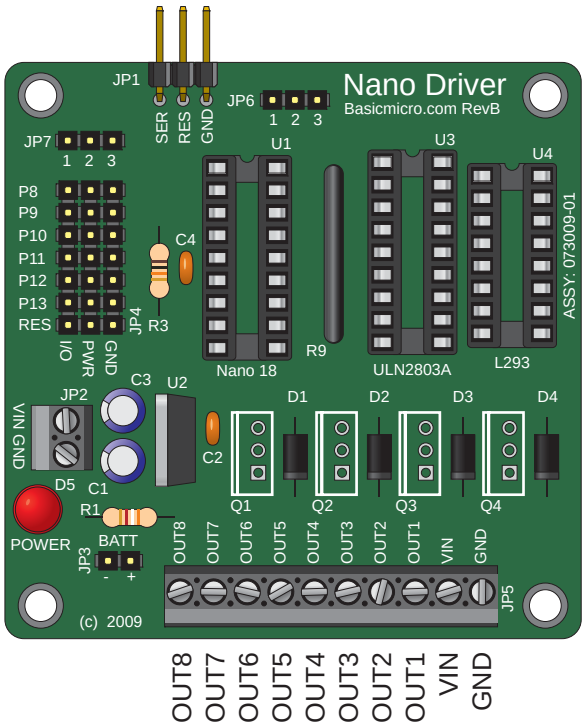
BASIC MICRO

TECHNOLOGY AT WORK

BasicATOM Nano Driver Board
Data Sheet

Feature Overview:

- ULN2803 Socket
- L293 Dual H Bridge Socket
- Power LED
- 3.5mm Power Screw Terminal
- 2-Pin Battery Connector
- LDO Power Regulator
- 8 Servo or I/O Headers
- 4 High AMP MOSFET Switches
- Incircuit Nano Programming
- 3.5mm Output Screw Terminal
- Selectable Pull-Up / Pull-Down Resistor



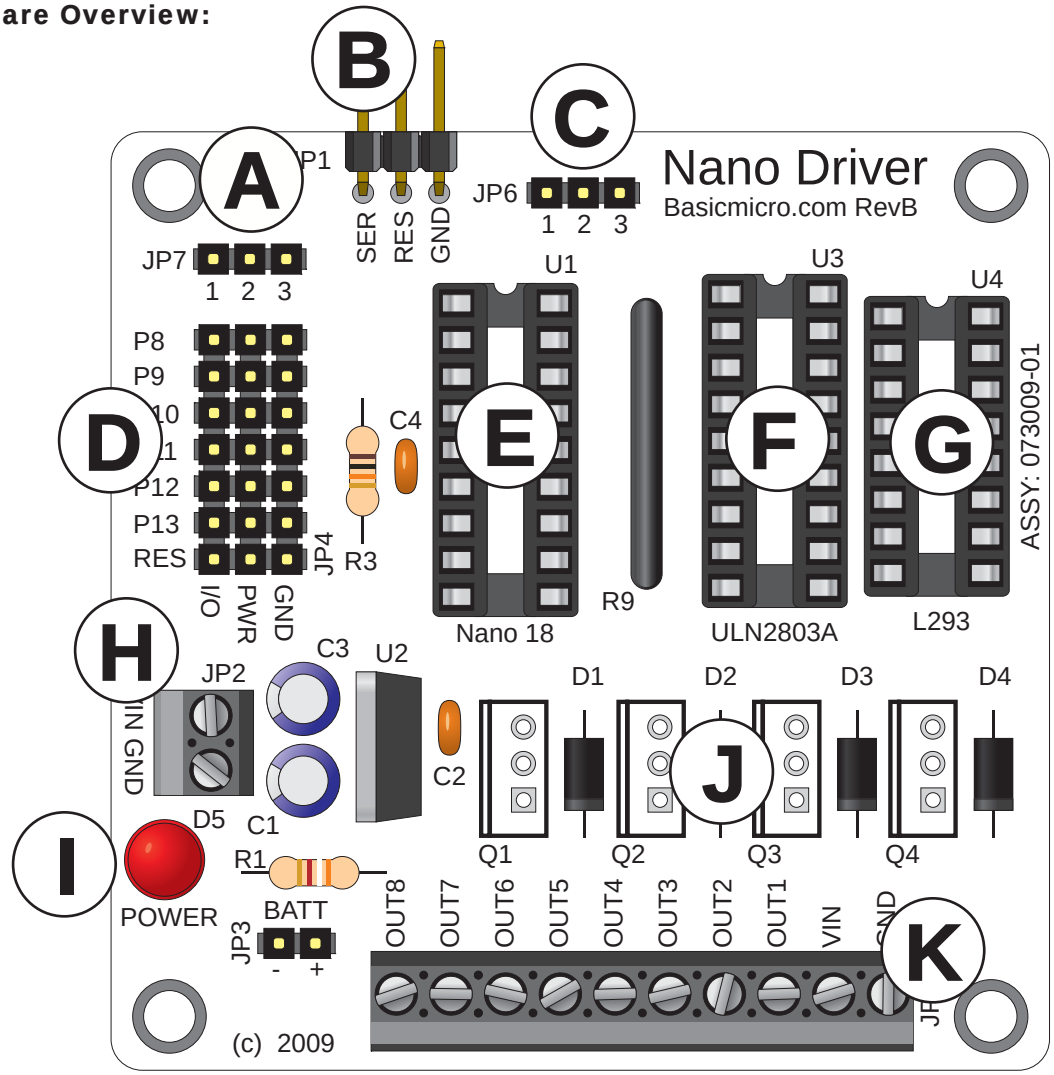
OUT8 OUT7 OUT6 OUT5 OUT4 OUT3 OUT2 OUT1 VIN GND

Basic Description

The BasicATOM Nano Driver board is a great platform for beginners or advance users alike. It demonstrates the power of the Nano by controlling several high current peripherals. The Nano Driver makes it easy to experiment with DC motors, stepper motors, servo motors and relays.

The Nano Drive board can be an ideal for a robotics controller platform. The board makes it easy to drive continious rotation servos or 2 dc motors for the drive train.

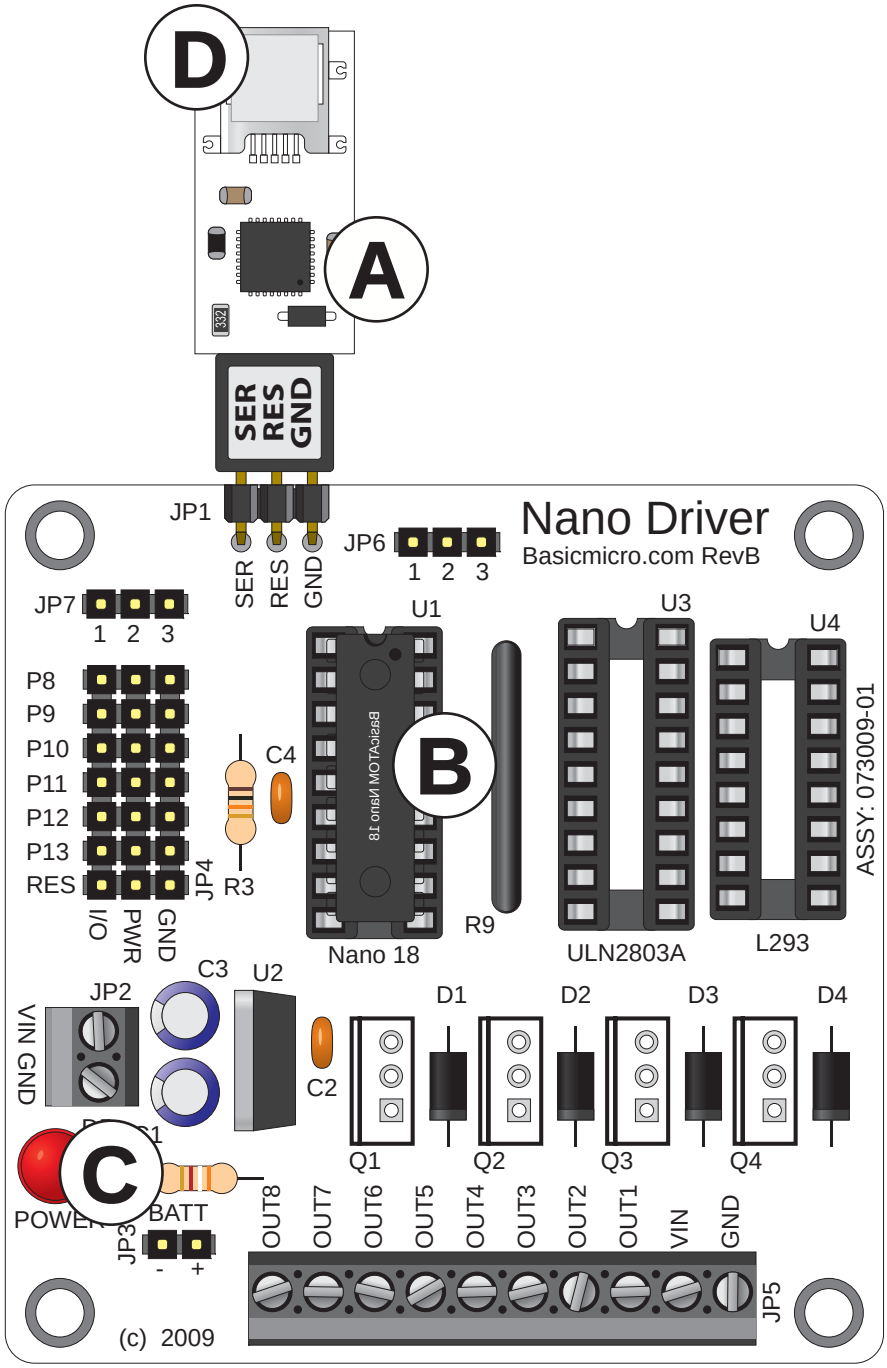
Hardware Overview:



A: JP7 set servo header power to VCC or VIN.
B: 3-pin programming header.
C: JP6 sets I/O on servo headers to pull-ups, pull-down or float.
D: Servo headers.
E: Nano 18-pin socket.
F: ULN2803 socket.
G: L293 socket.
H: 3.5mm screw terminals for power.
I: Power LED.
J: IRF520 MOSFETS.
K: 3.5mm screw terminals for outputs.

Program Nano Driver Board

Insert a Nano 18 pin chip in the Nano Driver board (B) socket labeled U1. Be careful to note Nano orientation. If Nano is placed in socket backward you will damage it. Insert the USB2Serial adapter as shown (A). Supply power either from screw terminals or BATT header (C). Then plug a miniB USB cable (D). Plug the other end of the USB cable into your pc. If you're using the USB2Serial adapter for the first time you will need to download the drivers from basicmicro.com. To program the Nano you will also need to download Basic Micro Studio software from basicmicro.com.

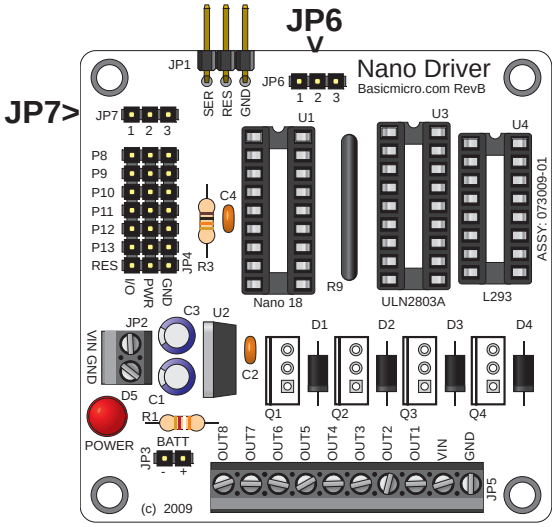


Jumpers

JP6 controls a resistor pack tied to P8 through P13. Moving JP6 will set P8 through P13 to pull-up, pull-down or floating, depending how the jumper is set. If a potentiometer is used remove the jumper from JP6 to set the I/O to floating. JP7 controls the power on the I/O header. If JP7 is set to 1,2 then the PWR header will have the direct input voltage before the regulator on it. This is ideal for driving a servo from a 6VDC battery. Normally JP7 would be set to 2,3.

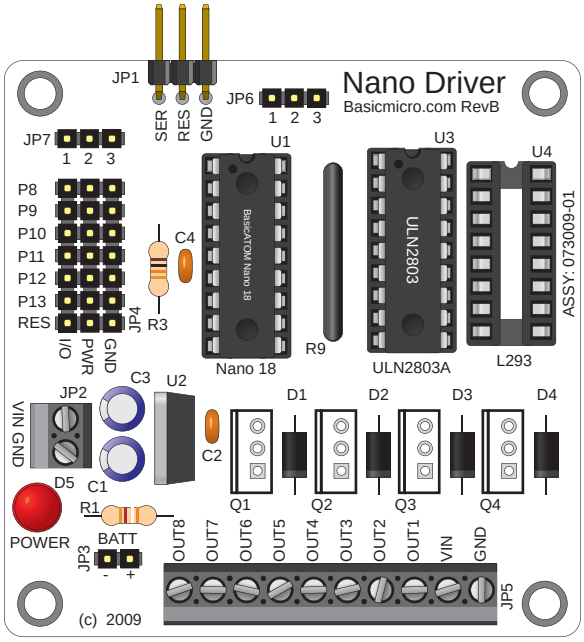
JP6
Jumper 1,2 = Pull-Up
Jumper 2,3 = Pull-Down
Jumper OFF = Floating

JP7
Jumper 1,2 = VIN
Jumper 2,3 = VCC
Jumper OFF = PWR OFF

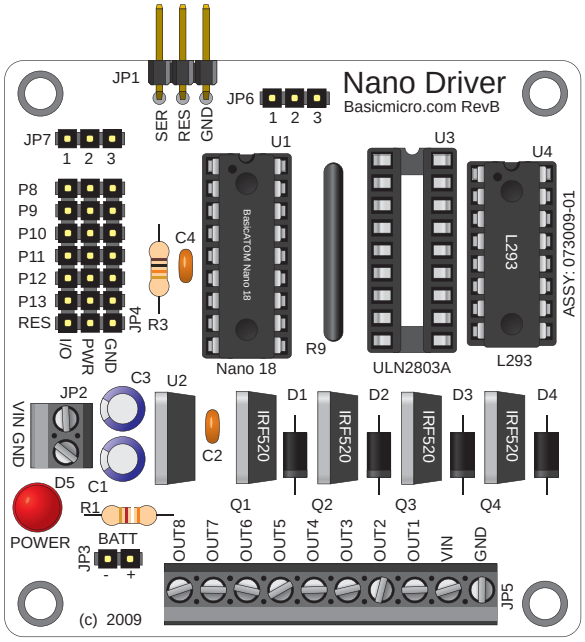


Configurations

Nano 18 I/Os are shared with the ULN2803 and IRF520 MOSFETs. The Nano Driver board can only be assembled in two configurations. The ULN2803 (U3) must be populated alone. The L293 (U4) and IRF520 (Q1-Q4) can be populated at the same time without the ULN2803 installed. To install the IRF520 you must solder them in place as shown below. Make sure orientation is correct. The large metal tabs of the IRF520s will line up with the silk pattern on the Nano Drive Board. Do not populate the ULN2803 and IRF520 MOSFETs at the same time.



ULN2803



L293 & IRF520

Sample Code

Sample code is provided to demonstrate each section of the Nano Driver board. Visit Basicmicro.com and the downloads section to obtain the sample code files for the Nano Driver board.

Power

The Nano Driver Board can be powered from 4 AA batteries, RC 8.4V battery or up to a 24VDC wall adapter. The BATT input pins will supply the on board regulator. The on board regulator will stop working once the battery output voltage drops below 5.5VDC. The on board regulator can source up to 1A.

ULN2803

The ULN2803 is a Darlington high current driver and can control a number of devices. It is well suited to control high current LEDs, two unipolar stepper motors or relays. It can control up to 500mA at 50VDC. The ULN2803 is controlled by pins P0 to P7. The outputs of the ULN2803 are OUT1 through OUT8 on the header. The ULN2803 voltage input pin is tied to VIN. Max power input to VIN is 24VDC. This means you can drive a device with up to 24VDC. The ULN2803 can drive up to 500mA continuous per channel. Visit basicmicro.com for sample code.

Control Pins:
P0 = OUT1
P1 = OUT2
P2 = OUT3
P3 = OUT4
P4 = OUT5
P5 = OUT5
P6 = OUT7
P7 = OUT8

To enable any of the 8 channels on the ULN2803 you would simply drive the corresponding pin high. To disable a channel you would drive its pin low. The example code below will turn on all 8 channels for 1 second then off for 1 second and repeat indefinitely.

```
;Start Program

DIRL = 0        ;Sets P0 - P7 as outputs. DIRL access the entire port.

Main
        OUTL = %11111111  ;OUTL access entire port. %11111111 sets all pins high.
        Pause 1000
        OUTL = %00000000  ;OUTL access entire port. %00000000 sets all pins low.
        Pause 1000
Goto Main
```

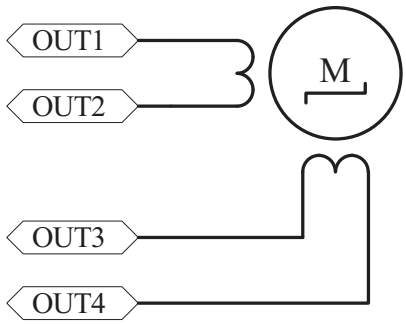
The DIRL and OUTL commands allow you to set an entire port in one command. OUTL and DIRL access the low port which is P0 to P7. When accessing a port, each bit in %11111111 represents a pin starting from left to right P7,P6,P5,P4,P3,P2,P1,P0. Which makes first bit in %11111111 is P7 and the last bit is P0. There are several ways to address each pin of the Nano. The above code only demonstrates a simple way to access a block of pins all at once.

L293

The L293 is a dual H bridge. The L293 is typically used to bidirectionally drive 2 DC motors or one bipolar stepper motor. It can also be used to drive inductive loads like relays and lamps. The L293 has two enable pins, one for each side of the H bridge. These are controlled by P11 and P12. Setting both pins high will enable the full H bridge. Each channel is controlled by P0,P1,P2 and P3. The L293 can drive up to 600mA continuous per channel with a peak of 1.2A. With 4 channels the total continuous output for the L293 is 2.4A. Visit basicmicro.com for sample code.

Control Pins:
P12 = Enable1
P11= Enable2
P0 = OUT1
P1 = OUT2
P2 = OUT3
P3 = OUT4

Bipolar Stepper Motor Connections:



The following code snippet will drive a bipolar stepper motor in one direction using the L293. Make sure VIN is within the operating voltage range of the stepper motor. If VIN is to high you can damage the motor. If VIN is to low the motor likely will not turn.

There is a small pause in between each step. This controls the speed. Every stepper motor varies so you may need to adjust the amount of time in between each step. If speed to fast the motor will not turn.

```
:Start Program

DIRA = 0        ;Sets P0 -P3 as outputs
OUTA = 0        ;Sets P0-P3 low

High P12
High P11

Main
        OUTA  = %0101       ;OUTA access first 4 pins of port P0-P3. 0 = low, 1 = high.
        Pause 10            ; Change this value in all 4 places to adjust the speed of rotation.
        OUTA = %0110
        Pause 10
        OUTA = %1010
        Pause 10
        OUTA = %1001
        Pause 10
Got Main
```

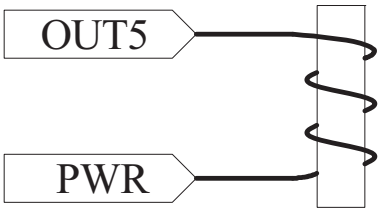
The DIRA and OUTA commands allow you to set the low 4 pins in one command. OUTA and DIRA access the low nib which is P0 to P3. When accessing a port, each bit in %1111 represents a pin starting from left to right P3,P2,P1,P0. Which makes first bit in %1111 is P3 and the last bit is P0. There are several ways to address each pin of the Nano. The above code only demonstrates a simple way to access a block of pins all at once.

IRF520

Can control high current loads up to 9.2Amp per MOSFET. These are ideal for heavier loads such as solenoids or larger DC motors. MOSFET outputs are on OUT5 through OUT8.

Control Pins:
P4 = OUT5
P5 = OUT6
P6 = OUT7
P7 = OUT8

Inductive Load Connections:



When driving an inductive load the IRF520 supplys the ground. One side of the coil will have voltage on it, while the other side is connected to the IRF520. When the IRF520 is turned on it will complete the circuit, sinking up to 9.2Amps.

Headers

There are 7 headers on the Nano Driver board which are labeled P8 - P13 and can be used for digital inputs or outputs. P8 - P11 can be used as analog inputs. The analog input pins are used to read analog voltages with an output range between 0 to 5VDC. An example would be potentiometers, accelerometers or temperature sensors to name just a few. Each header has an I/O, PWR and GND. The PWR pin voltage source is controlled by JP7. It can be set to 5VDC from the regulator or VIN. To access the analog pins you can use the code snippet shown below.

```
;Start program

Temp Var Word                ;Setup a variable

Main
        Adin P8, Temp        ;Read analog pin P8 can change P8 to any analog pin
        Serout S_Out, i9600, [DEC TEMP,13]        ;Send value to the terminal window
Goto Main                    ;Loop forever
```

The headers 3-pin configuration is setup to conveniently drive servos. When driving a servo you should power the board from a 6VDC source (Such as a battery pack) and use the VIN setting for JP7. Typical a single servo will draw more than 1Amp which is the max output of the on board regulator. To drive a servo you can use the code snippet shown below.

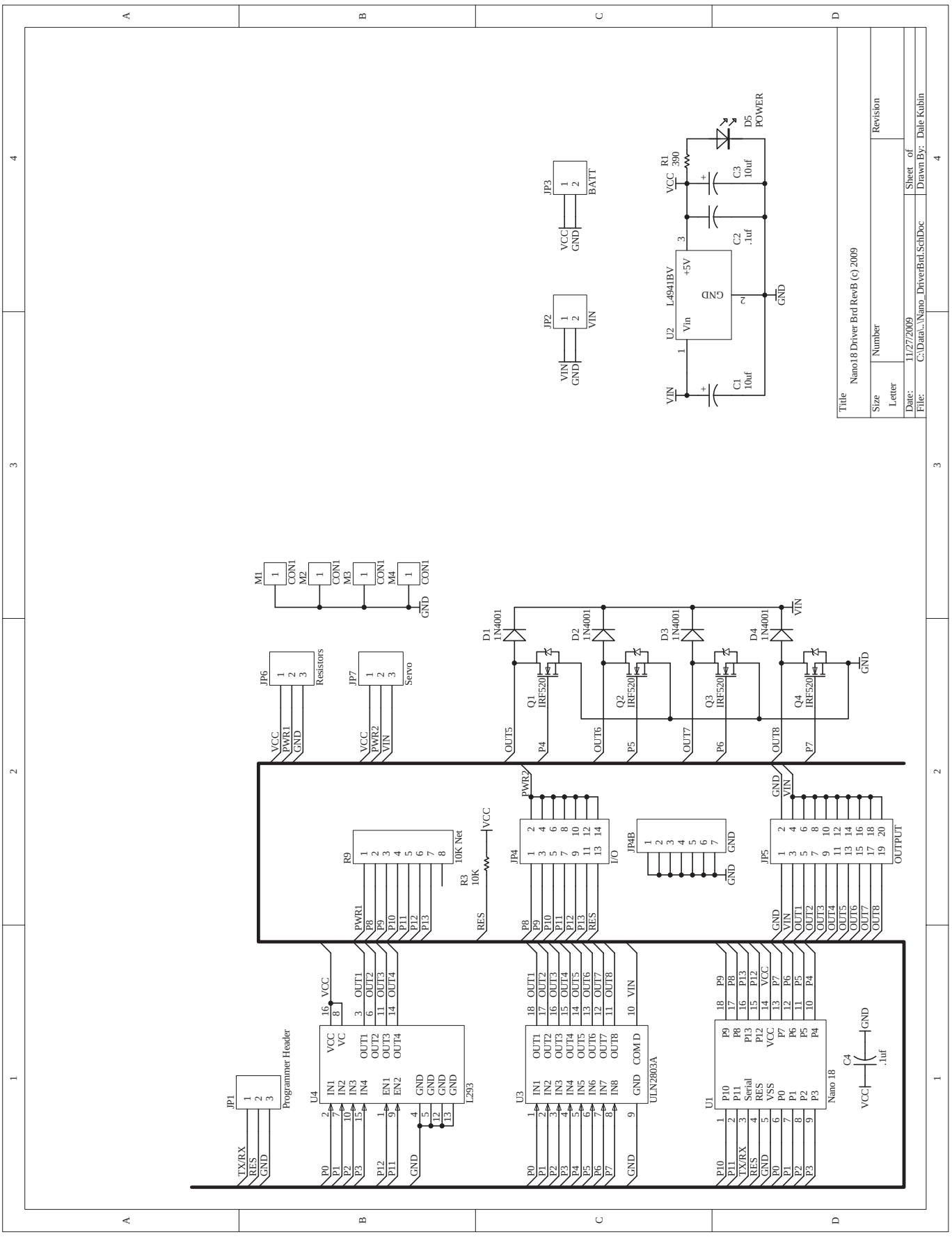
```
;Start program

Main
        Servo P8,700,40      ;700 repersents postion, this is the max range for HiTec 5645
        Pause 17             ;Pause minimum delay between next command
        Servo P8,-700,40     ;-700 full swing in opposite direction
        Pause 17
Goto Main                    ;Loop forever
```

Each servo will have a different maximum range. The HiTec 5645 digital servo, this is around 700 / -700. An analog servo like a HiTec 422 this number will be around 1400 / -1400. The 40 in the servo command is how long the command will output the pulse. This gives the servo time to travel. If you exit the command to quickly the servo may not have time to travel to the correct position.

Electrical Characteristics

Characteristic	Value (Units)
VIN Range (min - max)	6 – 24VDC
Current Draw (Idle)	50 mA
Current Draw (Max)	1000 mA



Warranty

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Technical Support

Technical support is made available by sending an email to support@basicmicro.com. All email will be answered within 48 hours. All general syntax and programming questions, unless deemed to be a software issue, will be referred to the on-line discussion forums.