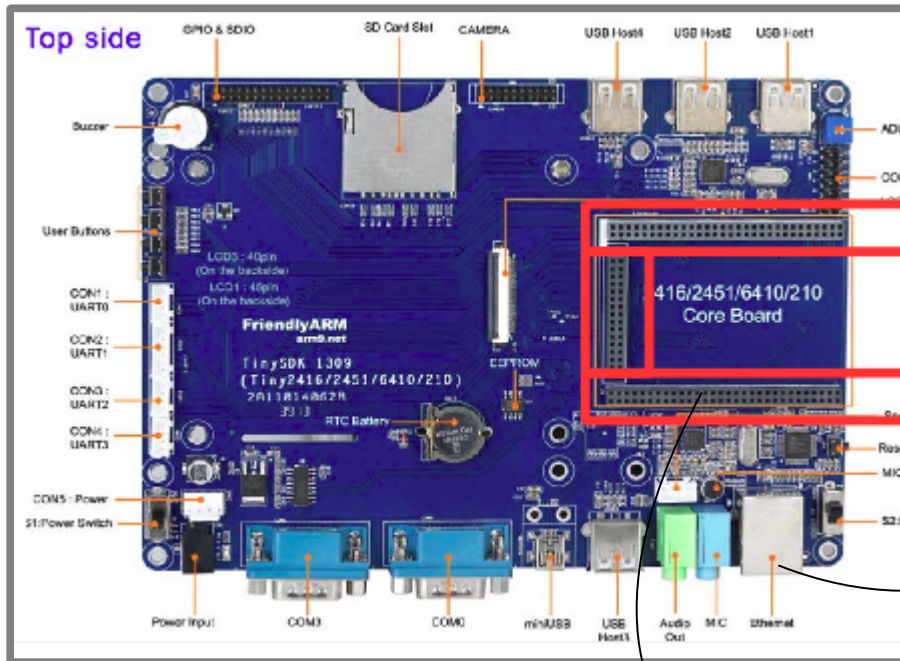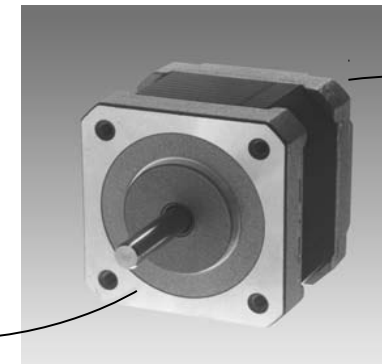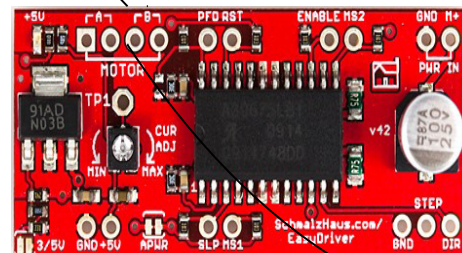# GPP Applications
For Controlling Motor Directions

Note: GPP enables the motor drive board and controls direction of the motor, PWM controls the speed of the motor.

Example:
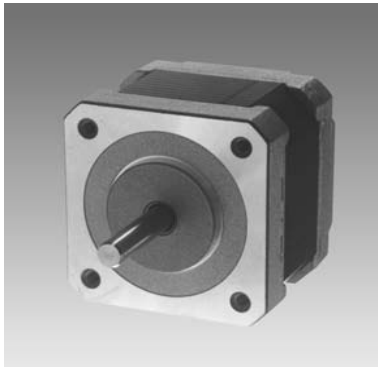GPP from ARM11 embedded system to driver stepper motors

Optic Encoder OMron E69-C04B

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Standard Stepper Motor

Stepper Motors

Note:

1. One revolution (360 degree) = 200 steps;
2. 1.8 degree per step;
3. Four wire stepper motor can provide

A full step:	1.8 degree;
A half step:	1.8/2 degree;
A quarter step:	1.8/4 degree;
One eighth step:	1.8/8 degree.

4. Stepper drive circuit provide 4 wires output to connect to the 4-wire (A1, A2, B1, B2) stepper motor, by modulation of the base band signal of each wire, the above step size can be achieved.

Witbot NEMA17
Stepper Motor ...
$9.59
Amazon.com

Motorized xy stage
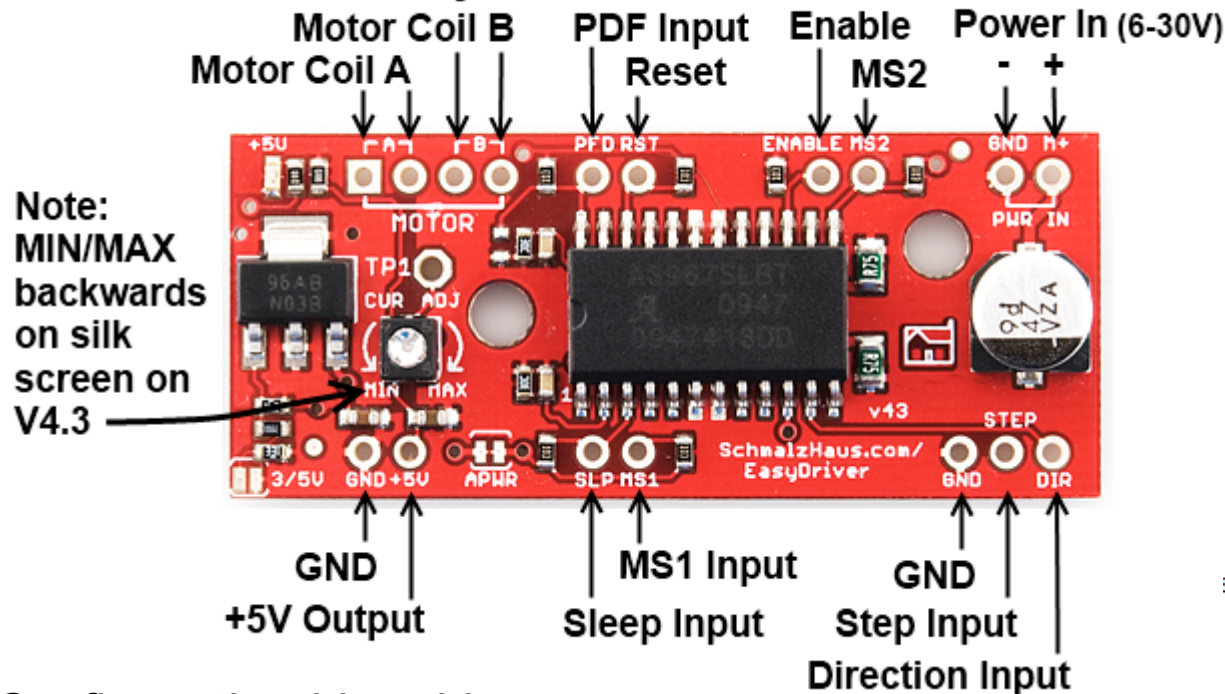
Brushed DC motors are ubiquitous, representing a mature technology invented in the 19th century. Brushless DC motors are a relatively recent advance, made possible by the development of solid state electronics in the 1960s[2] with further improvements in the 1980s thanks to better permanent magnet materials.

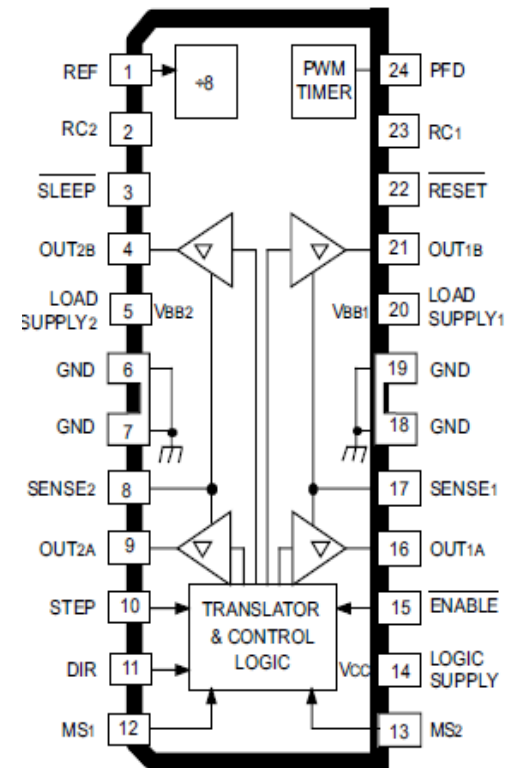https://en.wikipedia.org/wiki/Brushless_DC_electric_motor

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Motor Drive Board

EasyDriver v4.3 Pins

Motor Coil B

Motor Coil A

PDF Input

Reset

Enable

MS2

Power In (6-30V)

- +

Note:
MIN/MAX
backwards
on silk
screen on
V4.3

GND

+5V Output

MS1 Input

Sleep Input

GND

Step Input

Direction Input

Configure the drive chip

MS$_1$	MS$_2$	Resolution
L	L	Full step (2 phase)
H	L	Half step
L	H	Quarter step
H	H	Eighth step

See design schematics, MS1 and MS2 are
tied to Vcc so pre-configured to 1/8 step

http://www.schmalzhaus.com/EasyDriver/

|				
REF	1	+8	PWM TIMER	24	PFD
RC2	2			23	RC1
SLEEP	3			22	RESET
OUT2B	4			21	OUT1B
LOAD SUPPLY2	5	VBB2	VBB1	20	LOAD SUPPLY1
GND	6			19	GND
GND	7			18	GND
SENSE2	8			17	SENSE1
OUT2A	9			16	OUT1A
STEP	10	TRANSLATOR & CONTROL LOGIC		15	ENABLE
DIR	11		Vcc	14	LOGIC SUPPLY
MS1	12			13	MS2

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Control Bipolar Motors

Q) What kind of stepper motors can I use EasyDriver with?
A) The Allegro 3967 driver chip that the EasyDriver is based off of is a bi-polar driver. This means it has a true H-bridge design internally, and sends current both ways through each of the two coils. You can use 4-wire, 6-wire or 8-wire stepper motors. The only kind you can't use is 5-wire stepper motors. (They need uni-polar drivers.)
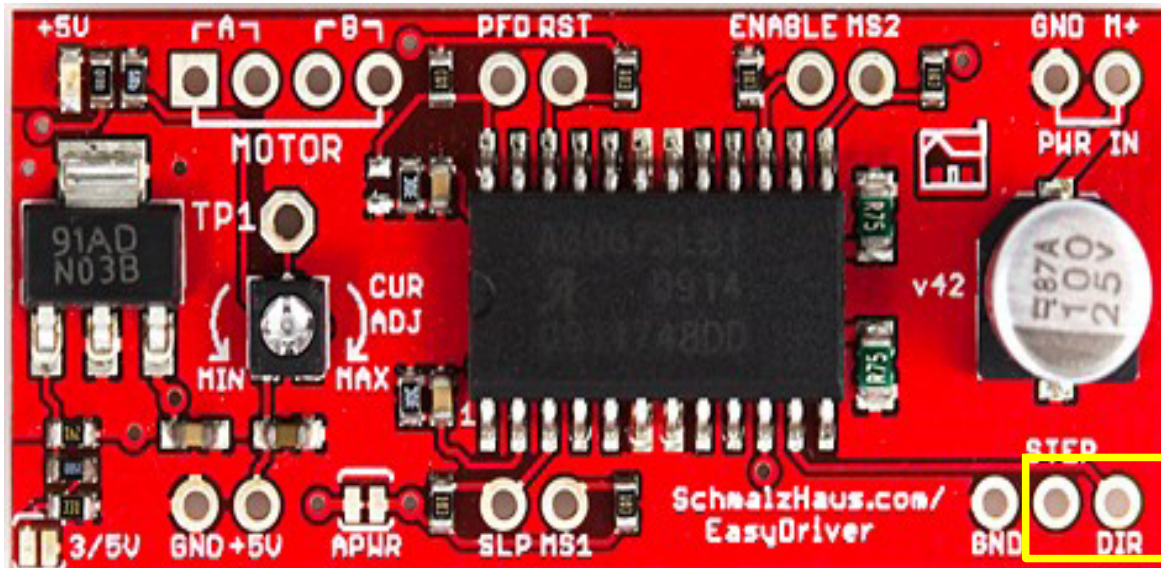
Here's a little drawing on one way to hook up a six wire stepper motor to the EasyDriver.
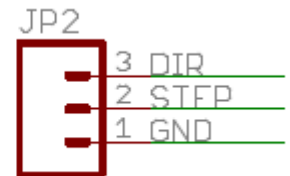
Tutorial
http://www.schmalzhaus.com/EasyDriver/
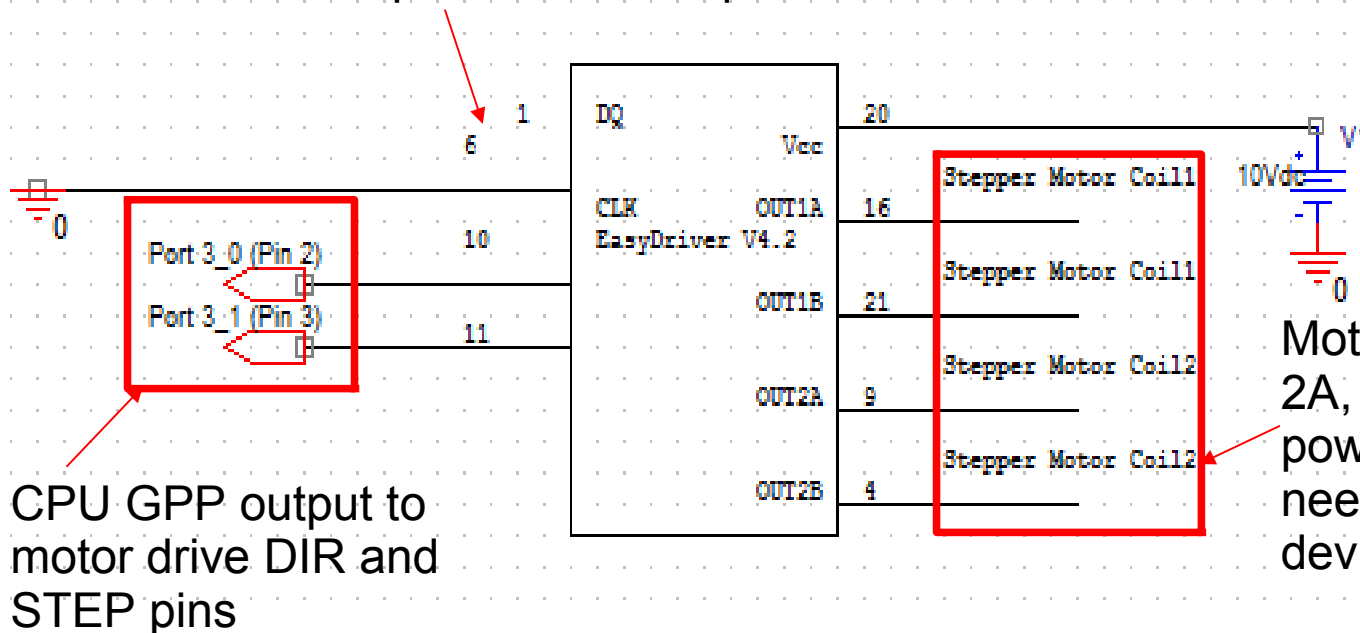
Harry Li, Ph.D.
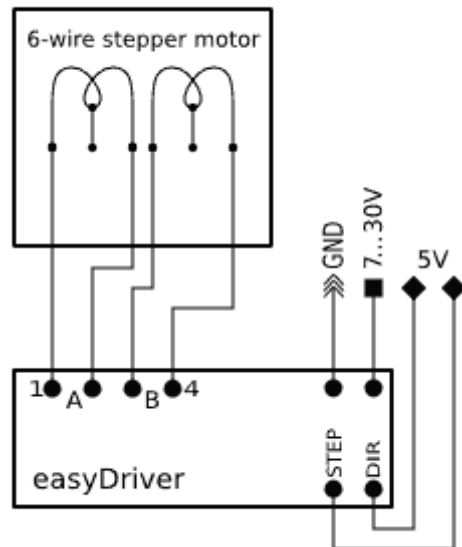
Motor Drive Input and Output

DIR is level sensitive
A rising edge on STEP
causes a step
Both take 0V to Vcc

JP2
3 DIR
2 STEP
1 GND

CPU GPP output to motor drive DIR and STEP pins

These are CPU pins, not board pins

CPU GPP output to motor drive DIR and STEP pins

Motor drive output (4): 1A, 1B, 2A, and 2B connect to MOSFET power amp circuit, so there is a need for 4 MOSFET power amp devices
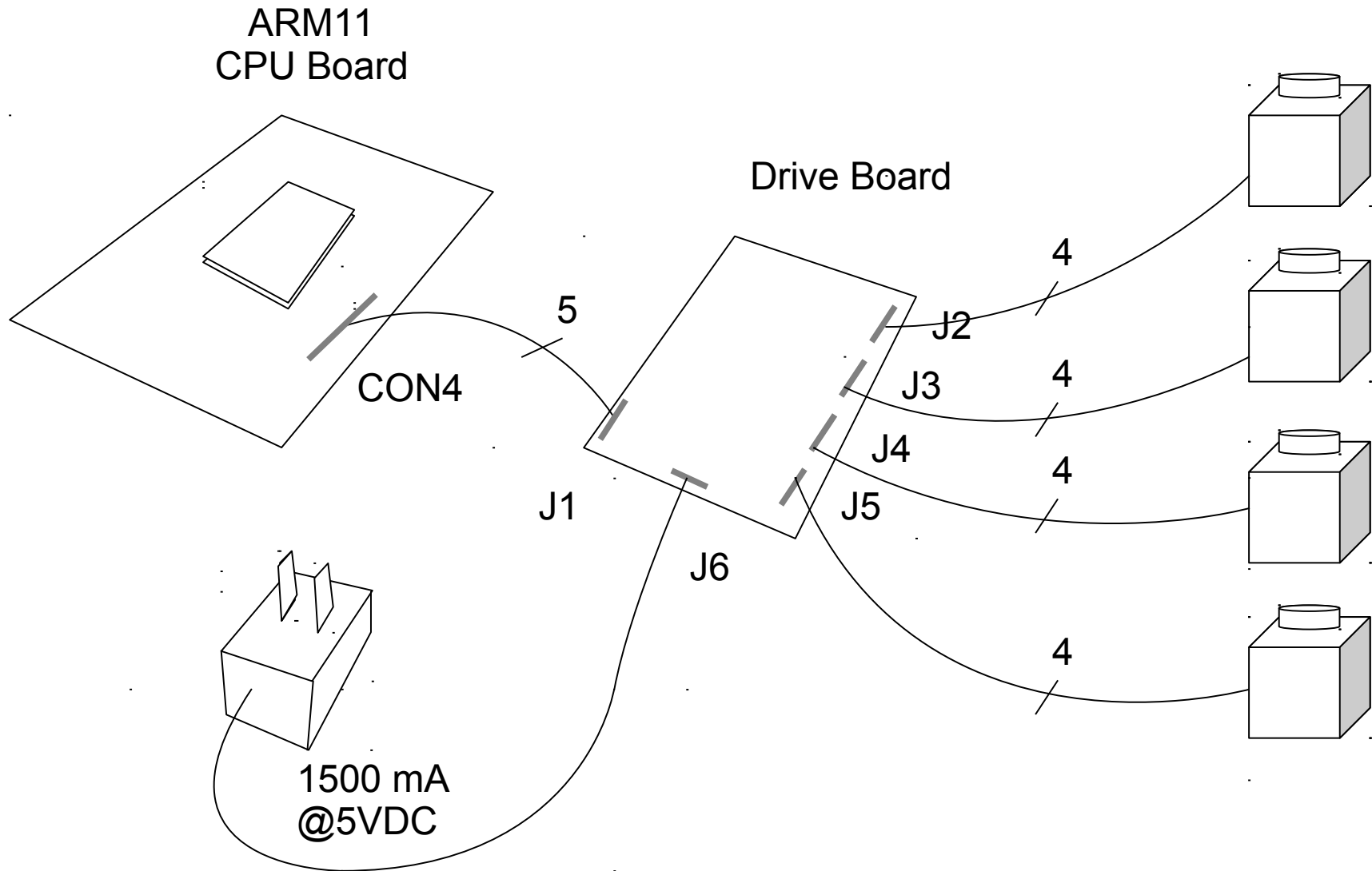
Simple Test on the Drive Board

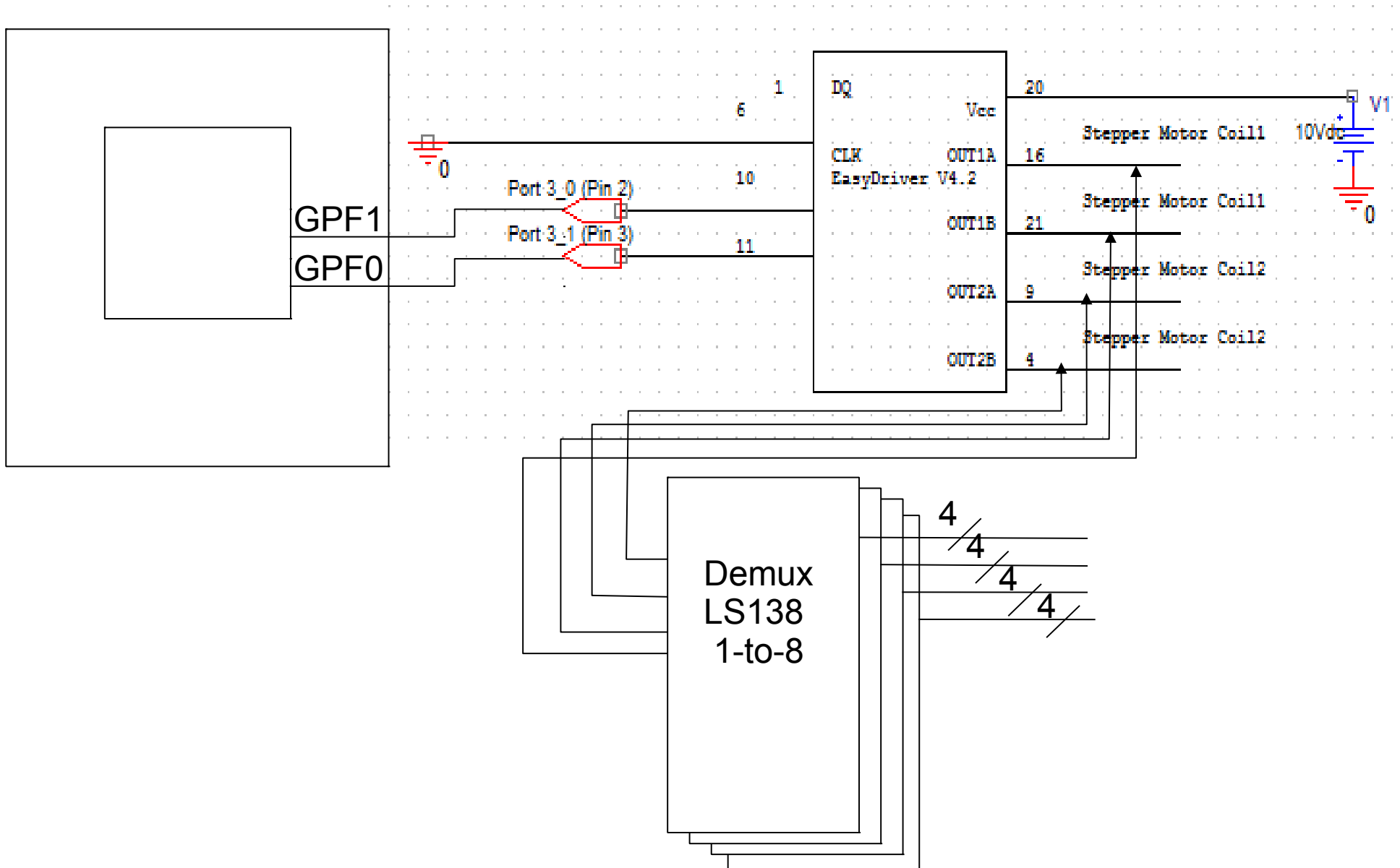What hardware/software can I use to test my EasyDriver?
A) Here's what I do. I solder headers in the pins of the EasyDriver and put it into a breadboard. I solder the wires on my stepper motor to a 4-pin .100" male header, and plug that into the breadboard so it connects properly to the EasyDriver. Then I take a PC power supply, and use the 12V from that into the GND and M+ pins on the EasyDriver. Then I tie the DIR pin to Ground with a wire. Then I take a square wave with a frequency of about 500Hz and put it into the STEP pin. This I generate with a signal generator or an Arduino or UBW. The motor should be spinning at this point. You can then take the DIR pin and connect it to +5V to see the motor go in the other direction. As the motor is running, you can slowly adjust the current adjust pot to see the effect that it has on the smoothness of the motor's motion.

http://www.schmalzhaus.com/EasyDriver/ Tutorial

Harry Li, Ph.D.

My Design Example To Drive xyz and Theta Stages

ARM11
CPU Board

Drive Board

5

CON4

J2   4

J3   4

J1   J4   4

J6   J5   4
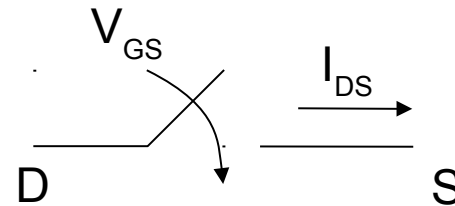
1500 mA
@5VDC

4

My Design Example Motor Drive Interface

Harry Li, Ph.D.

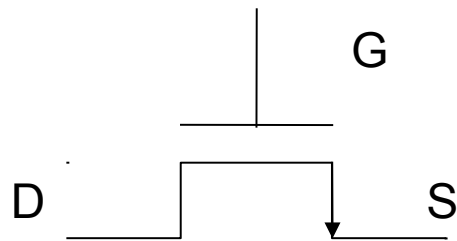# N-channel MOSFET Power Amp

IRF 510
Vdss = 100 V ; Igm = 1500 mA;

Vgs controls the flow of Ids
current, it is like a switch

G

V_{GS}

I_{DS}

D

S

D

S

Control signal is from CPU's GPP
port output pin [0,3.3V]

V_{GS}

Regulator

V_{GS}

1117

D

S

I_{DS} = 1500 mA

V_{PWR}

R_L

5 V

GND

GND

Harry Li, Ph.D.