



Multi-Sensor Module

Datasheet

Six synchronized sensors including a high-performance GNSS-receiver for ultra-precise positioning and attitude determination.

Features

- Centimeter-accurate carrier phase positioning (RTK) with patented GNSS integer ambiguity resolution
- High update rate of 106 Hz for position/velocity/attitude/time information through a tightly coupled sensor fusion of GNSS, inertial and barometric measurements
- Low power consumption – 625mW typical
- Small form factor – 80x52mm
- Multiple communication interfaces: USB, Bluetooth and UART
- All-in-one solution: Direct connection to ANavS processing module via ribbon cable
- GNSS antenna configuration: Both integrated and external antenna
- Raw-measurement output: Synchronized timestamps for GNSS, INS and barometric measurements
- SD-card slot for data-storage
- Charge controller for power supply with USB and Li-ion battery pack



Sensors

- Multi-GNSS receiver (LEA M8T, ublox) with dual-band GNSS antenna (AGGP.35F, Taoglas)
- Inertial sensor (MPU9250, Invensense) with 3D accelerometer, 3D gyroscope and 3D magnetometer
- Barometer (BMP 280, Bosch Sensortec) with thermometer

Applications

- Vehicular navigation (ADAS)
- Maritime navigation
- Geodesy
- Environmental monitoring
- Robotics
- Precision Agriculture
- Unmanned Aerial Vehicles (UAVs)

Overview

The ANavS Multi-Sensor Module integrates a low-cost, high-performance GNSS-receiver, inertial sensors and barometric sensor for a precise position, velocity, attitude, and timing information.

The small form factor, high update-rate and low power consumption makes it ideal for the integration into autonomous vehicles and other portable applications.

In combination with the ANavS RTK-Software, an accuracy of 0.25°/m (baseline-length) for the heading and of a few centimeters for the position is achieved. The sensor fusion with a tight coupling of GNSS and inertial measurements results in a seamless position and attitude information with 106 Hz in areas with and without GNSS signal reception (e.g. below trees, bridges, tunnels).

ANavS RTK positioning with Multi-Sensor Modules

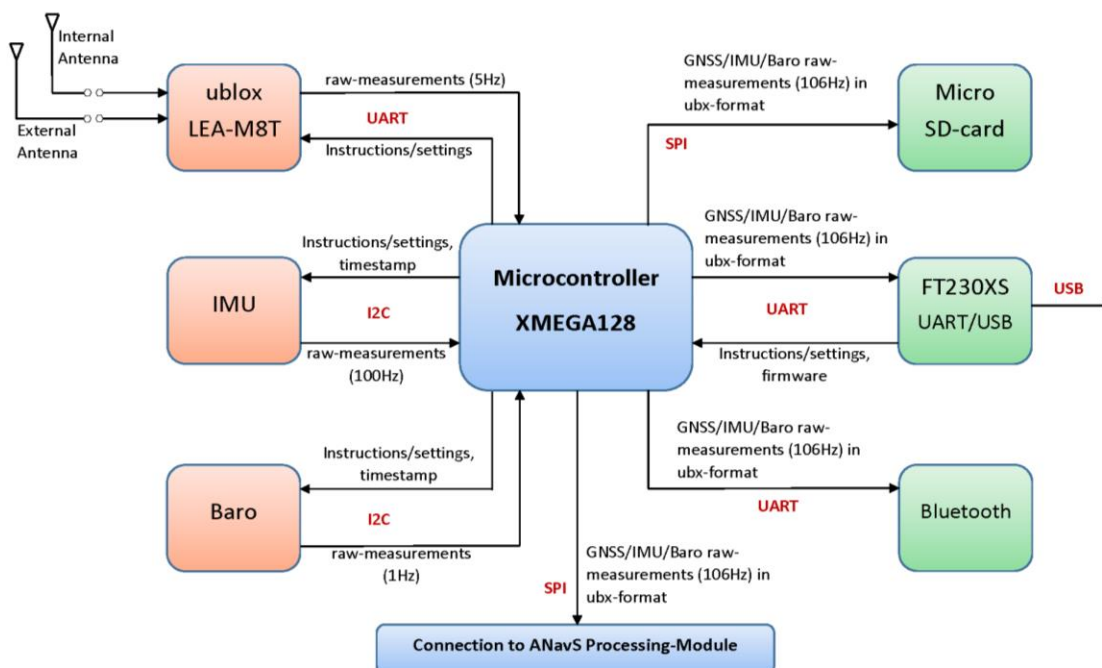
The accurately synchronized GNSS, IMU and barometric measurements can be fused for real-time kinematic (RTK) positioning. The ANavS Processing Module performs a tightly coupled fusion of the sensor data from at least one Multi-Sensor Module and a reference station. The correction data for RTK positioning can be generated by another Multi-Sensor Module or a Virtual Reference Station (VRS).

System Architecture

The ANavS Multi-Sensor board provides raw-measurements for all listed sensors with a corresponding time-stamp both in real-time and on data-storage. The on-board microcontroller is an XMEGA128 from Atmel.

Sensor configurations and the preparation of raw-measurements are handled by the microcontroller-firmware. All the sensor data is packaged in the ubx-standard-format.

Figure 2: Multi-Sensor Module Block Diagram



Connections

USB

The micro-USB socket provides USB connectivity to the host. The USB is configured as a USB-serial bridge to the microcontroller and as a high-speed FIFO interface for streaming full-rate raw measurements of all sensors. This allows the user to capture the raw sensor data for post-processing or to use the data in real time applications.

UART

The UART provides a high-speed 3.3V LVTTTL level asynchronous serial interface which can be configured to transmit raw-measurement data in ubx-standard-format, system status and debugging information and receive commands to configure sensors. When configured in USB-serial bridge mode, the USB interface operates identically to the dedicated UART.

BLUETOOTH

A Bluetooth connection provides the host sensor raw measurement data in ubx-standard-format.

EXTERNAL/INTERNAL GNSS ANTENNA

The U.FL-connector is either used with an external active antenna or with the provided TAOGLAS AGGP.35F patch-antenna. The internal antenna is mounted on an ideally matched PCB ground-plane and integrated on the top-side of the Multi-Sensor module.

POWER

The power supply is either provided over USB or with a Li-ion battery pack.

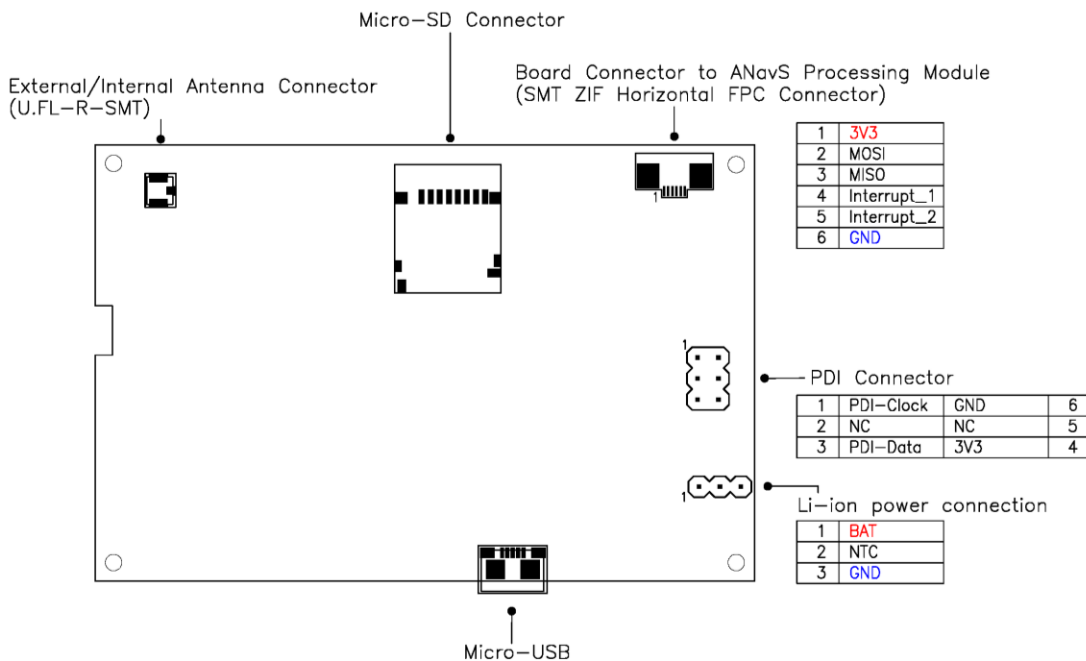


Figure 3: Multi-Sensor Module Connections

PDI

The PDI pinout is provided for advanced debugging. In nominal conditions it is not needed for firmware-updates.

FIRMWARE

The microcontroller XMEGA128 runs the ANavS firmware for synchronization of sensor data and for packaging them in an extended ubx-format.

Electrical Specifications

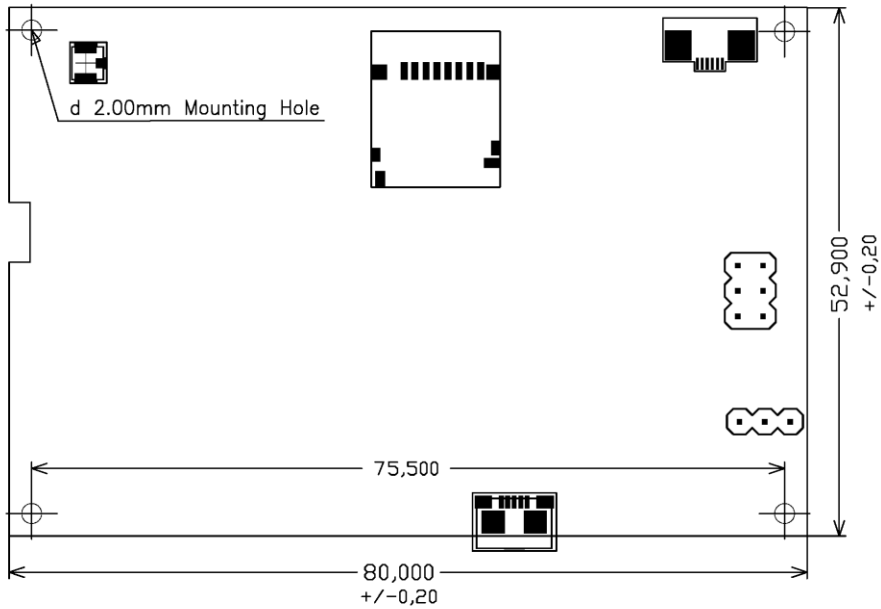
Supply voltage	4.35 - 5.5 V
Maximum voltage rating	-0.3 - 7.0 V ⁽¹⁾
Power consumption	625 mW ⁽²⁾
Active antenna input impedance	50 Ω
Active antenna bias voltage	3.3 V ⁽³⁾

⁽¹⁾ Overvoltage protection is not provided

⁽²⁾ Typical, dependent on configuration

⁽³⁾ Switchable in software

Mechanical Drawing



All dimensions are in millimeters. Drawing not to scale

Notes

1. Mass 20g
2. Mounting holes are not plated.
3. 3D CAD models are available from our website, <http://www.anavs.de>