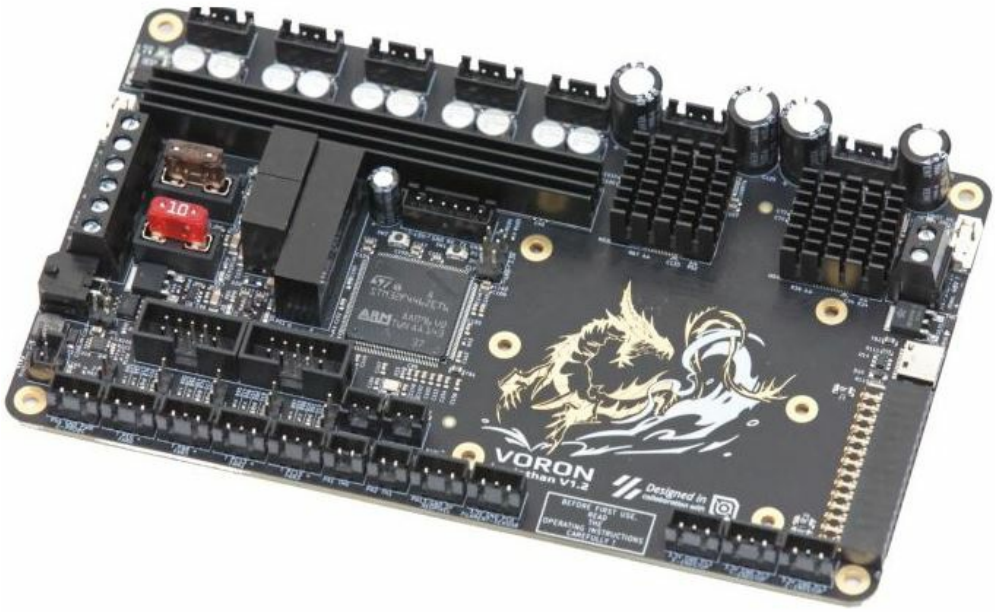
VORON V1.2 Leviathan Control Board User Manual

Contents

VORON V1.2 Leviathan Control Board



Specifications

- **Product Name:** VORON Leviathan V1.2
- **Manufacturer:** VORONDESIGN.COM in collaboration with LDO MOTORS
- **Features:** Designed for Voron printers, essential functions, controller board
- **Version:** 2023-05-29

Product Usage Instructions

Precautions

Before starting assembly, please read the entire manual carefully to avoid any accidents. The machine can be dangerous if not handled properly.

Preparation

Make sure to remove all jumpers from the controller board before proceeding with the wiring. Detailed wiring instructions can be found on docs.vorondesign.com.

Wiring

Refer to the pin assignment section for proper wiring of stepper motors, endstops, fans, sensors, and other components. Ensure correct connections to avoid any malfunctions.

Frequently Asked Questions (FAQ)

1. **Is it necessary to remove all jumpers from the controller board?**
    - Yes, it is essential to remove all jumpers as outlined in the manual to configure the board correctly.
2. **Where can I find additional documentation and alternative configurations?**
    - You can find additional documentation and alternative configurations on docs.vorondesign.com for detailed guidance.
3. **What are the main features of the Leviathan V1.2 board?**

- The board is designed specifically for Voron printers and provides all the necessary functions required for smooth operation.

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

FOREWORD

- 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 board.
- The target was to implement only the 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

INTRODUCTION

LEVIATHAN BOARD

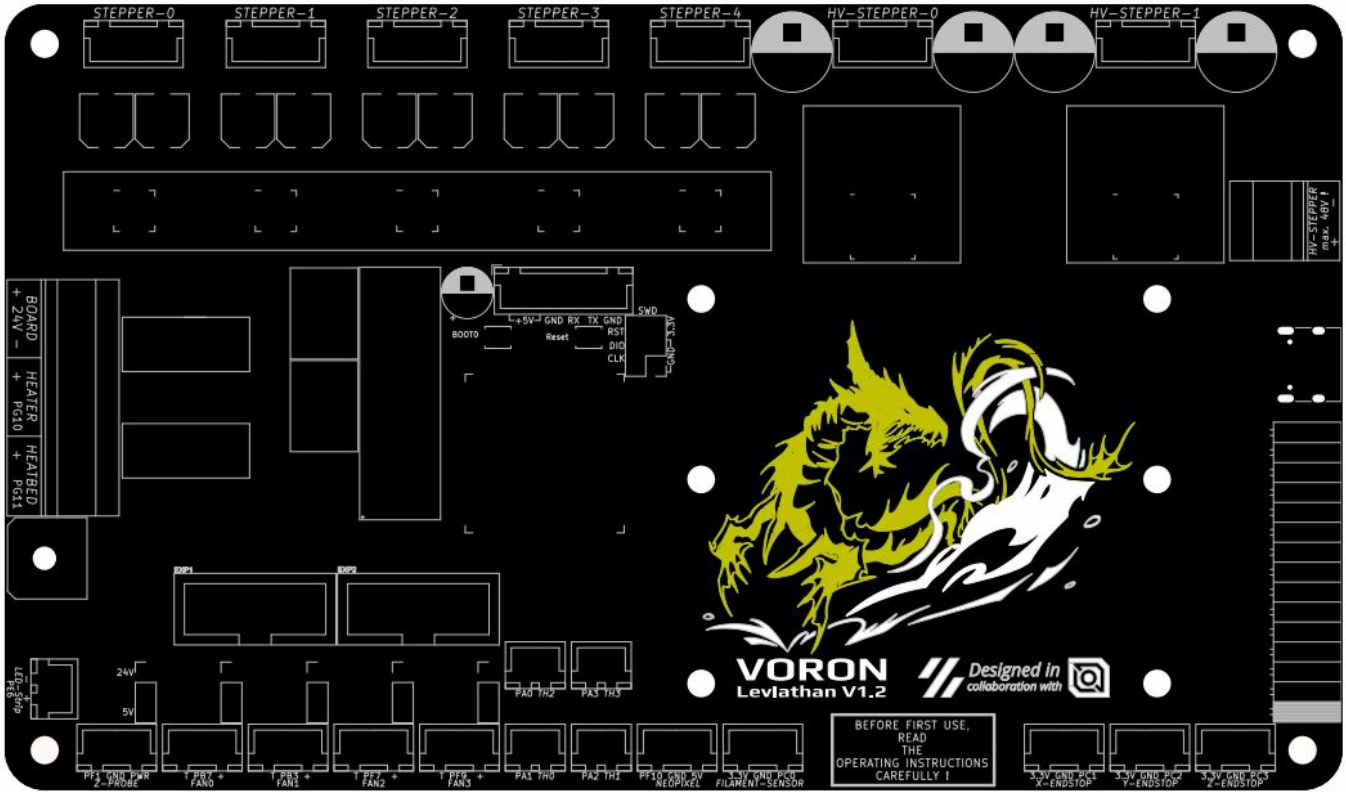
This Board is designed and developed for Voron printers. It provides all necessary functions.

These are the main features:

- Supports Klipper firmware
- STM32F446 MCU
- 1x Vin 24V Mainsupply (polarity and overvoltage protected)
- 1x Vin 24-48V TMC5160 supply (polarity and overvoltage protected)
- 5x TMC2209 onboard drivers (24V)
- 2x TMC5160 onboard drivers (24-48V), onboard 12V source for gate drive
- 4x Thermistor inputs
- 4x Fan outputs (with tacho signal support, 5/24V via jumpers)
- 1x Probe input (5/24V via jumper)
- 1x Filamentsensor 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 (backup)
- 1x USB-C interface
- 1x CAN Bus interface (MicroFit 3.0 connector)
- 1x RPi Power supply (5-pin JST-XH connector with UART support)
- Mountig holes for RPi Zero 2W and RPi3/4
- Better stepper driver cooling
- **Dimensions:** 170x100mm, Mounting holes: 160x90mm

CONTROLLER BOARD OVERVIEW



PREPARATION

CONTROLLER BOARD

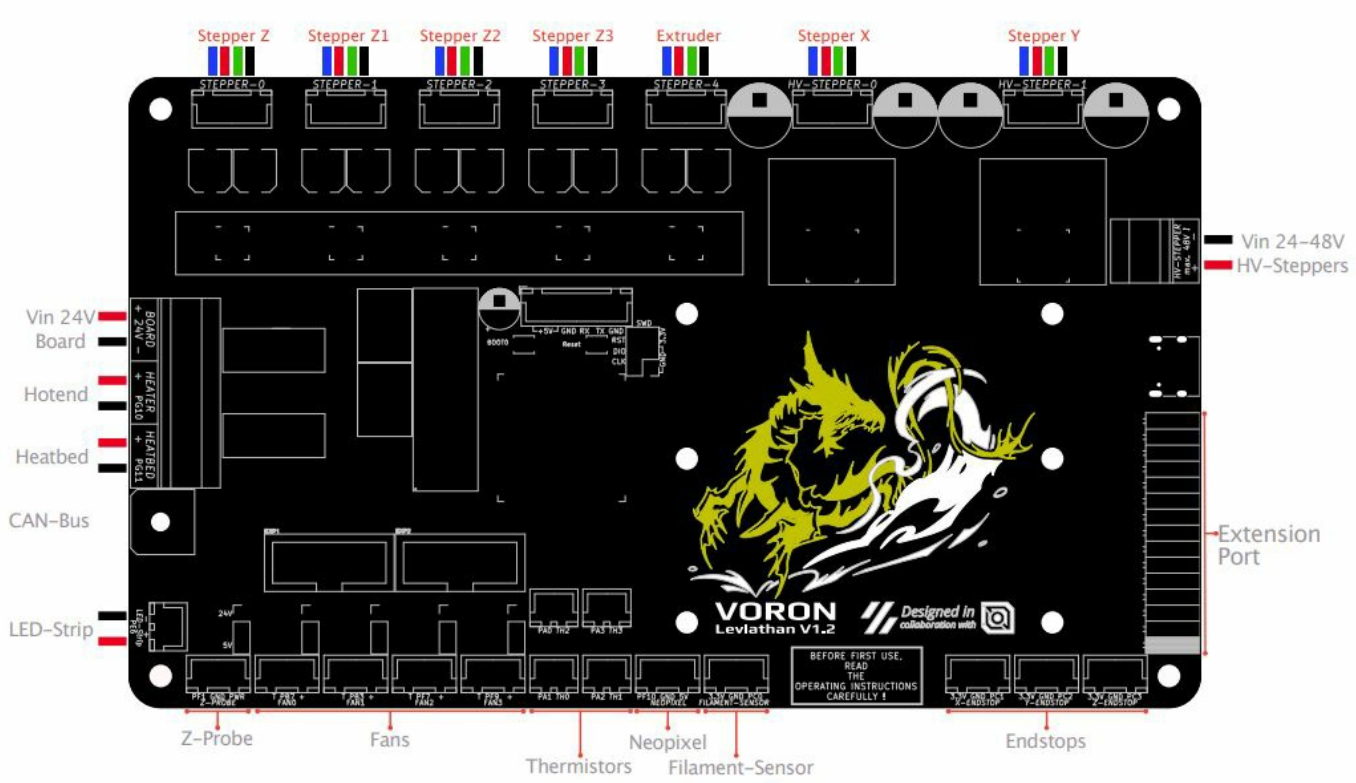
- The manual will outline the wiring for a Leviathan V1.2 board. You can find additional documentation and alternative configurations on [docs.vorondesign.com]

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”

WIRING



PIN ASSIGNMENT

Stepper

Signal	EN	STEP	DIR	DIAG	CART	CS	SCK	MOST	MISO
Stepper 0	PD7	PD4	PD3	PD6	PD5				
Stepper 1	PD2	PC12	PC11	PD1	PD0				
Stepper 2	PC10	PC9	PC8	PA15	PA8				
Stepper 3	PC7	PG7	PG6	PC6	PG8				
Stepper 4	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	PB0	PB4	PF6	PF8

Endstops

Signal	EndstopX	EndstopY	EndstopZ	Z–Probe	Filament–Senso
	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	PE4	PE3	PA7	PE5	Reset	PE4

Thermistors

Signal	TH0	TH1	TH2	TH3
	PA1	PA2	PA0	PA3

Neopixel

Signal	Data
	PF10

LED-Strip

Signal	PWM
	PE6

UARTPi

Signal	RX	TX
	PA10	PA9

Heatbed

Signal	PWM
	PG11

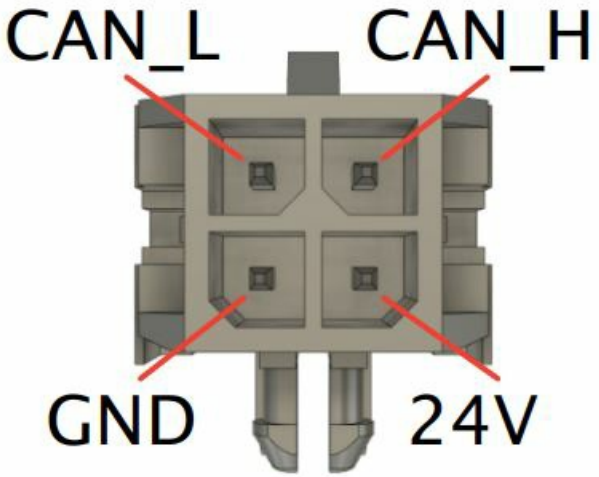
Hotend

Signal	**PWM**
	PG10

CANBus

Signal	**RX**	**TX**
	PB5	PB6

StatusLED PE1



EXTENSION PORT

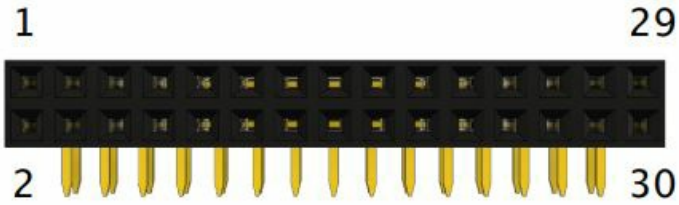
Pin Signal Function IO structure

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				

ATTENTION!

- All GPIO´s directly connected to the MCU.
- Be careful



- FT 5V tolerant I/O
- For further information see data sheet STM32F446ZET6

FIRMWARE

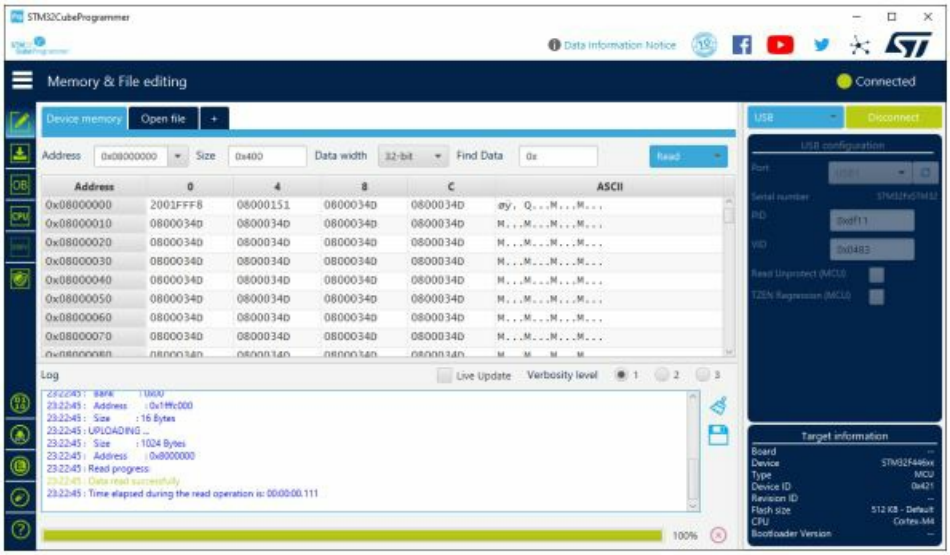
PREPARATION:

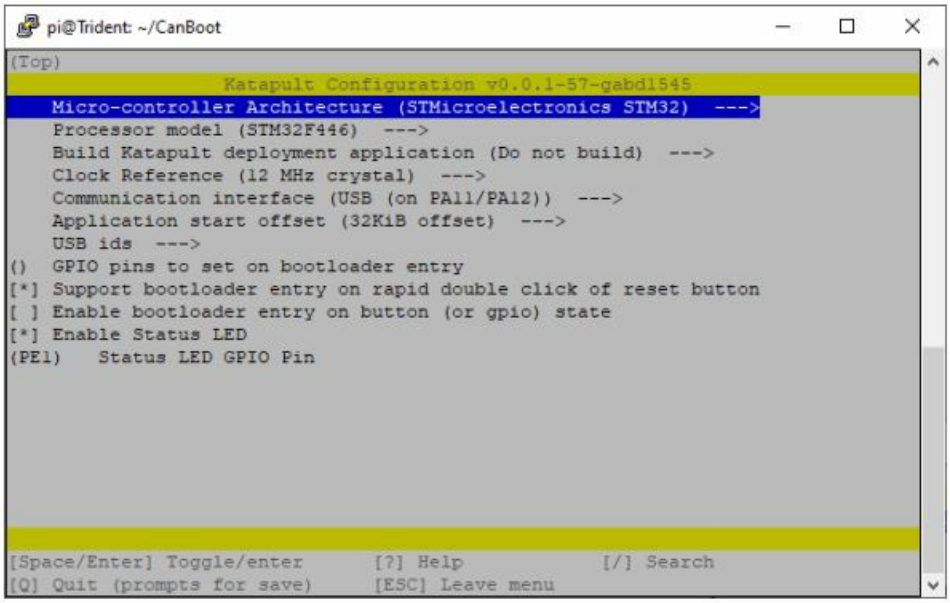
- The board can be flashed via USB with the STM32 CubeP programmer. (**https://www.st.com/en/development-tools/stm32cubeprog.html**)
- The board can be put into the necessary DFU mode using two switches.

- 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:

- Catapult (CanBoot) is recommended as a bootloader.
- The necessary settings can be seen in the picture.
- **https://github.com/Arksine/katapult.**





KLIPPER

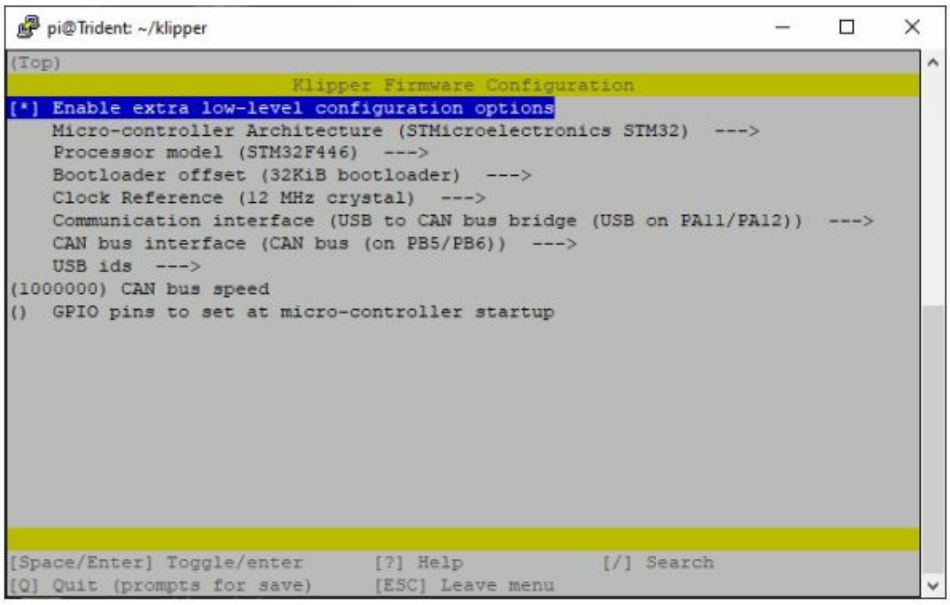
- Leviathan is supported by Klipper firmware.
- With the bootloader, the Klipper firmware can be flashed directly via the RPi. See also: **https://www.klipper3d.org/Installation.html#building-and-flashing-the-micro-controller**

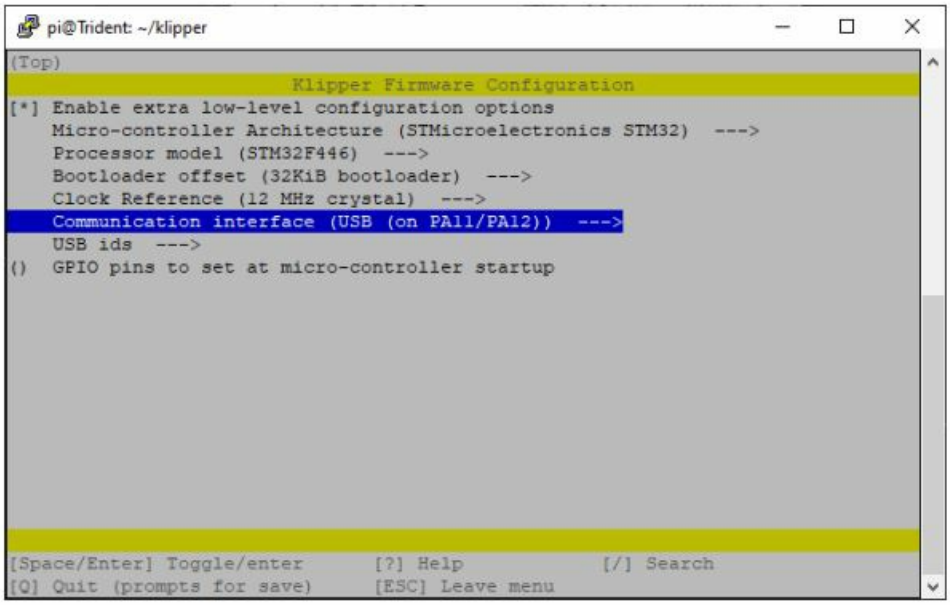
CAN Interface:

- If you want to use the CAN bus interface, Klipper must be configured as a USB to the 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.


pi@Trident: ~/klipper
(Top)
Klipper Firmware Configuration
[*] Enable extra low-level configuration options
Micro-controller Architecture (STMicroelectronics STM32) --->
Processor model (STM32F446) --->
Bootloader offset (32KiB bootloader) --->
Clock Reference (12 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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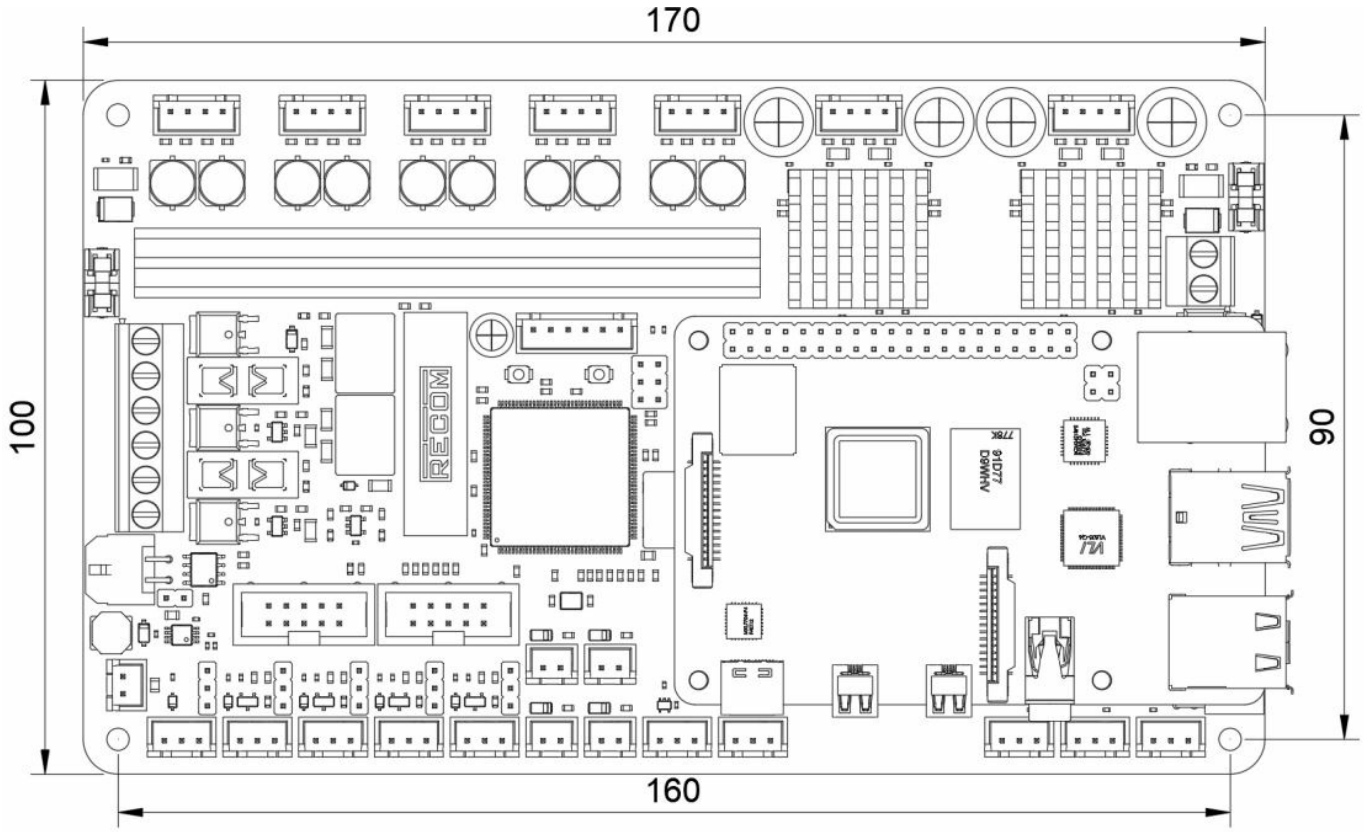
USB ids --->
() GPIO pins to set at micro-controller startup
[Space/Enter] Toggle/enter [?] Help [/] Search
[Q] Quit (prompts for save) [ESC] Leave menu

DRAWING



CREDITS

- 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
- meet you
- 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.

- VORONDESIGN.COM
- https://docs.ldomotors.com

Documents / Resources

	VORON V1.2 Leviathan Control Board [pdf] User Manual V1.2 Leviathan Control Board, V1.2, Leviathan Control Board, Control Board

References

- Voron Documentation | Voron Official and Community Documentation
- VORON Design
- LDO Documentation | LDO Documentation
- Voron Documentation | Voron Official and Community Documentation
- GitHub - Arksine/katapult: Configurable bootloader for Klipper
- Installation - Klipper documentation
- User Manual