Stepper Motor 5V 28BYJ-48

This is a 5V high torque 4 Phase stepper motor with more than 2000 steps per revolution. It has enough torque to move small robots. The motor can be connected with gear shaft and propeller.

FEATURES:

- The rotation angle of the motor is proportional to the input pulse.

- The motor has full torque at standstill(if the windings are energized)

- Precise positioning and repeatability of movement since good stepper motors have an accuracy of – 5% of a step and this error is non cumulative from one step to the next.

- Excellent response to starting/stopping/reversing. Very reliable since there are no contact brushes in the motor. Therefore the life of the motor is simply dependant on the life of the bearing.

- The motors response to digital input pulses provides open-loop control, making the motor simpler and less costly to control.

- It is possible to achieve very low speed synchronous rotation with a load that is directly coupled to the shaft.

- A wide range of rotational speeds can be realized as the speed is proportional to the frequency of the input pulses.

SPECIFICATIONS:

- High quality stepper motor

- Voltage: DC 5V

- Diameter: 25mm

- Step Angle: 5.625 x 1/64

- Reduction Ratio: 1/64

- Rated voltage : 5VDC

- Number of Phase : 4

- Speed Variation Ratio : 1/64

- Stride Angle : 5.625° /64

- Frequency : 100Hz

- DC resistance : 50Ω±7%(25℃)

- Idle In-traction Frequency : > 600Hz

- Idle Out-traction Frequency : > 1000Hz

- In-traction Torque >34.3mN.m(120Hz)

- Self-positioning Torque >34.3mN.m

- Friction torque : 600-1200 gf.cm

- Pull in torque : 300 gf.cm

- Insulated resistance >10MΩ(500V)

- Insulated electricity power : 600VAC/1mA/1s

- Insulation grade : A

- Rise in Temperature <40K(120Hz

- Noise <35dB(120Hz,No load,10cm)

- Model : 28BYJ-48

FUNCTIONAL DESCRIPTION:

- A stepper motor is an electromechanical device which converts electrical pulses into discrete mechanical movements. The shaft or spindle of a stepper motor rotates in discrete step increments when electrical command pulses are applied to it in the proper sequence. The motors rotation has several direct relationships to these applied input pulses. The sequence of the applied pulses is directly related to the direction of motor shafts rotation. The speed of the motor shafts rotation is directly related to the frequency of the input pulses and the length of rotation is directly related to the number of input pulses applied.One of the most significant advantages of a stepper motor is its ability to be accurately controlled in an open loop system. Open loop control means no feedback information about position is needed. This type of control eliminates the need for expensive sensing and feedback devices such as optical encoders. Your position is known simply by keeping track of the input step pulses.

- The motor has a 4 coil unipolar arrangement and each coil is rated for +5V hence it is relatively easy to control with any basic microcontrollers. These motors has a stride angle of 5.625°/64, this means that the motor will have to make 64 steps to complete one rotation and for every step it will cover a 5.625° hence the level of control is also high. However, these motors run only on 5V and hence cannot provide high torque

WORKING PRINCIPLE:

- These stepper motors consume high current and hence a driver IC like the ULN2003 is mandatory. To know how to make this motor rotate we should look into the coil diagram below.
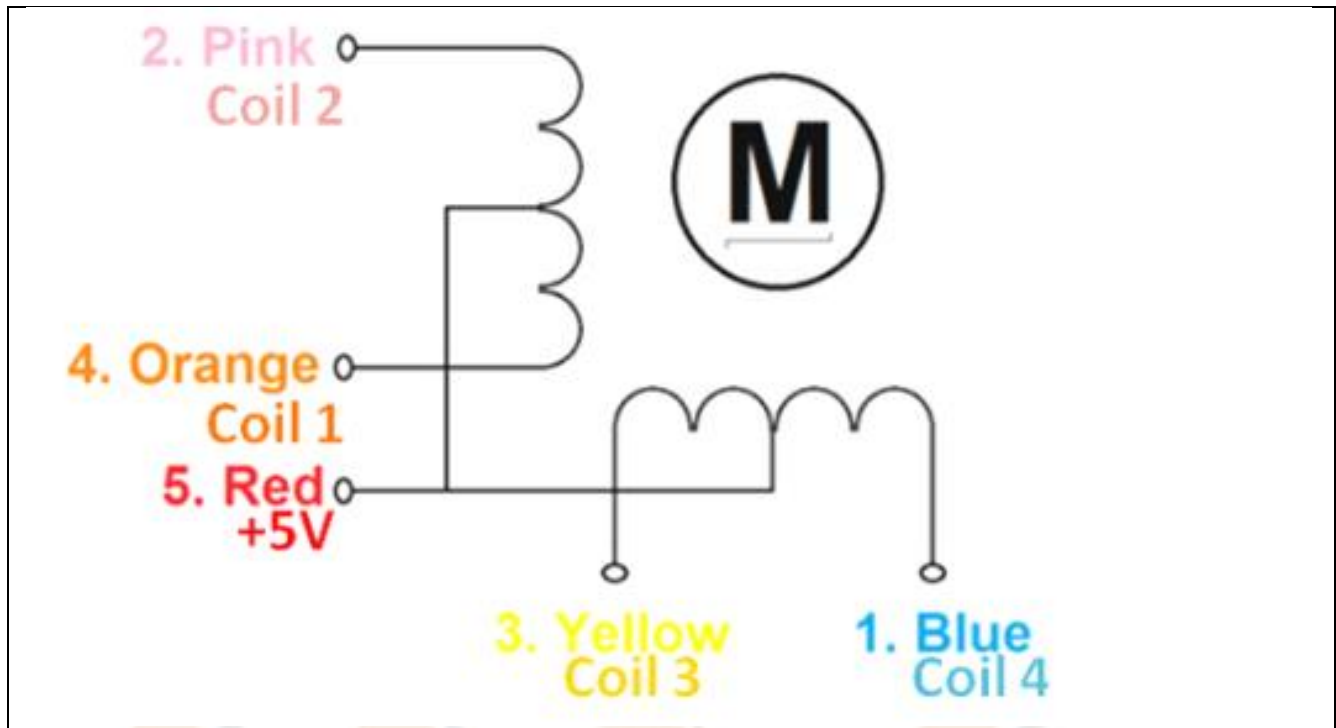
- As we can see there are four coils in the motor and one end of all the coil is tied to +5V (Red) and the other ends (Orange, Pink, Yellow and Blue) are taken out as wires. The Red wire is always provided with a constant +5V supply and this +5V will be across (energize) the coil only if the other end of the coil is grounded.
- A stepper motor can be made to rotate only if the coils are energized (grounded) in a logical sequence. This logical sequence can be programmed using a microcontroller or by designing a digital circuit. The sequence in which each coil should be triggered is shown in the table below. Here "1" represent the coil is held at +5V, since both the ends of coil is at +5V (red and other end) the coil will not be energised. Similarly "0" represents the coil is held to ground, now one end will be +5V and the other one is grounded so the coil will be energised.

| Motor Wire Color	Sequence to Rotate in clockwise Direction							
	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8
Orange	0	0	1	1	1	1	1	0
Yellow	1	0	0	0	1	1	1	1
Pink	1	1	1	0	0	0	1	1
Blue	1	1	1	1	1	0	0	0
Red	1	1	1	1	1	1	1	1

INTERFACING CIRCUITS:
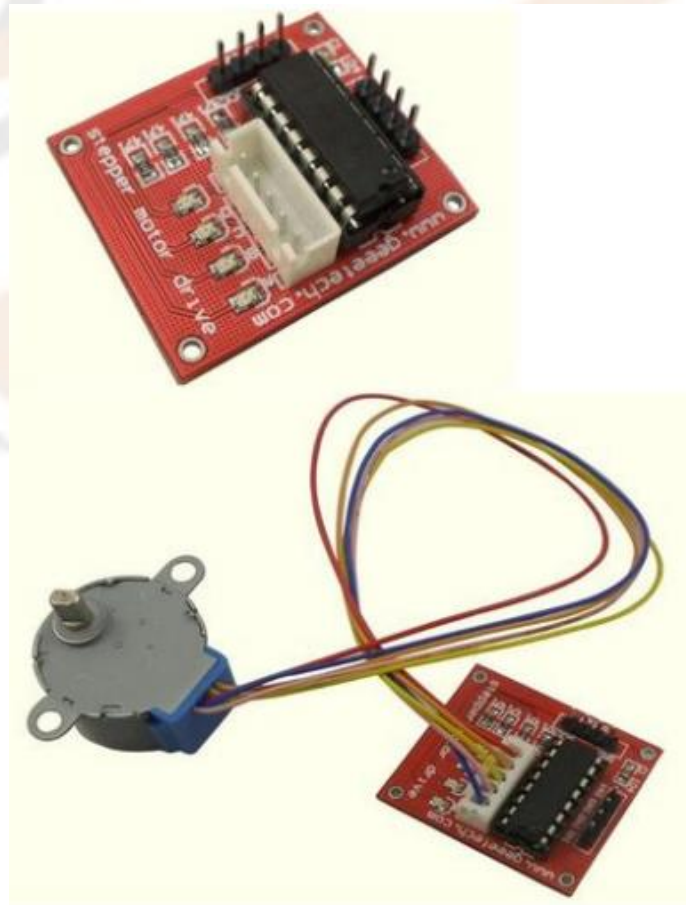
- The simplest way of interfacing a unipolar stepper to Arduino is to use a breakout for ULN2003A transistor array chip. The ULN2003A contains seven darlington transistor drivers and is somewhat like having seven TIP120 transistors all in one package. The

ULN2003A can pass up to 500 mA per channel and has an internal voltage drop of about 1V when on. It also contains internal clamp diodes to dissipate voltage spikes when driving inductive loads.To control the stepper, apply voltage to each of the coils in a specific sequence.
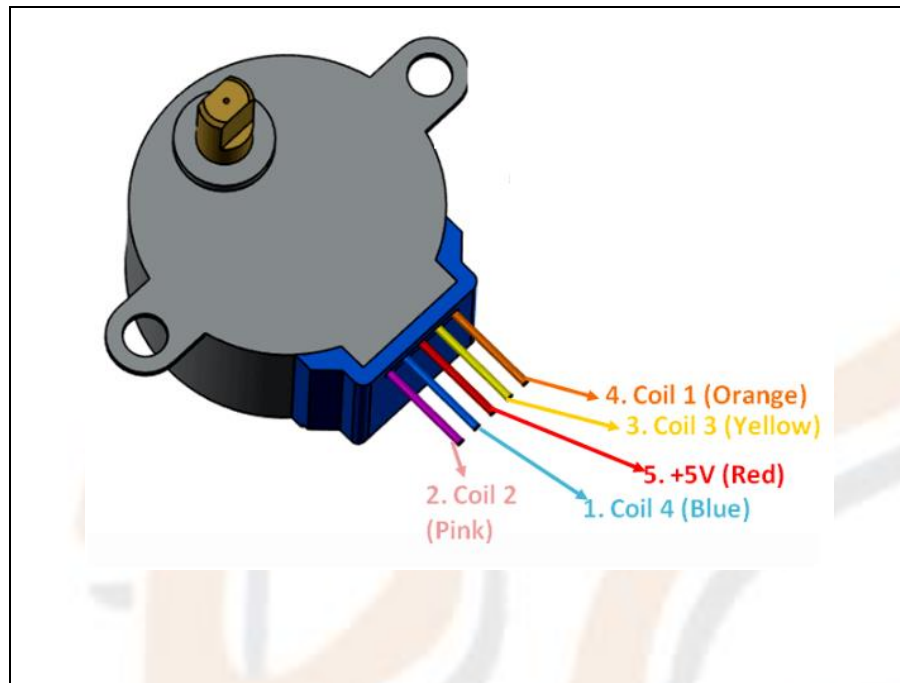
- The sequence would go like this:

Lead Wire Color	CW Direction(1-2 Phase)							
	1	2	3	4	5	6	7	8
4 ORG	-	-						
3 YEL		-	-	-				
2 PIK				-	-	-		
1 BLU						-	-	-

- Here are schematics showing how to interface a unipolar stepper motor to four controller pins using a ULN2003A, and showing how to interface using four TIP120's.
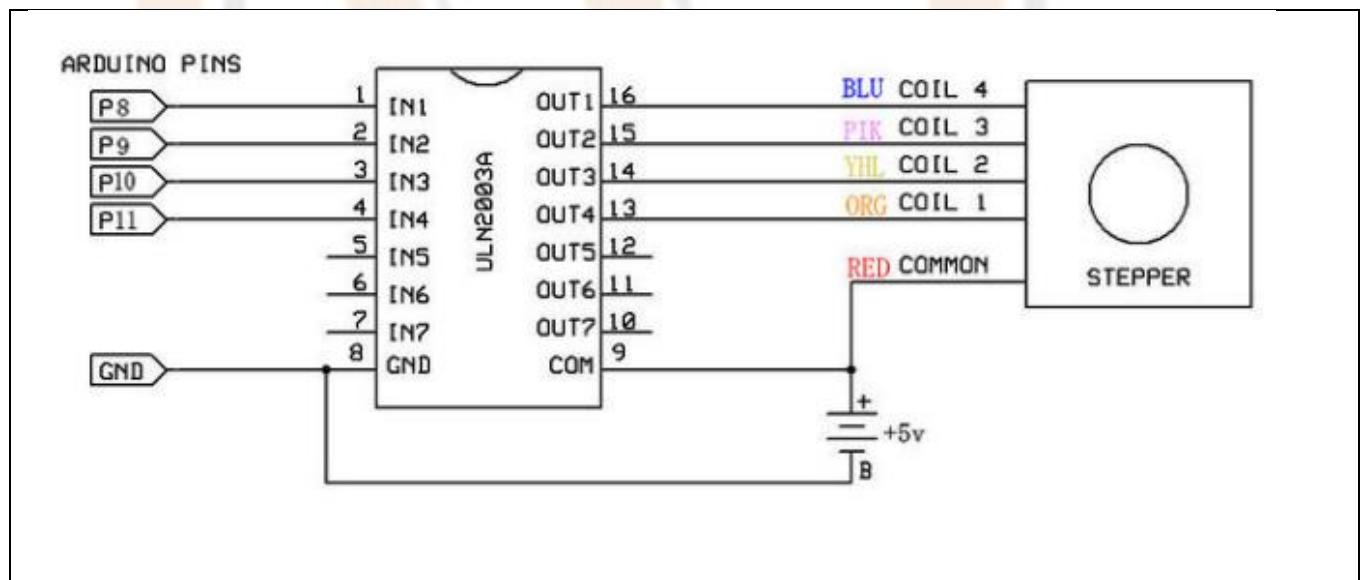
PIN LAYOUT AND FUNCTION:

Pin No	Pin Name	Wire Color	Description
1	Coil 1	Orange	This Motor has a total of four coils. One end of all the coils are connect to +5V (red) wire and the other end of each coil is pulled out as wire colors Orange, Pink, Yellow and Blue respectively
2	Coil 2	Pink	
3	Coil 3	Yellow	
4	Coil 4	Blue	
5	+5V	Red	It should supply +5V to this wire, this voltage will appear across the coil that is grounded.

APPLICATIONS:

- CNC machines
- Precise control machines
- Security cameras
- DVD Players
- Car side mirror tilt

DIMENSION:
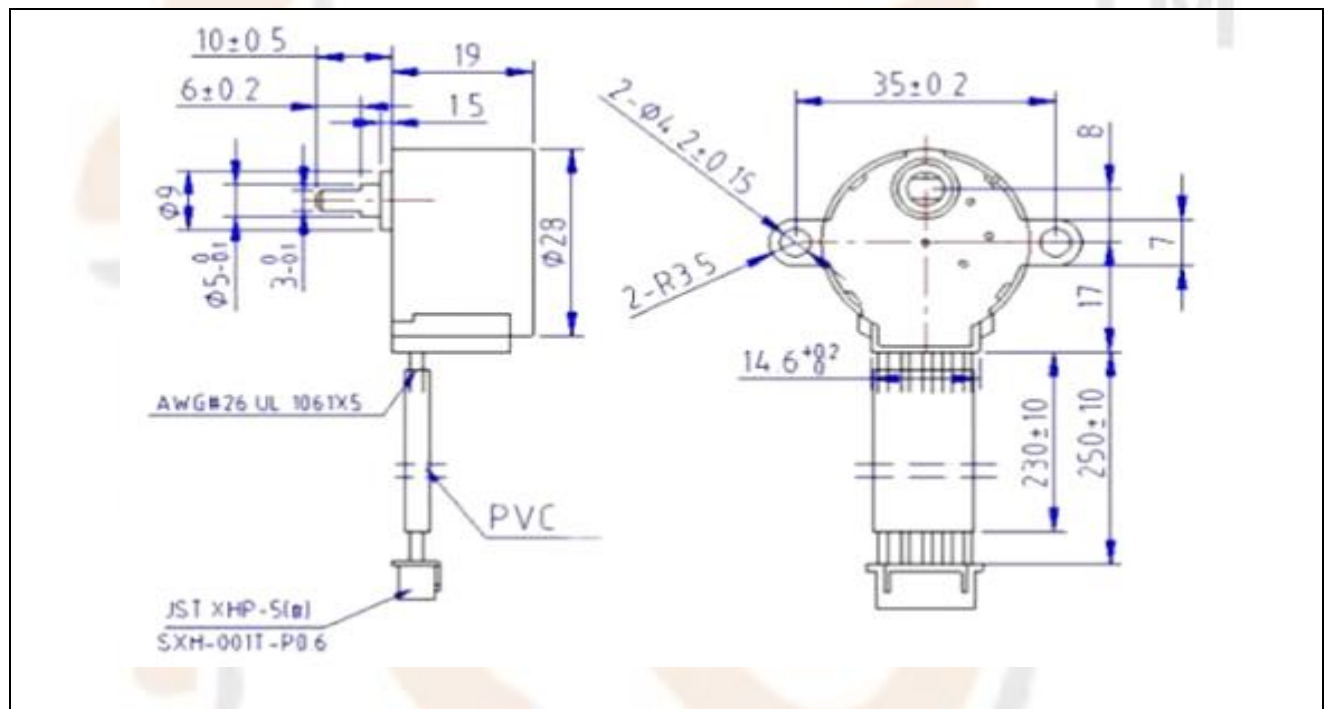
PACKAGE INCLUDES:

1x 28BYJ-48 - 5V Stepper Motor