

# VORON Leviathan V1.3 Manual

We build space shuttles with gardening tools so anyone can have a space shuttle of their own.

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VERSION 2025-06-26



Before you begin on your journey, a word of caution.

In the comfort of your own home you are about to assemble a robot. This machine can maim, burn, and electrocute you if you are not careful. Please do not become the first VORON fatality. There is no special Reddit flair for that.

Please, read the entire manual before you start assembly. As you begin wrenching, please check our Discord channels for any tips and questions that may halt your progress.

Most of all, good luck!

THE VORON TEAM

|                           |    |
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Why another board?

There was a time when the boards available on the market were either unreliable or just too feature rich.  
This gave Voron the idea to create their own board.

The target was to implement only the really essential functions that a Voron printer needs (maybe it turned out to be a bit more in the end).  
It quickly became clear that not everyone can build such a board themselves.

So they looked for a partner who could take on this task and also offer it on the market.  
This is how the cooperation with LDO came about.

At LDO it would also fit well into the portfolio with the existing kits.  
So the way was clear for both sides.

Thus the project Leviathan was born.

Sincerely!  
**JNP**

Further information can be found at:

<https://github.com/MotorDynamicsLab/Leviathan/>

### LEVIATHAN BOARD

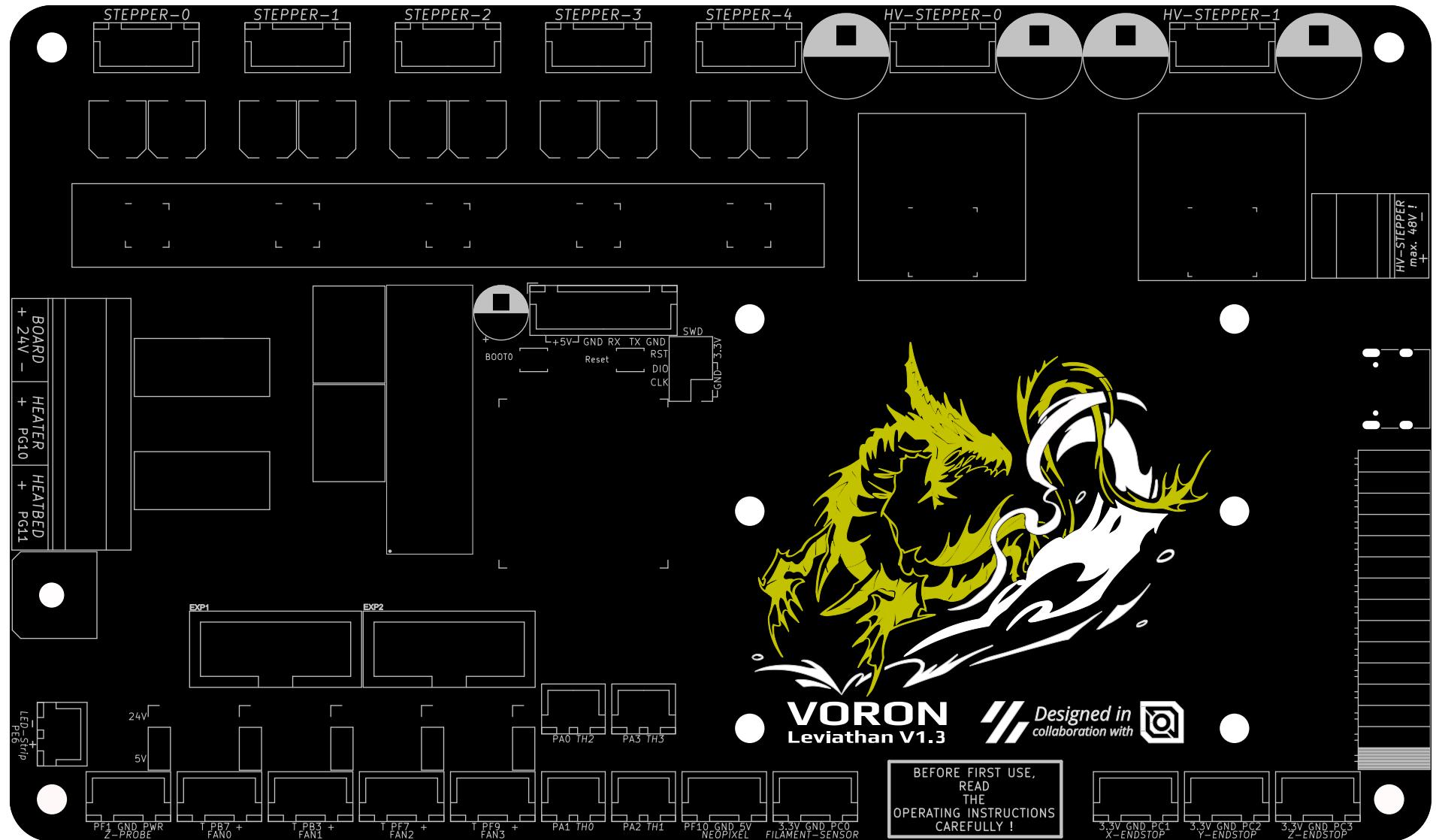
This Board is designed and developed for Voron printers. It provides all necessary functions.

These are the main features:

- Supports Klipper, RRF and Marlin (preflashed with bootloader and klipper firmware)
- STM32H743 MCU (25 MHz crystal)
- 1x Vin 24V Mainsupply (polarity and overvoltage protected), Connector type: screw terminal
- 1x Vin 24-48V TMC5160 supply (polarity and overvoltage protected), Connector type: screw terminal
- Superior stepper driver cooling (top and bottom heat sinks)
- 5x TMC2209 (rsense= 0.110) onboard drivers (24V), Connector type: 4pin JST-XH
- 2x TMC5160 (rsense=0.075) onboard drivers (24-48V, onboard 12V source for gate drive), Connector type: 4pin JST-XH
- 4x Thermistor inputs (pullup 2200), Connector type: 2pin JST-XH
- 4x Fan outputs (with tacho signal support, 5/24V via jumpers), Connector type: 3pin JST-XH
- 1x Probe input (5/24V via jumper), Connector type: 3pin JST-XH
- 1x Filament sensor input (5V tolerant), Connector type: 3pin JST-XH
- 1x Neopixel output, Connector type: 3pin JST-XH
- 3x Endstop inputs (5V tolerant), Connector type: 3pin JST-XH
- 1x Hotend heater output (max. 180 W, 7.5 A), Connector type: screw terminal
- 1x Heatbed heater output (max. 240 W, 10 A), Connector type: screw terminal
- 1x dimmable LED-strip output (350mA constant current source), Connector type: 2pin JST-XH
- 1x EXP1 port, Connector type: 2x5 pin header 2.54mm pitch
- 1x EXP2 port, Connector type: 2x5 pin header 2.54mm pitch
- 1x Extension port (4x ADC, 1xUART, 1xSPI or 1xCAN, 10GPIO, 3.3V@0.5A, 5V0.5A, 24V@0.5A)
- 1x STM32 programmer interface (SWD, backup), Connector type: 2x3 pin header 2.54mm pitch
- 1x USB port, Connector type: USB-C
- 1x CAN Bus interface (FD-CAN), Connector type: 2x2 MicroFit 3.0
- 1x Dedicated power supply for Raspberry Pi 3/4/5 or Zero 2W with UART support, Connector type: 5-pin JST-XH
- Dedicated mounting holes for Raspberry Pi 3/4/5 or Zero 2W
- Dimensions: 170x100mm, mounting holes: 160x90mm

## CONTROLLER BOARD OVERVIEW

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### CONTROLLER BOARD

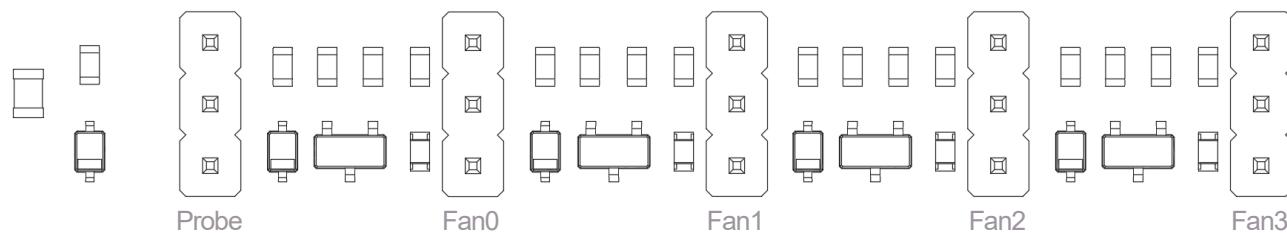
The manual will outline the wiring for a Leviathan V1.3 board. You can find additional documentation and alternative configurations on [docs.vorondesign.com](https://docs.vorondesign.com)

### JUMPERS

Several jumpers need to be configured on the controller board. Begin by **removing all the JUMPERS** from the controller board (MCU).

**1)** Remove the jumper in the "Probe Voltage Selection"

**2)** Remove all the jumpers on the "Fan Voltage Selection"



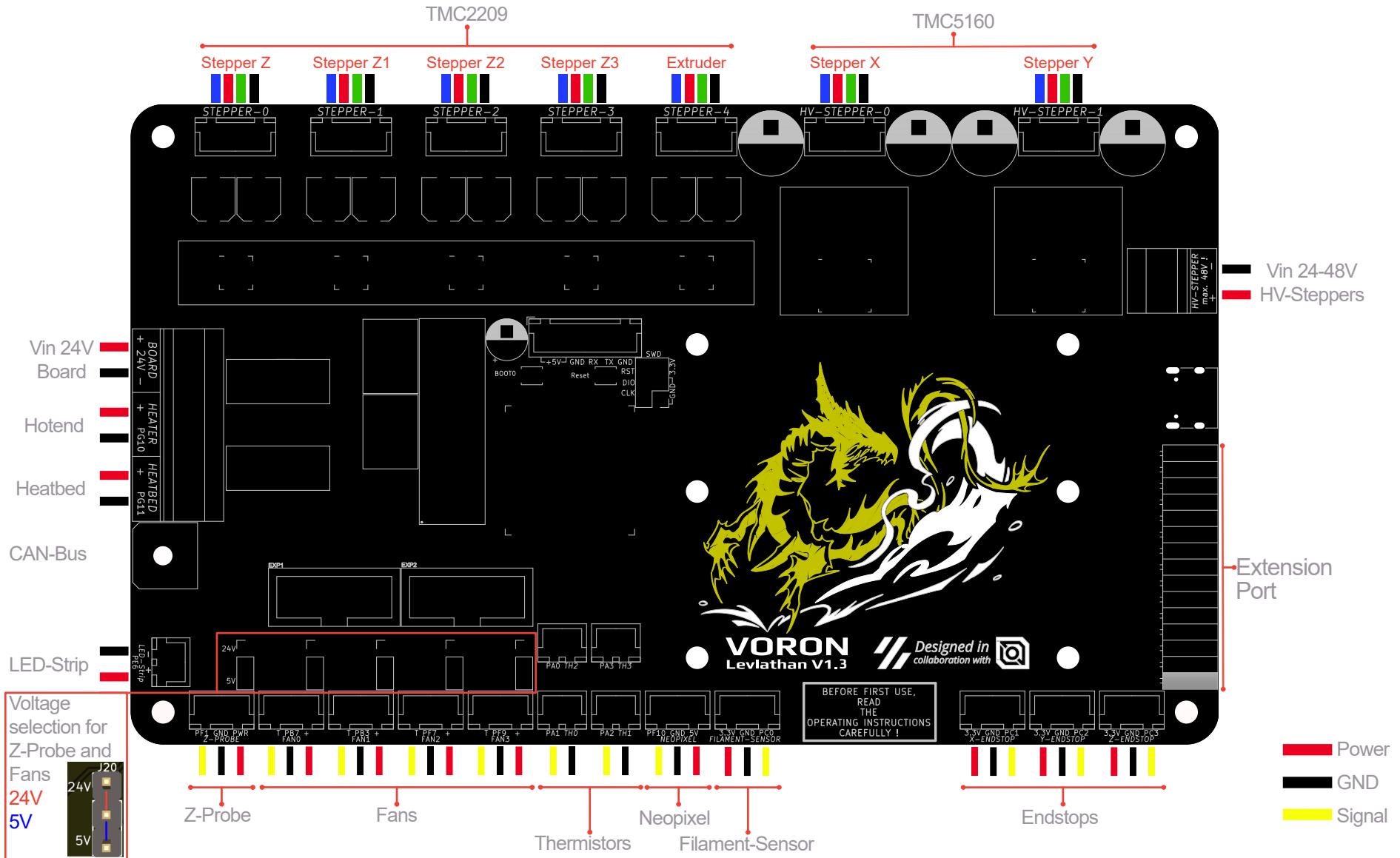
### WARNING !

When using passive toolhead boards, check if the 24V supply is shared between the fan, hotend and probe.

If so, set jumpers to 24V - as a 5V selection may cause the 5V and 24V line to be shorted.

## WIRING

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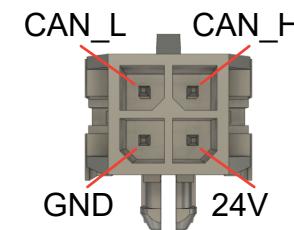


## PIN ASSIGNMENT

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|             | Signal      | EN       | STEP     | DIR      | DIAG    | UART            | CS       | SCK    | MOSI   | MISO |
|-------------|-------------|----------|----------|----------|---------|-----------------|----------|--------|--------|------|
| Stepper     | Stepper0    | PD7      | PD4      | PD3      | PD6     | PD5             |          |        |        |      |
|             | Stepper1    | PD2      | PC12     | PC11     | PD1     | PD0             |          |        |        |      |
|             | Stepper2    | PC10     | PC9      | PC8      | PA15    | PA8             |          |        |        |      |
|             | Stepper3    | PC7      | PG7      | PG6      | PC6     | PG8             |          |        |        |      |
|             | Stepper4    | PD13     | PD10     | PD9      | PD12    | PD11            |          |        |        |      |
|             | HV_Stepper0 | PG0      | PB10     | PB11     | PG1     |                 | PE15     | PE12   | PE14   | PE13 |
|             | HV_Stepper1 | PE9      | PF15     | PF14     | PE10    |                 | PE11     | PE12   | PE14   | PE13 |
| Fans        | Signal      | Fan0     | Fan1     | Fan2     | Fan3    |                 |          |        |        |      |
|             | PWM         | PB7      | PB3      | PF7      | PF9     |                 |          |        |        |      |
|             | Tacho       | PB8      | PB4      | PF6      | PF8     |                 |          |        |        |      |
| Endstops    | Signal      | EndstopX | EndstopY | EndstopZ | Z-Probe | Filament-Sensor |          |        |        |      |
|             |             | PC1      | PC2      | PC3      | PF1     | PC0             |          |        |        |      |
| EXP1        | Signal      | Beeper   | BTN_ENC  | LCD_EN   | LCD_RS  | LCD_D4          | LCD_D5   | LCD_D6 | LCD_D7 |      |
|             |             | PG9      | PG12     | PG13     | PG14    | PC13            | PC14     | PC15   | PF0    |      |
| EXP2        | Signal      | SPI_MISO | SPI_SCK  | BTN_EN2  | SPI_CS  | BTN_EN1         | SPI_MOSI | SD_DET | Reset  | Kill |
|             |             | PA6      | PA5      | PE2      | PA4     | PE3             | PA7      | PE5    | Reset  | PE4  |
| Thermistors | Signal      | TH0      | TH1      | TH2      | TH3     |                 |          |        |        |      |
|             |             | PA1      | PA2      | PA0      | PA3     |                 |          |        |        |      |
| Neopixel    | Signal      | Data     |          |          |         |                 |          |        |        |      |
|             |             | PF10     |          |          |         |                 |          |        |        |      |
| LED-Strip   | Signal      | PW       |          |          |         |                 |          |        |        |      |
|             |             | M        |          |          |         |                 |          |        |        |      |
|             |             | PE6      |          |          |         |                 |          |        |        |      |
| UARTPi      | Signal      | RX       | TX       |          |         |                 |          |        |        |      |
|             |             | PA10     | PA9      |          |         |                 |          |        |        |      |
| Heatbed     | Signal      | PWM      |          |          |         |                 |          |        |        |      |
|             |             | PG11     |          |          |         |                 |          |        |        |      |
| Hotend      | Signal      | PWM      |          |          |         |                 |          |        |        |      |
|             |             | PG10     |          |          |         |                 |          |        |        |      |
| CANBus      | Signal      | RX       | TX       |          |         |                 |          |        |        |      |
|             |             | PB5      | PB6      |          |         |                 |          |        |        |      |
| Status LED  | Signal      | PE1      |          |          |         |                 |          |        |        |      |

\* All thermistor inputs have a 2200 pullup resistor

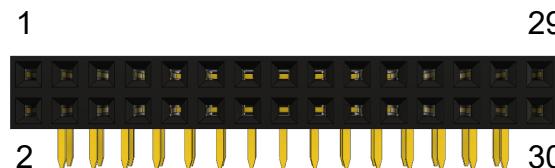


frontview of the board socket (MicroFit 3.0)

| Pin | Signal | Function  | IO structure |           |
|-----|--------|-----------|--------------|-----------|
| 1   | 5V     |           |              | max. 0.5A |
| 2   | 5V     |           |              |           |
| 3   | GND    |           |              |           |
| 4   | GND    |           |              |           |
| 5   | 3.3V   |           |              | max. 0.5A |
| 6   | 3.3V   |           |              |           |
| 7   | PF5    | I/O       | FT           |           |
| 8   | PF4    | I/O       | FT           |           |
| 9   | PF3    | I/O       | FT           |           |
| 10  | PF2    | I/O       | FT           |           |
| 11  | PC4    | I/O       | ADC          | FT        |
| 12  | PC5    | I/O       | ADC          | FT        |
| 13  | PB0    | I/O       | ADC          | FT        |
| 14  | PB1    | I/O       | ADC          | FT        |
| 15  | PE8    | I/O       | UART5 TX     | FT        |
| 16  | PE7    | I/O       | UART5 RX     | FT        |
| 17  | PG5    | I/O       |              | FT        |
| 18  | PG4    | I/O       |              | FT        |
| 19  | PG3    | I/O       |              | FT        |
| 20  | PG2    | I/O       |              | FT        |
| 21  | PD15   | I/O       |              | FT        |
| 22  | PD14   | I/O       |              | FT        |
| 23  | PB15   | SPI2 MOSI |              | FT        |
| 24  | PB14   | SPI2 MISO |              | FT        |
| 25  | PB13   | SPI2 CLK  | CAN2 TX      | FT        |
| 26  | PB12   | SPI2 CS   | CAN2 RX      | FT        |
| 27  | GND    |           |              |           |
| 28  | GND    |           |              |           |
| 29  | 24V    |           |              | max. 0.5A |
| 30  | 24V    |           |              |           |

**FT** 5V tolerant I/O

\* For further information see data sheet STM32H743ZIT6



frontview of the board socket

## HINT!

More detailed step-by-step instructions can be found under the following link:

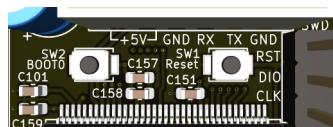
<https://www.ldomotion.com/p/guide/VORON-Leviathan-V13>

## PREPARATION:

The board can be flashed via USB with the STM32CubeProgrammer.

(<https://www.st.com/en/development-tools/stm32cubeprog.html>)

The board can be put into the necessary DFU mode using two switches.



To do this, connect the board to the PC using a USB-C cable.

Then press the reset (SW1) and boot (SW2) switches at the same time.

First release the reset switch, then the boot switch. DFU mode is activated.

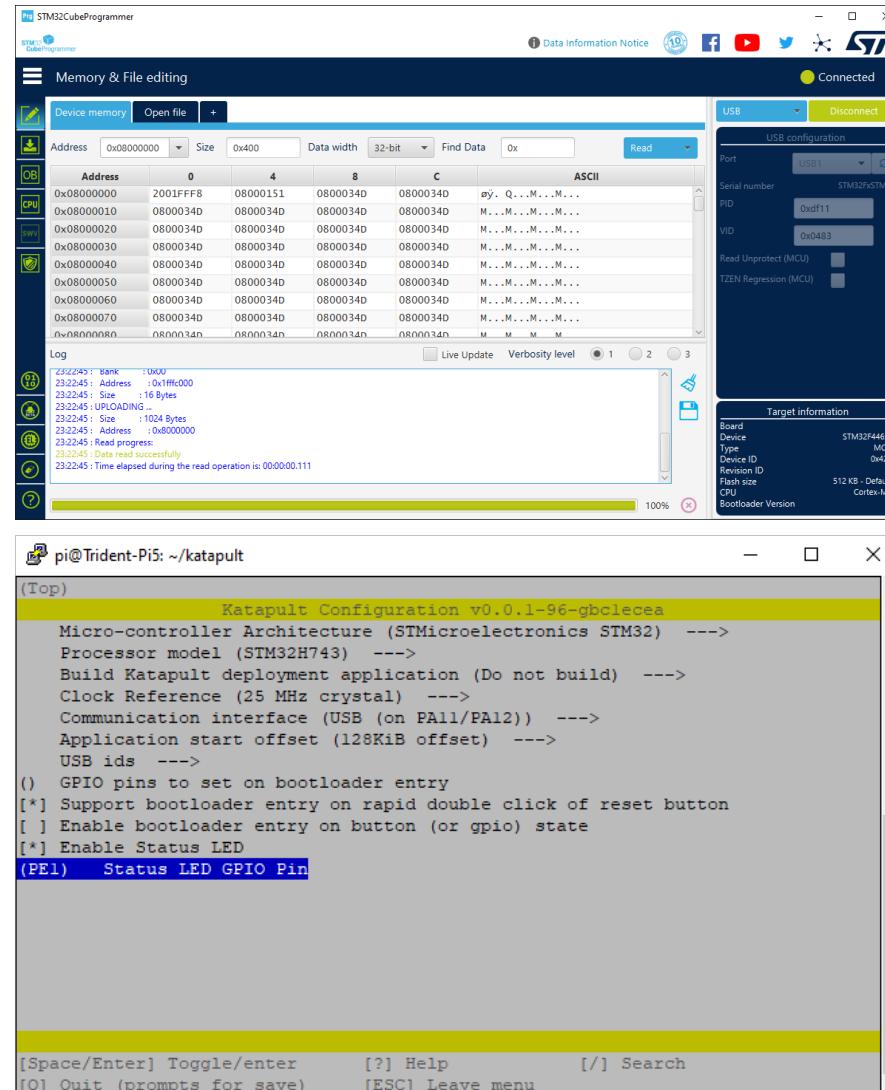
Firmware can now be flashed via STM32CubeProgrammer.

## BOOTLOADER:

Katapult (CanBoot) is recommended as a bootloader.

The necessary settings can be seen in the picture.

<https://github.com/Arksine/katapult>



Leviathan is supported by Klipper firmware.

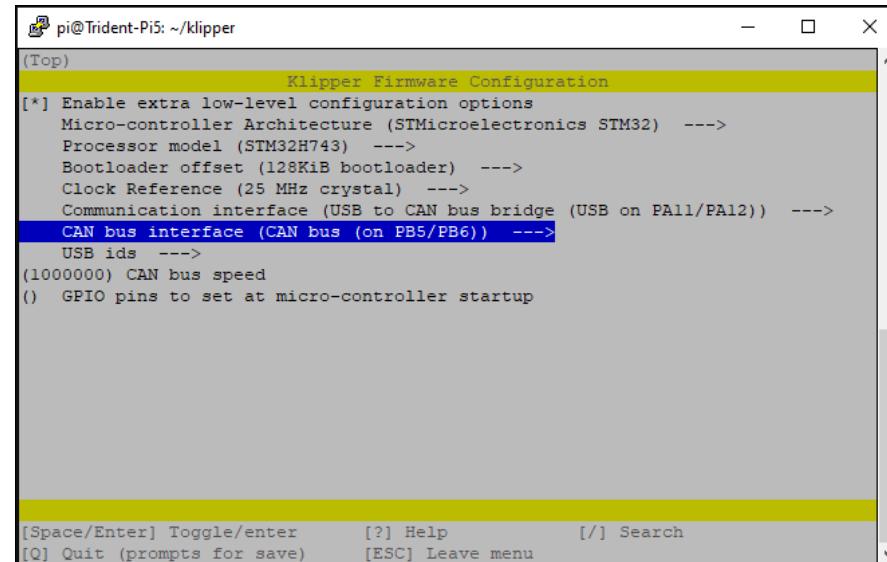
With the bootloader the Klipper firmware can be flashed directly via the RPi.

See also:

<https://www.klipper3d.org/Installation.html#building-and-flashing-the-micro-controller>

CAN Interface:

If you want to use the CAN bus interface, Klipper must be configured as a USB to CAN bus bridge. Necessary settings can be seen in the picture.



```
pi@Trident-Pi5: ~/klipper
(Klipper Firmware Configuration)
[*] Enable extra low-level configuration options
    Micro-controller Architecture (STMicroelectronics STM32) --->
    Processor model (STM32H743) --->
    Bootloader offset (128KiB bootloader) --->
    Clock Reference (25 MHz crystal) --->
    Communication interface (USB to CAN bus bridge (USB on PA11/PA12)) --->
    CAN bus interface (CAN bus (on PB5/PB6)) --->
    USB ids --->
    (1000000) CAN bus speed
    () GPIO pins to set at micro-controller startup

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

USB Interface:

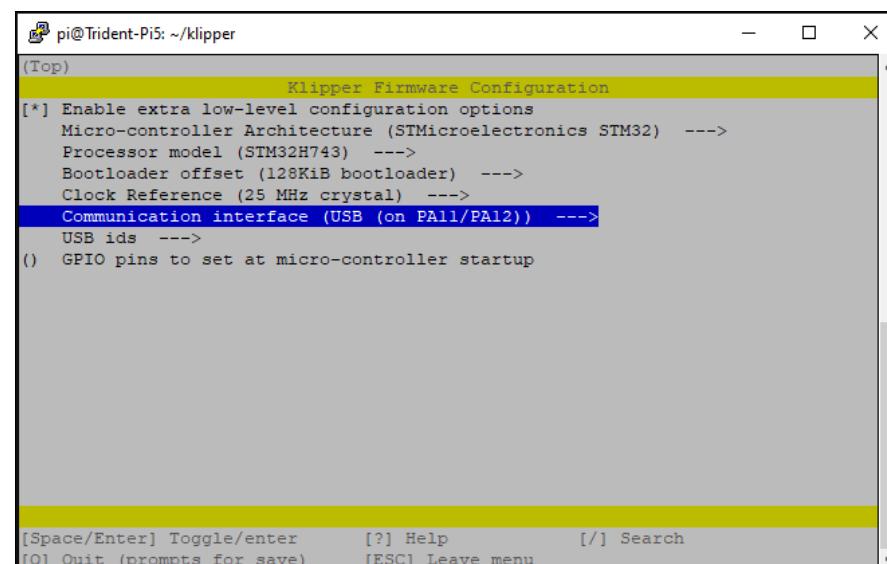
If you want to use the USB interface only, Klipper must be configured as seen in the picture.

UART Interface for Pi:

PA9/PA10 are the UART Pins for RPi

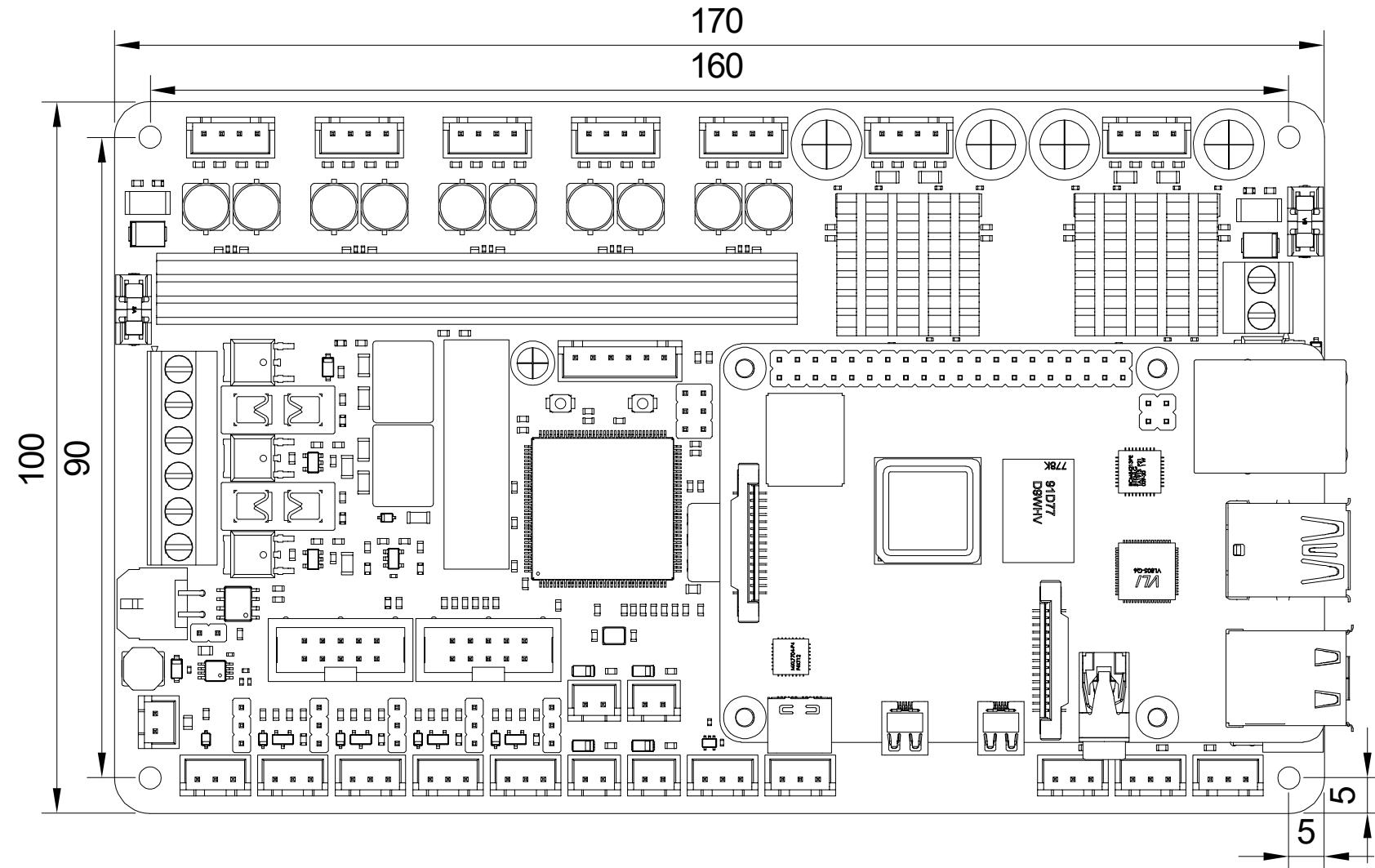
Note!

If communication between board and Pi via UART is used, CAN bus bridge mode is not available. This is not supported by the firmware.



```
pi@Trident-Pi5: ~/klipper
(Klipper Firmware Configuration)
[*] Enable extra low-level configuration options
    Micro-controller Architecture (STMicroelectronics STM32) --->
    Processor model (STM32H743) --->
    Bootloader offset (128KiB bootloader) --->
    Clock Reference (25 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
```



## CREDITS

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I would like to thank everyone who supported and encouraged this project.

Thanks to Jason, Dave and Cameron from LDO.

Thanks to the test team:

Alexz  
clee  
Doc  
Dunar  
Dustin  
Eddie  
FrySennberg  
Haribro  
HartK  
Jared  
meteyou  
Sanity  
Stephan  
Steve  
Thebrakshow

Special thanks to Dunar for allowing me to use his design for this guide.

Thanks also to the Voron team. It was a pleasure for me!

I hope I did not forget anyone. If so, I apologize for this.



<https://docs.vorondesign.com>



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