ECE 491 Lab 4

Motor Controller & Servo

1. Introduction:

The purpose of this lab is for the groups to create their own motor controller, to be able to run the car from the FRDM board.

2. Objective:

You are allowed to design any type of controller you want. This can be one FET controller, half-bridge, or full bridge. You are going to use the MAX620 driver and the NDP7060L / NDB7060L FETs. Remember to put in a snubber capacitor to smooth out the torque ripple, and the fly-back diode. Make sure you don't short the motor through your diode in a full H bridge (the tie fighter).

The lab will consists of three components:

1. You will design the circuit for the motor controller, and have the TA check this for you.
2. You will then test your driver on a breadboard using a small DC motor, and run this from your FRDM board.
3. You will then design the driver using Altium, using the base PCB, which includes the basic connections to the battery and the FRDM board.
4. On this board you will include connections to the servo.

Group name _____   Date _____

3. Circuit:

In space below, draw the circuit you will use for the controller. Mark inputs to the GPIO you use, as well as all the components. Us the attached datasheet for reference design.

4. Checkout 1:

The circuit has been inspected by the TA.

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5. Breadboard Test:

Test the circuit on a breadboard, to see if you can use your FRDM board to actuate a small motor from it
. You can either use either the battery or the power supply to drive the motor. Motors will be given in
class. We suggest that you construct your circuit in stages. A good method is to use the design and
conquer approach, where you first design the FET circuit connected to the motor, test it using wires
(gate to Vdd), then connect the MAXIM 620, test again using wires, and then connect it to FRDM.

Caution: In an H-bridge (tie fighter) make sure you never turn on more than two transistors.

Also, you need to check if GPIO is floating emitter, to be safe you need to design a pull-down resistor. TA
will explain.

6. Checkoff 2:

The group have shown the ability to control the small DC motor on PCB using FRDM board.

Extra Credit: Demonstrate PWM !!

7. PCB #1 Design:

Here, you will transfer your validated motor driver to the PCB design using Altium. You will use the PCB
daughterboard template provided to you by the TA. You will lay out traces to your GPIO's, the Maxim
620 driver, as well as FETs. The PCB template includes the power rail. When laying out the traces, make
sure the width of your trace is appropriate to carry the required current, you can calculate it using the
following link:

https://en.wikibooks.org/wiki/Practical_Electronics/PCB_Layout

In addition, include the connections to the servo, from GPIO, on your board. Draw a schematic for this in
the space below.

Group name _____   Date _____

8. Checkoff 3:

The group have shown a layout of their controller that passes the design rule checker, and is ready for fabrication.

9. Checkoff 4 (later):

The group have shown the ability to drive their car open loop in a figure 8 using the fabricated board.

Group name _____   Date _____