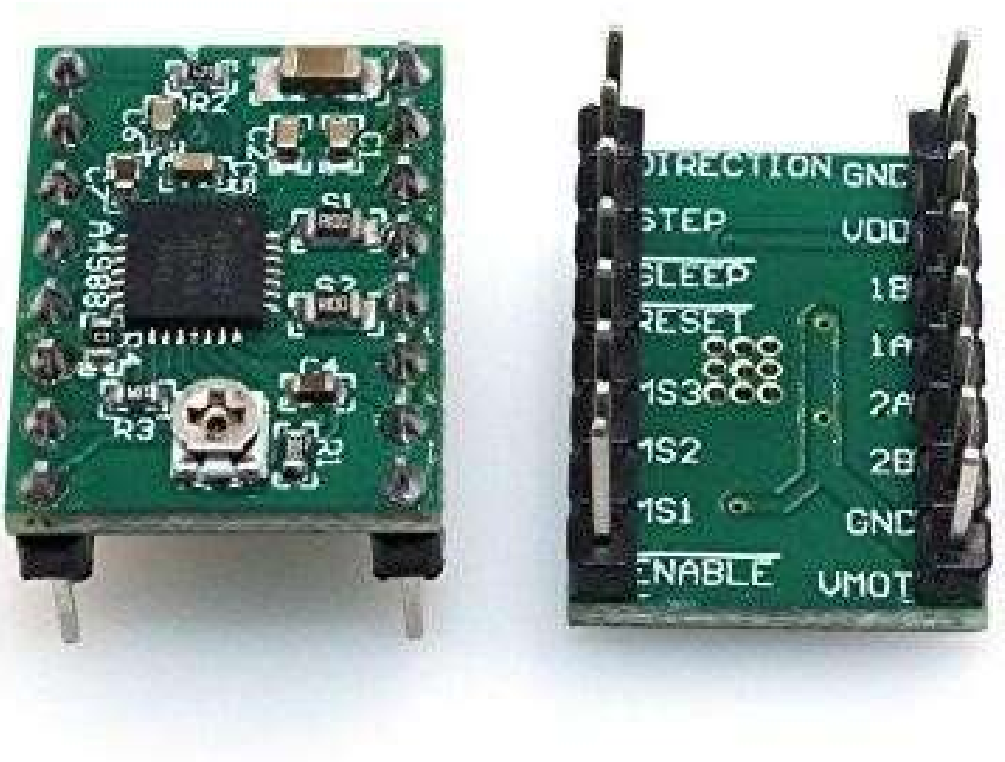
الحمـــادي للألكترونيـــات
ALHAMMADI FOR ELECTRONICS

BIGTREETECH
A4988

Driver instruction manual



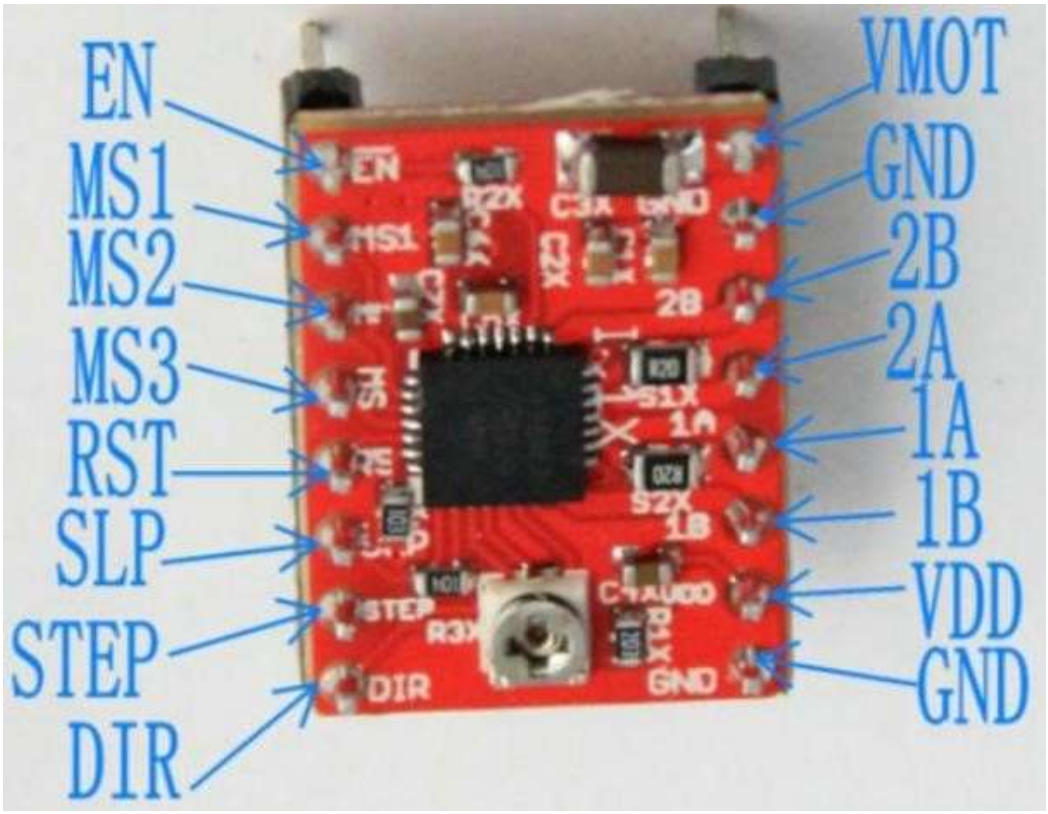
一、A4988 Brief introduction

The A4988 is a complete microstep motor driver with a built-in converter for easy operation. It can operate bipolar stepper motors in full, half, 1/4, 1/8 and 1/16 step modes with output drive performance up to 35 V and ±1 A. The A4988 includes a fixed-turn-off time current regulator that can operate in slow or mixed decay mode. The converter is key to the ease of implementation of the A4988. Just one pulse is input into the "step" input to drive the motor to produce microsteps. There is no need for phase sequence tables, high-frequency control lines, or complex interface programming. The A4988 interface is ideal for applications where complex microprocessors are unavailable or overloaded. The chopper control within the A4988 automatically selects the current decay mode (slow or mixed) during microstep operation. In mixed attenuation mode, the device is initially set to decay quickly during a portion of a fixed downtime, followed by a slow decay for the remainder of the downtime. The hybrid attenuation current control scheme reduces audible motor noise, increases step accuracy, and reduces power consumption. Internal synchronous rectification control circuitry is provided to improve power consumption during pulse-width modulation (PWM) operation. Internal circuit protections include thermal shutdown with hysteresis, undervoltage lockout (UVLO), and cross-current protection. No special energizing sequencing is required.

The A4988 is available in a surface-mount QFN package (ES) measuring 5 mm × 5 mm, with a nominal overall package height of 0.90 mm and an exposed heatsink for enhanced heat dissipation. The package is lead-free (suffix –T) with 100% matte tin plated leadframes.

二、A4988 use

1. Wiring diagram：



The two pins on the upper right side of the A4988 driver module (VMOT, GND) are external power supply pins to provide sufficient power output to the motor, power supply range: 8-35V, a 47uf is used here electrolytic capacitors to protect the driver board from instantaneous voltage shocks; The VDD and GND on the lower right side we need to connect it to the 3-5.5V supply side, and the 1A and 1B pins are connected to the one phase, 2A and 2A of the stepper motor The 2B pin is connected to another phase of the stepper motor; EN, STEP in the lower left corner, and DIR are connected to the IO port of the control board , and these two pins are mainly used to control the movement of the motor. The ENABLE pin controls the enable of the drive, the Direction pin controls the direction of rotation, and the STEP pin is used to control the step control of the motor rotation.

The SLEEP pin, low level enable puts the module in sleep mode, it can minimize power consumption when the motor is not working, and the default is high. RESET pin, if the input of this pin is low, then all microstep settings will be ignored. Therefore, the SLEEP and RESET pins need to be connected, with the aim of setting the RESET pins high so that the module can be controlled.

2. Segment selection:

Table 1: Microstepping Resolution Truth Table

MS1	MS2	MS3	Microstep Resolution	Excitation Mode
L	L	L	Full Step	2 Phase
H	L	L	Half Step	1-2 Phase
L	H	L	Quarter Step	W1-2 Phase
H	H	L	Eighth Step	2W1-2 Phase
H	H	H	Sixteenth Step	4W1-2 Phase

If ramps is used as the interface board, there is a corresponding short-circuit cap under the driver module interface, and if all three short-circuit caps are connected, MS1, MS2, and MS3 are all hight, and the 16 microstep mode is high. Generally, all 3 short-circuit caps can be plugged in.

3. Drive current regulation:

The formula for calculating the maximum current of A4988 is as follows: I_TripMax = Vref/(8*Rs). For example, if Rs is R100, we need a maximum drive current of 1.5A, and the Vref reference voltage needs to be adjusted to 1.2V.

【Rs】:

There are generally three types of Rs resistance values on the market: 0.05 ohms, 0.1 ohms or 0.2 ohms, which correspond to the S1 and S2 resistors on the drive module. Here is 0.1 ohm (designator R100 = 0.1 ohm, R200 = 0.2 ohm, R050 = 0.05 ohm)

【Vref】:

The reference voltage can be changed by adjusting the potentiometer, rotating the potentiometer clockwise to increase the voltage, and rotating the potentiometer counterclockwise to adjust the voltage. Measure the voltage between the potentiometer metal knob and the GND, i.e. Vref.

FAQ (Frequently Asked Questions)

1) Can the 4988 driver board drive 57 motors?

The motor that can be driven by 4988 has little to do with the size, mainly related to the working current, and the current is theoretically less than

The 2A stepper motor can be driven, whether it is a 42 or 57 motor.

1. How much current can be driven? If there is no heat sink on the 4988 chip, the current should be below 1.2A. If a heat sink is added, the current can reach 2A.
2. How are stepper motors connected? As marked on the back of the 4988 board, the connection method is to connect the stepper motor 1B-1A-2A-2B in turn, or reverse to 2B-2A-1A-1B, or 1A-1B-2B-2A, and so on. If your motor wires are the standard red-blue-green-black color, you can connect them by color as: red-blue-green-black, or vice versa: black-green-blue-red.
3. After connecting the motor, the motor can not operate normally, and it is shaking left and right, what is the reason? There are generally two reasons for the jitter of the motor, one is the lack of phase: it may be that the 4988 board is not welded well or because of external force that causes a certain phase of the output end of the 4988 to be disconnected, resulting in the lack of phase of the motor and thus jitter. It is also possible that the stepper motor is only wired with one phase and is not connected well; Rather, the two phases are connected incorrectly: if the stepper motors are not connected in the correct order, the motors will also jitter, please follow question 3 to make the correct connection.
4. How to solve the motor step loss? The size of the phase current is directly related to the torque of the stepper motor, if you feel that the torque of your stepper motor is insufficient and you lose the step, you can increase the current configuration of the 4988 board. The driver board uses a small potentiometer to configure the output current. The potential of the middle pin of the potentiometer can be measured by using a multimeter. The

relationship between potential and current satisfies the following formula: Vref = I_TripMax*0.8 (the Rs resistance of the module is R100), that is, if you want to configure the motor working current to 1A, the potential should be configured at 0.8V. The default component configuration can adjust the current to 1.5A, and if you need to change R1 in the circuit to change the resistance value of 30K to 20K (about 20A), you can adjust the current to about 2A.

5. Can the 4988 drive a two-phase six-wire or two-phase wireless motor? Yes, connect the two connecting wires according to question 3 and suspend the middle tap in the air.
6. When the motor stops rotating, there is a sizzling electric current sound.

The first thing to note is that this is normal. The stepper motor is characterized by going at a specific angle instead of turning all the time, so the stepper motor has a parameter, the step angle. If you subdivide, you can walk the minimum step angle/the angle of the number of subdivisions, such as a stepper motor with a step angle of 1.8 degrees, using 16 subdivisions, the minimum angle that can be walked is

1.8/16 = 0.1125 degrees.

However, since this angle is very small and not necessarily in the physical position of the motor (1.8 degrees is a physical position), the stepper motor also needs to be energized when it stops, so as to ensure that the motor does not automatically jump to the physical step angle. Because of this characteristic, the stepper motor will have a current sound when it is stationary, which is a normal phenomenon, so don't worry.

If you encounter other questions in use, you are welcome to contact us, we will answer you carefully; If you have any good comments or suggestions on our products, you are also welcome to give us feedback, we will also carefully consider your comments or suggestions, thank you for choosing BIGTREETECH products, thank you!