EBB SB2209 USB V1.1

User Manual

Revision Log

Version	Date	Revisions
v1.00	June 26th, 2024	Initial Version
V1.1	September 4th, 2024	Various updates including addition of grounding section.

1 Product Profile

The BIGTREETECH EBB SB2209 USB V1.0 is a tool board designed for the Voron StealthBurner. It features convenient, user-friendly USB communication via a dual XT30 shielded cable for stable at communication high-speed. It also includes a TMC2209 driver and LIS2DW accelerometer.

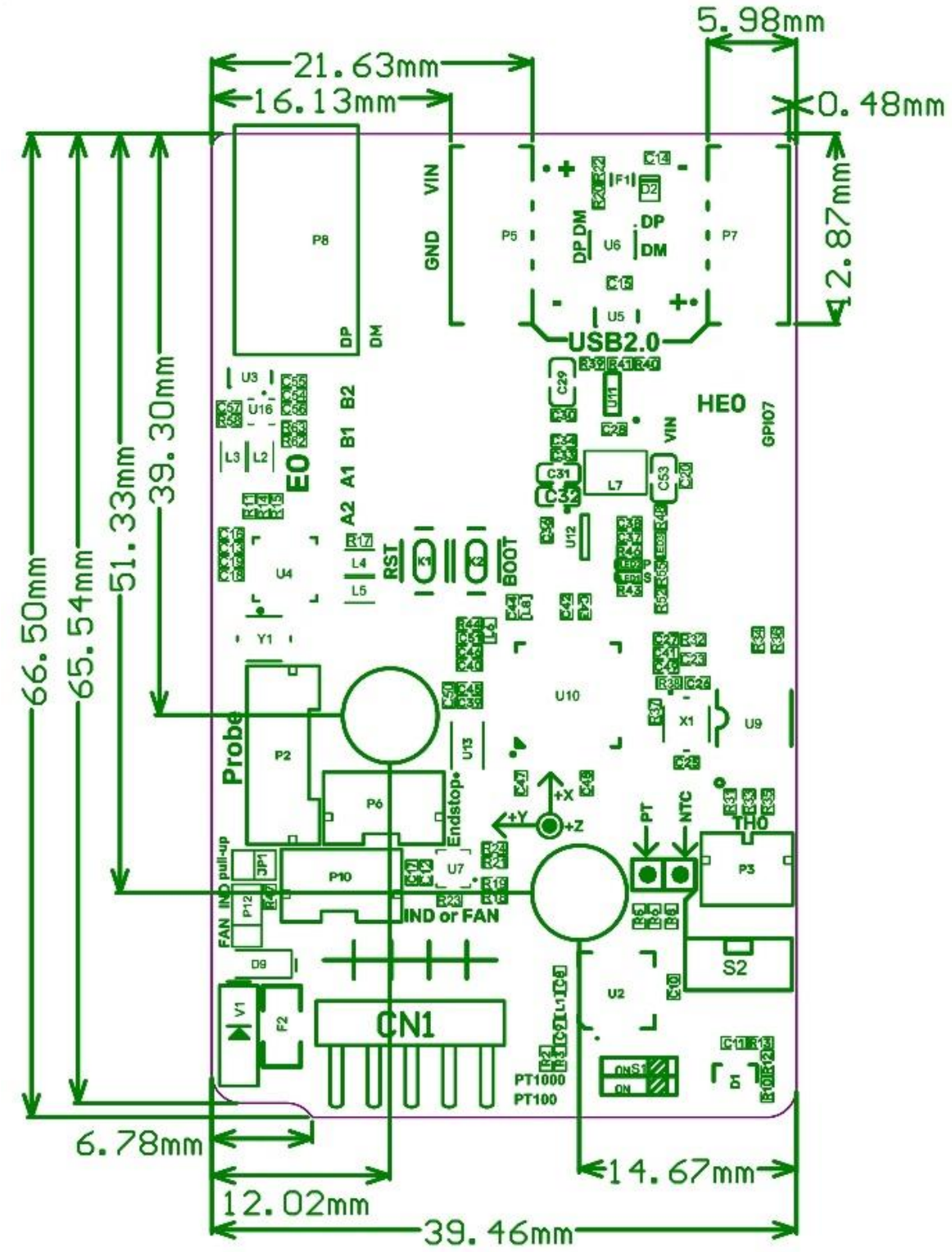
1.1 Feature Highlights

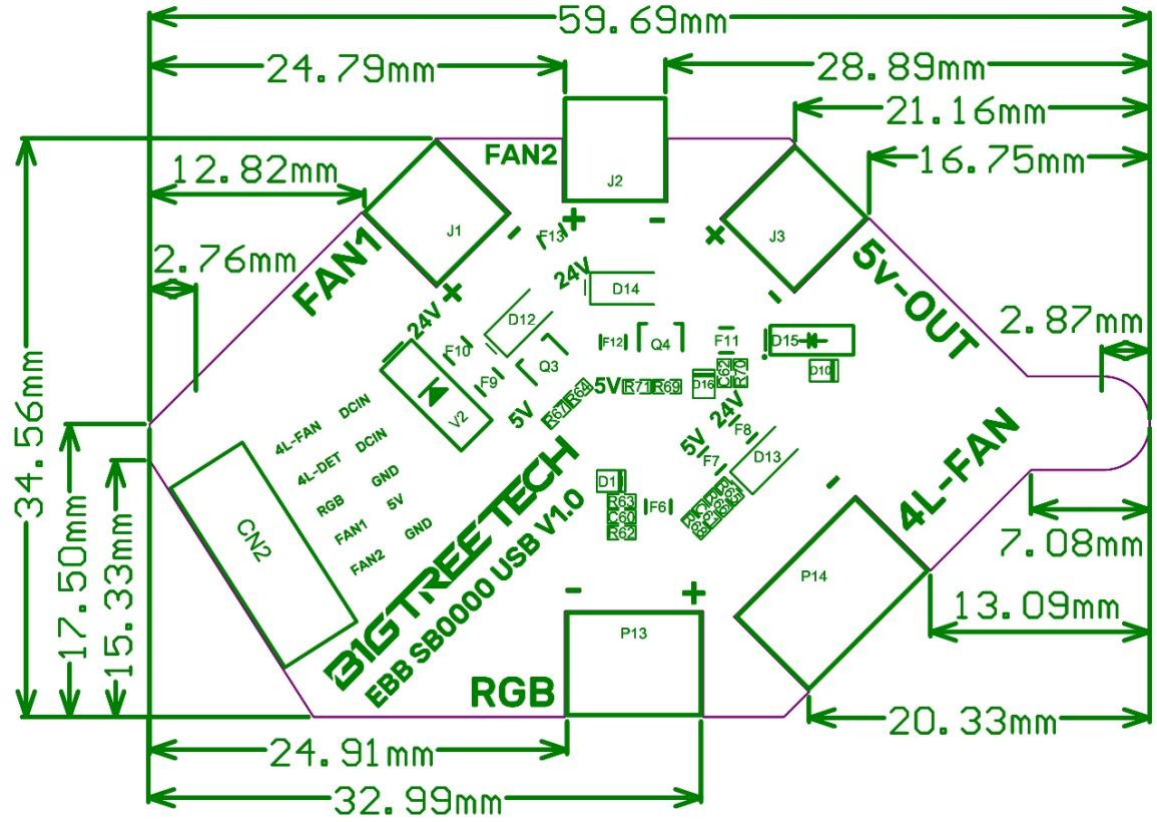
1. Utilizes a high-performance MCU: RP2040 133MHz.
2. The reserved BOOT and RESET buttons on the board allow users to enter DFU mode via USB to update the firmware.
3. A specially designed circuit on the board protects the thermistor, preventing MCU damage from shorted heater cartridge connections.
4. The heater cartridge driver utilizes high-performance MOSFETs to increase the output power capacity while reducing heat generation.
5. The PROBE port doubles as a PWM output via a simple jumper setting, providing a convenient interface to drive a tool board fan.
6. Onboard USB HUB chip - provides 3 USB ports to support multiple USB devices such as the BIGTREETECH Eddy, a nozzle camera, etc…
7. The USB ports are equipped with ESD protection chips to prevent the MCU from being damaged by static electricity at the USB ports.
8. Utilizes a high-speed signal conditioner to improve USB signal transmission and reduce disconnection risks.
9. Comes with a dual XT30 interface shielded and grounded cable to minimize external interference.
10. Utilizes JST connectors to increasing ensure good contact for all I/O.
11. PH2.0 spacing sockets make DIY wiring terminals easier.
12. DIY components, including connector housings, crimp terminals, and screws, are included for your convenience.

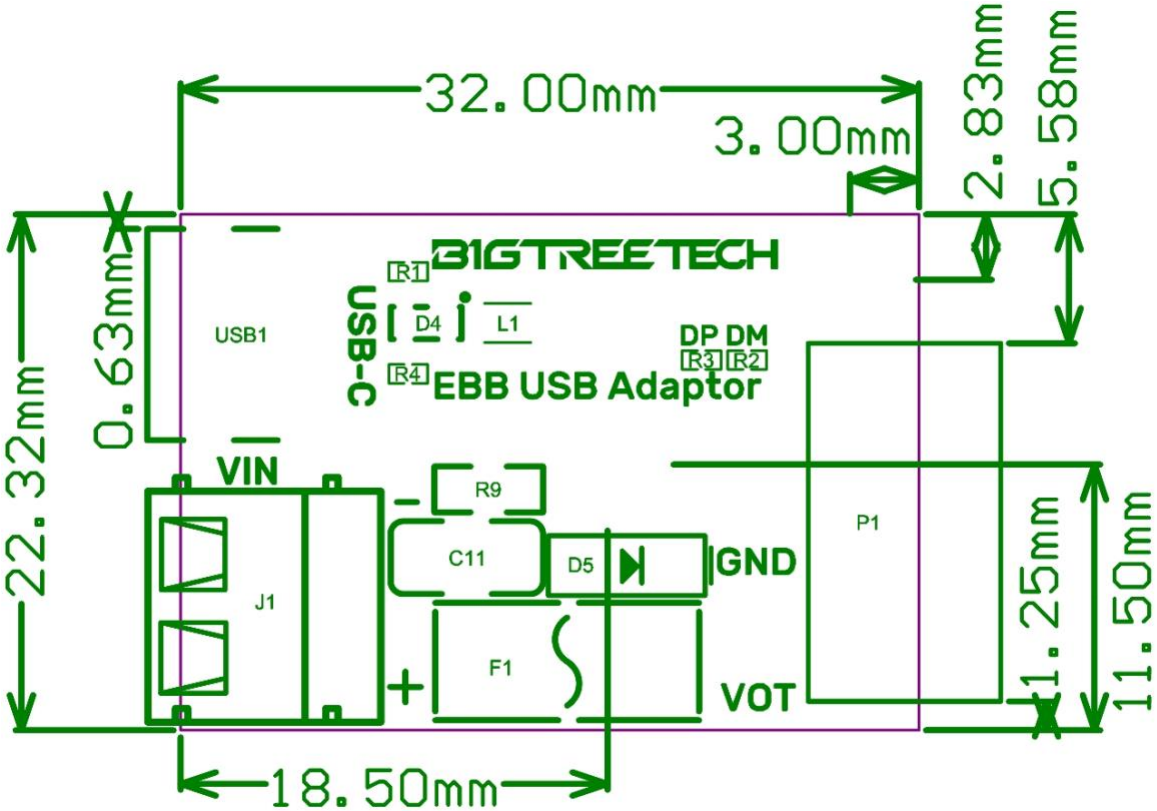
1.2 Specifications

MCU	RP2040 Dual ARM Cortex-M0+ @ 133MHz
Input Voltage	DC12V-DC24V 9A
Logic Voltage	DC3.3V
Heating Interface	Heater Cartridge (HE0), max output current: 6A
Onboard Accelerometer	LIS2DW
Fan Ports	2x PWM Fan Ports (FAN1, FAN2), 1x 4-pin Fan Port (4L-FAN)
Max Fan Output Current	1A, peak 1.5A
Expansion Interfaces	Probe, RGB, USB2.0 x 3, I^2C, Endstop, IND or FAN
Motor Driver	Onboard TMC2209
Driver Mode	UART
Stepper Motor Interface	E0
Temperature Sensor Interface	1x 100K NTC (pull-up resistor is 2.2K), supports PT1000
USB Communication Input Interface	XT30 2+2Pin
DCDC 5V Max Output Current	1A
Max ambient temperature	85°C

1.3 Dimensions

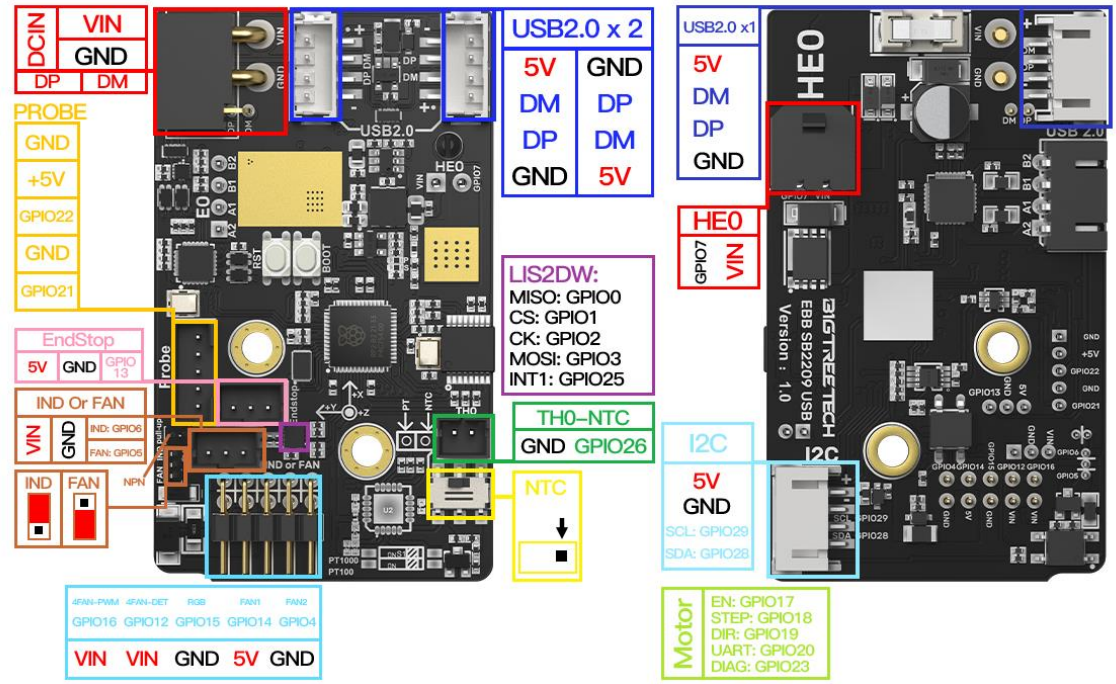


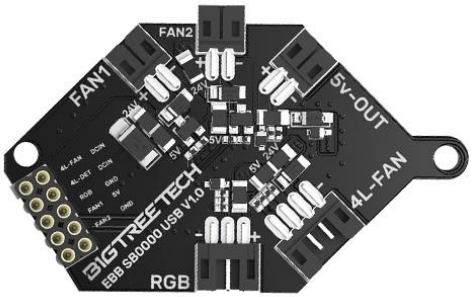

59.69mm
24.79mm
28.89mm
21.16mm
16.75mm
12.82mm
2.76mm
34.56mm
17.50mm
15.33mm
2.87mm
7.08mm
13.09mm
20.33mm
24.91mm
32.99mm
FAN1
FAN2
5V-OUT
4L-FAN
RGB
J1
J2
J3
P13
P14
CN2
BIGTREETECH
EBB SB0000 USB V1.0


32.00mm
3.00mm
2.83mm
5.58mm
0.63mm
22.32mm
BIGTREETECH
USB1
USB-C
DP DM
EBB USB Adaptor
VIN
GND
VOT
J1
P1
C11
D5
F1
R9
11.25mm
11.50mm
18.50mm

2 Peripheral Interfaces

2.1 Pin Description





EBB SB2209 USB-Pin

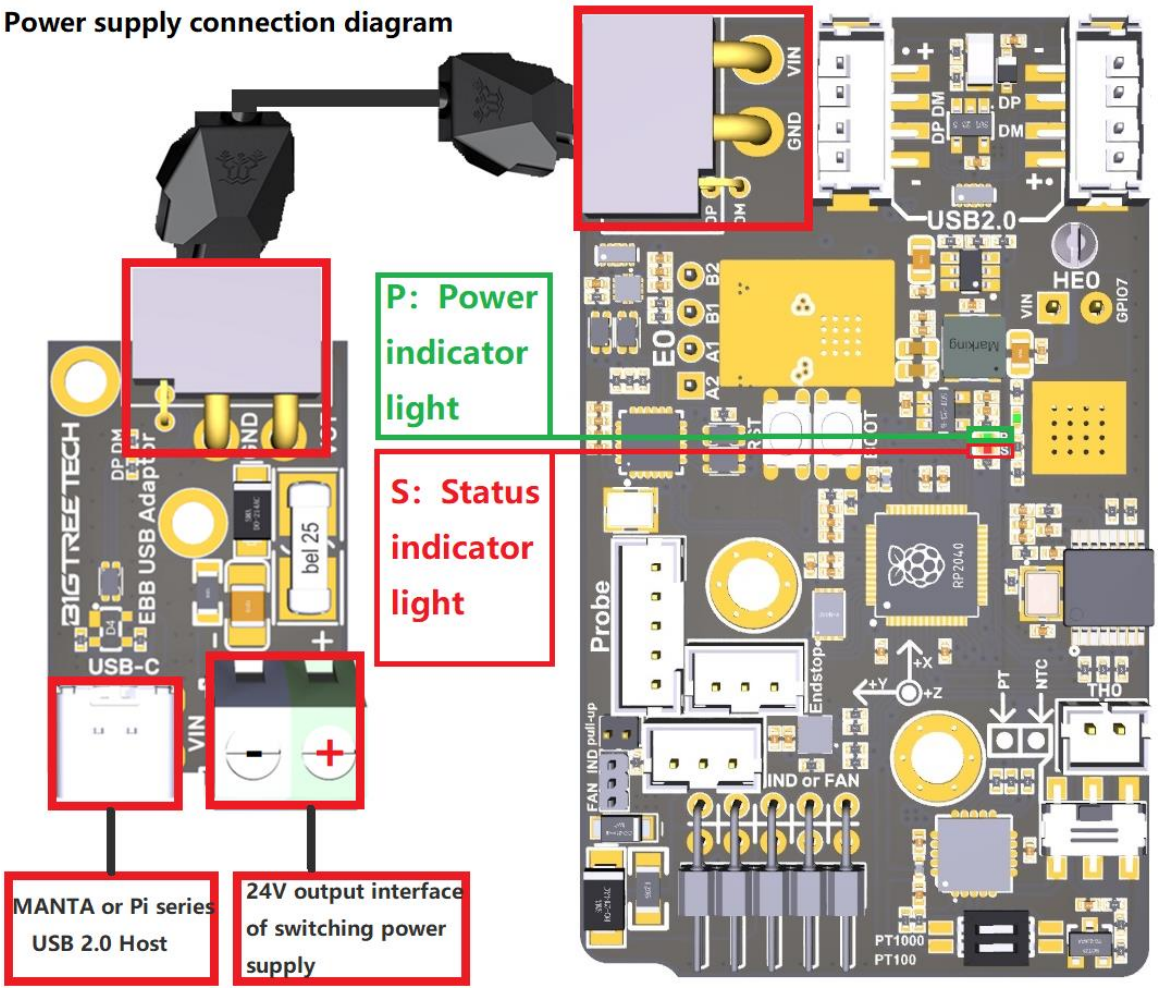
For details, please refer to BIGTREETECH EBB SB2209 USB-Pin.

3 Interface Connections

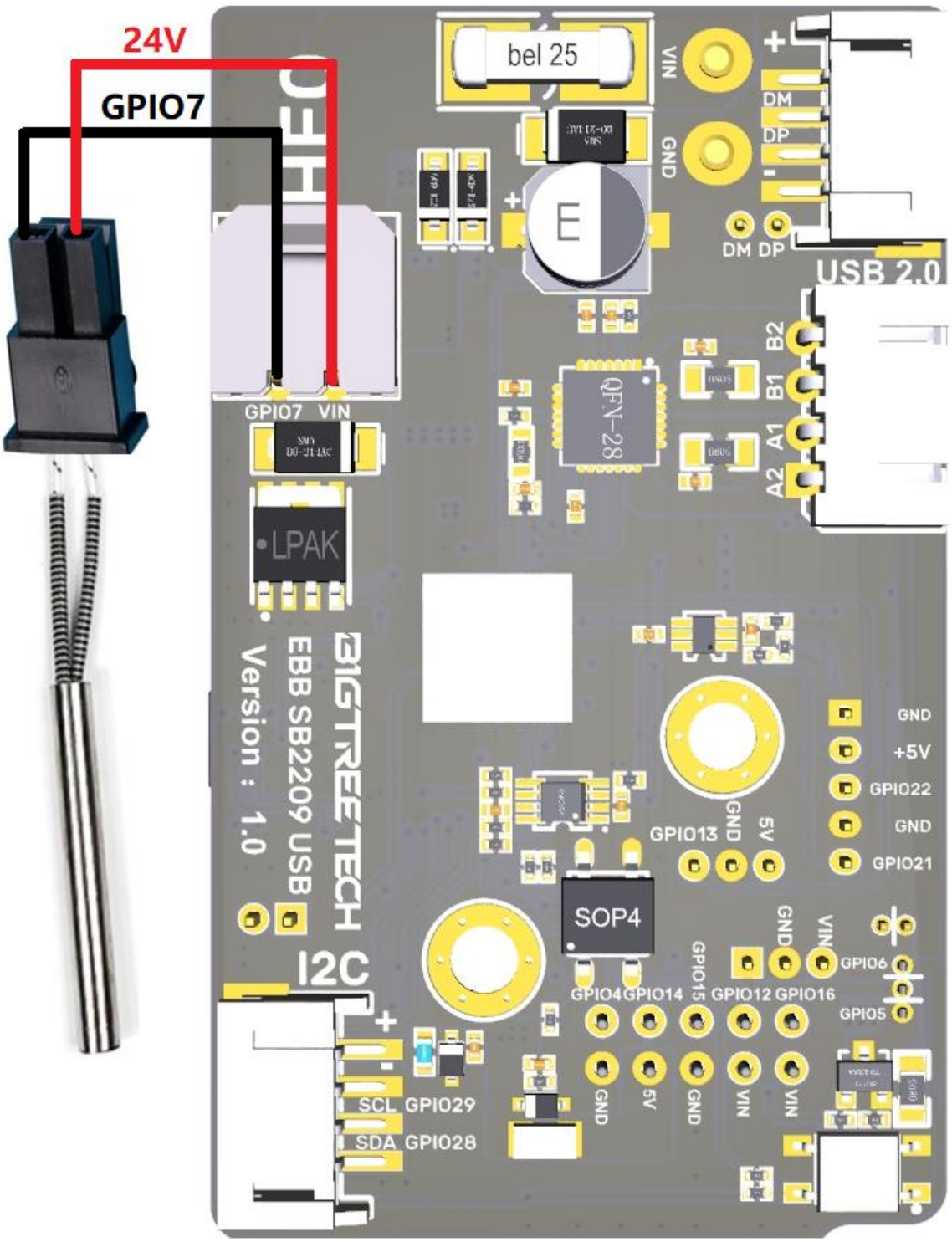
3.1 Power and USB Input Interface

When powered normally, the power indicator "P" stays on, and the status indicator "S" lights up when the program starts.

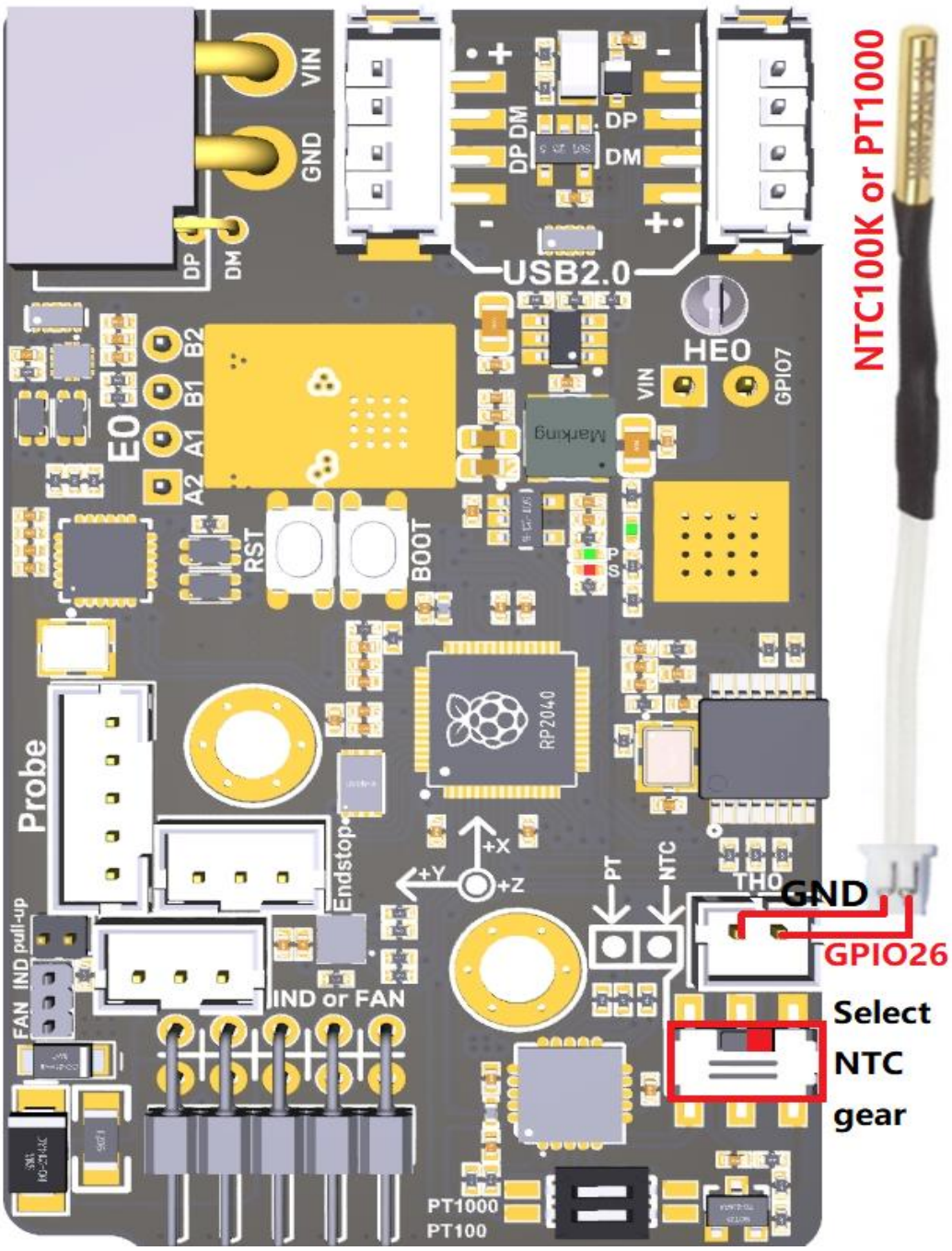
Power supply connection diagram



3.2 Heater Cartridge



3.3 100K NTC or PT1000

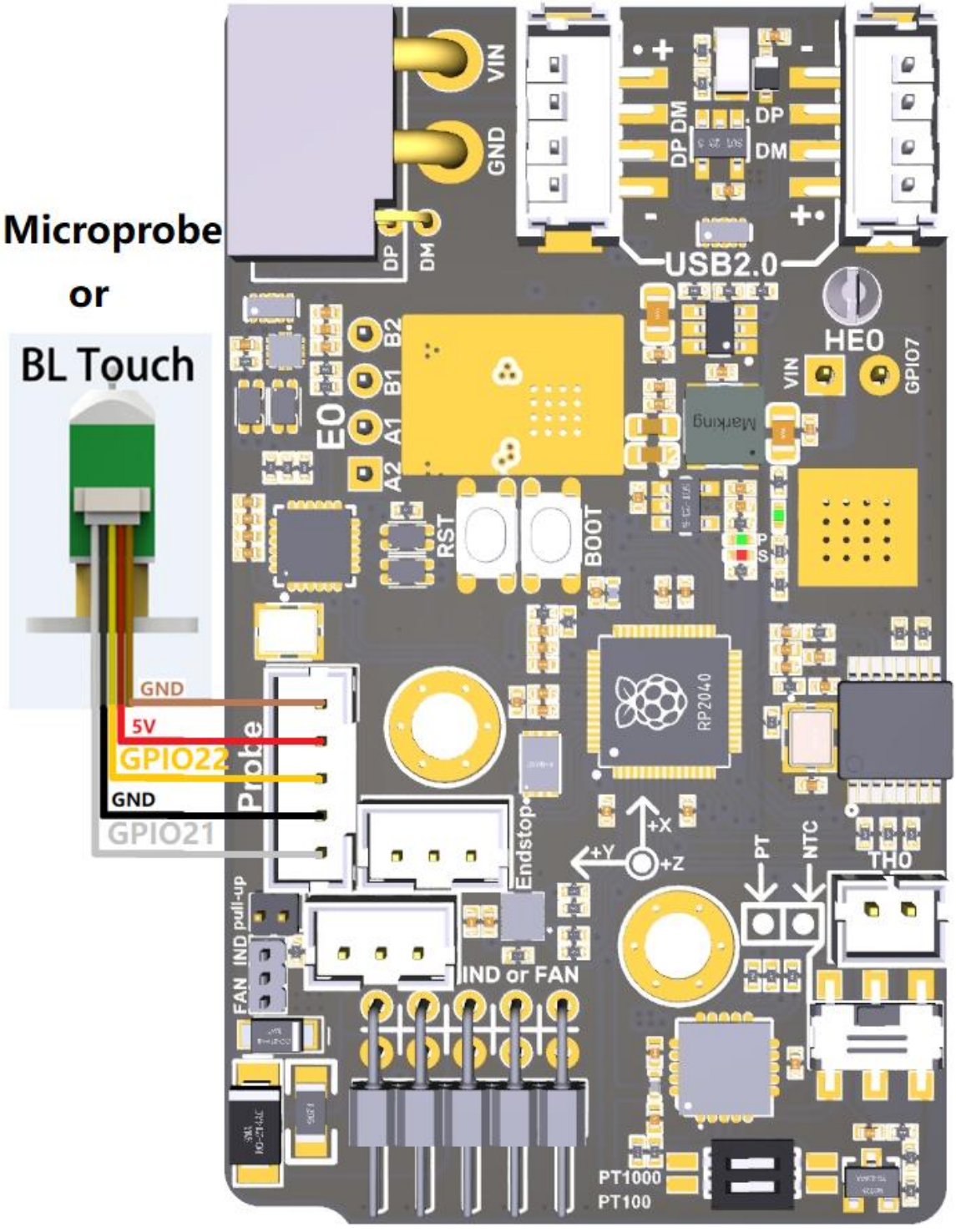


Note:

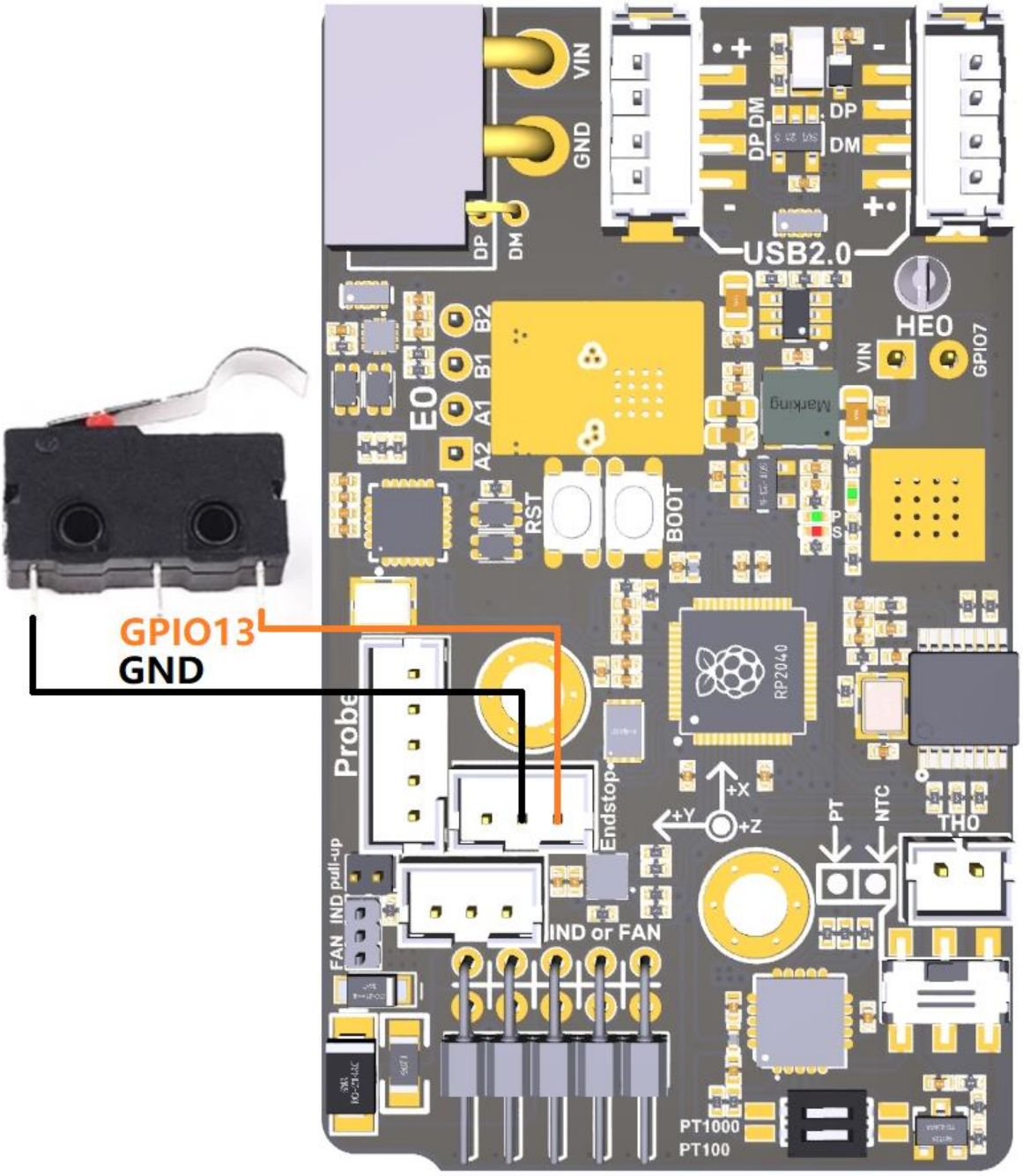
1. The factory default does not include the MAX31865 and related components.

2. The pull-up resistance value is 2.2K. When configuring the firmware, be careful not to incorrectly configure it as 4.7K, as this will cause inaccurate temperature readings.

3.4 Probe

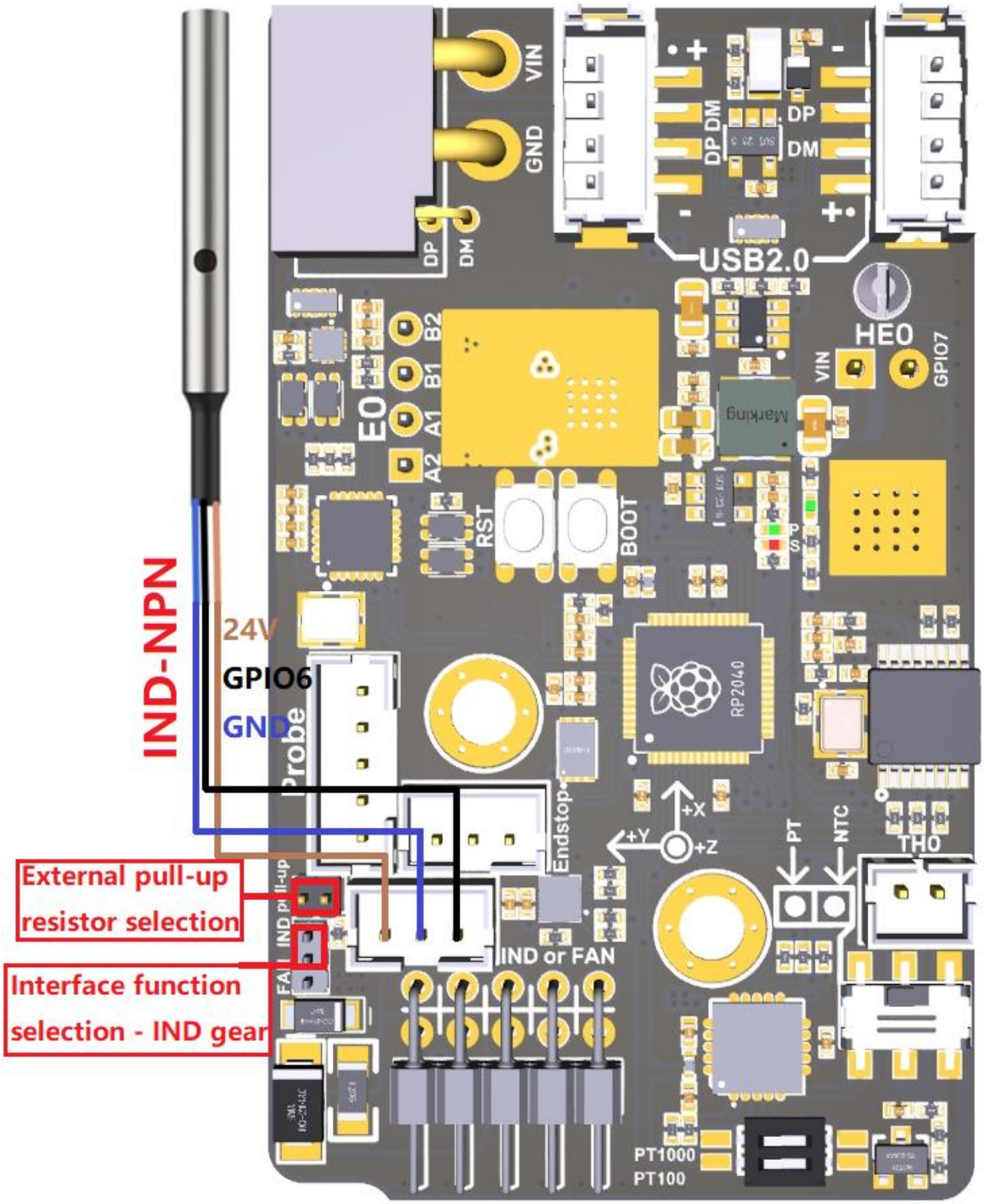

Microprobe
or
BL Touch
GND
5V
GPIO22
GND
GPIO21
Probe
VIN
GND
DP
DM
USB2.0
HE0
GPIO7
E0
B2
B1
A1
A2
RST
BOOT
RP2040
Endstop
+X
+Y
+Z
PT
NTC
TH0
FAN
IND pull-up
IND or FAN
PT1000
PT100

3.5 Endstop

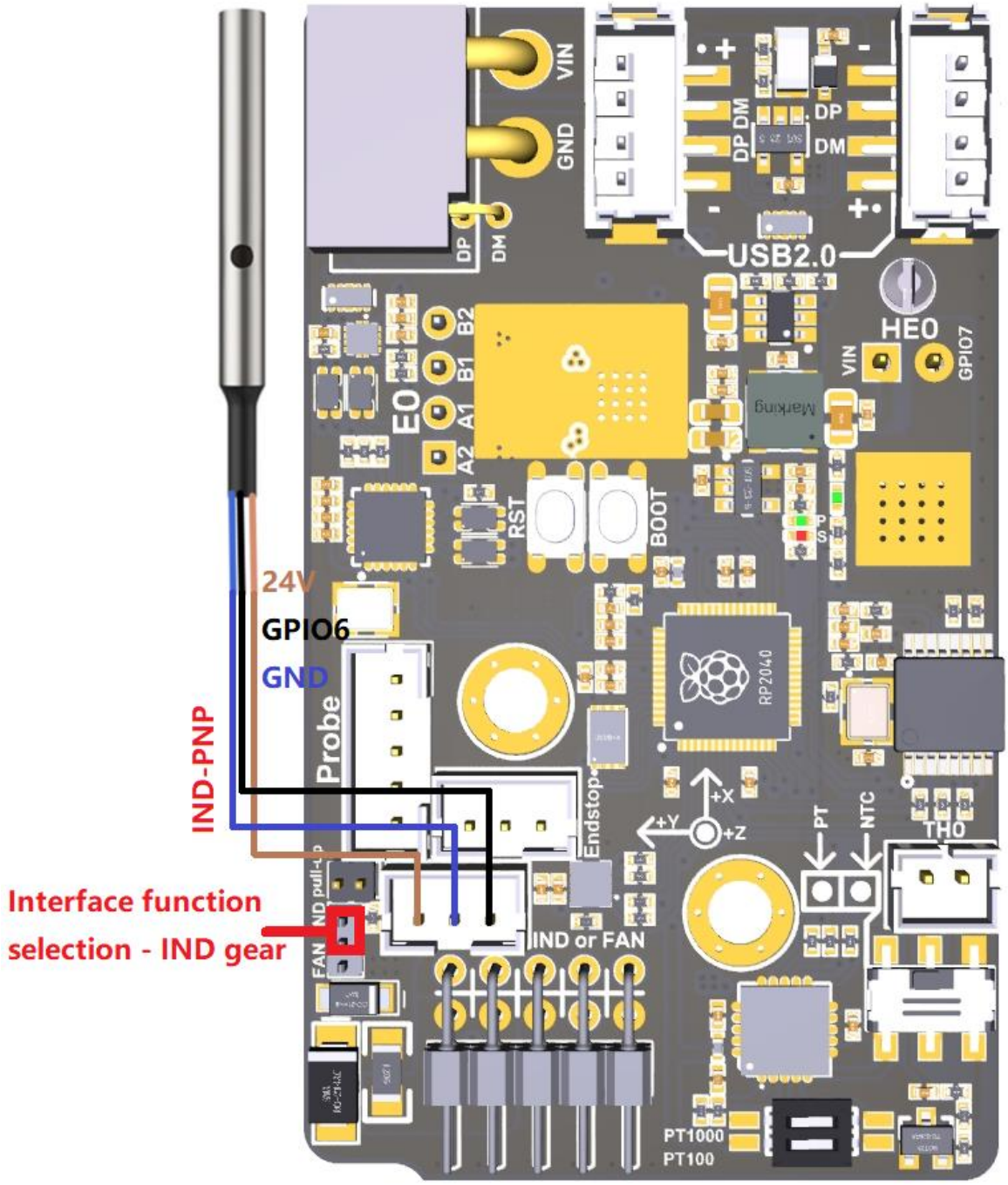

GPIO13
GND
VIN
GND
DP
DM
USB2.0
HE0
GPIO7
E0
B2
B1
A1
A2
RST
BOOT
RP2040
Probe
Endstop
+X
+Y
+Z
PT
NTC
TH0
FAN
IND pull-up
IND or FAN
PT1000
PT100

3.6 Proximity Switch

3.6.1 Connecting the NPN Type Proximity Switch



3.6.2 Connecting the PNP Type Proximity Switch

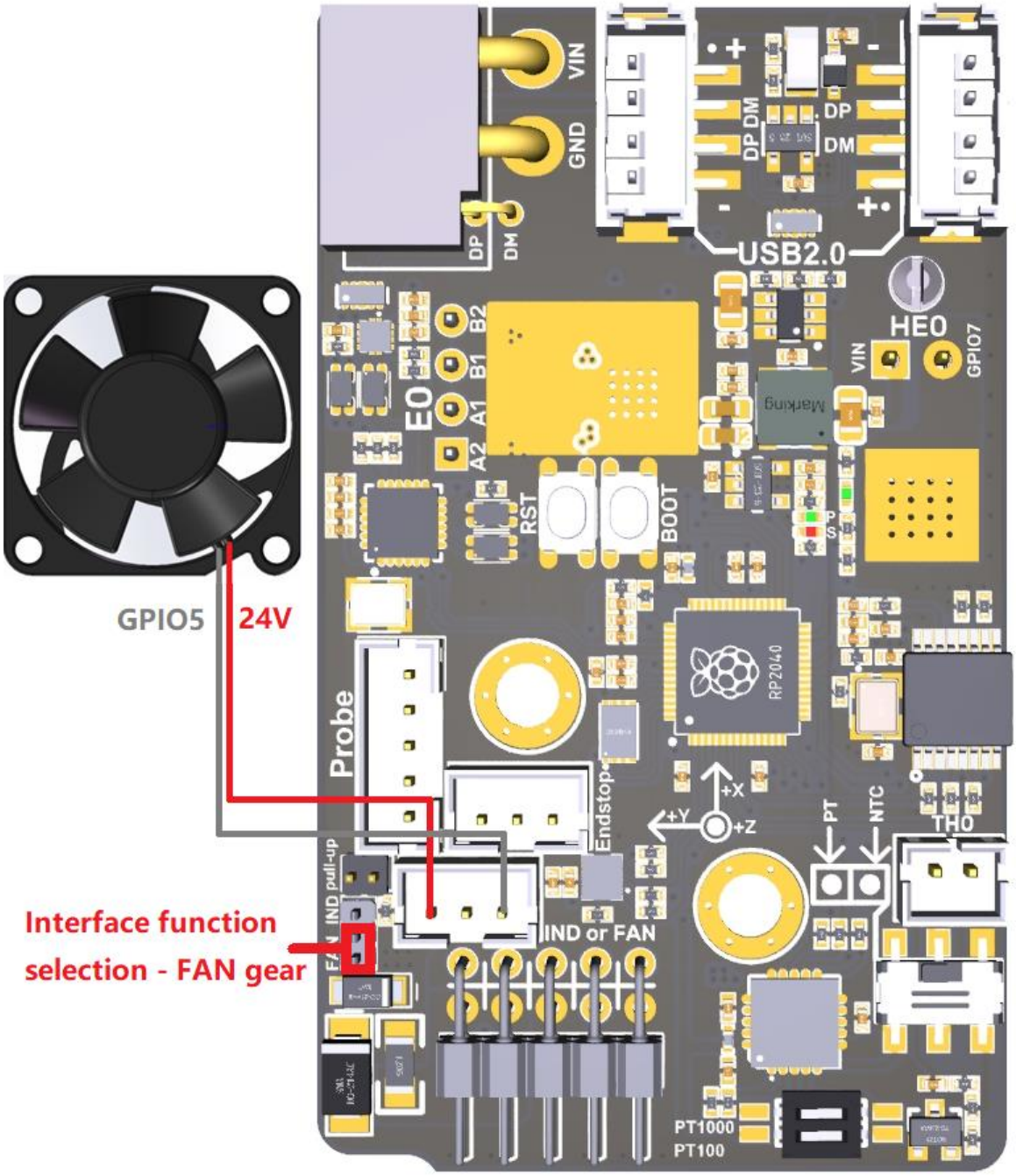


Note:

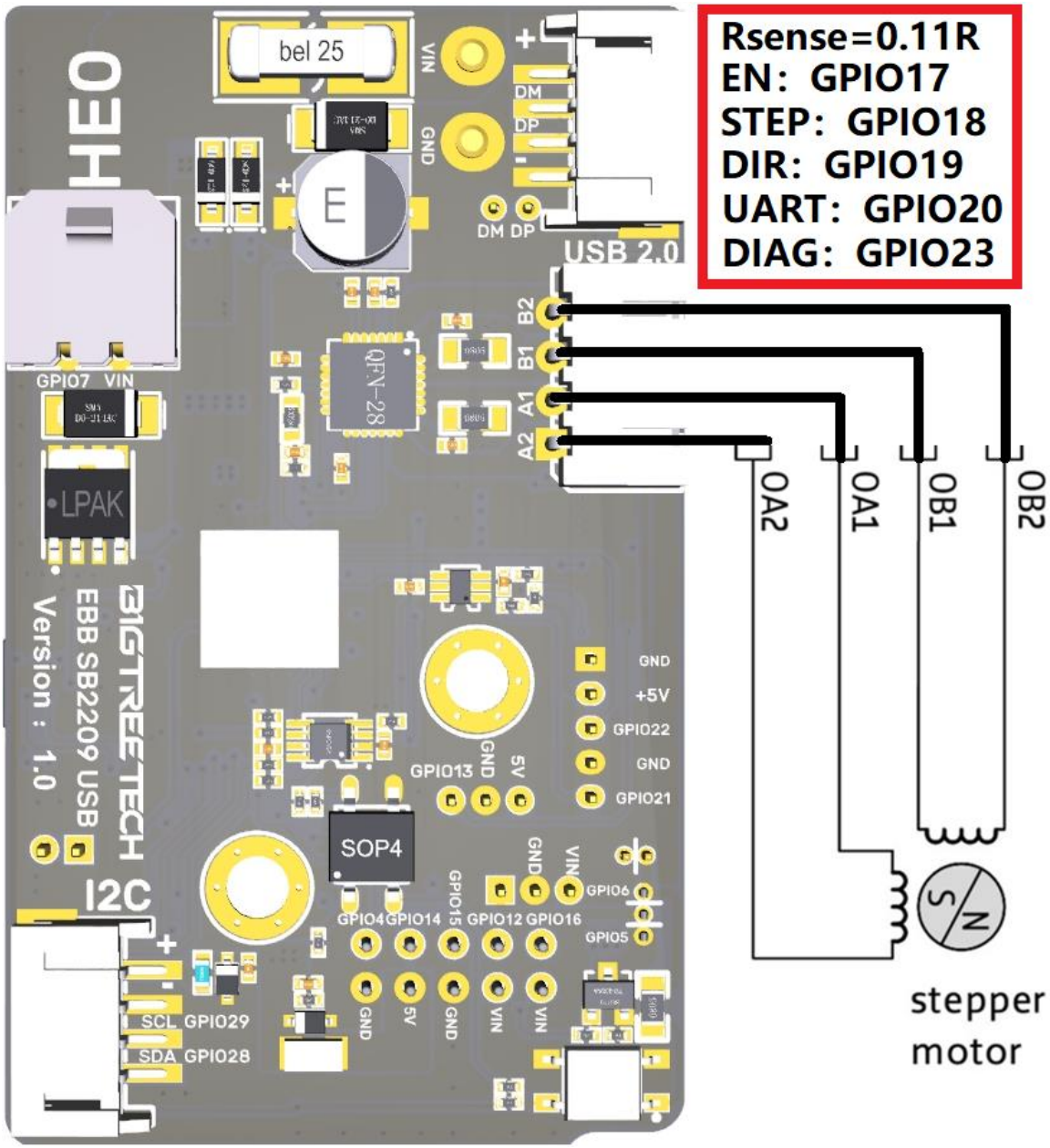
The interface only supports 24V proximity switches.

If using an NPN type proximity switch, use a jumper to short the two pins at the "pull-up" position.

3.6.3 Connecting a Fan



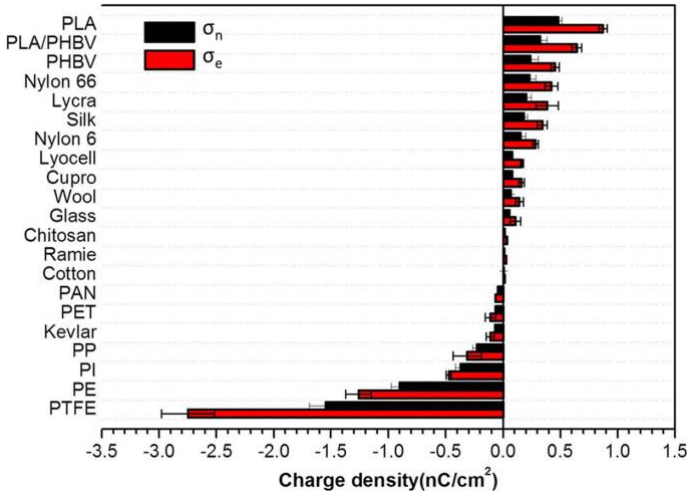
3.7 Stepper Motor



3.8 Grounding

When two materials rub together, they can generate a significant amount of static charge. In the case of 3D printers, it is the following interactions that are problematic:

- Filament and PTFE tubing.
- Belts and pulleys



Ref: https://ars.els-cdn.com/content/image/1-s2.0-S2211285518306335-fx1_lrg.jpg

Consider filament being fed into a reverse Bowden setup leading to a tool head mounted extruder. As the filament passes along the PTFE there is an exchange of electrons between the two materials. PTFE accepts electrons from the PLA which gladly donates them. This results in the PLA accumulating a massive positive charge over time and that positive charge is in turn carried to the toolhead components during printing. Eventually, the accumulated charge is able to jump across insulation barriers and onto conductors that lead to the toolboard. This sudden discharge can result in a number of problems during printing which are difficult to replicate and can be confusing to users. It is noteworthy that this issue mainly occurs in environments that have a relative humidity level below 60% at standard room temperature.

In order to prevent these sudden discharge events, it is better to provide a discharge path for the accumulated charge that has a very low resistance so that it can constantly discharge as it accumulates. Grounding the hotend components with electrical connections leading back to the toolboard is an effective way of doing this.

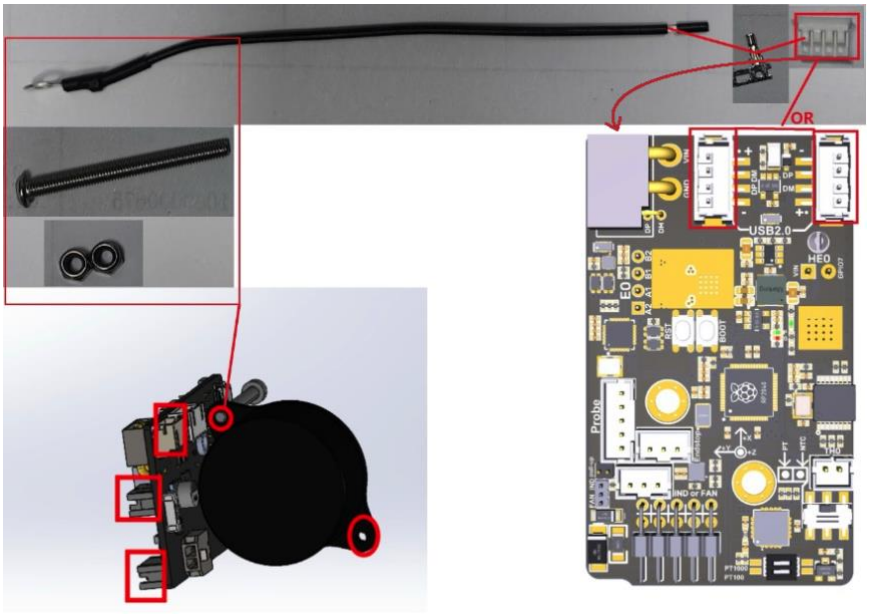
We recommend grounding the motor at the very least (grounding the nozzle and heatsink are exercises left to the discretion of the user) and this is why BIGTREETECH provides a motor grounding kit with each toolboard. Use the motor grounding kit according to the steps provided below if using a standard stealthburner. If your installation is non-standard then follow the principles while making the needed adjustments to fit your installation.

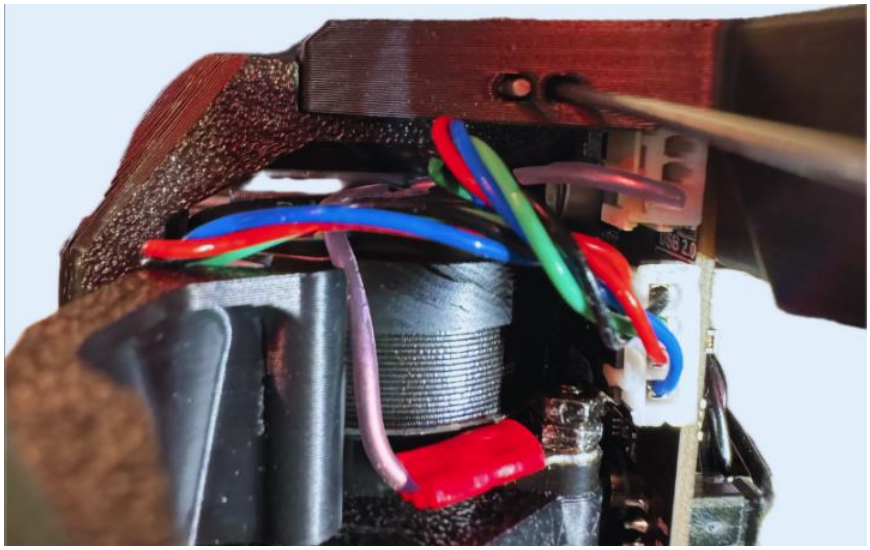
1. Remove the existing, upper screw holding the extruder motor in place.
2. Insert the provided screw in its place.
3. Place the ring terminal over the end of the screw and secure it in place with the two provided nuts. The nuts will lock together and prevent the arrangement from coming

loose during operation. If the arrangement interferes with a plug on your toolboard then you can substitute the two nuts with a single, M3 locknut (self sourced).

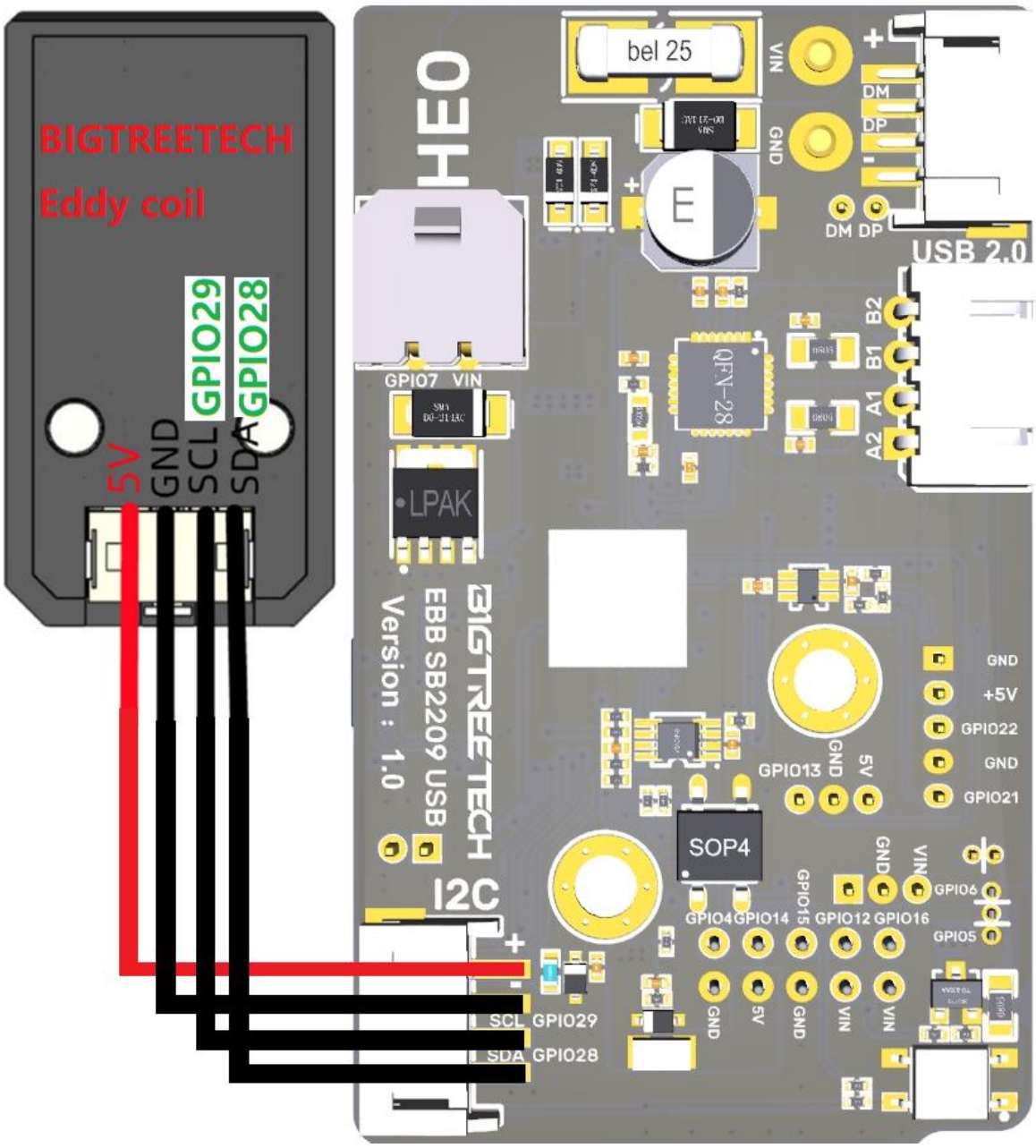
4. Identify an open connector on your toolboard with a ground pin.
5. Crimp the loose end of the grounding kit wire into a JST connector such that it will connect to the ground pin when inserted. Be absolutely sure that you have selected the ground pin otherwise you risk charging the body of the motor with whatever level is on the pin you use and this could cause damage to your toolboard and/or motor.
6. Insert the JST connector into the selected connector.

The images below show a typical installation for the EBB SB2209 USB.

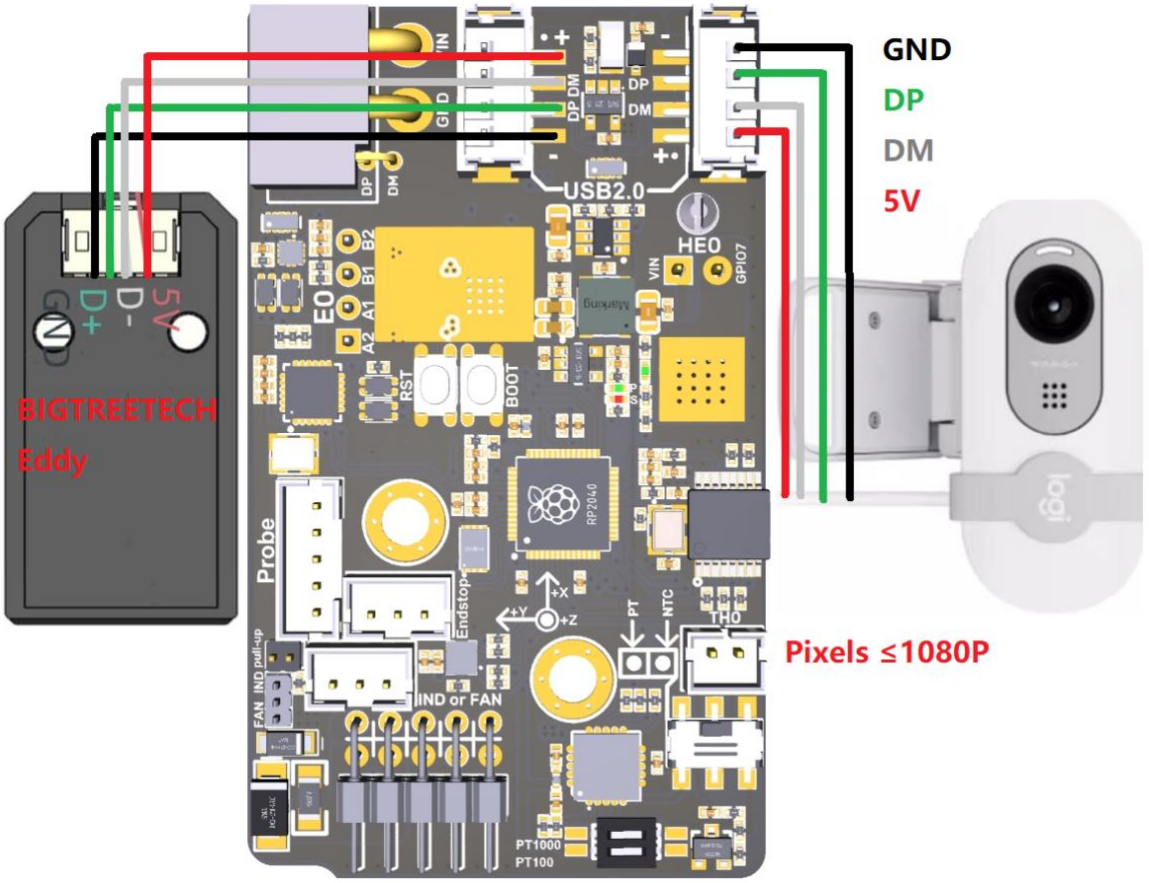


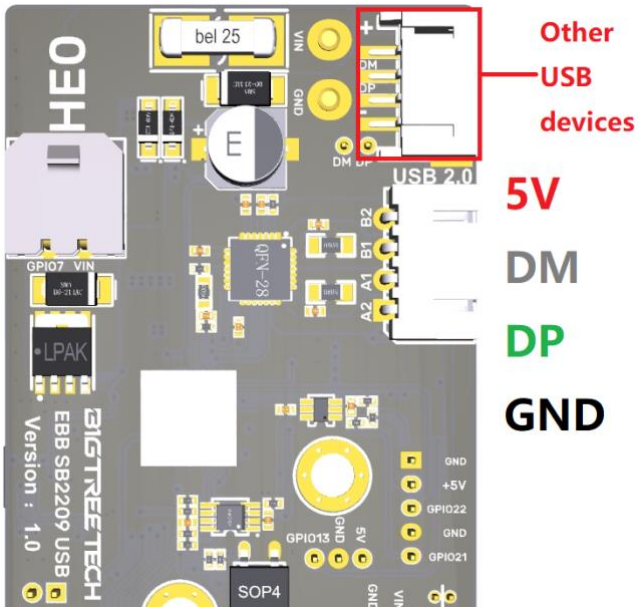


3.9 I²C


BIGTREETECH
Eddy coil
5V
GND
SCL
SDA
GPIO29
GPIO28
bel 25
VIN
GND
DM
DP
USB 2.0
QFN-28
LPAK
GPIO7
VIN
B2
B1
A1
A2
BIGTREETECH
EBB SB2209 USB
Version : 1.0
I2C
SCL GPIO29
SDA GPIO28
SOP4
GPIO13
GND
5V
GPIO4
GPIO14
GPIO15
GPIO12
GPIO16
GPIO6
GPIO5
GND
+5V
GPIO22
GPIO21

3.10 USB2.0





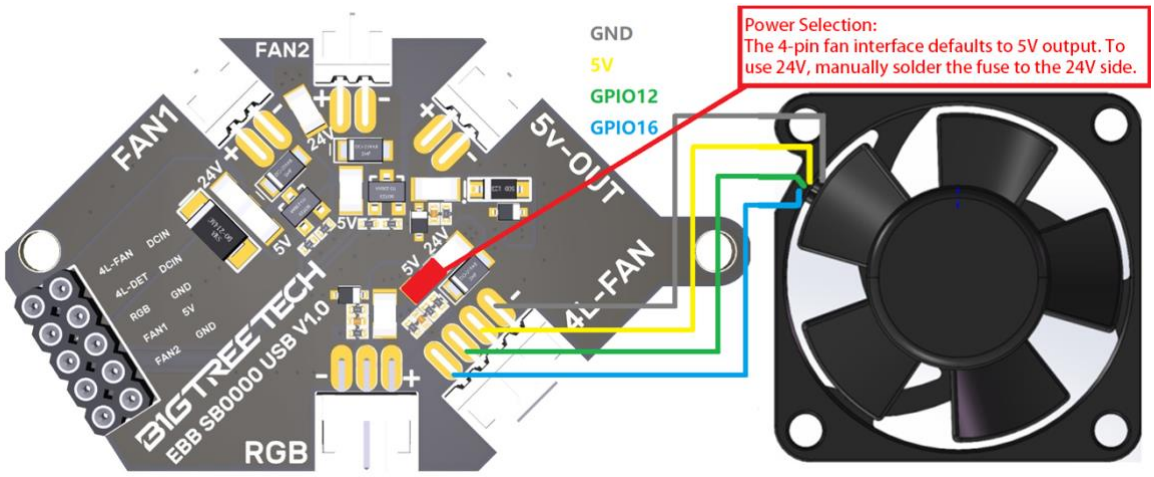
Note:

The three USB2.0 interfaces can only support one camera simultaneously.

It is recommended to use a camera with a resolution of 1080P or lower to maintain smooth performance.

3.11 Fan Connection and Voltage Selection

3.11.1 4-pin Fan

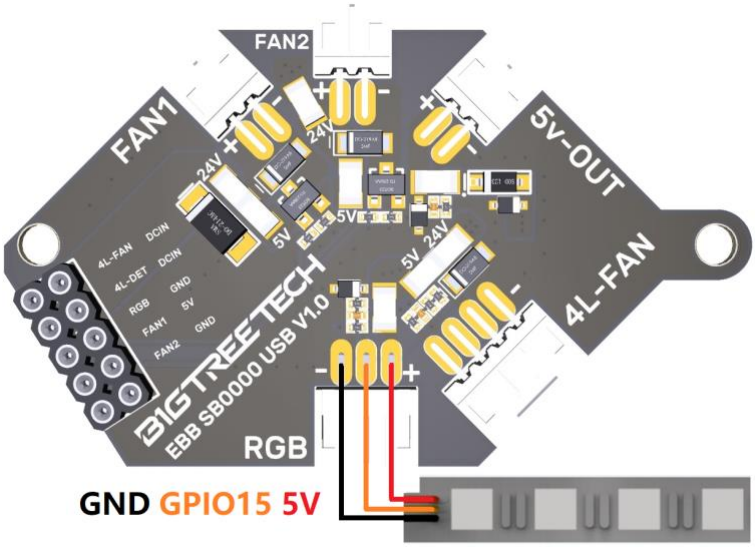


Note: The 4-pin fan interface defaults to 5V output at the factory. You will need to manually solder the fuse to the 24V side if you want to use 24V.

3.11.2 2-pin Fan

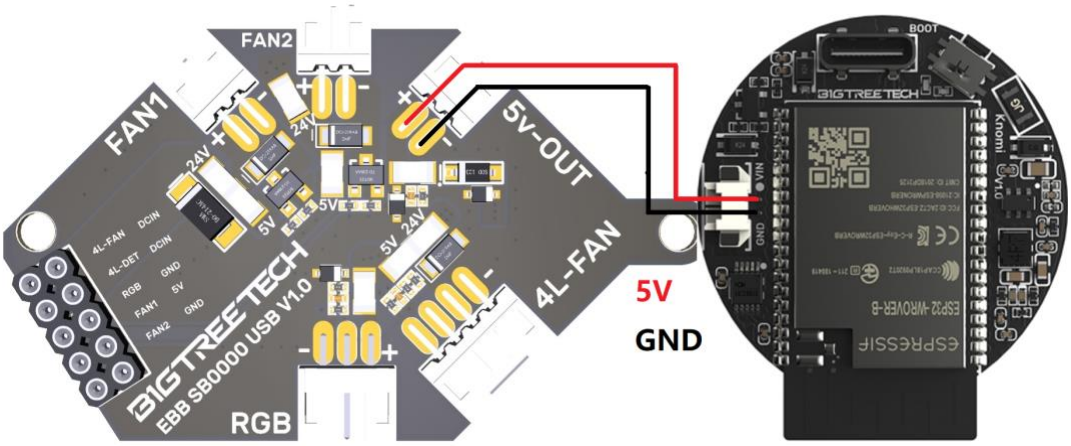
Note: The 2-pin fan interface defaults to 24V output at the factory. You will need to manually solder the fuse to the 5V side if they want to use 5V.

3.12 RGB

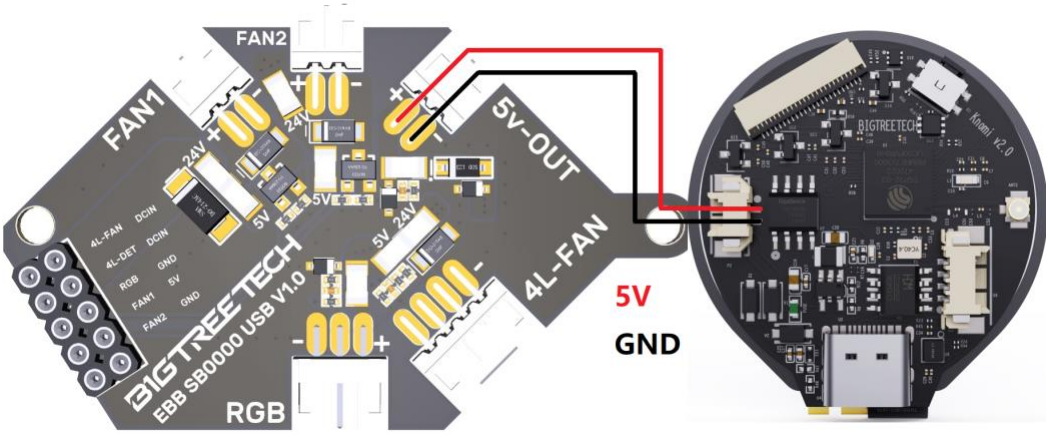


3.13 5V-OUT

KNOMI:



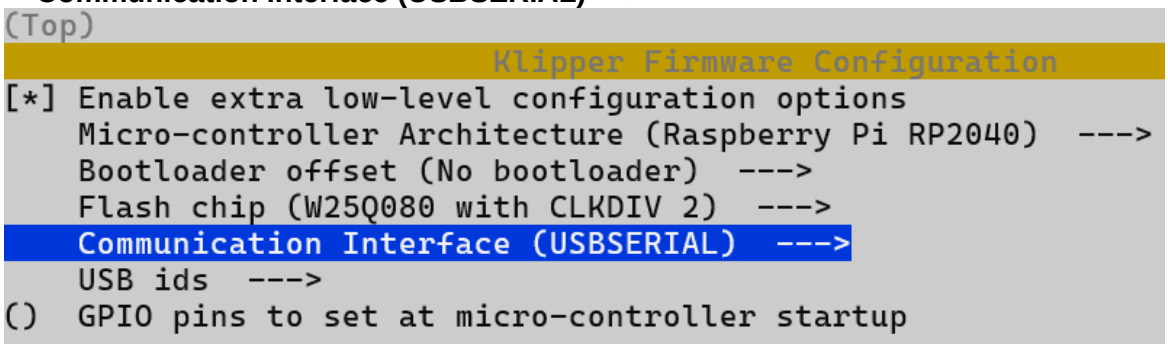
KNOMI 2:



4 Klipper

4.1 Compiling Firmware

1. After SSH connects to Raspberry Pi, enter the following in the command line:
cd ~/klipper/
make menuconfig
Compile the firmware using the configuration below (if these options are not available, update the Klipper firmware source code to the latest version).
[*] Enable extra low-level configuration options
Micro-controller Architecture (Raspberry Pi RP2040) --->
Bootloader offset (No bootloader) --->
Flash chip (W25Q080 with CLKDIV 2) --->
Communication Interface (USBSERIAL) --->

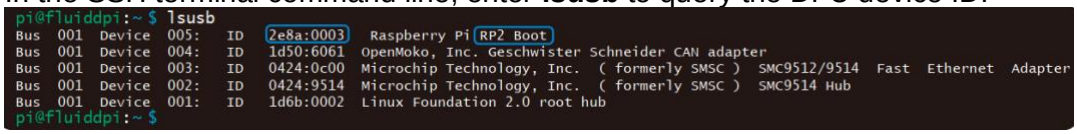


2. After configuring, enter ‘q’ to exit the configuration interface. When asked to save configuration, select ‘Yes’.
3. Enter **make** to compile the firmware. When make is completed, the required **klipper.uf2** firmware will be generated in the **home/biqu/klipper/out** folder.

4.2 Firmware Update

Raspberry Pi or CB1 firmware update through DFU

1. Use the adapter board to connect the BIGTREETECH EBB SB2209 USB V1.0 to Raspberry Pi/CB1, and ensure the power cable is also connected.
2. Hold down the Boot button, then press the Reset button once to enter DFU mode.
3. In the SSH terminal command line, enter **lsusb** to query the DFU device ID.



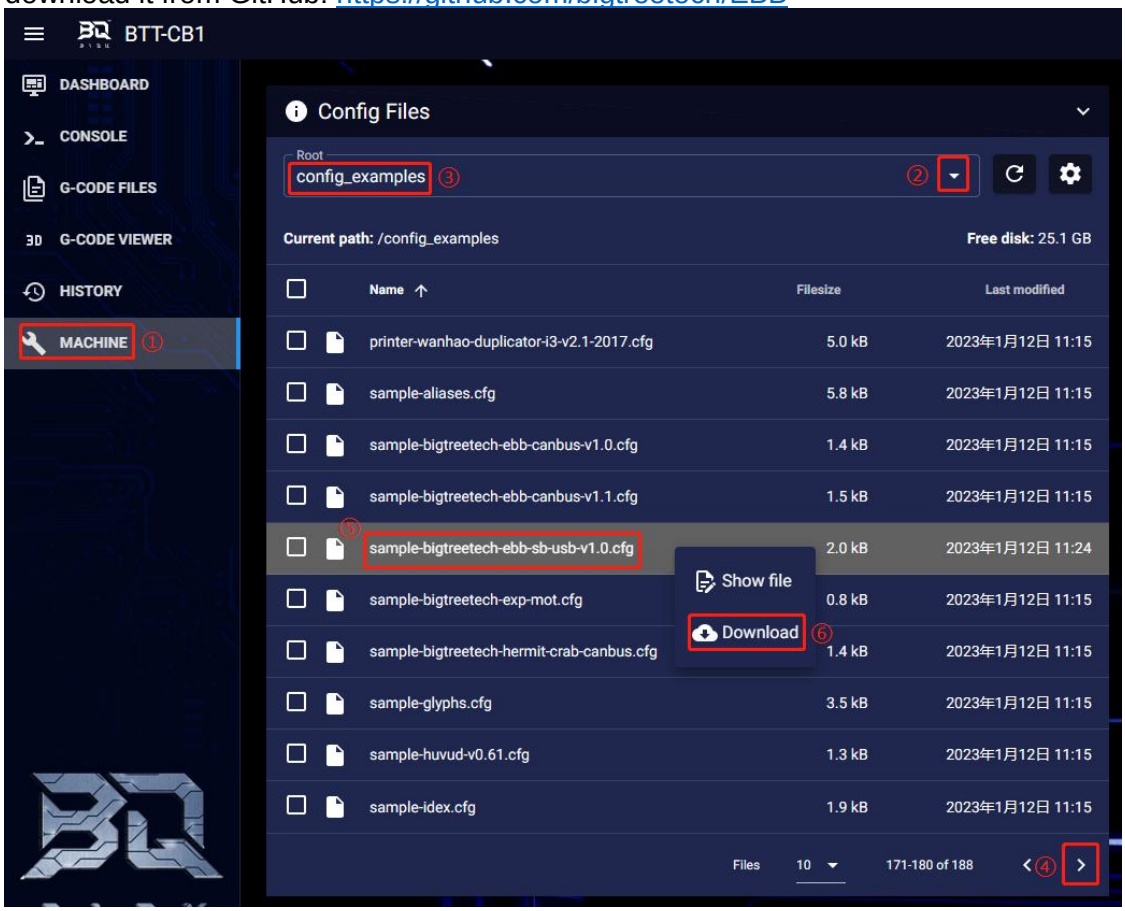
Enter **cd klipper** to navigate to the klipper directory, then enter
make flash FLASH_DEVICE= 2e8a:0003
to start flashing the firmware (note: replace 2e8a:0003 with the actual device ID obtained in the previous step).

4. After flashing, enter
ls /dev/serial/by-id/
to query the device Serial ID.

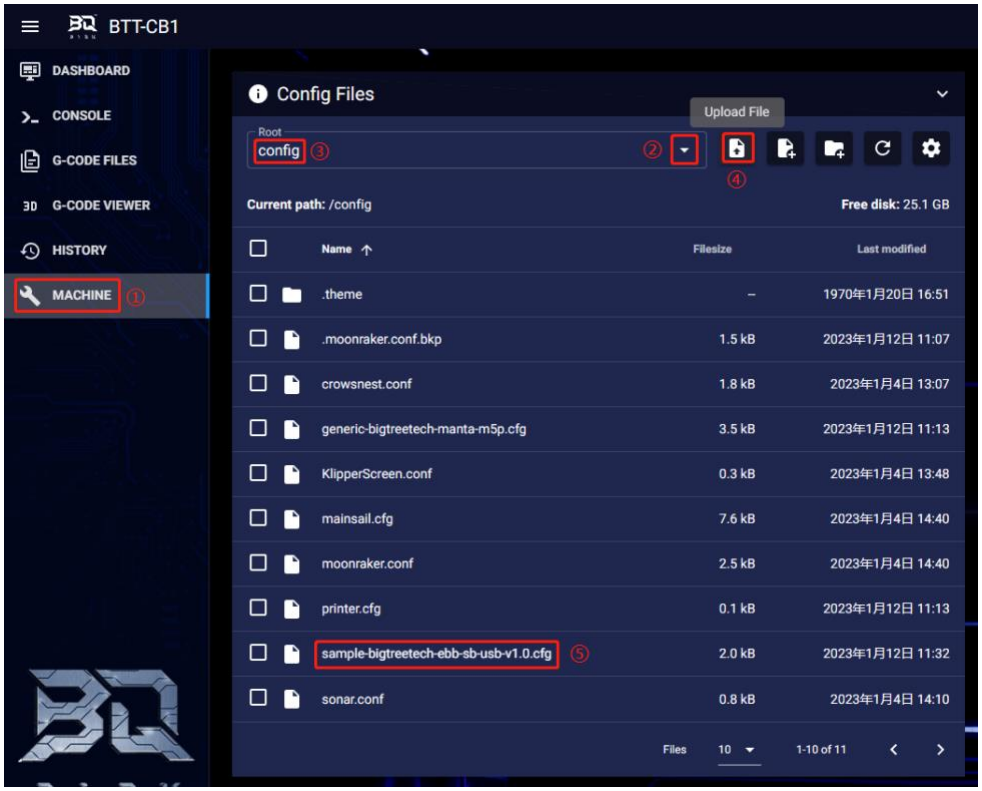
5. There is no need to manually press the Boot button to enter DFU mode for subsequent updates after the first flashing is completed. Directly enter **make flash FLASH_DEVICE=/dev/serial/by-id/usb-Klipper_rp2040_4550357128922FC8-if00** to flash the firmware (note: replace **/dev/serial/by-id/xxx** with the actual ID obtained in the previous step).
6. After flashing, remove the VUSB jumper and Type-C data cable.

4.3 Configuring Klipper

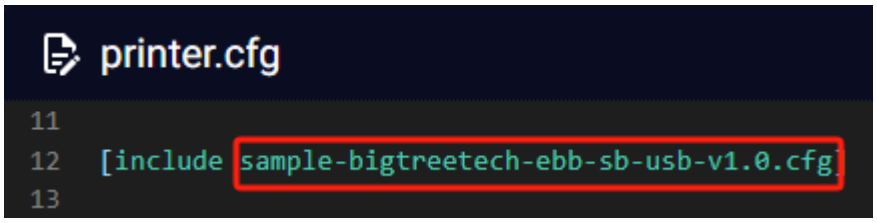
1. Access the mainsail web UI by entering the IP address of the Raspberry Pi into your browser. Using the path shown in the image below, download the reference configuration named **sample-bigtreetech-ebb-sb-usb-v1.0.cfg**. If this file is not found, update the Klipper firmware source code to the latest version or use the link to download it from GitHub: https://github.com/bigtreetech/EBB



2. Upload the motherboard configuration file to **Configuration Files**.



3. Add the mainboard configuration in the "printer.cfg" file:
[include sample-bigtreetech-ebb-sb-usb-v1.0.cfg]



4. Change the USB serial within the configuration file to match the actual ID of the motherboard.

5. Configure the specific functions of the module according to the instructions in the following link: https://www.klipper3d.org/Overview.html

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).

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