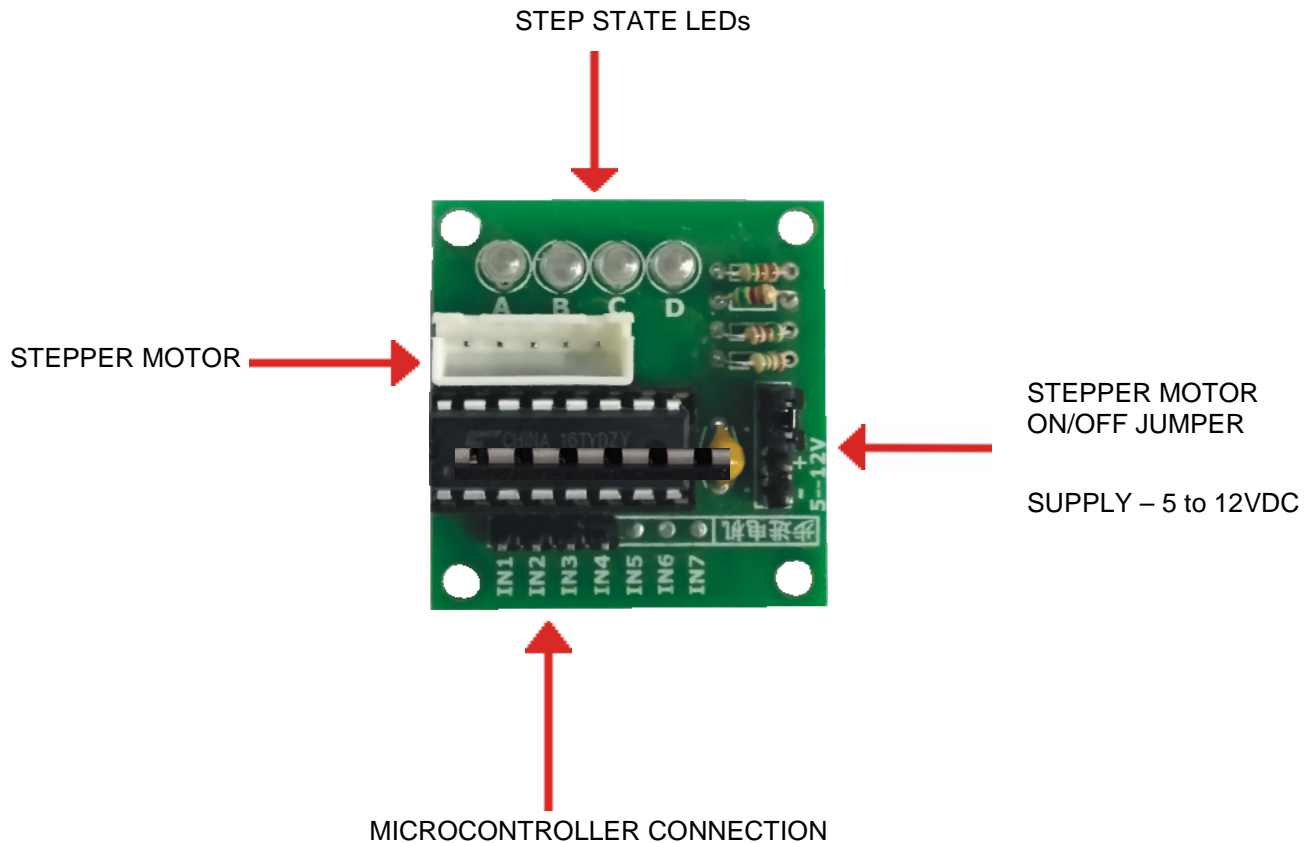


## 4 Phase ULN2003 Stepper Motor Driver PCB

The ULN2003 stepper motor driver PCB provides a direct drive interface between your microcontroller and stepper motor. The PCB provides 4 inputs for connection to your microcontroller, power supply connection for the stepper motor voltage, and ON/OFF jumper, a direct connect stepper motor header and 4 LEDs to indicate stepping state.



### Stepper Motor Connection

Connect stepper motor to this header. If you use one of our stepper motors they will just plug directly into the header. If you have another brand without the correct header plug, you could solder the wires directly to the back of the PCB.

### Step State LEDS

Indicate which channel is active.

### ON/OFF Jumper

Isolates power to the stepper Motor

### Supply

Power to drive stepper motor. Make sure it matches the rating of the stepper motor you are using.

### Microcontroller Connection

Connect 4 outputs from your microcontroller to the four inputs.

Supply Volts: 5-12VDC

Maximum Current per output : 500mA

## Operation

The driver board accepts a four bit command from any microcontroller and in turn applies the necessary power pulse to step the motor. At the heart of the driver is a ULN2003AN integrated circuit. The board can supply between 5V to 12V to the motor from an independent power supply. It also has a bank of LED's that correspond to the input signals received from the controller. They provide a nice visual when stepping.

Some typical stepper motor details:

- Model: 28KYJ-48
- Voltage: 5VDC
- Phase: 4
- Step Angle:  $5.625^\circ (1/64)$
- Reduction ratio: 1/64

It takes 4096 steps to rotate the spindle  $360^\circ$ . It is impossible to see a single step. When testing it pays to have something distinct on the spindle to show it is turning.

Physically connecting a microcontroller to the driver board is straight forward. Pick a free GPIO pin on an expansion header and run a wire from it to one of the input pins on the driver board. The driver board requires power. Make sure your power supply has sufficient power to drive the stepper motor. It is usually a good idea to use a separate power source to the one that is driving the microcontroller. Having wired a GPIO pins to the driver board you can test the interface. Set the GPIO pin high and the corresponding LED on the driver board will illuminate. Set it low and the LED turns off.

### Typical Connections

Signal Name	Microcontroller Pin	Driver Board Pin
VDD_5V		+
GND	GND	-
GPIO1	PORTA.0	IN1
GPIO2	PORTA.1	IN2
GPIO3	PORTA.2	IN3
GPIO4	PORTA.3	IN4

The motor steps when a specific combination of inputs are driven from the microcontroller. This is just a pulse of power, just enough to get the motor to step. This driver uses a very simple protocol. Applying a signal to an input pin causes power to be sent to the motor on a corresponding wire.

### MCU IO Code Wire Color

IN1	A	Blue
IN2	B	Pink
IN3	C	Yellow
IN4	D	Orange

The following codes define the step commands.

8 Step : A – AB – B – BC – C – CD – D – DA

4 Step : AB – BC – CD – DA (Usual application)

### Step Command IN4 IN3 IN2 IN1

A	01H	0	0	0	1
AB	03H	0	0	1	1
B	02H	0	0	1	0
BC	06H	0	1	1	0
C	04H	0	1	0	0
CD	0CH	1	1	0	0
D	08H	1	0	0	0
DA	09H	1	0	0	1

Some compilers have specific STEP commands and instructions included and do all the work for you. But now you know how to control the stepper motor by directly driving the IO pins.

