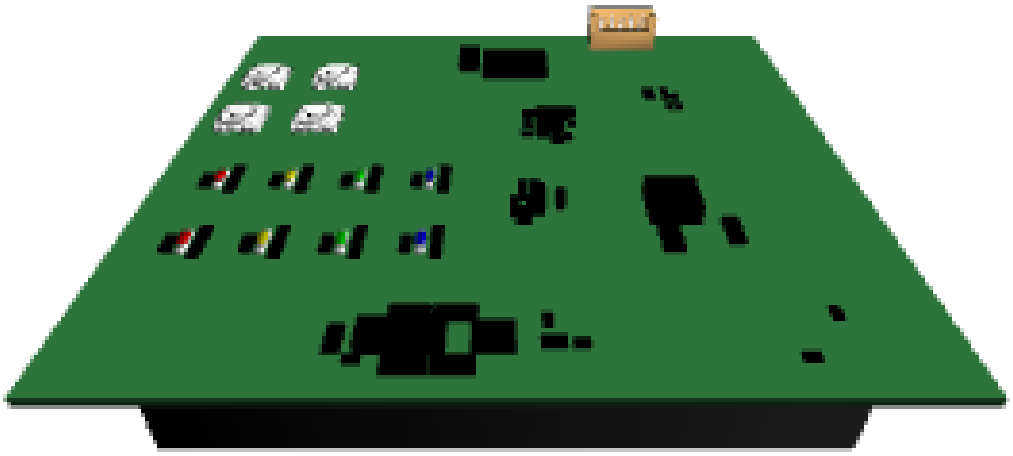
Gumstix Pi HAT Sensor board



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Made with geppetto™

Board Description

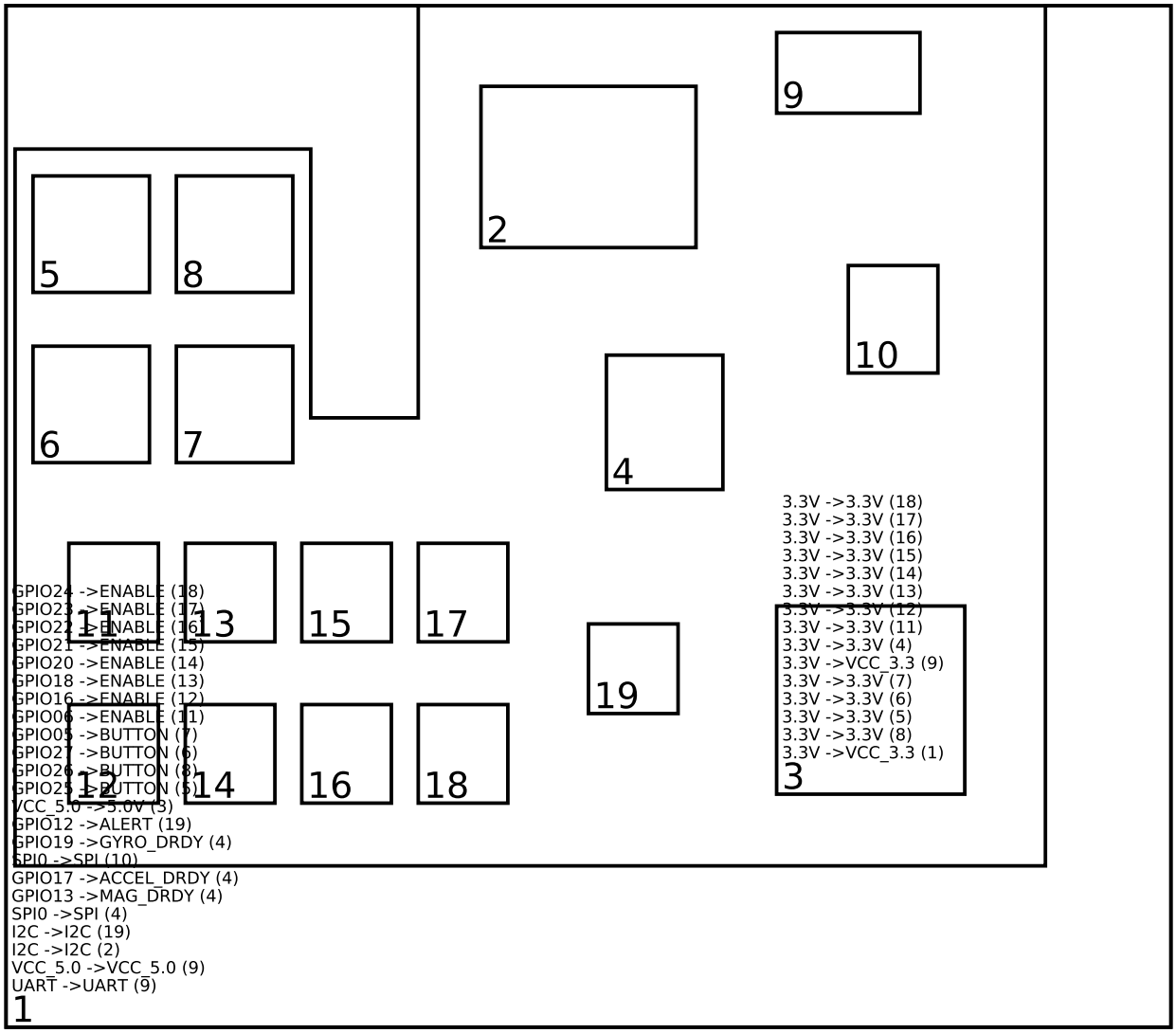
Pi HAT Sensor Board

Board Dimensions

6.5cm x 5.7cm

Contents

1 Modules on Board



1.1 COM Connectors

1.1.1 Raspberry Pi HAT Connector (v5) (1)

The Raspberry Pi **H**ardware **A**ttached on **T**op (**HAT**) Module provides many GPIO, serial and special purpose signals from the Raspberry Pi B+ SBC to custom Geppetto expansion boards.
Specifications, mechanical drawings and design guidelines for HAT expansion boards are available from:

https://github.com/raspberrypi/hats

Requires:

- VCC_3.3 from 3.3V/1.5A Regulator (3)

The Raspberry Pi HAT connector provides the following outputs:

- UART to Five-pin GPS Header (9)
- VLOGIC to:
  - Five-pin GPS Header (9)
  - Real Time Clock (2)
  - Ambient Temperature Sensor (19)
  - 9-Axis IMU (4)
  - Barometer (10)
- VCC_5.0 to:
  - Five-pin GPS Header (9)
  - 3.3V/1.5A Regulator (3)
- I2C to:
  - Real Time Clock (2)
  - Ambient Temperature Sensor (19)
- SPI0 to:
  - 9-Axis IMU (4)
  - Barometer (10)
- GPIO13 to 9-Axis IMU (4)
- GPIO17 to 9-Axis IMU (4)
- GPIO19 to 9-Axis IMU (4)
- GPIO12 to Ambient Temperature Sensor (19)
- GPIO25 to Tactile Switch (5)
- GPIO26 to Tactile Switch (8)
- GPIO27 to Tactile Switch (6)
- GPIO05 to Tactile Switch (7)
- GPIO06 to Top-side LED (11)
- GPIO16 to Top-side LED (12)
- GPIO18 to Top-side LED (13)
- GPIO20 to Top-side LED (14)
- GPIO21 to Top-side LED (15)
- GPIO22 to Top-side LED (16)
- GPIO23 to Top-side LED (17)
- GPIO24 to Top-side LED (18)

1.2 Power

1.2.1 Real Time Clock (v8) (2)

This real-time clock backup is powered by a 6mm coin cell battery. The MI DS1340 RTC is programmed over I2C and is connected to a crystal oscillator at 32.8 kHz.

NOTE: The RTC IC used in this module is trickle-charge capable. Only **NiCd** cells should be used if this feature is enabled.

Technical documentation for the MI DS1340 is available at:

`https://datasheets.maximintegrated.com/en/ds/DS1340-DS1340C.pdf`

This module is connected to I2C on Raspberry Pi HAT Connector (1).

1.2.2 3.3V/1.5A Regulator (v9) (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 5.0V from Raspberry Pi HAT Connector (1).

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 HAT Connector (1)
- Tactile Switch (8)
- Tactile Switch (5)
- Tactile Switch (6)
- Tactile Switch (7)
- Five-pin GPS Header (9)
- 9-Axis IMU (4)
- Top-side LED (11)
- Top-side LED (12)
- Top-side LED (13)
- Top-side LED (14)
- Top-side LED (15)
- Top-side LED (16)
- Top-side LED (17)
- Top-side LED (18)

1.3 Sensors

1.3.1 9-Axis IMU (v16) (4)

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^{2}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

I^{2}C addresses

Accel & compass:	0x1e
Gyro:	0x6a

Connections

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

It has the following data ready signals:

- ACCEL_DRDY to GPIO17 on Raspberry Pi HAT Connector (1)
- GYRO_DRDY to GPIO19 on Raspberry Pi HAT Connector (1)
- MAG_DRDY to GPIO13 on Raspberry Pi HAT Connector (1)

1.3.2 Barometer (v7) (10)

The barometer module is an ultra-compact, low-power barometric preasure 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^{2}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

Connections
This module is connected to SPI0 on Raspberry Pi HAT Connector (1).

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

1.3.3 Ambient Temperature Sensor (v7) (19)

The ambient temperature sensor module hosts the TI TMP102 IC to measure temperatures with an accuracy of $\pm 0.5°C$ and communicates to a host system over I²C.

Download the datasheet for the TMP102 at:

`http://www.ti.com.cn/cn/lit/ds/symlink/tmp102.pdf`

Highlights

Max resolution:	0.0625	°C/LSb
I²C slave addr:		0x48

Connections
The ambient temperature sensor module is connected to I2C on Raspberry Pi HAT Connector (1).
The overtemperature alert pin is connected to GPIO12 on Raspberry Pi HAT Connector (1)

1.4 IO

1.4.1 Tactile Switch (v10) (5)

This 4.9 sq. mm light touch switch provides a user input for the signal GPIO25 on Raspberry Pi HAT Connector (1).

1.4.2 Tactile Switch (v10) (6)

This 4.9 sq. mm light touch switch provides a user input for the signal GPIO27 on Raspberry Pi HAT Connector (1).

1.4.3 Tactile Switch (v10) (7)

This 4.9 sq. mm light touch switch provides a user input for the signal GPIO05 on Raspberry Pi HAT Connector (1).

1.4.4 Tactile Switch (v10) (8)

This 4.9 sq. mm light touch switch provides a user input for the signal GPIO26 on Raspberry Pi HAT Connector (1).

1.4.5 Top-side LED (v2) (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 GPIO06 from Raspberry Pi HAT Connector (1).

1.4.6 Top-side LED (v2) (12)

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 GPIO16 from Raspberry Pi HAT Connector (1).

1.4.7 Top-side LED (v2) (13)

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 GPIO18 from Raspberry Pi HAT Connector (1).

1.4.8 Top-side LED (v2) (14)

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 GPIO20 from Raspberry Pi HAT Connector (1).

1.4.9 Top-side LED (v2) (15)

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 GPIO21 from Raspberry Pi HAT Connector (1).

1.4.10 Top-side LED (v2) (16)

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 GPIO22 from Raspberry Pi HAT Connector (1).

1.4.11 Top-side LED (v2) (17)

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 HAT Connector (1).

1.4.12 Top-side LED (v2) (18)

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 GPIO24 from Raspberry Pi HAT Connector (1).

1.5 Headers

1.5.1 Five-pin GPS Header (v6) (9)

The off-board GPS header provides a 2-wire UART interface alongside power and ground pins for use with the Gumstix PRE-GO GNSS board. It also works with some third party positioning modules.

This module is connected to the UART bus on Raspberry Pi HAT Connector (1).

2 Module Connections Graph

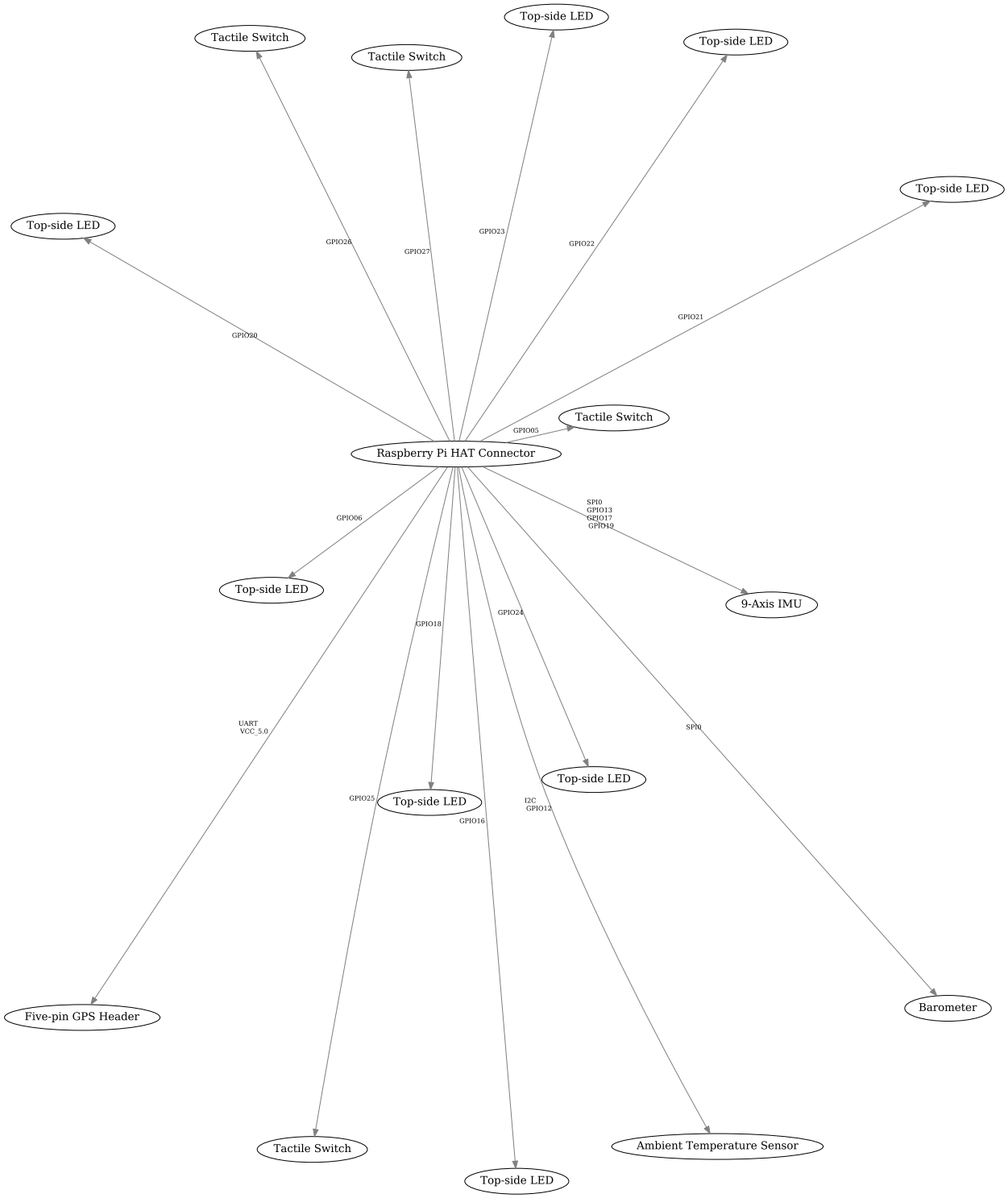


Figure 1: excludes power modules

3 Module Power Graph

Mouser Electronics

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Gumstix:
PKG900000000356