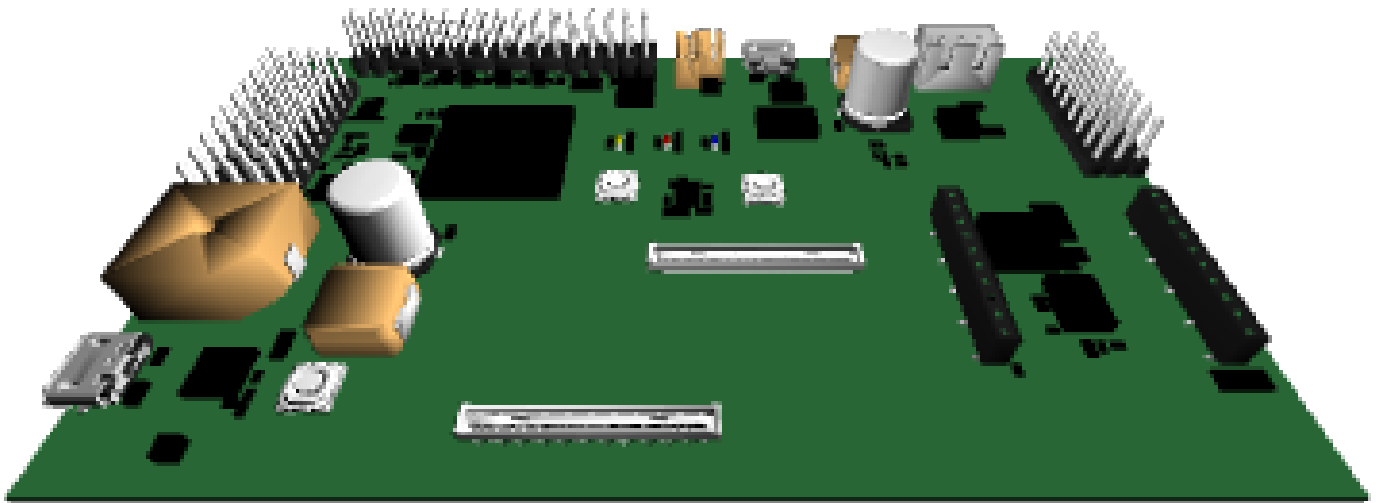


AeroCore 2 for Intel Joule Module



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Board Description

MAV control board featuring an integrated Cortex-M4 microprocessor and NuttX RTOS. Compatible with: [Intel Joule Module], the [Pre-GO](<https://store.gumstix.com/accessories/prego.html>), and the [Pre-GO PPP](<https://store.gumstix.com/accessories/prego-ppp.html>).

Board Dimensions

11.0cm x 6.5cm



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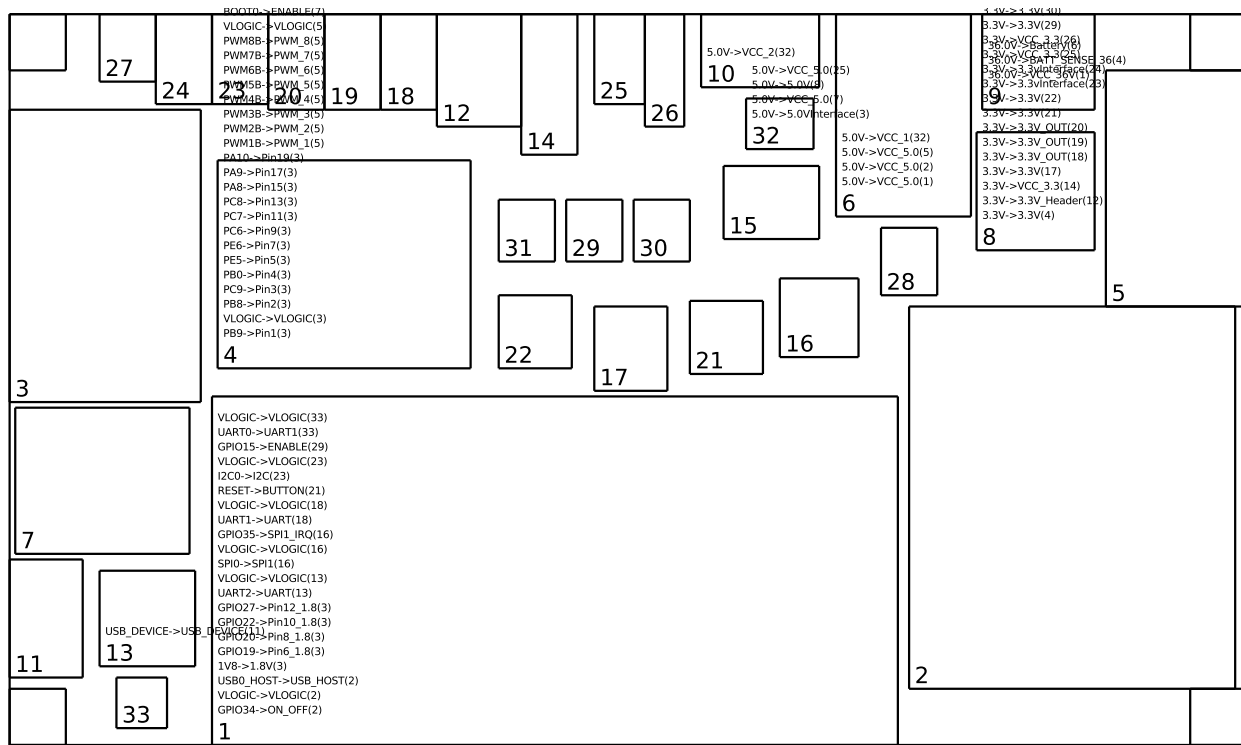
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1 Modules on Board



1.1 COM Connectors

1.1.1 Intel Joule Module Connector (v6) (1)

- VCC_5.0 from 5V/5A Regulator (6)
- VCC_3.6V from Battery 2-Cell Balance Connector (9)

The Tesla connectors provide the following outputs:

- RESET to Tactile Switch (21)
- GPIO15 to Red LED (29)
- SPI0 to SPI Bridge (16)
- GPIO19 to 40 Pin Header (3)
- UART1 to UART Header (18)
- UART0 to UART-UART (33)
- UART2 to USB-UART (13)
- 1V8 to 40 Pin Header (3)
- USB0_HOST to NimbeLink Skywire Modem (2)



- VLOGIC to:
 - NimbeLink Skywire Modem (2)
 - USB-UART (13)
 - SPI Bridge (16)
 - UART Header (18)
 - I2C Header (23)
 - UART-UART (33)
- GPIO20 to 40 Pin Header (3)
- GPIO27 to 40 Pin Header (3)
- GPIO22 to 40 Pin Header (3)
- I2C0 to I2C Header (23)
- GPIO34 to NimbeLink Skywire Modem (2)
- GPIO35 to SPI Bridge (16)

1.2 Network

1.2.1 NimbeLink Skywire Modem (v1) (2)

The NimbeLink Skywire LTE modem module connects to the cellular network using the Telit LE910 chipset.

The modem connects to the following buses:

- USB Host from Intel Joule Module Connector (1)
- Enable signal from Intel Joule Module Connector (1)

1.3 Headers

1.3.1 40 Pin Header (v11) (3)

The 40-Pin header connects up to 16 GPIO or PWM signals and outputs them at 3.3V or 5.0V. An additional voltage rail and ground is provided for compatibility with standard 3-pin headers.

The header also includes two ground pins, a 1.8V/3.3V reference, and an output level reference.

The 40-pin header has the following connections:

- Pin8_1.8 to GPIO20 from Intel Joule Module Connector (1)
- Pin19 to PA10 from ST Micro Cortex-M4 (4)
- Pin17 to PA9 from ST Micro Cortex-M4 (4)
- Pin15 to PA8 from ST Micro Cortex-M4 (4)
- Pin13 to PC8 from ST Micro Cortex-M4 (4)



- Pin11 to PC7 from ST Micro Cortex-M4 (4)
- Pin6_1.8 to GPIO19 from Intel Joule Module Connector (1)
- Pin9 to PC6 from ST Micro Cortex-M4 (4)
- Pin5 to PE5 from ST Micro Cortex-M4 (4)
- Pin3 to PC9 from ST Micro Cortex-M4 (4)
- Pin2 to PB8 from ST Micro Cortex-M4 (4)
- Pin1 to PB9 from ST Micro Cortex-M4 (4)
- Pin12_1.8 to GPIO27 from Intel Joule Module Connector (1)
- Pin7 to PE6 from ST Micro Cortex-M4 (4)
- Pin10_1.8 to GPIO22 from Intel Joule Module Connector (1)
- Pin4 to PB0 from ST Micro Cortex-M4 (4)

1.3.2 Octal PWM Header (v9) (5)

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

This header offers PWM outputs connected to:

- PWM_1 to PWM1B on ST Micro Cortex-M4 (4)
- PWM_2 to PWM2B on ST Micro Cortex-M4 (4)
- PWM_3 to PWM3B on ST Micro Cortex-M4 (4)
- PWM_4 to PWM4B on ST Micro Cortex-M4 (4)
- PWM_5 to PWM5B on ST Micro Cortex-M4 (4)
- PWM_6 to PWM6B on ST Micro Cortex-M4 (4)
- PWM_7 to PWM7B on ST Micro Cortex-M4 (4)
- PWM_8 to PWM8B on ST Micro Cortex-M4 (4)

1.3.3 SPI Header (v11) (12)

This header breaks out SPI1 on ST Micro Cortex-M4 (4) .

1.3.4 CAN Header (v5) (14)

The CAN header is connected to CAN1 on ST Micro Cortex-M4 (4).



1.3.5 UART Header (v8) (18)

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

This module is connected to the UART1 bus on Intel Joule Module Connector (1).

1.3.6 UART Header (v8) (19)

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

This module is connected to the UART2 bus on ST Micro Cortex-M4 (4).

1.3.7 UART Header (v8) (20)

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

This module is connected to the UART7 bus on ST Micro Cortex-M4 (4).

1.3.8 I2C Header (v12) (23)

This header breaks out I2C0 on Intel Joule Module Connector (1) .

1.3.9 I2C Header (v12) (24)

This header breaks out I2C2 on ST Micro Cortex-M4 (4) .

1.3.10 Five-pin GPS Header (v6) (25)

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 UART1 bus on ST Micro Cortex-M4 (4).

1.3.11 Spektrum DSM-2 Remote Connector (v7) (26)

This header is used to connect to a Spektrum DSM/X satellite receiver. It uses a UART RX signal and has a switched 3.3V power supply.

This module is connected to the UART8 bus on ST Micro Cortex-M4 (4).

1.3.12 4-pin Analog Header (v4) (27)

Analog header. Provides access to 4 ADC pins and supplies a GND.

AIN_A1 is connected to ADC_IN11 on ST Micro Cortex-M4 (4)

AIN_A2 is connected to ADC_IN12 on ST Micro Cortex-M4 (4)

AIN_B1 is connected to ADC_IN13 on ST Micro Cortex-M4 (4)



1.4 Processors

1.4.1 ST Micro Cortex-M4 (v33) (4)

An ARM Cortex-M4 processor of ST Microelectronics 32F427. The processor runs at 168MHz at 1.8 or 3.3 volts – and has a hardware floating point unit. The battery voltage is sensed on ADC_IN10 with a gain of 0.09091.

Requires:

- 3.3V from 3.3V/1.5A Regulator (8)
- BATT_SENSE_36 from Battery 2-Cell Balance Connector (9)

Provides:

- RESET to Tactile Switch (22)
- PD3 to 9-Axis IMU (17)
- PWM1B to Octal PWM Header (5)
- BOOT0 to Buzzer (7)
- PD2 to 9-Axis IMU (17)
- PWM5B to Octal PWM Header (5)
- PA10 to 40 Pin Header (3)
- PWM3B to Octal PWM Header (5)
- PWM7B to Octal PWM Header (5)
- SPI2 to SPI Bridge (16)
- SPI3 to:
 - 9-Axis IMU (17)
 - Barometer (28)
- SPI1 to SPI Header (12)
- PB0 to 40 Pin Header (3)
- SPI4 to FRAM (128 KB) (15)
- PD4 to 9-Axis IMU (17)
- PB9 to 40 Pin Header (3)
- PB8 to 40 Pin Header (3)
- ADC_IN12 to 4-pin Analog Header (27)
- UART1 to Five-pin GPS Header (25)
- UART3 to UART-UART (33)
- UART2 to UART Header (19)



- ADC.IN11 to 4-pin Analog Header (27)
- UART7 to UART Header (20)
- PWM8B to Octal PWM Header (5)
- UART8 to Spektrum DSM-2 Remote Connector (26)
- PB5 to Power Muxer (two 5V sources) (32)
- AGND to 4-pin Analog Header (27)
- PWM2B to Octal PWM Header (5)
- CAN1 to CAN Header (14)
- PWM4B to Octal PWM Header (5)
- VLOGIC to:
 - 40 Pin Header (3)
 - Octal PWM Header (5)
 - SPI Header (12)
 - FRAM (128 KB) (15)
 - 9-Axis IMU (17)
 - UART Header (19)
 - UART Header (20)
 - I2C Header (24)
 - Five-pin GPS Header (25)
 - Barometer (28)
 - Power Muxer (two 5V sources) (32)
- ADC.IN13 to 4-pin Analog Header (27)
- PWM6B to Octal PWM Header (5)
- I2C2 to I2C Header (24)
- PC8 to 40 Pin Header (3)
- PC9 to 40 Pin Header (3)
- PE9 to Blue LED (30)
- PA8 to 40 Pin Header (3)
- PE5 to 40 Pin Header (3)
- PE6 to 40 Pin Header (3)
- PC6 to 40 Pin Header (3)
- PC7 to 40 Pin Header (3)
- PC4 to SPI Bridge (16)
- PC5 to SPI Header (12)
- USB_DEVICE to Micro-B Jack (10)
- PA9 to 40 Pin Header (3)
- PE15 to Spektrum DSM-2 Remote Connector (26)
- PE10 to Yellow LED (31)



1.5 Power

1.5.1 5V/5A Regulator (v3) (6)

Takes 6 - 36V input from Battery 2-Cell Balance Connector (9) and provides up to 5A at 5V to:

- Intel Joule Module Connector (1)
- NimbeLink Skywire Modem (2)
- Octal PWM Header (5)
- Power Muxer (two 5V sources) (32)

1.5.2 3.3V/1.5A Regulator (v9) (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. Currently, its input is 5V from Power Muxer (two 5V sources) (32).

This regulator provides 3.3V to:

- ST Micro Cortex-M4 (4)
- SPI Header (12)
- CAN Header (14)
- 9-Axis IMU (17)
- UART Header (18)
- UART Header (19)
- UART Header (20)
- Tactile Switch (21)
- Tactile Switch (22)
- I2C Header (23)
- I2C Header (24)
- Five-pin GPS Header (25)
- Spektrum DSM-2 Remote Connector (26)
- Red LED (29)
- Blue LED (30)
- Yellow LED (31)



1.5.3 Power Muxer (two 5V sources) (v5) (32)

Takes 5V input from 5V/5A Regulator (6) or Micro-B Jack (10) and provides up to 1.25A at 5V to:

- 40 Pin Header (3)
- Buzzer (7)
- 3.3V/1.5A Regulator (8)
- Five-pin GPS Header (25)

1.6 Audio

1.6.1 Buzzer (v7) (7)

This SMT buzzer provides an audible indicator for the signal BOOT0 on ST Micro Cortex-M4 (4).

1.7 Power Connectors

1.7.1 Battery 2-Cell Balance Connector (v6) (9)

This is a standard 2S LiPo balance connector (XH Type). Although it's a 2S connector, it can provide 16.0V or 36.0V.

This connector provides 36.0V to:

- Intel Joule Module Connector (1)
- ST Micro Cortex-M4 (4)
- 5V/5A Regulator (6)

1.8 USB

1.8.1 Micro-B Jack (v8) (10)

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

This module is connected to USB_DEVICE on ST Micro Cortex-M4 (4).

It supplies 5.0V to:

- Power Muxer (two 5V sources) (32)

1.8.2 Micro-B Jack (v8) (11)

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

This module is connected to USB_DEVICE on USB-UART (13).



1.9 Connectivity

1.9.1 USB-UART (v14) (13)

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.

This USB to UART converter connects a host machine from Micro-B Jack (11) to UART2 on Intel Joule Module Connector (1).

1.9.2 SPI Bridge (v9) (16)

The SPI bridge connects two SPI interfaces on different modules, allowing them to communicate.

This module connects SPI0 on Intel Joule Module Connector (1) to SPI2 on .

1.9.3 UART-UART (v6) (33)

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

This UART bridge connects UART0 on Intel Joule Module Connector (1) to UART3 on ST Micro Cortex-M4 (4).

1.10 Memory

1.10.1 FRAM (128 KB) (v8) (15)

This 128 KB non-volatile FRAM memory module is connected via SPI and is useful for storing small amounts of data.

This module is connected to SPI4 on ST Micro Cortex-M4 (4).

1.11 Sensors

1.11.1 9-Axis IMU (v16) (17)

This module provides 3-axis acceleration, 3-axis rotational rates and 3-axis magnetic field information. It is connected via a SPI bus. Data-ready pins are provided.

Its SPI bus is connected to SPI3 on ST Micro Cortex-M4 (4)

It has the following data ready signals:

- ACCEL_DRDY to PD3 on ST Micro Cortex-M4 (4)
- GYRO_DRDY to PD2 on ST Micro Cortex-M4 (4)
- MAG_DRDY to PD4 on ST Micro Cortex-M4 (4)



1.11.2 Barometer (v7) (28)

An ultra-compact, low-power barometer useful for aerial vehicles. The barometer module offers a high resolution reading, accurate to within 10 cm and is optimized for altimeter and variometer applications. At altitudes close to sea level, covering the barometer module with a light piece of foam may help to improve the accuracy of readings.

This module is connected to SPI3 on ST Micro Cortex-M4 (4).

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

1.12 IO

1.12.1 Tactile Switch (v9) (21)

This 4.9 sq. mm light touch switch provides a user input for the signal RESET on Intel Joule Module Connector (1).

1.12.2 Tactile Switch (v9) (22)

This 4.9 sq. mm light touch switch provides a user input for the signal RESET on ST Micro Cortex-M4 (4).

1.12.3 Red LED (v11) (29)

This 1608 standard size red LED provides an indicator for the signal GPIO15 on Intel Joule Module Connector (1).

1.12.4 Blue LED (v14) (30)

This 1608 standard size blue LED provides an indicator for the signal PE9 on ST Micro Cortex-M4 (4).

1.12.5 Yellow LED (v13) (31)

This 1608 standard size yellow LED provides an indicator for the signal PE10 on ST Micro Cortex-M4 (4).

1.13 Mechanical

1.13.1 Mounting Hole (2.2mm)

A #0 mounting hole for securing the board with mounting pins.

1.13.2 Mounting Hole (2.2mm)

A #0 mounting hole for securing the board with mounting pins.



1.13.3 Mounting Hole (2.2mm)

A #0 mounting hole for securing the board with mounting pins.

1.13.4 Mounting Hole (2.2mm)

A #0 mounting hole for securing the board with mounting pins.



2 Module Connections Graph

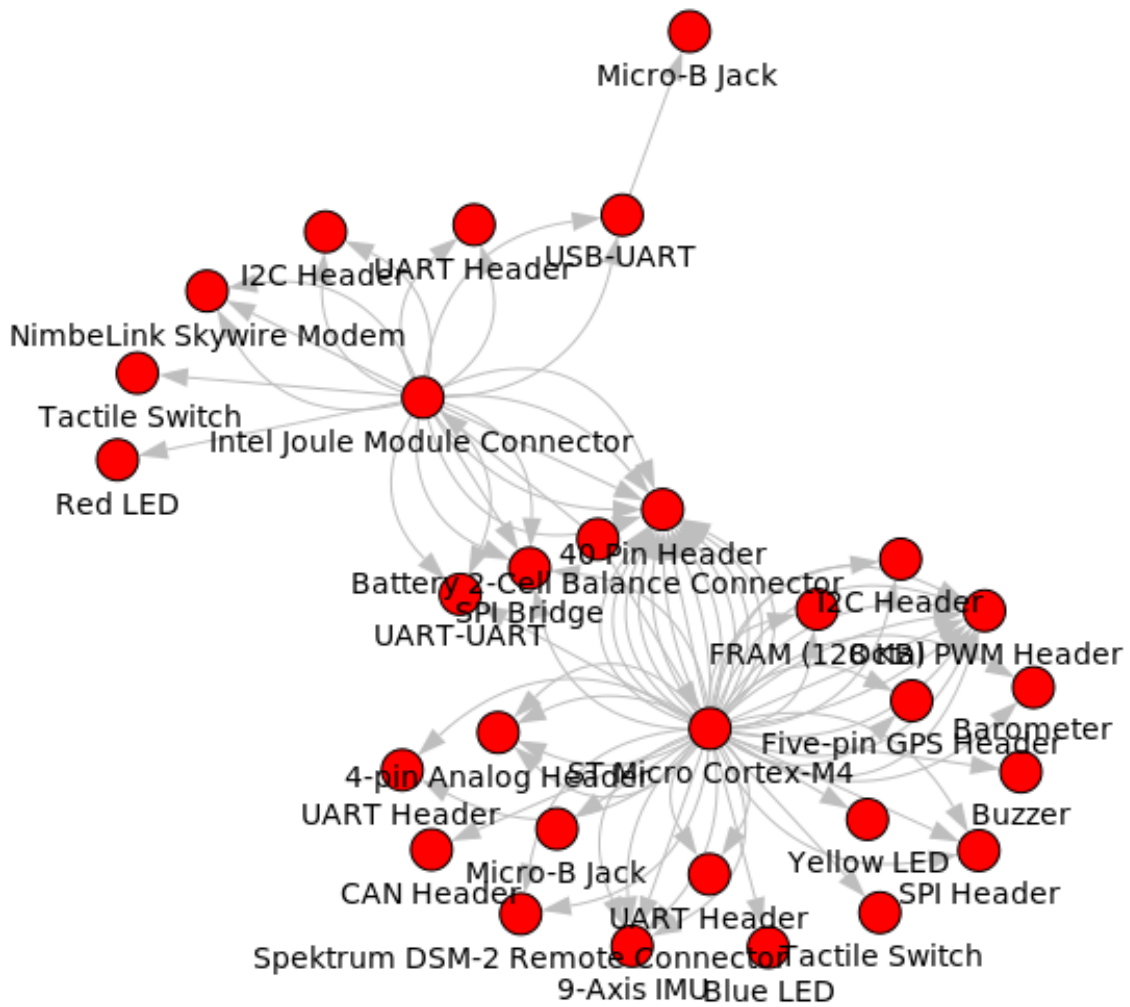


Figure 1: excludes power modules



3 Module Power Graph

