

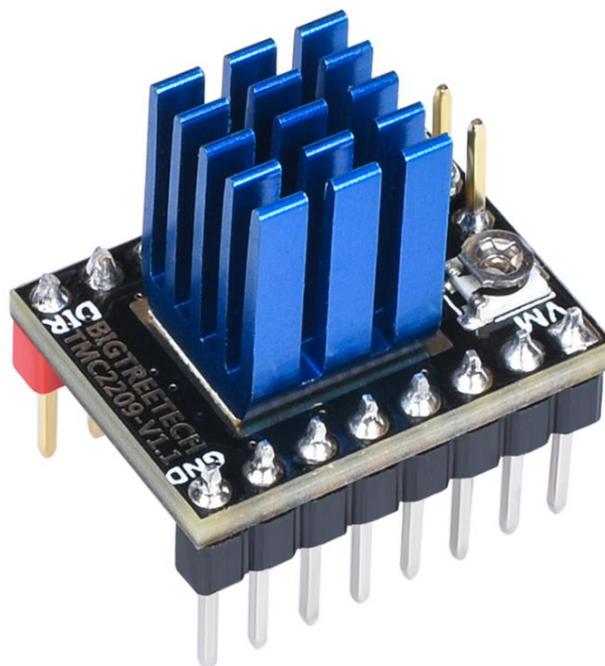
深圳市必趣科技有限公司

BIG TREE TECH

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TMC2209-V1.1

Stepper motor drive module



一、Product Introduction

1、TMC2209 is an ultra-silent motor driver IC for two-phase stepper motors. Its continuous drive current is 2A and peak current is 2.8A. Compared with TMC2208, the driving current of this IC is not only improved by 0.6a-0.8a, but also this IC increases the function of locked-motor test.

2、Voltage Range : 4.75V - 28V DC

This IC have some patent technologies:

SpreadCycle™ (highly dynamic motor control chopper)

StealthChop2™ (ultra-quiet technology)

MicroPlyer™ (microstep control)

StallGuard4™ (locked-motor test)

CoolStep™ (current dynamic control)

3 、 The Flexible microPlyer interpolation unit can provide 256 microsteps. Stallguard4™ locked-motor test can provide an abnormal signal when the motor rotates abnormally. CoolStep™ current dynamic control can save 75% energy. The sinusoidal control can be perfectly realized even in the system with limited pulse frequency. Since stealthChop2™ ultra-quiet technology is widely used in 3D printing, the design of these components is also compatible with existing 3D printer electronic devices, and it eliminates the expensive cost of redesigning. The module has a standard step/dir interface, it's easy to use.

二、Product Parameters

Product size : 15.24mm*20.32mm ;

Power voltage (VM) : 4.75V---28V DC ;

Peak current : 2.8A ;

Current RMS : 2A ;

Microstep setting : 2、4、8、16 (can be divided into 256 parts)

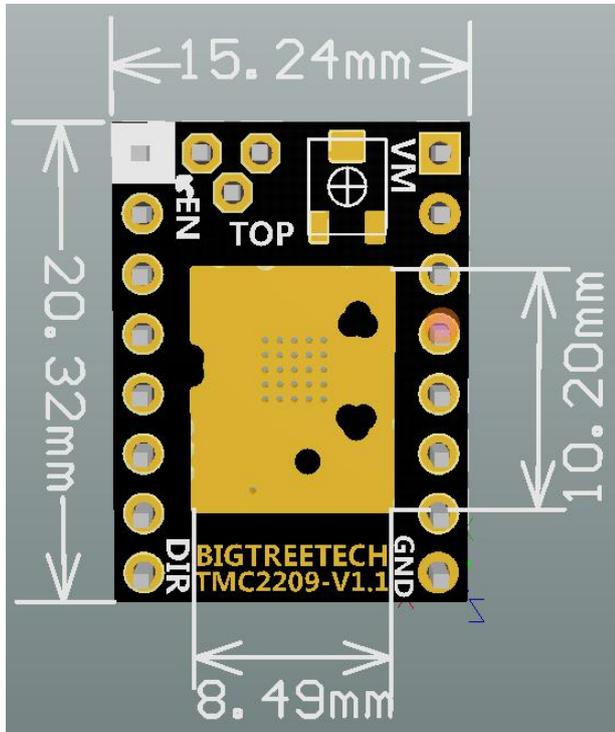
Max microstep : 256

Operating mode : STEP/DIR or UART

三、Product Advantages

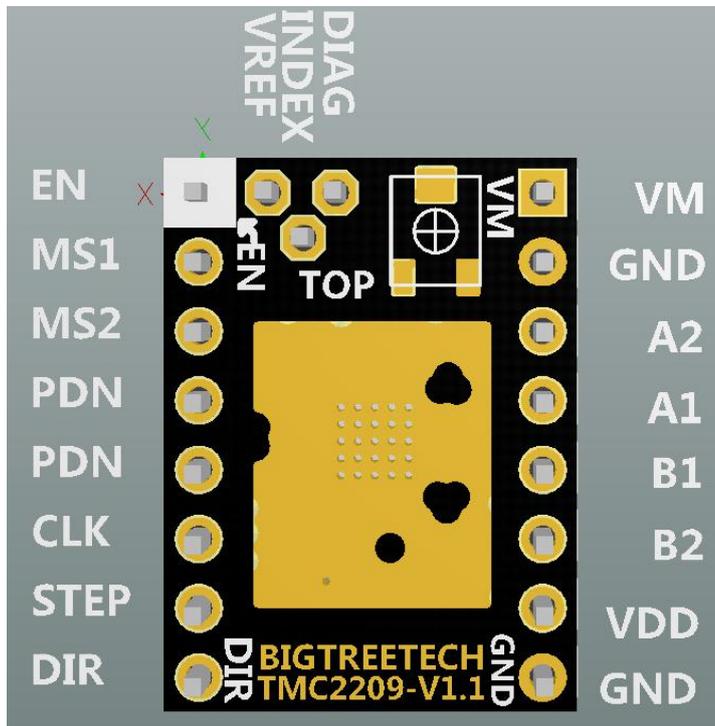
- 1、 The motor is difficult to lose steps.
- 2、 Ultra-quiet mode ;
- 3、 The module has a large-area cooling pad , it can lower the temperature when drive is working.
- 4、 The module can prevent the motor from shaking.
- 5、 The module support locked-motor test.
- 6、 The module support STEP/DIR and UART mode.

四、Drive Size and Cooling Pad Size



五、Pin Instruction

5.1、Pin Designation



5.2、Pin Mode

J1	Mode	J2	Mode
1	(EN) Enable	1	(VM) Power voltage
2	(MS1) Microstep setting	2	(GND) Ground
3	(MS2) Microstep setting	3	(A2) Phase A
4	(PDN) UART	4	(A1) Phase A
5	(PDN) UART	5	(B1) Phase B
6	(CLK) clock	6	(B2) Phase B
7	(STEP) Pulse input	7	(VCC_IO) Logic voltage
8	(DIR) Direction input	8	(GND) Ground
DIAG	Diagnostic and StallGuard output. Hi level upon stall detection or;driver error. Reset error condition by ENN=high.		
VREF	Analog reference voltage for current scaling or reference current for;use of internal sense resistors (optional mode)		
INDEX	Configurable index output. Provides index pulse.		

六、Microstep Setting

MS1/MS2: CONFIGURATION OF MICROSTEP RESOLUTION FOR STEP INPUT		
MS2	MS1	Microstep Setting
GND	GND	8 microsteps
GND	VCC_IO	2 microsteps (half step)
VCC_IO	GND	4 microsteps (quarter step)
VCC_IO	VCC_IO	16 microsteps

七、Drive Current Formula

$$I_{RMS} = \frac{325mV}{R_{SENSE} + 20m\Omega} * \frac{1}{\sqrt{2}} * \frac{V_{VREF}}{2.5V}$$

- 1、Vref: 0.2V - 2.2V
- 2、Factory default Vref: 1.2V \pm 0.1V
- 3、Factory default current: 0.9A
- 4、Potentiometer regulation instructions

Rotate the potentiometer clockwise to reduce the Vref voltage and the drive current can be reduced.

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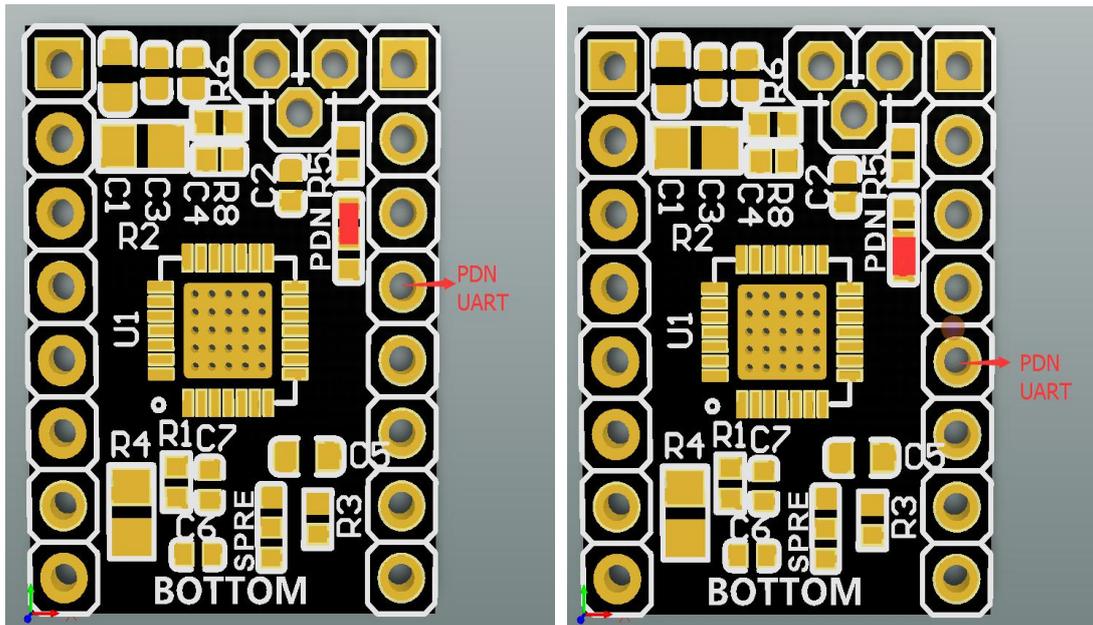
the drive current can be reduced.

Rotate the potentiometer counterclockwise to increase the Vref voltage and the drive current can be increased.

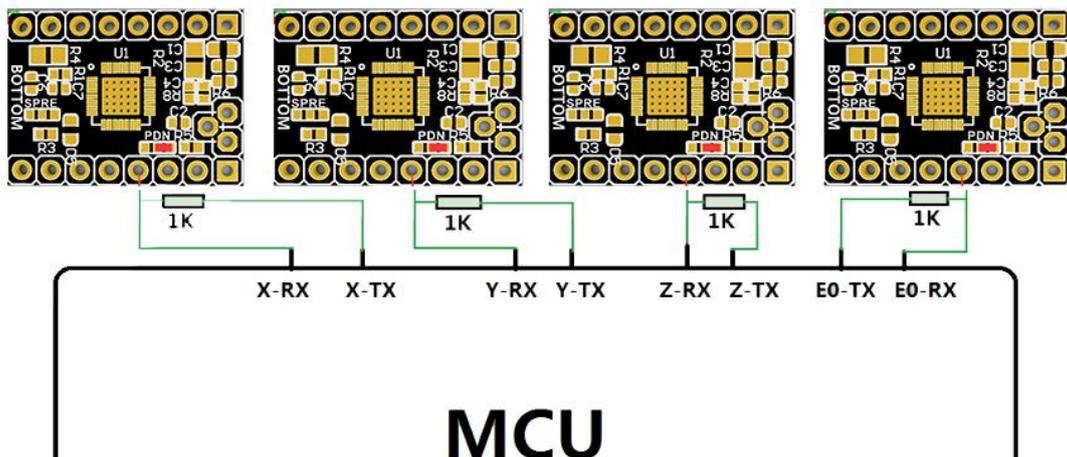
八、Operating Mode

8.1、Pin setting of UART mode

The factory has connected the UART Pin to the fourth Pin, namely the PDN_UART Pin shown on the left side of the figure below. If the fifth Pin is used as the UART Pin, the resistance shall be removed and welded to the following two pads, as shown on the right side of the figure below. PDN is welded to select pins corresponding to UART mode;



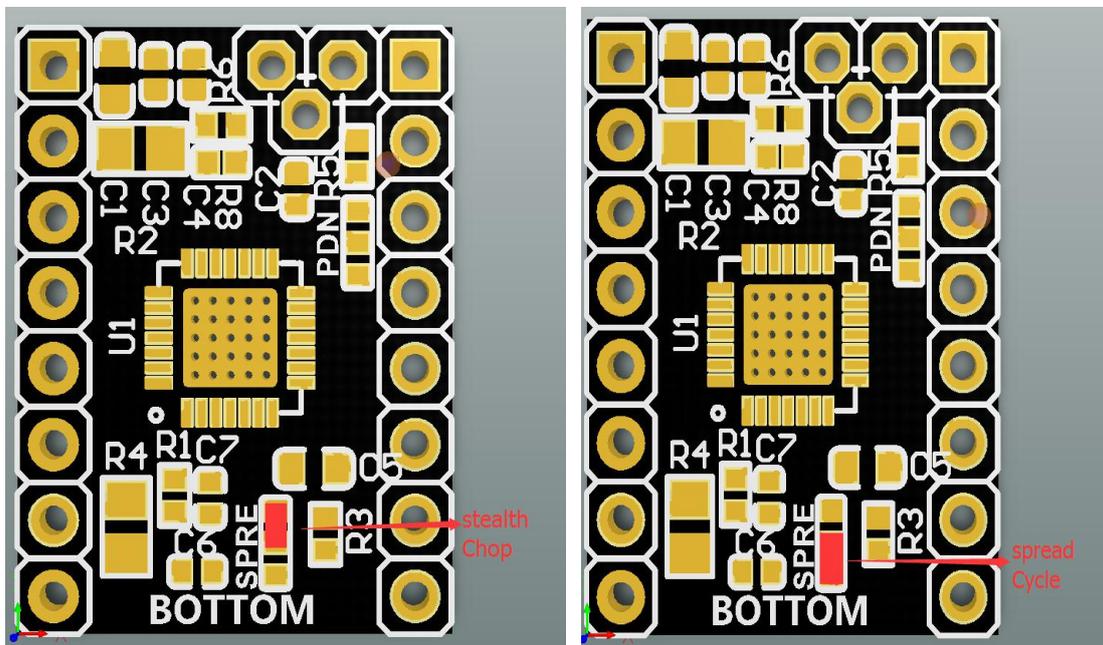
8.2、UART mode wiring diagram



8.3、Mute mode and anti-shake mode selection

The default mode used by the factory is mute mode, as shown in the picture on the left of the following figure. If anti-shake mode is needed, remove the resistance and weld it to the following two pads, as shown in the picture on the right of the picture below.

SPREAD	7	DI (pd)	Chopper mode selection: Low=StealthChop, High=SpreadCycle (may be left unconnected)
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九、Matters needing attentions

1、 Before installing the drive, make sure disconnect the power supply to prevent the drive from burning out.

2、 Before installing the drive, user must confirm the drive direction, to prevent back connection caused by the drive burning.

3、 Pay attention to the wiring sequence and I/O port when wiring. If the wrong line is connected, the driver will not work directly, please connect carefully as shown above.

4、 Do not plug and unplug the drive module when the device is working in order to avoid damage.

5、 When user install the heat sink, make sure the heat sink is not connected to the pin. We need prevent driving short circuit.

6、 The product is sensitive to static electricity, please handle it carefully. It is better that remove the package before using.

7、 Make sure to do heat dissipation treatment for the drive before using. (cooling pad, cooling fan)