



# Makerbase

广州谦辉信息科技有限公司

Guangzhou Qianhui Information Technology Co.,Ltd.

## MKS BASE Motherboard Manual

MAKER BASE

QQ Discussion Group:489095605 232237692


E-mail:Huangkaida@makerbase.com.cn

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Firmware version update

Firmware version	Modified Time	Modify Content	Note
V1.5	2016.11	1.Add two normally open output interfaces for fan and LED light interfaces	
V1.6	2017.9	1. All changed to color terminals; 2. Modify the power supply part circuit.	

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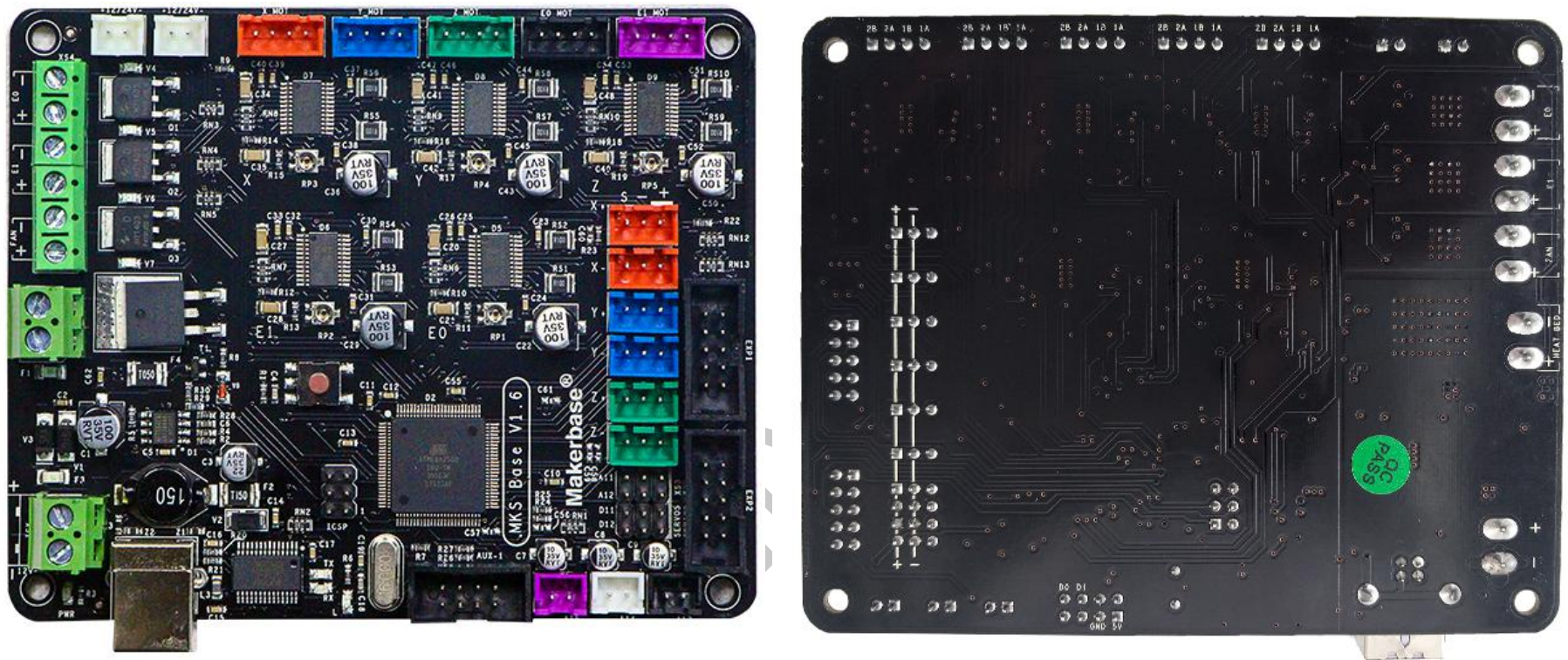
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## I Overview

MKS Base is a product developed by MKS .For the problems of the ramps1.4 open source motherboard, especially optimized R & D.At present, the very stable 3D printer main control board is suitable for mass production of 3D printers as the main control board. Compared with Ramps1.4, it adds one E1 heating output, which is more suitable for double-head printers.



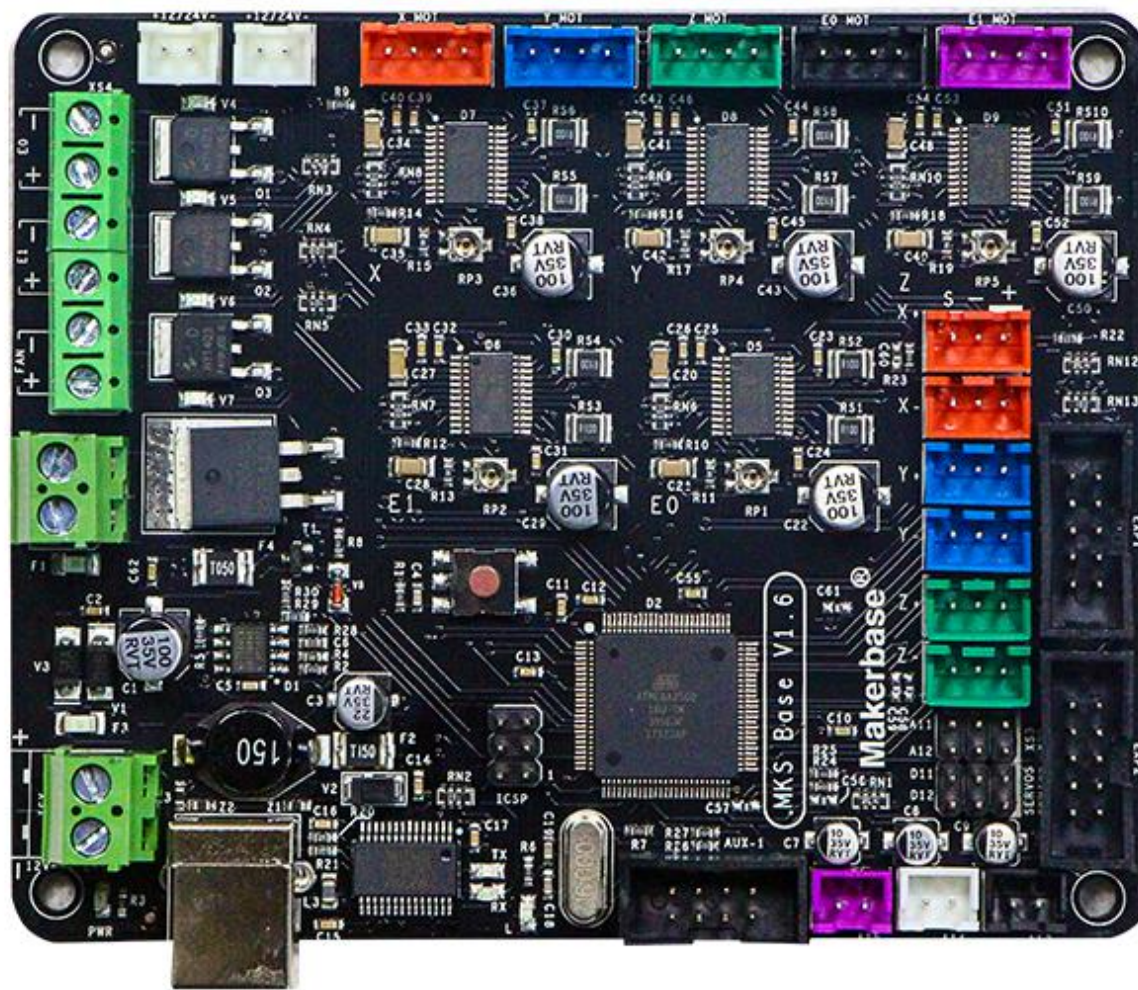
## II Features

1. The 2560 and ramps1.4 are assembled on one board, which solves the cumbersome and troublesome problem of the Ramps1.4 combination interface.
2. Using the international FT232 high-end USB to serial communication scheme, the data transmission is stable.
3. Using the 4982 as a motor drive, it has the same performance as the 4988, but with a SOP package, the heat dissipation is better.
4. The board uses a high-quality 4-layer board and is specially designed for heat dissipation;
5. High quality MOSFET is used for better heat dissipation.
6. Using a dedicated power chip to support 12V-24V power input, solve the heating problem of Ramps voltage conversion chip.;
7. Can accept 24V input, the same system power can reduce the hot bed current to 1/4, effectively solve the hot bed MOS tube heating problem..
8. Firmware can use the open source firmware Marlin, the configuration is exactly the same as ramps1.4, which can directly replace Ramps1.4.
9. It can be directly connected to Ramps1.4, 2004LCD control panel and 12864LCD control panel.
10. Fully consider stability, heat dissipation, and ease of use issues, and pass continuous printing reliability testing.

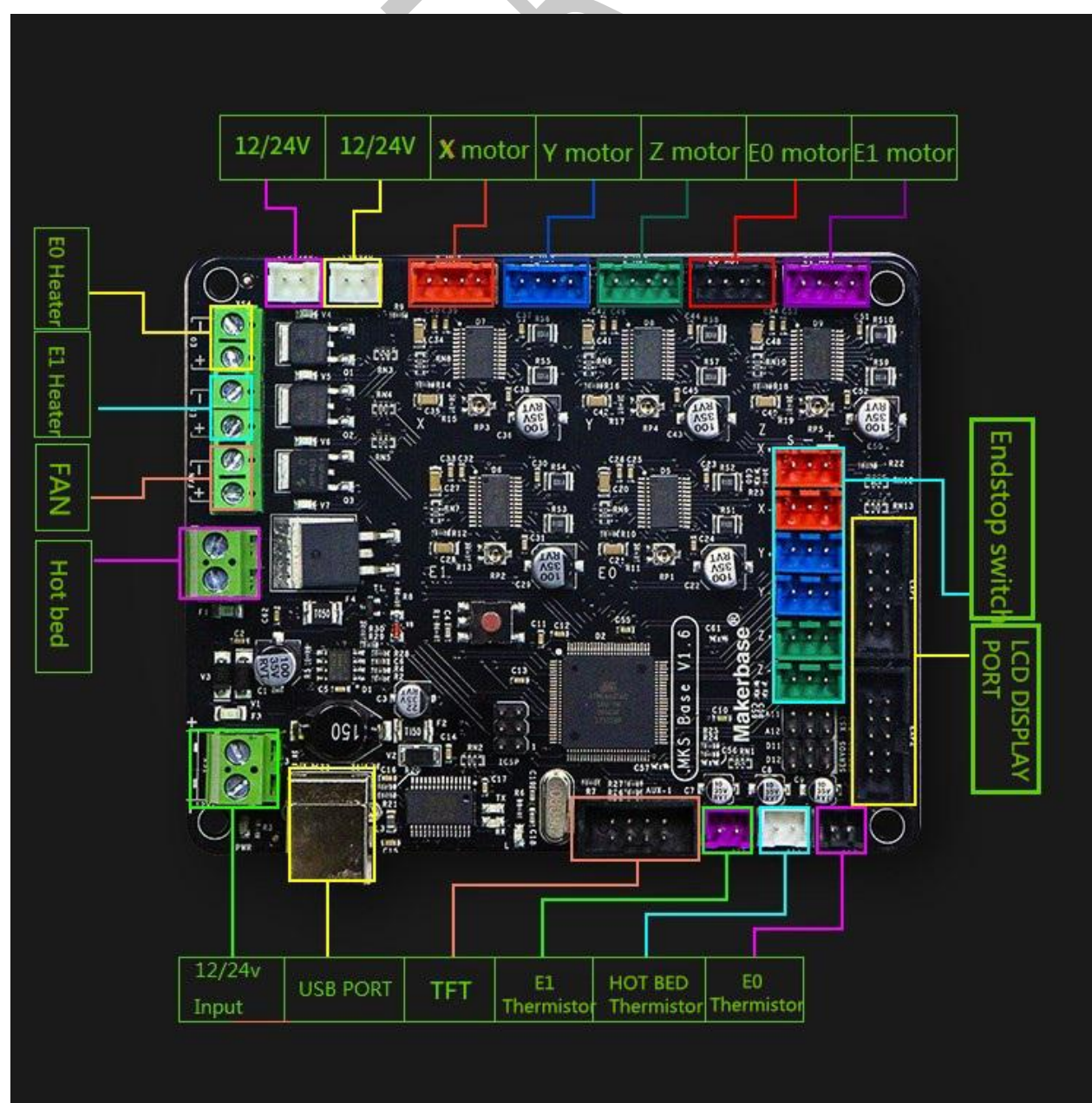


### III The connection description and size chart

#### 1 MKS Base v1.6 motherboard product

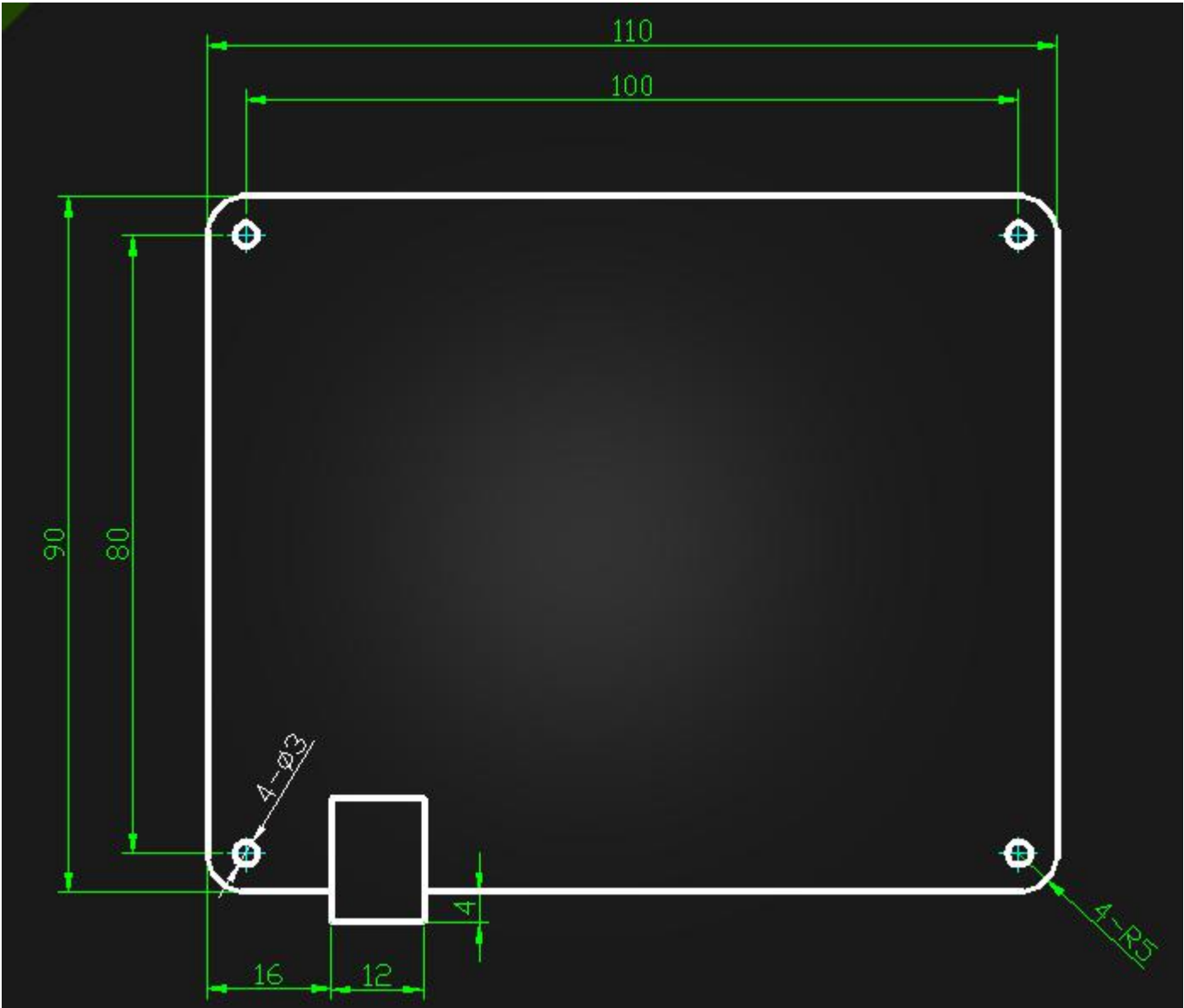


#### 2 System connection diagram

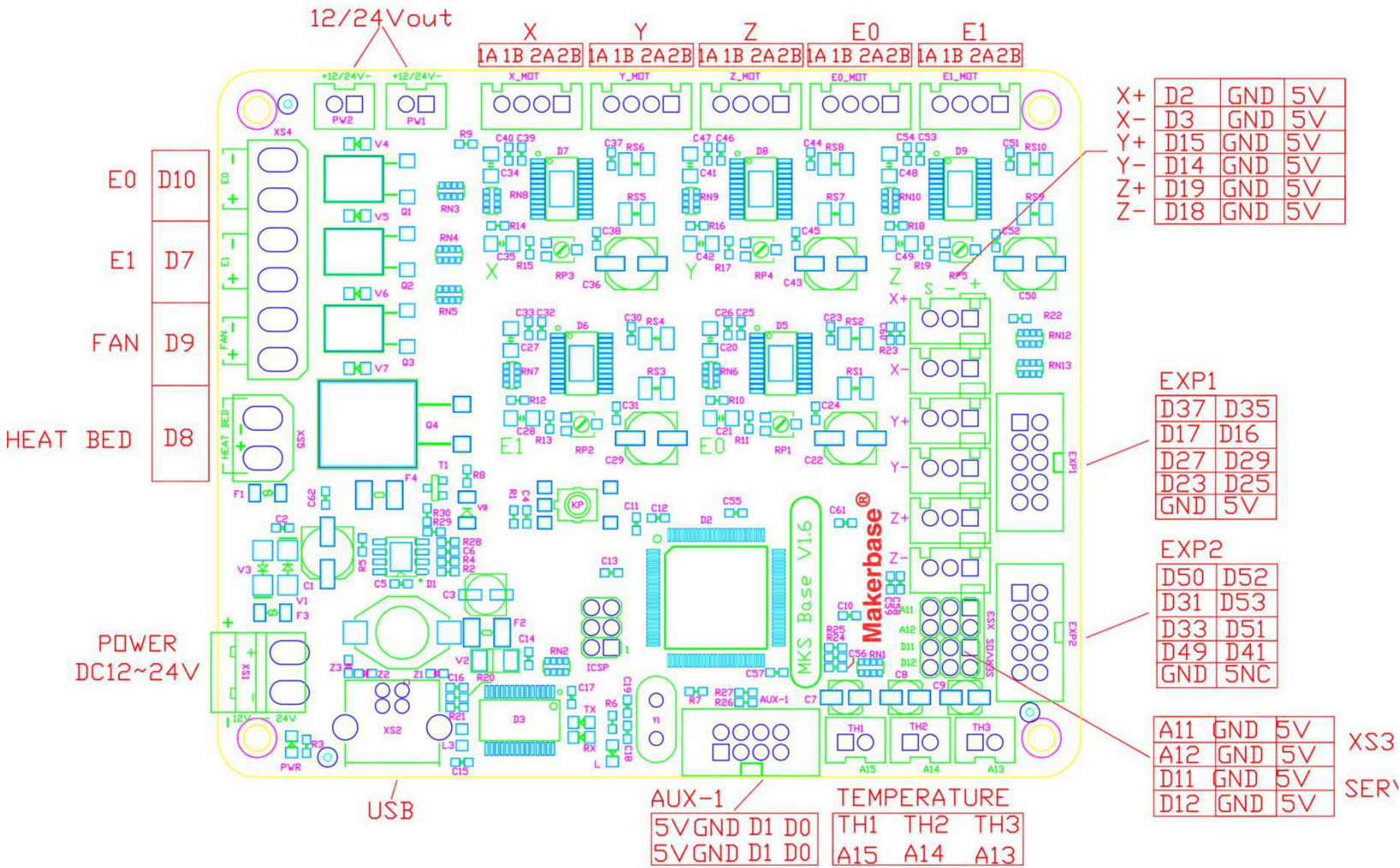




3 MKS Base v1.6 Installation Dimensional Drawing



4 MKS Base V1.6 PIN Port





## IV Instructions

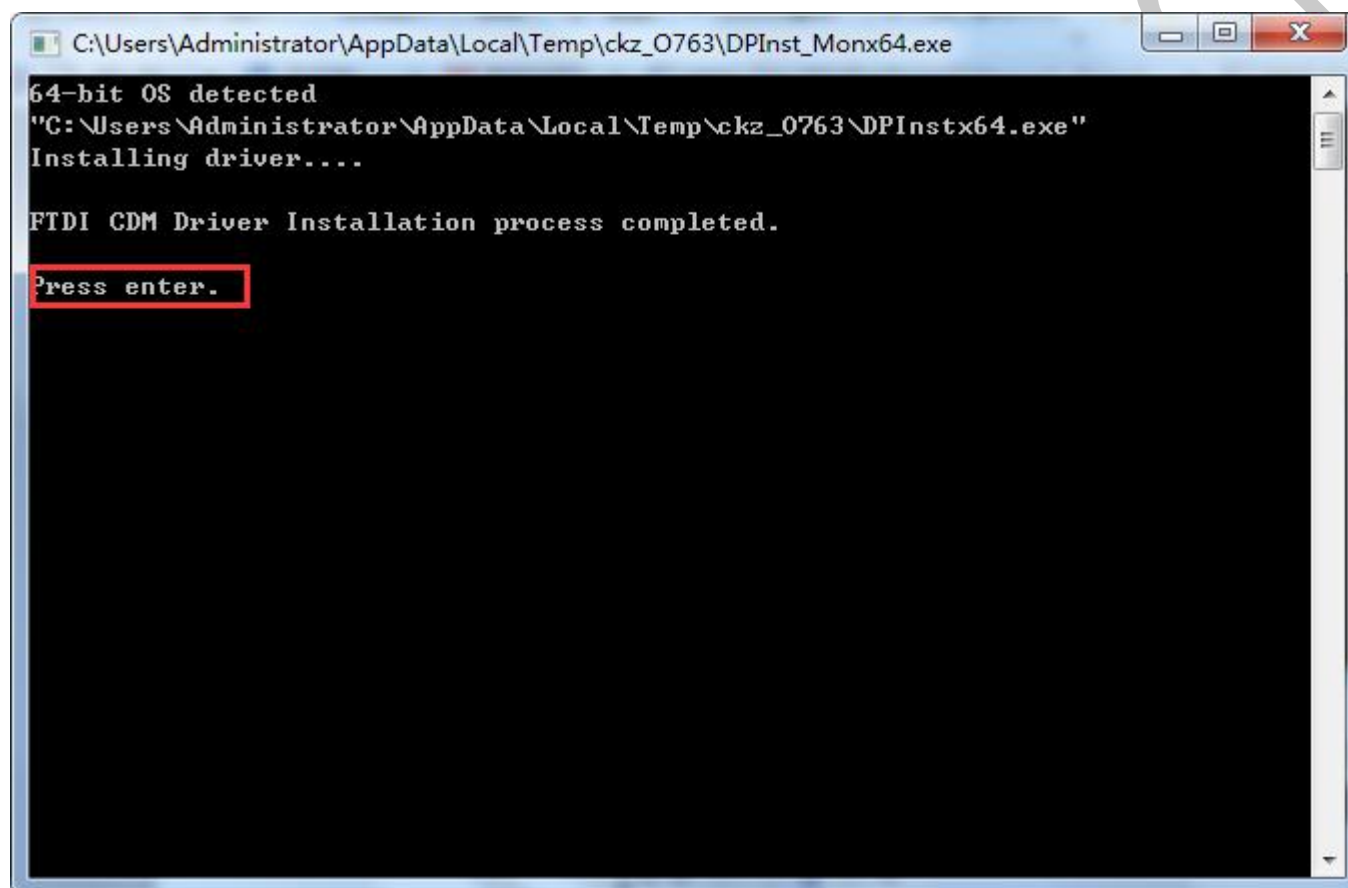
1 The ways to get the MKS Base v1.6 Latest Firmware.

- Get firmware from customer service or technician
- Download the firmware from the makerbase discussion group.
- Download on Web:

<https://github.com/makerbase-mks?tab=repositories>

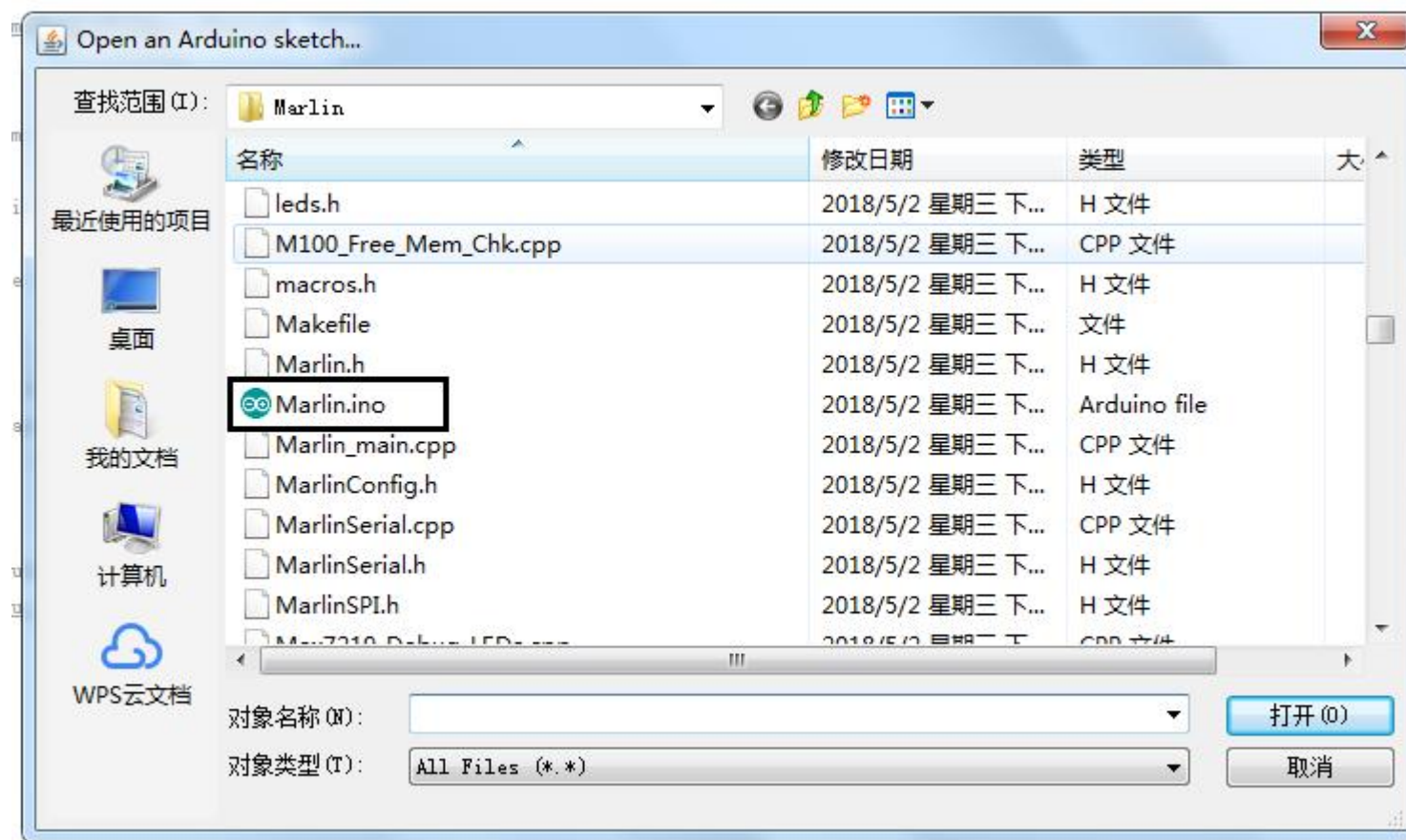
2 USB driver Installation

2.1 First find the driver installation file on the computer, click ftdi\_ft232\_drive.exe to install the driver

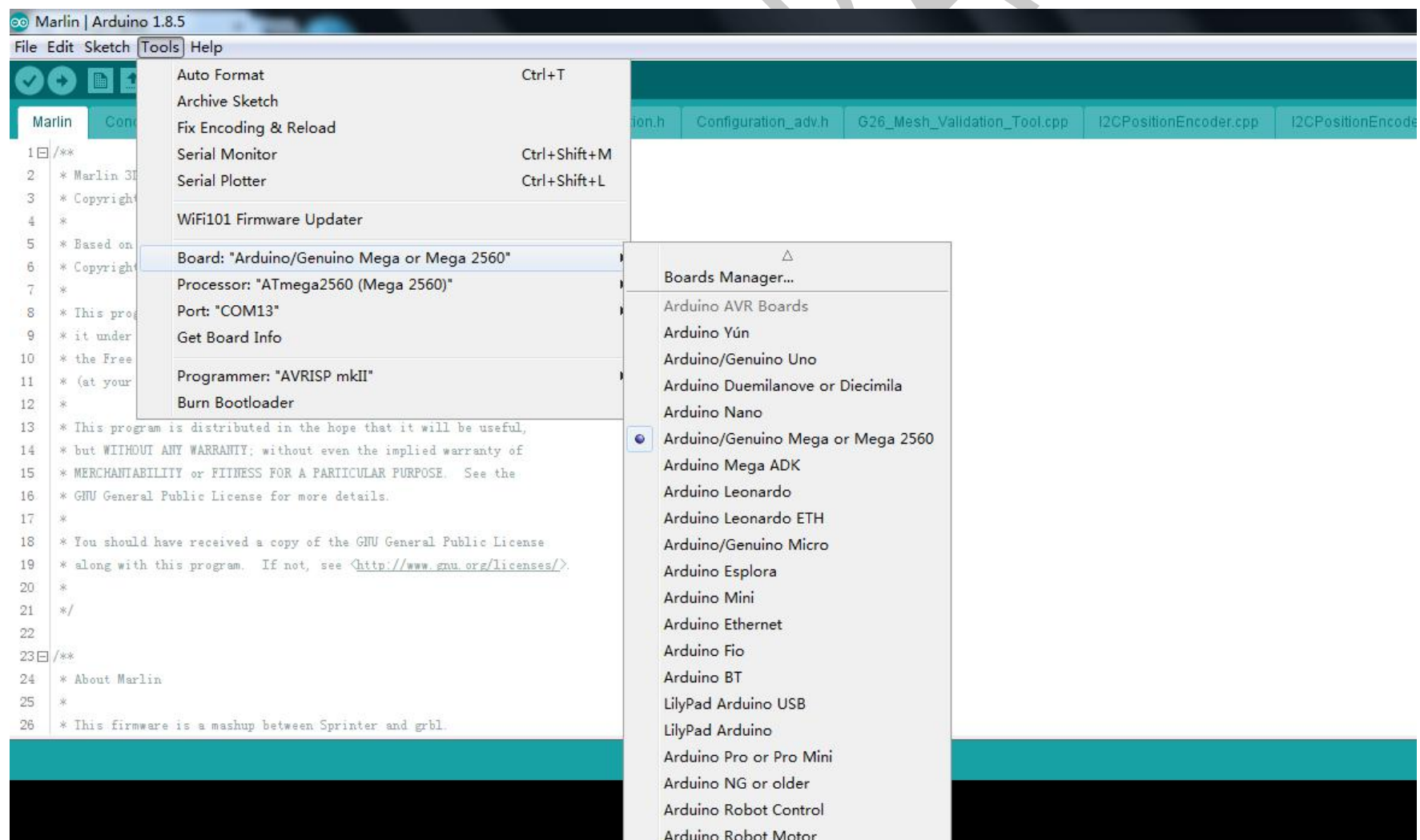


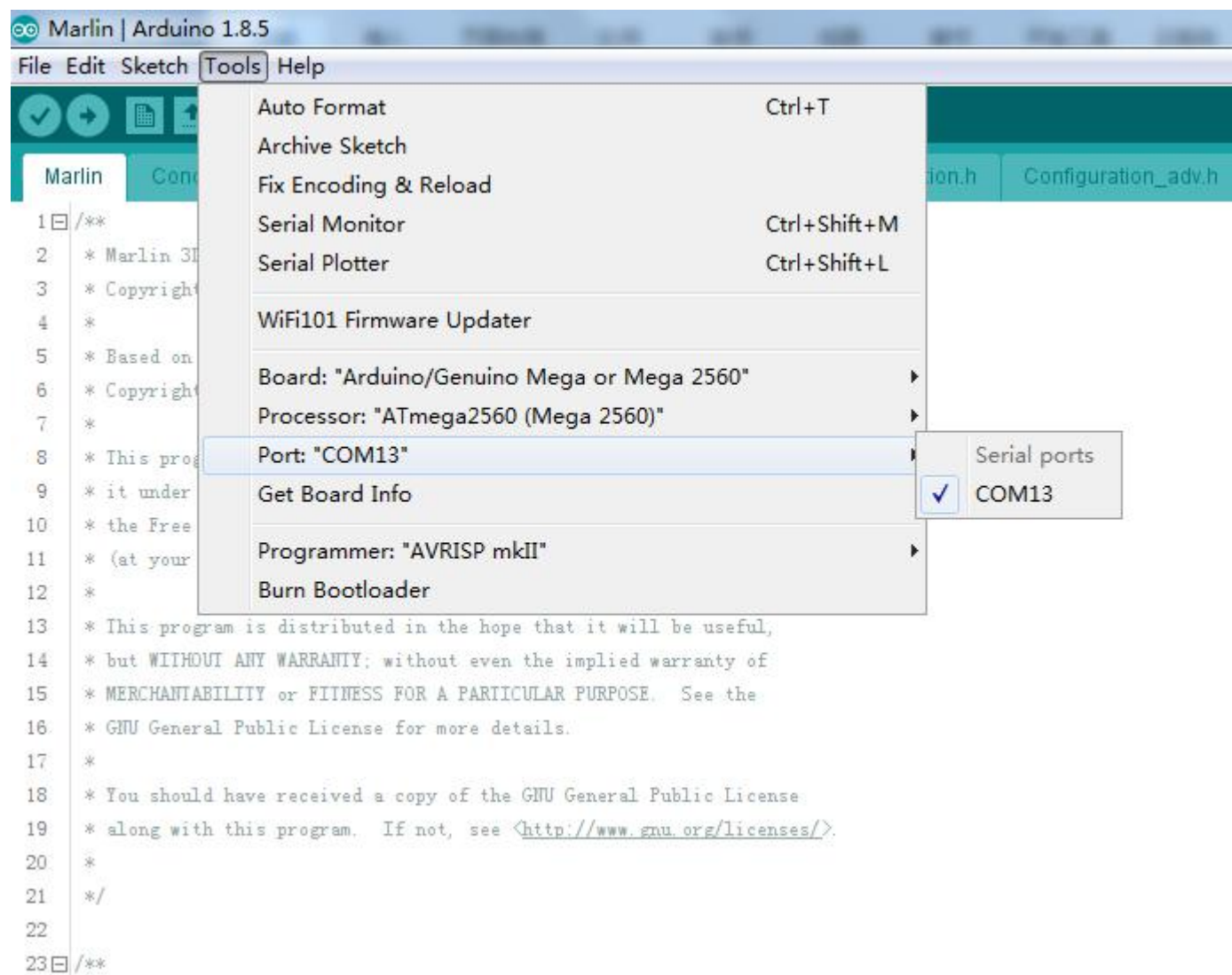
3 Upload the marlin firmware

Start uploading the marlin firmware, open the Arduino, execute "File" "Open", select the marlin firmware to be uploaded, and select the file with the suffix \*.pde or \*.ino to open;

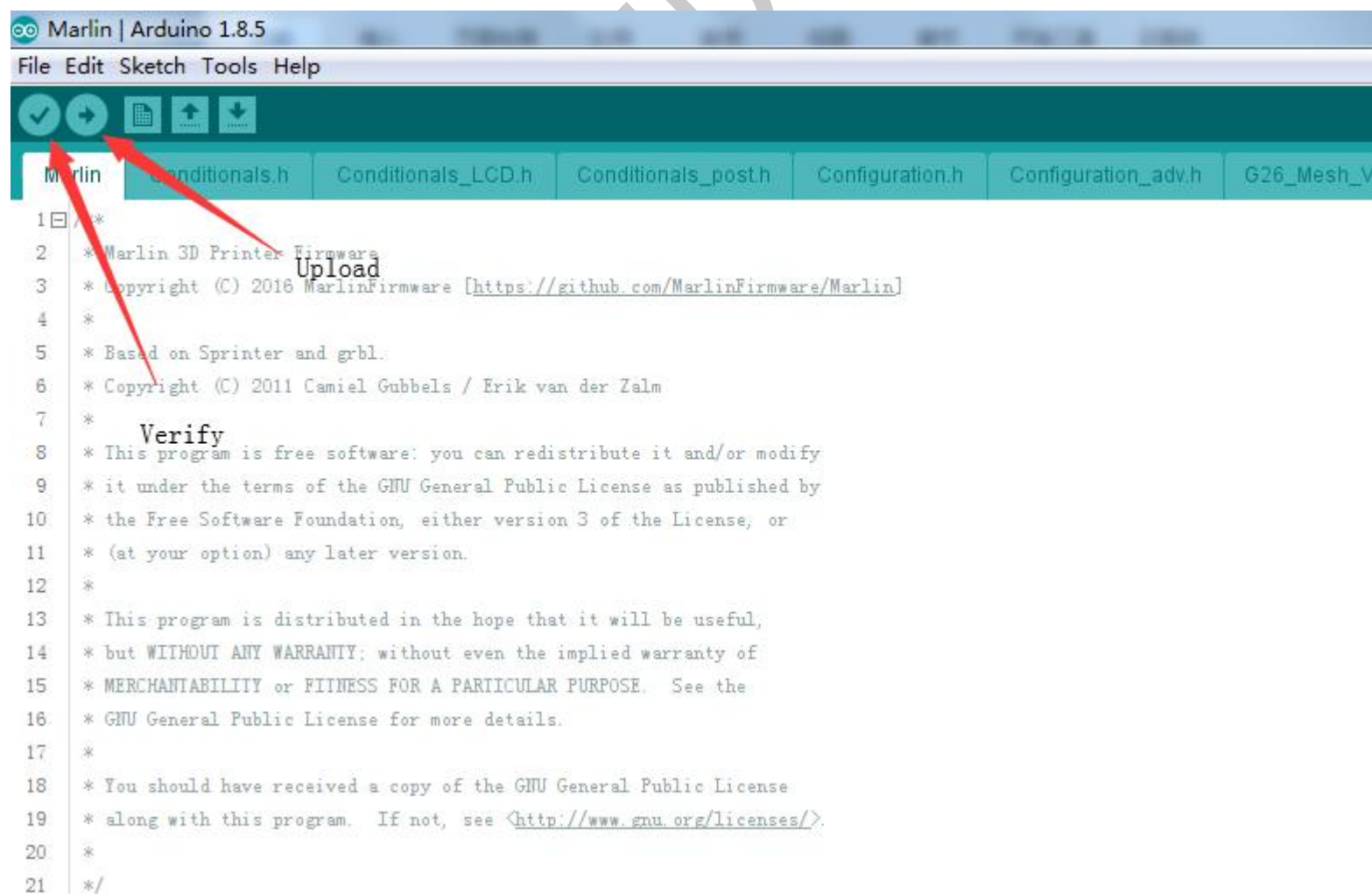


After opening, select the board type in the toolbar on the Arduino software and select the COM port of the port.





Click "Upload" (you can also verify first, then upload)





After clicking upload, it will compile and download again. When downloading, you can see that the indicator light of the motherboard will flash, indicating that the firmware is being uploaded. After the firmware upload is completed, the indicator light stops flashing, and Arduino shows that the upload is successful.

```
8  * This program is free software: you can redistribute it and/or modify
9  * it under the terms of the GNU General Public License as published by
10 * the Free Software Foundation, either version 3 of the License, or
11 * (at your option) any later version.
12 *
13 * This program is distributed in the hope that it will be useful,
14 * but WITHOUT ANY WARRANTY; without even the implied warranty of
15 * MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE. See the
16 * GNU General Public License for more details.
17 *
18 * You should have received a copy of the GNU General Public License
19 * along with this program. If not, see <http://www.gnu.org/licenses/>.
20 *
21 */
22
23 ☐ /**
24 * @author Morlin
```

```
Done uploading.
avrdude: 112454 bytes of flash verified

avrdude done. Thank you.
```

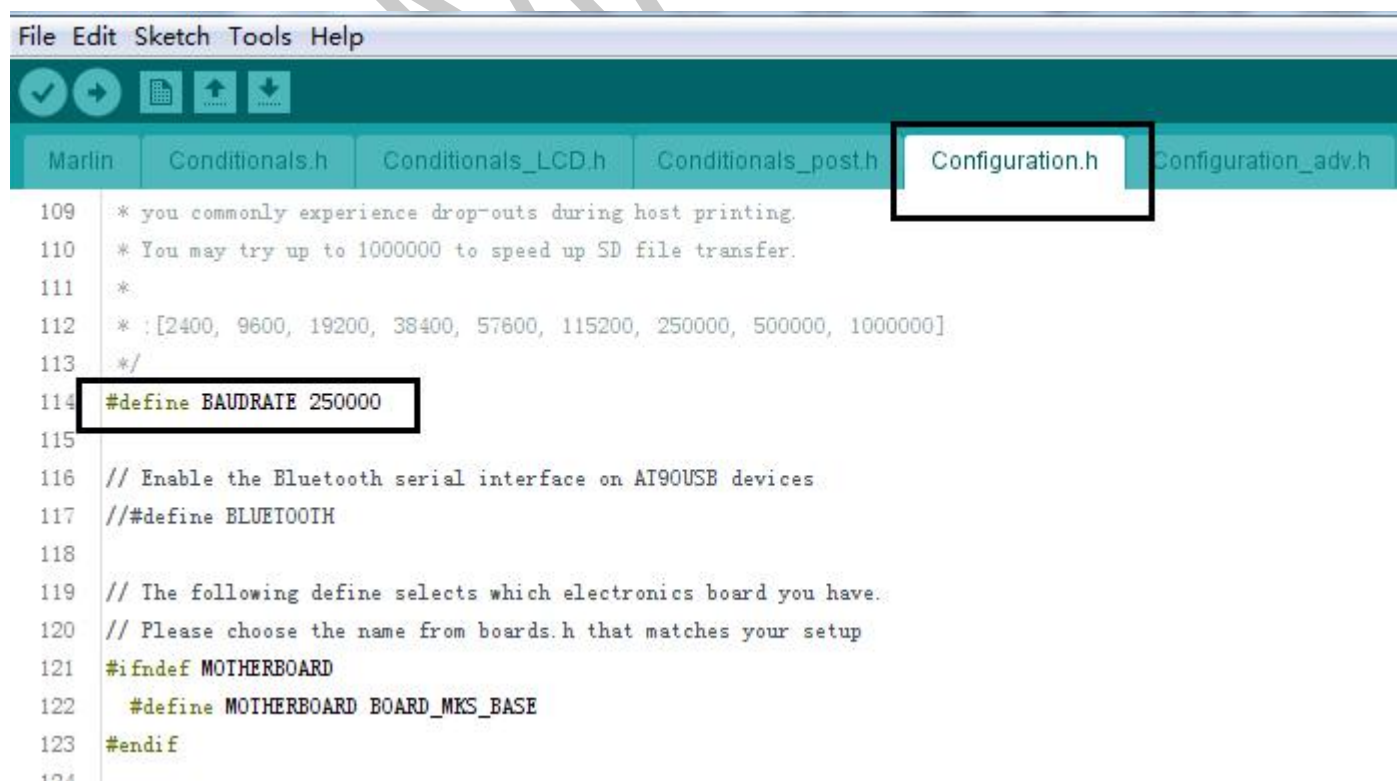
MAKER BI

## V modify the firmware

The basic configuration of Marlin firmware is generally carried out in the configuration.h file. I need to modify it to list it in the table. Download the corresponding firmware in the group file only need to modify the sensor type, motor direction, maximum stroke, pulse. That's it.

Number	Types	explanation
1	Baud rate	The baud rate must be consistent with the host computer to communicate.
2	Motherboard type	The type for mks is BOARD_RAMPS_14_EFB
3	Sensor type	Sensor type for temperature detection
4	End stop switch type	Set the switch type to normally open or normally closed
5	Motor direction	Set the direction in which each motor returns to zero
6	Maximum stroke of each axis	Set according to the size of the model itself
7	Pulse	Set the number of pulses per mm for each axis
8	LCD display type	The type of display used when printing offline (if the touch screen is defined by any one of them)

1. Select the baud rate, generally 115200 and 250,000, the baud rate should be consistent with the baud rate selected by the host computer to communicate.

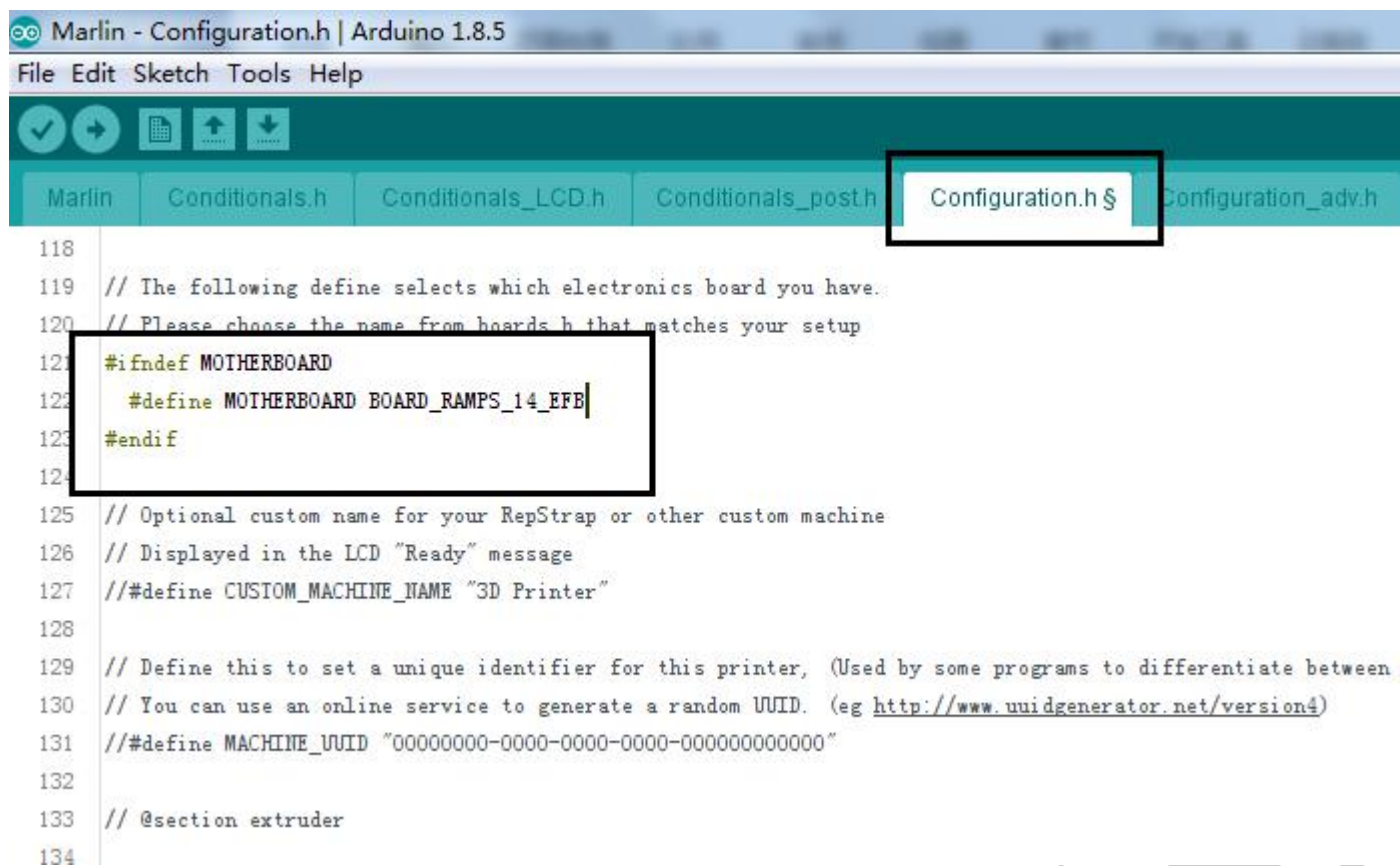


```

File Edit Sketch Tools Help
[Icons]
Marlin Conditionals.h Conditionals_LCD.h Conditionals_post.h Configuration.h Configuration_adv.h
109  * you commonly experience drop-outs during host printing.
110  * You may try up to 1000000 to speed up SD file transfer.
111  *
112  * :[2400, 9600, 19200, 38400, 57600, 115200, 250000, 500000, 1000000]
113  */
114  #define BAUDRATE 250000
115
116  // Enable the Bluetooth serial interface on AT90USB devices
117  //#define BLUETOOTH
118
119  // The following define selects which electronics board you have.
120  // Please choose the name from boards.h that matches your setup
121  #ifndef MOTHERBOARD
122    #define MOTHERBOARD BOARD_MKS_BASE
123  #endif
124

```

2. Motherboard type, the motherboard of the maker base selects BOARD\_RAMPS\_14\_EFB.(or BOARD\_MKS\_BASE)




```

118
119 // The following define selects which electronics board you have...
120 // Please choose the name from boards.h that matches your setup
121
122 #ifndef MOTHERBOARD
123   #define MOTHERBOARD BOARD_RAMPS_14_EFB
124 #endif
125
126 // Optional custom name for your RepStrap or other custom machine
127 // Displayed in the LCD "Ready" message
128 // #define CUSTOM_MACHINE_NAME "3D Printer"
129
130 // Define this to set a unique identifier for this printer, (Used by some programs to differentiate between machines)
131 // You can use an online service to generate a random UUID. (eg http://www.uuidgenerator.net/version4)
132 // #define MACHINE_UUID "00000000-0000-0000-0000-000000000000"
133
134 // @section extruder

```

3. The sensor type is generally NTC 100K thermistor, PT100 thermocouple, AD597 thermocouple and so on. You can choose according to your own thermal type.



```

286 *
287 * :{ '0': "Not used", '1': "100k / 4.7k - EPCOS", '2': "200k / 4.7k - ATC Semitec 204GI-2", '3': "Mendel-parts / 4.7k"
288 */
289 #define TEMP_SENSOR_0 1
290 #define TEMP_SENSOR_1 0
291 #define TEMP_SENSOR_2 0
292 #define TEMP_SENSOR_3 0
293 #define TEMP_SENSOR_4 0
294 #define TEMP_SENSOR_BED 1
295

```

If using a PT100 thermocouple, you need to modify the PIN port to be connected in pins\_RAMPS.h, for example, the A11 pin of the MKS Base motherboard. Modify as follows:

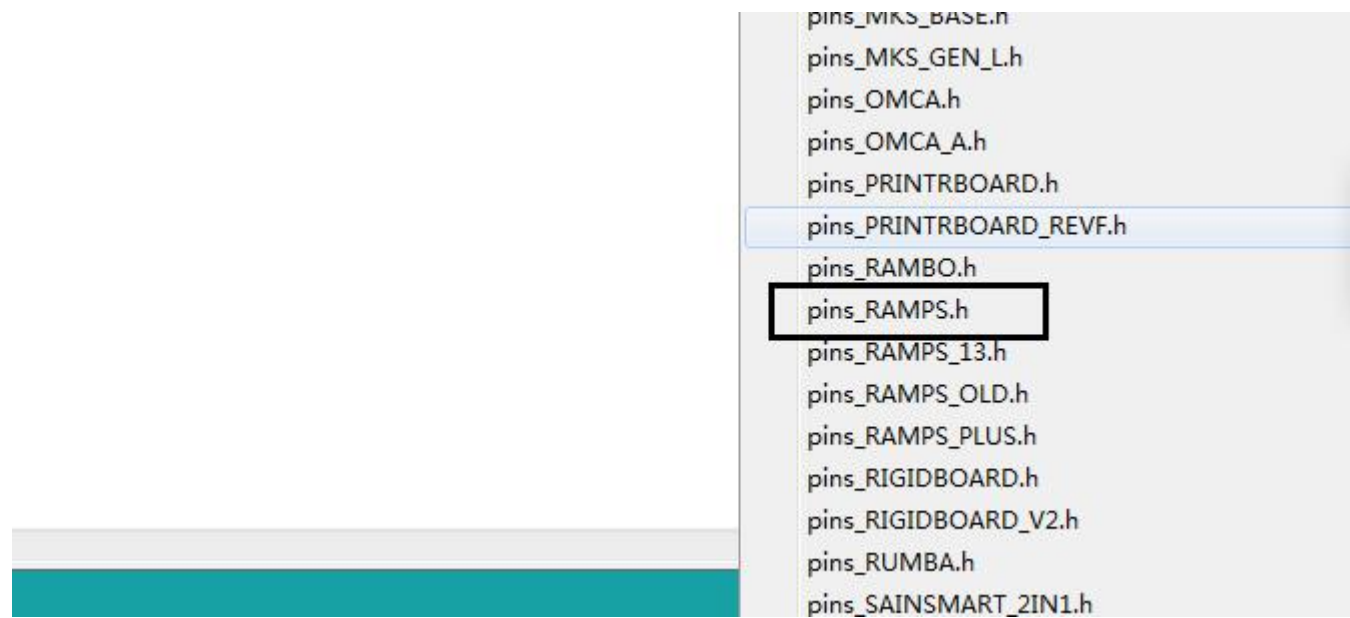


```

286 *
287 * :{ '0': "Not used", '1': "100k / 4.7k - EPCOS", '2': "200k / 4.7k - ATC Semitec 204GI-2", '3': "Mendel-parts / 4.7k"
288 */
289 #define TEMP_SENSOR_0 20
290 #define TEMP_SENSOR_1 0
291 #define TEMP_SENSOR_2 0
292 #define TEMP_SENSOR_3 0
293 #define TEMP_SENSOR_4 0
294 #define TEMP_SENSOR_BED 1
295

```





```

Marlin  Conditionals.h  Conditionals_LCD.h  Conditionals_post.h  Configuration.h  Configuration_
//
// Temperature Sensors
//
#define TEMP_0_PIN    11 // Analog Input
#define TEMP_1_PIN    15 // Analog Input
#define TEMP_BED_PIN  14 // Analog Input

```

4. The endstop switch type is divided into normally open and normally closed. If the endstop switch is mechanical and normally open, it is “true” here. If it is photoelectric switch (normally closed), it is “false” here.

```

Marlin  Conditionals.h  Conditionals_LCD.h  Conditionals_post.h  Configuration.h $  Configuration_adv.h  G26_Mesh_Validation_Tool
// Mechanical endstop with COM to ground and NC to Signal uses "false" here (most common setup).
#define X_MIN_ENDSTOP_INVERTING false // set to true to invert the logic of the endstop.
#define Y_MIN_ENDSTOP_INVERTING false // set to true to invert the logic of the endstop.
#define Z_MIN_ENDSTOP_INVERTING false // set to true to invert the logic of the endstop.
#define X_MAX_ENDSTOP_INVERTING true  // set to true to invert the logic of the endstop.
#define Y_MAX_ENDSTOP_INVERTING true  // set to true to invert the logic of the endstop.
#define Z_MAX_ENDSTOP_INVERTING true  // set to true to invert the logic of the endstop.
#define Z_MIN_PROBE_ENDSTOP_INVERTING false // set to true to invert the logic of the probe.

```

5. Motor movement direction control. Due to the different origin positions of each printer, the uncertainty of the motor's zero return direction. If the motor moves in the opposite direction, the following parameter values can be true or false, or the same group of stepper motors can be replaced. For example, 1A and 1B are swapped.

```

Marlin | Conditionals.h | Conditionals_LCD.h | Conditionals_post.h | Configuration.h $ | Configur
// Invert the stepper direction. Change (or reverse the motor connec
#define INVERT_X_DIR true
#define INVERT_Y_DIR false
#define INVERT_Z_DIR true

```

6. The maximum stroke of each axis, which is the maximum print size of the printer

```

Marlin | Conditionals.h | Conditionals_LCD.h | Conditionals_post.h | Configuration.h $ | Configur
// Travel limits after homing (units are in mm)
#define X_MIN_POS 0
#define Y_MIN_POS 0
#define Z_MIN_POS 0
#define X_MAX_POS 200
#define Y_MAX_POS 200
#define Z_MAX_POS 200

```

7. Set the number of pulses corresponding to each axis to move 1mm, and calculate the number of pulses for each axis motor as follows:

Formula of pulse number/mm of synchronous wheel motor:  $(360 \div \text{step angle}) \times \text{Subdivision} \div (\text{Diameter} \times 3.14)$

The formula of the pulse number/mm of The screw rod Motor:  $(360 \div \text{step angle}) \times \text{Subdivision} \div \text{lead}$

```

Marlin | Conditionals.h | Conditionals_LCD.h | Conditionals_post.h | Configuration.h $ | Configuration_adv.h
* Override with M92
*
X, Y, Z, E0 [, E1[, E2[, E3[, E4]]]]
*/
#define DEFAULT_AXIS_STEPS_PER_UNIT { 80, 80, 400, 96 }
X Y Z E0
/**

```

8. The type setting of the display is also relatively easy to make mistakes, so it is recommended that you download the firmware of the corresponding display directly in the group to make some basic modifications. (Cannot be defined together with two LCD screen types, otherwise it will compile, but only one LCD can be defined.

Screen type, if it is a touch screen, define any one of them)

(1) Define LCD2004 display



The screenshot shows the Marlin configuration file editor with the 'Configuration.h' tab selected. The code is at line 1466, where the line `#define REPRAP_DISCOUNT_SMART_CONTROLLER` is highlighted with a black box. The surrounding code includes comments about the RepRapDiscount Smart Controller and the GADGETS3D G3D LCD/SD Controller.

```
File Edit Sketch Tools Help
1466 // http://reprap.org/wiki/RepRapDiscount Smart Controller
1467 //
1468 // Note: Usually sold with a white PCB.
1469 //
1470 #define REPRAP_DISCOUNT_SMART_CONTROLLER
1471 //
1472 //
1473 // GADGETS3D G3D LCD/SD Controller
1474 // http://reprap.org/wiki/RAMPS 1.3/1.4 GADGETS3D Shield with Panel
1475 //
1476 //
```

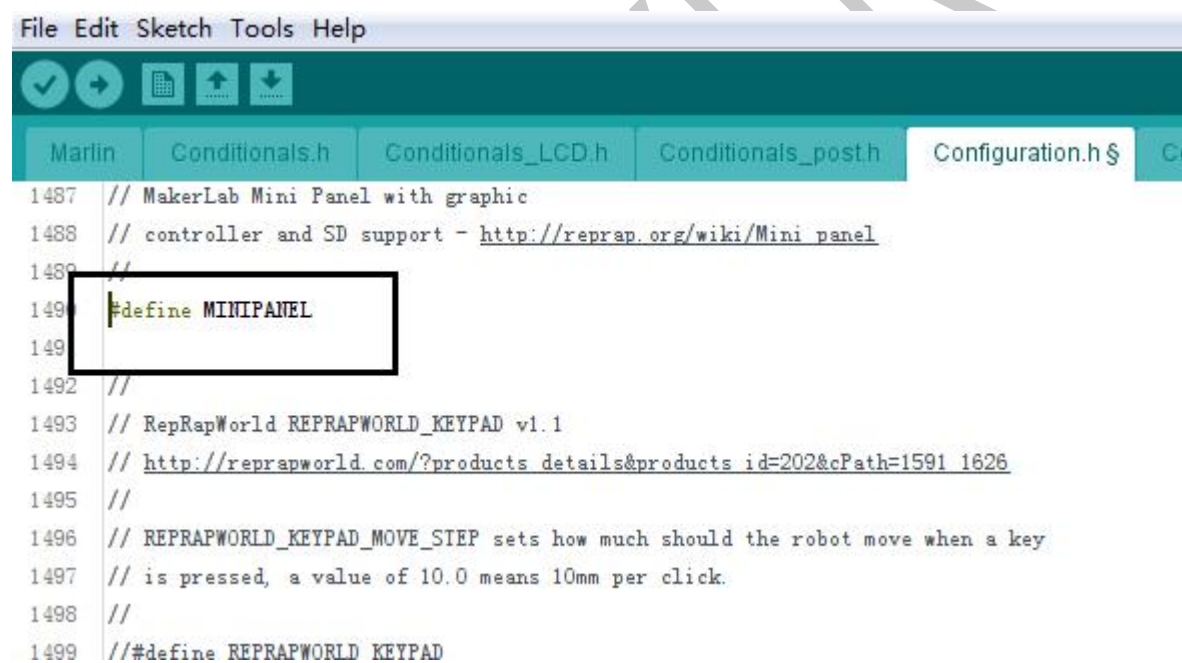
## (2) Define LCD12864 display



The screenshot shows the Marlin configuration file editor with the 'Configuration.h' tab selected. The code is at line 1484, where the line `#define REPRAP_DISCOUNT_FULL_GRAPHIC_SMART_CONTROLLER` is highlighted. The surrounding code includes comments about the RepRapDiscount FULL GRAPHIC Smart Controller and the RepRapDiscount Full Graphic Smart Controller.

```
File Edit Sketch Tools Help
1478 // #define G3D_PANEL
1479 //
1480 //
1481 // RepRapDiscount FULL GRAPHIC Smart Controller
1482 // http://reprap.org/wiki/RepRapDiscount Full Graphic Smart Controller
1483 //
1484 #define REPRAP_DISCOUNT_FULL_GRAPHIC_SMART_CONTROLLER
1485 //
1486 //
```

## (3) Define LCD mini12864 display



The screenshot shows the Marlin configuration file editor with the 'Configuration.h' tab selected. The code is at line 1491, where the line `#define MINIPANEL` is highlighted with a black box. The surrounding code includes comments about the MakerLab Mini Panel with graphic controller and SD support, and the RepRapWorld REPRAPWORLD\_KEYPAD v1.1.

```
File Edit Sketch Tools Help
1487 // MakerLab Mini Panel with graphic
1488 // controller and SD support - http://reprap.org/wiki/Mini panel
1489 //
1490 #define MINIPANEL
1491 //
1492 //
1493 // RepRapWorld REPRAPWORLD_KEYPAD v1.1
1494 // http://reprapworld.com/?products details&products id=202&cPath=1591 1626
1495 //
1496 // REPRAPWORLD_KEYPAD_MOVE_STEP sets how much should the robot move when a key
1497 // is pressed, a value of 10.0 means 10mm per click.
1498 //
1499 // #define REPRAPWORLD_KEYPAD
```

Define the type of display, just delete the `//` if you find the corresponding type.



## VI the main matters before loading the machine

According to the connection diagram introduced by Taobao, all the lines are connected to debug the printer and test the printing. There are a few points to note after connecting the line:

1. Never reverse the +and- of the power supply, drive and fan! ! !
2. The position of the endstop is to be inserted. Generally, the XYZ and I3 are connected to the minimum value, the delta is connected to the maximum value; the 2pin endstop switch is connected to the S and -, and the 3Pin limit switch is connected to the S, -, and + .
3. Must be connected to the thermal to operate, otherwise "Err: MINITEMP" will appear;
4. Before moving each axis, you must first return to zero.

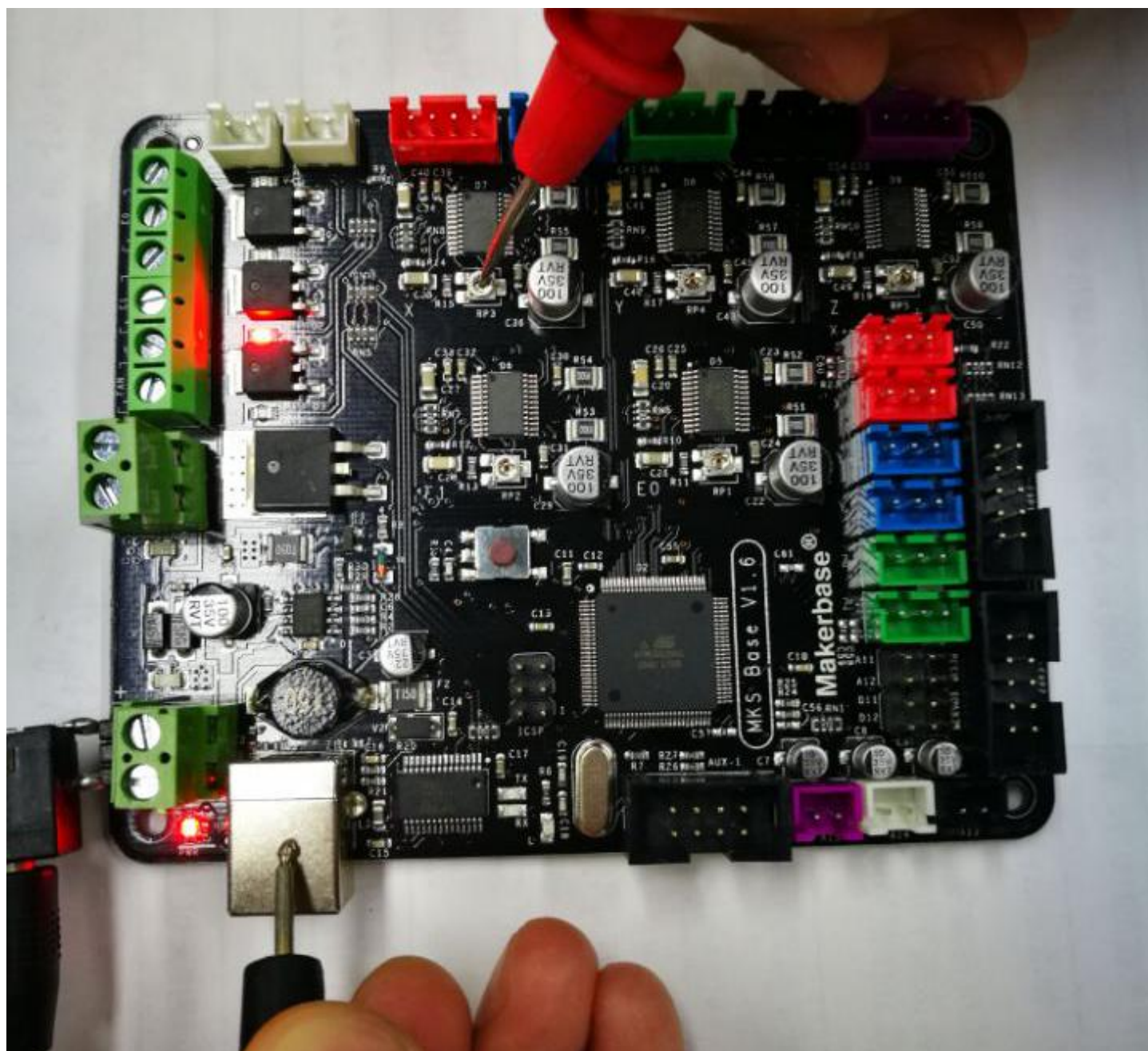
MAKER BASE

## VII Adjust the drive current

The motor driver chip on the MKS Base board is A4982, connected to 12V power supply, and the voltage of the intermediate foot of the potentiometer is measured with a multimeter.

The maximum load current formula is:  $I = V_{REF} / (8 \times R_S)$ ,  $R_S = 0.1$

The  $V_{REF}$  measurement method is shown below. Do not connect the motor to regulate the current, burn the driver easily!!! The default driving current is 1A, and the maximum current is 2A. It is recommended not to exceed 1.5A.



Note: Please do not plug or unplug the motor when the power is on, it is easy to cause the drive to burn out; do not adjust the current during the running of the motor. The correct way is to disconnect the power supply, unplug the motor, re-power it, adjust the potentiometer, and test the voltage of the potentiometer until the measured voltage is the same as expected! ! !

## VIII. Technical support and protection

1. Power test will be done prior to shipment to ensure normal use of the product

2. Welcome friends to join the discussion group: [232237692](#).

3. Welcome to Blog Exchange : <http://flyway97.blog.163.com>.

4. 3D printer motherboard contact

Miss Zhong: [15521638375](#) Mr. Huang: [13148932315](#) Mr. Tan: [13640262556](#).

Mr.Peng: [13427595835](#)

5. If you have any questions you can contact our customer service or find technical support staff in the group, we will be happy to serve you.



MKS official website



MKS Taobao website