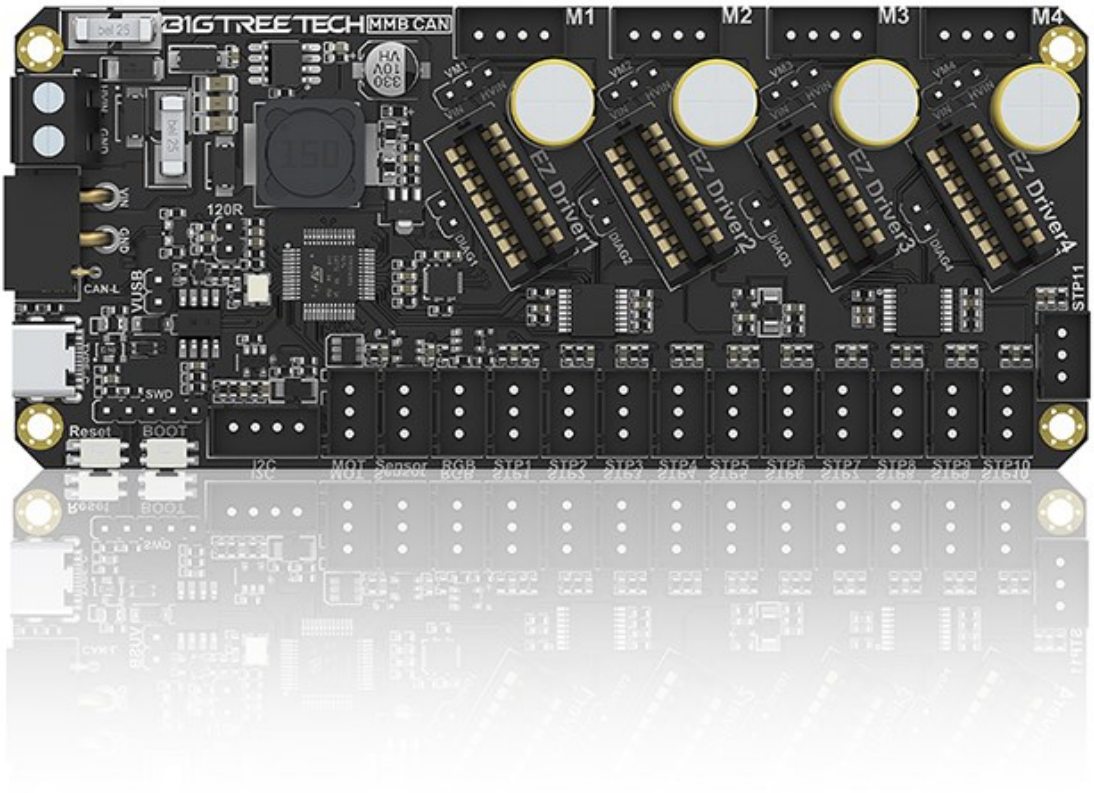
BIGTREETECH

MMB CAN V1.0

User Manual



Revision Log

Version	Date	Revisions
v1.00	23rd August 2023	Initial Version

CONTENTS

Product Profile

BIGTREETECH MMB CAN V1.0 is a control board for multi-material 3D printing system, e.g., ERCF. It simplifies wiring by communicating via USB or CAN.

Feature Highlights

- The board has BOOT and RESET buttons, allowing users to update firmware in DFU mode via USB.
- I2C interface reserved for filament run out/clogging detection, or other DIY functions.
- The power interface has reverse polarity protection to prevent the board from being damaged if power cables are connected incorrectly during DIY.
- Supports CAN or USB communication, with selectable 120R terminal resistance for CAN and reserved CAN expansion interface.
- USB port has ESD protection to prevent controller damage from electrostatic discharge.
- Uses XT30 interface for CAN communication and board power supply, simplifying wiring.
- Stepper motor driver supports high and low voltage selection for DIY use.

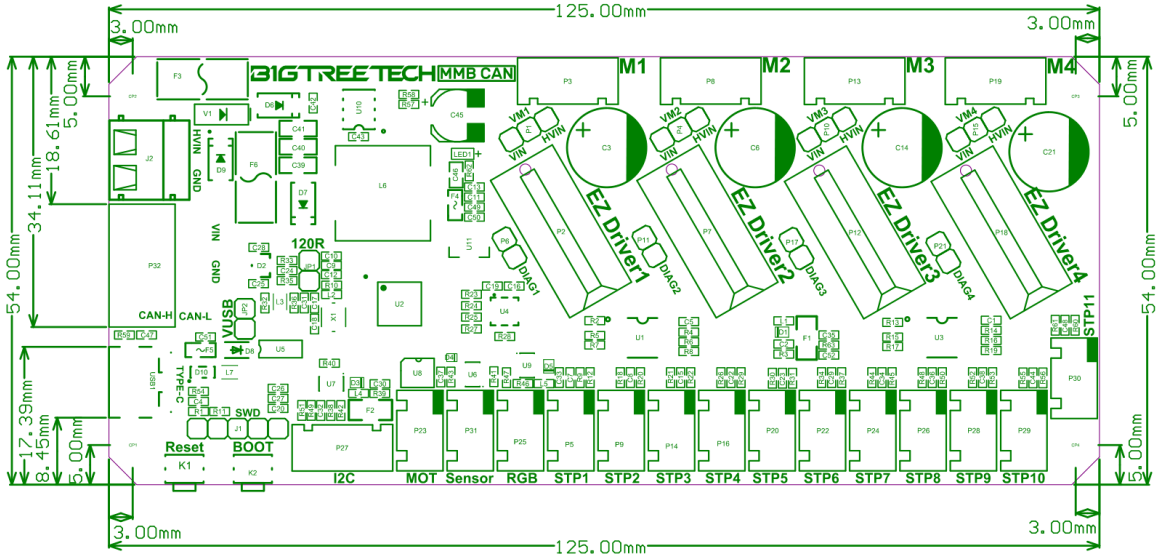
Specifications

Dimensions	125mm x 54mm
Installation Size	Refer to BIGTREETECH MMB CAN V1.0-SIZE.pdf
Microprocessor	ARM Cortex-M0+ STM32G0B1CBT6 64MHz
Input Voltage	DC12V-DC24V 9A
Logic Voltage	DC 3.3V
Servo Interface (MOT)	
Maximum Output	5V 2A, peak 2.5A
Expansion Interfaces	STP1-STP11, I2C, RGB, Sensor (infrared sensor interface), USB, CAN
Motor Driver Support	EZ Drive (supports voltage selection)
Driver Operating Modes	STEP/DIR, UART, SPI
Stepper Motor Interfaces	M1, M2, M3, M4
USB Communication Interface	USB Type-C
DCDC 5V Output Maximum Current	3.6A

Firmware Support

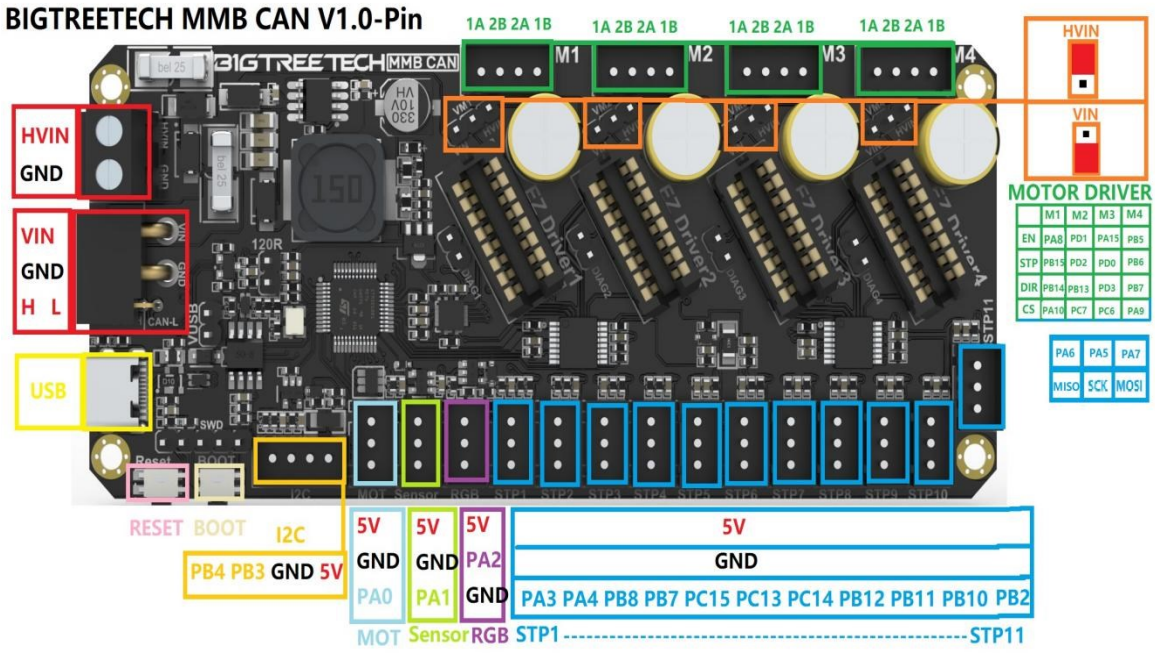
Currently, MMB CAN V1.0 only supports Klipper firmware.

Product Dimensions



Peripheral Interfaces

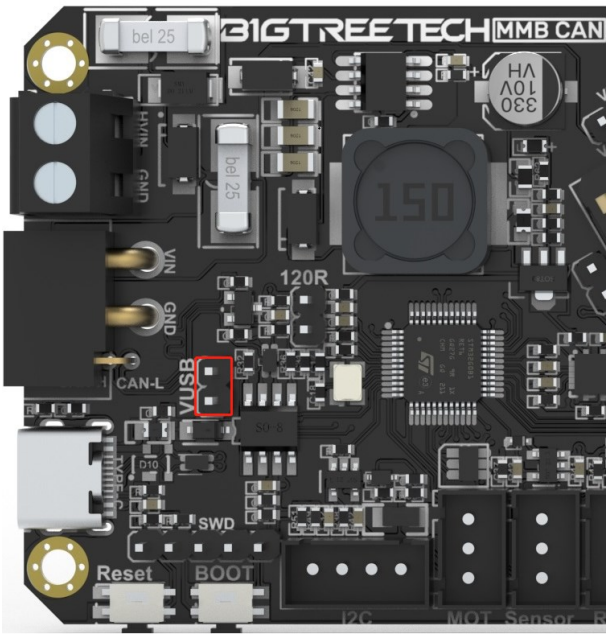
Pin Description



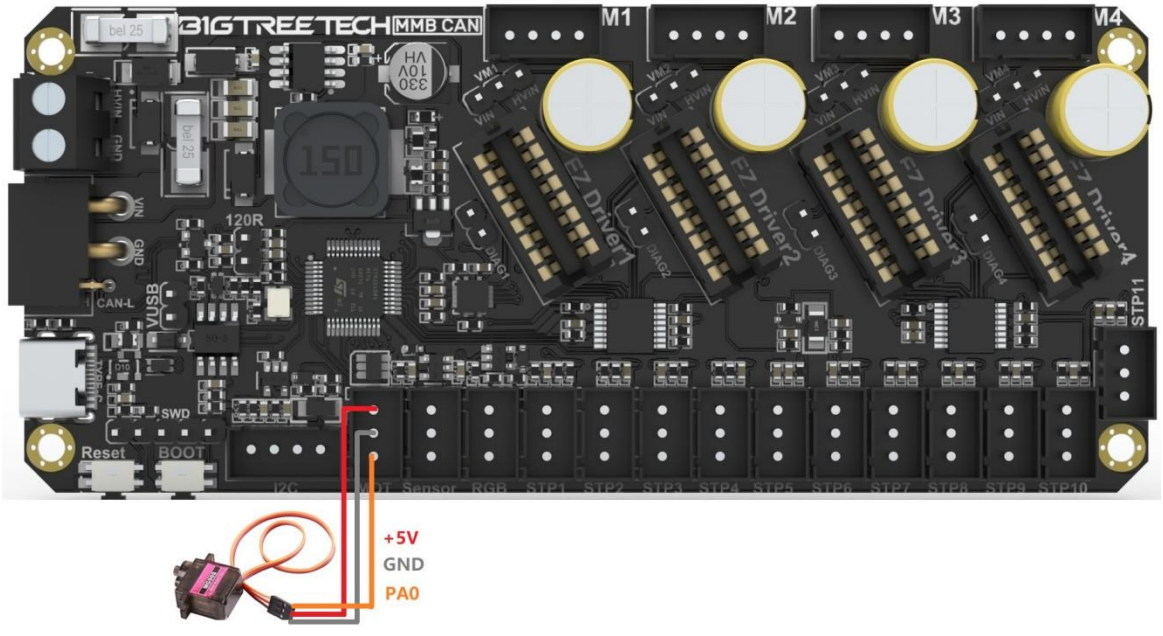
Interface Introduction

USB Power Supply

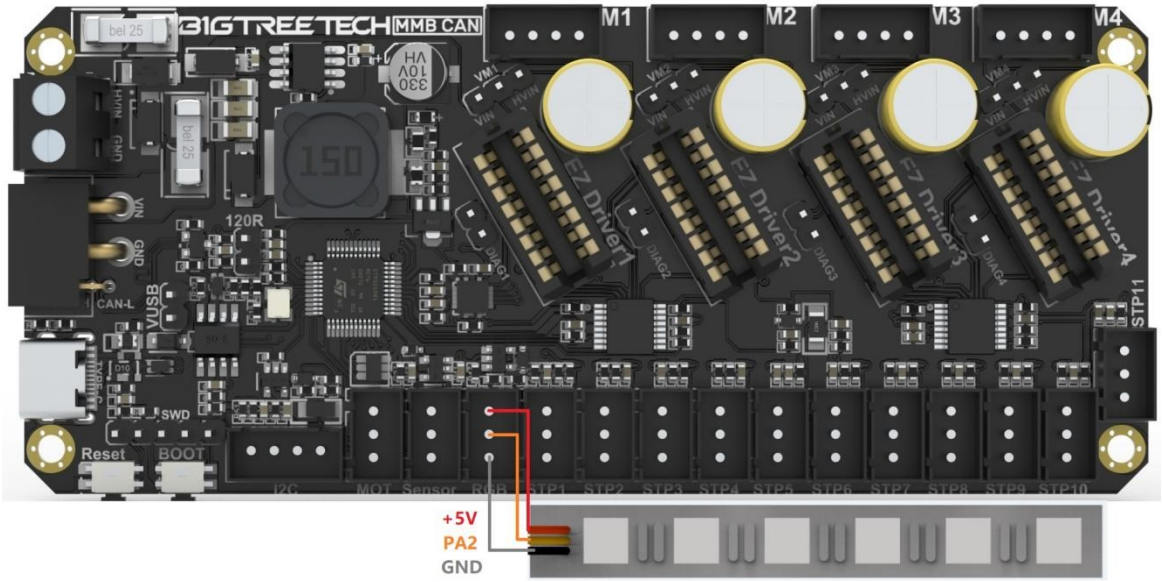
After the board is powered on, the power indicator light will turn on, indicating that the power supply is normal. The VUSB label on the board is the power selection terminal, and a jumper is needed to short VUSB only when using USB to power the board.



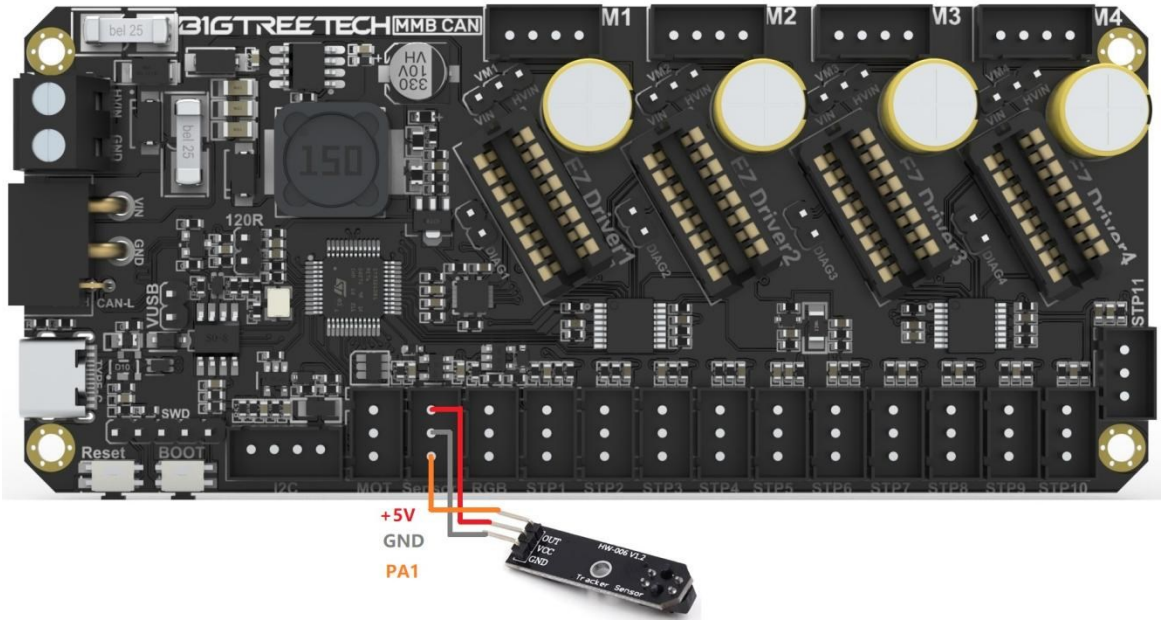
Servo Wiring



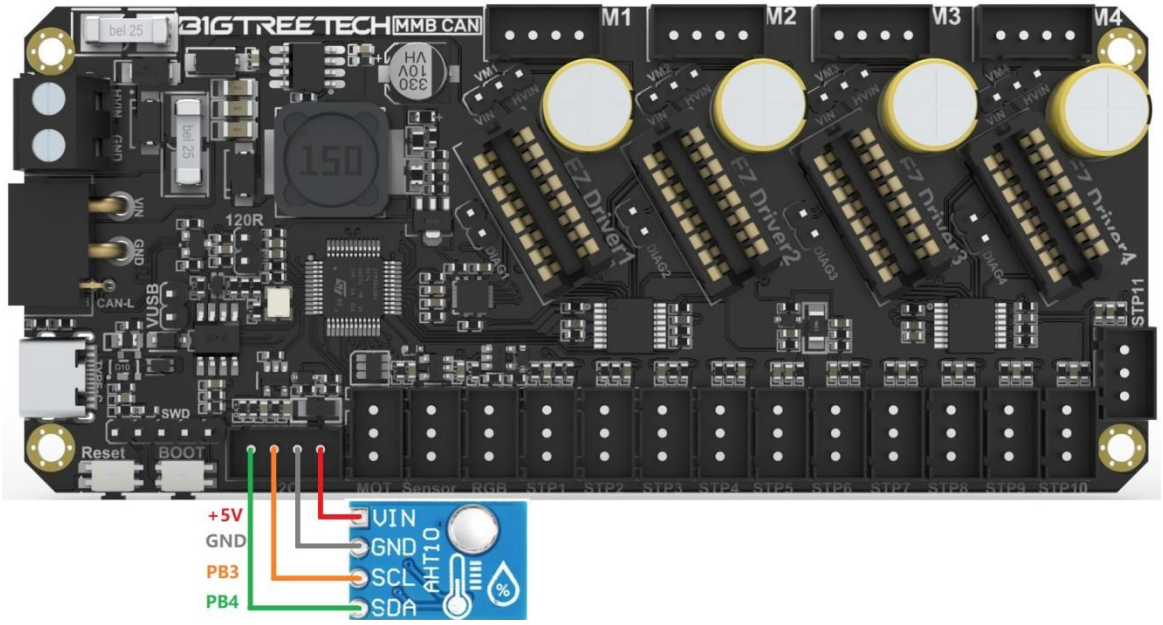
RGB-WS2812 Wiring



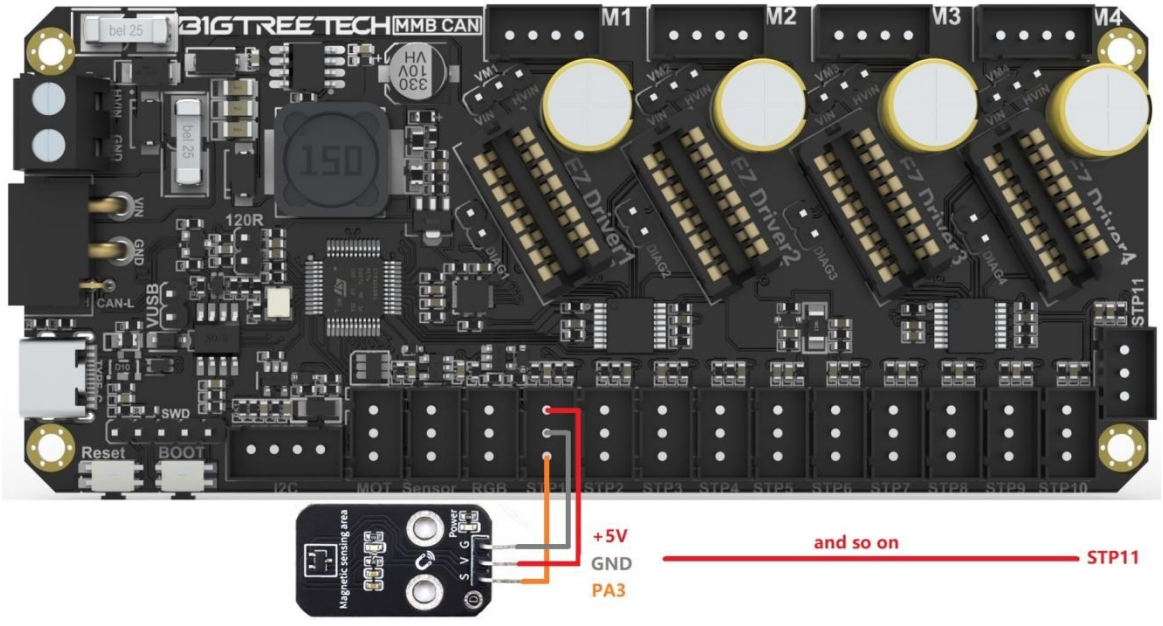
Sensor (e.g., CRT5000 infrared sensor) Wiring



I2C (e.g., AHT10 temperature and humidity sensor) Wiring



Endstop (e.g., Hall sensor) Wiring



Klipper Firmware

Flashing CANBOOT

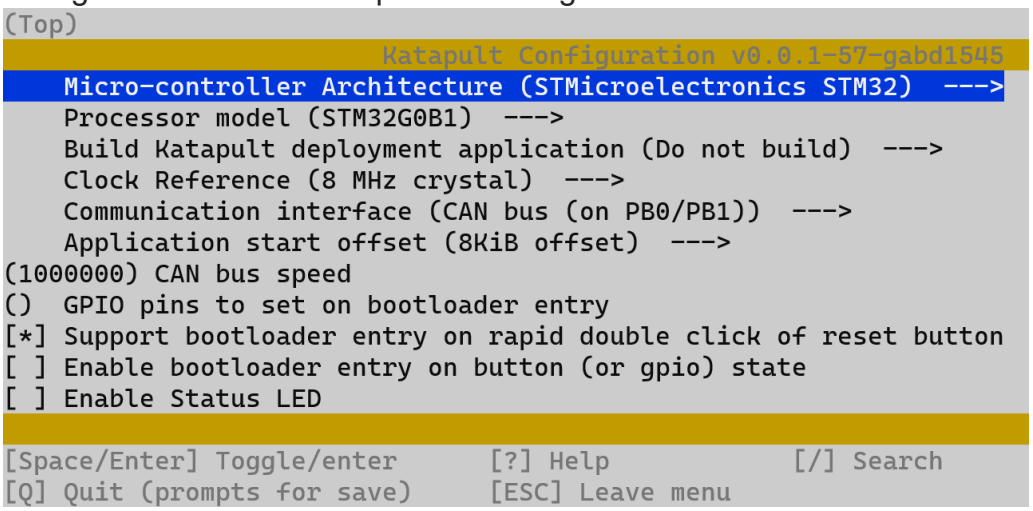
Note: CanBoot is for updating MCU firmware directly via CAN bus. If you prefer DFU, skip this step.

To flash CanBoot on Raspberry Pi or CB1, follow the instructions at https://github.com/Arksine/CanBoot

1. Enter
   cd ~
   Navigate to the main directory and input
   git clone https://github.com/Arksine/CanBoot
   to download the CanBoot project. Then enter

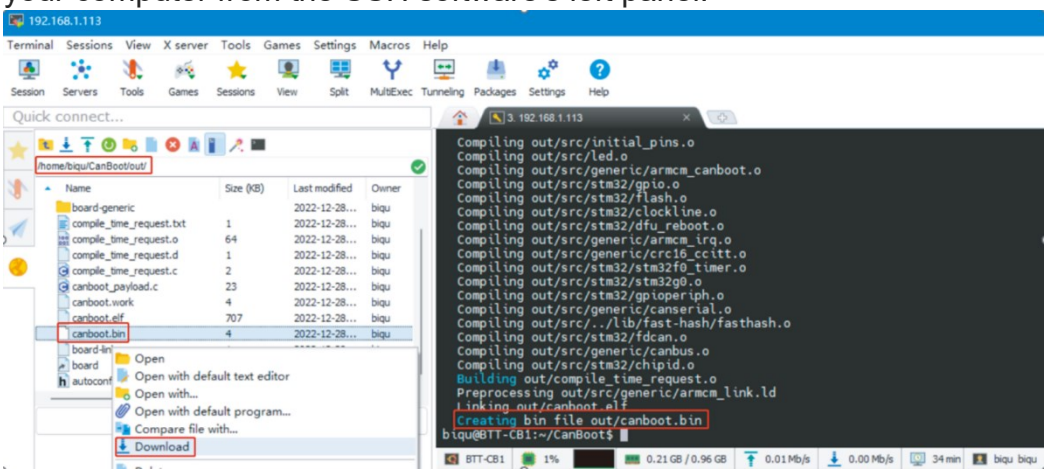
   cd CanBoot
   navigate to the CanBoot directory.

2. Enter
   make menuconfig
   configure as shown in the provided image:



3. Enter **make** to compile the firmware. The resulting **canboot.bin** file will be in the **home/biqu/CanBoot/out** folder. This can be directly downloaded to

your computer from the SSH software's left panel.



4. Hold the **Boot** button and connect the board to Raspberry Pi/CB1 via Type-C cable to enter DFU mode.

5. Enter **lsusb** in the SSH terminal to query the DFU device ID.

```
pi@fluiddpi:~ $ lsusb
Bus 001 Device 005: ID 0483:df11 STMicroelectronics STM Device in DFU Mode
Bus 001 Device 004: ID 1d50:6061 OpenMoko, Inc. Geschwister Schneider CAN adapter
Bus 001 Device 003: ID 0424:0c00 Microchip Technology, Inc. ( formerly SMSC ) SMC9512/9514 Fast Ethernet Adapter
Bus 001 Device 002: ID 0424:9514 Microchip Technology, Inc. ( formerly SMSC ) SMC9514 Hub
Bus 001 Device 001: ID 1d6b:0002 Linux Foundation 2.0 root hub
pi@fluiddpi:~ $
```

6. Enter the following command to flash CanBoot
   make flash FLASH_DEVICE=0483:df11
   replacing **0483:df11** with the actual device ID found in the previous step.

7. After flashing, disconnect the Type-C cable.

Compiling Klipper Firmware

1. Connect to CB1/Raspberry Pi via SSH and enter the following commands:
   cd ~/klipper/
   make menuconfig
   Configure the firmware as shown in the provided image (update Klipper firmware to the latest version if options are not available).

```
(Top)
                    Klipper Firmware Configuration
[*] Enable extra low-level configuration options
    Micro-controller Architecture (STMicroelectronics STM32)  --->
    Processor model (STM32G0B1)  --->
    Bootloader offset (No bootloader)  --->
    Clock Reference (8 MHz crystal)  --->
    Communication interface (USB (on PA11/PA12))  --->
    USB ids  --->
()  GPIO pins to set at micro-controller startup


[Space/Enter] Toggle/enter      [?] Help            [/] Search
[Q] Quit (prompts for save)     [ESC] Leave menu
```

[*] Enable extra low-level configuration optionsMicro-controller
Micro-controller Architecture (STMicroelectronics STM32) --->
Processor model (STM32G0B1) --->

If not using CanBoot

Bootloader offset (No bootloader) --->

If CanBoot is used

Bootloader offset (8KiB bootloader) --->

If USB communication on Type-C is used

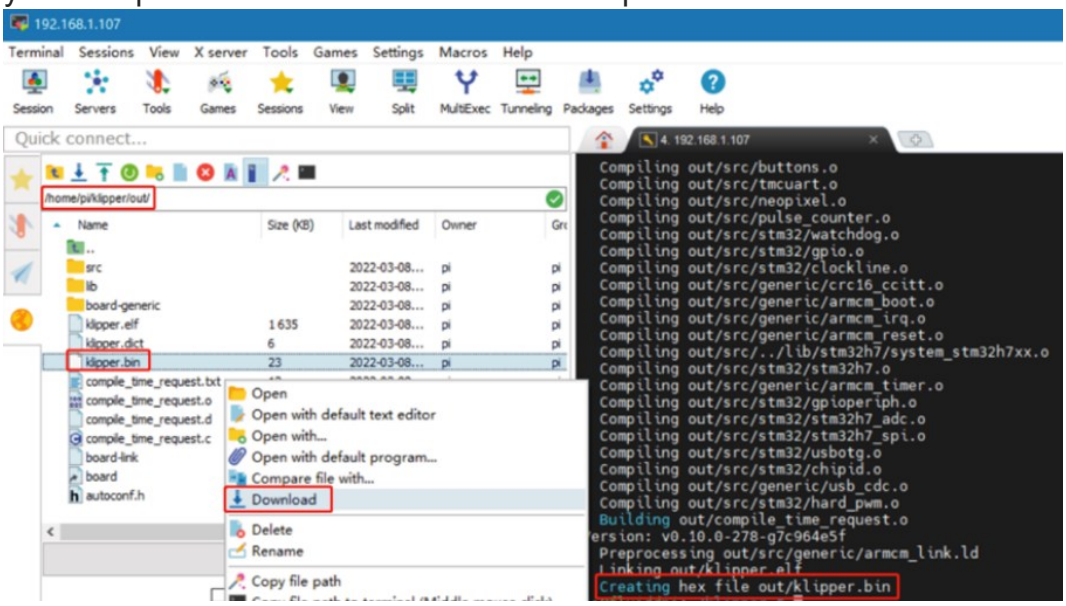
Communication interface (USB (on PA11/PA12)) --->

If CAN-Bus communication is used

Communication interface (CAN bus (on PB0/PB1)) --->
(1000000) CAN bus speed

2. After configuration, press **q** to exit, and select **Yes** when prompted to save.

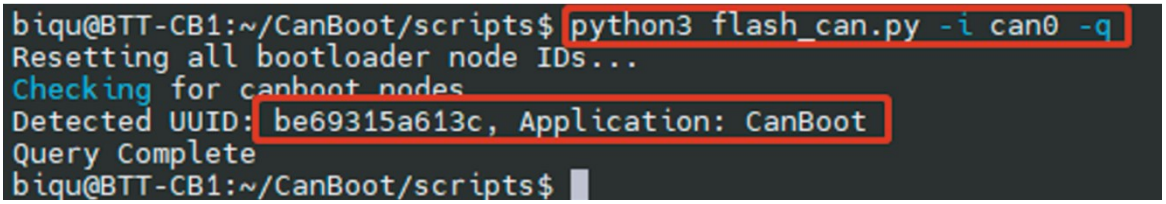
3. Enter **make** to compile the firmware. The resulting **klipper.bin** file will be in the **home/pi/klipper/out** folder. This can be directly downloaded to your computer from the SSH software's left panel.



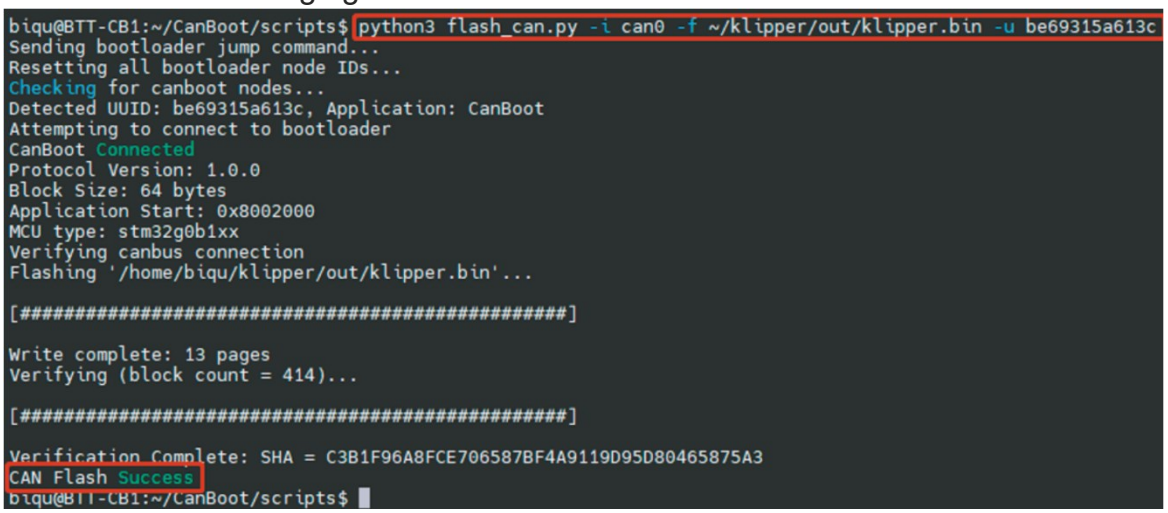
Firmware Update via CANBOOT

1. Connect the CAN bus cable and plug a jumper at the 120R terminal resistor.

2. Enter
   cd ~/CanBoot/scripts
   then enter
   python3 flash_can.py -i can0 -q
   query the canbus ID (make sure the CAN cable is connected and powered on) as shown in the figure below, the UUID of the device has been found:

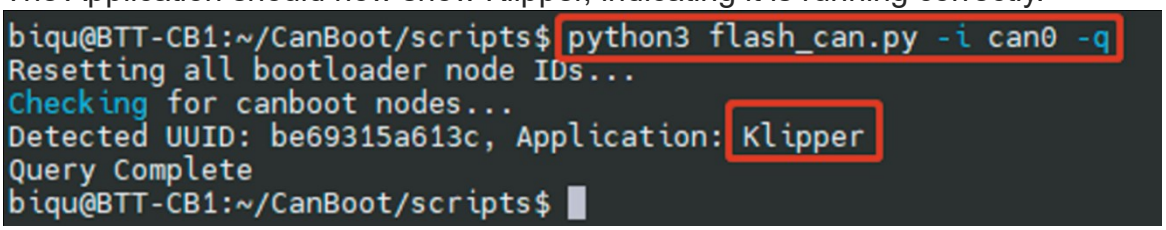


3. Enter
   python3 flash_can.py -i can0 -f ~/klipper/out/klipper.bin -u be69315a613c
   The **be69315a613c** is replaced with the actual UUID. Note: **klipper.bin** needs to be generated in advance using the **make** command, and the **application start offset** of CanBoot is **8KiB offset**, so **Klipper's menuconfig Bootloader offset** should also be **8KiB bootloader**, as shown in the following figure.



4. Query again with
   python3 flash_can.py -i can0 -q

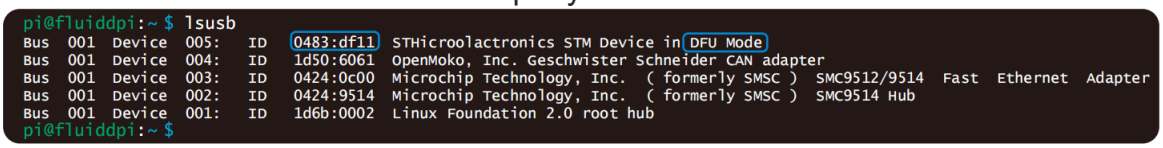
The Application should now show Klipper, indicating it is running correctly.



Firmware Update via DFU

Raspberry Pi or CB1 update via DFU.

1. Hold the **Boot** button and connect the board to Raspberry Pi/CB1 via Type-C cable to enter DFU mode.
2. Enter **lsusb** in the SSH terminal to query the DFU device ID.

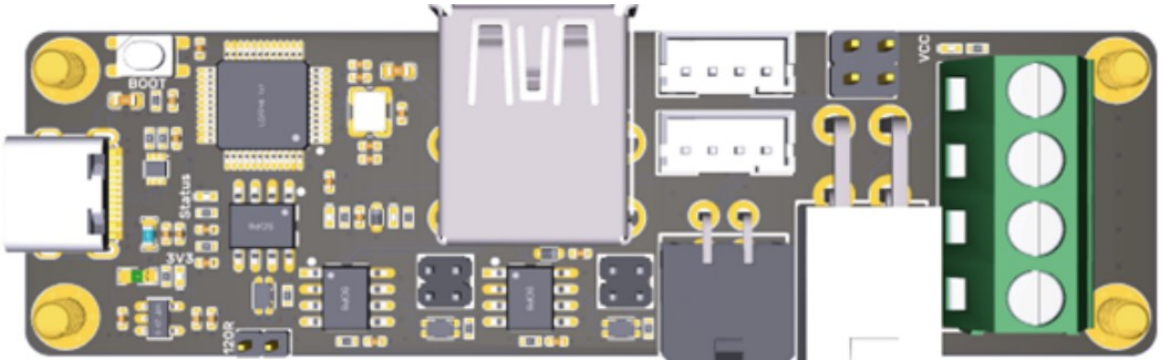


3. Enter
   cd klipper
   navigate to the Klipper directory, and enter
   make flash FLASH_DEVICE=0483:df11
   start flashing the firmware (Note: Replace 0483: df11 with the actual device ID found in the previous step.)
4. After flashing, enter
   ls /dev/serial/by-id/
   to query the device's Serial ID (only applicable for USB communication, not for CANBus).
5. For USB communication, you don't need to press the Boot button for subsequent updates. Enter the following command to flash the firmware

   make flash FLASH_DEVICE=/dev/serial/by-id/usb-Klipper_stm32g0b1xx_4550357128922FC8-if00
   (Note: replacing **/dev/serial/by-id/xxx** with the actual ID found in the previous step).
6. For CAN bus communication, disconnect the Type-C cable after flashing.

CAN bus Configuration

Use with BIGTREETECH U2C module.



1. Enter the following command in the SSH terminal:
   sudo nano /etc/network/interfaces.d/can0
   Add the following content:
   allow-hotplug can0
   iface can0 can static
   bitrate 1000000
   up ifconfig $IFACE txqueuelen 1024
   Set the CAN bus speed to **1M** (must match the firmware setting of 1000000 CAN bus speed). Save (Ctrl + S) and exit (Ctrl + X), then enter **sudo reboot** to restart Raspberry Pi.

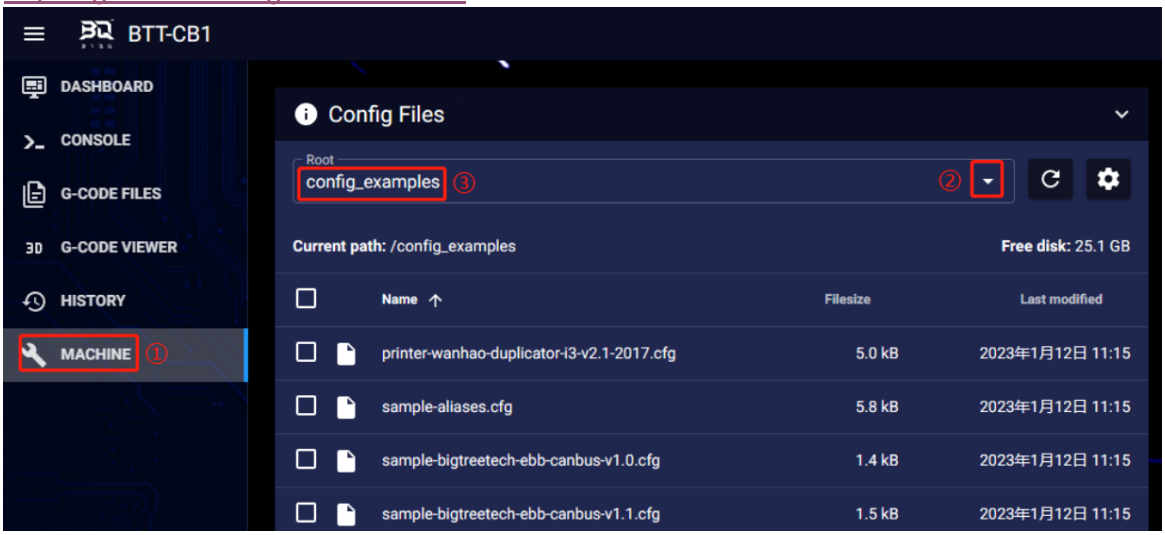
2. Each device on CAN bus will generate a **canbus_uuid** according to the UID of MCU, to find each microcontroller device ID, ensure the hardware is powered on and connected correctly, then run:
   ~/klippy-env/bin/python ~/klipper/scripts/canbus_query.py can0

3. If an uninitialized CAN device is detected, the command will report the canbus_uuid:
   Found canbus_uuid=0e0d81e4210c

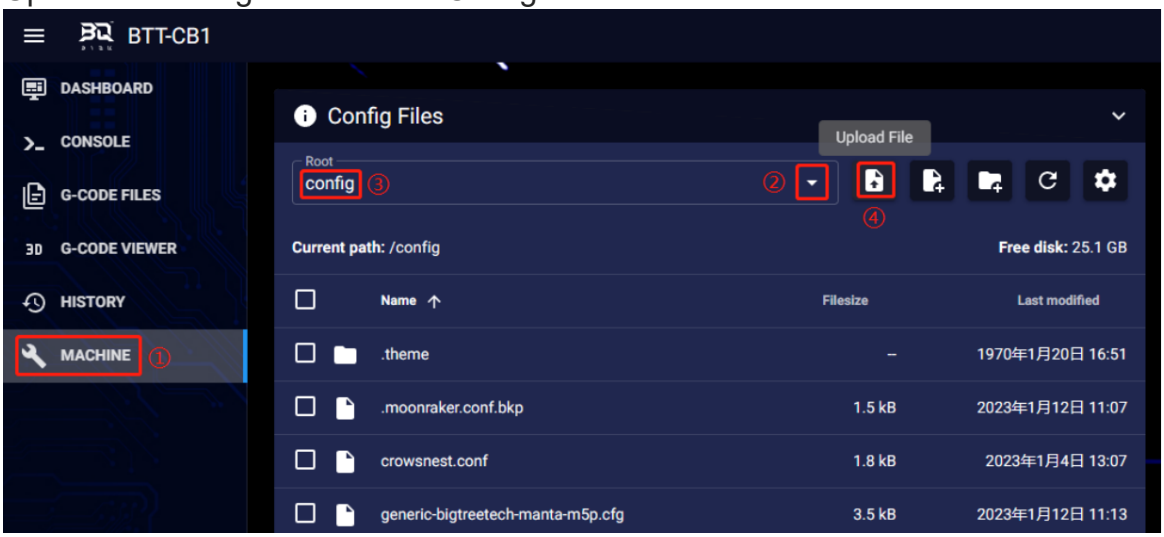
4. If Klipper is running and connected to the device, the canbus_uuid will not be reported, which is normal.

Configuring Klipper

1. In your computer's web browser, enter the Raspberry Pi's IP address, and as shown in the path below, download the reference configuration file **sample-bigtreetech-mmb-canbus.cfg**. If the file is not available, update Klipper firmware to the latest version or download from: https://github.com/bigtreetech/MMB



2. Upload the configuration file to Configuration Files.



3. Add the board configuration to the "printer.cfg" file:
[include sample-bigtreetech-mmb-canbus.cfg]

4. Modify the ID number in the configuration file to match the actual ID of the board (USB serial or canbus).

5. Configure the module's specific functions according to the instructions at https://www.klipper3d.org/Overview.html