1.

CSE251

Electronic Devices and Circuits

Exp-04: Study of MOSFET I-V Characteristics and Implementation of Logic Gates Using MOSFETs

Submitted By:

Name: FAHAD MOHAMMAD REJWANUL ISLAM

ID: 20101443

Software simulation generated By:

Name: Fardeen Bin Ibrahim

ID: 20201066

Group-05

Semester: Fall22

Cooperated by:

ID: 21301610

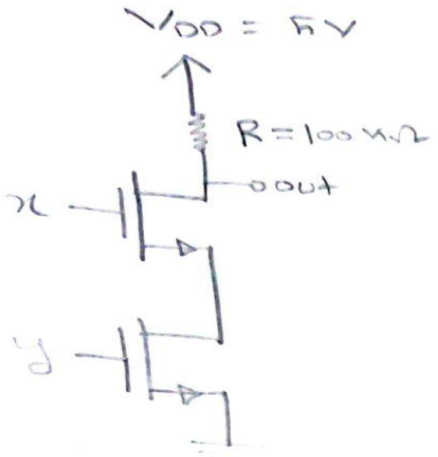
ID: 2130161

Date of Performance: 24/10/22

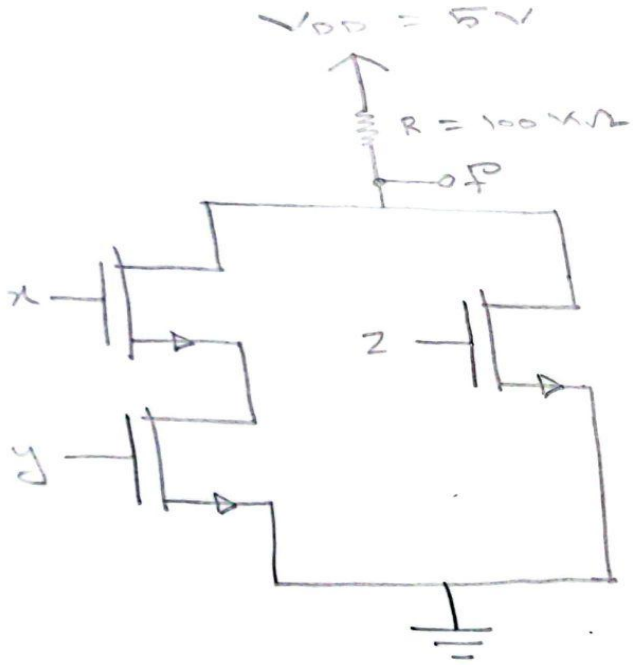
Date of Submission: 31/10/22

2. Circuit Diagrams:

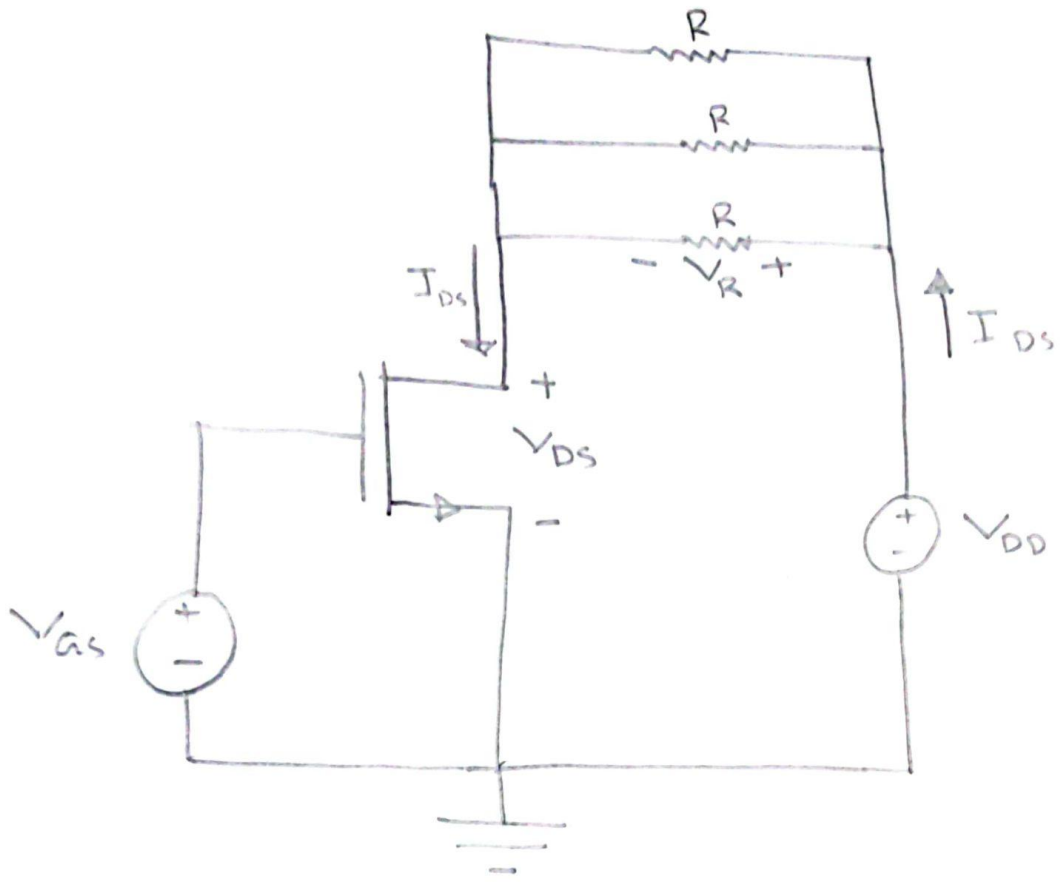
Circuit diagrams →



Circuit 1 : NAND gate using MOSFET



Circuit 2 : Logical function $f = \overline{xy+z}$ using MOSFET



Circuit 3: Circuit for measurement of IV characteristics (I_{DS} Vs V_{DS}) of MOSFET.

3.Signed Datasheet:

Group No:...5..... Student IDs: .20201066..,..20201493,..2130161D..,..2130161I

Task-01: Logic Gate and Logical Function Implementation using MOSFET

1. NAND Gate

Input Voltage, V_x (volt)	Input Voltage, V_y (volt)	State of LED (On/Off)	Boolean Output (0 or 1)
0V	0V	ON	1
0V	5V	ON	1
5V	0V	ON	1
5V	5V	OFF	0

2. Logical Function, $f = \overline{xy + z}$

Input Voltage, V_x (volt)	Input Voltage, V_y (volt)	Input Voltage, V_z (volt)	State of LED (On/Off)	Boolean Output (0 or 1)
0V	0V	0V	ON	1
0V	0V	5V	OFF	0
0V	5V	0V	ON	1
0V	5V	5V	OFF	0
5V	0V	0V	ON	1
5V	0V	5V	OFF	0
5V	5V	0V	OFF	0
5V	5V	5V	OFF	0

Task-02: I-V Characteristics of a MOSFET

Equivalent Resistance, Req (using Multimeter) = 0.728 kΩ kΩ

I-V Characteristics Data for V_{GS} = 2.9 V 2.895 V

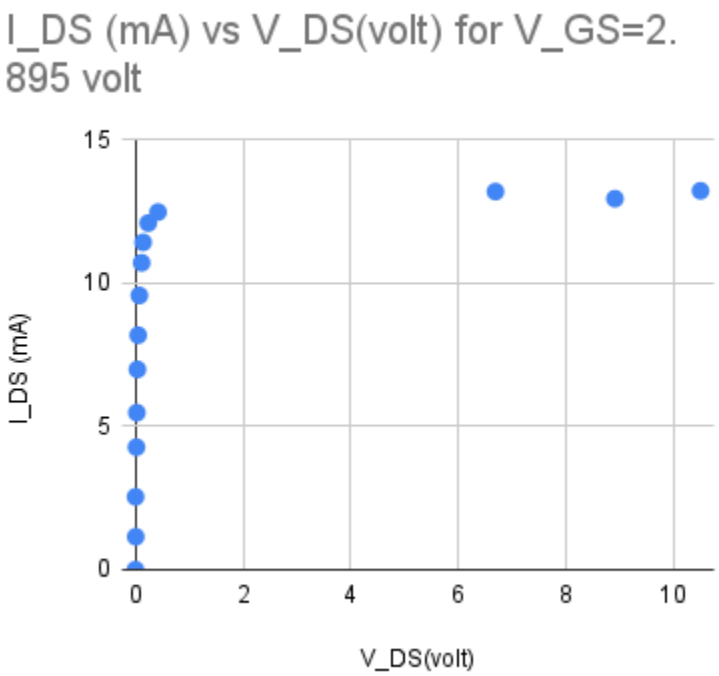
V_{DD} (volt)	V_{DS} (volt)	V_R (volt)	$I_{DS} = V_R/R_{eq}$ (mA)
0	0	0	0
1	5.3mV	0.837	1.1497
2	1.95mV	1.851	2.5426
3	18.3mV	3.114	4.2777
4	26.2mV	3.991	5.4821
5	36.6mV	5.09	6.9917
6	50.7mV	5.96	8.1868
7	73mV	6.99	9.57417
8	115.6mV	7.80	10.7142
8.5	142.6mV	8.32	11.4285
9	237.5mV	8.81	12.1016
9.5	0.42V	9.09	12.4862
10	8.9V	9.43	12.9532
12	6.69V	9.61	13.2005
14	10.50V	9.63	13.2280

I-V Characteristics Data for V_{GS} = 2.85 V

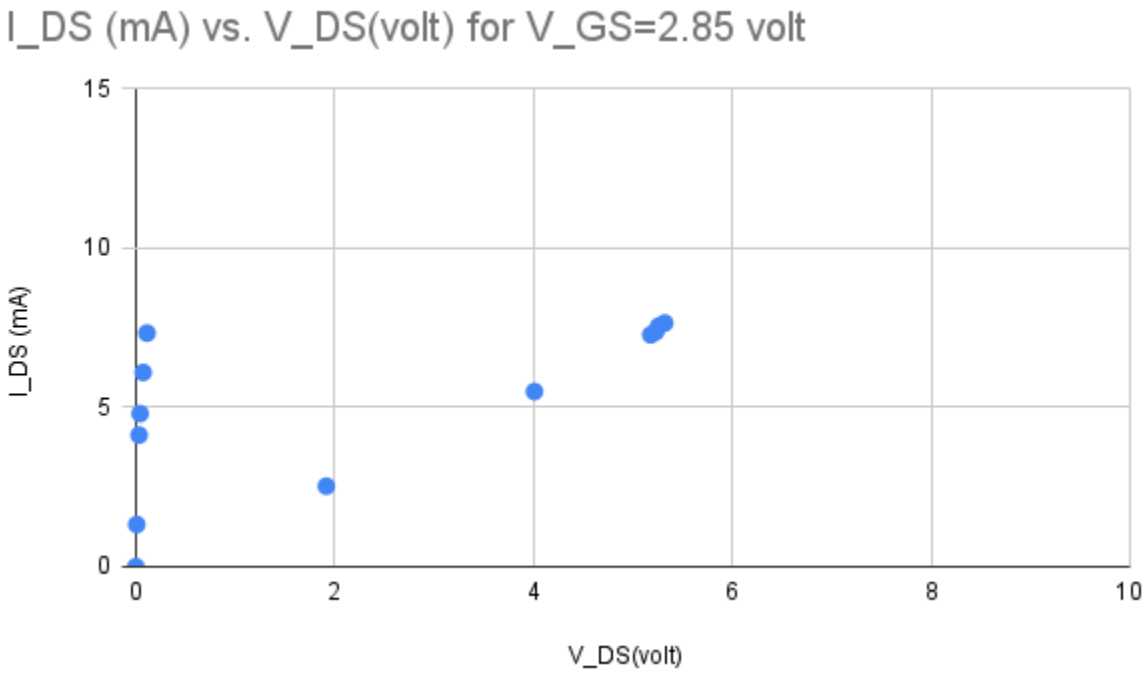
V_{DD} (volt)	V_{DS} (volt)	V_R (volt)	$I_{DS} = V_R/R_{eq}$ (mA)
0	0	0	0
1	8.5mV	0.964	1.3241
2	1.916	1.841	2.5288
3	32.3mV	3.008	4.1318
3.5	42.2mV	3.494	4.8003
4	4.01	4.004	5.5
4.5	732mV	4.444	6.0989
5	111.8mV	5.34	7.3351
5.5	253.8mV	5.34	7.3451
6	5.18	5.30	7.2802
8	5.23	5.39	7.3763
10	5.26	5.50	7.5529
12	5.32	5.57	7.6910

4.

For, V_GS=2.895 v
And R= 0.728 k ohm

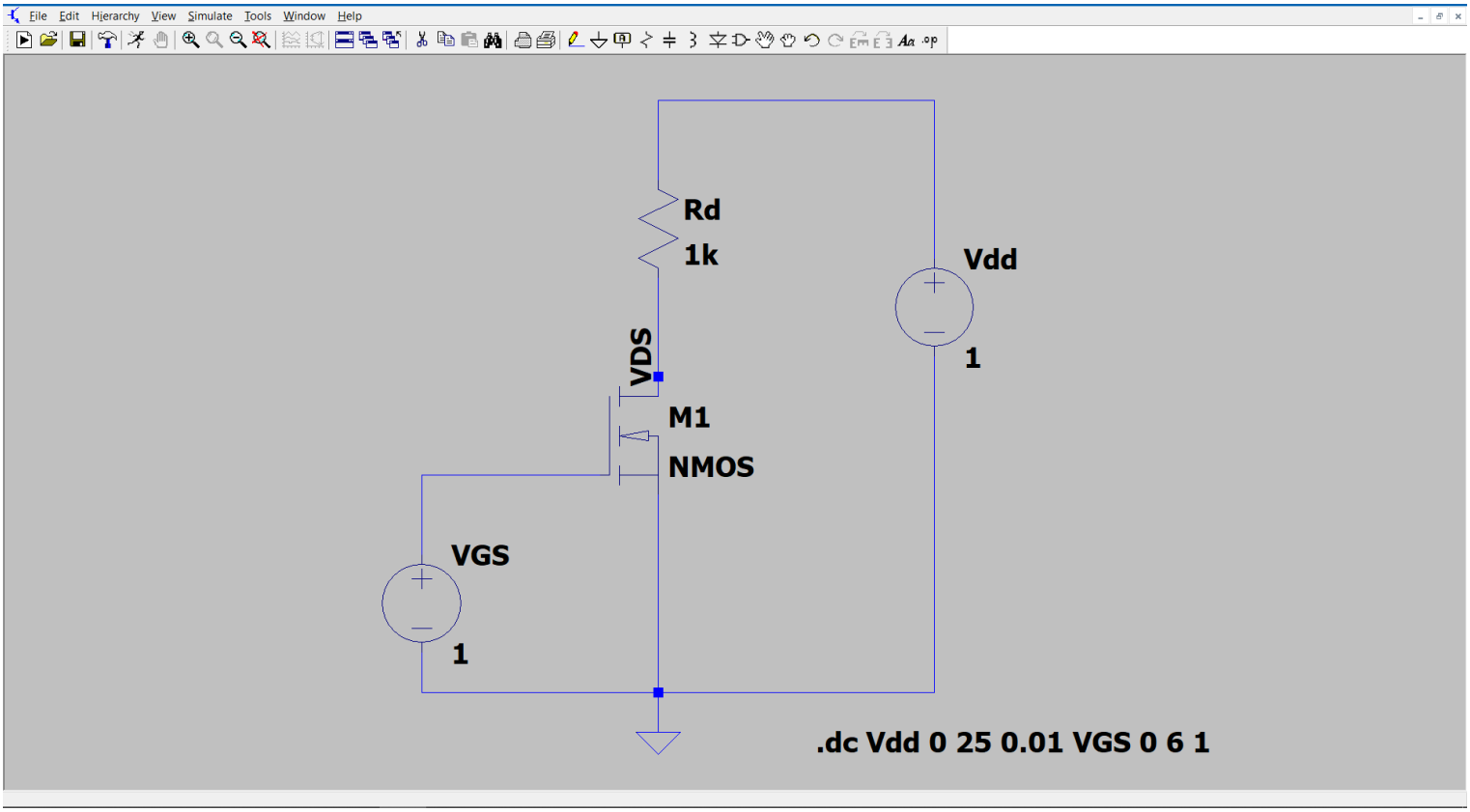


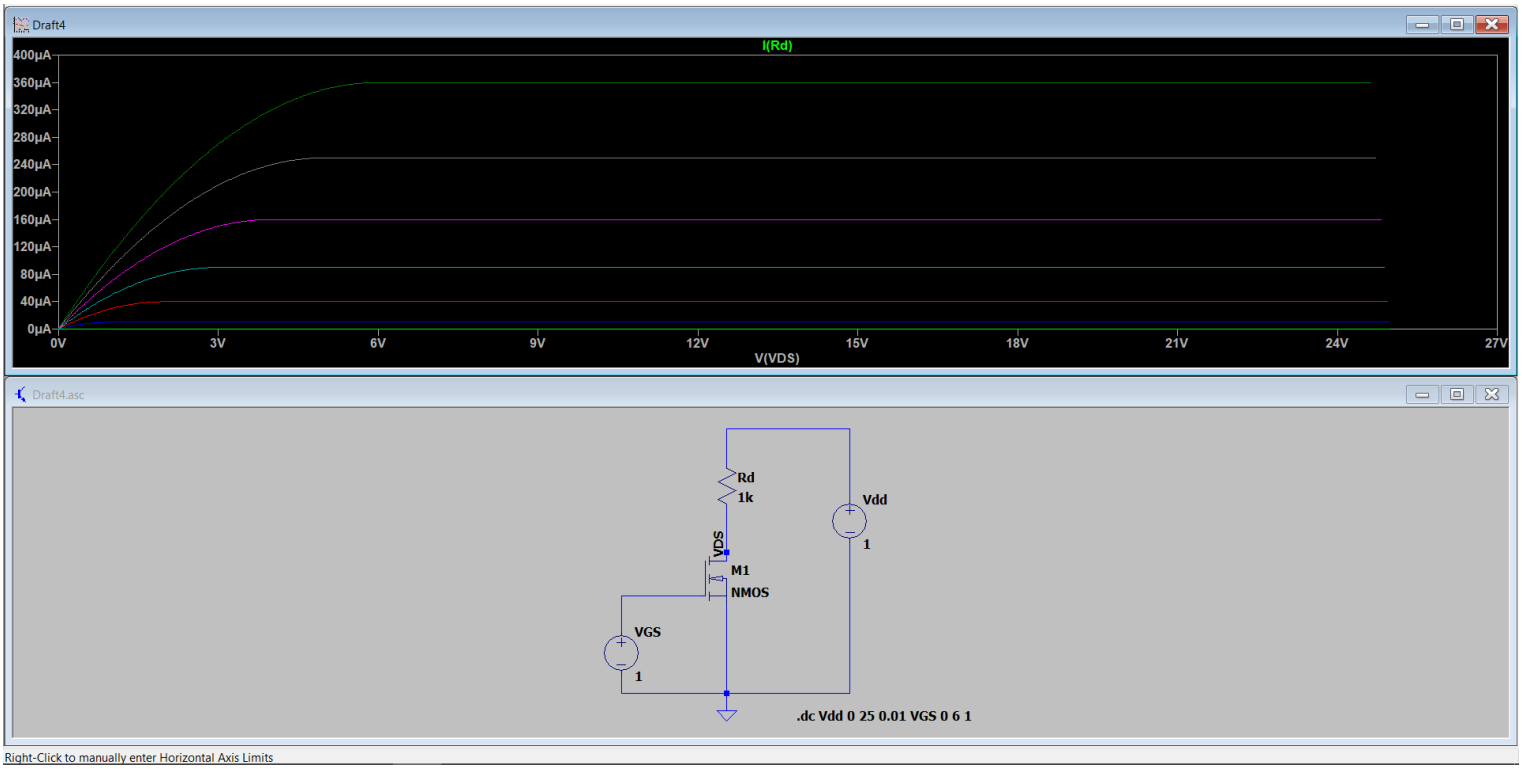
And for, V_GS=2.85 v
And R= 0.728 k ohm



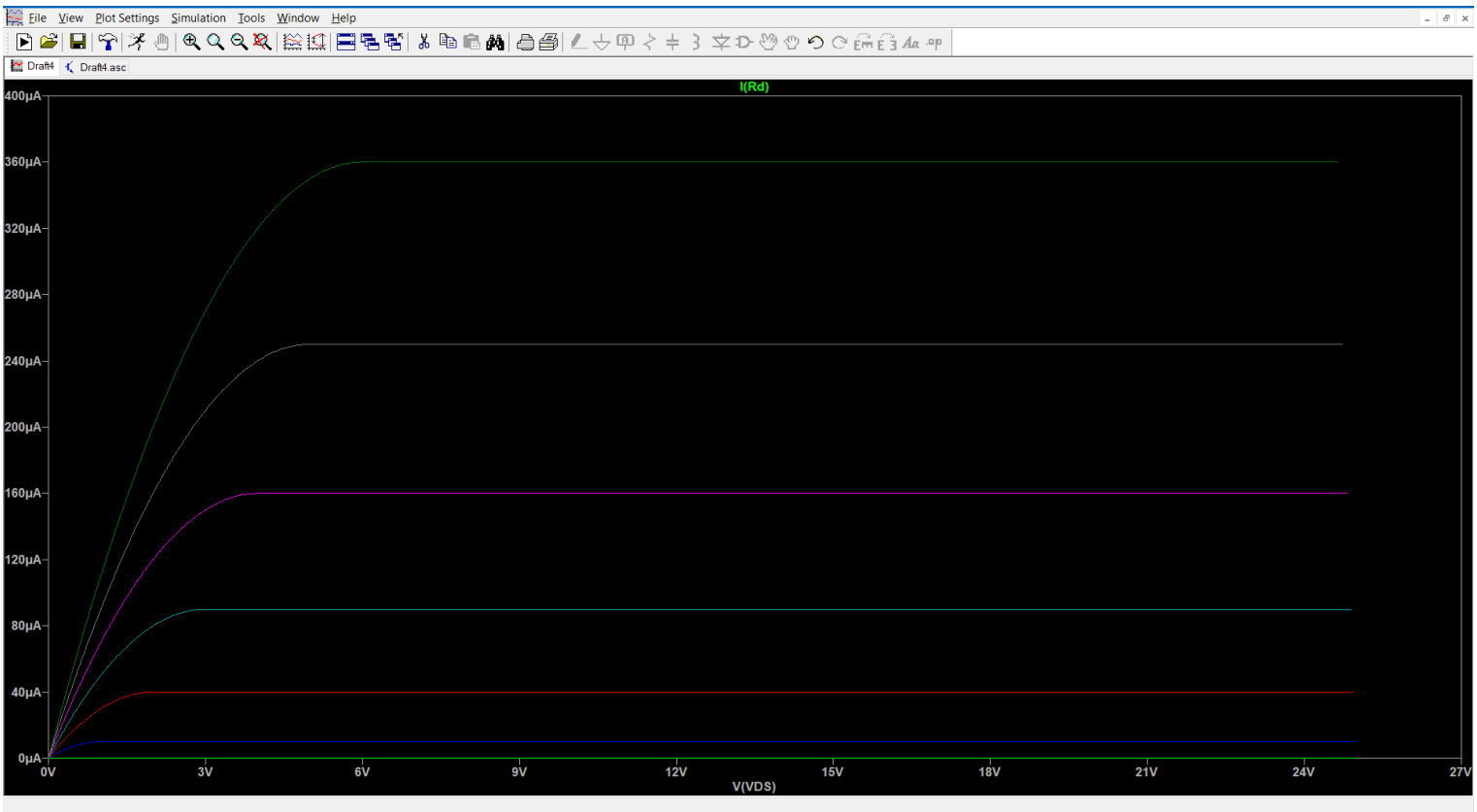
4.

Simulation part:





Right-Click to manually enter Horizontal Axis Limits



5.

Disucussion:

For the datasheet of V_GS=2.895 volt, we can notice that the graph presents, for the same value of V_DS , I_DS has higher value for higher value of V_GS. Moreover, we can see that V_DS is increasing from top to bottom. But for the datasheet of V_GS=2.85 volt, we can see that, the graph doesnt represent the increase of V_DS from top to bottom. So, there is something error in the datasheet 2. It is because some wrong values of V_DS while the experiment or because of equipment error and also we get less time for the experiment.