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Position and Speed Controller for DC Motor with Incremental Encoder

SKU: EL143757

Open Source Hardware Projects

Position and Speed Controller for DC Motor With Incremental Encoder

This project consists of Arduino-compatible microcontroller ATmega328, an L298 Motor driver, a Joystick, a programming connector, an Infrared sensor, and various analog and digital I/O pins. The project is Arduino compatible and can be programmed using Arduino IDE and many motor-related projects can be developed using this hardware.

Arduino code is available to test the project, and you can edit the appropriate PID values to tune the motor. Check the link below for more information about boot-loader and Arduino programming, also refer to the connection diagram for the same.

Arduino Compatible Motor Driver Key Features

- Atmega328 Arduino Compatible Micro-Controller
- L298 H Bridge Bidirectional DC Motor Driver
- Joystick + Switch Joystick Connected to A1, Switch Connected to D12 + GND
- CN3 Arduino Programming/Bootloader Connector
- CN5 Analog I/O, A1, A2, A3 (For External Sensor or I/))
- CN4 Digital I/O D6, D7, D8 (For I/O)
- CN1 Digital Pin D2, D3 (For Incremental Encode A and B Channel) With Pull-ups (Interrupt Pins)
- Jumper J1 Enable Control for L298, Optional Jumper Do Note Populate
- U1 External Potentiometer (VCC, Analo A0, GND)
- LM78M05 5V Regulator Optional Only Use when Motor Power Supply 18V Maximum
- D1 Logic Power LED
- D4 Motor Power LED

L298 has two H-bridges but here in this project the two H-bridges are configured/connected in parallel to provide more power to the motor, D9, and D10 are connected to the Input of L298 and these two pins can be used to control the direction of the motor or direction and speed. D5 is connected to the Enable pin of L298 and can be used for PWM input for speed control or to enable the L298. Connector CN1 is provided to connect the incremental encoder to Channel A and Channel B and Arduino and D2, D3 interrupt pins of the Arduino, these two pins have also pullups. The operating power supply for the motor is 7V to 46V DC, logic supply is 5VDC. If the motor voltage is below 18V, the project can work with a single supply, in this case, install the LM7805 regulator provided under the PCB.

APPLICATIONS

- PID Closed Loop DC Motor with Incremental Encoder Feedback for Position Control
- PID Closed Loop DC Motor with Potentiometer Feedback Potion Control
- DC Motor Speed Controller Open Loop
- DC Motor Speed Controller Closed Loop (Velocity Control)
- DC Motor Speed Control Using IR Remote
- DC Motor Speed and Direction Control Using Joystick Open Loop or Closed Loop
- DC Motor Speed and Direction Control Using External Potentiometer Open Loop or Closed Loop

FEATURES

- Power Supply Motor 7V to 46V DC
- Maximum Motor Load 2Amps Continues (4Amp Peak)
- Logic Power Supply 5V DC
- Optional 5V Regulator for Single Supply Operation Only Valid for Maximum Motor Supply 18V DC
- LED for Motor Power
- Power LED for Logic Supply
- On Board Joystick Including Tactile Switch
- Connector for Arduino Programming
- Connector for Analog Inputs
- Connector for Digital I/O
- On Board IR Sensor for Infrared Remote Motor Control
- On Board Jumper for Direct Motor Enable/Disable (Jumper J1)
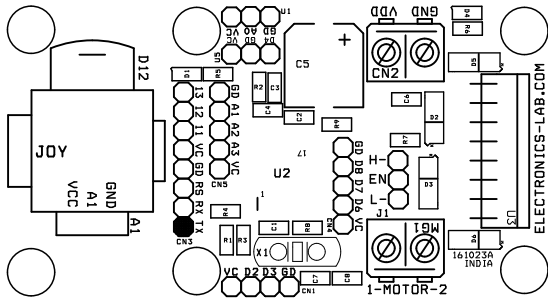- 4X 3MM Mounting Holes
- PCB Dimensions 72.39 X 39.05 MM

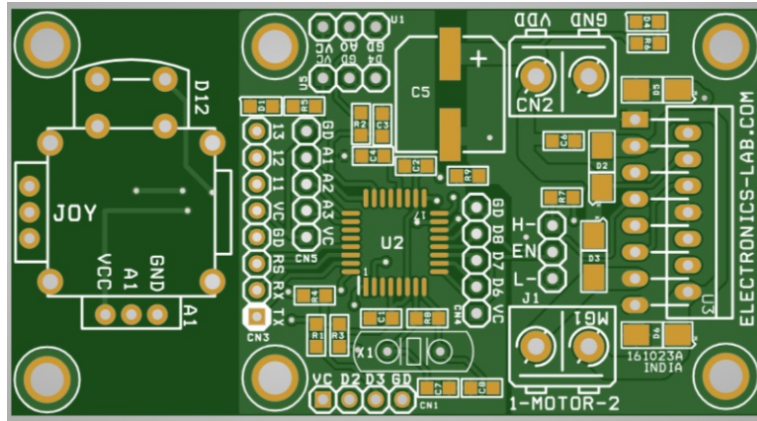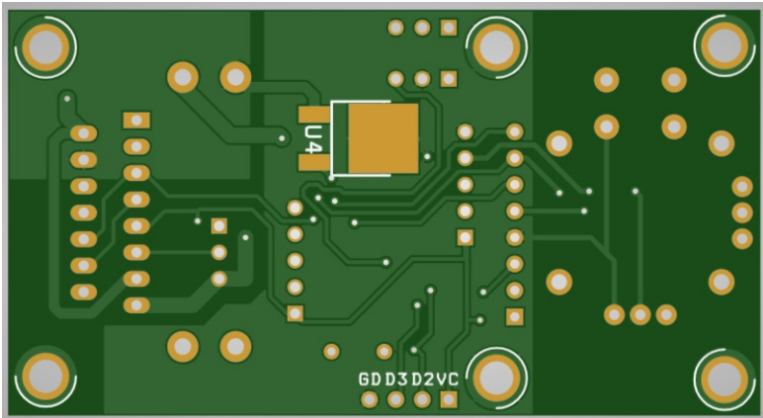Open Source Hardware Projects

Schematic
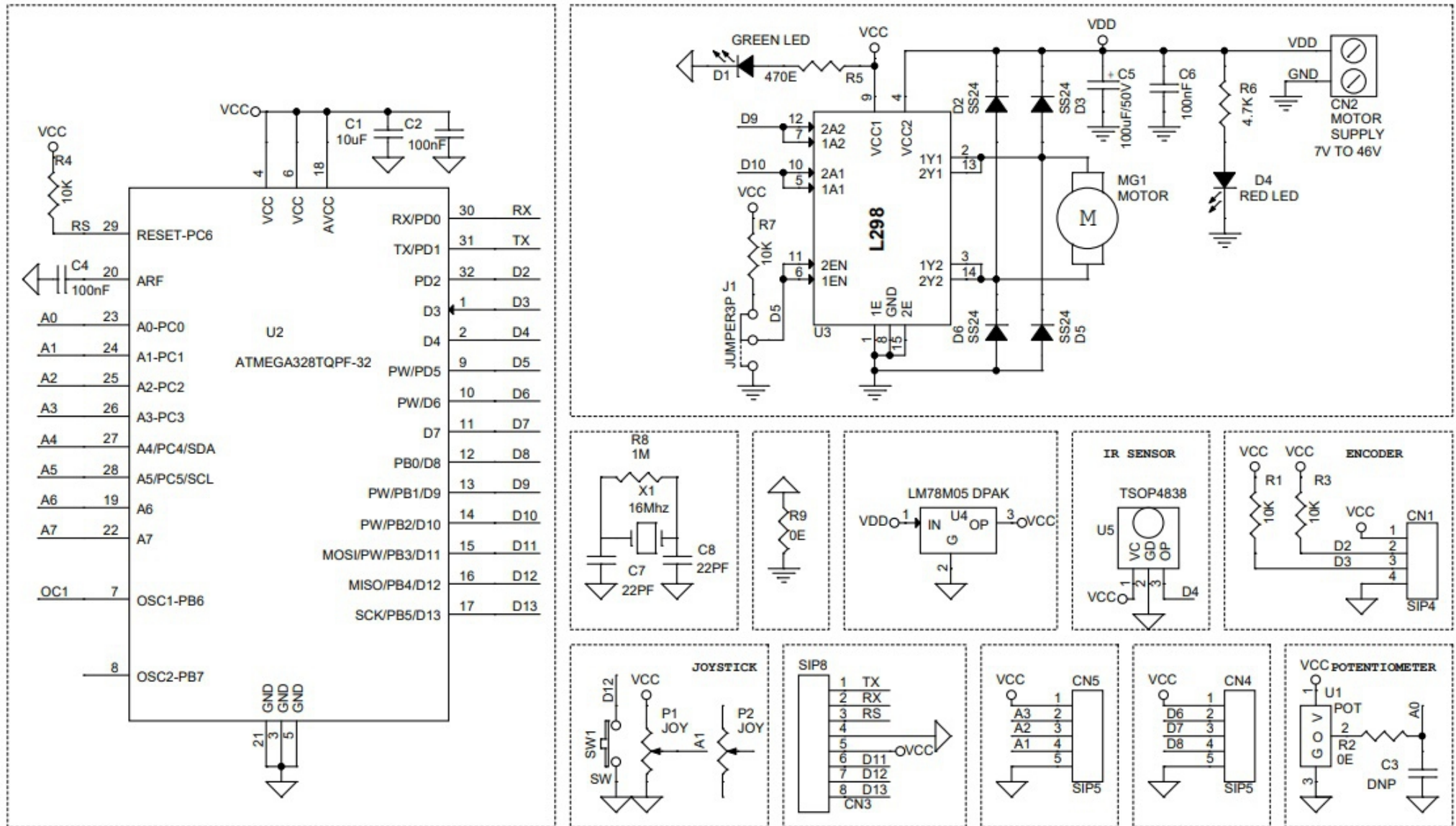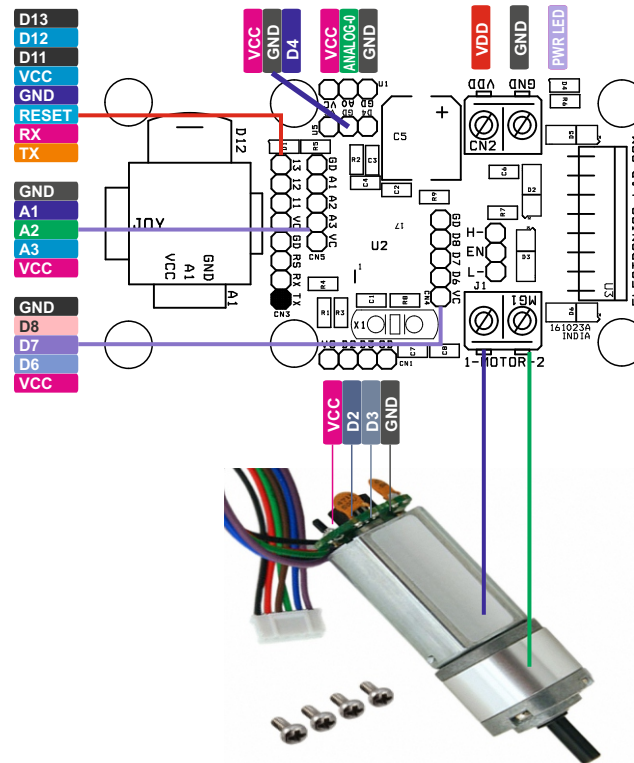
Connections

Connections:

- CN1: Pin 1 = VCC, Pin 2 = D2-Pullup, Pin 3 = D3-Pullup, Pin 4 = GND
- CN2: Pin 1 VDD Motor Supply. Pin 2 = GND
- CN3: Pin 1 TX, Pin 2 = RX, Pin 3 = Reset, Pin 4 = GND, Pin 5 = VCC, Pin 6 D11, Pin 7 = D12, Pin 8 = D13
- CN4: Pin 1 = VCC, Pin 2 = D6, Pin 3 = D7, Pin 4 = D8, Pin 5 = GND
- CN5: Pin 1 = VCC, Pin 2 = A3, Pin 3 = A2, Pin 4 = A1, Pin 5 = GND
- U1: Pin 1 = VCC, Pin 2 = A0, Pin 3 = GND
- U5: Infra-Red Sensor for IR Remote Motor Control Application
- Joy: Joystick Connected to A1 Analog Pin and Joystick Switch Connected to D12 and GND
- D1: Power LED Logic Power
- D4: Power LED Motor Power
- L298 2X Direction Pins = Arduino D9 and D10, L298 PWM/Enable = Arduino D5

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Arduino Connections

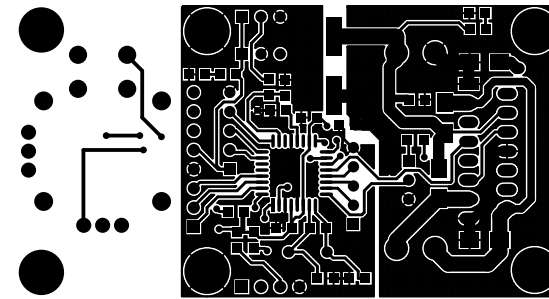Boot-Loader Connections

Arduino Programming Connections

PCB

PCB GERBER FILES AVAILABLE

SILK SCREEN TOP
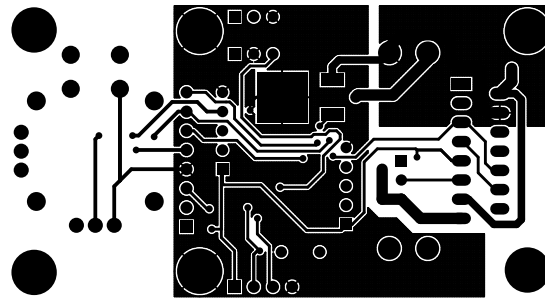
BOTTOM LAYER

TOP LAYER

PCB DIMENSIONS 72.39 X 39.05MM

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Parts List

NO	QNTY	REF	DESC	MANUFACTURER	SUPPLIER	SUPPLIER PART NO
			BOM			
1	1	CN1	4 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5317-ND
2	1	CN2	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
3	1	CN3	8 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5321-ND
4	2	CN4,CN5	5 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5318-ND
5	1	C1	10uF/10V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
6	3	C2,C4,C6	100nF/50V CERAMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
7	1	C3	DNP			
8	1	C5	220uF/50V ELECTROLYTIC	PANASONIC	DIGIKEY	PCE3921CT-ND
9	1	SHUNT	SHUNT FOR JUMPER J1	SULLINS CONNECT	DIGIKEY	S9001-ND
10	2	C7,C8	22PF/50V CERMIC SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
11	1	D1	GREEN LED SMD SIZE 0805	DIALIGHT	DIGIKEY	350-2044-1-ND
12	4	D2,D3,D5,D6	SS34 SMD FAST DIODE	TAIWAN SEMI	DIGIKEY	1801-SS24CT-ND
13	1	D4	RED LED SMD SIZE 0805	OSRAM	DIGIKEY	
14	1	J1	3 PIN MALE HEADER PITCH 2.54MM	WURTH	DIGIKEY	732-5316-ND
15	1	MG1	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
16	2	P1,P2,SW1	THUMB JOYSTICK INCLUDING SWITCH	C&K	DIGIKEY	108-THB001P-ND
17	4	R1,R3,R4,R7	10K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
18	2	R2,R9	0E SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
19	1	R5	470E 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
20	1	R6	4.7K 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
21	1	R8	1M 5% SMD SIZE 0805	YAGEO/MURATA	DIGIKEY	
22	1	U1	2 PIN SCREW TERMINAL PITCH 5.08MM	PHOENIX	DIGIKEY	277-1247-ND
23	1	U2	ATMEGA328TQPF-32	MICROCHIP	DIGIKEY	ATMEGA328PB-AURCT-ND
24	1	U3	L298 TO220 11 PIN	ST	DIGIKEY	497-1395-5-ND
25	1	U4	LM78M05 DPAK	TI	DIGIKEY	MC78M05CDTGOS-ND
26	1	U5	TSOP4838	VISHAY	DIGIKEY	TSOP4838-ND
27	1	X1	16Mhz	ECS INC	DIGIKEY	X1103-ND

Notes

APP

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Android App

DOWNLOAD

Android App launched in 2017 and has 100k+ downloads - rated with 4.5 stars.

SCAN QR CODE

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