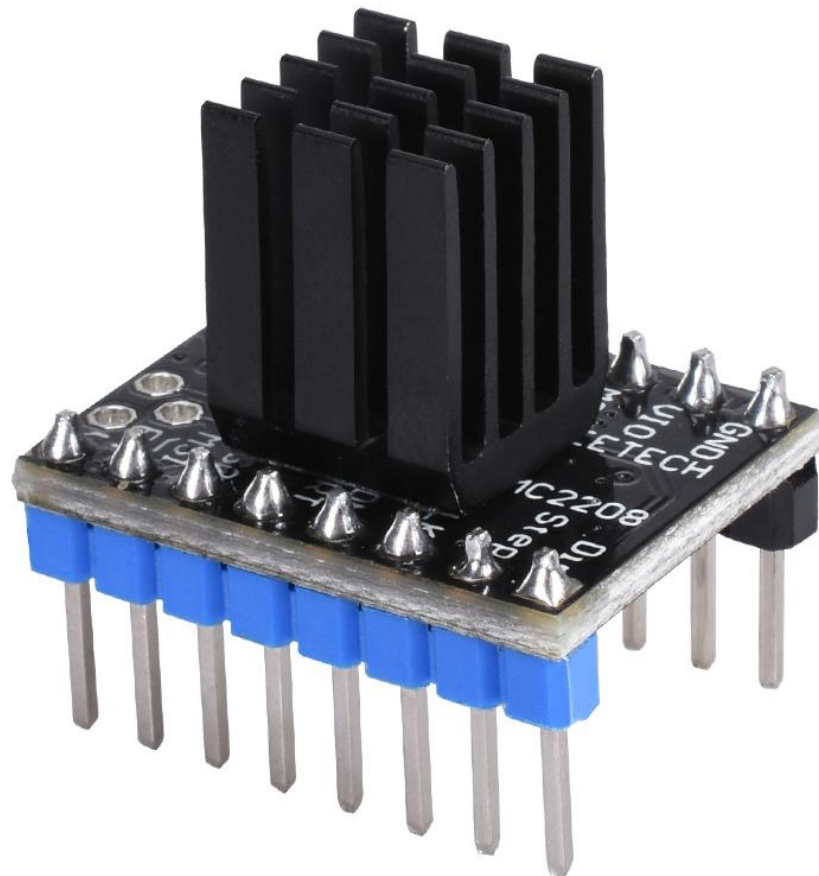


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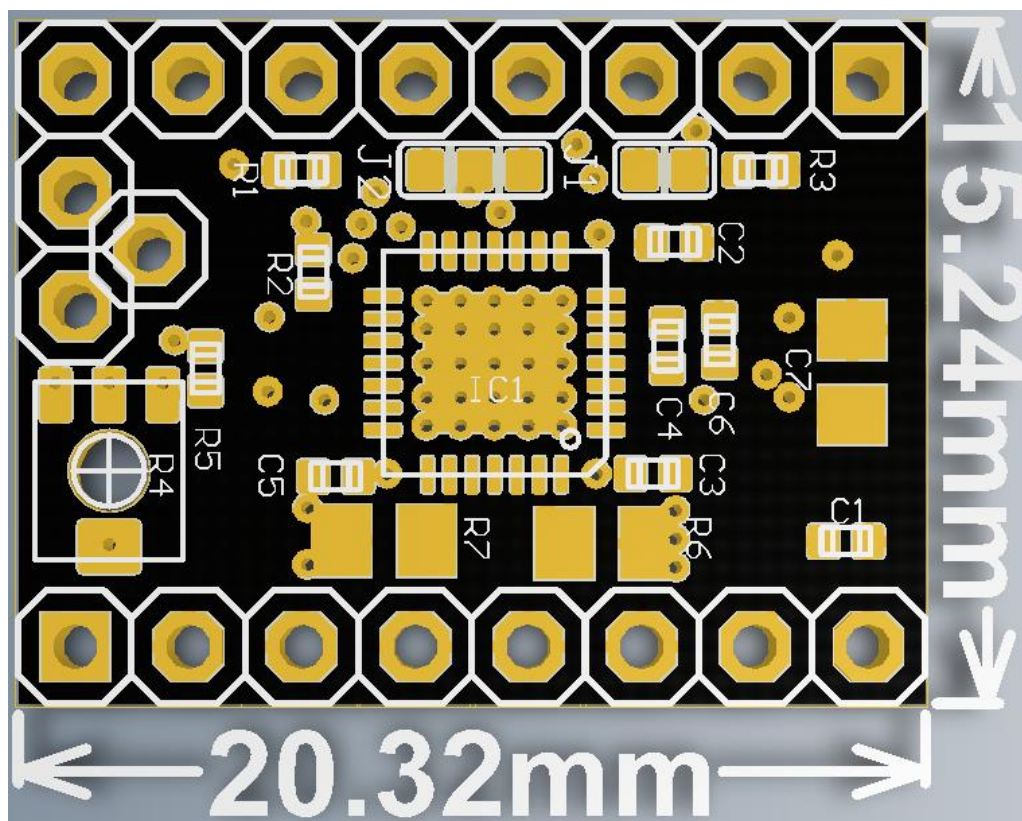
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TMC2208-V2.1

步进电机驱动模块

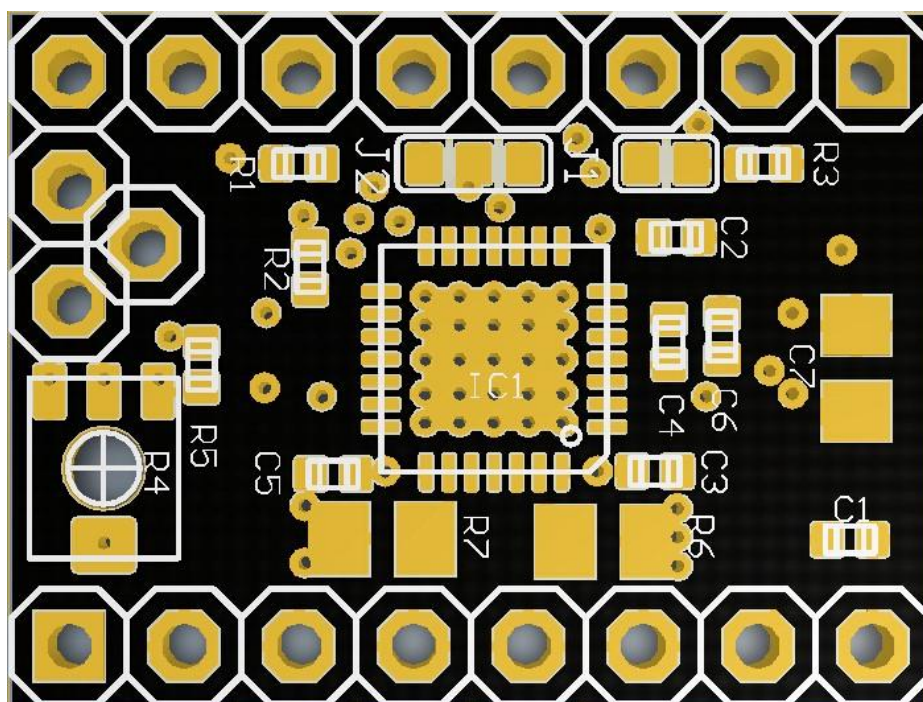


一、尺寸参数



二、工作模式说明

1.STEP/DIR 模式:



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- 1.如上图默认的出厂设置使驱动为 STEP/DIR 工作模式；
- 2.工作模式选择：MS1、MS2：

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.

工作电流参考：

```
URef 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

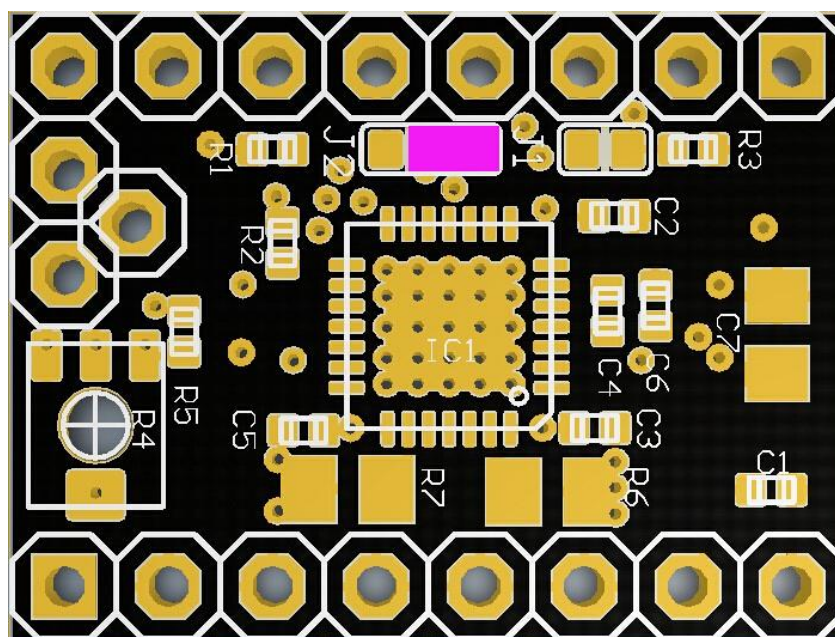
PDN/UART (with pull-down)
GND automatic standstill current reduction
VCC automatic standstill power down disable
optional UART interface

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

2.UART 工作模式接线说明：

接线前，需对驱动模块进行工作模式选择的硬件操作：

1. 将 J2 如图紫色区域所示进行焊接，使驱动处于 UART 工作模式。



2. UART 模式的好处:

电机电流可以通过固件任意设定;

可以通过固件任意设置微步 (最多 256 个实际微步);

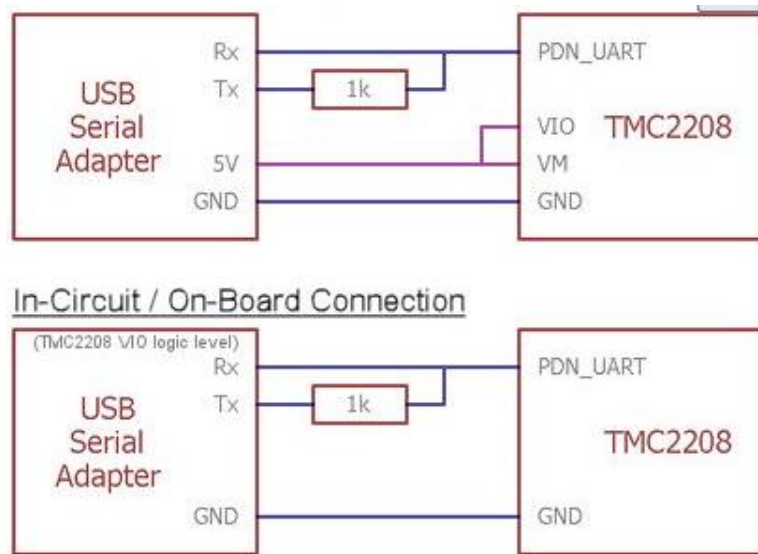
可以组合实际和内插的微步以实现最大扭矩;

固件可以通过 UART 动态地在 stealthChop2 和 spreadCycle 模式之间切

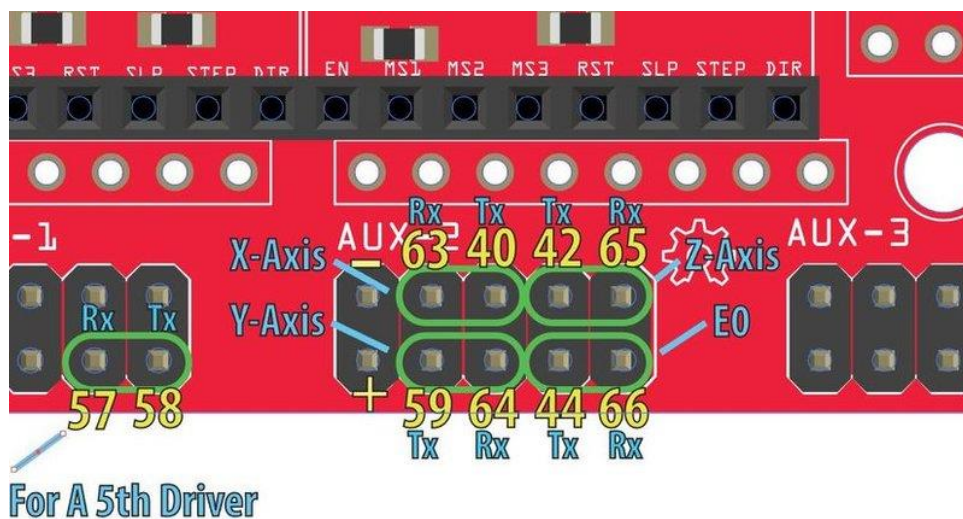
换步进电机;

当电机不动时, 可以动态降低电机待机电流 (通过 UART)。

接线示意图如下:

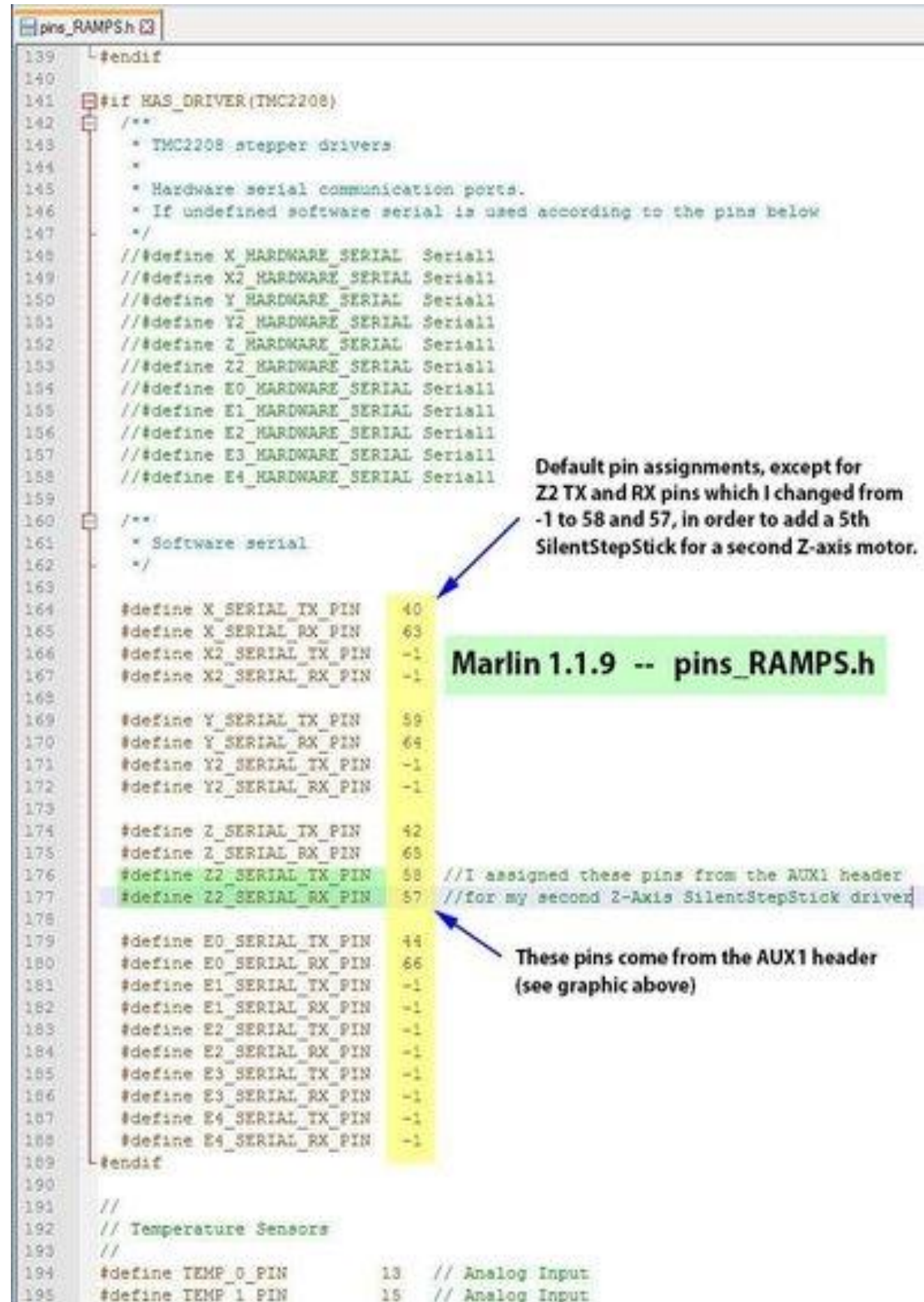


固件 (Marlin 1.1.9): Pins.h 文件:



Marlin 1.1.9 - Default Pin Assignment

特别值得注意的是，开发人员更改了 SilentStepStick 轴的默认引脚分配。请参见上图，了解每个轴的默认 1.1.9 引脚分配。




```
139 #endif
140
141 #if HAS_DRIVER(TMC2208)
142 /**
143  * TMC2208 stepper drivers
144  *
145  * Hardware serial communication ports.
146  * If undefined software serial is used according to the pins below
147  */
148 // #define X_HARDWARE_SERIAL Serial1
149 // #define X2_HARDWARE_SERIAL Serial1
150 // #define Y_HARDWARE_SERIAL Serial1
151 // #define Y2_HARDWARE_SERIAL Serial1
152 // #define Z_HARDWARE_SERIAL Serial1
153 // #define Z2_HARDWARE_SERIAL Serial1
154 // #define E0_HARDWARE_SERIAL Serial1
155 // #define E1_HARDWARE_SERIAL Serial1
156 // #define E2_HARDWARE_SERIAL Serial1
157 // #define E3_HARDWARE_SERIAL Serial1
158 // #define E4_HARDWARE_SERIAL Serial1
159
160 /**
161  * Software serial
162  */
163
164 #define X_SERIAL_TX_PIN 40
165 #define X_SERIAL_RX_PIN 63
166 #define X2_SERIAL_TX_PIN -1
167 #define X2_SERIAL_RX_PIN -1
168
169 #define Y_SERIAL_TX_PIN 59
170 #define Y_SERIAL_RX_PIN 64
171 #define Y2_SERIAL_TX_PIN -1
172 #define Y2_SERIAL_RX_PIN -1
173
174 #define Z_SERIAL_TX_PIN 42
175 #define Z_SERIAL_RX_PIN 65
176 #define Z2_SERIAL_TX_PIN 58 //I assigned these pins from the AUX1 header
177 #define Z2_SERIAL_RX_PIN 57 //for my second 2-Axis SilentStepStick driver
178
179 #define E0_SERIAL_TX_PIN 44
180 #define E0_SERIAL_RX_PIN 66
181 #define E1_SERIAL_TX_PIN -1
182 #define E1_SERIAL_RX_PIN -1
183 #define E2_SERIAL_TX_PIN -1
184 #define E2_SERIAL_RX_PIN -1
185 #define E3_SERIAL_TX_PIN -1
186 #define E3_SERIAL_RX_PIN -1
187 #define E4_SERIAL_TX_PIN -1
188 #define E4_SERIAL_RX_PIN -1
189 #endif
190
191 //
192 // Temperature Sensors
193 //
194 #define TEMP_0_PIN 13 // Analog Input
195 #define TEMP_1_PIN 15 // Analog Input
```

Default pin assignments, except for Z2 TX and RX pins which I changed from -1 to 58 and 57, in order to add a 5th SilentStepStick for a second Z-axis motor.

Marlin 1.1.9 -- pins_RAMPS.h

These pins come from the AUX1 header (see graphic above)

固件（Marlin 1.1.9）： Configuration.h 文件



The image shows a screenshot of the `Configuration.h` file in the Marlin 1.1.9 firmware. The file is open in a text editor, and the line numbers 536 through 591 are visible on the left. The code is in C++ and defines various settings for the stepper drivers. Annotations with arrows point to specific lines:


- An arrow points to line 537, which is the start of the `Stepper Drivers` section.
- An arrow points to line 550, which defines `X_DRIVER_TYPE` as `TMC2208`.
- An arrow points to line 551, which defines `Y_DRIVER_TYPE` as `TMC2208`.
- An arrow points to line 552, which defines `Z_DRIVER_TYPE` as `TMC2208`.
- An arrow points to line 553, which defines `X2_DRIVER_TYPE` as `A4988`.
- An arrow points to line 554, which defines `Y2_DRIVER_TYPE` as `A4988`.
- An arrow points to line 555, which defines `Z2_DRIVER_TYPE` as `TMC2208`.
- An arrow points to line 556, which defines `E0_DRIVER_TYPE` as `TMC2208`.
- An arrow points to line 557, which defines `E1_DRIVER_TYPE` as `A4988`.
- An arrow points to line 558, which defines `E2_DRIVER_TYPE` as `A4988`.
- An arrow points to line 559, which defines `E3_DRIVER_TYPE` as `A4988`.
- An arrow points to line 560, which defines `E4_DRIVER_TYPE` as `A4988`.

Annotations on the right side of the image:

- Search for "stepper drivers"** points to the `Stepper Drivers` section header.
- Marlin 1.1.9 -- configuration.h** is a title for the section.
- Change each axis or extruder you are using to TMC2208 or to TMC2208_STANDALONE** points to the driver type definitions.

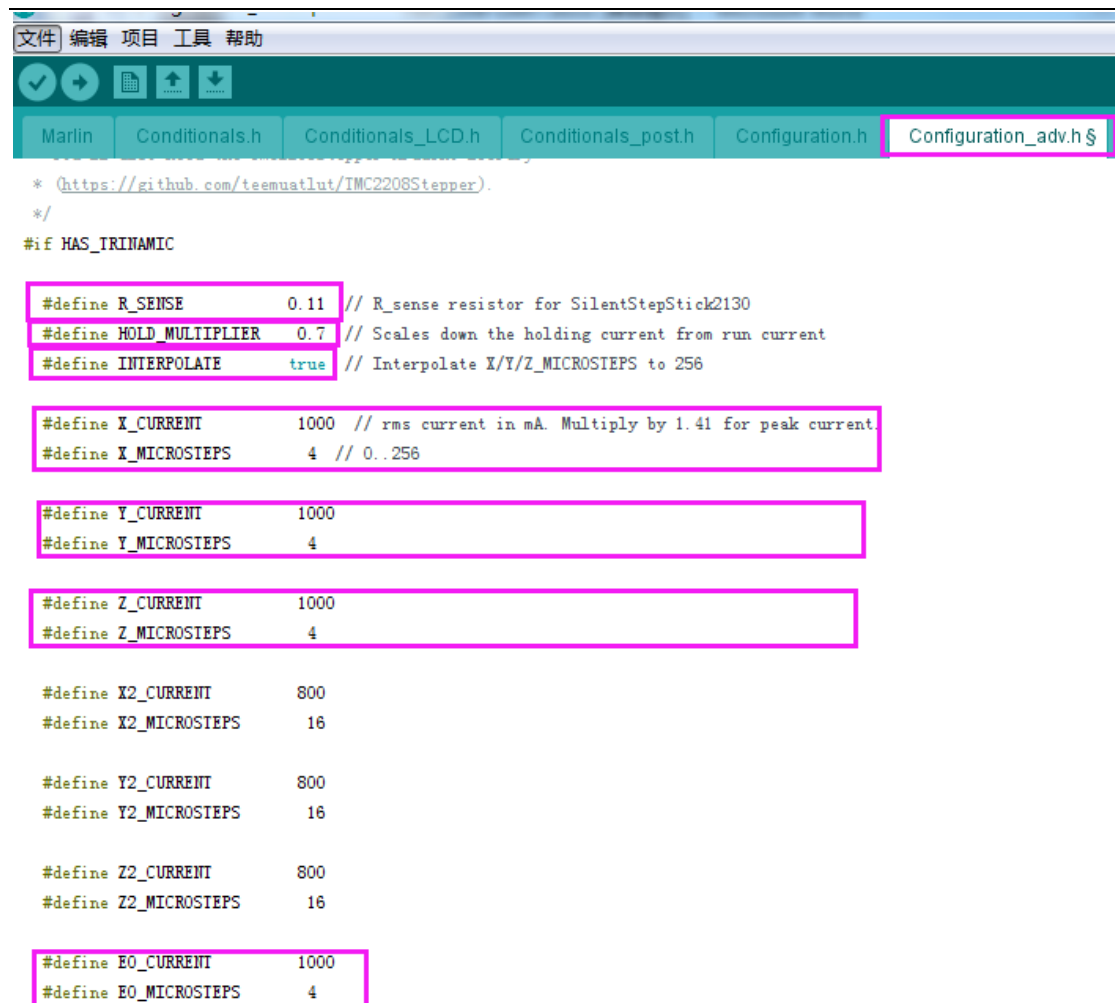
- TMC2208 - 表示您想通过 UART 控制 SilentStepStick
- TMC2208_STANDALONE - 不使用 UART 控制，而是以与标准 Pololu A4988 相同的方式使用 TMC2208 SilentStepStick，换句话说即插即用

固件 (Marlin 1.1.9): Configuration_adv.h 文件:



```
*/  
#define STEALTHCHOP  
  
/**  
 * Monitor Trinamic TMC2130 and TMC2208 drivers for error conditions,  
 * like overtemperature and short to ground. TMC2208 requires hardware serial.  
 * In the case of overtemperature Marlin can decrease the driver current until error condition clears.  
 * Other detected conditions can be used to stop the current print.  
 * Relevant g-codes:  
 * M906 - Set or get motor current in milliamps using axis codes X, Y, Z, E. Report values if no axis codes given.  
 * M911 - Report stepper driver overtemperature pre-warn condition.  
 * M912 - Clear stepper driver overtemperature pre-warn condition flag.  
 * M122 S0/1 - Report driver parameters (Requires TMC_DEBUG)  
 */  
#define MONITOR_DRIVER_STATUS  
  
#if ENABLED(MONITOR_DRIVER_STATUS)  
  #define CURRENT_STEP_DOWN 50 // [mA]  
  #define REPORT_CURRENT_CHANGE  
  #define STOP_ON_ERROR  
#endif  
  
/**  
 * The driver will switch to spreadCycle when stepper speed is over HYBRID_THRESHOLD.  
 * This mode allows for faster movements at the expense of higher noise levels.  
 * STEALTHCHOP needs to be enabled.  
 * M913 X/Y/Z/E to live tune the setting  
 */  
#define HYBRID_THRESHOLD  
  
#define X_HYBRID_THRESHOLD 100 // [mm/s]  
#define X2_HYBRID_THRESHOLD 100  
#define Y_HYBRID_THRESHOLD 100  
#define Y2_HYBRID_THRESHOLD 100  
#define Z_HYBRID_THRESHOLD 3  
#define Z2_HYBRID_THRESHOLD 3  
#define E0_HYBRID_THRESHOLD 30  
#define E1_HYBRID_THRESHOLD 30  
#define E2_HYBRID_THRESHOLD 30  
#define E3_HYBRID_THRESHOLD 30  
#define E4_HYBRID_THRESHOLD 30
```


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The image shows a screenshot of a code editor window with a menu bar (文件, 编辑, 项目, 工具, 帮助) and a toolbar. The file explorer shows a list of files: Marlin, Conditionals.h, Conditionals_LCD.h, Conditionals_post.h, Configuration.h, and Configuration_adv.h. The Configuration_adv.h file is selected and open in the editor. The code in the editor is a C++ configuration file for a stepper motor driver. It includes a comment about the GitHub repository and a conditional compilation block for HAS_IRINAMIC. The code defines several variables for stepper motor settings, including R_SENSE, HOLD_MULTIPLIER, INTERPOLATE, X_CURRENT, X_MICROSTEPS, Y_CURRENT, Y_MICROSTEPS, Z_CURRENT, Z_MICROSTEPS, X2_CURRENT, X2_MICROSTEPS, Y2_CURRENT, Y2_MICROSTEPS, Z2_CURRENT, Z2_MICROSTEPS, E0_CURRENT, and E0_MICROSTEPS. The values are set to 0.11, 0.7, true, 1000, 4, 1000, 4, 1000, 4, 800, 16, 800, 16, 800, 16, 1000, and 4 respectively. The code is highlighted in yellow, and the file name Configuration_adv.h is highlighted in blue.

```
* (https://github.com/teemuatlut/TMC2208Stepper).
*/
#if HAS_IRINAMIC

#define R_SENSE 0.11 // R_sense resistor for SilentStepStick2130
#define HOLD_MULTIPLIER 0.7 // Scales down the holding current from run current
#define INTERPOLATE true // Interpolate X/Y/Z_MICROSTEPS to 256

#define X_CURRENT 1000 // rms current in mA. Multiply by 1.41 for peak current.
#define X_MICROSTEPS 4 // 0..256

#define Y_CURRENT 1000
#define Y_MICROSTEPS 4

#define Z_CURRENT 1000
#define Z_MICROSTEPS 4

#define X2_CURRENT 800
#define X2_MICROSTEPS 16

#define Y2_CURRENT 800
#define Y2_MICROSTEPS 16

#define Z2_CURRENT 800
#define Z2_MICROSTEPS 16

#define E0_CURRENT 1000
#define E0_MICROSTEPS 4
```

固件更改好之后，进行固件烧录，并检测驱动是否正确链接：

Ctrl+Shift+M 打开串口监视器，输入 M122 看检测结果：

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	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	
OI prewarn	false	false	false	false	
OI 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

1.4 注意事项:

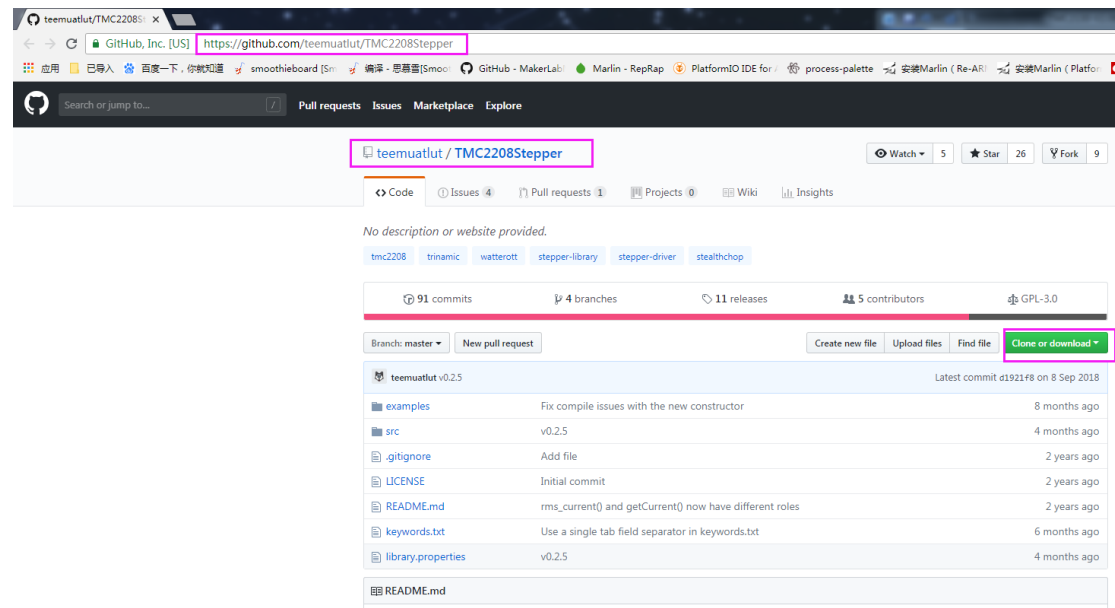
1. 硬件选择 UART 工作模式时，小心使用烙铁，防止烫伤手，处理完之后仔细观察模块是否有残留的锡渣，必须将其清理干净，防止它导致模块短路烧毁；
2. 接线时候注意线序和 IO 口，接错线将直接导致驱动不能工作，对应上面图示细心连接；
3. 往主板上插驱动时，注意看清驱动方向，万不可插反，防止驱动被烧毁；
4. 驱动工作前一定做好散热工作（散热片+散热风扇），防止驱动不正常工作；

三、FAQ（常见问题解答）

Q: 更改固件时，在 Configuration_adv.h 中搜索不到 TMC2208

A: 是因为你的 Arduino 软件缺少了 TMC2208Stepper 这个库文件，只需下载该库文件后，解压到你的库中即可。网址：

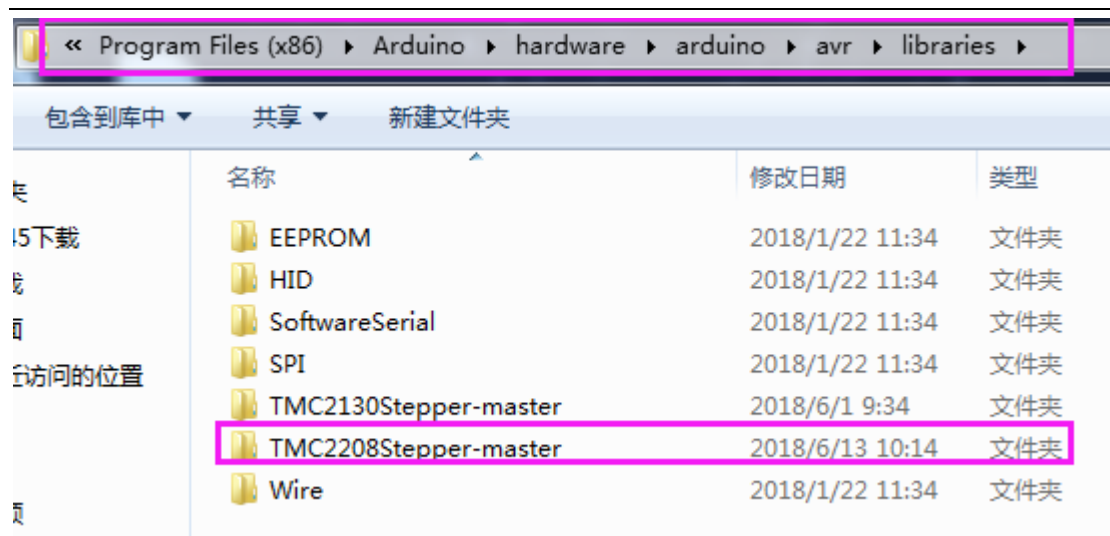
<https://github.com/teemuatlut/TMC2208Stepper>



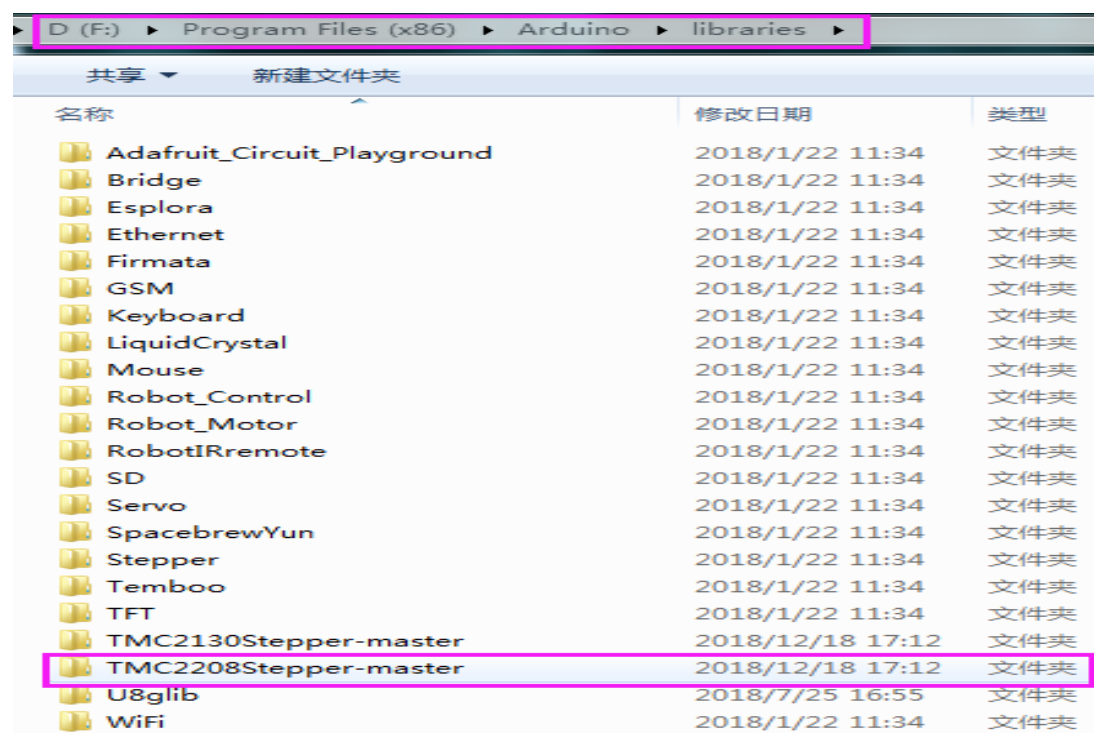
Q: 怎么添加 TMC2208Stepper 库文件

A: 下载好 TMC2208Stepper 库文件之后将其解压，然后找到你的 Arduino 库，把它复制粘贴到你的库就行了。如果你的 Arduino 安装在 D 盘，则库的文件夹路径为：D:\Program Files (x86)\Arduino\hardware\arduino\avr\libraries\TMC2208Stepper-master；如果是安装在 C 盘，则库的文件夹路径为：C:\Program Files (x86)\Arduino\hardware\arduino\avr\libraries\TMC2208Stepper-master。例图如下：

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由于版本差异原因，有些版本还需要将 TMC2208Stepper 库文件放入下图文件夹：



若您使用中还遇到别的问题，欢迎您联系我们，我们定会细心为您解答；若您对我们的产品有什么好的意见或建议，也欢迎您回馈给我们，我们也会仔细斟酌您的意见或建议，感谢您选择 BIGTREETECH 制品，谢谢！