Homework #7: Power MOSFET's and H-Bridges

1. (2 pts) Look at the data sheet for the IRL520. What is the maximum voltage that can be applied between the drain and source? What is the maximum current that this device can handle?

2. Get the data sheet for the SN754410 Quadruple Half-H Driver chip. This part is made by Texas Instruments (www.ti.com)
   a. (2 pts) Which pin is used to supply power to make the chip (itself) functional?
   b. (2 pts) Which pin is used to supply power to a device you desire to control?
   c. (2 pts) Which pins are used for ground?
   d. (4 pts) Show (draw a diagram) how you can interface this chip to a dc motor and the microcontroller so that the microcontroller could control the motor (on-off and direction). In other words, show how to connect pins from the microcontroller to pins on the SN754410 and how to connect the motor to the SN754410, so that a program running on the microcontroller can control the current to the motor.

A good diagram to look at to understand this device is shown on page 2 of the data sheet. Each input (those labeled 1A, 2A, etc.) controls an output (those labeled 1Y, 2Y, etc.). The schematic diagram shows that each output essentially looks like half of an H-bridge. The pair above the line marked ‘Output’ is called a pseudo-Darlington pair, and the pair below, just a Darlington pair. Taken as pairs, you can think of them like a single transistor with large $h_{fe}$. Note the protection diodes for inductive transient voltage are already included.

The inputs take logic voltage levels (0 or 5 volts, say from the microcontroller) and will allow the half H-bridge to either source current (send current out the Output line to the motor), or sink current (take current in the Output line from the motor). The function table for which input level causes what output function is shown in the small table on page 1 of the data sheet.

There are also pins on the SN754410 marked ‘EN’. These enable or disable the outputs. If enabled, changes on the inputs 1A, 2A, etc. will cause the corresponding function on the outputs 1Y, 2Y, etc. If disabled, the outputs are put in a high impedance state, i.e. will not source or sink current.

3. (10 pts) Write a program that will:
   - read two external switches, such that if one switch is closed (and the other open), the motor turns one direction and vice-versa (if the other switch closes while the first switch is open, the motor turns the other direction).
   - If neither switch is closed or both switches are closed the motor is off.