Analog Electronics

I-V Characteristics of N-Type Power Mosfets

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1 Abstract

In this experimentation we will measure the I-V characteristics of a N-type power mosfet. Through the use of several circuit analysis techniques we will discover the voltage threshold V_t and using it we will plot lines for several threshold voltages. This will allow for the characteristic of the transistor to also be plotted by iterating VDS and measuring with respects to I_D.

2 Materials

1. Bread Board
2. N-Type Power Mosfet
3. Jumper Cables
4. DC Voltage Source
5. Multimeter
6. Various Probes

3 Finding V_t

1. Begin by wiring the mosfet and ensuring that voltage is indeed being applied to the gate
2. Using the multimeter measure the current I_d
3. Increase the Voltage V_{gs} until current begins to flow.
4. Once current begins to flow, note the voltage V_{gs} that is the V_t

4 I-V Characteristics

To plot the I-V characteristics graph we must first gather the necessary values.

1. Using several values of Vgs that are at or above V_t begin to change the variable resistance R_1.
2. While changing V_{ds} make note of its value from 0-10 while also keeping track of the values of I_d
3. The resulting data is the points that will be used to plot your data.

Table 1: My caption

VGS at 2.4v		VGS at 2.6		VGS at 2.2	
VDS	ID mA	VDSmV	IDmA	VDSmV	IDmA
1.4	0.002	0.2	0.001	4.9	0.0008
2.4	0.0036	0.3	0.0032	7	0.001
3.5	0.0051	0.4	0.0052	10.8	0.0014
4.4	0.0067	0.5	0.0064	12.6	0.0015
5.3	0.0076	0.7	0.01	16.1	0.0018
7	0.01	1.25	0.0196	22.8	0.0023
8.5	0.012	1.85	0.03	29.6	0.0028
10	0.014	2.5	0.041	37.4	0.003
12.3	0.0165	3.2	0.0535	43	0.003
18	0.02	4.1	0.0688	68.9	0.0039
38	0.0344	6.3	0.0956	101.5	0.0043
52.4	0.0396	8.2	0.1311	197.5	0.0043
78.5	0.044	9.7	0.152	571	0.0048
96.8	0.0457	11.3	0.1745	1596	0.0052
150	0.0477	20.5	0.2837	3076	0.0057
342	0.054	33.6	0.3972	5028	0.0068
960	0.0545	43.9	0.457		
2.5	0.061	54.9	0.5047		
3	0.0636	70.7	0.548		
4.65	0.0707	100	0.5945		
5	0.0718	213	0.649		

5 Conclusion

In this experimentation we used a variety of analysis techniques to calculate and design a transistor circuit that was then manipulated in a variety of ways to test for V_t and also to find the I-V Characteristics. One of the major problems was my lack of experience in excel. In the future I will try my best to plot the data in a was that is actually coherent.