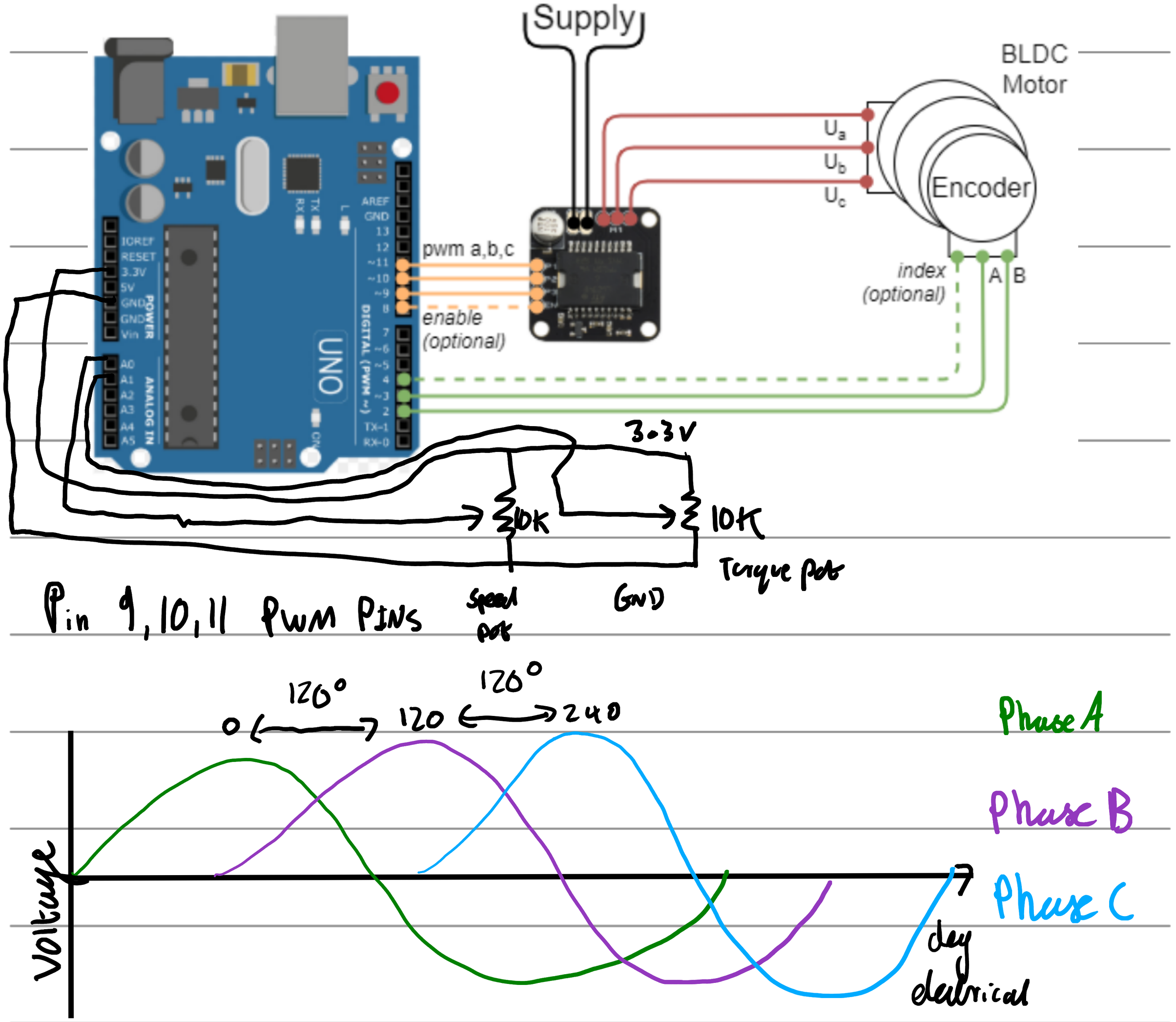
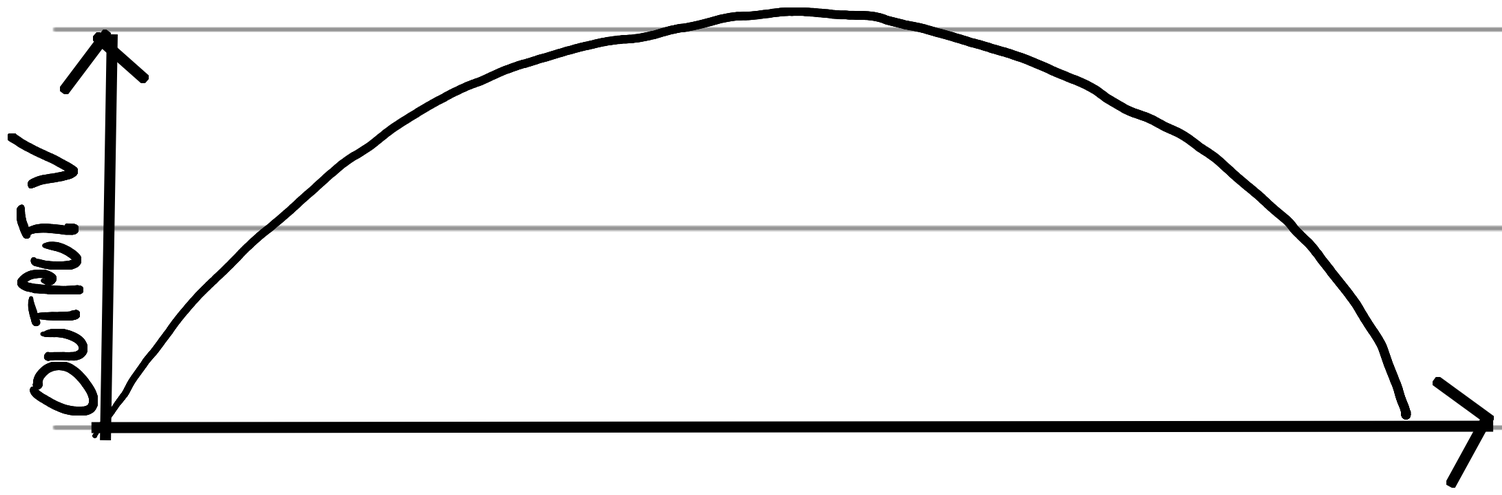
L6234D breakout + uno 3 phase driver

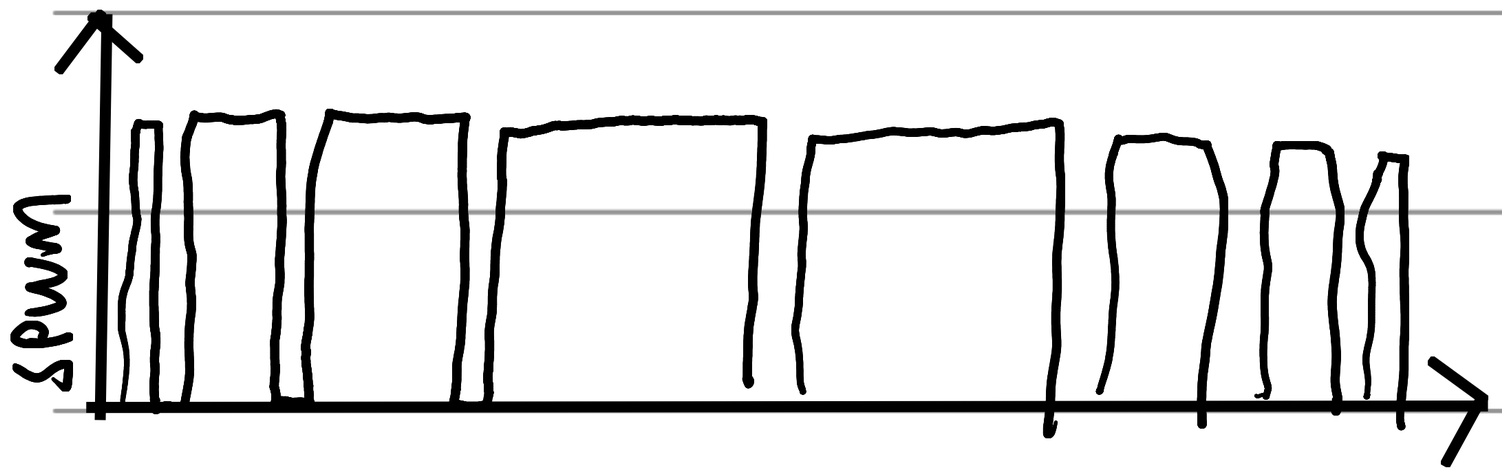


Use the Arduino to create the sinusoidal waves & the L6234 to amplify the signal. & apply them to the motor.

How to create such signals from Pwm, SPWM modules

the signals to generate an approximate sinusoidal signal. One changes the width of the Pwm signal that follow a sinewave amplitude





Degrees to radians $1^{\circ} \times \frac{\pi}{180} = 0.0174533^{\circ}$ rad

int electrical_degrees_phase A = 0

phase B = 120

phase C = 240

loop electrical angle

loop: electrical_degrees_phase A %= 360

-phase B %= 360

-phase C %= 360

get spwm duty

spwm_phase_A = sin((double)electrical_deg_phase_A * π/180) X127.5 +127.5

phase_B -phase B

phase_C -phase C

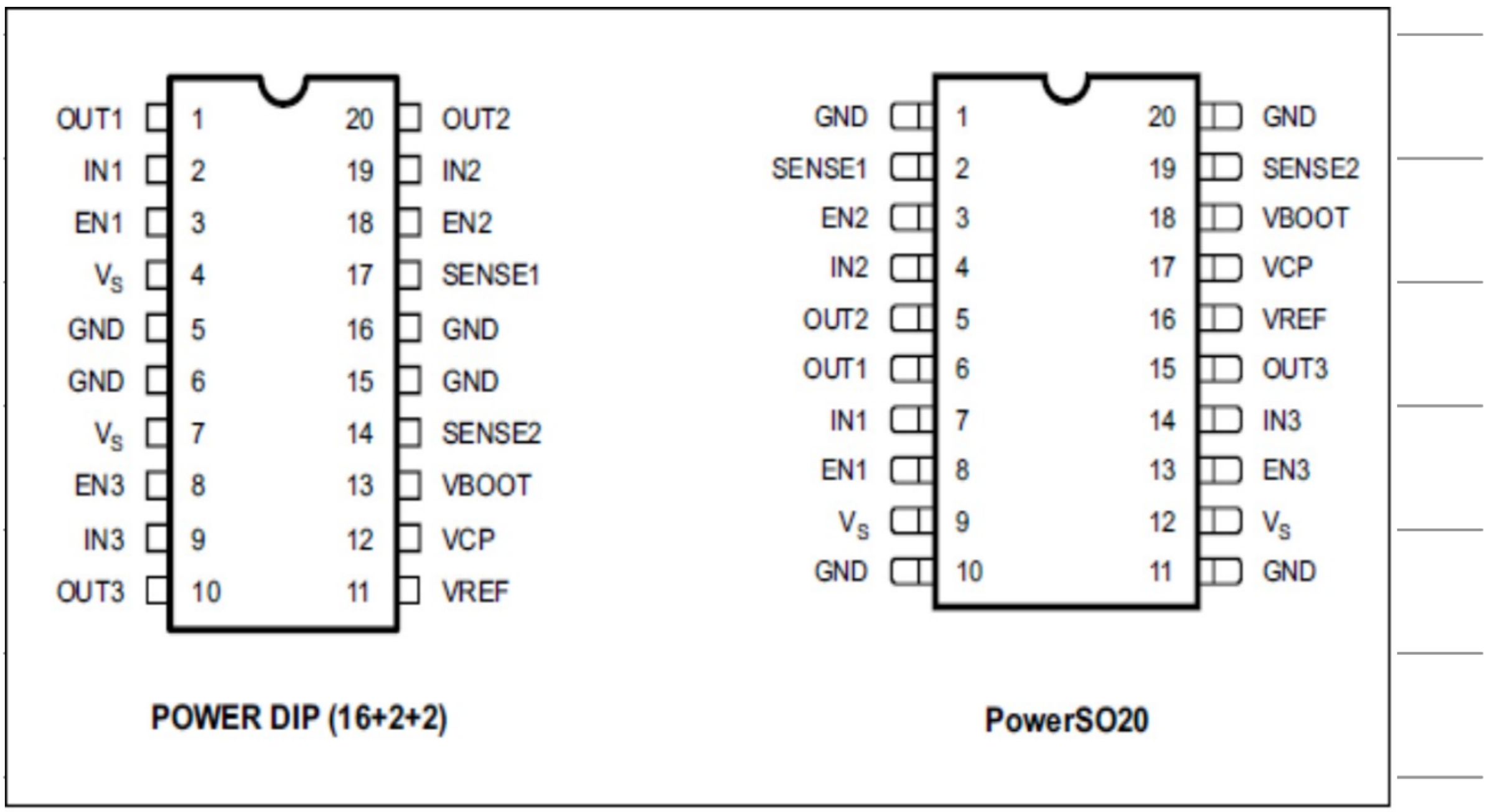
write duty

analogue_write(motor phase A, spwm_phase_A x amplitude / PC)

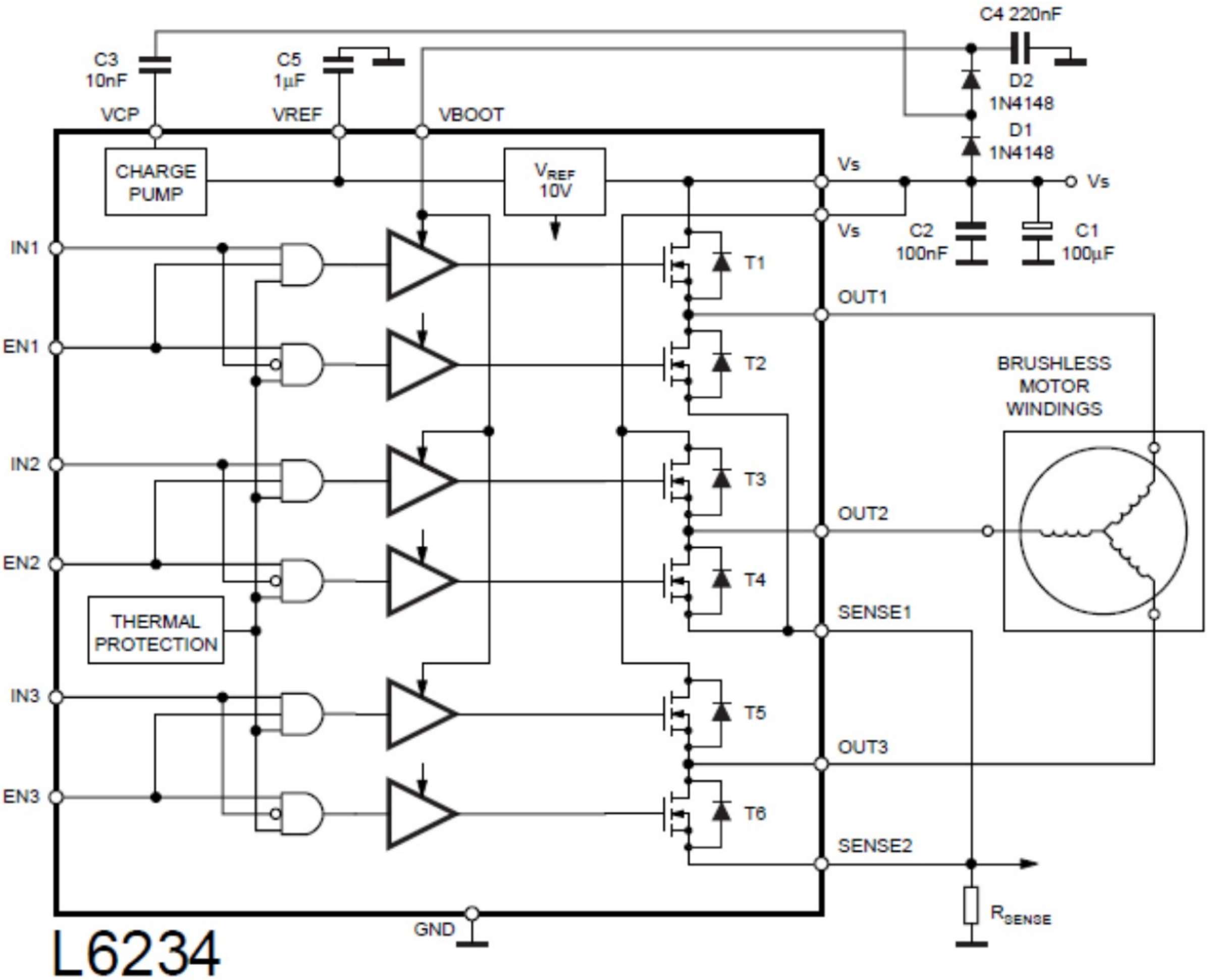
delay (some speed interval).

extra ... set pwm clocks. etc

L6234 Pin out



L6234 Datasheet Circuit



Components

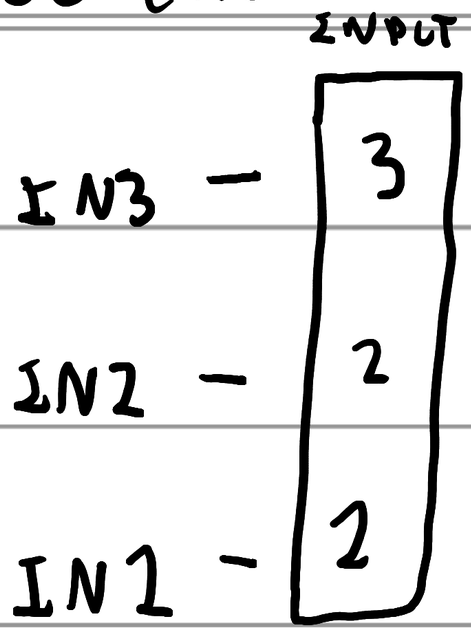
Rsense 4x 1Ω

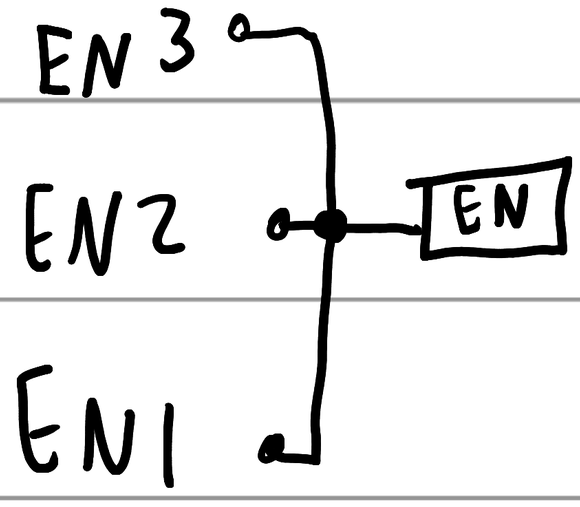
C1: 100µF polarised 25V. C4: 220nF 224. 0.22µF

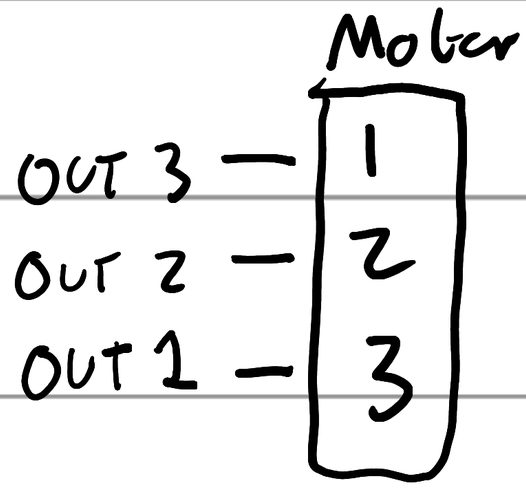
C2: 100nF 104. C5: 1µF 105.

C3: 10nF 103. D1/D2: IN4148.

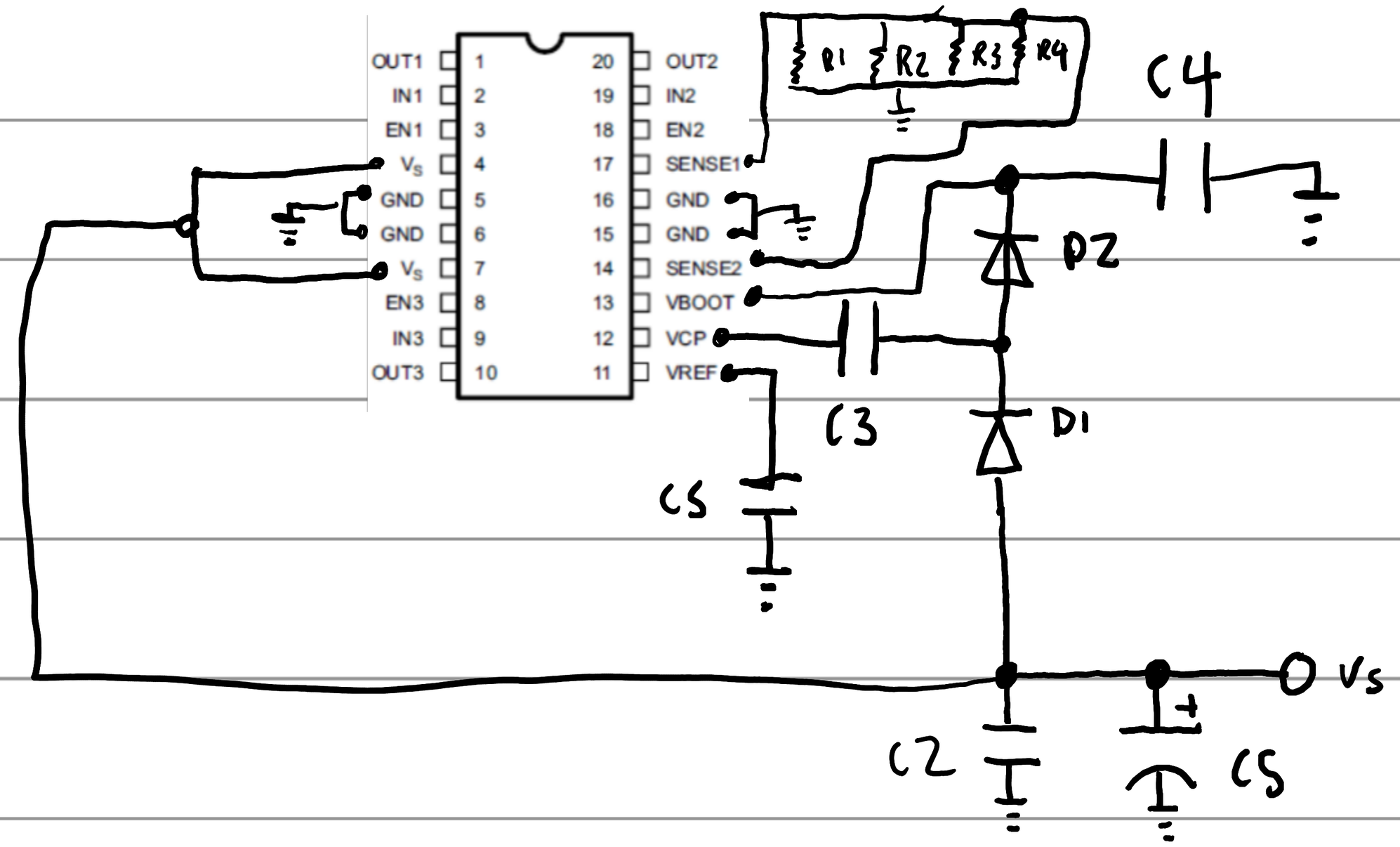
DIP 20 circuit



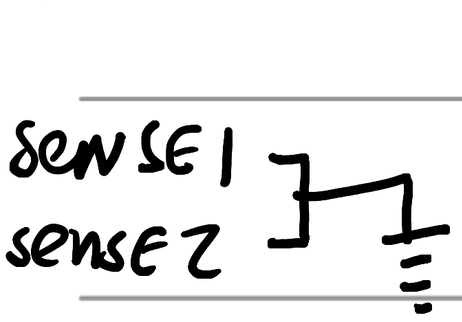


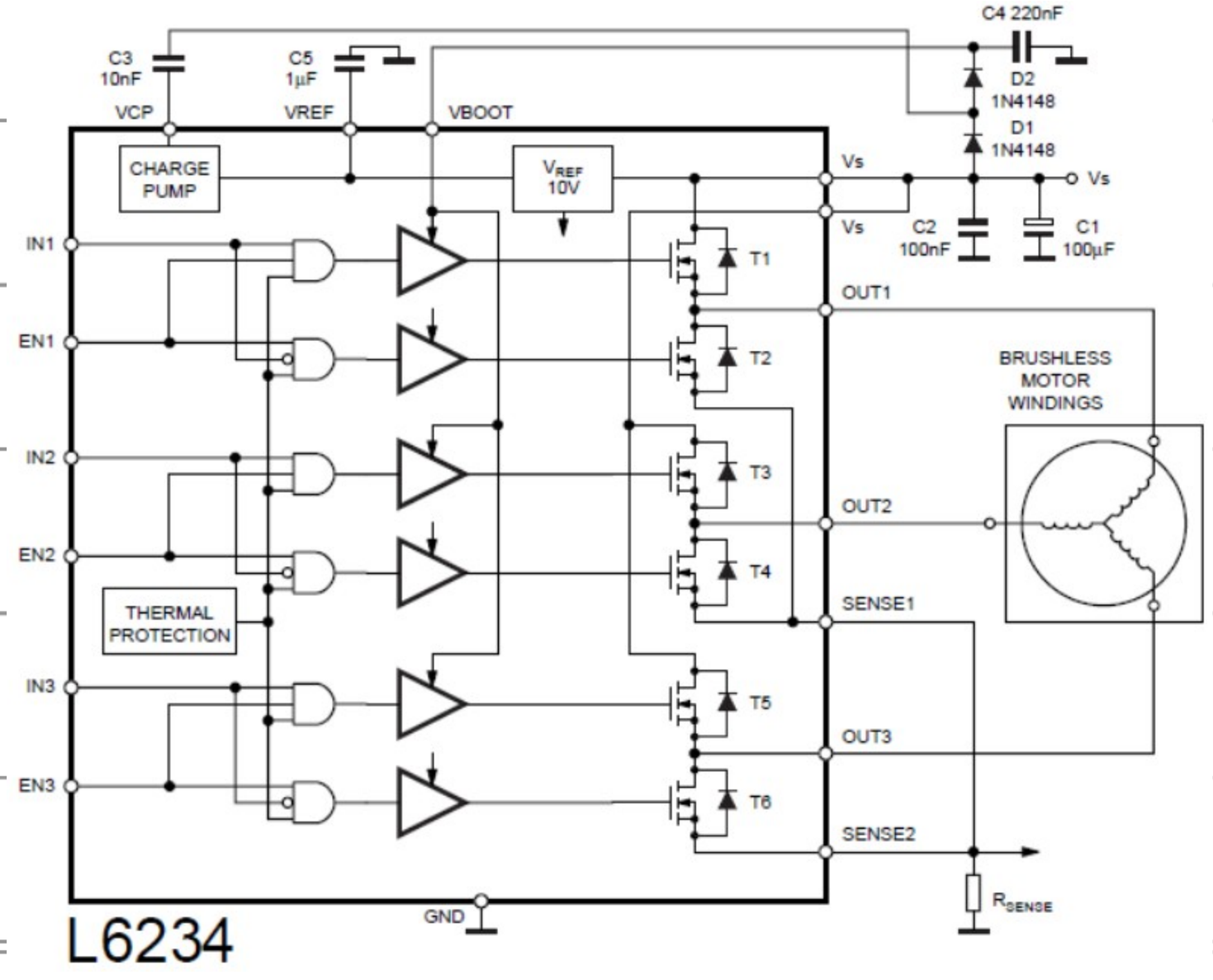


R1, R2, R3, R4 1Ω



Alternative





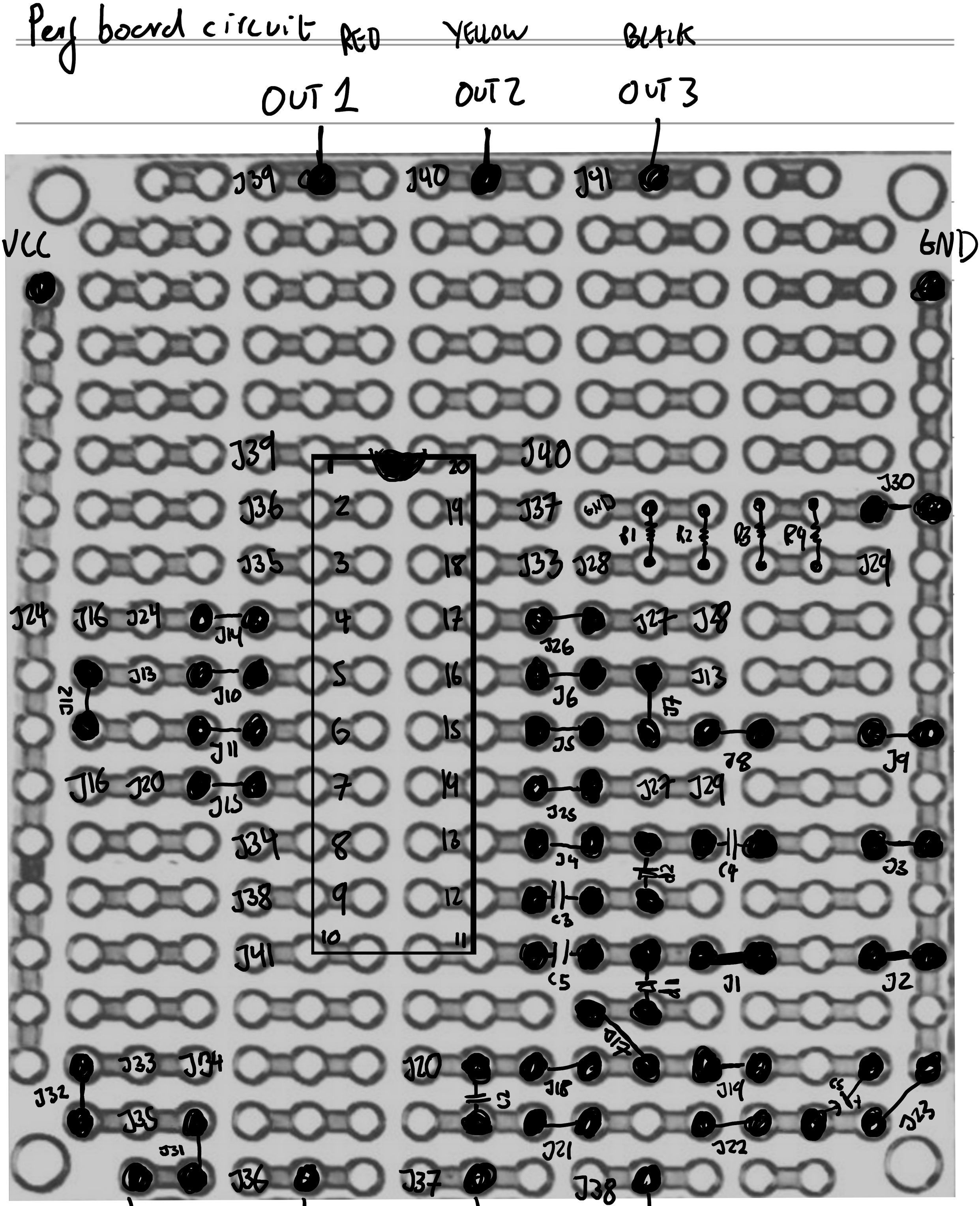
Performance, added millisecond loop timer. ~10ms at full speed.

int32 -> int16

double -> float

Disabling serial print 2ms

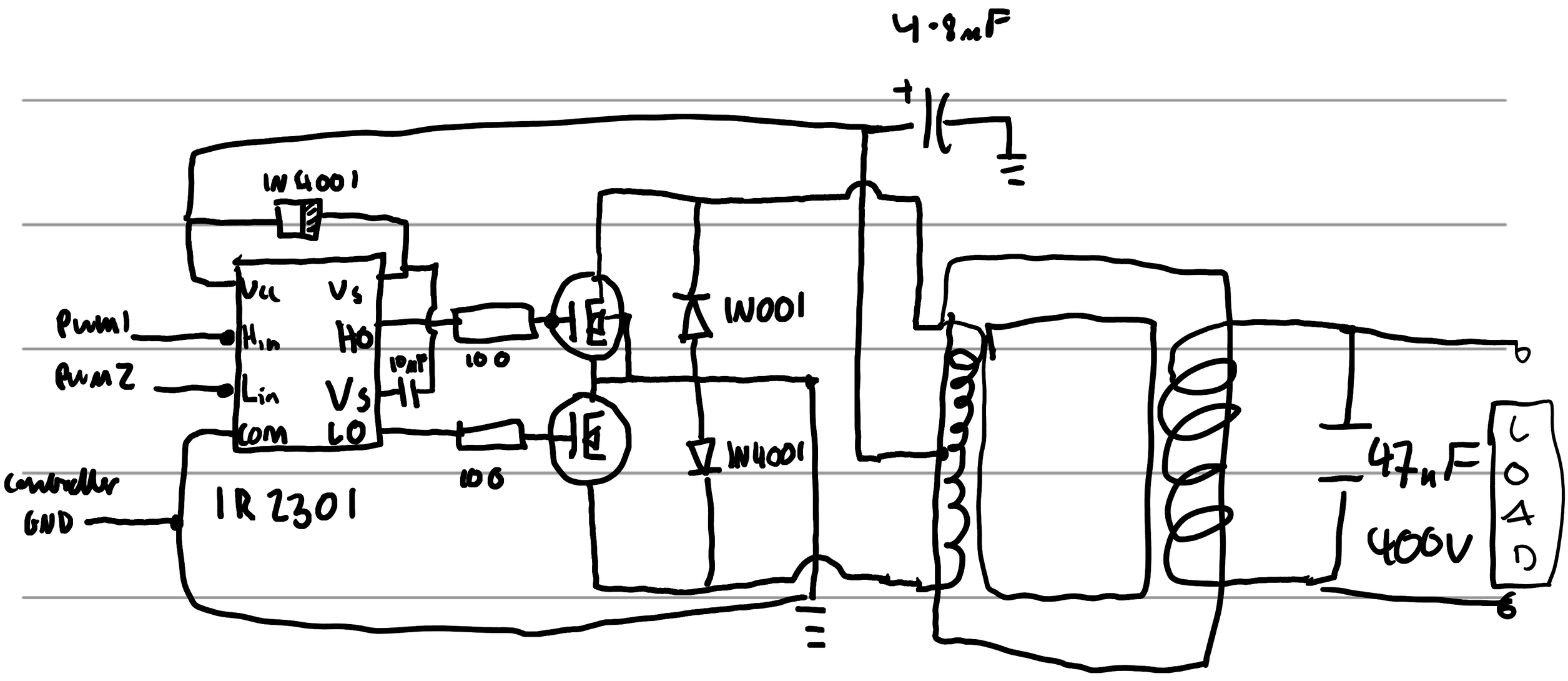
Perf board circuit



2104 (6 step) alternative for spwm ... ~~IR2101~~ no

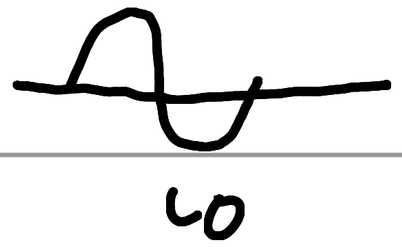
comperiter ic LM339, INS2608D ?

Higher power spwm



1:14

Ho

So we want a wave form like 

OUT

A RED

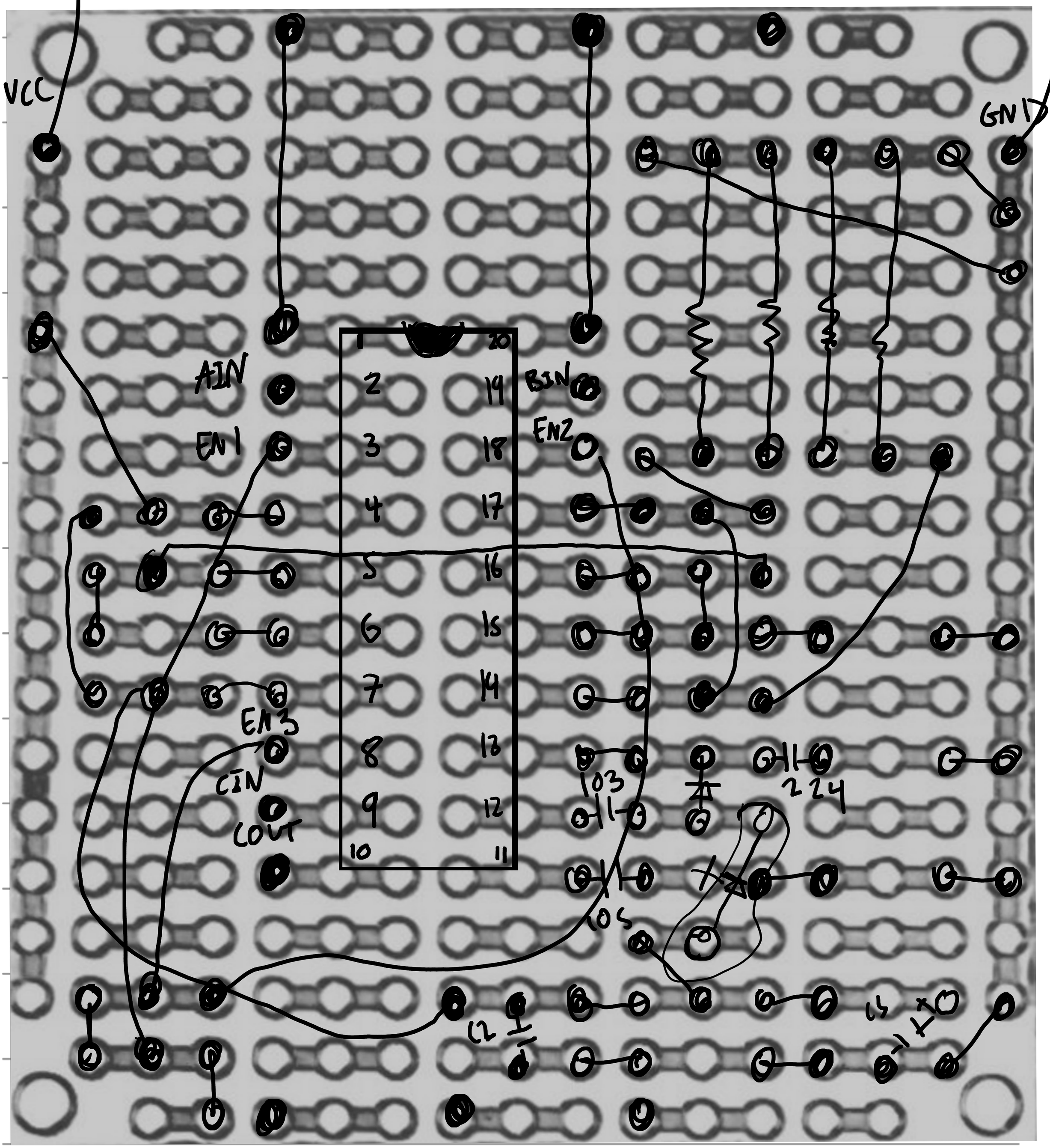
B Yellow

C Black

CJ

105 1MF

COUT



FN AIN BIN CIN

Pins phase A 9 Enable 8

phase B 10

phase C 11

Speed pot (A0)

Torque pot (A1)

Added ground battery to Arduino bridge.

Manual pump looks reasonable, not sure if

speed pot label is correct, perhaps high → low & low → high

25/3/23

Made some progress with SPWM circuit, it works with

the arduino code Its very quiet & smooth great success!

Need to determine if encoder model works & if the pedal

fix the vector in position or give new impulse in a direction

Speed pot value /15 is the setting pot 0 -> 1023 pot val /15

0 -> float 2.0

so when 0 delay time should be 0! so maybe the arduino is too slow.

check with serial prints (got bent) to check don't forget 0-7 value clamp.

(sin cosine table)

Next target objective is move the code to teensy & see how this

changes the perform do we get higher speeds with the same code

or is there a lag? change degrees to a smaller increment.

when using the encoder do we need to shift the angle by 1 unit?

Perhaps we need the Kalman filter for this.

order convert to teensy 4.0, test speed, attach encoder,
try voltage model, try Kalman state model, test Kalman
manually (ipm phase upp), do we need second term for
the higher derivatives.

$$\theta \quad \frac{d\theta}{dt} \quad \frac{d\theta}{dt^2} \quad \frac{d\theta}{dt^3}$$

(jerk)

IR2101 chan 10K for beg not 7K

23/3/23

Started converting to Teensy 4.0, set Frequency, changed pins
for Pwm & pcb. May need to configure(ADC.h)

ADC *adc = new ADC()

adc -> adc0 -> setAveraging (4)

adc ->adc0 -> setResolution (8) (bits)

adc -> adc0 -> setConversionSpeed (ADC_CONVERSION_SPEED::HIGH_SPEED)

adc -> adc0 -> setSamplingSpeed (ADC_SAMPLING_SPEED::HIGH_SPEED)

use setAveraging (4) to take multiple measurements to reduce the noise intrinsic to ADCs otherwise pot values might be unstable.

30/3/23

Moving to digital only as pots read from ADC are unstable.

Factorise out controller

31/3/23

1) Made new power cables with XT-30/60 connectors

2) Remove switch

3) Test cable polarities

4) check switch

5) parameterise thrust delay model with options for

min, max, increment etc.

6) Factorise voltage model /class.jy

7) Test PCB & hook up power circuit via AUX

8) Apply encoder voltage model w/ thrust direction model

9) Test theory t_1 - or fixed percent tracking

10) Kalman cpp

11) Encoder spam improvements with Kalman

12) speed, acc, jerk control. Interval logging

13) Kalman notes without power.