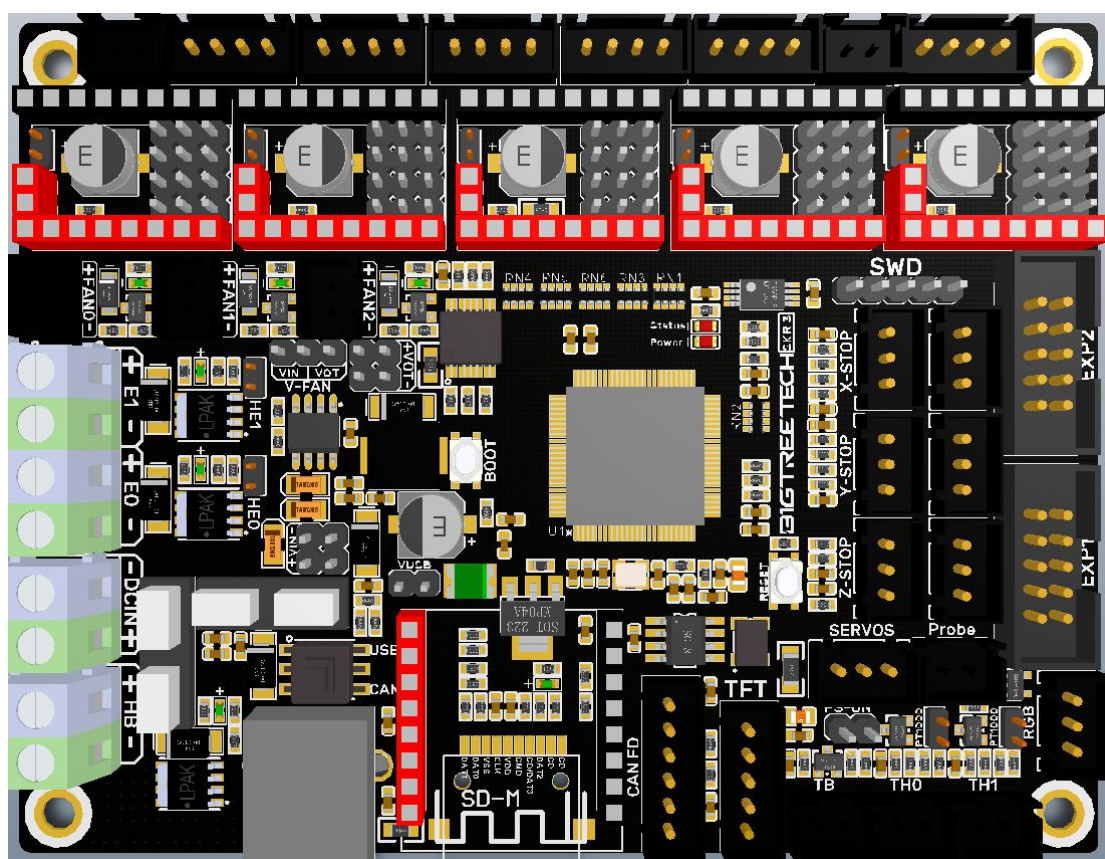# BIGTREETECH

SKR 3

User Manual

Ⅰ.Product Introduction

BIGTREETECH SKR 3 is a 32-bit motherboard designed for 3D printer, which launched by 3D printing team of Shenzhen Big Tree Technology Co., Ltd.

It is upgrade of SKR V1.4/Turbo.

1.Features:

1) 32-bit 480MHz ARM-class Cortex-M7 series main control chip STM32H743VIT6, with better performance.

2) With power supply chip TPS5450-5A, DC12/24V power input, output current up to 5A/ 6A, perfect power supply for Raspberry Pi

3) Works with all serial screen, SPI screen and LCD screen of BIGTREETECH.

4）To upgrade configuration firmware by SD card, easy and efficient operation.

5) On-board SPI working mode and UART working mode driven by TMC; on-board DIAG pins, which can be used by unplugging jumper caps.

6) With resume printing, filament break detection, auto shutdown, BL touch, RGB light and other functions.

7) Adopting high-performance MOSFET tubes to reduce heat generation.

8)The fuse are easy to replace.

9)Adding protection circuit for the thermistor to avoid burning of main control caused by hot bed or heating cable leakage.

10)WIFI module (ESP12S, ESP-07, ESP32) common interface for customers to DIY and use RRF firmware.

11) On-board TF card slot without self-ejecting and SDIO working mode improve the transmission rate.

12) Reserved BOOT0 button for customers to use DFU mode, convenient for customers to burn firmware through DFU mode.

13) On-board EEPROM, convenient for customers to adjust and save parameters.

14) As for CNC fan, there is 24V, 12V, 5V voltage selection of the external power supply module , easy to operation, avoid damage to the motherboard.

15) The resistance value of thermistor can be selected through the jumper. Support PT1000, without external module.

16) Reserved two CAN interfaces, USB port and XH2.54 6Pin terminal interface

2. Motherboard parameters:

Product size: 110*85mm

Installation size: 102*76mm

Microprocessor: ARM Cortex-M7 CPU STM32H743VIT6

EEPROM: 24C32 32-Kbit

Input Voltage: DC12V-DC24V

Logic voltage: DC 3.3V

Firmware: Marlin, Klipper

WIFI interfaces: ESP-12S, ESP-07S, ESP32

Fan interfaces: three CNC fans, two frequent fans, the voltage of the CNC fan is optional

Expansion interfaces: Servos, Probe, PS-ON, PWR-DET, Fil-DET, RGB, CAN FD

Motor driver: TMC5160, TMC2209, TMC2225, TMC2226, TMC2208, TMC2130, ST820, LV8729, DRV8825, A4988, etc.

Working modes of driver: SPI, UART, STEP/DIR

Motor driver interfaces: X, Y, Z (dual Z-axis), E0, E1, five-way

Heating interfaces: hot bed (HB), heating cable (E0, E1)

Temperature sensor interface: 1 way 100K NTC, 2 way 100K NTC and PT1000 optional

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

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

File format: G-code

Printer structure: XYZ, delta, kossel, Ultimaker, corexy

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

Ⅱ.Motherboard power on

After the SKR motherboard is powered on, the D7 red light will light up, indicating normal power supply; the VUSB in the middle of the board is the power selection terminal;

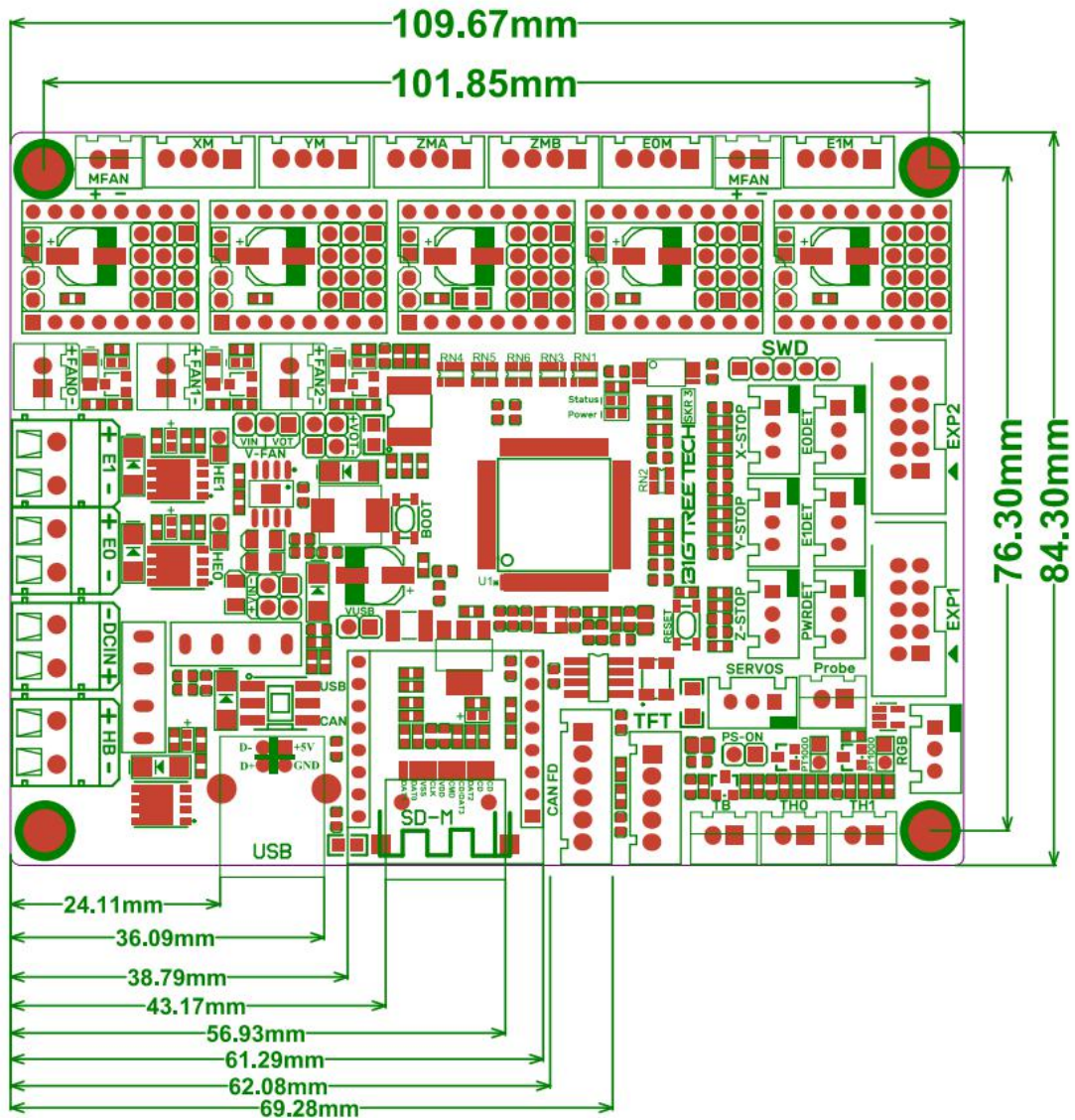When the motherboard is powerd through USB, to short VUSB with jumper cap; vice versa, do not plug the jumper cap.
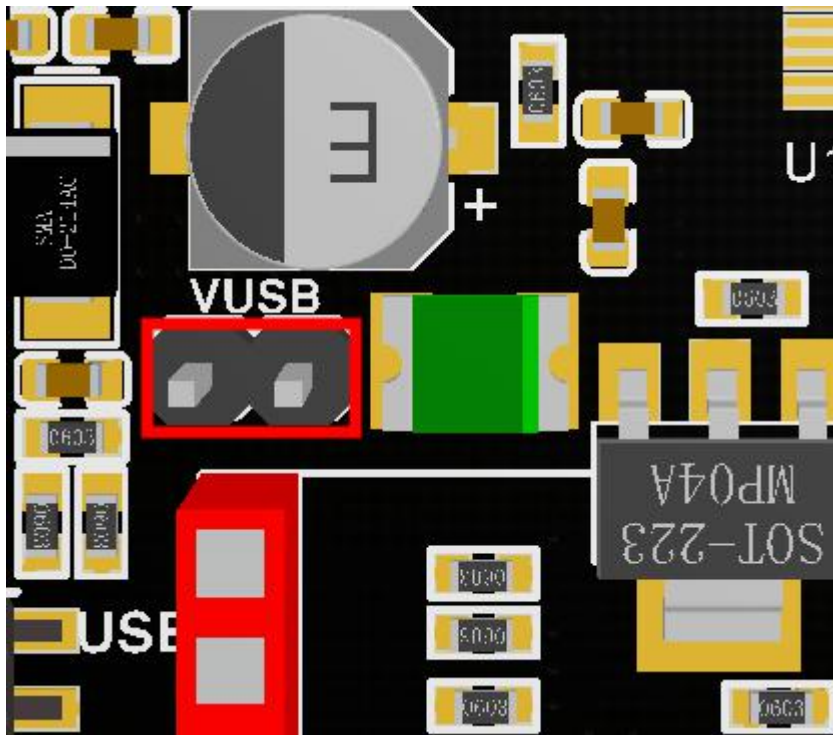
Ⅲ. Communication of the motherboard and computer
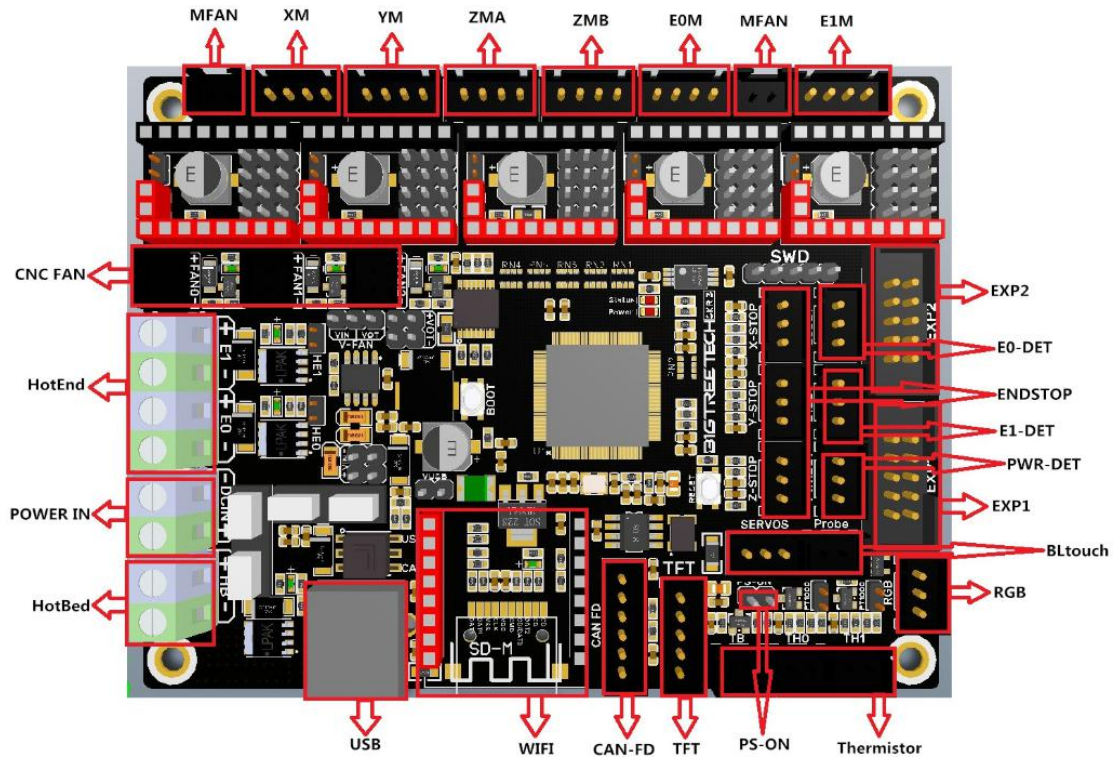
Marlin 2.0 firmware
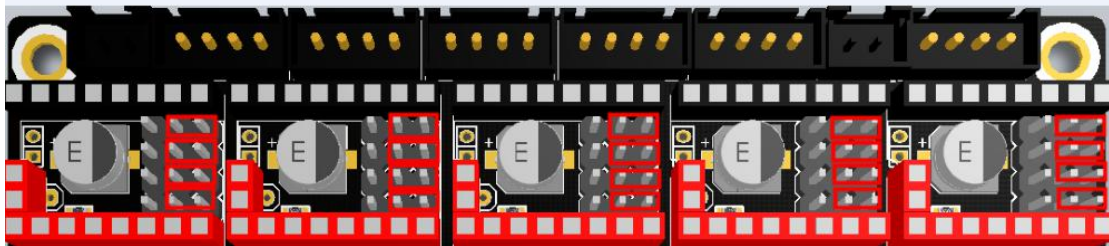
Ⅳ. Interfaces of motherboard

1.Size Diagram

2.Wiring Diagram

3.Working modes of driver：

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

Note: If you choose A4988 or DRV8825 driver, please short the RST and SLP with jumper cap.

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				Imax = Vref / (8 * Rs)	

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℃	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				$I_{CHOP} = \dfrac{V_{REFX}}{5 \cdot R_{ISENSE}}$	

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				$I_{OUT} = (VREF / 5) / RF1$	

| 驱动芯片	MS3	MS2	MS1	细分
ST820 最大 256 细分 45V 1.5A	L	L	L	Full Step
	L	L	H	1/2
	L	H	L	1/4
	L	H	H	1/8
	H	L	L	1/16
	H	L	H	1/32
	H	H	L	1/128
	H	H	H	1/256
驱动电流计算公式 Rs=0.15Ω				$\mathbf{I_{peak}} = \dfrac{\mathbf{V_{REF*}\ V_{DD}}}{\mathbf{5 * R_S}}$

②UART mode for TMC driver: (e.g. TMC2208, TMC2209, TMC2225, etc.)

Each axis is shorted to the red box with a shorting cap. The subdivision and drive current are set by firmware.
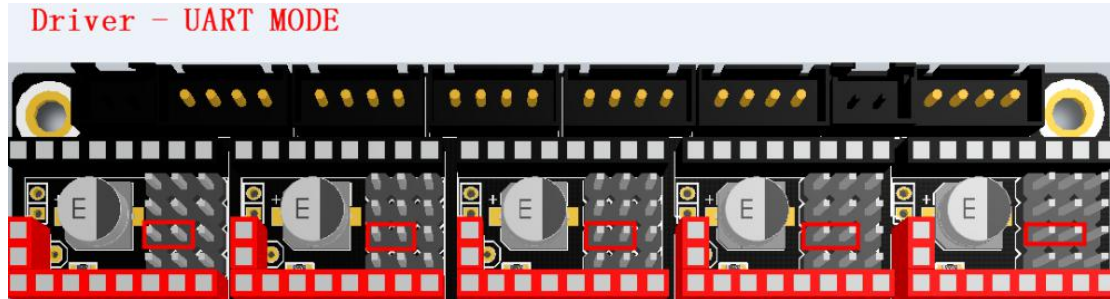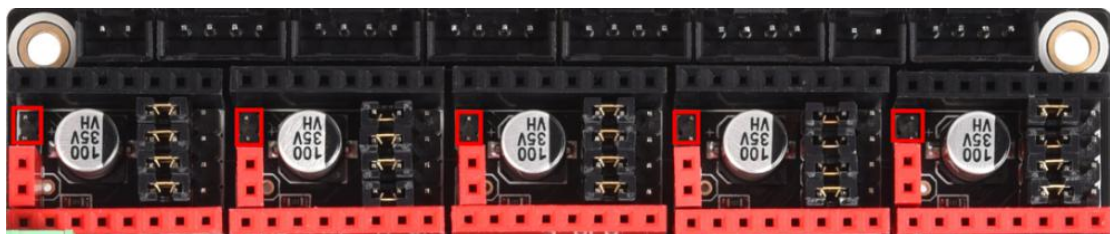

③SPI mode for TMC driver: (e.g. TMC2130, TMC5160, TMC5161, etc.)

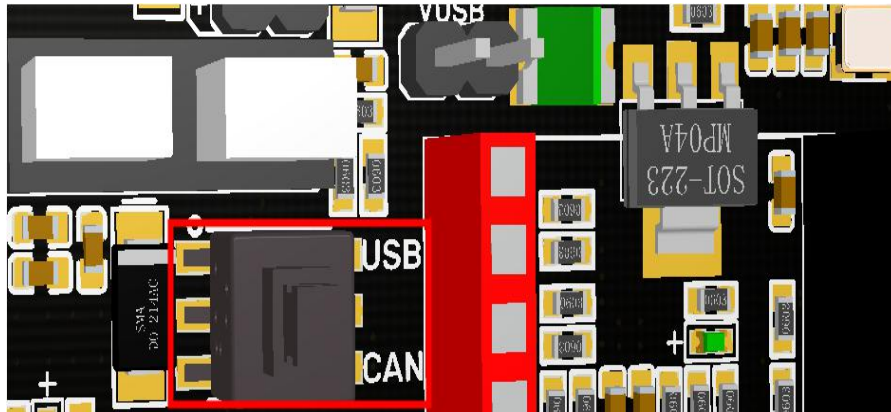Short the red part with four shorting caps, subdivision and drive current can be set by firmware.
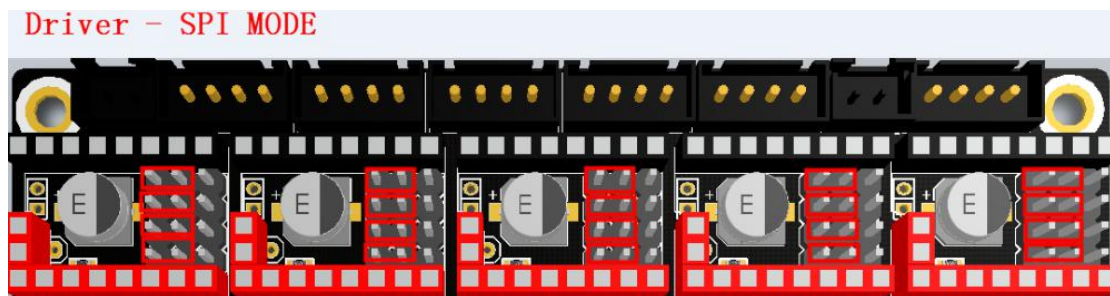
④DIAG pin: Insert the shorting cap when using SensorlessHoming function, no need to cut the driver DIAG pin.

4.USB and CAN：

DPDT switch: USB interface when the switch is pop-up, CAN FD interface when the switch is pressed.

5.The voltage of CNC fan：

If the DCIN is the CNC fan power supply,to short two pins of VIN; To choose 12V or 5V as the CNC fan power supply, short the jumper cap to two pins of VOT and insert SKR 3-DC MODE to the 2*4Pin female row of VOT and VIN.
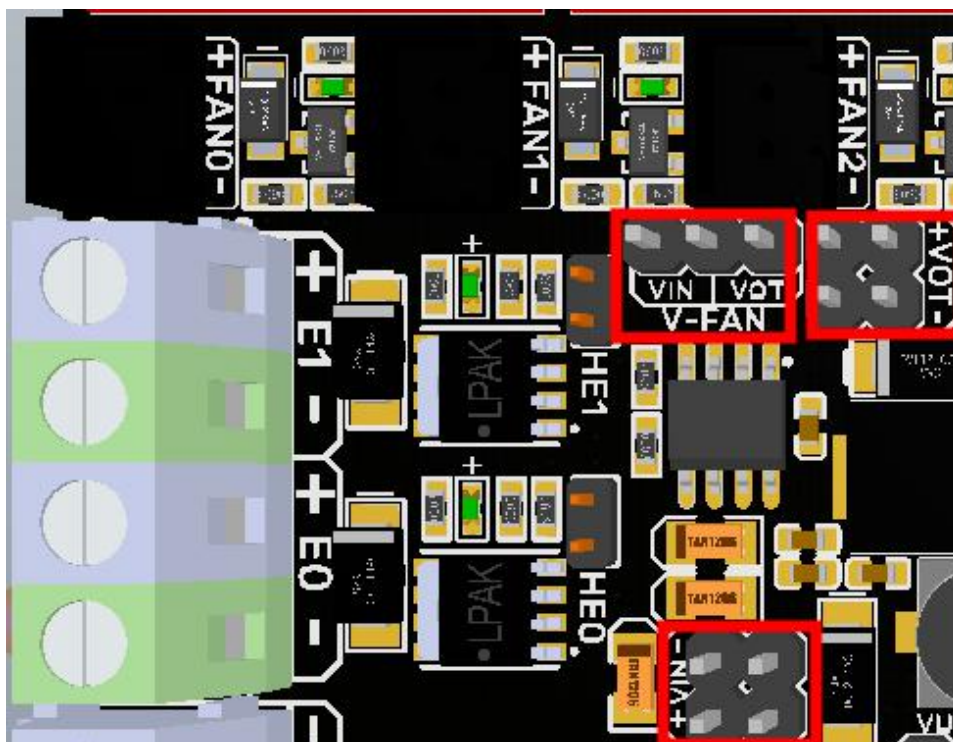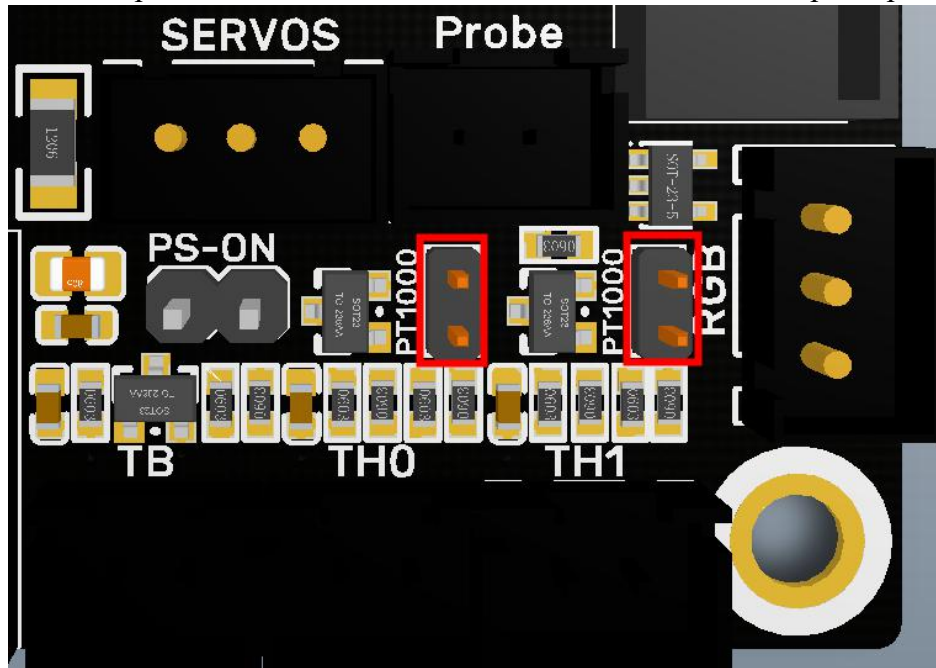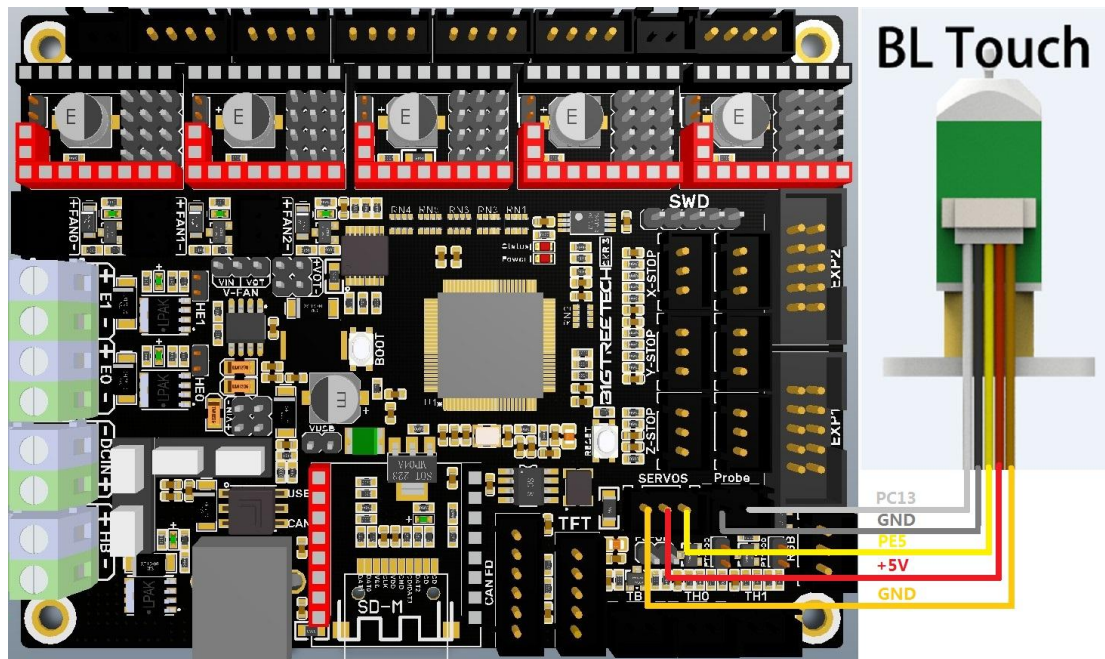
6.PT1000 and 100K NTC：

There is no need to insert jumper cap if choose 100K NTC thermistor. TH0 and TH1 are 4.7K pull-up resistors.

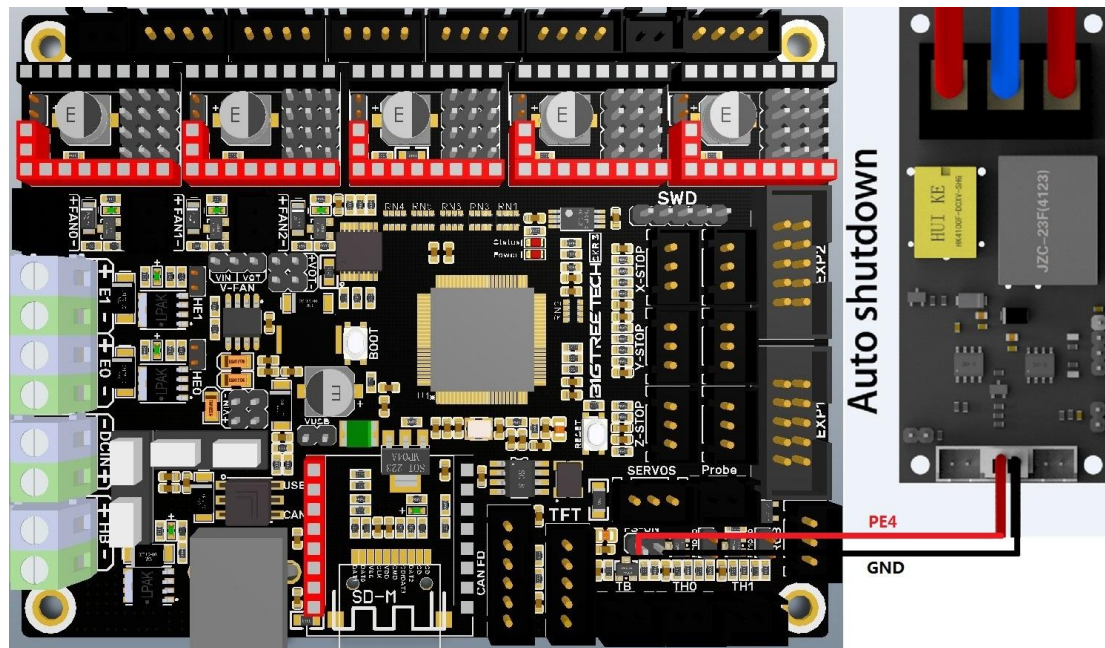Short the two pins below to choose PT1000. TH0 and TH1 are 1K pull-up resistor.

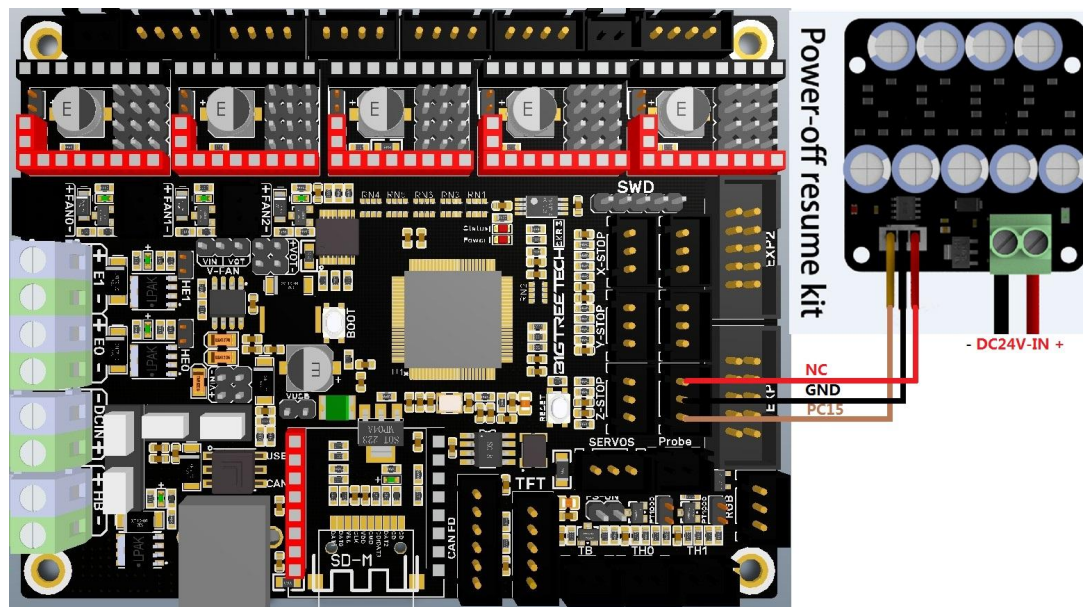## 7.Connection of BIGTREETECH SKR 3 and BLtouch：

8.Connection of BIGTREETECH SKR 3 and Relay V1.2:

9.Connection of BIGTREETECH SKR 3 and UPS 24V V1.0：

10.Connection of BIGTREETECH SKR 3 and RGB light：

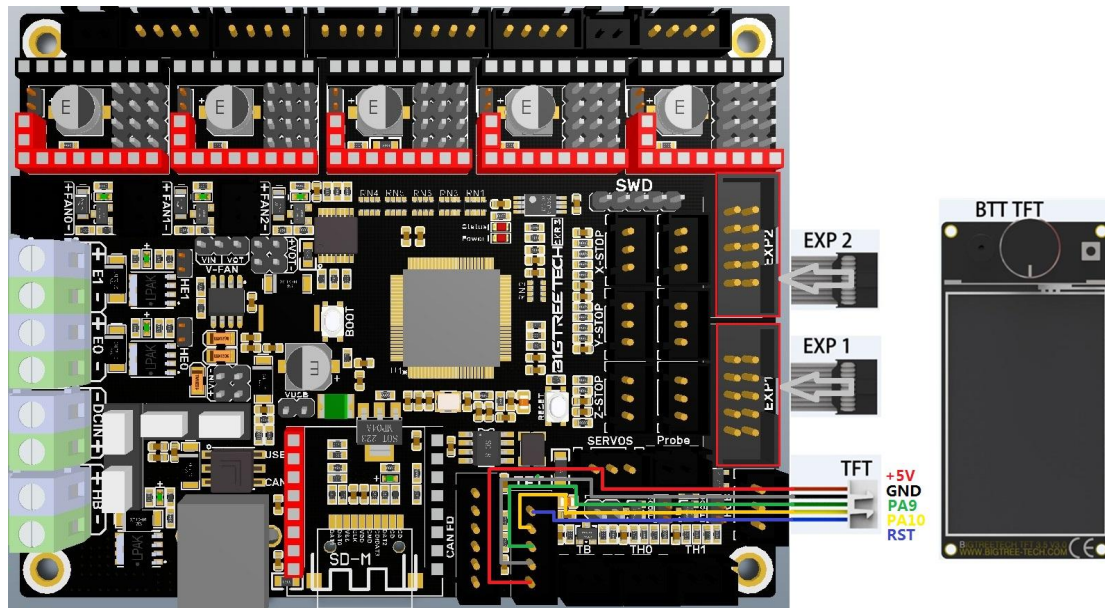11.Connection of BIGTREETECH SKR 3 and Raspberry Pi：

12. Connection of BIGTREETECH SKR 3 and Material break detection

module：
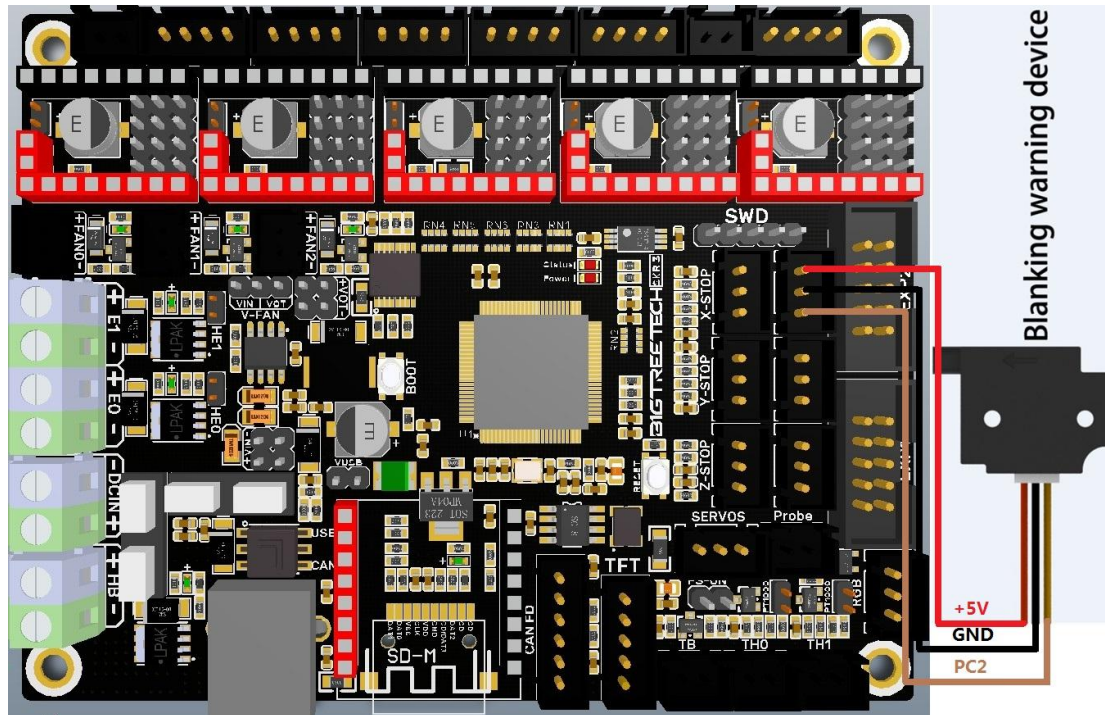
13. Connection of BIGTREETECH SKR 3 and SFS V2.0 module：
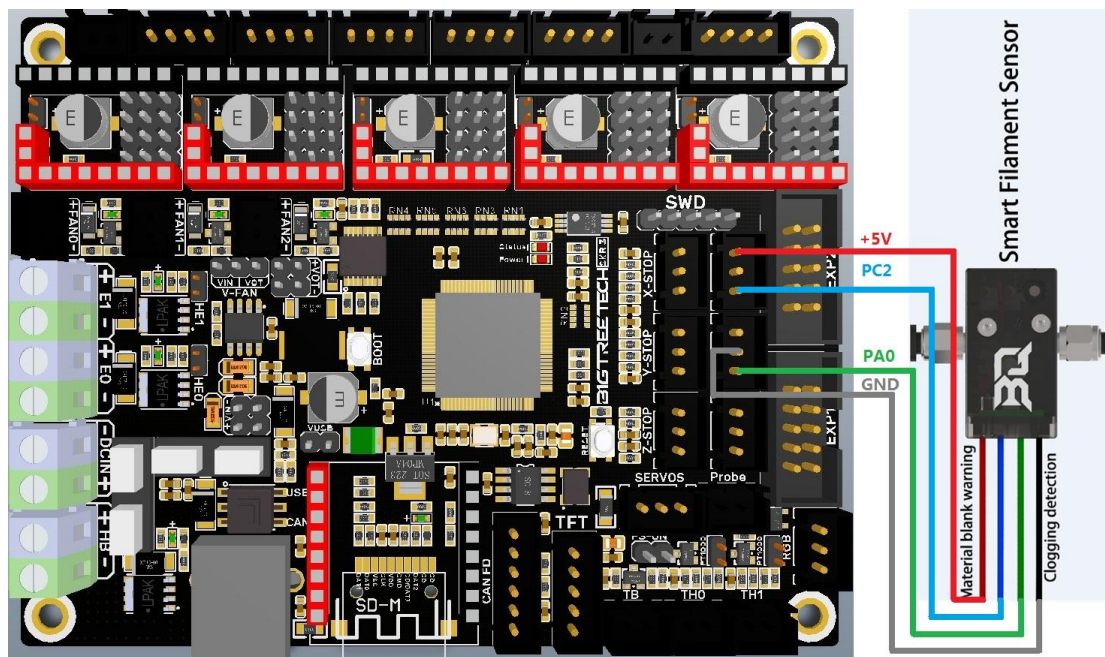
14. Connection of BIGTREETECH SKR 3 and BTT TFT screen：

V. Firmware of motherboard

The factory motherboard contains firmware for testing (I3 models), which can be used directly or changed.

1. How to get SKR 3 motherboard firmware

Contact our customer service or technical support.

Download link: https://github.com/bigtreetech

2.Marlin2.0 firmware update

After downloading the open source Marlin2.0 firmware, open the project with Visual Studio Code for compilation, and then find firmware.bin file, copy it to SD card, at last reset the motherboard.

3. For customer DIY please refer to BIGTREETECH SKR 3-PIN.pdf

Ⅵ.Cautions：

1.Do not insert the jumper caps if PT1000 not used, otherwise it will lead to inaccurate temperature readings.

2.The power of the hot bed must be ≤10A

If you choose high-powered hot bed, it is recommended to use a 24 V power supplied hot bed and 24 V to power the motherboard.

3. Please note the selection of power supply for CNC fan so that the fan works as normal.

4. Please note the selection of USB port. It there is no response when it is inserted into the computer, press DPDT switch to change mode.

5. Adopting the slot without self-ejecting, with less sistance. Please insert the card slowly. We are not responsible for damage caused by incorrection operation.

Should you have any issues, please don't hesitate to contact us. We strive to provide you with the best quality products and services. If you have any good comments or suggestions, please feel free to share with us. Thank you for choosing BIGTREETECH products!