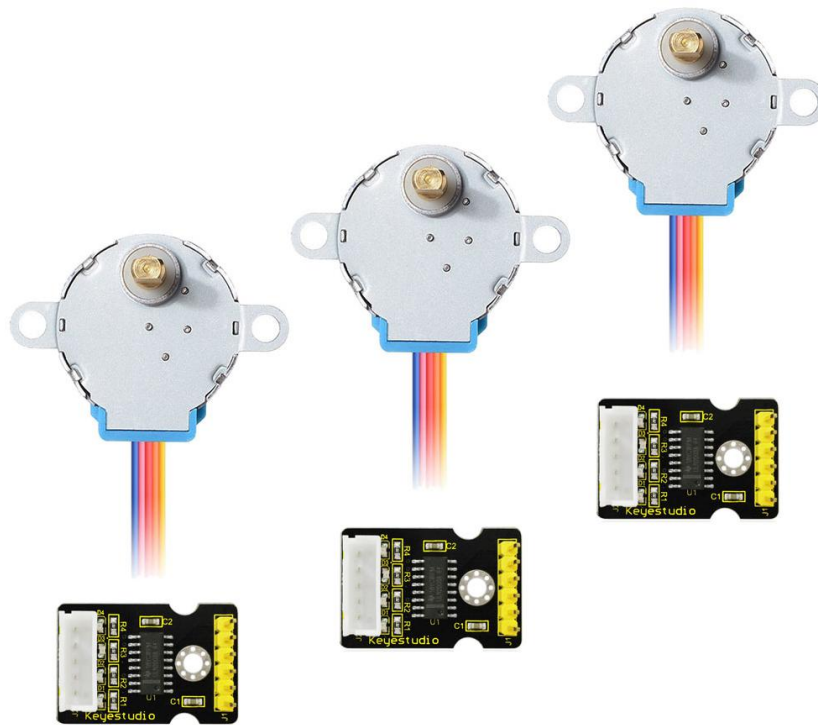


## Stepper Motor Drive Board + 5V Stepper Motor (3PCS)

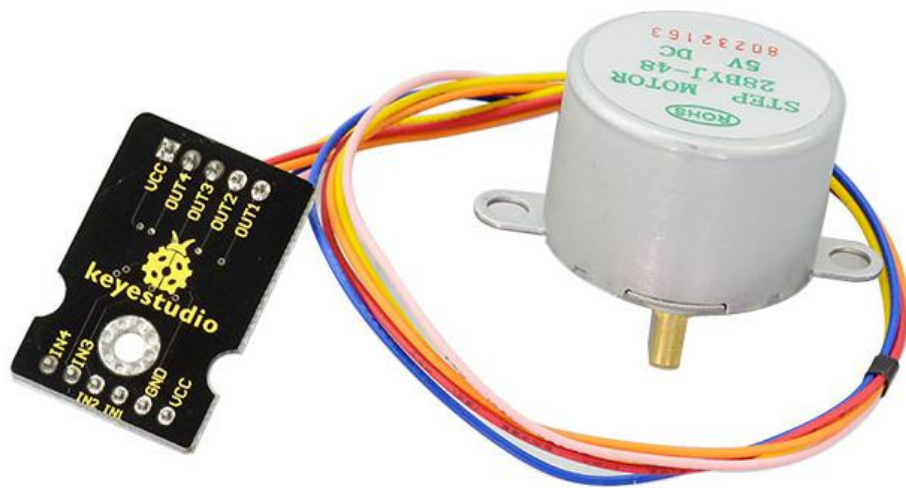


### Overview

This kit mainly consists of three deceleration stepper motors (28BYJ-48) and three stepper motor(5-wire 4-phase) driver boards (ULN2003). Stepper motor driver board mainly adopts ULN2003 chip. It is a seven-fold Darlington array. This circuit is the inverted output type, that is, its output terminal can be turned on to work only by inputting a low-level voltage. Onboard comes with 4 LEDs, so in this way you can know the state of input control pulse.

In the experiment, we connect the stepper motor to its driver board, and then connect the drive board to microcontroller. The interface is anti-reversed type, so do not worry about the wrong connection.

**Details Display:**



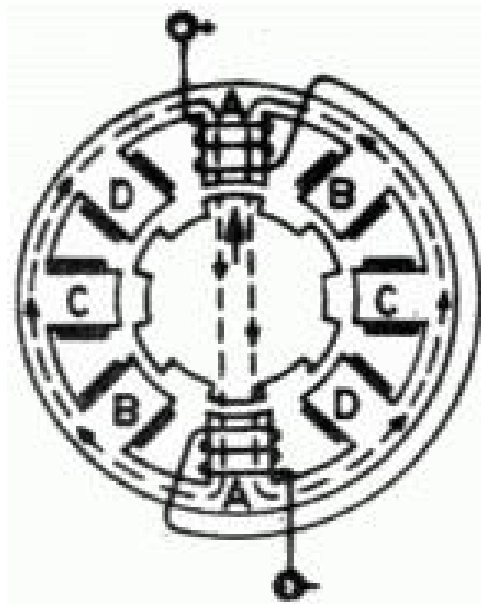
### **Deceleration Stepper Motor:**

- Diameter: 28mm
- Voltage: 5V
- Stepping angle:  $5.625 \times 1/64$
- Reduction ratio: 1/64

The stepper motor's no-load power consumption is below 50mA, with 64 times reducer, and its output torque is relatively large, can drive heavy load, very suitable for the development board.

**Notice:** Compared with those stepper motors without reducer, the rotation speed of this stepper motor with 64 times reducer is more slower, you can stick a small paper on its output shaft for convenient observation.

### **Working Principle**



#### **1. One-phase Excitation Mode:**

That is, A-B-C-D each phase is powered up in sequence. When phase A is powered, due to attraction of the NS phase, the pole nearest to phase A on the rotor turns to the position of phase A. Then phase B is powered, the pole nearest to phase B on the rotor turns to the position of phase B. After that, both phase C and phase D are powered in turn, this way, the rotors can be continuously rotated. By sequentially powering the phase ABCD, so that achieve the rotors rotate continually.

**Key Points:**

- 1) Stator: the fixed part of the motor is called stator, such as ABCD magnetic poles.
- 2) Rotor: refer to the rotating part.
- 3) Note that when AB is turned on in turn, the direction of the arrow does not turn clockwise from phase A to phase B immediately, but rotates a small angle counterclockwise because the rotor pole nearest to the electromagnetic pole is turned to the position of energized phase.
- 4) In the 1-2 phase excitation mode, the angle at which the rotor rotates at each step is called the Stepping Angle. In the one-phase excitation mode, the angle of rotor rotation per step divided by 2 is the Stepping Angle.

## **2. One-Two Phase Excitation Mode:**

In other words, the mode of electrification becomes A-AB-B-BC-C-CA, and the principle is the same as that of 1-phase excitation. At different points, when AB is connected with electricity, the rotor turns to the place where the magnetic tension between phase A and B is the most strongest.

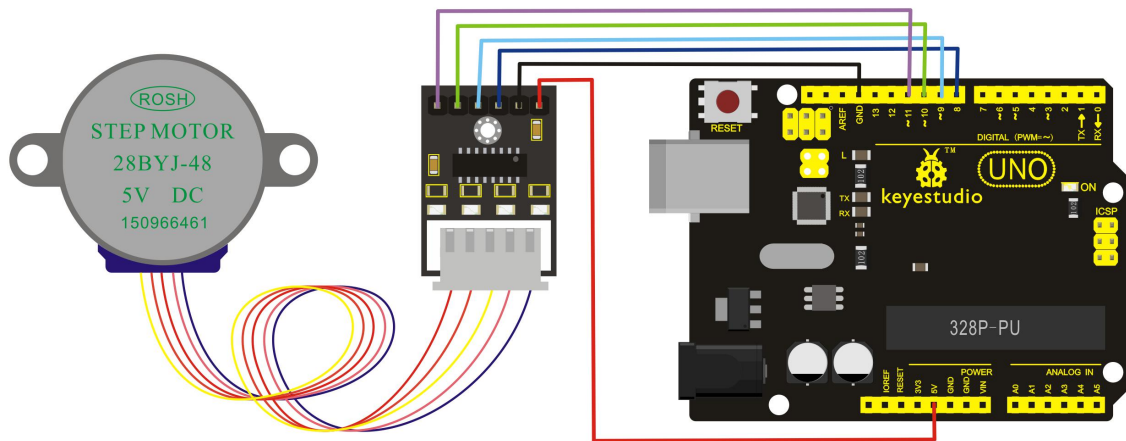
### **Setting Method**

#### **Parameters of Motor:**

Voltage 5V; Step Angle 5.625; Reduction Ratio 1:64

1. Calculate the angle at which A-B-C-D is powered on at one turn  $5.625 \times 2 \times 4 / 64 = 0.703125$  (2 means that the per step in 1-phase excitation mode is 2 times step angle; 4 means that it goes four steps; 64 refers to the reduction ratio of motor)
2. The number of powering ABCD in 360-degree cycle is  $360 / 0.7031 = 512$
3. Wiring method: the output terminal A1, B1, C1, D1 of ULN2803 stepper motor driver are connected to the stepping motor's ABCD four phases respectively, corresponding to blue, pink, yellow, orange line. The red line is connected to VCC. The input pin header of ULN2803 driver are connected to to Digital port 8, 9, 10 and 11. The + and - pin are connected to the arduino's 5V and GND, respectively. You can refer to the connection diagram below.

### **Connection Diagram**



### Driving Program

```
////////////////////////////////////
```

```
void setup()
{
  for(int i=8;i<12;i++)
  {
    pinMode(i,OUTPUT);
  }
}
void loop()
{
  int a;
  a=512;
  while(a--)
  {
    for(int i=8;i<12;i++)
    {
      digitalWrite(i,1);
      delay(10);
      digitalWrite(i,0);
    }
  }
}
```

```
////////////////////////////////////
```

## Test Result

After wiring and uploading the above program, you should see the stepper motor rotate slowly.

