}	I_{sd} (mA)
0	0
0.1	0
0.2	0
0.6	0
0.78	0.002
1.13	0.03
1.56	0.114
2.01	0.247
2.5	0.442
3.06	0.704
3.54	0.965
3.96	1.207
4.47	1.51
4.74	1.704
5.06	1.914

2.2.3 Plot Obtained



2.3 Part 2 - Drain Characteristics

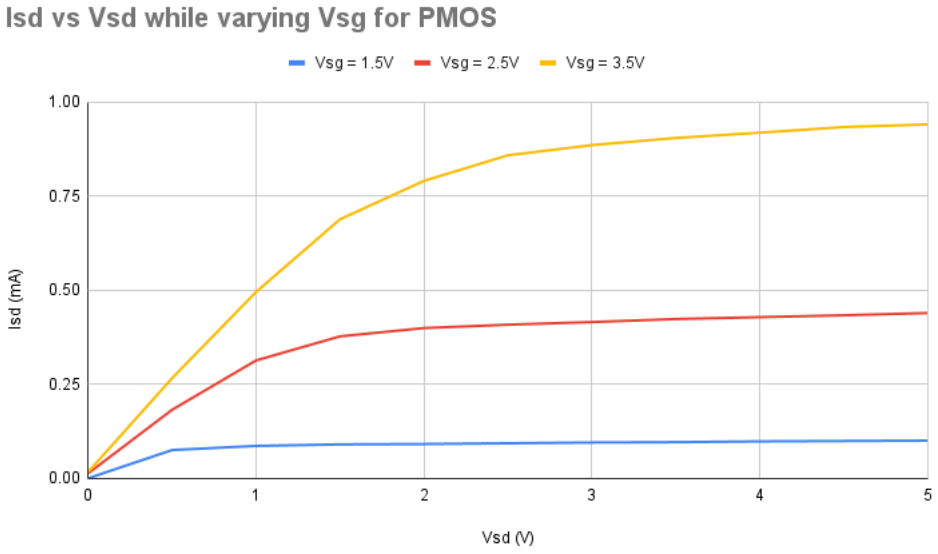
2.3.1 Circuit Used for Part 2



2.3.2 Readings Obtained

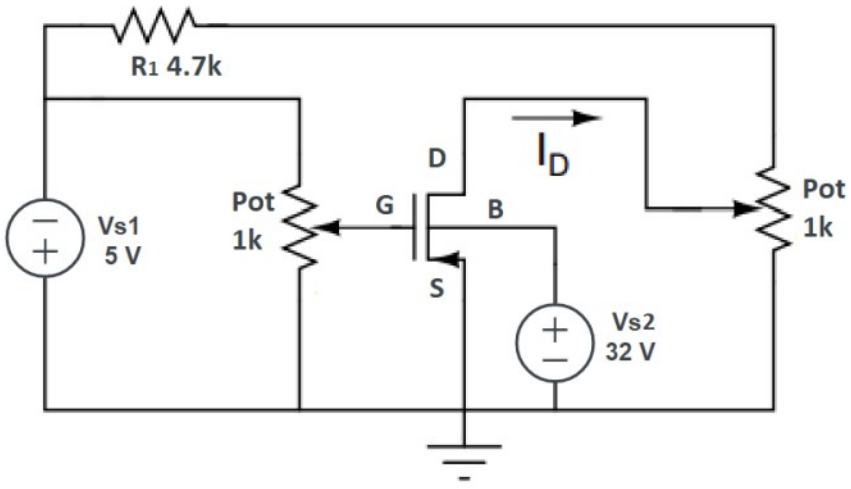
		I_{sd} (mA)	
V_{sd}	$V_{sg} = 1.5$V	$V_{sg} = 2.5$V	$V_{sg} = 3.5$V
0	0	0.013	0.017
0.5	0.075	0.182	0.266
1	0.086	0.313	0.495
1.5	0.09	0.377	0.688
2	0.091	0.399	0.79
2.5	0.093	0.408	0.858
3	0.095	0.415	0.885
3.5	0.096	0.423	0.904
4	0.098	0.428	0.918
4.5	0.099	0.433	0.933
5	0.1	0.439	0.94

2.3.3 Plot Obtained



2.4 Part 3 - Body Effect

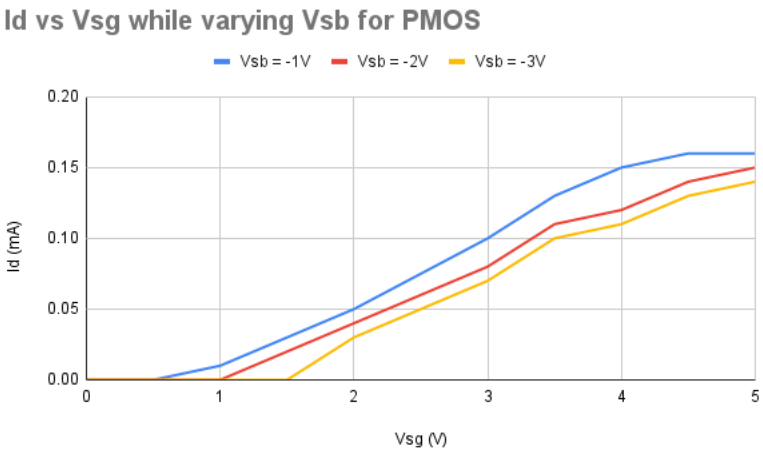
2.4.1 Circuit Used for Part 3



2.4.2 Readings Obtained

		I_d (mA)	
V_{sg}	V_{sb} = -1V	V_{sb} = -2V	V_{sb} = -3V
0	0	0	0
0.5	0	0	0
1	0.01	0	0
1.5	0.03	0.02	0
2	0.05	0.04	0.03
2.5	0.075	0.06	0.05
3	0.1	0.08	0.07
3.5	0.13	0.11	0.1
4	0.15	0.12	0.11
4.5	0.16	0.14	0.13
5	0.16	0.15	0.14

2.4.3 Plot Obtained



3 Calculations

3.1 Part 1

For Linear Region, Id = K(Vsg - Vt - 0.1) as Vsd = 0.2V. The value of K was approximated from the graph for the linear area region as 29.56e-6 A/V. The Vt is calculated as Vsg - Id/K - 0.1, for Vsg = 1.8V was obtained as **0.123 V**.

The value of g_m is nothing but the slope, which is K which we got as $29.56\mu A/V$