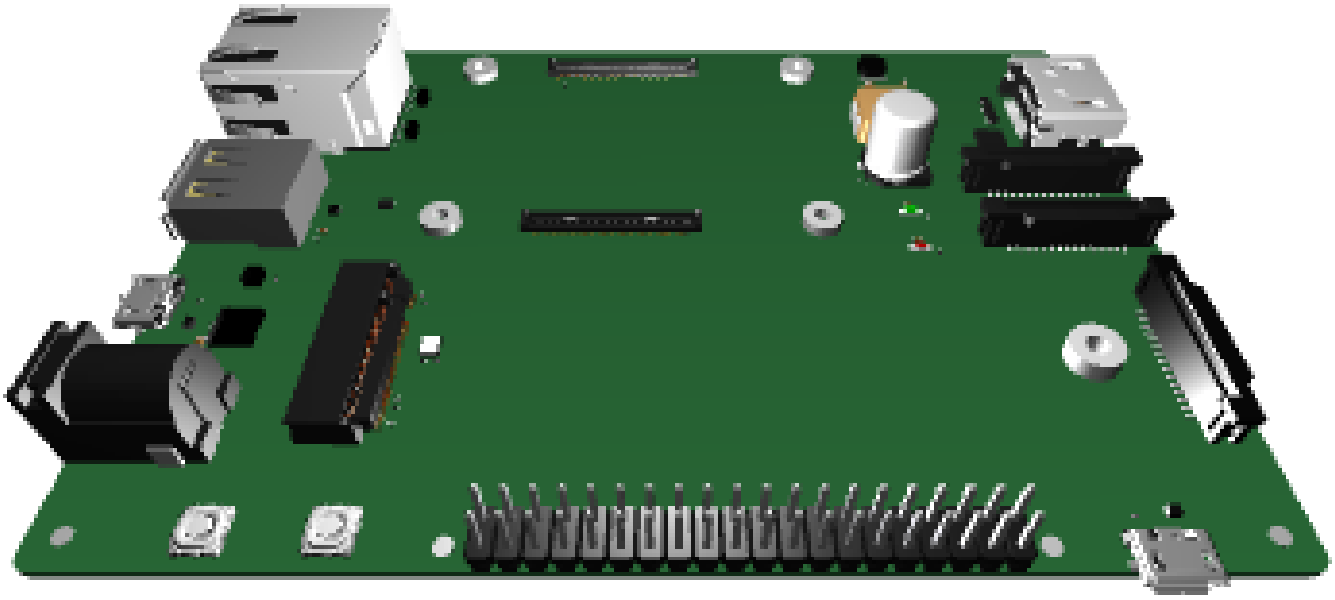
Gumstix Raspberry Pi CM4 Dev Board



This board was designed and built by Geppetto

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

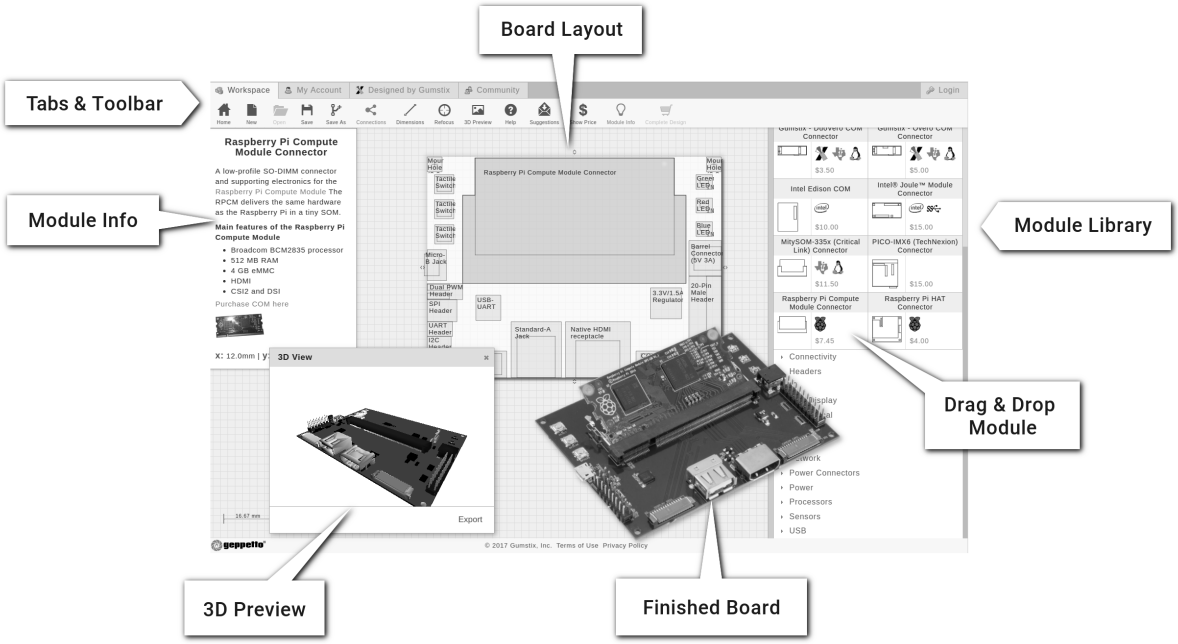
No Minimum Order Automated Supply Chain Reduce Cost and Errors

geppetto™ by gumstix

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.



Board Description

Uses Raspberry Pi CM4 as its COM/processor.

Functional modules include:
USB-UART
USB Micro-B Jack
Camera Connector (CSI-2)
M.2 Key M Connector
Ethernet Connector

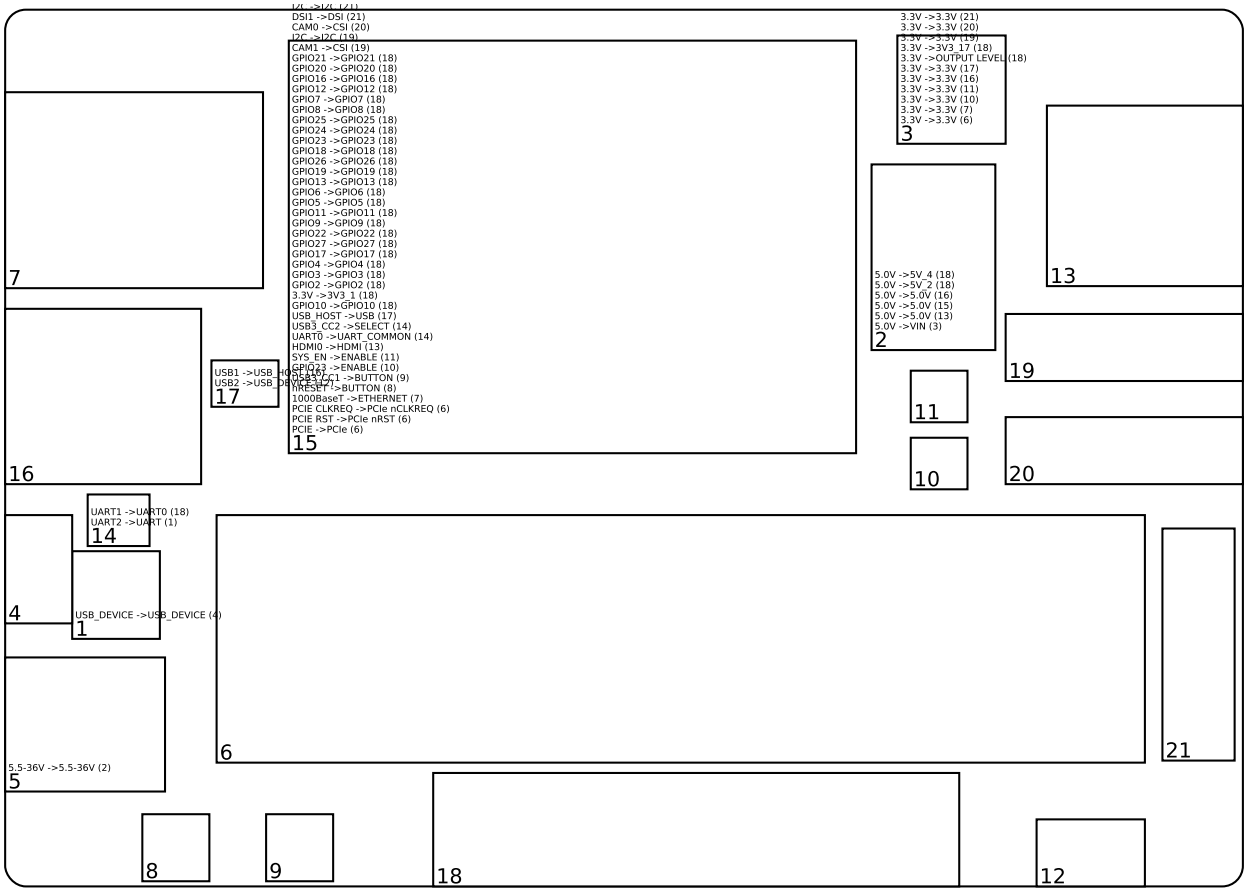
Powered by a Barrel Connector.

Board Dimensions

12cm x 8.5cm

Contents

1 Modules on Board



1.1 Converters

1.1.1 USB-UART (v21) (1)

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 Micro-B Jack (4) to UART2 on UART Mux (2 output) (14).

1.2 Power

1.2.1 5V/5A Regulator (v16) (2)

Takes 5.5 - 36V input from Barrel Connector (2.1mm x 5.5mm) (5) and provides up to 5A at 5V to:

- 3.3V/1.5A Regulator (3)
- HDMI (13)
- Raspberry Pi CM4 Connector (15)
- USB Standard-A Jack (16)
- Raspberry Pi 4 Header (18)
- Raspberry Pi 4 Header (18)

1.2.2 3.3V/1.5A Regulator (v21) (3)

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 recieves VIN from 5V/5A Regulator (2).

The datasheet for the TPS6211 regulator is available at:

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

This regulator provides 3.3V to:

- M.2 Key M Connector (6)
- Ethernet Connector (7)
- Top-side LED (10)
- Top-side LED (11)
- USB Standard-A Jack (16)
- USB 2-Port Switch (17)
- Raspberry Pi 4 Header (18)
- Raspberry Pi 4 Header (18)
- Raspberry Pi Vertical Camera Connector (19)
- Raspberry Pi Vertical Camera Connector (20)
- Raspberry Pi Vertical Display Connector (21)

1.3 USB

1.3.1 Micro-B Jack (v20) (4)

The USB micro-B port module allows your design to connect as a USB device to a USB host.

This module is connected to USB_DEVICE on USB-UART (1).

This module does not supply power.

1.3.2 Micro-B Jack (v20) (12)

The USB micro-B port module allows your design to connect as a USB device to a USB host.

This module is connected to USB2 on USB 2-Port Switch (17).

This module does not supply power.

1.3.3 USB Standard-A Jack (v19) (16)

A standard A USB host port that allows you to connect USB devices to the board. This port is connected to USB1 on USB 2-Port Switch (17).

1.3.4 USB 2-Port Switch (v1) (17)

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

It requires:

- 3.3V from 3.3V/1.5A Regulator (3)
- USB from Raspberry Pi CM4 Connector (15)

It provides the following outputs:

- USB2 to Micro-B Jack (12)
- USB1 to USB Standard-A Jack (16)

1.4 Power Connectors

1.4.1 Barrel Connector (2.1mm x 5.5mm) (v8) (5)

Standard 2.1mm x 5.1mm barrel connector.

This power jack provides up to 36V to the following modules:

- 5V/5A Regulator (2)

1.5 Connectors (Signal)

1.5.1 M.2 Key M Connector (v7) (6)

The M.2 Key M expansion slot includes interface options for PCIe (x1, X2, or X4) for SSD's.

The M.2 Key M Connector module receives the following inputs:

- 3.3V from 3.3V/1.5A Regulator (3)
- PCIe from Raspberry Pi CM4 Connector (15)

- PCIe nRST from Raspberry Pi CM4 Connector (15)
- PCIe nCLKREQ from Raspberry Pi CM4 Connector (15)

1.5.2 UART Mux (2 output) (v10) (14)

A bidirectional 2 x SPDT switch connects two UART interfaces (RX/TX only). A SELECT line is used to control which UART is output.

This UART 2-output mux switches between UART0 on Raspberry Pi 4 Header (18) or UART on USB-UART (1) to UART0 on Raspberry Pi CM4 Connector (15).

The output is controlled by USB3_CC2 on Raspberry Pi CM4 Connector (15).

1.5.3 Raspberry Pi Vertical Camera Connector (v6) (19) — 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 (15).

I2C communication is connected to I2C on Raspberry Pi CM4 Connector (15).

ENABLE input provided by GPIO_CAMERA on Raspberry Pi CM4 Connector (15).

1.5.4 Raspberry Pi Vertical Camera Connector (v6) (20) — 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 (15).

I2C communication is connected to I2C_ID on Raspberry Pi CM4 Connector (15).

ENABLE input provided by GPIO_CAMERA on Raspberry Pi CM4 Connector (15).

1.5.5 Raspberry Pi Vertical Display Connector (v1) (21)

The DSI connector module is a 15-pin ribbon connector that exposes a 2-lane MIPI DSI display bus to an external LCD display.

The DSI port is connected to DSI1 on Raspberry Pi CM4 Connector (15)

I2C communication is connected to I2C on Raspberry Pi CM4 Connector (15) .

1.6 Network and Wireless

1.6.1 Ethernet Connector (v5) (7)

This module offers a 10/100 Base-T or 1000 Base-T Ethernet connection.

The module provides ethernet to

1000BaseT on Raspberry Pi CM4 Connector (15)

.

1.7 Lights and Switches

1.7.1 Tactile Switch (v22) (8)

This 4.9 sq. mm pull-down touch switch provides a user input for the signal nRESET on Raspberry Pi CM4 Connector (15).

1.7.2 Tactile Switch (v22) (9)

This 4.9 sq. mm pull-down touch switch provides a user input for the signal USB3_CC1 on Raspberry Pi CM4 Connector (15).

1.7.3 Top-side LED (v12) (10)

The top-side LED module contains a 1608 standard size LED of a user-selected color, mounted on the top side of a Geppetto board.

The LED is active-high on GPIO23 from Raspberry Pi CM4 Connector (15).

1.7.4 Top-side LED (v12) (11)

The top-side LED module contains a 1608 standard size LED of a user-selected color, mounted on the top side of a Geppetto board.

The LED is active-high on SYS_EN from Raspberry Pi CM4 Connector (15).

1.8 Monitors

1.8.1 HDMI (v22) (13)

The native HDMI receptacle module provides HDMI video and audio signals to an external display and speakers. This module uses the TI TPD12S016UFQN HDMI companion chip with a standard HDMI port to provide ESD-protected display connectivity.

The datasheet for the TPD12S016 IC can be found at:

`http://www.ti.com/lit/ds/symlink/tpd12s016.pdf`

The module transmits high definition video from **HDMI0** on **Raspberry Pi CM4 Connector (15)** .

1.9 COM Connectors

1.9.1 Raspberry Pi CM4 Connector (v2) (15)

The **R**aspberry **P**i **C**ompute **M**odule 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 5V/5A Regulator (2)

The Geppetto Pi Compute 4 connector provides the following outputs:

- PCIE to M.2 Key M Connector (6)
- PCIE RST to M.2 Key M Connector (6)
- PCIE CLKREQ to M.2 Key M Connector (6)
- 1000BaseT to Ethernet Connector (7)
- nRESET to Tactile Switch (8)
- USB3_CC1 to Tactile Switch (9)
- GPIO23 to:
  - Top-side LED (10)
  - Raspberry Pi 4 Header (18)
- SYS_EN to Top-side LED (11)
- HDMI0 to HDMI (13)
- UART0 to UART Mux (2 output) (14)
- USB3_CC2 to UART Mux (2 output) (14)
- USB_HOST to USB 2-Port Switch (17)
- GPIO10 to Raspberry Pi 4 Header (18)
- 3.3V to Raspberry Pi 4 Header (18)
- GPIO2 to Raspberry Pi 4 Header (18)
- GPIO3 to Raspberry Pi 4 Header (18)
- GPIO4 to Raspberry Pi 4 Header (18)
- GPIO17 to Raspberry Pi 4 Header (18)
- GPIO27 to Raspberry Pi 4 Header (18)
- GPIO22 to Raspberry Pi 4 Header (18)
- GPIO9 to Raspberry Pi 4 Header (18)

- GPIO11 to Raspberry Pi 4 Header (18)
- GPIO5 to Raspberry Pi 4 Header (18)
- GPIO6 to Raspberry Pi 4 Header (18)
- GPIO13 to Raspberry Pi 4 Header (18)
- GPIO19 to Raspberry Pi 4 Header (18)
- GPIO26 to Raspberry Pi 4 Header (18)
- GPIO18 to Raspberry Pi 4 Header (18)
- GPIO24 to Raspberry Pi 4 Header (18)
- GPIO25 to Raspberry Pi 4 Header (18)
- GPIO8 to Raspberry Pi 4 Header (18)
- GPIO7 to Raspberry Pi 4 Header (18)
- GPIO12 to Raspberry Pi 4 Header (18)
- GPIO16 to Raspberry Pi 4 Header (18)
- GPIO20 to Raspberry Pi 4 Header (18)
- GPIO21 to Raspberry Pi 4 Header (18)
- CAM1 to Raspberry Pi Vertical Camera Connector (19)
- I2C to:
  - Raspberry Pi Vertical Camera Connector (19)
  - Raspberry Pi Vertical Display Connector (21)
- CAM0 to Raspberry Pi Vertical Camera Connector (20)
- DSI1 to Raspberry Pi Vertical Display Connector (21)
- GPIO_CAMERA to:
  - Raspberry Pi Vertical Camera Connector (20)
  - Raspberry Pi Vertical Camera Connector (19)
- I2C_ID to Raspberry Pi Vertical Camera Connector (20)

1.10 Custom Modules

1.10.1 Raspberry Pi 4 Header (v5) (18)

The 40-pin header module offers up to 40 pins that can be used at the customer's discretion.

This module has the following connections:

- 5V_2 to 5.0V from 5V/5A Regulator (2)
- 5V_4 to 5.0V from 5V/5A Regulator (2)

- OUTPUT LEVEL to 3.3V from 3.3V/1.5A Regulator (3)
- 3V3_17 to 3.3V from 3.3V/1.5A Regulator (3)
- UART0 to UART1 from UART Mux (2 output) (14)
- GPIO10 to GPIO10 from Raspberry Pi CM4 Connector (15)
- 3V3_1 to 3.3V from Raspberry Pi CM4 Connector (15)
- GPIO2 to GPIO2 from Raspberry Pi CM4 Connector (15)
- GPIO3 to GPIO3 from Raspberry Pi CM4 Connector (15)
- GPIO4 to GPIO4 from Raspberry Pi CM4 Connector (15)
- GPIO17 to GPIO17 from Raspberry Pi CM4 Connector (15)
- GPIO27 to GPIO27 from Raspberry Pi CM4 Connector (15)
- GPIO22 to GPIO22 from Raspberry Pi CM4 Connector (15)
- GPIO9 to GPIO9 from Raspberry Pi CM4 Connector (15)
- GPIO11 to GPIO11 from Raspberry Pi CM4 Connector (15)
- GPIO5 to GPIO5 from Raspberry Pi CM4 Connector (15)
- GPIO6 to GPIO6 from Raspberry Pi CM4 Connector (15)
- GPIO13 to GPIO13 from Raspberry Pi CM4 Connector (15)
- GPIO19 to GPIO19 from Raspberry Pi CM4 Connector (15)
- GPIO26 to GPIO26 from Raspberry Pi CM4 Connector (15)
- GPIO18 to GPIO18 from Raspberry Pi CM4 Connector (15)
- GPIO23 to GPIO23 from Raspberry Pi CM4 Connector (15)
- GPIO24 to GPIO24 from Raspberry Pi CM4 Connector (15)
- GPIO25 to GPIO25 from Raspberry Pi CM4 Connector (15)
- GPIO8 to GPIO8 from Raspberry Pi CM4 Connector (15)
- GPIO7 to GPIO7 from Raspberry Pi CM4 Connector (15)
- GPIO12 to GPIO12 from Raspberry Pi CM4 Connector (15)
- GPIO16 to GPIO16 from Raspberry Pi CM4 Connector (15)
- GPIO20 to GPIO20 from Raspberry Pi CM4 Connector (15)
- GPIO21 to GPIO21 from Raspberry Pi CM4 Connector (15)

2 Module Connections Graph

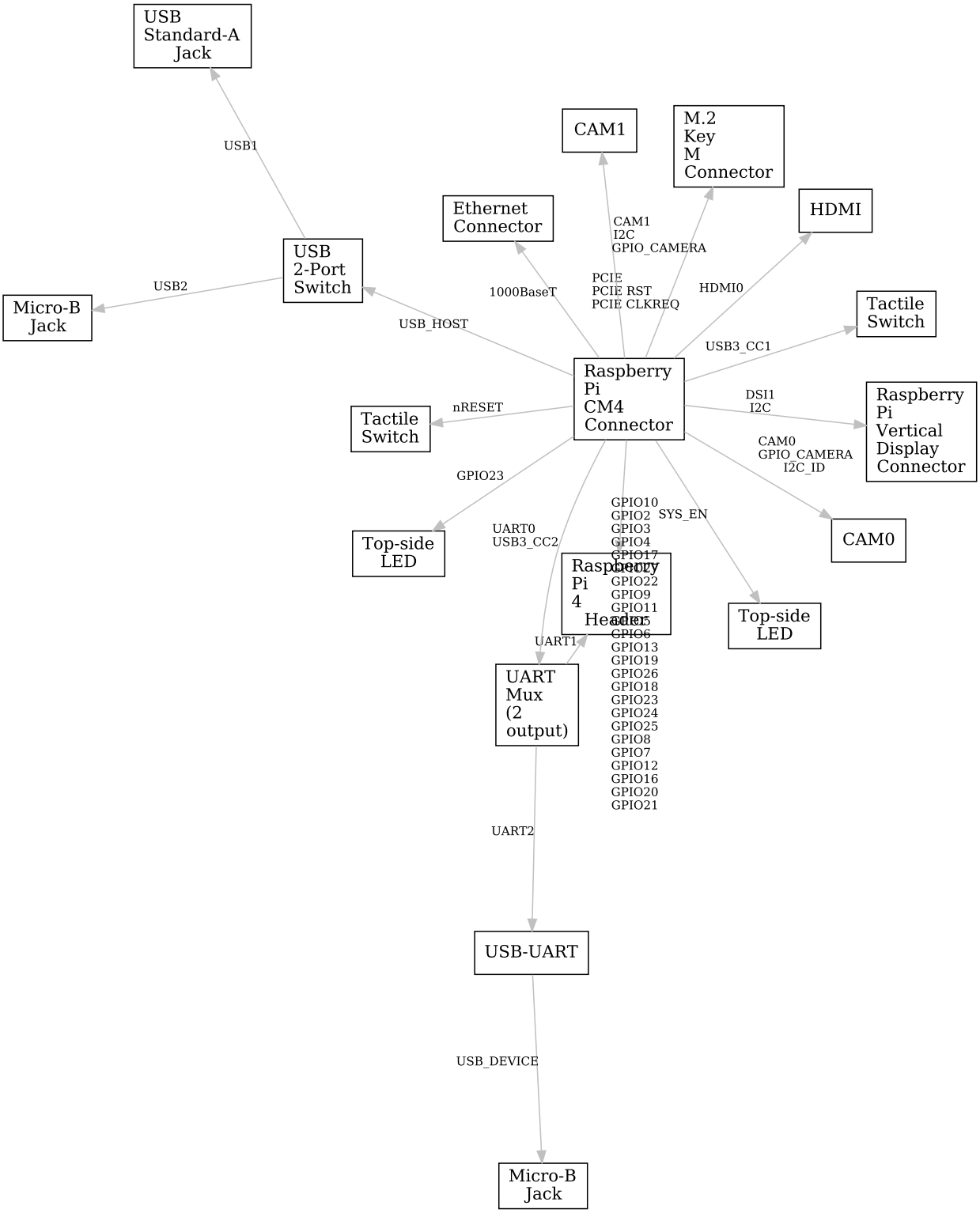


Figure 1: excludes power modules

3 Module Power Graph