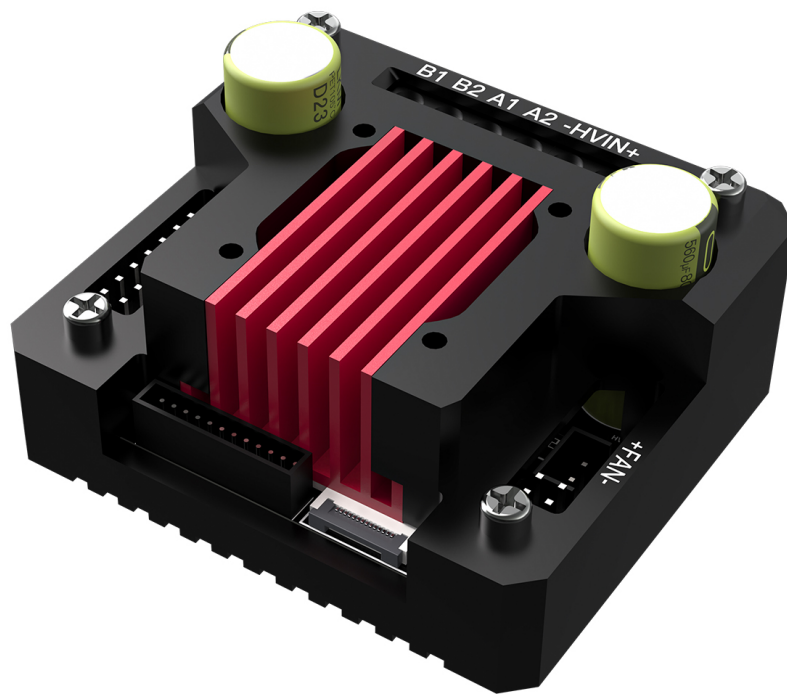


**BIGTREE TECH**

# TMC5160T Plus

## User Manual



## Revision Log

Version	Date	Revisions
v1.00	15th April 2023	Initial Version

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## Product Profile

TMC5160T Plus is a high-power stepper motor driver control module, featuring 8 high-power MOSFETs separately mounted on the board with a maximum voltage of 60V. This supports a wider range of stepper motors and offers greater adaptability.

## Features Highlights

- 8 high-power MOSFETs separately mounted on the board with 100V voltage resistance, 93A current resistance, and equivalent resistance as low as 6mΩ, significantly enhancing the drive's performance;
- Supports a maximum voltage of 60V, a maximum effective current (IRMS) of 10.6A, and a sine wave peak current of up to 15A;
- StealthChop™ mode and SpreadCycle™ mode selectable, with standalone mode, UART mode, and SPI mode selectable;
- Generates significantly less heat compared to other drives with the same chip model, and outperforms others on the market;
- Can prevent motor jitter and avoid losing steps;
- Tested to drive 36, 42, 57, 86, etc., stepper motors;
- ESD protection on the drive power, logic power, etc., to prevent damage due to power fluctuations and static electricity;
- On-board 24V always-on fan interface facilitates active cooling;
- Encoder interface reserved for DIY usage;
- Integrated heat sink design, providing high heat dissipation while enhancing structural integrity and aesthetics;
- Supplied with adapters and wires for both standard drives and EZ drive, for user convenience;
- Heat sink pre-designed with fan mounting holes for DIY fan installation.

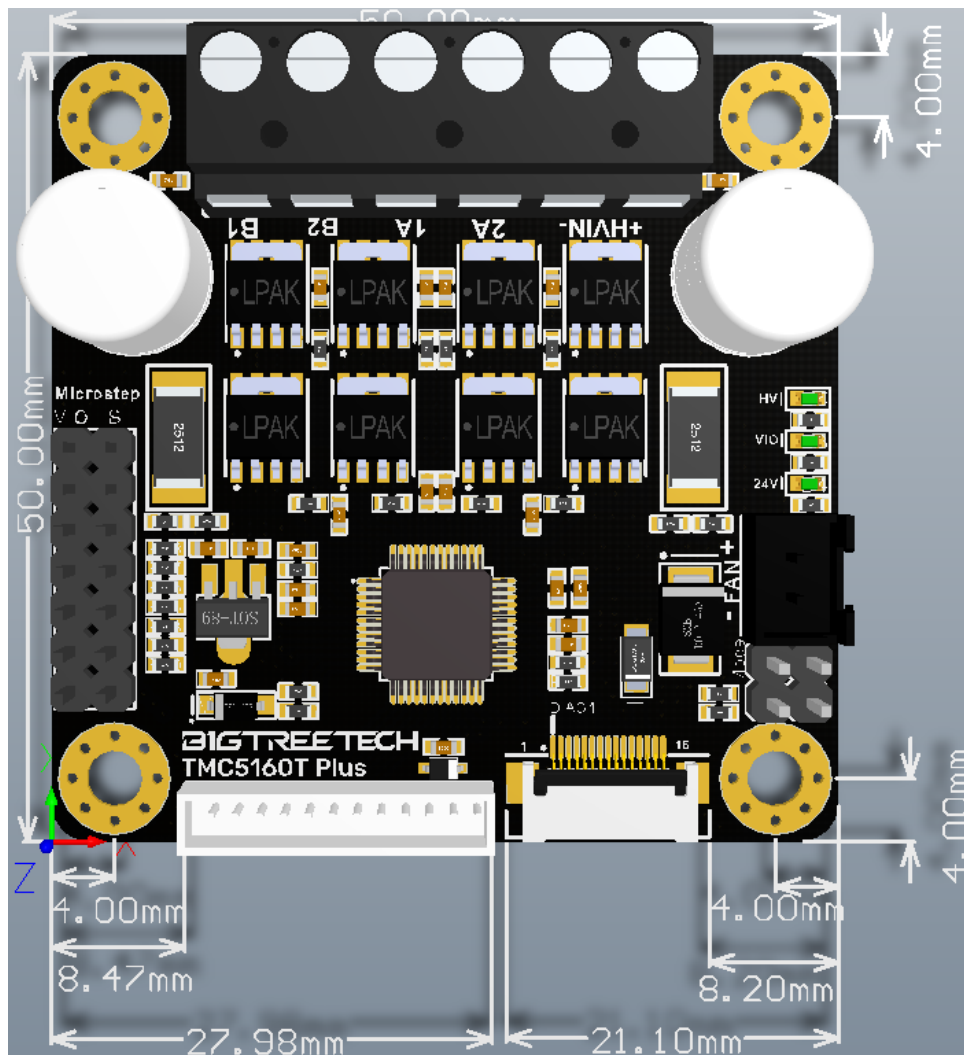
## Specifications

Dimensions	TMC5160T Plus: 64 x 56 x 32.55mm TMC5160T Plus(W/o case): 58 x 50 x 28mm
Drive Chip	TMC5160-TA

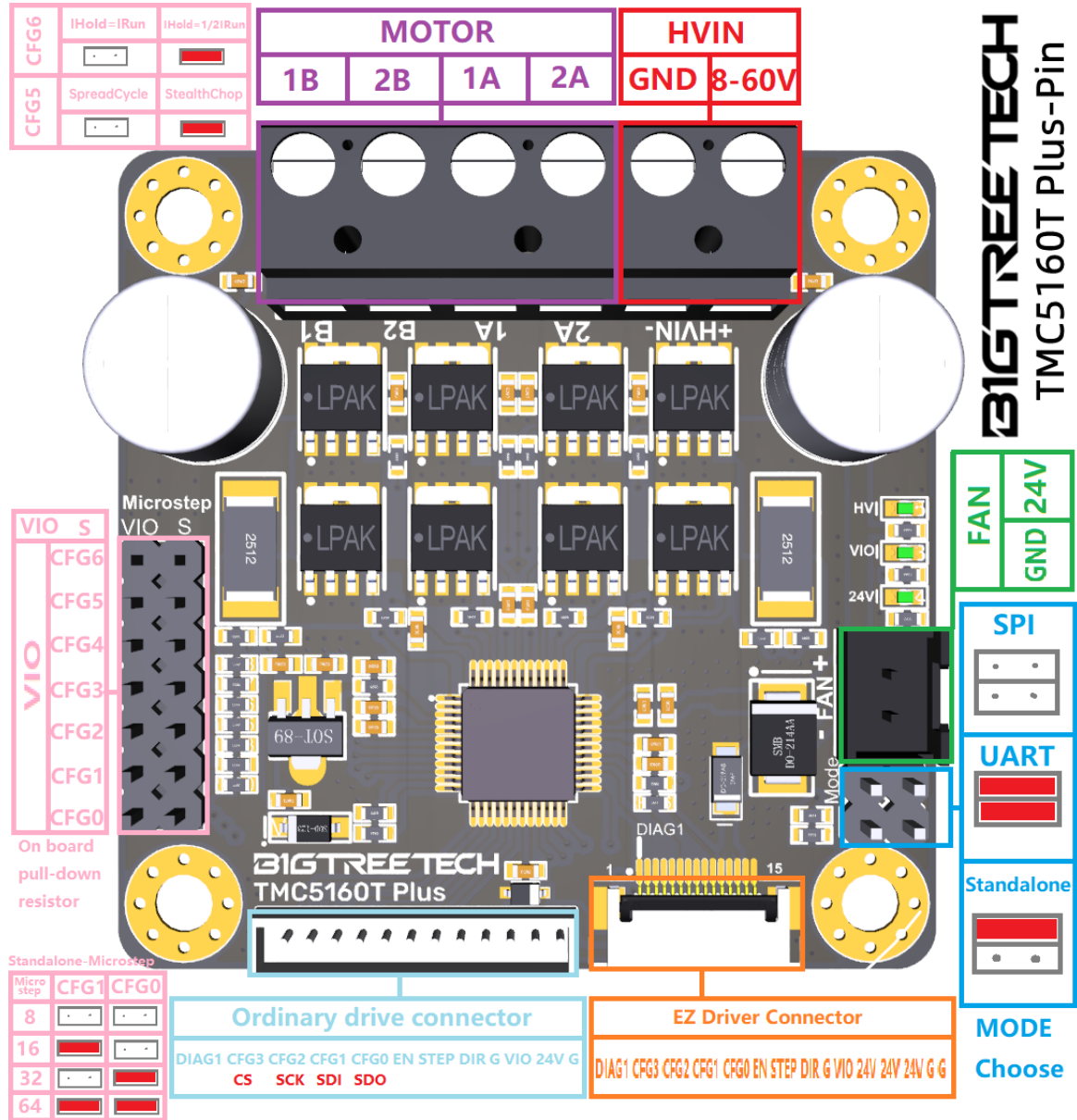
Input Voltage (HVIN)	8V-60V
Maximum Effective Current	10.6A, Sine Wave Peak Current 15A
Capacitor	2 x 560uF
Maximum Subdivision	256
Operating Mode	SPI, SD
Sampling Resistor	22mΩ

## Peripheral Interface

### Dimensions



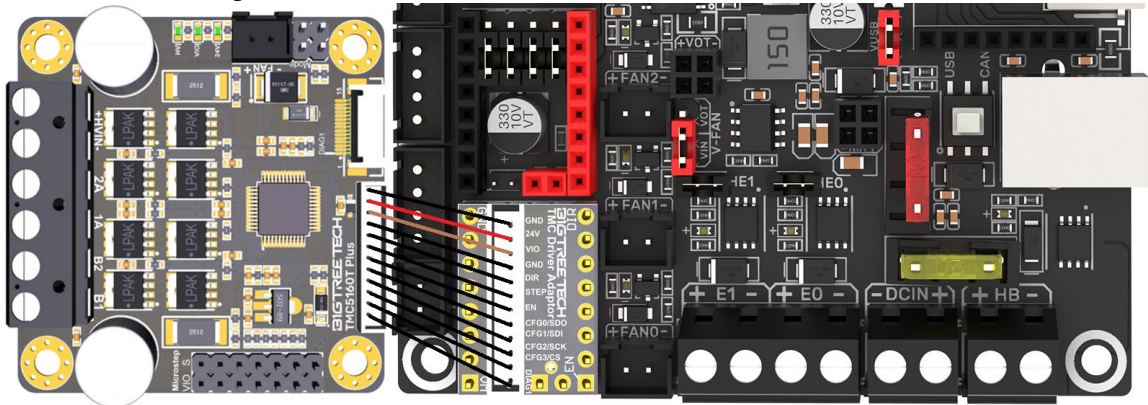
### Pin Description



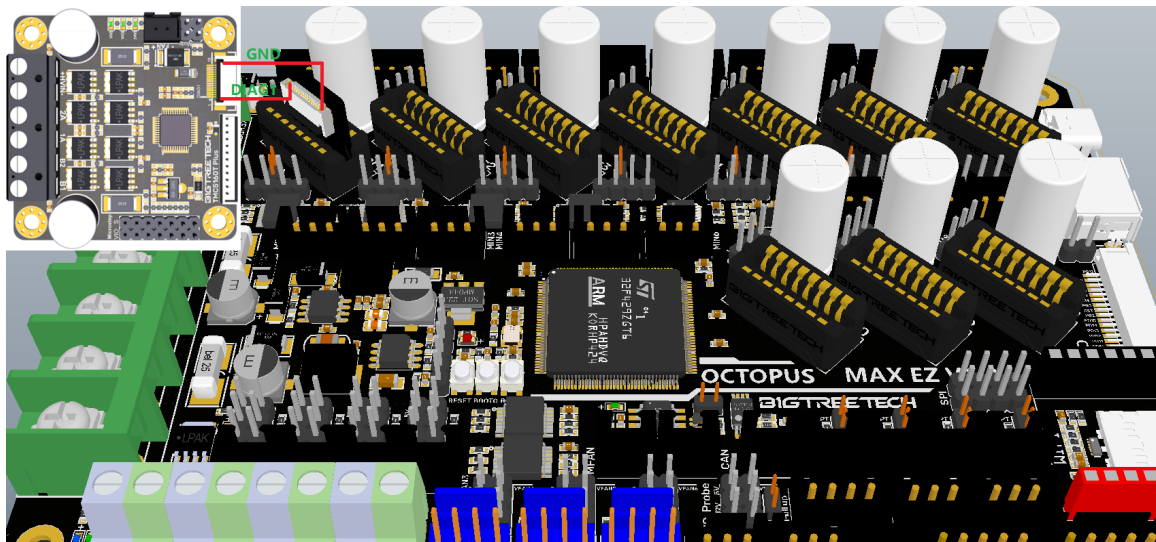
## Interface Introduction

### Installation and Interface

Connection methods for common motherboards (e.g., SKR3), use the supplied TMC Driver Adaptor and cables to connect the TMC5160T Plus with SKR3 as shown in the diagram:



For EZ series motherboards (e.g., Octopus MAX EZ), use the supplied EZ Driver Adaptor and cables to connect the TMC5160T Plus with Octopus MAX EZ as shown in the diagram:

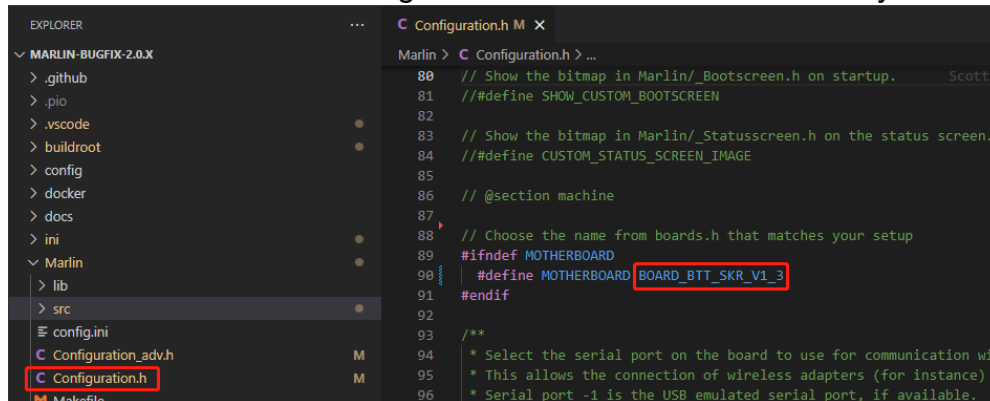


## Firmware Settings

### Marlin Firmware Settings

**Important Note:** Currently, only Marlin 2.0 and later firmware versions support TMC5160's SPI mode.

**Step 1:** In the Marlin 2.0 firmware, locate and open the "Configuration.h" file, then find the line "#define MOTHERBOARD XXXXXX". "XXXXXX" represents the model of the board being used. Confirm the motherboard you are using.

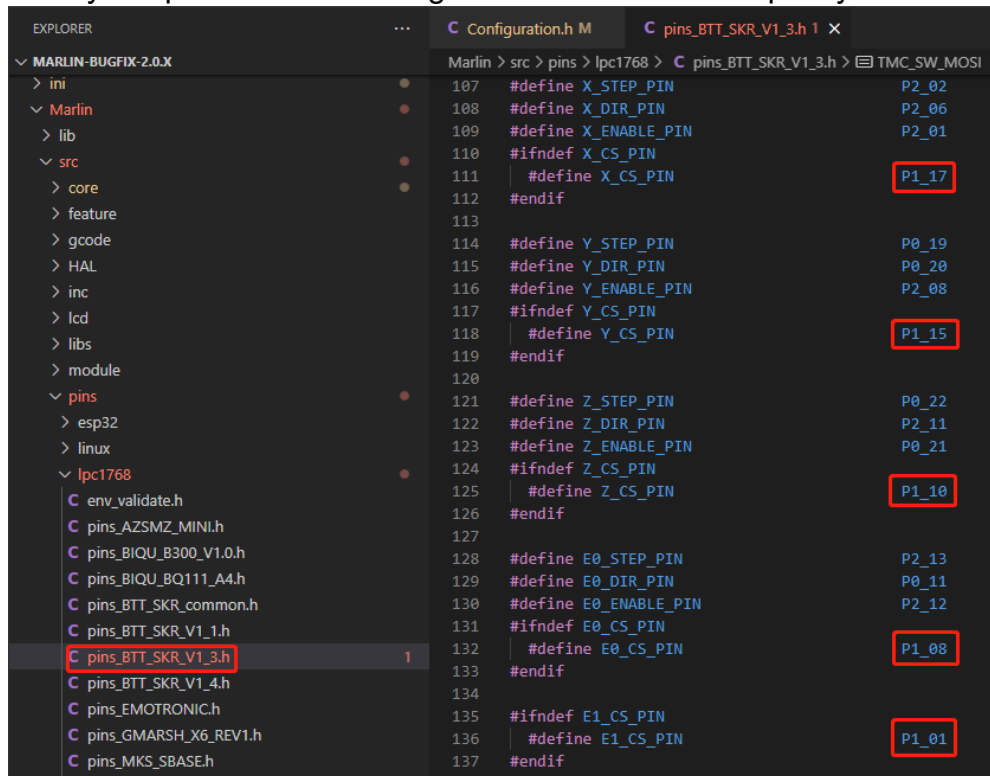


```

80 // Show the bitmap in Marlin/_Bootscreen.h on startup.      Scott
81 // #define SHOW_CUSTOM_BOOTSCREEN
82
83 // Show the bitmap in Marlin/_Statusscreen.h on the status screen.
84 // #define CUSTOM_STATUS_SCREEN_IMAGE
85
86 // @section machine
87
88 // Choose the name from boards.h that matches your setup
89 #ifndef MOTHERBOARD
90   #define MOTHERBOARD BOARD_BTT_SKR_V1_3
91 #endif
92
93 /**
94  * Select the serial port on the board to use for communication with
95  * This allows the connection of wireless adapters (for instance) to
96  * Serial port -1 is the USB emulated serial port, if available.

```

**Step 2:** In the Marlin\src\pins directory, find the "pins\_XXXXX.h" file corresponding to your board (XXXXXX represents the board model), and then locate "X\_CS\_PIN", "Y\_CS\_PIN", "Z\_CS\_PIN", and "EO\_CS\_PIN" within the file. Modify the pin names following these variables to the pins you are using.



```

107 #define X_STEP_PIN P2_02
108 #define X_DIR_PIN P2_06
109 #define X_ENABLE_PIN P2_01
110 #ifndef X_CS_PIN
111   #define X_CS_PIN P1_17
112 #endif
113
114 #define Y_STEP_PIN P0_19
115 #define Y_DIR_PIN P0_20
116 #define Y_ENABLE_PIN P2_08
117 #ifndef Y_CS_PIN
118   #define Y_CS_PIN P1_15
119 #endif
120
121 #define Z_STEP_PIN P0_22
122 #define Z_DIR_PIN P2_11
123 #define Z_ENABLE_PIN P0_21
124 #ifndef Z_CS_PIN
125   #define Z_CS_PIN P1_10
126 #endif
127
128 #define E0_STEP_PIN P2_13
129 #define E0_DIR_PIN P0_11
130 #define E0_ENABLE_PIN P2_12
131 #ifndef E0_CS_PIN
132   #define E0_CS_PIN P1_08
133 #endif
134
135 #ifndef E1_CS_PIN
136   #define E1_CS_PIN P1_01
137 #endif

```



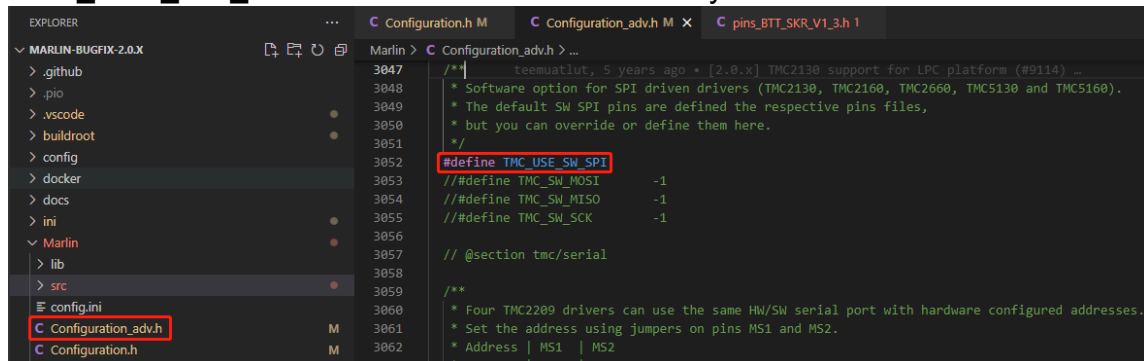
**Step 3:** In the file from Step 2, locate "`#define TMC_SW_MOSI XXX`", "`#define TMC_SW_MISO XXX`", and "`#define TMC_SW_SCK XXX`". Change "XXX" to the pins you want to use.

```

139 //
140 // Software SPI pins for TMC2130 stepper drivers
141 //
142 #if ENABLED(TMC_USE_SW_SPI)
143   #ifndef TMC_SW_MOSI
144     #define TMC_SW_MOSI P4_28
145   #endif
146   #ifndef TMC_SW_MISO
147     #define TMC_SW_MISO P0_05
148   #endif
149   #ifndef TMC_SW_SCK
150     #define TMC_SW_SCK P0_04
151   #endif
152 #endif

```

**Step 4:** Find and open "`Configuration_adv.h`", then locate "`#define TMC_USE_SW_SPI`" and remove the comment symbols "`///  
//`".

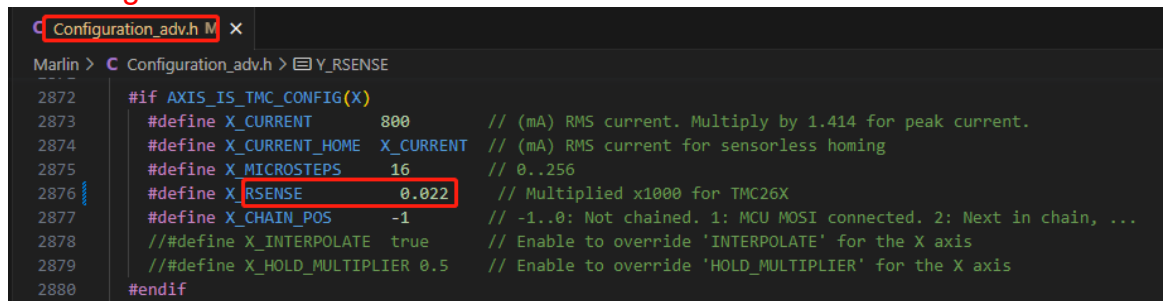


```

3047 /**
3048  * Software option for SPI driven drivers (TMC2130, TMC2160, TMC2660, TMC5130 and TMC5160).
3049  * The default SW SPI pins are defined in the respective pins files,
3050  * but you can override or define them here.
3051  */
3052 #define TMC_USE_SW_SPI
3053 // #define TMC_SW_MOSI -1
3054 // #define TMC_SW_MISO -1
3055 // #define TMC_SW_SCK -1
3056
3057 // @section tmc/serial
3058
3059 /**
3060  * Four TMC2209 drivers can use the same HW/SW serial port with hardware configured addresses.
3061  * Set the address using jumpers on pins MS1 and MS2.
3062  * Address | MS1 | MS2
3063  * -----|----|----

```

**Step 5:** In the "`Configuration_adv.h`" file, find "`#define X_CURRENT`", "`#define X_MICROSTEPS`", and "`#define X_RSENSE`" and modify the parameters that follow (for each axis being used). The RSENSE value for each used axis should be changed to "0.022".



```

Marlin > Configuration_adv.h > Y_RSENSE
2872 #if AXIS_IS_TMC_CONFIG(X)
2873   #define X_CURRENT 800 // (mA) RMS current. Multiply by 1.414 for peak current.
2874   #define X_CURRENT_HOME X_CURRENT // (mA) RMS current for sensorless homing
2875   #define X_MICROSTEPS 16 // 0..256
2876   #define X_RSENSE 0.022 // Multiplied x1000 for TMC26X
2877   #define X_CHAIN_POS -1 // -1..0: Not chained. 1: MCU MOSI connected. 2: Next in chain, ...
2878   // #define X_INTERPOLATE true // Enable to override 'INTERPOLATE' for the X axis
2879   // #define X_HOLD_MULTIPLIER 0.5 // Enable to override 'HOLD_MULTIPLIER' for the X axis
2880 #endif

```

## Step 6: Set the corresponding axis drive type to "TMC5160" in the "Configuration.h" file.

```

153 /** DerAndere, 23 months ago · Support for up to 6 linear axes (#19112) ...
154 * Stepper Drivers
155 *
156 * These settings allow Marlin to tune stepper driver timing and enable advanced options for
157 * stepper drivers that support them. You may also override timing options in Configuration_adv.h.
158 *
159 * Use TMC2208/TMC2208_STANDALONE for TMC2225 drivers and TMC2209/TMC2209_STANDALONE for TMC2226 drivers.
160 *
161 * Options: A4988, A5984, DRV8825, LV8729, TB6560, TB6600, TMC2100,
162 *          TMC2130, TMC2130_STANDALONE, TMC2160, TMC2160_STANDALONE,
163 *          TMC2208, TMC2208_STANDALONE, TMC2209, TMC2209_STANDALONE,
164 *          TMC226X, TMC226X_STANDALONE, TMC2660, TMC2660_STANDALONE,
165 *          TMC5130, TMC5130_STANDALONE, TMC5160, TMC5160_STANDALONE
166 * :['A4988', 'A5984', 'DRV8825', 'LV8729', 'TB6560', 'TB6600', 'TMC2100', 'TMC2130', 'TMC2130_STANDALONE',
167 * ]
168 #define X_DRIVER_TYPE  TMC5160
169 #define Y_DRIVER_TYPE  TMC5160
170 #define Z_DRIVER_TYPE  TMC5160
171 //#define X2_DRIVER_TYPE  A4988
172 //#define Y2_DRIVER_TYPE  A4988
173 //#define Z2_DRIVER_TYPE  A4988
174 //#define Z3_DRIVER_TYPE  A4988
175 //#define Z4_DRIVER_TYPE  A4988
176 //#define I_DRIVER_TYPE  A4988
177 //#define J_DRIVER_TYPE  A4988
178 //#define K_DRIVER_TYPE  A4988
179 //#define U_DRIVER_TYPE  A4988
180 //#define V_DRIVER_TYPE  A4988
181 //#define W_DRIVER_TYPE  A4988
182 #define E0_DRIVER_TYPE TMC5160
183 #define E1_DRIVER_TYPE TMC5160
184 //#define E2_DRIVER_TYPE  A4988
185 //#define E3_DRIVER_TYPE  A4988
186 //#define E4_DRIVER_TYPE  A4988
187 //#define E5_DRIVER_TYPE  A4988
188 //#define E6_DRIVER_TYPE  A4988
189 //#define E7_DRIVER_TYPE  A4988

```

## Klipper Firmware Settings

```

[tmc5160 stepper_x]
cs_pin: P1.17
spi_software_miso_pin: P0.5
spi_software_mosi_pin: P4.28
spi_software_sclk_pin: P0.4
sense_resistor: 0.022
#diag1_pin: P1.29
run_current: 0.800
stealthchop_threshold: 999999

```

**Note:** The default **sense\_resistor** in Klipper is 0.075; it needs to be set to 0.022.

## Safety Instructions

1. Turn off the power before installing the driver to prevent damage.
2. Do not plug or unplug the driver module with power on to avoid damage.
3. Be cautious of polarity when connecting; reversing can cause the driver to burn out.
4. The factory-installed heat sink should not be removed, as doing so will decrease heat dissipation in the absence of thermal interface material.
5. For large currents (greater than 3A), active cooling is required for normal operation.
6. This product uses a 0.022R sampling resistor, so the maximum effective driving current is 10.6A.
7. Pay attention to the power sequence; ensure the driver power is turned on before the logic power. That is, turn on the driver power first, then power on the motherboard.
8. Regardless of whether the driver uses high or low voltage power delivery, the output voltage from the main control board to the drive must not exceed 24V; exceeding this will damage the driver.

If you need further resources for this product, you can find them at [GitHub](<https://github.com/bigtreetech/>). If you cannot find what you need, you may contact our after-sales support([service005@biqu3d.com](mailto:service005@biqu3d.com)).

If you encounter any other problems during use or have suggestions or feedback, please contact us. Thank you for choosing BIGTREETECH products.