DC Motor Control

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Parts needed

- 1 - Arduino Mega & USB Connector
- 2 - Monster Moto Shield
- DC Motors
  - 2 pcs - 99 RPM
  - 2 pcs - 840 RPM
- 12V DC Adapter
- 2 - Battery: 12V High Current
- 6 - Alligator Clips
- Breadboard
- Potentiometer
- Jumper wires

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Safety

- Concentrate and Focus
- Tie your hair to prevent it being caught with the motor.
- Know the correct voltages of each wires
- Secure or fasten the motors when using them, motors jerk.
- Make sure that motors will not run away unintentionally.
- Start weak, slowly increase power when you are comfortable
- Do not put the motors near fragile objects (example: laptops)
- Turn Off ALL power when connecting and disconnecting wires or components
- When moving the motor, hold the body of the motor. NOT the wires.
- Do not immediately stop the motor or change direction when it is running fast.

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Wire safety convention

Red → 3.3V, 5V, 12V

Black → GND

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Put electrical tape on Arduino Mega USB Casing

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Purpose of a DC Motor

Continuous Rotation

Goal

Make the 4 DC Motors with 2 Motor Drivers working independently

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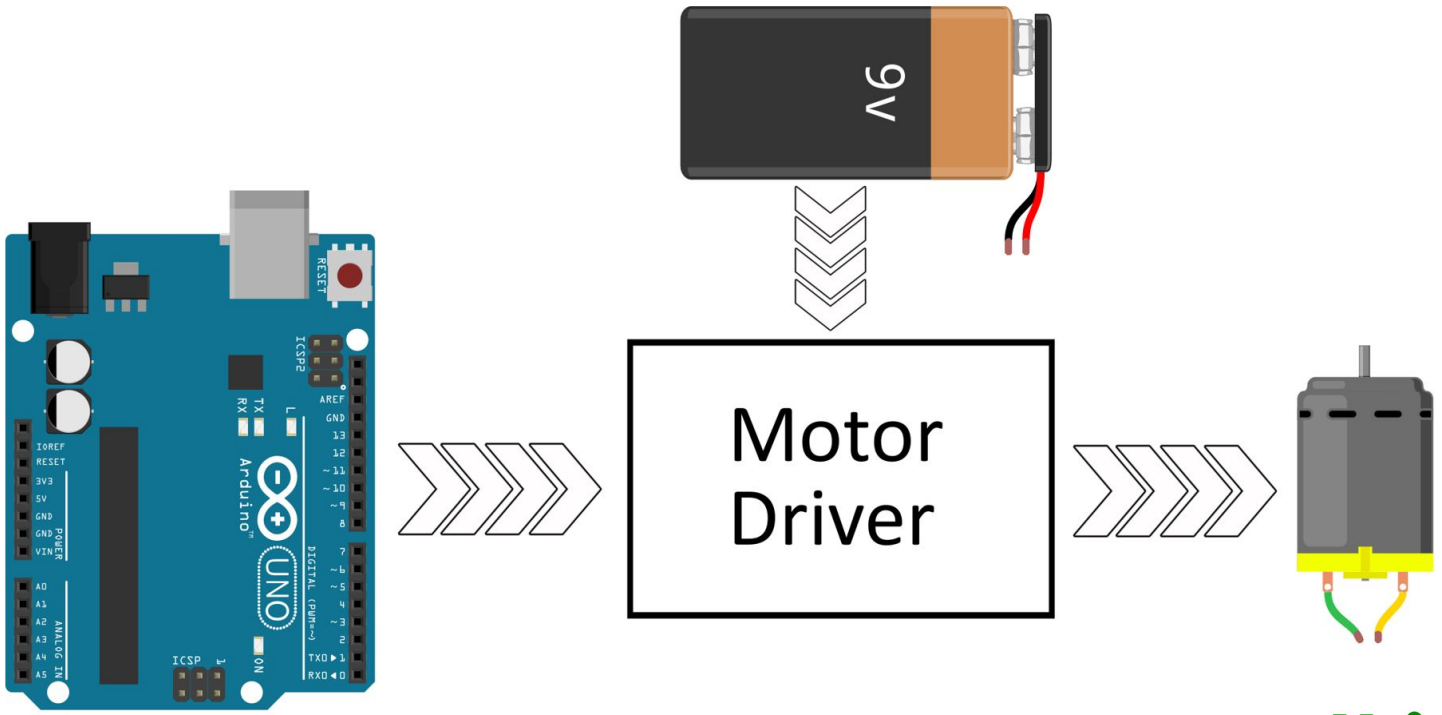
Arduino Uno/Mega Limitations

- Current: 40 mA per pin
- Current: 200 mA total for all the pins

DC Motors requires more than that.

Motor Driver



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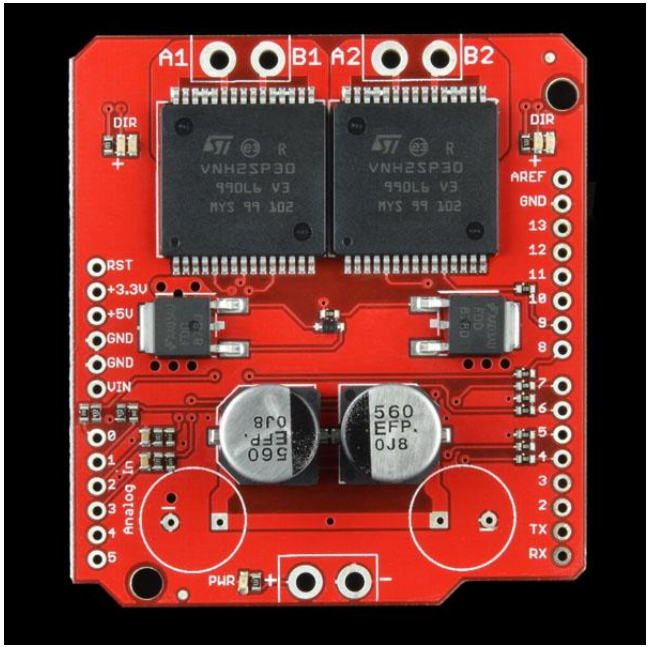
Properties: Monster Moto Shield



	Max	Tagisan
Motor Voltage	16V	12V
Motor Current	30A	
PWM Frequency	20 kHz	490Hz, 980Hz, 60Hz
Thermal Shutdown	YES	

Can be connected directly to Arduino Uno/Mega

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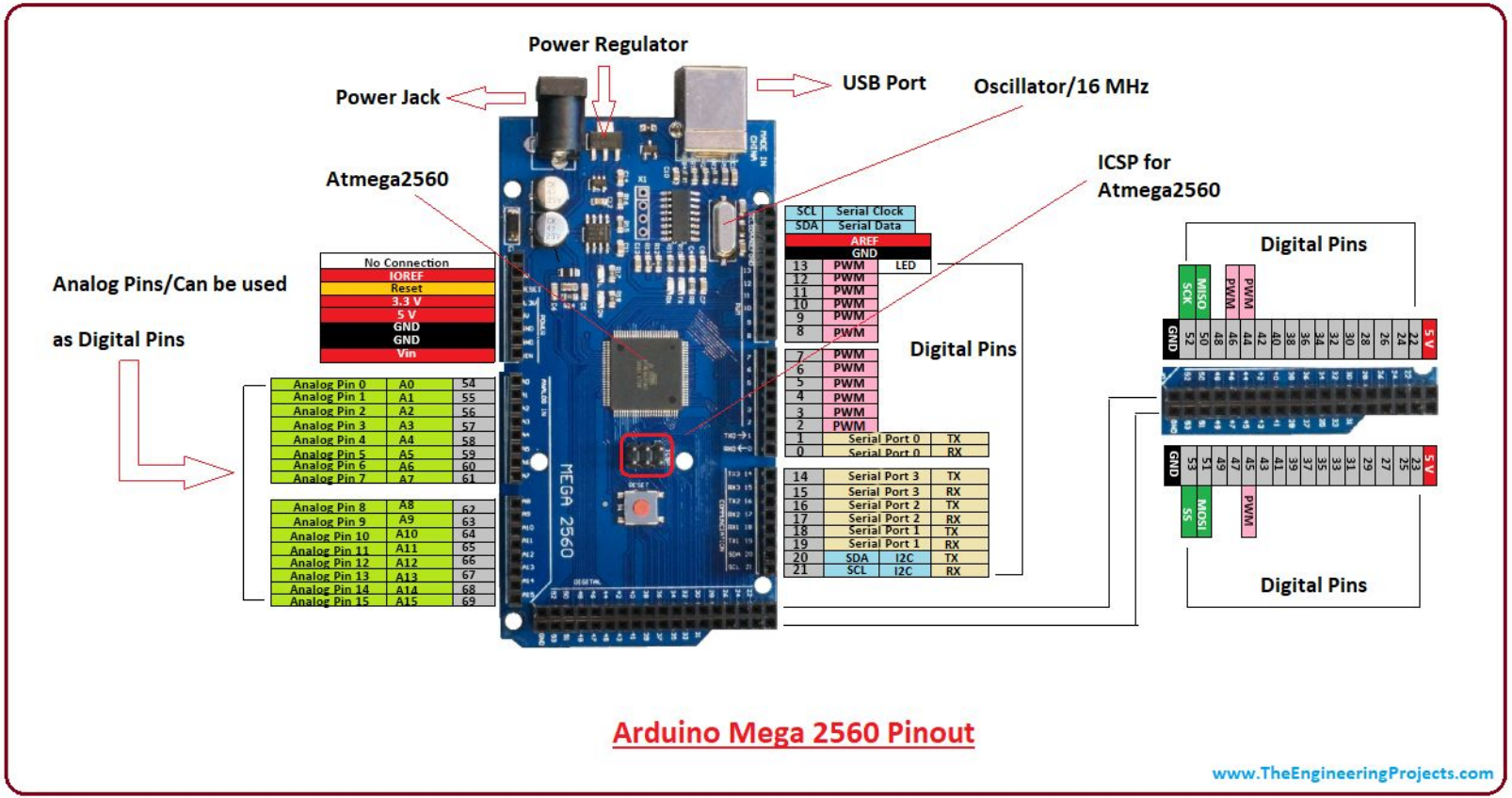
Arduino Mega Pinouts



Arduino Mega 2560 Pinout

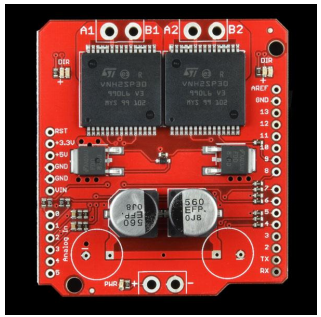
www.TheEngineeringProjects.com

Pinouts: Monster Moto Shield

Motor 1	
A1, B1	DC Motor 1
A0	Enable
D7	A1 Control
D8	B1 Control
D5	PWM

Motor 2	
A2, B2	DC Motor 2
A1	Enable
D4	A2 Control
D9	B2 Control
D6	PWM

Power	
GND	GND
+	Power 12V
-	Power GND



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12V DC Adapter + Socket with switch

Power Source

Know the +12V and GND wires.

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Connect the Monster Moto Shield To Arduino Mega

No jumper

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Connect the 99 RPM DC Motors to Monster Moto Shield

Do not connect the Power Supply yet

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MonsterMotor_Library Installation

- Go to https://github.com/josiahthinklab/tagisan2019
- Click **`Clone or download`** >> **`Download ZIP`**.
- Go into **`tagisan2019-master.zip`**
- Copy **`MonsterMoto_Library`**
- Paste inside **`Documents`** >> **`Arduino`** >> **`libraries`**

File >> Examples >> MonsterMoto_Library >> single_motor

Arduino Code

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MonsterMoto_Library

`MonsterMotor motor1`	Declares an object motor1 of the class MonsterMotor
`motor1.enable()`	Enables motor1
`motor1.disable()`	Disables motor1
`motor1.setMaxPower(19)`	Max Power in Percent (%) Min: 0.0 Max: 100.0 Default: 20 Limit Protected
`motor1.getMaxPower()`	Gets the Max Power

MonsterMoto_Library

`motor1.setDirection(CW)` `motor1.setDirection(CCW)`	Sets the direction.
`motor1.getDirection()`	Gets the direction. CW = true CCW = false
`motor1.setSpeed(23)`	Set the speed in Percent (%) Min: 0.0 Max: 100.0 Default: 0.0 Limit Protected
`motor1.getSpeed()`	Returns the speed (float)
`motor1.getPwmValue()`	Gets the current pwmValue for analogWrite()

Effective Power & PWM Computation

effective_power = max_power * speed / 100

pwm_value = 255 * effective_power / 100

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How do DC motors change rotation direction?

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File >> Examples >> MonsterMoto_Library >> double_motor

Arduino Code

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Exercise 1:

Level 1: Use a Potentiometer to control the speed of the 2 motors. (Single Direction)

Level 2: Use a potentiometer to control the speed and direction of the 2 motors.

Potentiometer Value	Speed	Direction
0	High	Clockwise
512	Stopped	Clockwise
513	Stopped	Counterclockwise
1023	High	Counterclockwise

Connecting 4 motors
2 DC Motor Drivers

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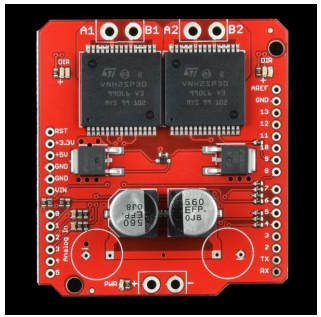
Pinouts: Monster Moto Shield (Jumper)

Motor 1	
A1, B1	DC Motor 1
A0	Enable
D7	A1 Control
D8	B1 Control
D5	PWM

Motor 2	
A2, B2	DC Motor 2
A1	Enable
D4	A2 Control
D3	B2 Control
D6	PWM

Power	
GND	GND
+	Power 12V
-	Power GND



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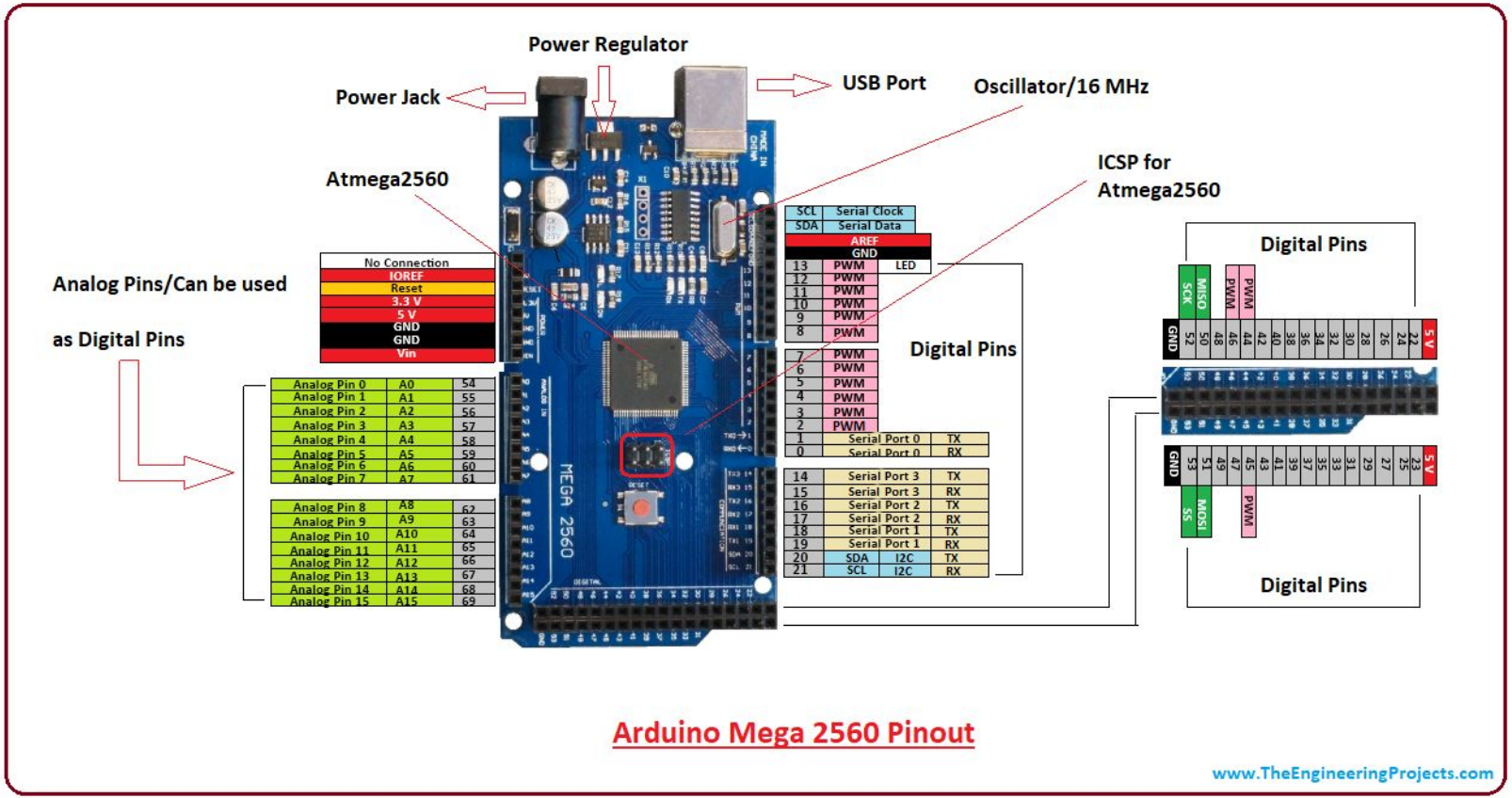
Arduino Mega Pinouts



Arduino Mega 2560 Pinout

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Pinouts: Monster Moto Shield 2 (External)

Motor 3		Arduino Mega
A1, B1	DC Motor 3	
A0	Enable	38
D7	A1 Control	40
D8	B1 Control	42
D5	PWM	44

Motor 4		Arduino Mega
A2, B2	DC Motor 4	
A1	Enable	39
D4	A2 Control	41
D9	B2 Control	43
D6	PWM	45

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Exercise 2:

Level 1: Use a Potentiometer to control the speed of the 4 motors. (Single Direction)

Level 2: Use a potentiometer to control the speed and direction of the 4 motors.

Potentiometer Value	Speed	Direction
0	High	Clockwise
512	Stopped	Clockwise
513	Stopped	Counterclockwise
1023	High	Counterclockwise

For Fun

Install the Arduino Library - Adafruit PWM Servo Driver Library.

1. Click on **`Sketch`**
2. Go to **`Include Library`** >> **`Manage Libraries…`**
3. Search for **`Adafruit PWM Servo Driver Library`**
4. Click **`Install`**.

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