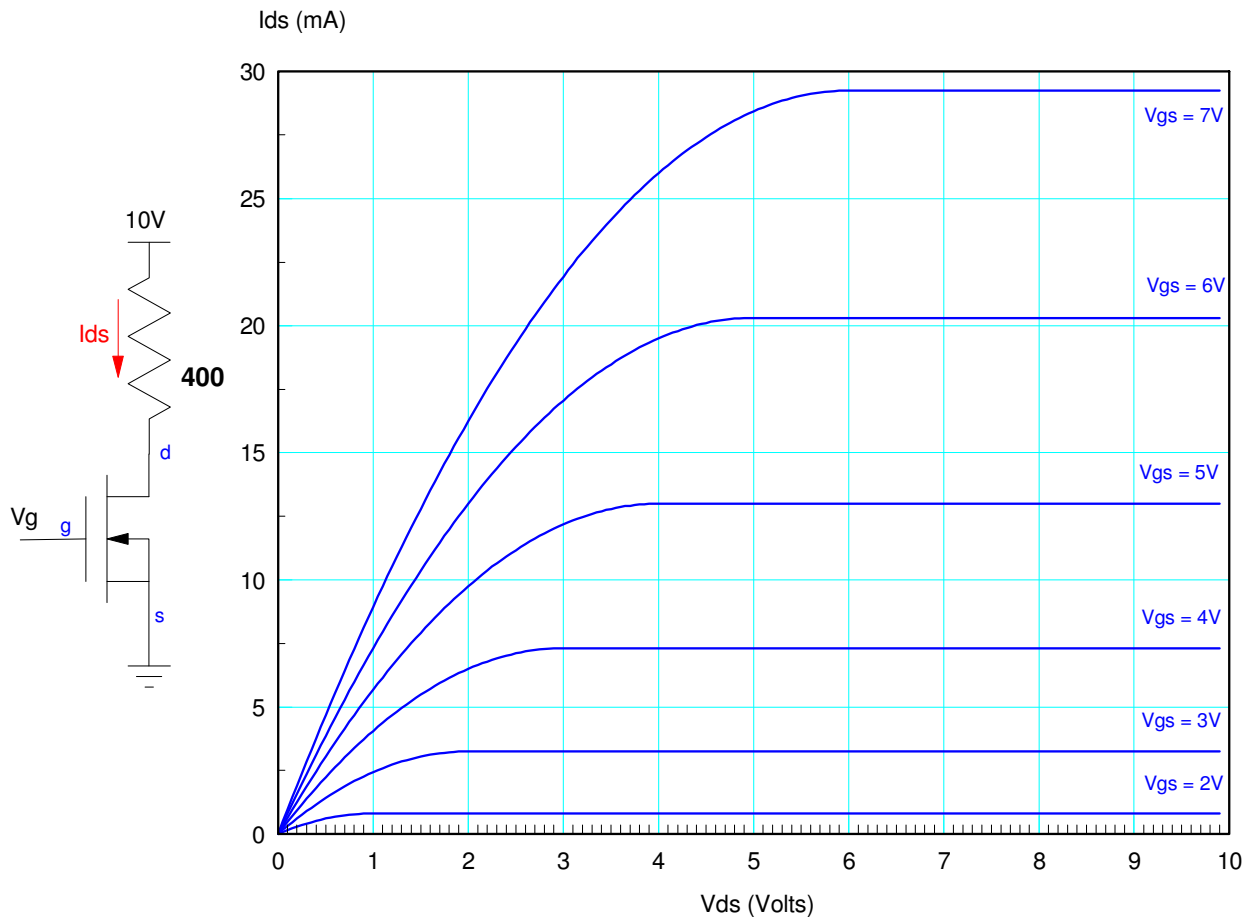


ECE 320 - Homework #9

MOSFET Switches, CMOS logic. Due Monday, March 20th
Please email to jacob.glower@ndsu.com, or submit as a hard copy, or submit on BlackBoard

MOSFETs

- 1) The VI characteristics for an n-channel MOSFET are shown below.
 - Label the off / ohmic / and saturated regions
 - Determine the transconductance gain, k_n . Assume $V_{th} = 1.00V$
- 2) Draw the load-line for the circuit below. From the load line, determine the Q-point (V_{ds} , I_{ds}) when
 - $V_g = 0V$
 - $V_g = 4V$
 - $V_g = 7V$



MOSFET Switch

The characteristics for a IRF3710 MOSFET are

- Max Current = 57A continuous (180A pulsed)
- $R_{ds} = 0.023 \text{ Ohms @ } 6V_{gs} = 10V @ I_d = 28A$
- $2V < V_{th} < 4V$

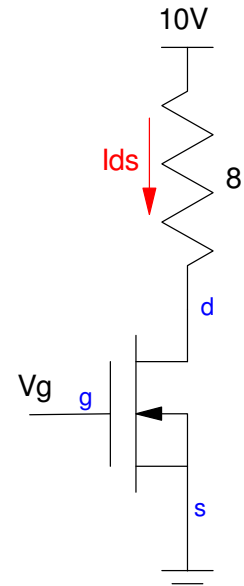
3) Determine the transconductance gain, k_n

4) The CircuitLab model for an IRF3710 MOSFET is

- $k = 48.1147 \frac{A}{V^2}$
- $V_{th} = 3.39715V$

Using the CircuitLab parameters, determine the voltages for the following circuit for

- $V_{in} = V_g = 0V$
- $V_{in} = V_g = 5V$
- $V_{in} = V_g = 10V$



5) Simulate this circuit in CircuitLab using an IRF3710. Determine the voltages and currents when

- $V_{in} = V_g = 0V$
- $V_{in} = V_g = 5V$
- $V_{in} = V_g = 10V$
-

CMOS Logic

6) Design a CMOS gate to implement the function: $Y(A, B, C, D)$

Y(A,B,C,D)		CD			
		00	01	11	10
AB	00	1	0	0	x
	01	1	0	x	1
	11	1	x	1	0
	10	0	1	x	0