



PIC16F628A:
 Operating Voltage 3.0V to 5.5V
 16 digital I/O Pins
 25mA per I/O Pin
 200mA all I/O Pins

Input
 Vss to 0.8v Low
 2.0V to Vdd High

Output
 Low 0.6v
 High Vdd-0.7v

$V = I \times R$
 $R = V / I$
 $R = 5v / 25mA$
 $R = 5 / 0.025$
 $R = 200 \text{ ohms}$

AH337 Current draw max 25mA
 $R = V / I$
 $R = 5v / 25mA$
 $R = 5 / 0.025$
 $R = 200 \text{ ohms}$

Using a 4k7
 $V = I \times R$
 $I = V / R$
 $I = 5v / 4k7$
 $I = 5 / 4700$
 $I = 0.00106$
 $I = 1mA$

For -ve = -12v
Charge (high side):
 $V = I \times R$
 $I = V / R$
 $I = 5v / 4k7$
 $I = 5 / 4700$
 $I = 0.00106$
 $I = 1mA$

BC547 gain: 200
 $Ic = Ib \times Hfe$
 $Ic = 1mA \times 200$
 $Ic = 200mA$

From supply
 $I = V / R$
 $I = 12v / 2 \times (10k)$
 $I = 12 / 20000$
 $I = 0.0006$
 $I = 600uA$

$I = V / R$
 $I = (12v - 0.7v) / 10k$
 $I = 11.3 / 10000$
 $I = 0.00113$
 $I = 1.13mA$

BC557B Gain: 200
 $Ic = Ib \times Hfe$
 $Ic = 1.13mA \times 200$
 $Ic = 0.00113 \times 200$
 $Ic = 0.226$
 $Ic = 226mA$

IRL2203N:
 Gate charge: 60nC
 Gate Threshold: 1v
 Gate Hard On: 7v
 Gate Max: 16v
 Drain Max: 30v 116A

P10NK60Z:
 Gate charge: 70nC
 Gate Threshold: 4.5v
 Gate Hard On: 6v
 Gate Max: 30v
 Drain Max: 600v 10A

$R = 1k$
 From 24v to 1v: $t = 13uS$
 From 7v to 1v: $t = 8uS$
 $t = 1uS$
 From 24v to 1v: $R = 80$
 From 7v to 1v: $R = 125$

<http://mustcalculate.com/electronics/capacitorchargeanddischarge.php>

IRL2203N C(gate) = 4nF
 $V(\text{full}) = 7v$
 $V(\text{threshold}) = 1v$
 $R = 1k$
 From 24v to 4.5v: $t = 2.3uS$
 From 24v to 1v: $t = 4.4uS$
 From 6v to 4.5v: $t = 400nS$
 From 6v to 1v: $t = 2.5uS$
 $t = 1uS$
 From 24v to 4.5v: $R = 2k5$
 From 24v to 1v: $R = 200$
 From 6v to 4.5v: $R = 450$
 From 6v to 1v: $R = 400$

$f = 1 / t$
 $f = 1 / 5uS$
 $f = 1 / 0.000005$
 $f = 200000$
 $f = 200kHz$

for 1% Mark/Space 2Hz
 For 7 pole
 $RPM = f / 7$
 $RPM = 286$

Speed / control trade off
 $P = V \times I / R$
 $P = 24v \times 24v / 1k$
 $P = 24 \times 24 / 1000$
 $P = 0.576$
 $P = 576mW$

So things could be a little toasty.
 Maybe 2 x 2k2 in parallel