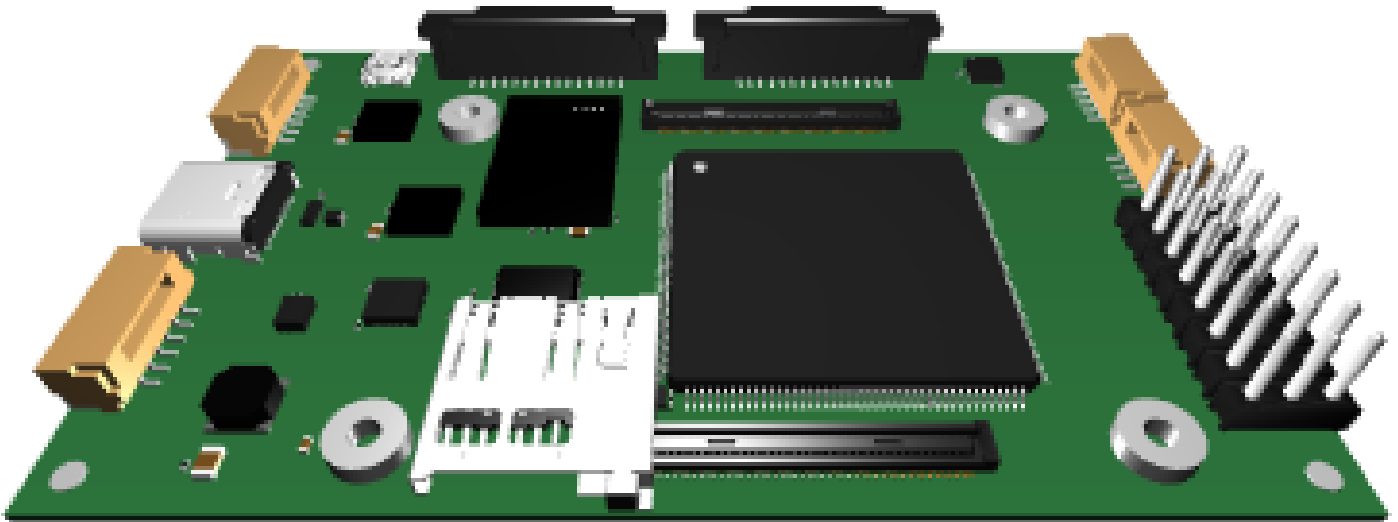


CM4 Pixhawk 6 Mini



This board was designed and built by Geppetto

Free automated documentation anytime.
Design for free @ <https://geppetto.gumstix.com/>

No Minimum Order

Automated Supply Chain

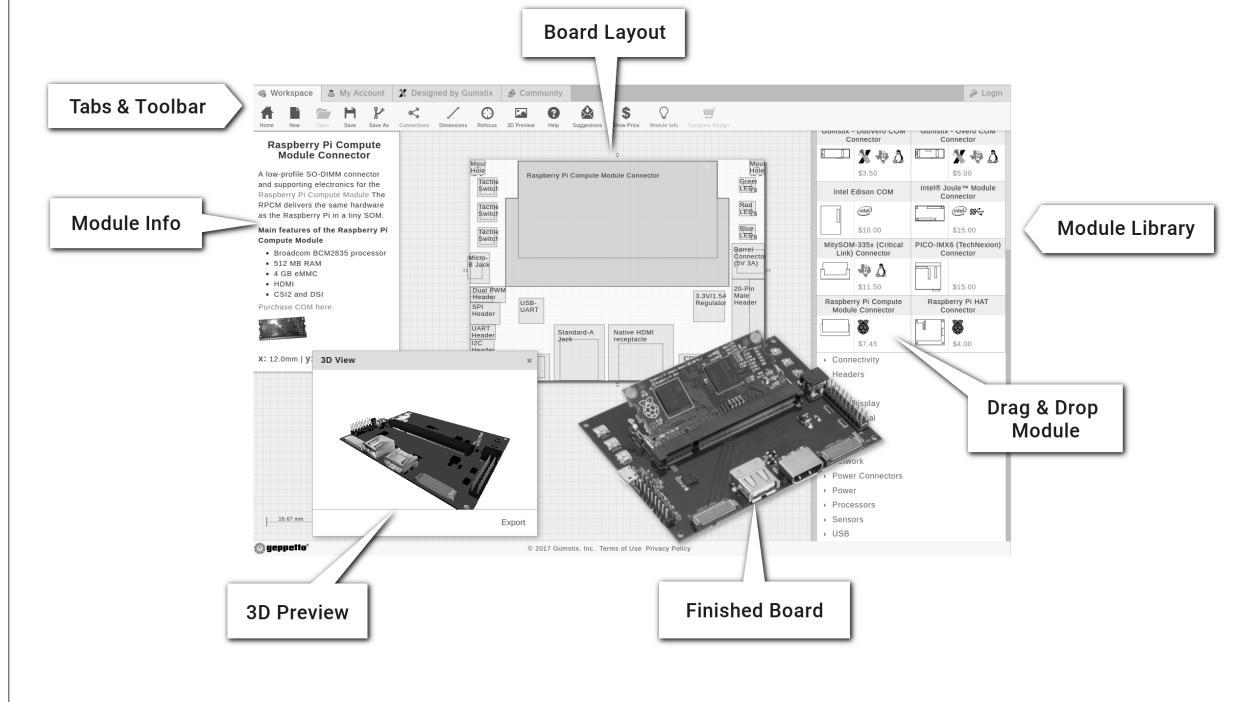
Reduce Cost and Errors



Thanks for using Geppetto to design this board!

One Stop Design-to-Order

Simply place displays, sensors, processors, and Geppetto connects it all.
No routing needed.



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Board Description

Uses Raspberry Pi CM4 Connector as its COM/processor.

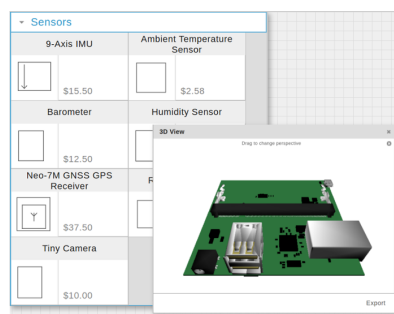
Functional modules include:

USB Type-C PD (5V)
3-Port USB Client Hub
USB-UART
USB-UART
USB Type-C PD (5V)
HART Bridge

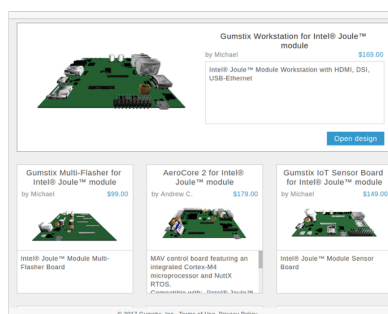
Board Dimensions

8cm x 5cm

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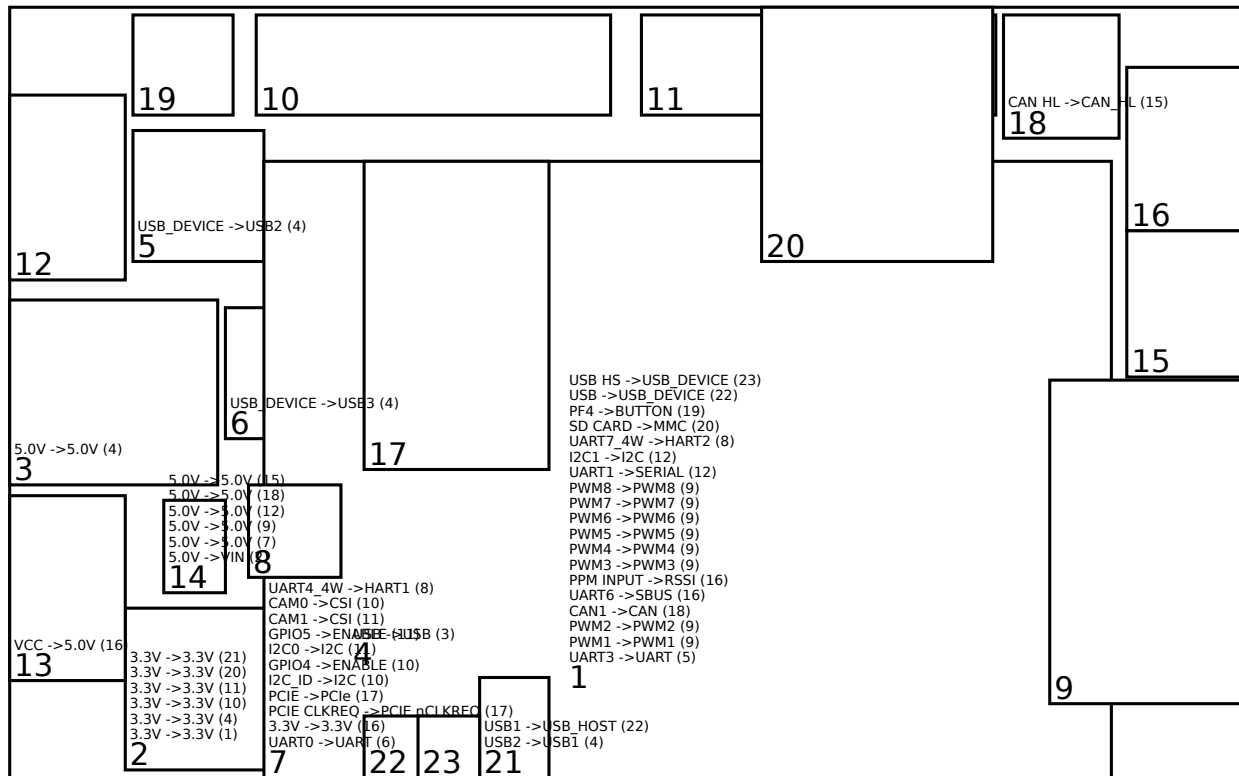
Built in Geppetto
No engineering required.
Delivered in 15 days.

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1 Modules on Board



1.1 Processors

1.1.1 PX4 FMUv6 (v1) (1)

PX4 FMUv6

STM32H753IIT6 is a 32-bit Arm Cortex-M7 core with double precision FPU and L1 cache: 16 Kbytes of data and 16 Kbytes of instruction cache; frequency up to 480 MHz, MPU, 1027 DMIPS/2.14 DMIPS/MHz (Dhrystone 2.1), and DSP instructions. It has 2 Mbytes of Flash memory and 1 Mbyte of RAM. Requires:

- 3.3V from 3.3V/1.5A Regulator (2)

Provides:

- UART3 to USB-UART (5)
- PWM1 to Octal PWM Header (9)
- PWM2 to Octal PWM Header (9)
- CAN1 to NXP TJA1051TK/3 CAN Transceiver (18)
- UART6 to Pixhawk RC Input (16)

- PPM INPUT to Pixhawk RC Input (16)
- PWM3 to Octal PWM Header (9)
- PWM4 to Octal PWM Header (9)
- PWM5 to Octal PWM Header (9)
- PWM6 to Octal PWM Header (9)
- PWM7 to Octal PWM Header (9)
- PWM8 to Octal PWM Header (9)
- UART1 to Pixhawk Basic GPS (12)
- I2C1 to Pixhawk Basic GPS (12)
- UART7_4W to HART Bridge (8)
- SD CARD to microSD slot (20)
- PF4 to Tactile Switch (19)
- USB to USB Bridge (22)
- USB HS to USB Bridge (23)

1.2 Power

1.2.1 3.3V/1.5A Regulator (v21) (2)

This DC to DC step down regulator provides a 3.3V DC output at 1.5A needed by certain components on this board. It is capable of accepting an input voltage between 3.1 to 16V DC and output is controlled by the TI TPS6211 buck regulator.
It receives VIN from TI TPS2121 Power Mux (14).

The datasheet for the TPS6211 regulator is available at:

<http://www.ti.com/lit/ds/symlink/tps62110.pdf>

This regulator provides 3.3V to:

- PX4 FMUv6 (1)
- 3-Port USB Client Hub (4)
- Raspberry Pi Vertical Camera Connector (10)
- Raspberry Pi Vertical Camera Connector (11)
- microSD slot (20)
- USB 2-Port Switch (21)

1.2.2 TI TPS2121 Power Mux (v3) (14)

The TI TPS2121 power muxer module transitions between two power sources seamlessly. The autoswitching power multiplexer ensures power is delivered from the connected source with the highest voltage.

The TPS2121 datasheet is available at:

<http://www.ti.com/lit/ds/symlink/tps2121.pdf>

This module is not connected.

1.3 USB

1.3.1 USB Type-C PD (5V) (v1) (3)

A USB Type-C port allows your design to connect as a USB 2.0 and provides up to 3A @ 5.0V.

This port is connected to USB on 3-Port USB Client Hub (4).

1.3.2 3-Port USB Client Hub (v7) (4)

The 3-port USB client hub module offers three interfaces for on-board USB client devices to a single USB device port using the Microchip USB2513 USB 2.0 Hi-speed Hub Controller.

The datasheet for the USB2513 IC is available at:

<http://ww1.microchip.com/downloads/en/DeviceDoc/00001692C.pdf>

The USB client hub links: USB on USB Type-C PD (5V) (3);
to the following USB device ports:

- USB_DEVICE on USB-UART (5)
- USB_DEVICE on USB-UART (6)
- USB2 on USB 2-Port Switch (21)

1.3.3 USB 2-Port Switch (v1) (21)

USB 2-Port Switch allows the sharing of a single USB 2.0 port.

It requires:

- 3.3V from 3.3V/1.5A Regulator (2)

It provides the following outputs:

- USB2 to 3-Port USB Client Hub (4)
- USB1 to USB Bridge (22)

1.4 Converters

1.4.1 USB-UART (v21) (5)

Also known as an FTDI, this USB to UART converter allows a USB connection to the board to behave as a virtual RS232 serial connection. It offers direct and complete access to the system from a development machine by way of the FTDI FT232RQ USB – UART IC.

Technical documentation for the FT232RQ is available at:

http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT232R.pdf

This USB to UART converter connects a host machine from 3-Port USB Client Hub (4) to UART3 on PX4 FMUv6 (1).

1.4.2 USB-UART (v21) (6)

Also known as an FTDI, this USB to UART converter allows a USB connection to the board to behave as a virtual RS232 serial connection. It offers direct and complete access to the system from a development machine by way of the FTDI FT232RQ USB – UART IC.

Technical documentation for the FT232RQ is available at:

http://www.ftdichip.com/Support/Documents/DataSheets/ICs/DS_FT232R.pdf

This USB to UART converter connects a host machine from 3-Port USB Client Hub (4) to UART0 on Raspberry Pi CM4 Connector (7).

1.4.3 HART Bridge (v1) (8)

A HART-HART bridge interfaces two modules with hardware controlled UART lines (e.g., interfacing two processors).

This HART bridge connects UART4_4W on Raspberry Pi CM4 Connector (7) to UART7_4W on PX4 FMUv6 (1).

1.4.4 NXP TJA1051TK/3 CAN Transceiver (v2) (18)

The TJA1051TK/3 is a high-speed CAN transceiver that provides an interface between a controller Area Network (CAN) protocol controller and the physical two-wire CAN bus. The transceiver is designed for high-speed CAN applications in the automotive industry, providing differential transmit and receive capability to (a microcontroller with) a CAN protocol controller. The TJA1051TK3 implements the CAN physical layer as defined in ISO 11898-2:2016 and SAE J2284-1 to SAE J2284-5. This implementation enables reliable communication in the CAN FD fast phase at data rates up to 5 Mbit/s. It is suitable for 12 V and 24 V systems. The operating supply voltage of the transceiver is between 4.5V and 5.5V. The module supports IO logic levels of either 3.3V or 5.0V between the controller and transceiver based on the user's selection while designing on geppetto.

TJA1051TK/3 datasheet:

<https://www.nxp.com/docs/en/data-sheet/TJA1051.pdf>

This module is connected to CAN1 on PX4 FMUv6 (1).

This module provides the following outputs:

- CAN HL to CAN_HL on Pixhawk CAN (15)

1.5 COM Connectors

1.5.1 Raspberry Pi CM4 Connector (v4) (7)

The **Raspberry Pi Compute Module 4** (RPCM4) module contains two connectors to interface with the RPCM4 device. The RPCM4 COM connector is **ONLY** compatible with the RPCM4.

Technical details for the RPCM modules can be found at:

<https://www.raspberrypi.org/documentation/hardware/computemodule/datasheet.md>

It requires:

- 5.0V from TI TPS2121 Power Mux (14)

The Geppetto Pi Compute 4 connector provides the following outputs:

- UART0 to USB-UART (6)
- 3.3V to Pixhawk RC Input (16)
- PCIE CLKREQ to Google Coral G313-06329-00 Accelerator (17)
- PCIE to Google Coral G313-06329-00 Accelerator (17)
- I2C.ID to Raspberry Pi Vertical Camera Connector (10)
- GPIO4 to Raspberry Pi Vertical Camera Connector (10)
- I2C0 to Raspberry Pi Vertical Camera Connector (11)
- GPIO5 to Raspberry Pi Vertical Camera Connector (11)
- CAM1 to Raspberry Pi Vertical Camera Connector (11)
- CAM0 to Raspberry Pi Vertical Camera Connector (10)
- UART4_4W to HART Bridge (8)

1.6 Motors and Relays

1.6.1 Octal PWM Header (v11) (9)

This module offers eight PWM headers for controlling servo motors and other PWM-controlled devices.

This header offers PWM outputs connected to:

- PWM1 to PWM1 on PX4 FMUv6 (1)
- PWM2 to PWM2 on PX4 FMUv6 (1)

- PWM3 to PWM3 on PX4 FMUv6 (1)
- PWM4 to PWM4 on PX4 FMUv6 (1)
- PWM5 to PWM5 on PX4 FMUv6 (1)
- PWM6 to PWM6 on PX4 FMUv6 (1)
- PWM7 to PWM7 on PX4 FMUv6 (1)
- PWM8 to PWM8 on PX4 FMUv6 (1)
- 5.0V to 5.0V on TI TPS2121 Power Mux (14)

1.7 Connectors (Signal)

1.7.1 Raspberry Pi Vertical Camera Connector (v6) (10) — CAM0

The Raspberry Pi Vertical camera connector module is a 15-pin ribbon connector that exposes a 2-lane MIPI camera system to an external high-resolution camera module.

The CSI port is connected to CAM0 on Raspberry Pi CM4 Connector (7).

I2C communication is connected to I2C_ID on Raspberry Pi CM4 Connector (7).

ENABLE input provided by GPIO4 on Raspberry Pi CM4 Connector (7).

1.7.2 Raspberry Pi Vertical Camera Connector (v6) (11) — CAM1

The Raspberry Pi Vertical camera connector module is a 15-pin ribbon connector that exposes a 2-lane MIPI camera system to an external high-resolution camera module.

The CSI port is connected to CAM1 on Raspberry Pi CM4 Connector (7).

I2C communication is connected to I2C0 on Raspberry Pi CM4 Connector (7).

ENABLE input provided by GPIO5 on Raspberry Pi CM4 Connector (7).

1.7.3 USB Bridge (v9) (22)

The USB bridge connects PX4 FMUv6 (1) to USB 2-Port Switch (21) as a USB device.

1.7.4 USB Bridge (v9) (23)

The USB bridge connects PX4 FMUv6 (1) to as a USB device.

1.8 Custom Modules

1.8.1 Pixhawk Basic GPS (v3) (12)

The custom 6-pin JST GH header offers up to 6 pins that can be used at the customer's discretion.

This module has the following connections:

- SERIAL to UART1 from PX4 FMUv6 (1)
- I2C to I2C1 from PX4 FMUv6 (1)
- 5.0V to 5.0V from TI TPS2121 Power Mux (14)

1.8.2 Pixhawk Analog Power (v3) (13)

The custom 6-pin JST GH header offers up to 6 pins that can be used at the customer's discretion.

This module is not connected.

1.8.3 Pixhawk CAN (v6) (15)

The custom 4-pin JST GH header offers up to 4 pins that can be used at the customer's discretion.

This module has the following connections:

- 5.0V to 5.0V from TI TPS2121 Power Mux (14)
- CAN_HL to CAN HL from NXP TJA1051TK/3 CAN Transceiver (18)
-

1.8.4 Pixhawk RC Input (v4) (16)

The custom 5-pin JST GH header offers up to 5 pins that can be used at the customer's discretion.

This module has the following connections:

- SBUS to UART6 from PX4 FMUv6 (1)
- RSSI to PPM INPUT from PX4 FMUv6 (1)
- 3.3V to 3.3V from Raspberry Pi CM4 Connector (7)
- 5.0V to VCC from Pixhawk Analog Power (13)

1.9 Sensors

1.9.1 Google Coral G313-06329-00 Accelerator (v2) (17)

The Google Coral Accelerator Module is a multi-chip module (MCM) that includes the Edge TPU and its own power control. The Edge TPU is a small ASIC designed by Google that accelerates Tensor

Flow Lite models using little power: it's capable of performing 4 trillion operations per second (4 TOPS), using 2 watts of power that's 2 TOPS per watt. For example, it can execute state-of-the-art mobile vision models such as MobileNet v2 at almost 400 frames per second, in a power efficient manner. This on-device ML processing reduces latency, increases data privacy, and removes the need for a constant internet connection. The module provides either of the host interface i.e. PCIe Gen2 x 1 or USB2.0.

The datasheet for the G313-06329-00 module is available at:

<https://coral.ai/static/files/Coral-Accelerator-Module-datasheet.pdf>

The module connects to the following buses:

- PCIe nCLKREQ to PCIe CLKREQ on Raspberry Pi CM4 Connector (7)
- VLOGIC_PCIE_CTRL to VLOGIC on Raspberry Pi CM4 Connector (7)
- PCIe to PCIe on Raspberry Pi CM4 Connector (7)
-

1.10 Lights and Switches

1.10.1 Tactile Switch (v22) (19) — RESET

This 4.9 sq. mm pull-down touch switch provides a user input for the signal PF4 on PX4 FMUv6 (1).

1.11 Memory

1.11.1 microSD slot (v16) (20)

The Micro SD card slot module provides removable non-volatile memory to Geppetto designs.

The SD card reader is connected to SD CARD on PX4 FMUv6 (1).

2 Module Connections Graph

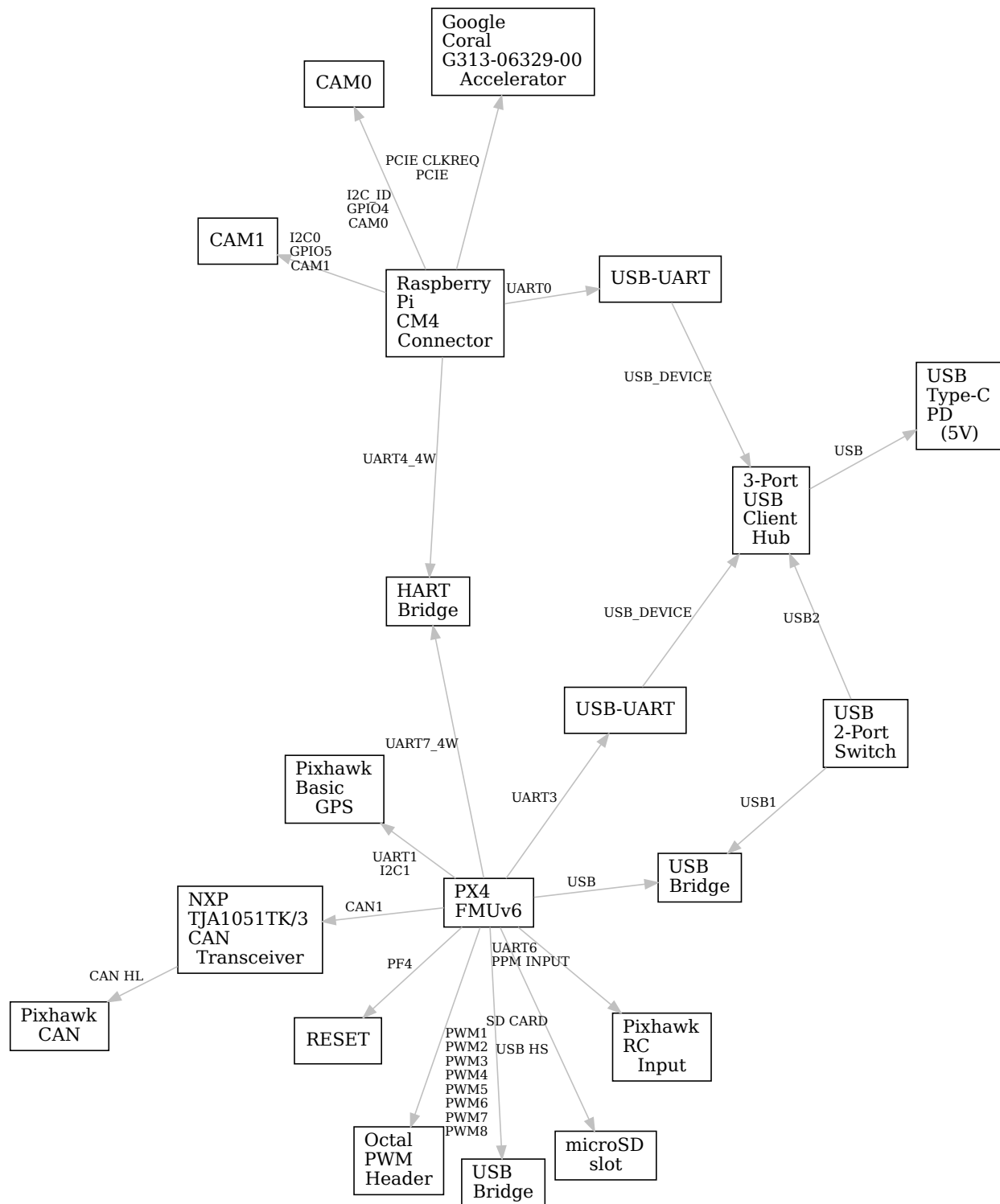


Figure 1: excludes power modules

3 Module Power Graph

