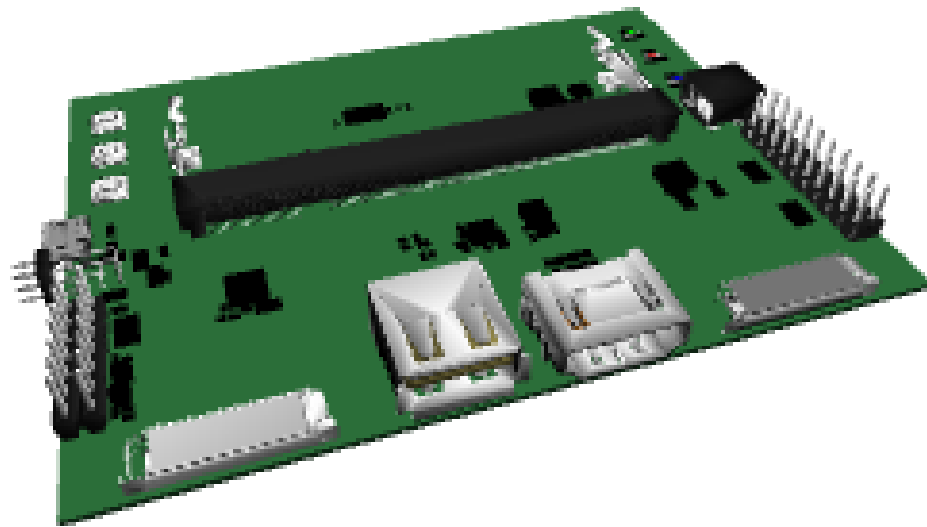


# Gumstix Pi Compute Dev Board



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**geppetto**<sup>™</sup>

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## Board Description

Designed by Gumstix in Geppetto, the Raspberry Pi Computer Module I/O Board provides the following headers for breaking out the features of the Raspberry Pi Compute Module:

- \* SPI Header
- \* UART Header
- \* I2C Header
- \* 20-pin Male Header
- \* Dual PWM Header

In addition, it contains: \* DSI connector for connecting to audio / display

\* CSI2 connector for connecting a camera

\* HDMI port for Audio/Display

\* USB Type-A port for expandability

## Board Dimensions

10cm x 7.55cm



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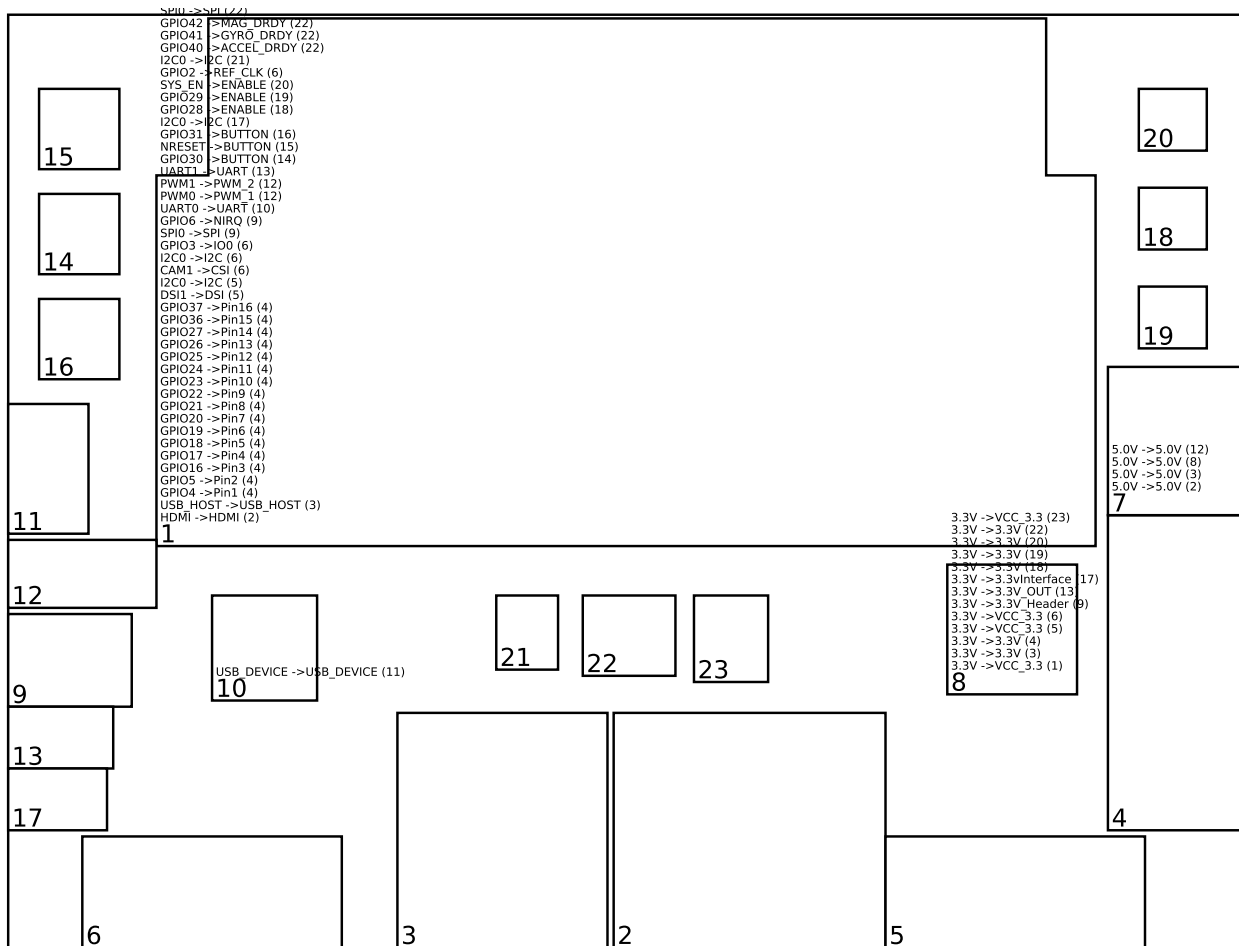
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# 1 Modules on Board



## 1.1 COM Connectors

### 1.1.1 Raspberry Pi Compute Module Connector (v12) (1)

The **Raspberry Pi Compute Module (RPCM)** connector is a SODIMM socket powering the RPCM and providing the module's function to Geppetto designs. The RPCM COM connector is pin-compatible with 3 variants of the module: RPCM1, RPCM3 and RPCM3L.

Module features:

|           | RPCM1    | RPCM3    | RPCM3L   |
|-----------|----------|----------|----------|
| SoC       | BCM2835  | BCM2837  | BCM2837  |
| CPU Clock | 700MHz   | 1.0GHz   | 1.0GHz   |
| Cores     | 1x32-bit | 4x64-bit | 4x64-bit |
| DDR2 RAM  | 512 MB   | 1.0 GB   | 1.0 GB   |
| eMMC      | 4 GB     | 4 GB     | N/A      |

More technical details for the RPCM modules can be found at:



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

It requires:

- VCC\_3.3 from 3.3V/1.5A Regulator (8)

The Geppetto Pi Compute connector provides the following outputs:

- HDMI to Native HDMI receptacle (2)
- VLOGIC to:
  - Native HDMI receptacle (2)
  - 20-Pin Male Header (4)
  - COM to DSI Connector (5)
  - COM to CSI2 Connector (6)
  - SPI Header (9)
  - USB-UART (10)
  - Dual PWM Header (12)
  - UART Header (13)
  - Tactile Switch (14)
  - Tactile Switch (15)
  - Tactile Switch (16)
  - I2C Header (17)
  - Barometer (21)
  - 9-Axis IMU (22)
  - Humidity Sensor (23)
- USB\_HOST to Standard-A Jack (3)
- GPIO4 to 20-Pin Male Header (4)
- GPIO5 to 20-Pin Male Header (4)
- GPIO16 to 20-Pin Male Header (4)
- GPIO17 to 20-Pin Male Header (4)
- GPIO18 to 20-Pin Male Header (4)
- GPIO19 to 20-Pin Male Header (4)
- GPIO20 to 20-Pin Male Header (4)
- GPIO21 to 20-Pin Male Header (4)
- GPIO22 to 20-Pin Male Header (4)
- GPIO23 to 20-Pin Male Header (4)
- GPIO24 to 20-Pin Male Header (4)
- GPIO25 to 20-Pin Male Header (4)
- GPIO26 to 20-Pin Male Header (4)



- GPIO27 to 20-Pin Male Header (4)
- GPIO36 to 20-Pin Male Header (4)
- GPIO37 to 20-Pin Male Header (4)
- DSI1 to COM to DSI Connector (5)
- I2C0 to:
  - COM to DSI Connector (5)
  - COM to CSI2 Connector (6)
  - I2C Header (17)
  - Barometer (21)
  - Humidity Sensor (23)
- CAM1 to COM to CSI2 Connector (6)
- GPIO3 to COM to CSI2 Connector (6)
- SPI0 to:
  - SPI Header (9)
  - 9-Axis IMU (22)
- GPIO6 to SPI Header (9)
- UART0 to USB-UART (10)
- PWM0 to Dual PWM Header (12)
- PWM1 to Dual PWM Header (12)
- UART1 to UART Header (13)
- GPIO30 to Tactile Switch (14)
- NRESET to Tactile Switch (15)
- GPIO31 to Tactile Switch (16)
- GPIO28 to Red LED (18)
- GPIO29 to Blue LED (19)
- SYS\_EN to Green LED (20)
- GPIO2 to COM to CSI2 Connector (6)
- GPIO40 to 9-Axis IMU (22)
- GPIO41 to 9-Axis IMU (22)
- GPIO42 to 9-Axis IMU (22)





## 1.2 Monitors

### 1.2.1 Native HDMI receptacle (v11) (2)

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 **HDMI** on **Raspberry Pi Compute Module Connector (1)**.

## 1.3 USB

### 1.3.1 Standard-A Jack (v10) (3)

A standard A USB host port that allows you to connect USB devices to the board. This port is connected to USB\_HOST on Raspberry Pi Compute Module Connector (1).

### 1.3.2 Micro-B Jack (v10) (11)

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 (10).

This module does not supply power.

## 1.4 Headers

### 1.4.1 20-Pin Male Header (v11) (4)

The 20-pin male header module offers up to 16 bi-directional GPIO or Pulse Width Modulation (PWM) signals.

This module has the following connections:

- Pin1 to GPIO4 from Raspberry Pi Compute Module Connector (1)
- Pin2 to GPIO5 from Raspberry Pi Compute Module Connector (1)
- Pin3 to GPIO16 from Raspberry Pi Compute Module Connector (1)
- Pin4 to GPIO17 from Raspberry Pi Compute Module Connector (1)
- Pin5 to GPIO18 from Raspberry Pi Compute Module Connector (1)
- Pin6 to GPIO19 from Raspberry Pi Compute Module Connector (1)
- Pin7 to GPIO20 from Raspberry Pi Compute Module Connector (1)
- Pin8 to GPIO21 from Raspberry Pi Compute Module Connector (1)



- Pin9 to GPIO22 from Raspberry Pi Compute Module Connector (1)
- Pin10 to GPIO23 from Raspberry Pi Compute Module Connector (1)
- Pin11 to GPIO24 from Raspberry Pi Compute Module Connector (1)
- Pin12 to GPIO25 from Raspberry Pi Compute Module Connector (1)
- Pin13 to GPIO26 from Raspberry Pi Compute Module Connector (1)
- Pin14 to GPIO27 from Raspberry Pi Compute Module Connector (1)
- Pin15 to GPIO36 from Raspberry Pi Compute Module Connector (1)
- Pin16 to GPIO37 from Raspberry Pi Compute Module Connector (1)
- 3.3V to 3.3V from 3.3V/1.5A Regulator (8)

#### 1.4.2 COM to DSI Connector (v5) (5)

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 Compute Module Connector (1)

I2C communication is connected to I2C0 on Raspberry Pi Compute Module Connector (1) .

#### 1.4.3 COM to CSI2 Connector (v8) (6)

The CSI-2 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 Compute Module Connector (1).

I2C communication is connected to I2C0 on Raspberry Pi Compute Module Connector (1).

REF\_CLK is provided by GPIO2 on Raspberry Pi Compute Module Connector (1).

#### 1.4.4 SPI Header (v12) (9)

The SPI header module provides a 6-wire SPI interface on a 2x3-pin header. In addition to the data and clock lines, chip select, ground and IRQ pins are also provided.

This header breaks out SPI0 on Raspberry Pi Compute Module Connector (1) .

#### 1.4.5 Dual PWM Header (v7) (12)

The dual PWM header module offers two Pulse Width Modulation (PWM) outputs for driving servos or other PWM-controlled motors.

This module connects:

- PWM\_1 to PWM0 on Raspberry Pi Compute Module Connector (1)
- PWM\_2 to PWM1 on Raspberry Pi Compute Module Connector (1)



### 1.4.6 UART Header (v11) (13)

The UART header module provides a 2-wire serial data interface alongside power and ground pins for UART signals.

This module is connected to the UART1 bus on Raspberry Pi Compute Module Connector (1).

### 1.4.7 I2C Header (v13) (17)

The I<sup>2</sup>C header module provides a connection for external devices to communicate over a 2-wire Inter-Integrated Circuit (I<sup>2</sup>C) bus. This header breaks out I2C0 on Raspberry Pi Compute Module Connector (1).

## 1.5 Power Connectors

### 1.5.1 Barrel Connector (5V 3A) (v7) (7)

This power jack is compatible with Gumstix 5V/3.5A DC power adapter using a 4.0mm x 1.7mm barrel connector. It provides more current than a standard 5V DC power supply, suitable for use with multi-processor designs.

This power jack provides 5V to the following modules:

- Native HDMI receptacle (2)
- Standard-A Jack (3)
- 3.3V/1.5A Regulator (8)
- Dual PWM Header (12)

## 1.6 Power

### 1.6.1 3.3V/1.5A Regulator (v11) (8)

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 5.0V from Barrel Connector (5V 3A) (7).

The dataheet for the TPS6211 regulator is available at:

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

This regulator provides 3.3V to:

- Raspberry Pi Compute Module Connector (1)
- Standard-A Jack (3)
- 20-Pin Male Header (4)



- COM to DSI Connector (5)
- COM to CSI2 Connector (6)
- SPI Header (9)
- UART Header (13)
- I2C Header (17)
- Red LED (18)
- Blue LED (19)
- Green LED (20)
- 9-Axis IMU (22)
- Humidity Sensor (23)

## 1.7 Connectivity

### 1.7.1 USB-UART (v16) (10)

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

This USB to UART converter connects a host machine from Micro-B Jack (11) to UART0 on Raspberry Pi Compute Module Connector (1).

## 1.8 IO

### 1.8.1 Tactile Switch (v16) (14)

This 4.9 sq. mm pull-down touch switch provides a user input for the signal GPIO30 on Raspberry Pi Compute Module Connector (1).

### 1.8.2 Tactile Switch (v16) (15)

This 4.9 sq. mm pull-down touch switch provides a user input for the signal NRESET on Raspberry Pi Compute Module Connector (1).

### 1.8.3 Tactile Switch (v16) (16)

This 4.9 sq. mm pull-down touch switch provides a user input for the signal GPIO31 on Raspberry Pi Compute Module Connector (1).



#### 1.8.4 Red LED (v11) (18)

This 1608 standard size red LED provides an indicator for the signal GPIO28 on Raspberry Pi Compute Module Connector (1).

#### 1.8.5 Blue LED (v14) (19)

This 1608 standard size blue LED provides an indicator for the signal GPIO29 on Raspberry Pi Compute Module Connector (1).

#### 1.8.6 Green LED (v13) (20)

This 1608 standard size green LED provides an indicator for the signal SYS\_EN on Raspberry Pi Compute Module Connector (1).

### 1.9 Sensors

#### 1.9.1 Barometer (v8) (21)

The barometer module is an ultra-compact, low-power barometric pressure sensor useful for aerial vehicles. The module's MS5611-01BA03 Barometric Pressure Sensor offers a high resolution reading, accurate to within 10 cm and is optimized for altimeter and variometer applications. It can communicate serially either over I<sup>2</sup>C or SPI buses. *At altitudes close to sea level, covering the barometer module with a light piece of foam may help to improve the accuracy of readings.*

##### Highlights

|                              |           |      |
|------------------------------|-----------|------|
| Max resolution:              | 0.065     | mbar |
| Range:                       | 10 – 1200 | mbar |
| Min response time:           | 0.5       | ms   |
| I <sup>2</sup> C slave addr: |           | 0x76 |

##### Connections

This module is connected to I2C0 on Raspberry Pi Compute Module Connector (1).

Visit <http://www.meas-spec.com/downloads/MS5611-01BA03.pdf> for details.

#### 1.9.2 9-Axis IMU (v18) (22)

The 9-axis IMU module provides 3-axis acceleration, 3-axis gyroscopic, and 3-axis magnetic field information. The accelerometer and magnetometer are provided by the ST LSM303D high-performance eCompass module, which also includes an ambient temperature sensor. Gyroscopic data is provided by the ST L3GD20H MEMS motion sensor. The IMU can be connected via I<sup>2</sup>C or SPI serial interfaces.

Datasheets for the LSM303D and L3GD20H chips can be downloaded at:

- <http://www.st.com/content/ccc/resource/technical/document/datasheet/1c/9e/71/05/4e/b7/4d/d1/DM00057547.pdf/files/DM00057547.pdf/jcr:content/translations/en.DM00057547.pdf>



- <http://www.st.com/content/ccc/resource/technical/document/datasheet/35/b1/e0/39/71/57/43/01/DM00060659.pdf/files/DM00060659.pdf/jcr:content/translations/en.DM00060659.pdf>

### **Maximum Resolutions**

Accelerometer: 0.061 mG/LSB  
Magnetometer: 0.080 mGauss/LSB  
Gyroscope: 8.750 m°/s/LSB  
Temperature: 0.125 °C/LSB

### **Connections**

Its SPI bus is connected to SPI0 on Raspberry Pi Compute Module Connector (1)

It has the following data ready signals:

- ACCEL\_DRDY to GPIO40 on Raspberry Pi Compute Module Connector (1)
- GYRO\_DRDY to GPIO41 on Raspberry Pi Compute Module Connector (1)
- MAG\_DRDY to GPIO42 on Raspberry Pi Compute Module Connector (1)

### **1.9.3 Humidity Sensor (v3) (23)**

The humidity sensor module uses the Silicon Labs Si7021-A20 humidity and temperature sensor to measure ambient humidity. The module communicates with host devices serially over I<sup>2</sup>C.

The Si7021-A20 sensor's datasheet is available at:

<https://www.silabs.com/Support%20Documents%2FTechnicalDocs%2FSi7021-A20.pdf>

### **Highlights**

|                                |       |      |
|--------------------------------|-------|------|
| Maximum resolution             | 0.025 | 5°RH |
| Maximum temp. resolution       | 0.01  | °C   |
| I <sup>2</sup> C slave address |       | 0x40 |

### **Connections**

The humidity sensor module is connected to I2C0 on Raspberry Pi Compute Module Connector (1).



## 2 Module Connections Graph

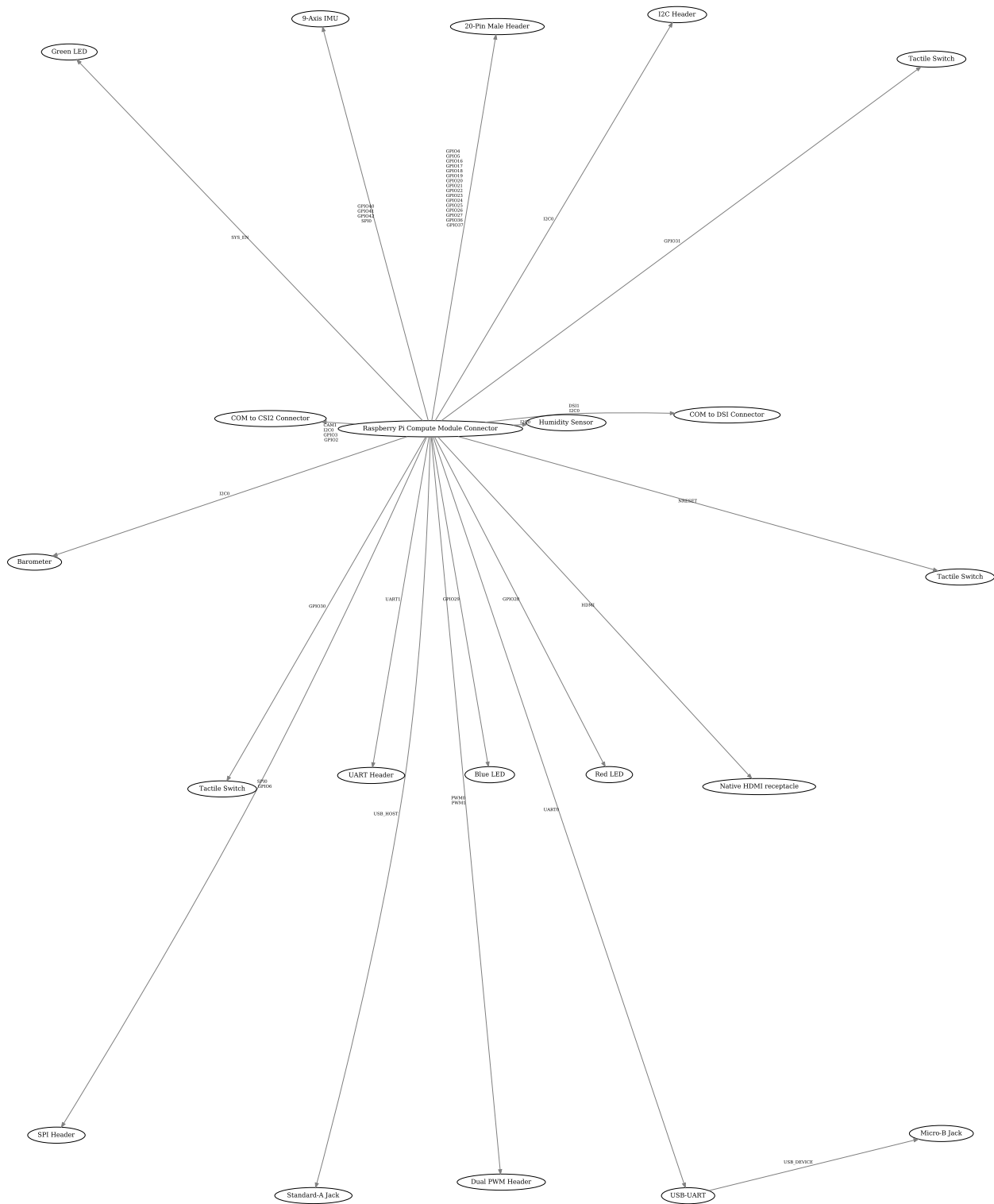


Figure 1: excludes power modules



### 3 Module Power Graph

