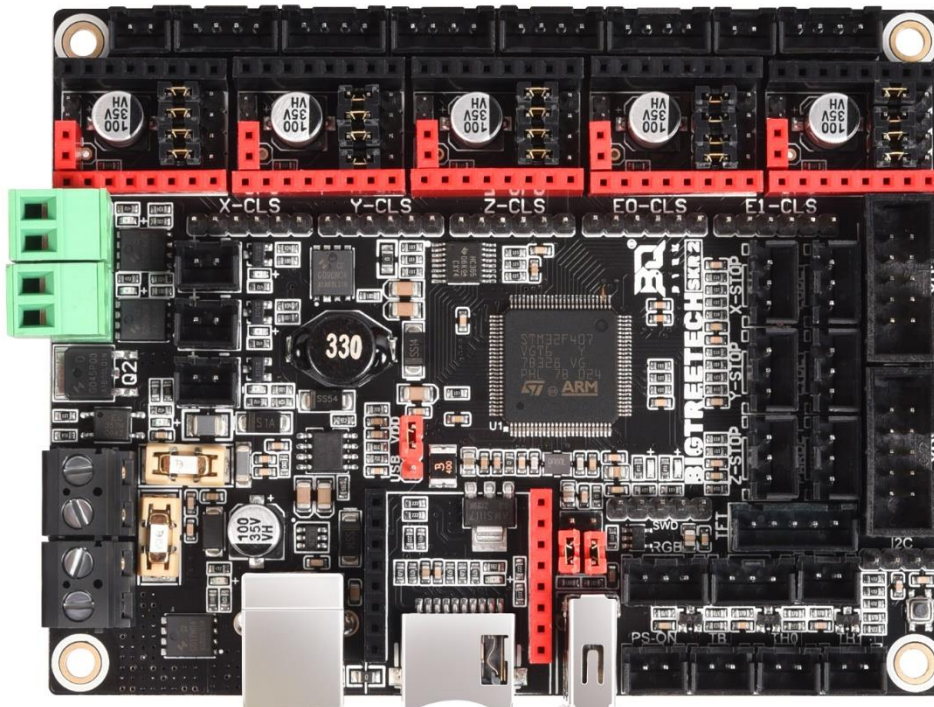


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SKR 2

User Guide



I. Introduction to SKR Motherboard

The BIGTREETECH SKR 2 motherboard is a 32-bit 3D printer motherboard designed and manufactured by the 3D printing team of Shenzhen BIQU Technology Co., Ltd. It is a successor to the SKR1.4 and SKR1.4 Turbo series of motherboards and adds many features that we are sure the community will love.

1. Main board features:

- 1) Uses a 32-bit ARM Cortex-M4 series STM32F407VGT6 main control chip with a core frequency of *168MHz* that packs enough performance to run even the most demanding UI while ensuring stutter free printing.
- 2) Integrates a AOZ1284PI power regulator which supports 12-24V power input and a maximum output current of 4A – enough to power external components such as LEDs and even a raspberry pi;
- 3) Support all versions of the company's serial screen, SPI screen and LCD screen;
- 4) Upgrade the configuration firmware via SD card. This burning method is simple, convenient and efficient;
- 5) TMC Motor drivers can be used in SPI or UART mode by simply adjusting the onboard jumpers beneath each motor driver. Additionally you can connect or disconnect the TMC DIAG pin using an onboard jumper allowing you to use hard endstops or sensorless homing without the need to cut any pins.
- 6) Supports functions such as power loss print resume, filament runout detection, shutdown after printing, BLtouch and other ABL sensors, RGB lights, etc. Note that external modules will be required for many of these functions;
- 7) Use high-performance MOSFET to reduce heat generation;
- 8) The use of replaceable fuses makes the replacement process more convenient;
- 9) Includes a protection circuit on thermistor inputs which protects against short circuits between the heater cartridge and the bed heating element. This is a common mistake made by many users when replacing a nozzle or working on the hotend so we expect this feature to be a welcome one;
- 10) Includes an additional heater protection circuit which protects against runaway heating on the bed and hotend heaters. By default, the heaters are off so if the MCU or MOSFETs are damaged, the heaters will shut down instead of enter into thermal runaway;
- 11) Introduces a new “anti-reversal” stepper driver protection which is achieved through a combination of new hardware and Marlin firmware. This protects against motherboard or driver damage due to incorrect driver insertion;
- 12) ESP8266 WIFI module (ESP12S or ESP-07) interface for customers to use RRF firmware;
- 13) Onboard push-pull TF card slot (SDIO working mode) and U disk interface;

- 14) A filter circuit is added to the power input terminal to reduce ripple and noise interference;
- 15) The fuses now use a smaller package which leaves more space on the PCB for more features and makes it easier to swap them out;
- 16) The number of PWM controllable fan interfaces has been increased from one to three.

2. Main board parameters:

Appearance size: 110*85mm For details, please refer to: BIGTREETECH SKR 2-SIZE.pdf

Installation size: 102*76mm

Microprocessor: ARM Cortex-M4 CPU STM32F407VGT6

Input voltage: DC12V-DC24V

Logic voltage: DC 3.3V

Firmware support: Marlin, Reprap Firmware

WIFI interface: ESP-12S, ESP-07S

Fan interface: three CNC fans, two normally closed fans (non-controllable)

Expansion interface: I2C, Servos, Probe, PS-ON, PWR-DET, Fil-DET, RGB, etc.

Motor driver: support TMC5160, TMC2209, TMC2225, TMC2226, TMC2208, TMC2130, ST820, LV8729, DRV8825, A4988, etc., and can be externally connected to a motor drive

Drive working mode support: SPI, UART, STEP/DIR

Motor drive interface: X, Y, Z (double Z axis), E0, E1, five channels (each channel has a closed loop drive interface)

Temperature sensor interface: TH0, TH1, TB, 3 channels 100K NTC (thermal resistance)

Display: serial touch screen, SPI touch screen, LCD display

PC communication interface: square USB, easy to plug and unplug, communication baud rate 115200

Support file format: G-code

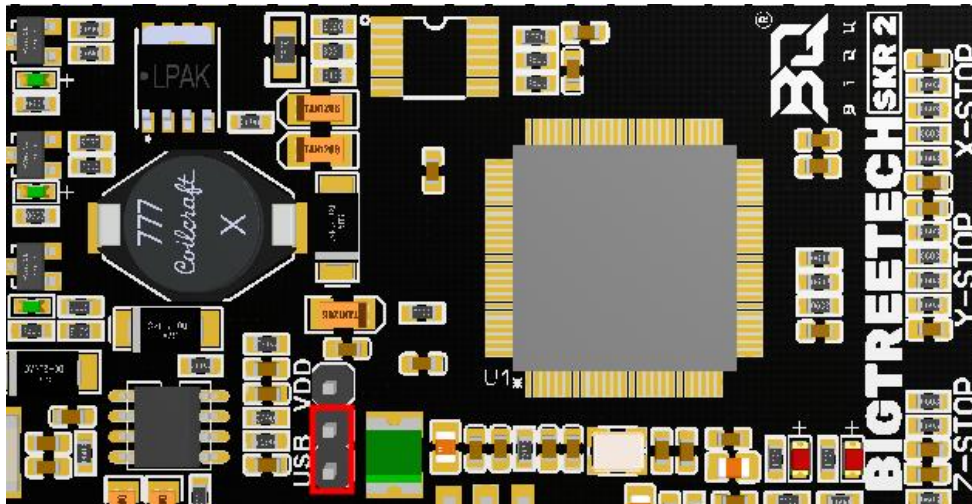
Support machine structure: XYZ, delta, kossel, Ultimaker, corexy

Recommended software: Cura, Simplify3D, pronterface, Repetier-host, Makerware

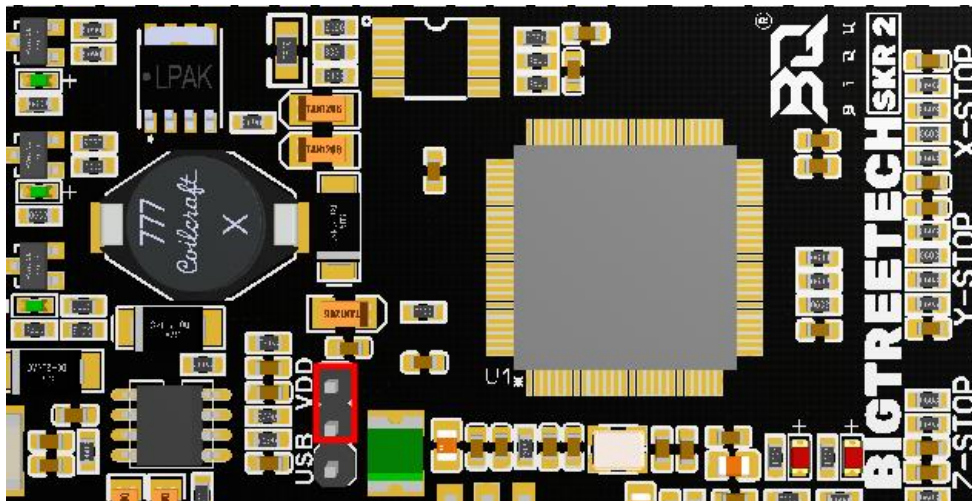
II. Power on the motherboard

After the SKR motherboard is powered on, the D6 LED will light up, indicating that the power supply is at nominal levels. The 5V SEL jumper, in the middle of the board, allows you to select whether you would like to use the 5V USB power input or the onboard 5V regulated supply. Configure the jumper as shown below:

1) When using USB to power the motherboard:

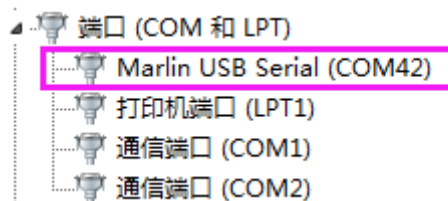


2) When using 12V-24V power supply:



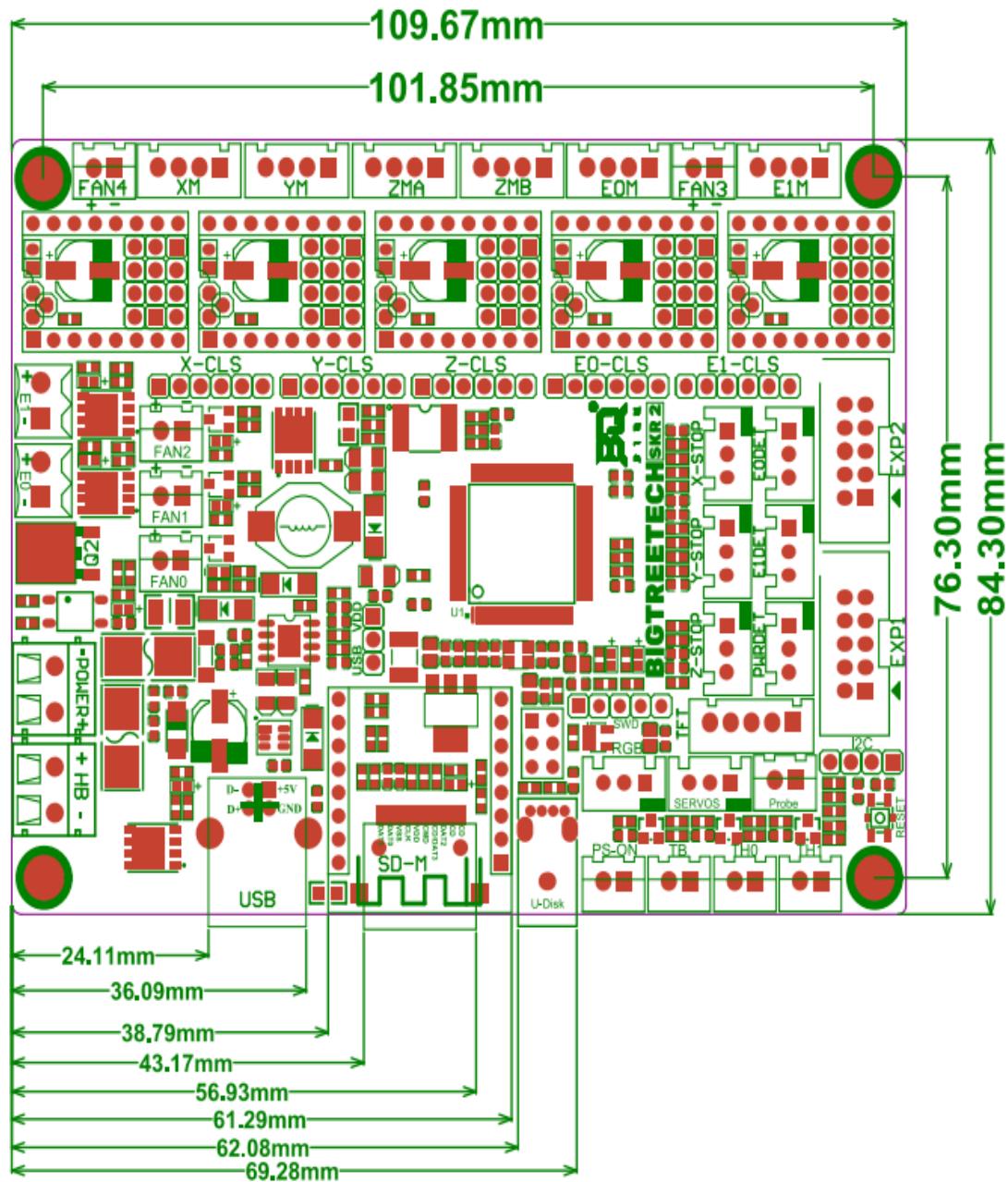
III. Communication between motherboard and computer

When using Marlin2.0 firmware the motherboard will enumerate as a virtual serial port in both macOS and windows. An example of the enumerated device within the windows device manager is shown below.



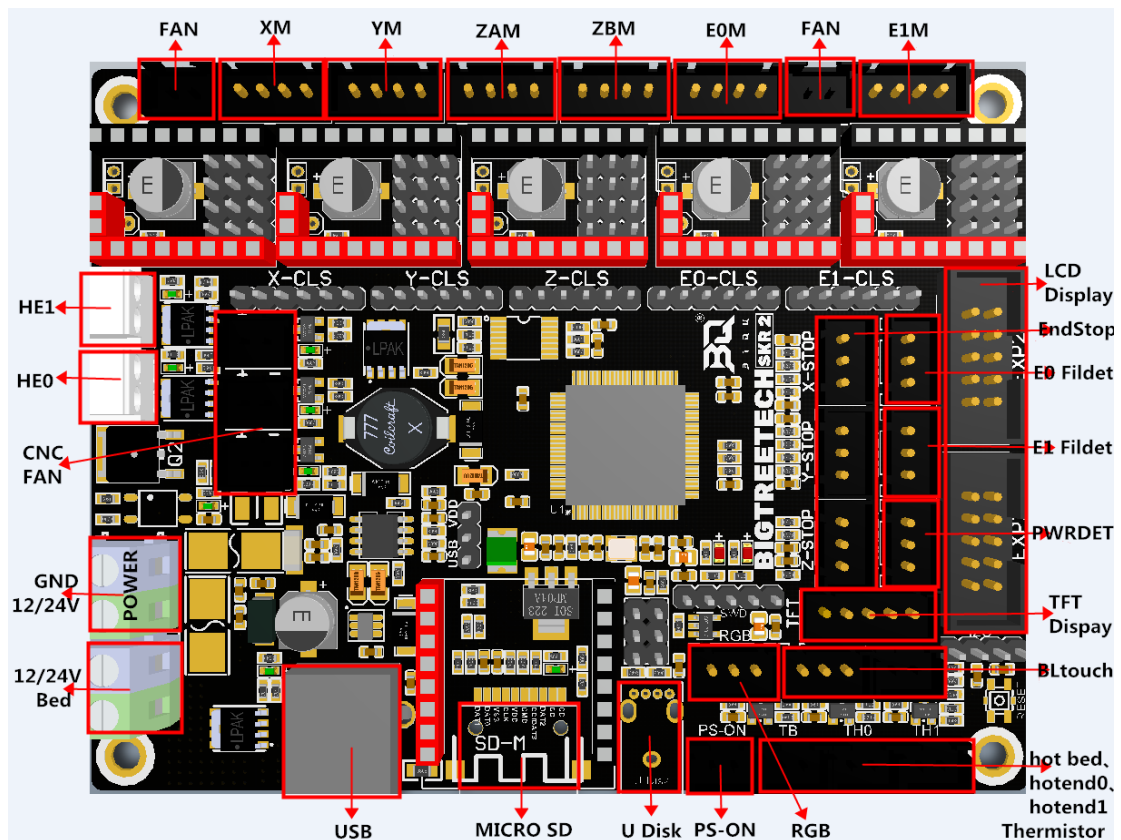
IV. Motherboard interface description

1. Motherboard size:



2. Motherboard wiring diagram:

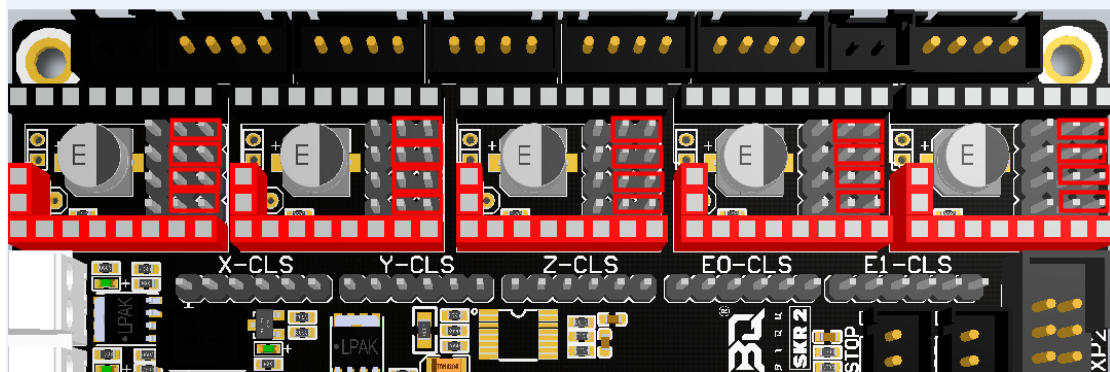
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3. Selection method of drive working mode:

① Normal STEP/DIR mode: (such as: A4988, DRV8825, LV8729, ST820, etc.) according to the drive subdivision table to select the shorting cap to short-circuit MS0-MS2.

Driver – STEP/DIR MODE



Note: If you use A4988 or DRV8825 driver, you must short-circuit RST and SLP with a jumper cap to work normally.

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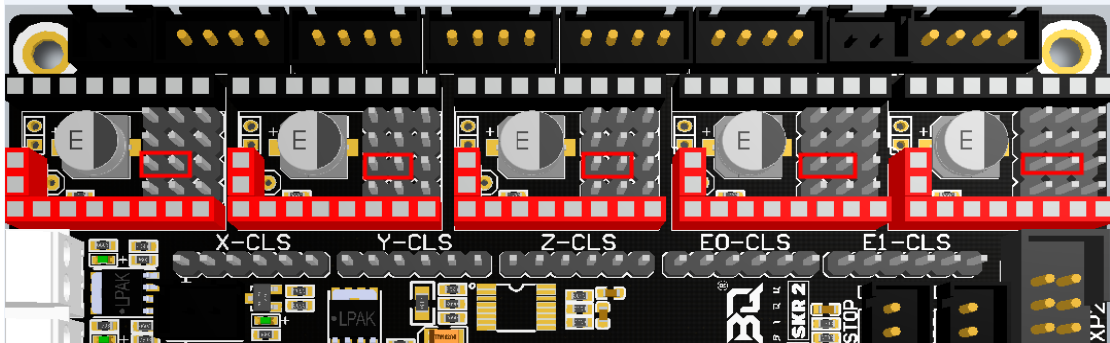
驱动芯片	MS1	MS2	MS3	细分	Excitation Mode
A4988 最大 16 细分 35V 2A	L	L	L	Full Step	2 Phase
	H	L	L	1/2	1-2 Phase
	L	H	L	1/4	W1-2 Phase
	H	H	L	1/8	2W1-2 Phase
	H	H	H	1/16	4W1-2 Phase
驱动电流计算公式 Rs=0.1Ω	$I_{max} = V_{ref} / (8 * R_s)$				

驱动芯片	MD3	MD2	MD1	细分	Excitation Mode
LV8729 最大 128 细分 36V 1.8A	L	L	L	Full Step	2 Phase
	L	L	H	1/2	1-2 Phase
	L	H	L	1/4	W1-2 Phase
	L	H	H	1/8	2W1-2 Phase
	H	L	L	1/16	4W1-2 Phase
	H	L	H	1/32	8W1-2 Phase
	H	H	L	1/64	16W1-2 Phase
	H	H	H	1/128	32W1-2 Phase
驱动电流计算公式 Rs=0.22Ω	$I_{OUT} = (V_{REF} / 5) / R_{F1}$				

驱动芯片	MODE2	MODE1	MODE0	细分	Excitation Mode
DRV8825 最大 32 细分 8.2V-45V 2.5A at 24V T=25°C	L	L	L	Full Step	2 Phase
	L	L	H	1/2	1-2 Phase
	L	H	L	1/4	W1-2 Phase
	L	H	H	1/8	
	H	L	L	1/16	
	H	L	H	1/32	
	H	H	L	1/32	
	H	H	H	1/32	
驱动电流计算公式 Rs=0.1Ω	$I_{CHOP} = \frac{V_{REFX}}{5 \cdot R_{ISENSE}}$				

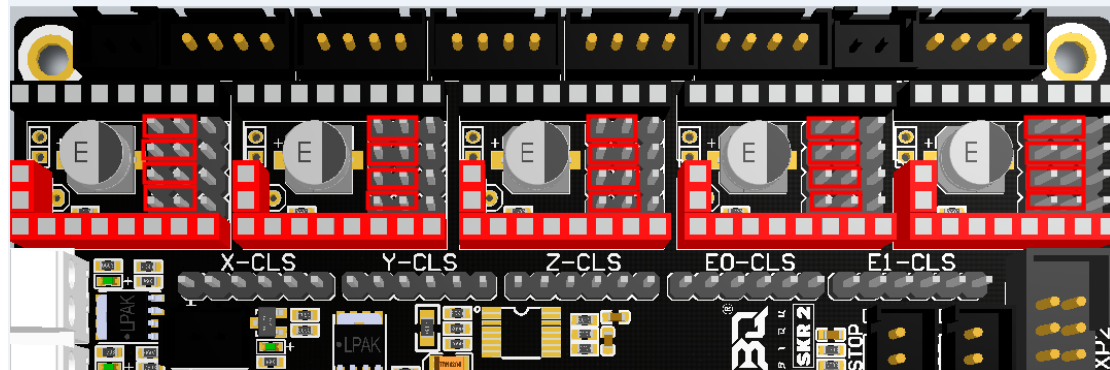
② UART mode driven by TMC: (such as: TMC2208, TMC2209, TMC2225, etc.)
Each axis uses a shorting cap to short the position of the red box in the figure, and the subdivision and drive current are set by firmware.

Driver – UART MODE



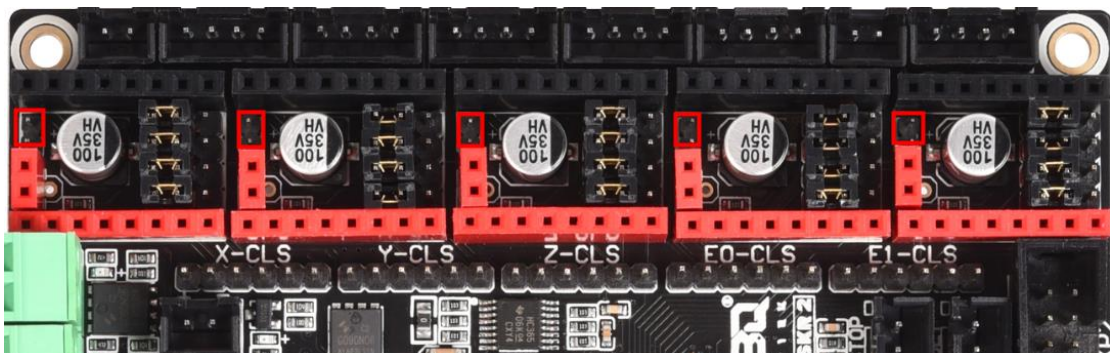
③ SPI mode of TMC drive: (such as: TMC2130, TMC5160, TMC5161, etc.) Use four shorting caps for each axis to short the position of the red box in the figure, and the subdivision and drive current can be set by firmware.

Driver – SPI MODE

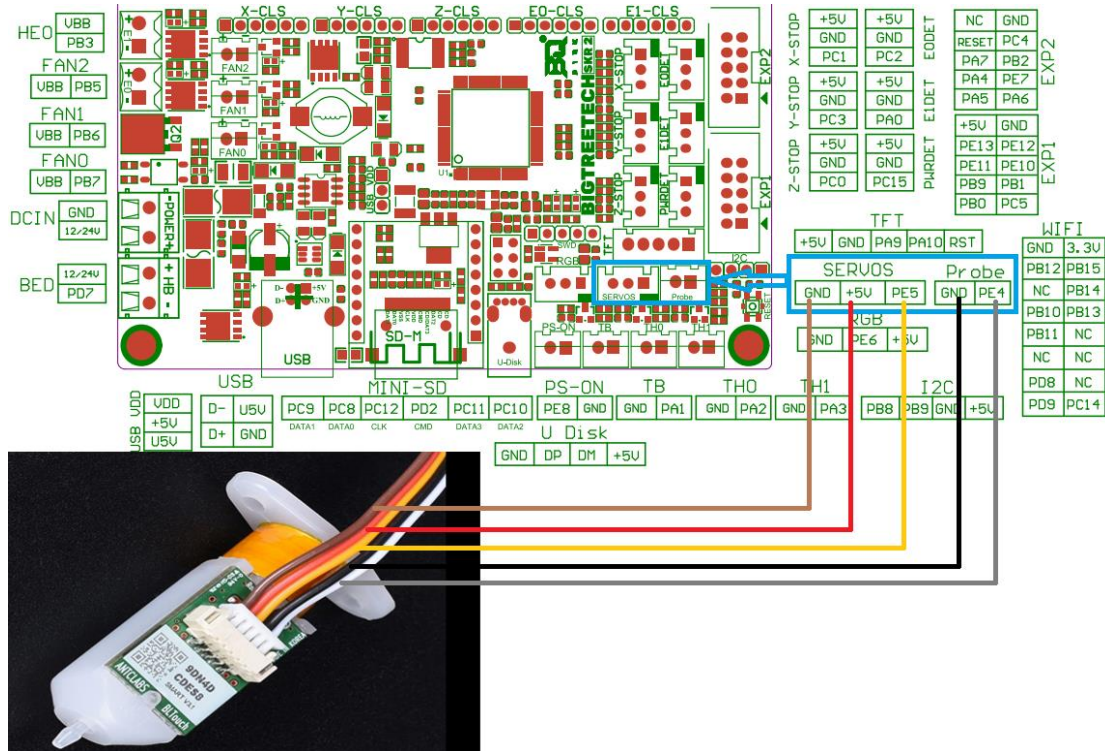


④DIAG Pin of TMC drive:

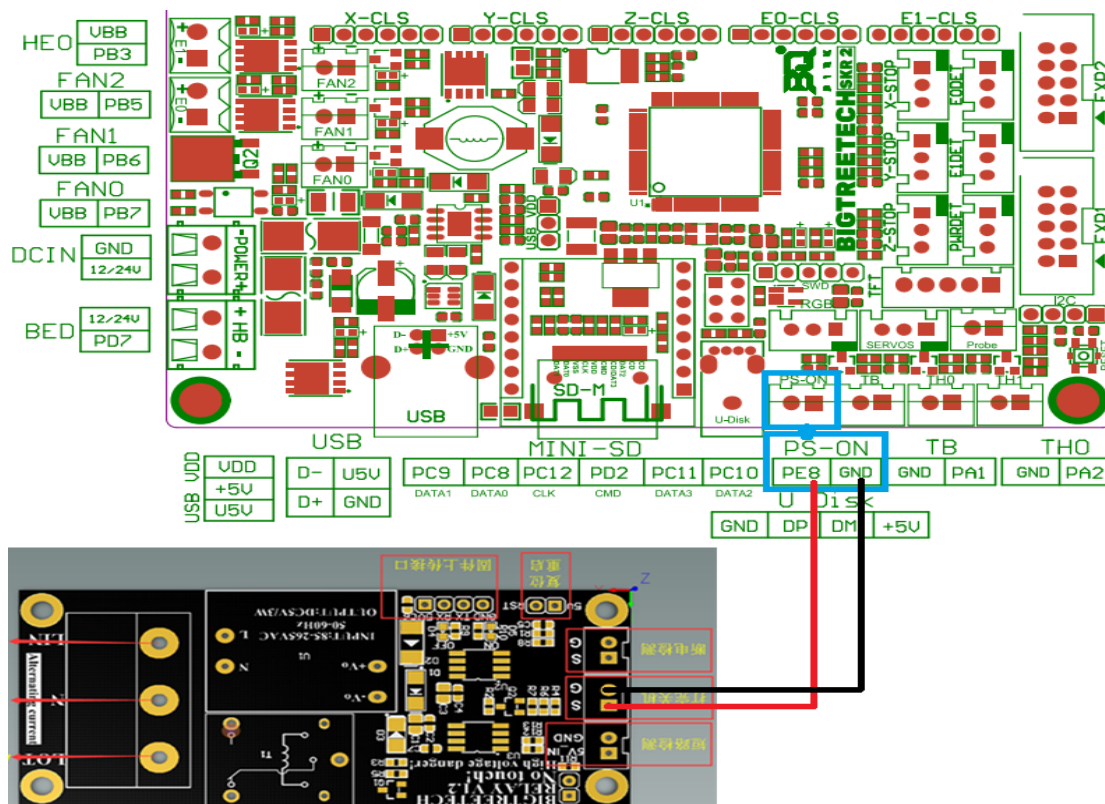
As shown in the picture, insert the short-circuit cap when using the sensorless homing function, and do not insert it when not using it. There is no need to cut the driving diag pin.



4. The connection between BIGTREETECH SKR 2 and BLtouch:

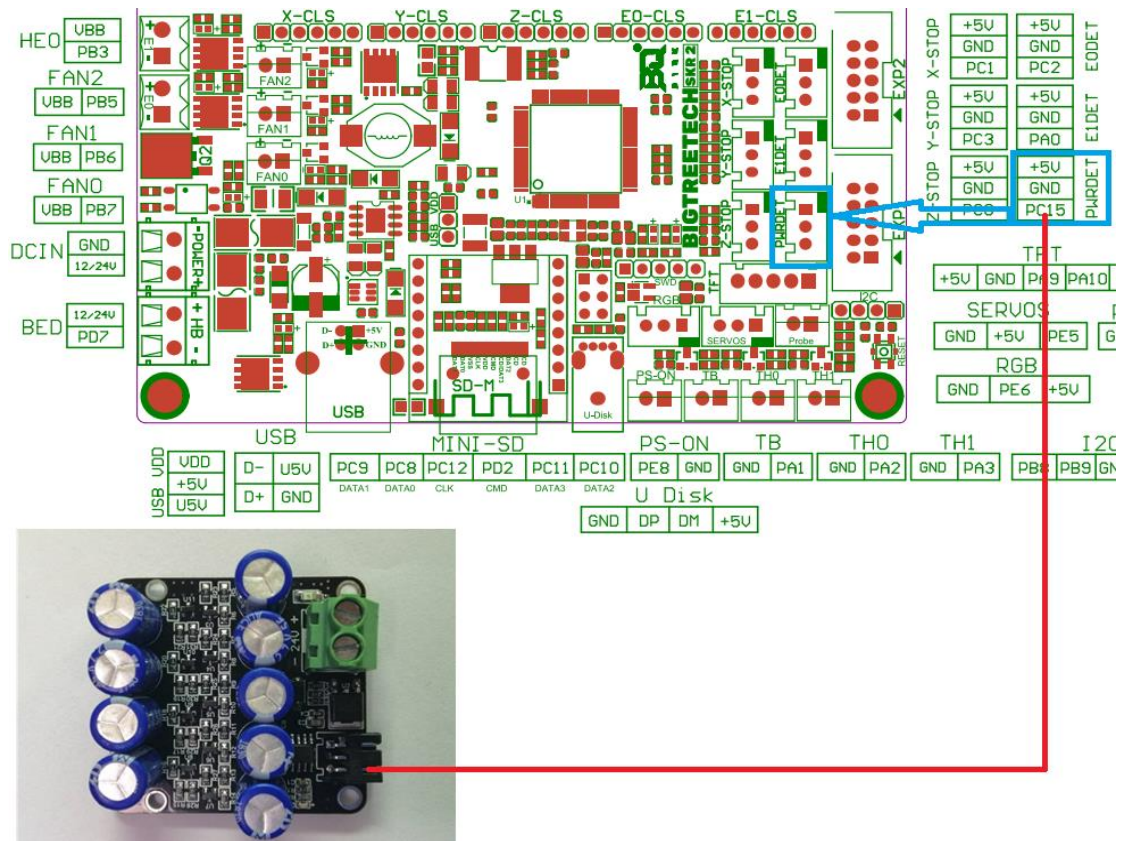


5. Connection between BIGTREETECH SKR 2 and shutdown (Relay V1.2):

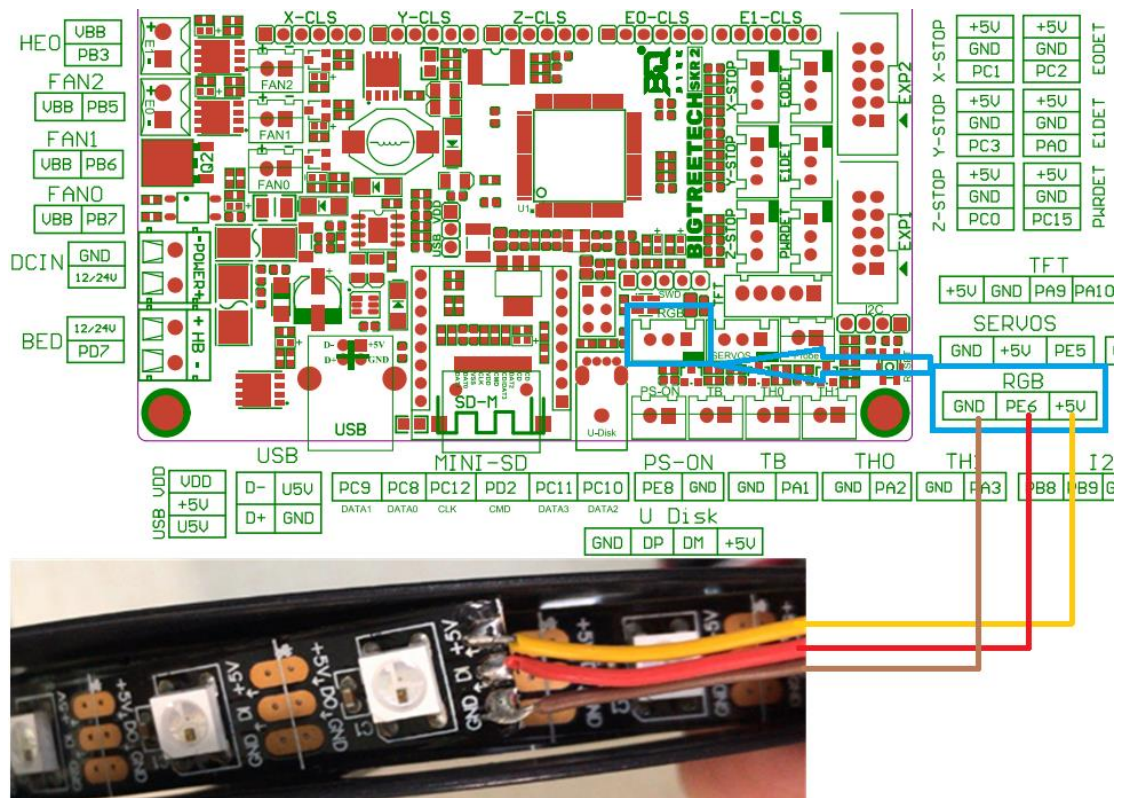


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6. The connection between BIGTREETECH SKR 2 and power failure (UPS 24V V1.0):



7. Connection between BIGTREETECH SKR 2 and RGB-LED drive:



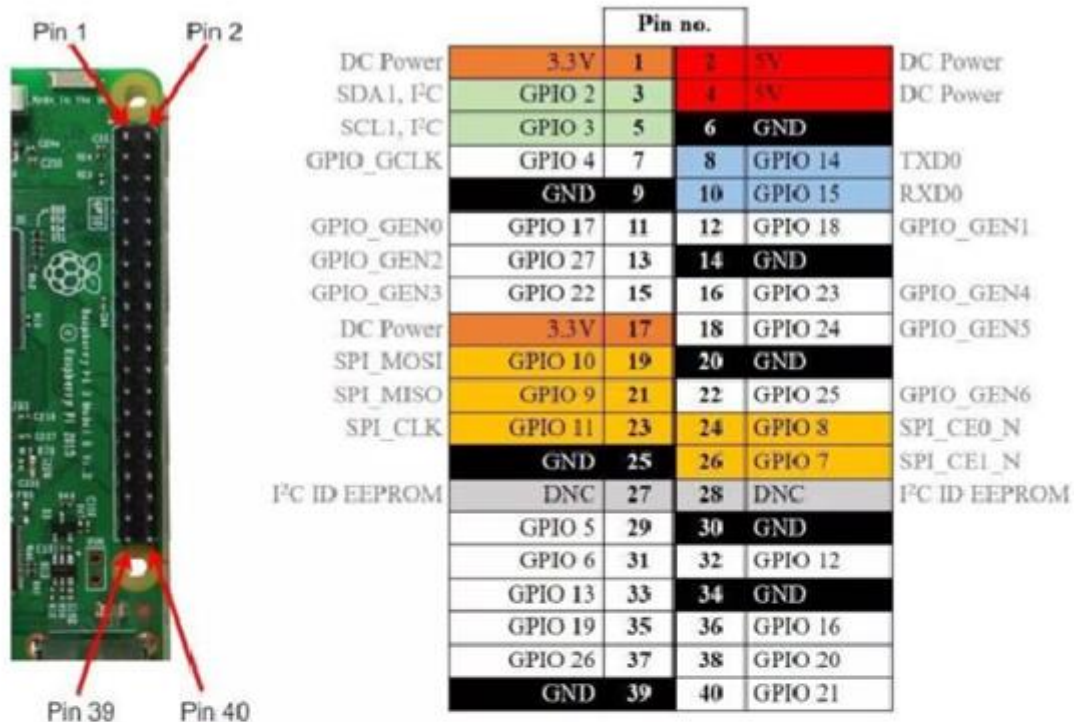
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8.Connecting the BIGTREETECH SKR 2 to a Raspberry Pi using TTL UART:

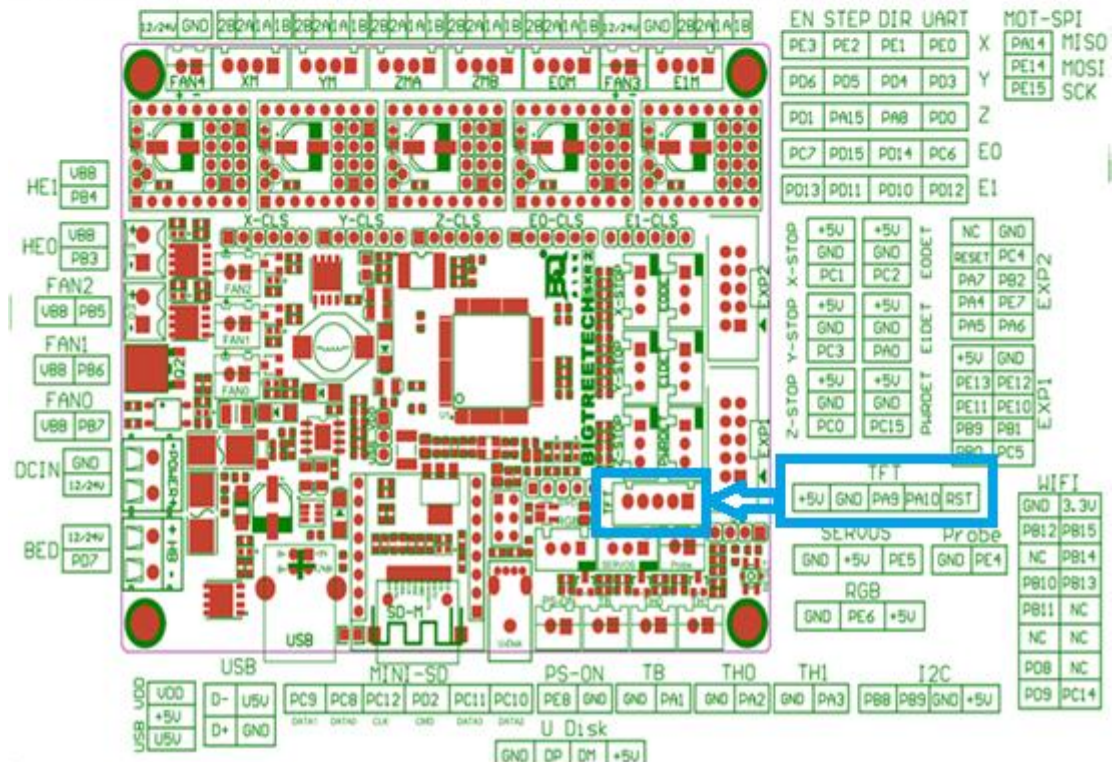
No need to connect V+

Rasberry Pi 3 and SKR V1.4 both with 3.3V logic.

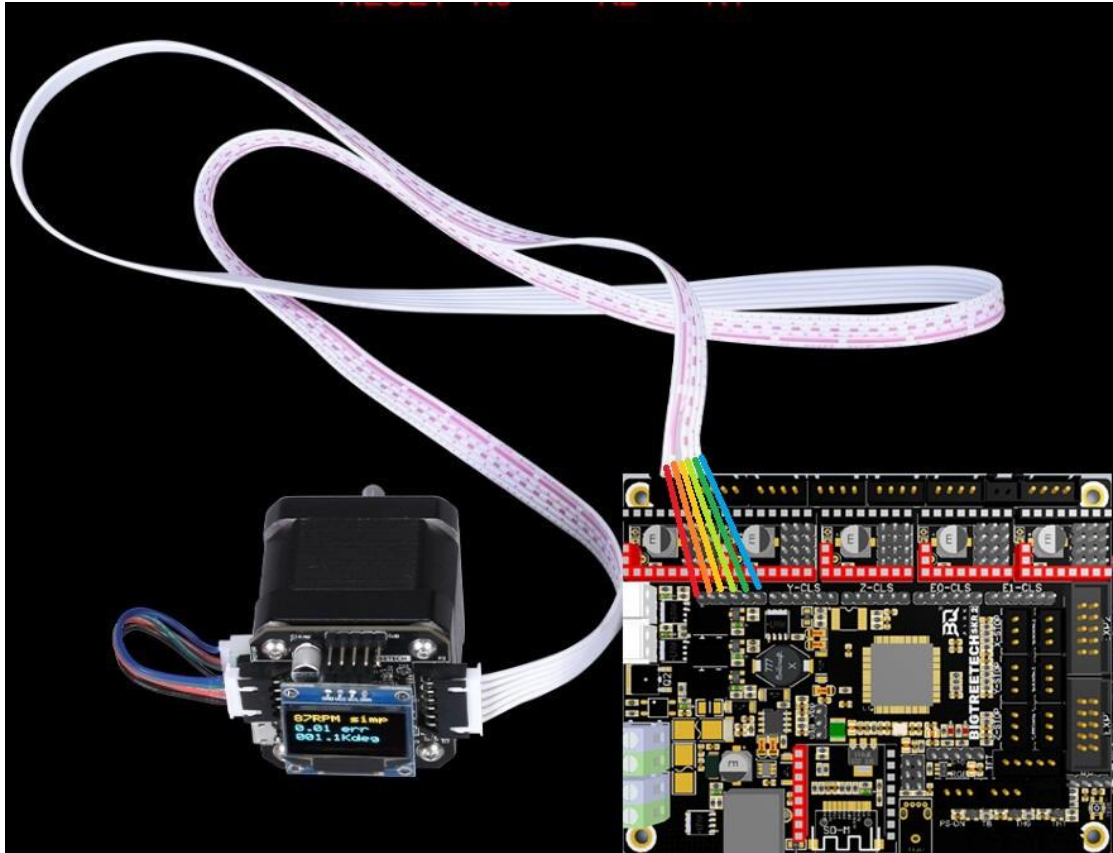
PI 3B+ @ GPIO connector TXD0 - RXD0 – GND (8-0-10)



BIGTREETECH SKR 2 @ TFT connector Tx-Rx-GND

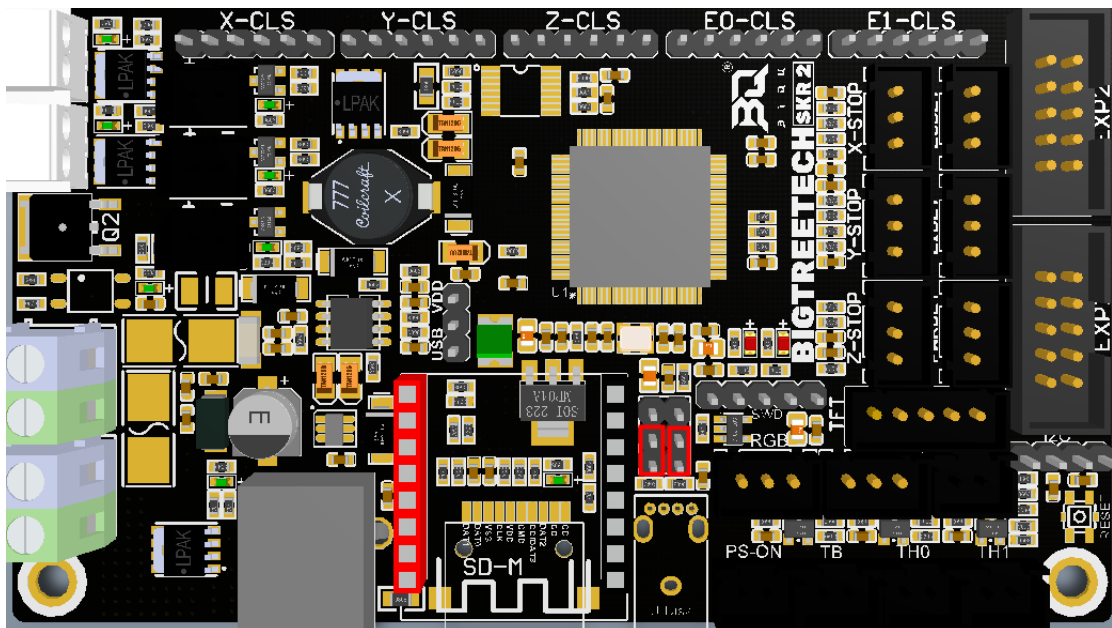


9. Connection between BIGTREETECH SKR 2 and closed-loop drive:



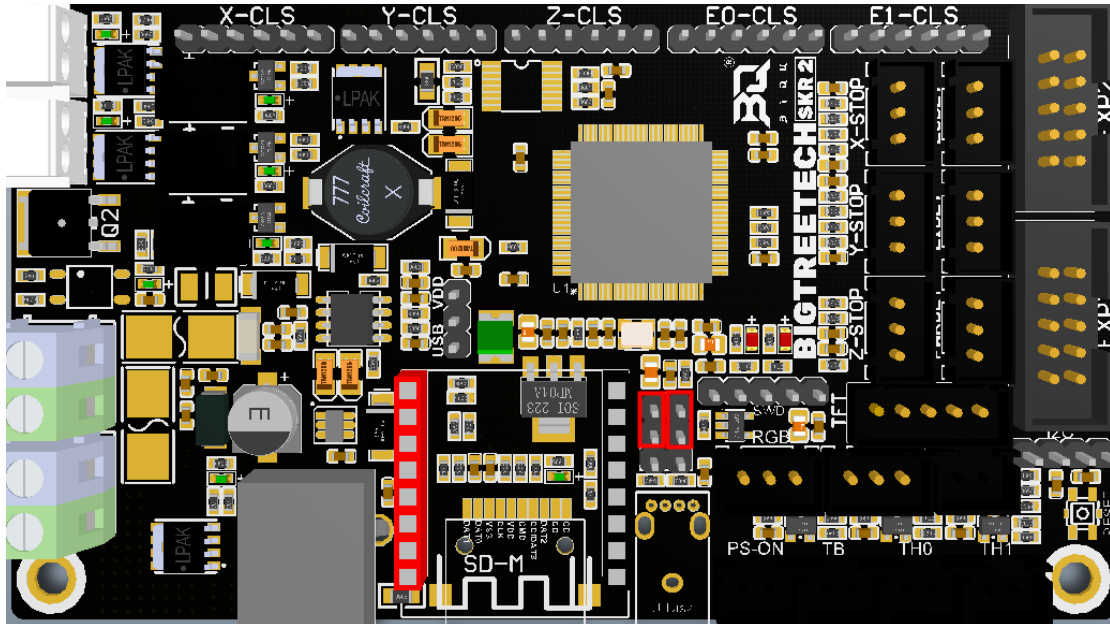
10. U disk function and RRF WIFI function selection:

①U disk function: When the U disk function is selected, the WIFI module only works in UART mode. At this time, RRF firmware cannot be used, only Marlin firmware can be used;



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②RRF WIFI function: If selected (as per the jumper configuration below), the U disk function will not be available as WIFI will work through SPI mode, and RRF firmware can be used.



V. Motherboard firmware description

The motherboard comes pre-installed with firmware that is used for testing at the factory. The firmware is configured for use with an i3 style printer however you will likely find it useful to configure and install your own firmware.

Due to the abundance of printer types and firmware distributions in the market, BIGTREETECH cannot offer customized firmware for each application. You may, however, be able to find firmware for your application by trying one of the following:

- Ask customer service or technical personnel to obtain;

- Compile your own using a distribution of your choice.

- Download from our original website: <https://github.com/bigtreetech>

If you decide to use Marlin then you will need to download the source code, use Visual Studio Code to configure the code to your application, find the firmware.bin file within the pio-build folder, copy it to the SD card and then reset the motherboard. There is an abundance of information on the internet which elaborates on these steps should you need more guidance.

If you require more information about the pin numbers when compiling your firmware, please refer to the BIGTREETECH SKR 2-PIN.pdf document.

VI. Matters needing attention:

1. The jumper that allows selection between USB power or on-board power must be inserted so as to select one of the two options otherwise no power will be supplied to the logic section of the motherboard and the power LED will not light up.

2. The power of the hot bed connected to the main board must be less than or equal to 10A. If you want to use a high-power hot bed, it is recommended to choose a hot bed with 24V power supply and use 24V to power the main board;

3. The jumpers that allow selection between SPI WiFi (for RRF) or U disk functionality should be inserted to select at least one option.;

4.The driver anti-reversal insertion function is a newly developed function from BIGTREETECH. It is currently only supported in Marlin firmware and therefore not available when using RRF firmware. Therefore, when you are not using Marlin firmware, please carefully check whether the driver is inserted correctly to avoid causing damage to the driver and/or the motherboard. Customers can also choose to install the Marlin firmware first and then install the RRF firmware after they are confident that the hardware installation is correct.

5. This motherboard uses a push-pull type SD slot which does not eject when pushing on the card after insertion. The installation stroke is far shorter than a push-push type SD slot and therefore customers should be gentle when inserting or removing a card. Returns for damage caused by mis-handling the SD card will not be entertained.

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