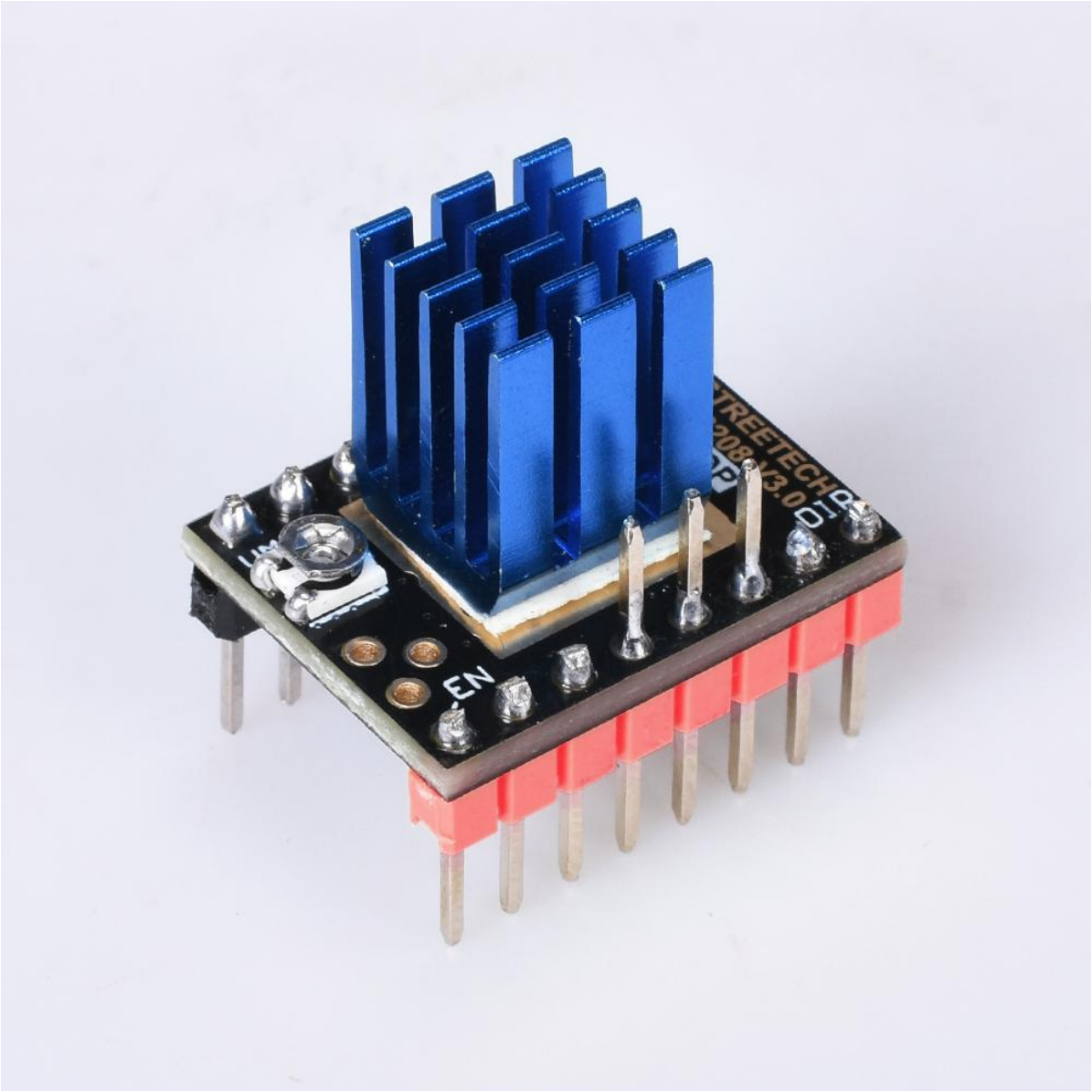
深圳市必趣科技有限公司

BIG TREE TECH

BIGTREETECH

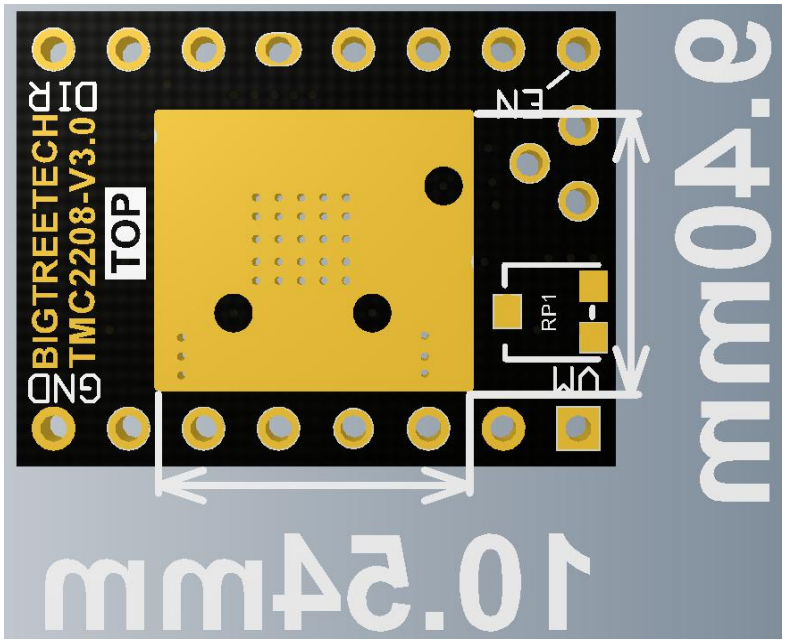
TMC2208-V3.0

Stepper motor driver



TMC2208 V3.0 single-axis stepper motor drive chip, power tube built-in drive current 1.4A peak current 2A, voltage range 4.75V-36V, 256 subdivision; with patented technology spreadCycle ™ high chopper frequency, dcStep ™ and CoolStep ™ current dynamic adjustment technology. It can save 70% of the energy, StealthChop mute technology. It also support Single Wire UART for advanced configuration options and integrated Pulse Generator for standalone motion.

Parameter description



Parameter description

256 microsteps per fullstep

interpolation from lower input resolutions

stealthChop2™ - for quiet positioning

spreadCycle™ - for high speed and high dynamics

Low RDSon LS 280mΩ & HS 290mΩ (typ. at 25°C)

Voltage Range 4.75V/36VDC

Single Wire UART for advanced configuration options

Integrated Pulse Generator for standalone motion

Configuration:STEP/ DIR or UART

microsteps: Up to 1/256

microPlyer: 1/256

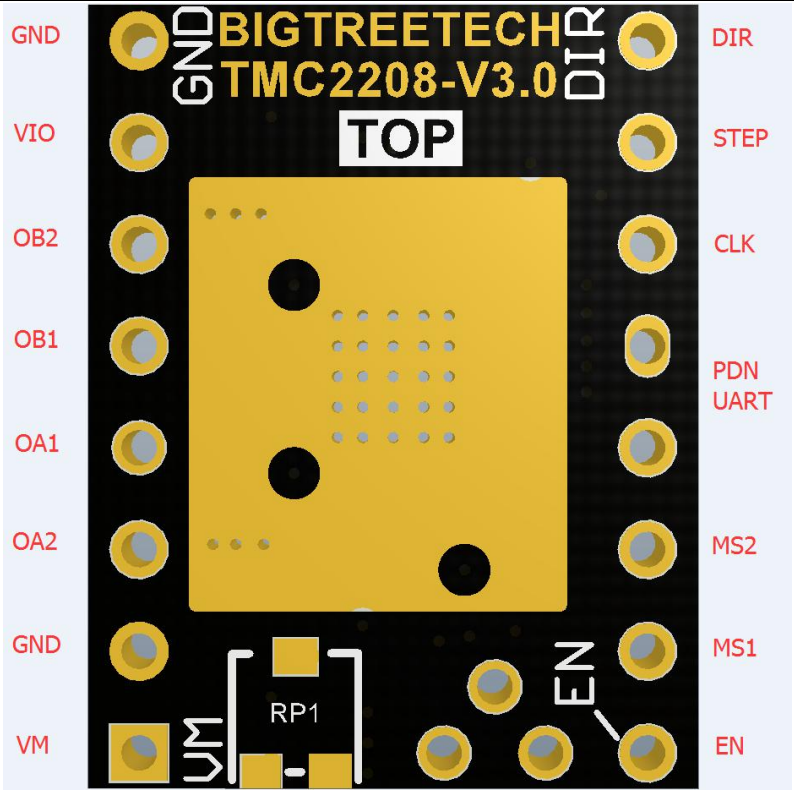
Logic Voltage VI0: 3.3-5V

Motor Voltage : 4.75-36V

Motor Phase Current: 1.2A RMS, 2.0A Peak

I. Working mode and potentiometer description

STEP/DIR mode ：



MS1	MS2	Steps	Interpolation	ChopperMode
GND	GND	8	Yes to 256	stealthChop2
VIO	GND	2	Yes to 256	stealthChop2
GND	VIO	4	Yes to 256	stealthChop2
VIO	VIO	16	Yes to 256	stealthChop2

To access all other modes (eg spreadCycle) you have to use the UART interface.

Choice of working mode： MS1、MS2：

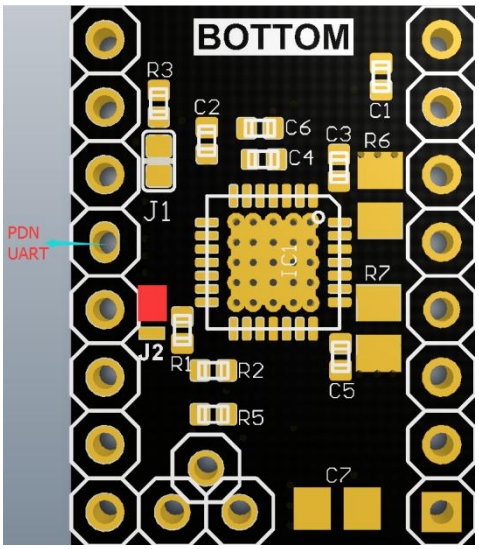
Working Current Reference:

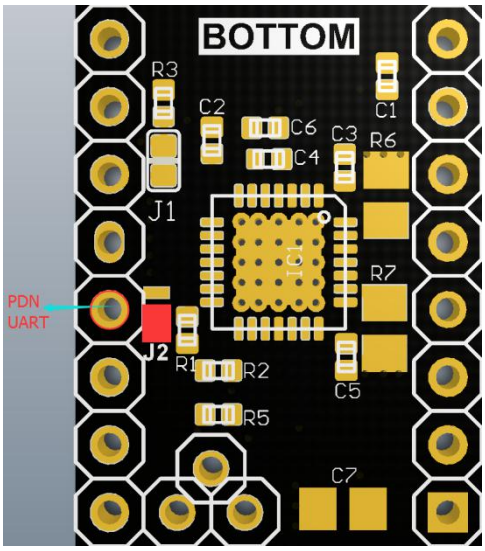
```
VRef 0...2.5V (0.11 Ohm   sense resistor)
>=2.50V     100% - 1.77A RMS
  1.25V      50% - 0.88A RMS
  0.50V      20% - 0.35A RMS

EN (with pull-up)
GND          driver enabled
VCC          driver disabled

PDN/UART (with pull-down)
GND          automatic standstill current reduction
VCC          automatic standstill power down disable
optional     UART interface

CLK (with pull-down)
GND          internal clock
optional     supply external clock
```

2.2 UART working mode

Before wiring, it is necessary to select the working mode of the driver module.

1.Weld J2 as shown in the purple area, and put the driver in UART working mode.





The benefits of UART mode:

1.Motor current can be set arbitrarily by firmware.

2.Micro-steps can be set arbitrarily by firmware (up to 256 actual micro-steps);

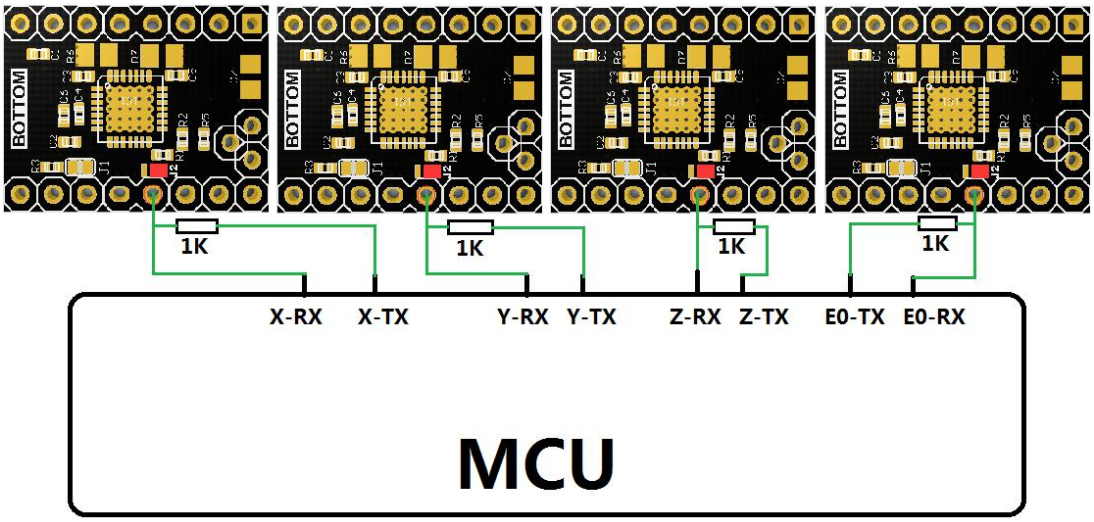
3.The actual and interpolated microsteps can be combined to achieve maximum torque.

Firmware can dynamically switch stepper motors between stealthChop2 and spreadCycle modes through UART.

When the motor is not moving, the standby current of the motor can be reduced dynamically (through UART).

The wiring diagram is as follows:

Note: TMC2208-V3.0 is available in STEP/DIR and UART modes. Customers can choose according to their own needs.



3.Potentiometer regulation instructions:

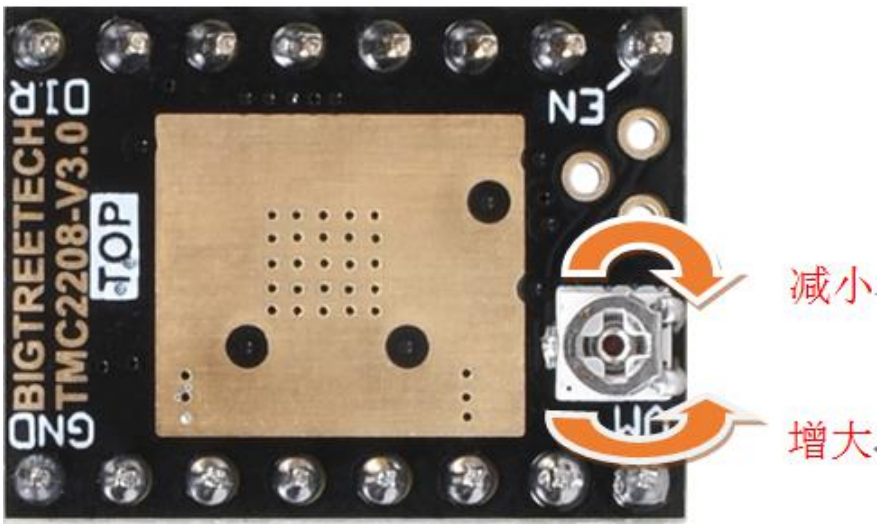
Clockwise Rotating Potentiometer - Reduces Vref, thereby reducing drive current;

Counterclockwise rotating potentiometer - Increase Vref, thereby increasing the driving current.

The accurate voltage of Vref can only be measured when the main board is supplied with 12V or 24V voltage.

The range of Vref value: default value: 1V (+0.2); MAX: 2V; MIN: 0V;

Rotating potentiometer must not use too much force to prevent irreversible damage to the potentiometer; when the counter-clockwise rotation reaches the maximum, if it continues to rotate, it will become the minimum; similarly, when the clockwise rotation reaches the minimum, if it continues to rotate, it will become the maximum

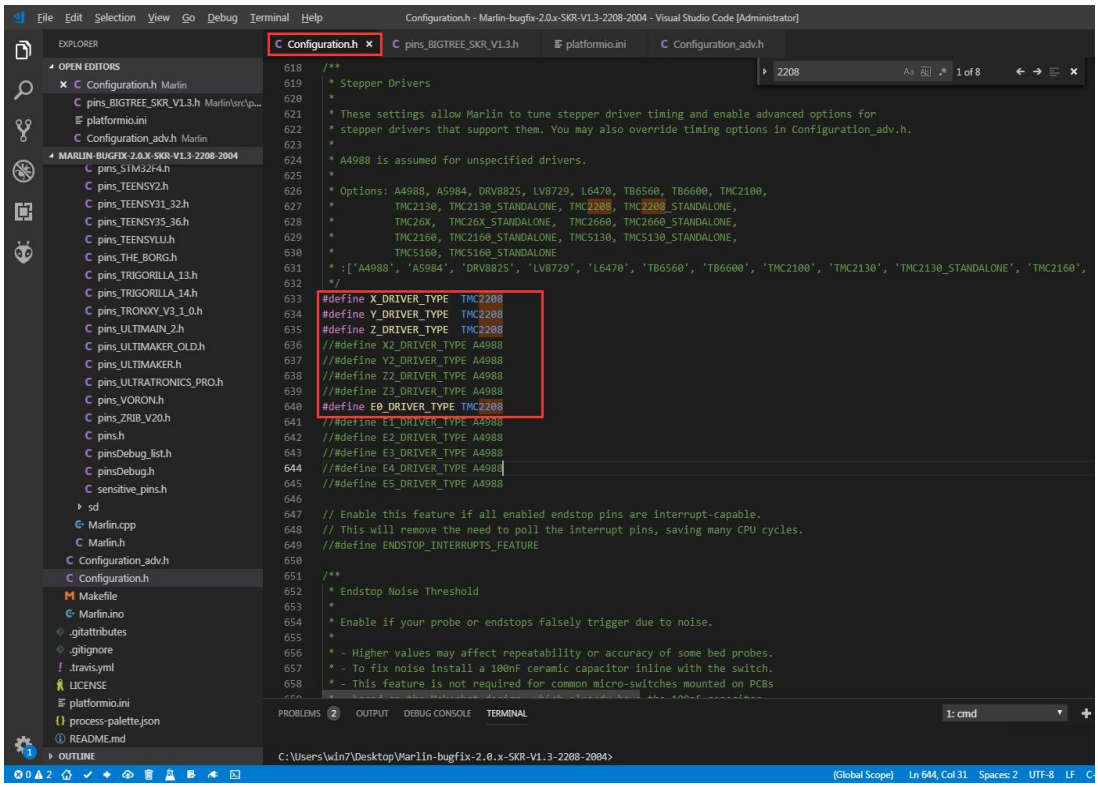


4.firmware change instructions:

Firmware (marlin-bugfix-2.0)

BIGTREETECH SKR V1.3 as example：

Configuration.h files

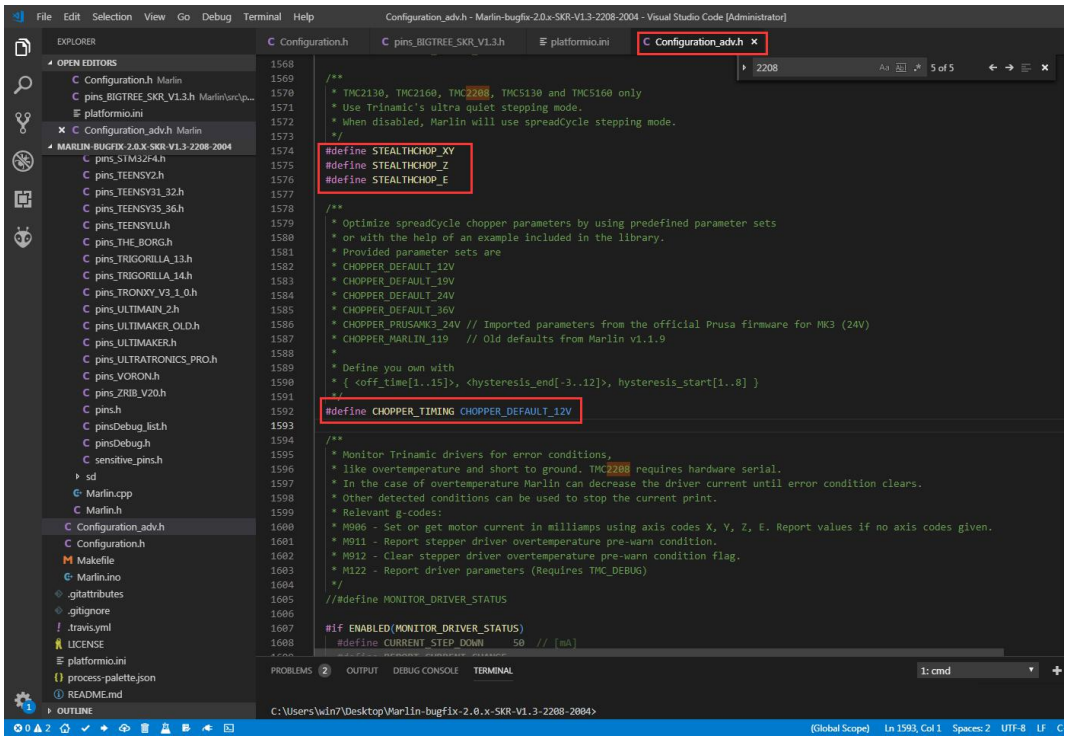


TMC2208 - means you want to control SilentStepStick through UART.

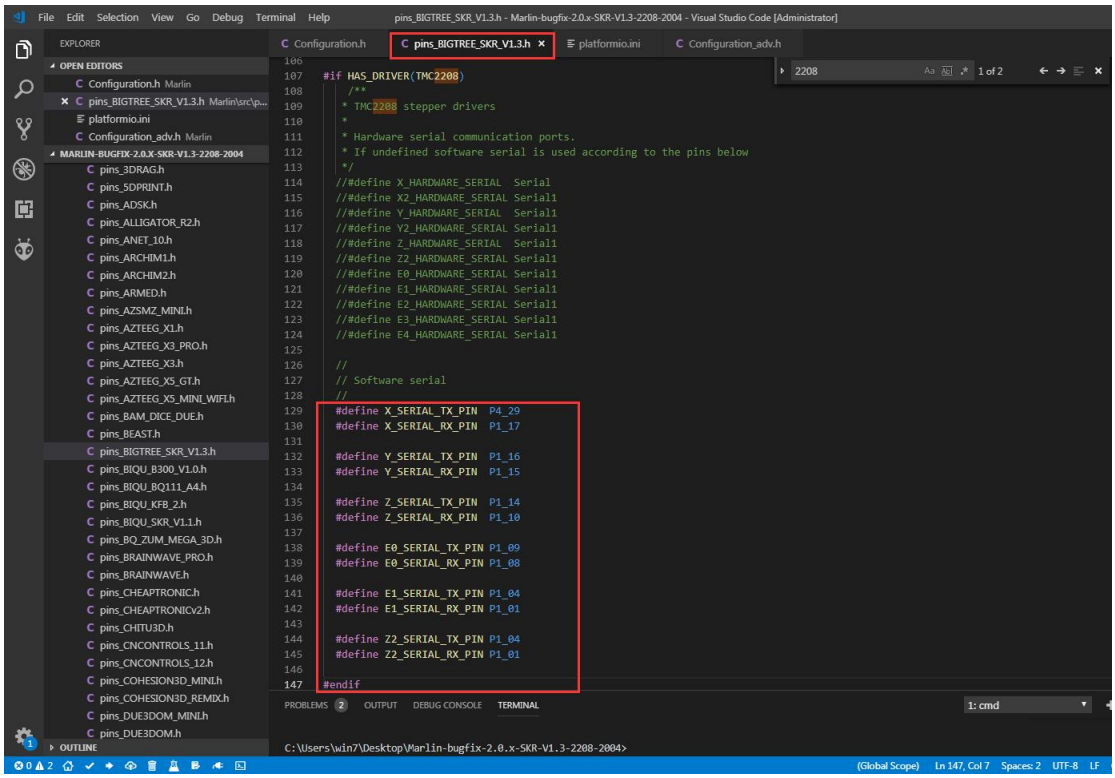
TMC2208_STANDALONE - does not use UART control but STEP/DIR .

TMC2208 SilentStepStick， In other words plug and play.

Configuration_adv.h files



Pins_BIGTREE_SKR_V1.3.h file



After the firmware is changed, burned the firmware and check whether the driver is correctly installed is detected.

	X	Y	Z	E0	
Enabled	true	true	true	true	
Set current	1000	1000	1000	1000	
RMS current	994	994	994	994	
MAX current	1402	1402	1402	1402	
Run current	17/31	17/31	17/31	17/31	
Hold current	11/31	11/31	11/31	11/31	
CS actual		11/31	11/31	11/31	11/31
PWM scale		13	13	13	13
vsense	0=.325	0=.325	0=.325	0=.325	
stealthChop	true	true	false	true	
msteps	4	4	4	4	
tstep	1048575	1048575	1048575	1048575	
pwm					
threshold		24	24	16	13
[mm/s]	102.95	102.95	3.09	30.41	
OT prewarn	false	false	false	false	
OT prewarn has					
been triggered	false	false	false	false	
off time		5	5	5	5
blank time	24	24	24	24	
hysteresis					
-end	2	2	2	2	
-start	3	3	3	3	
Stallguard thrs					
DRVSTATUS	X	Y	Z	E0	
stst	X	X	X	X	
olb					
ola					
s2gb					
s2ga					
otpw					
ot					
157C					
150C					
143C					
120C					
s2vsa					
s2vsb					

```
Driver registers:       X = 0xC0:0B:00:00
        Y = 0xC0:0B:00:00
        Z = 0xC0:0B:00:00
        E0 = 0xC0:0B:00:00
```

5.Attention ：

1. When hardware chooses UART working mode, cautiously use soldering iron to prevent scalding hands. After treatment, carefully observe whether there is residual tin slag in the module. It must be cleaned up to prevent short circuit burning of the module.

2. Pay attention to the line sequence and IO port when wiring. If the wrong line is connected, the drive will not work.

3. When inserting drive into the main board, pay attention to see the direction of drive, can not insert backward, to prevent drive from burning.

4.Make sure to do a good job in heat dissipation (heat sink + heat dissipation fan) before driving to prevent abnormal operation of the drive.

If you encounter problems in use, welcome to contact us, we will be answer to you ASAP . If you have any good comments or suggestions on our products, please tell us , we will carefully consider your comments or Suggestions. Thank you for choosing BIGTREETECH products, thank you!