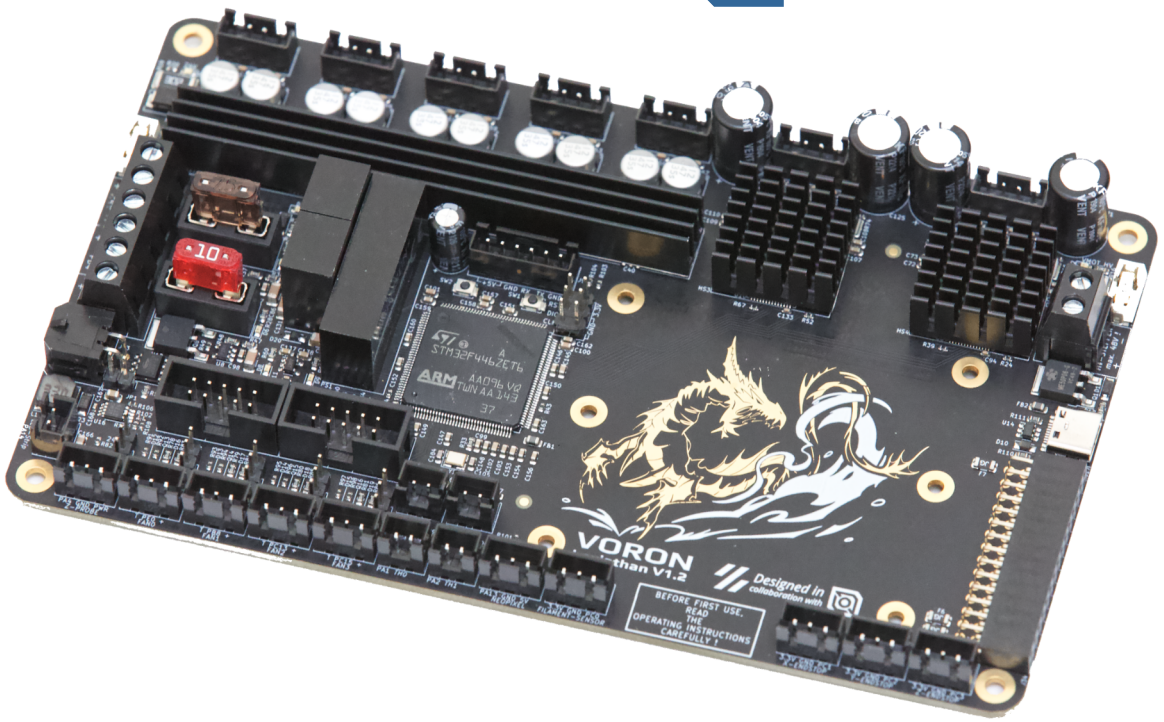
VORON

LDO MOTORS



VORON Leviathan V1.2 Manual

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

VERSION 2023-11-27

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

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.

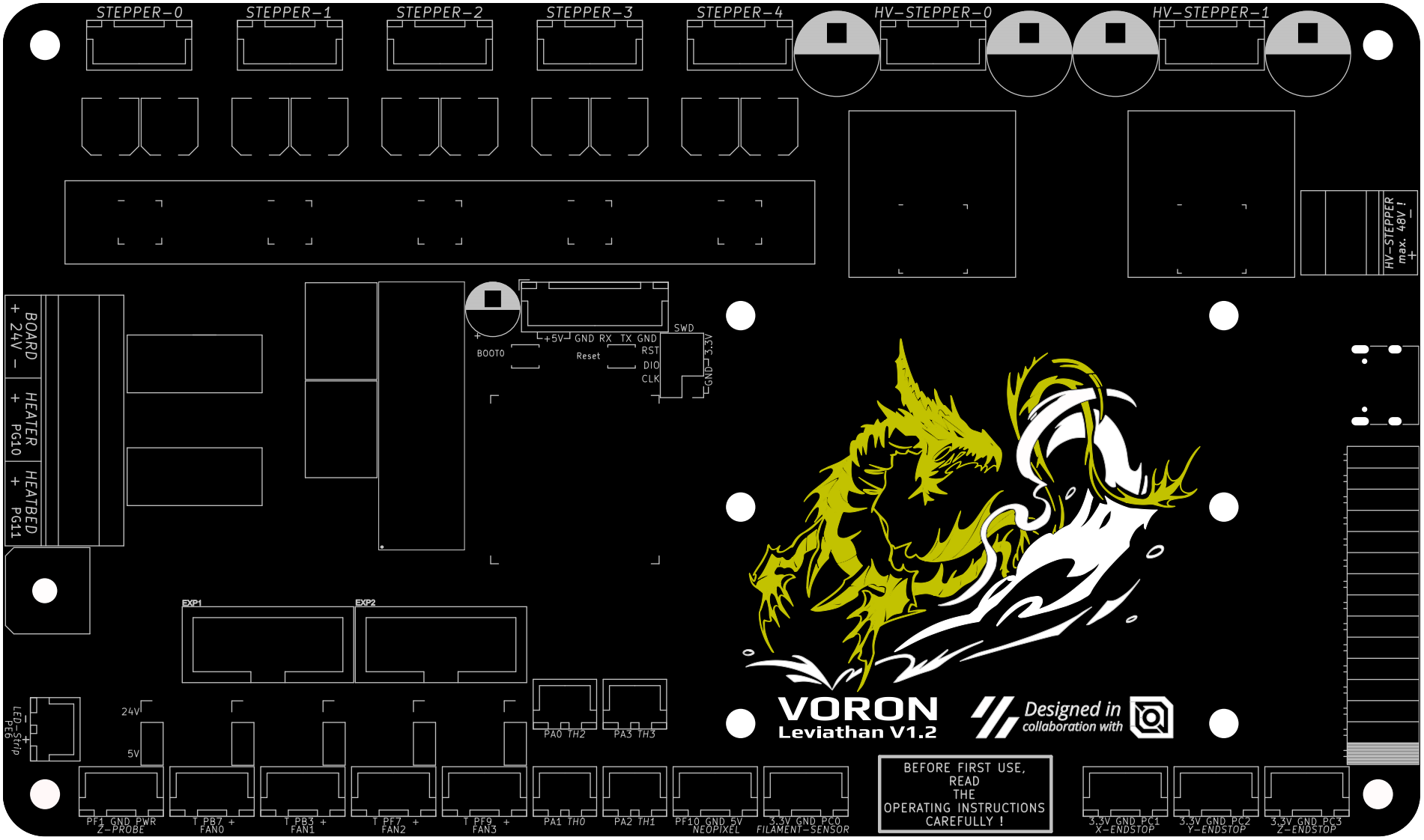
Sincerely!
JNP

LEVIATHAN BOARD

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

These are the main features:

- Supports Klipper, Marlin and RRF
- STM32F446 MCU
- 1x Vin 24V Mainsupply (polarity and overvoltage protected)
- 1x Vin 24–48V TMC5160 supply (polarity and overvoltage protected)
- Superior stepper driver cooling (top and bottom heat sinks)
- 5x TMC2209 onboard drivers (24V)
- 2x TMC5160 onboard drivers (24–48V), onboard 12V source for gate drive
- 4x Thermistor inputs (pullup 2200)
- 4x Fan outputs (with tacho signal support, 5/24V via jumpers)
- 1x Probe input (5/24V via jumper)
- 1x Filament sensor input (5V tolerant)
- 1x Neopixel output
- 3x Endstop inputs (5V tolerant)
- 1x Hotend heater output (max. 180 W, 7.5 A)
- 1x Heatbed heater output (max. 240 W, 10 A)
- 1x dimmable LED-strip output (350mA constant current source)
- 1x EXP1 port
- 1x EXP2 port
- 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)
- 1x USB port (type-C connector)
- 1x CAN Bus interface (MicroFit 3.0 connector)
- 1x Dedicated power supply for Raspberry Pi 3/4/5 or Zero 2W (5-pin JST-XH connector with UART support)
- Dedicated mounting holes for Raspberry Pi 3/4/5 or Zero 2W
- Dimensions: 170x100mm, mounting holes: 160x90mm


STEPPER–0
STEPPER–1
STEPPER–2
STEPPER–3
STEPPER–4
HV–STEPPER–0
HV–STEPPER–1
HV–STEPPER
max. 48V !
BOARD
24V
HEATER
PG10
HEATBED
PG11
BOOT0
+5V GND RX TX GND
Reset
SWD
RST
DIO
CLK
GND 3.3V
EXP1
EXP2
LED–Strip
PE6
24V
5V
PA0 TH2
PA3 TH3
VORON
Leviathan V1.2
Designed in
collaboration with
BEFORE FIRST USE,
READ
THE
OPERATING INSTRUCTIONS
CAREFULLY !
PF1 GND PWR
Z–PROBE
PB7
FAN0
PB3
FAN1
PF7
FAN2
PF9
FAN3
PA1 TH0
PA2 TH1
PF10 GND 5V
NEOPIXEL
3.3V GND PC0
FILAMENT–SENSOR
3.3V GND PC1
X–ENDSTOP
3.3V GND PC2
Y–ENDSTOP
3.3V GND PC3
Z–ENDSTOP

CONTROLLER BOARD

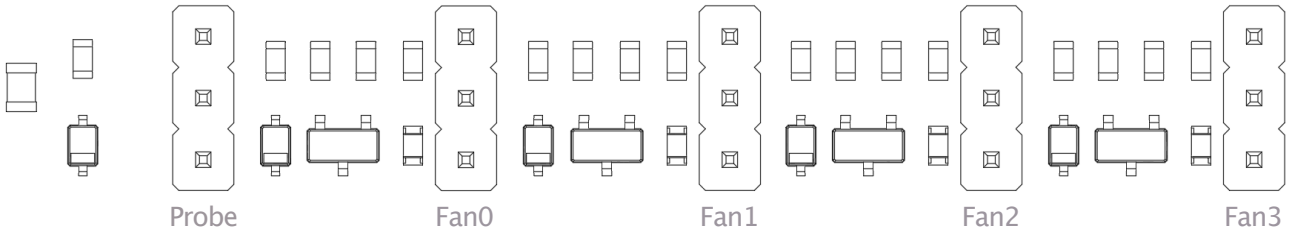
The manual will outline the wiring for a Leviathan V1.2 board. You can find additional documentation and alternative configurations on docs.vorondesign.com

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"

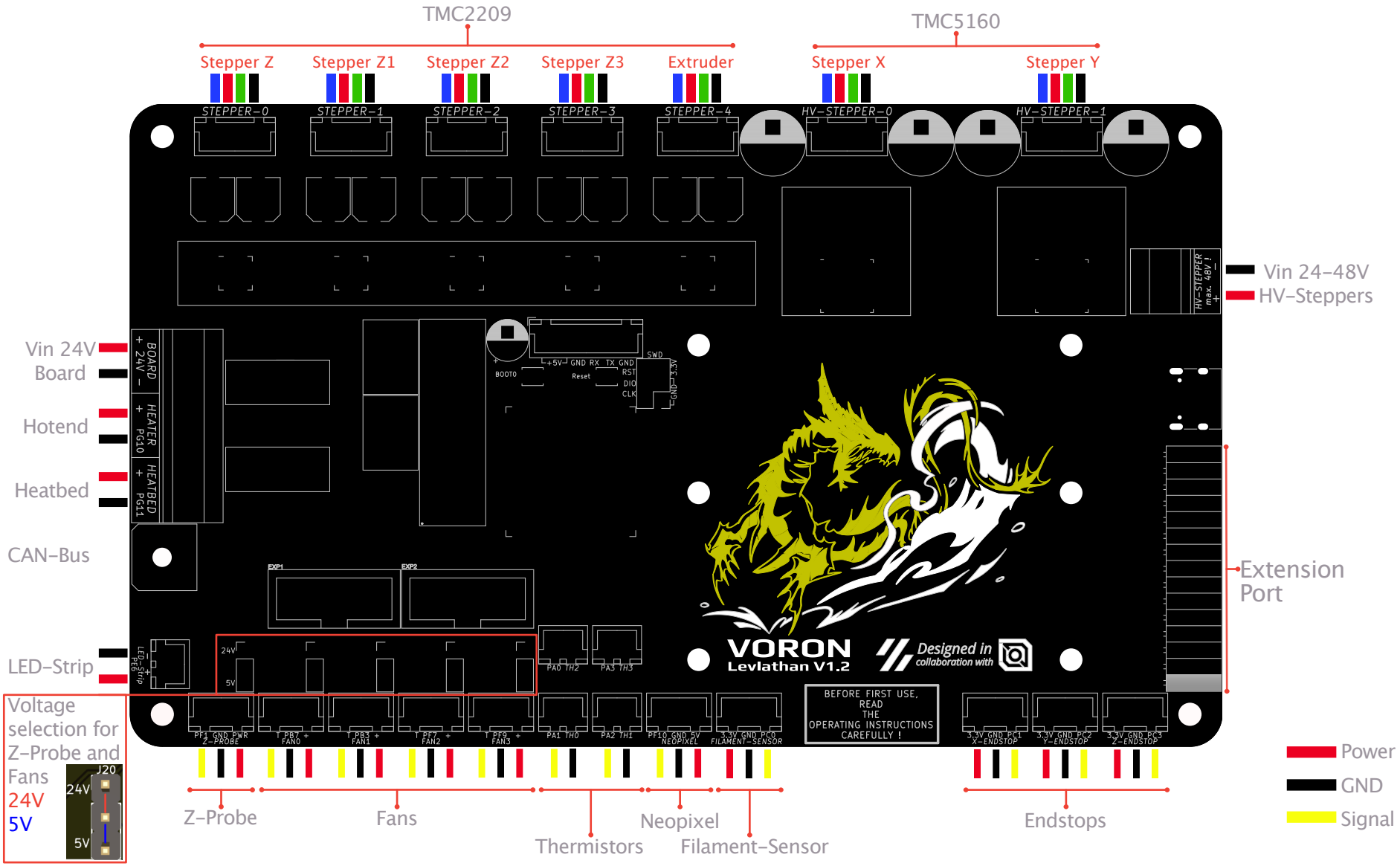
2) Remove all the jumpers on the “Fan Voltage Selection”



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.


TMC2209
TMC5160
Stepper Z
Stepper Z1
Stepper Z2
Stepper Z3
Extruder
Stepper X
Stepper Y
STEPPER-0
STEPPER-1
STEPPER-2
STEPPER-3
STEPPER-4
HV-STEPPER-0
HV-STEPPER-1
Vin 24-48V
HV-Steppers
Vin 24V
Board
Hotend
Heatbed
CAN-Bus
LED-Strip
Extension
Port
Voltage
selection for
Z-Probe and
Fans
24V
5V
J20
VORON
Levlathan V1.2
Designed in
collaboration with
BEFORE FIRST USE,
READ
THE
OPERATING INSTRUCTIONS
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Z-Probe
Fans
Thermistors
Neopixel
Filament-Sensor
Endstops
Power
GND
Signal

PIN ASSIGNMENT

Stepper

Signal	EN	STEP	DIR	DIAG	UART	CS	SCK	MOSI	MISO
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	Endstop X	Endstop Y	Endstop Z	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

*** All thermistor inputs have a 2200 pullup resistor**

Neopixel

Signal	Data
	PF10

LED-Strip

Signal	PWM
	PE6

UART Pi

Signal	RX	TX
	PA10	PA9

Heatbed

Signal	PWM
	PG11

Hotend

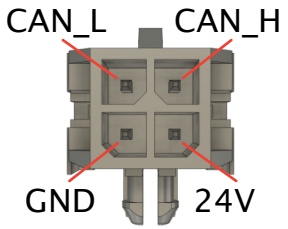
Signal	PWM
	PG10

CAN Bus

Signal	RX	TX
	PB5	PB6

Status LED

PE1

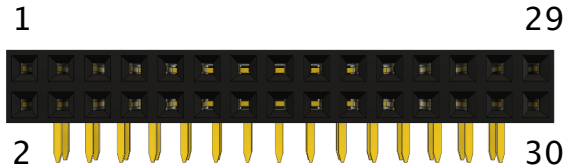


frontview of the board socket

EXTENSION PORT

ATTENTION !

All GPIOs directly connected to the MCU.
Be carefull!



frontview of the board socket

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				

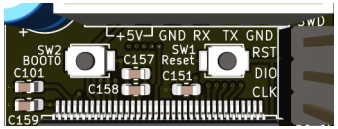
FT 5V tolerant I/O

*** For further information see data sheet STM32F446ZET6**

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.



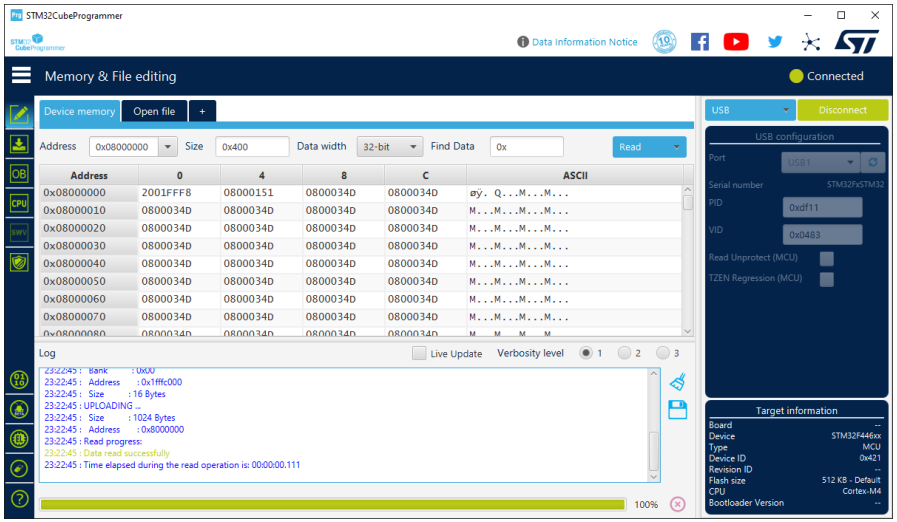
To do this, connect the board to the PC using a USB-C cable.

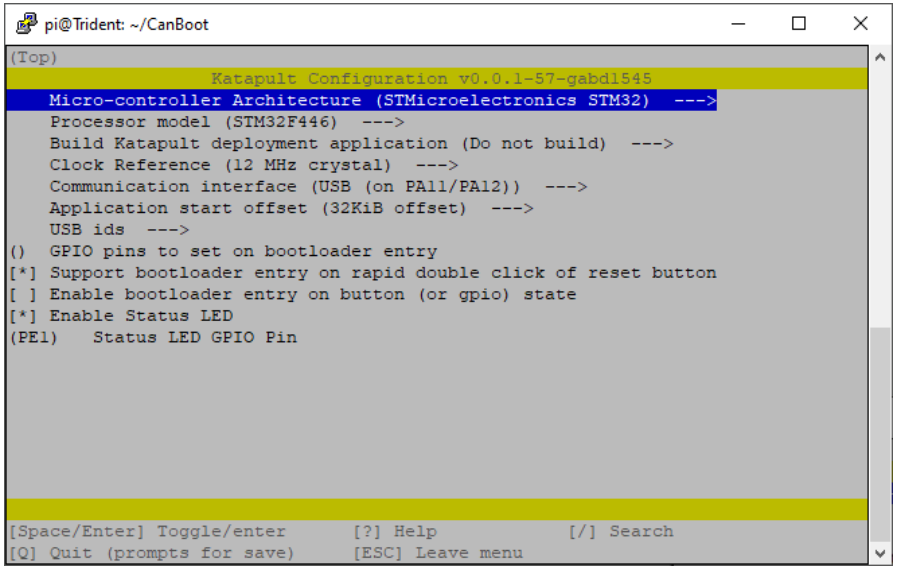
Then press the reset (SW1) and boot (SW2) switches at the same time.
First release the reset switch, then the boot switch. DFU mode is activated.

Firmware can now 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



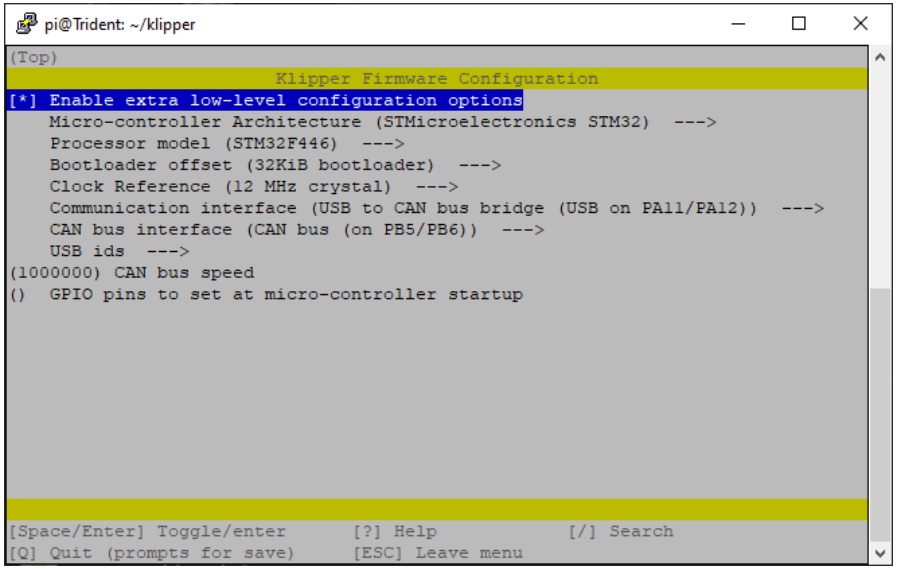


Leviathan is supported by Klipper firmware.

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

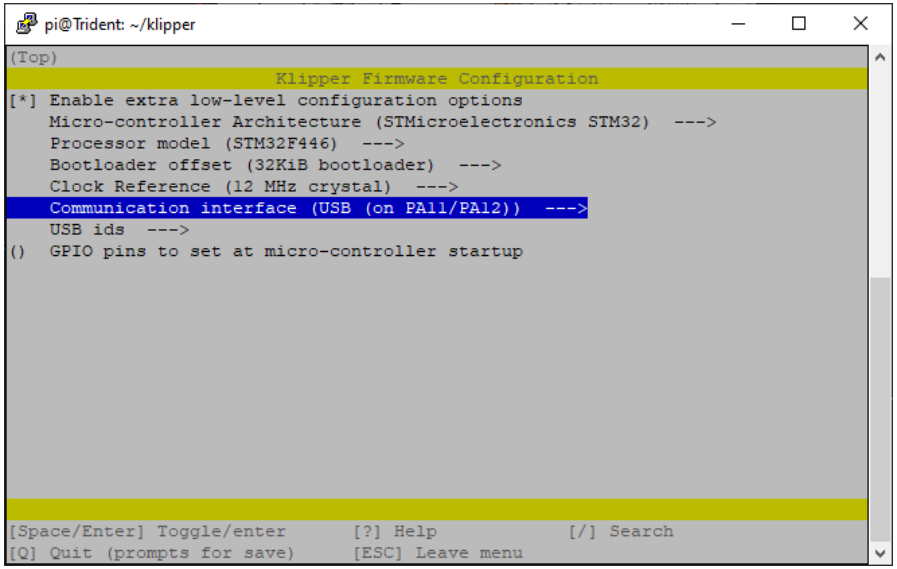
CAN Interface:

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.



USB Interface:

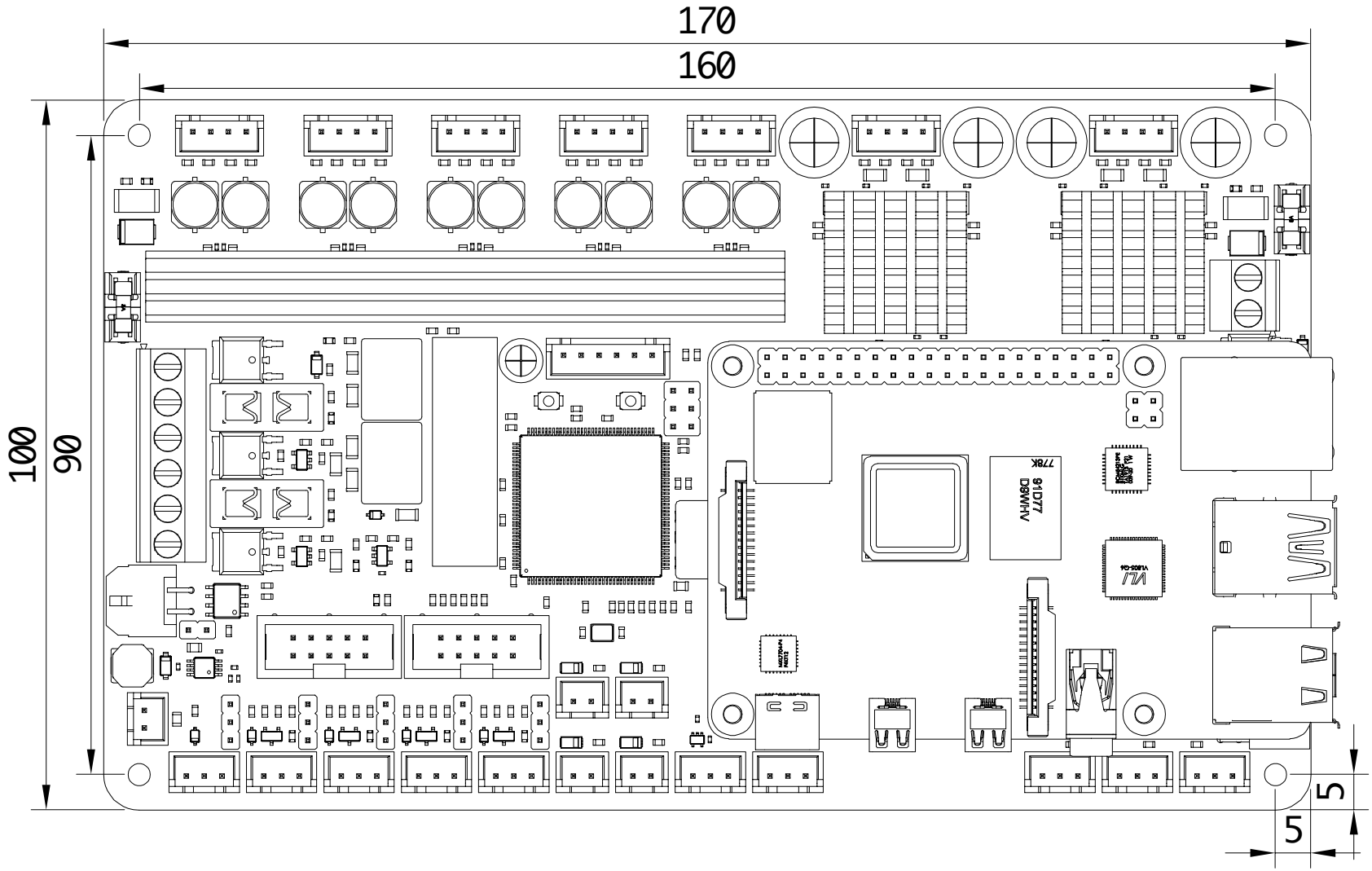
If you want to use the USB interface only, Klipper must be configured as seen in the picture.



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.


170
160
100
90
5
5

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

Thanks to Jason and Dave 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

https://docs.ldomotors.com