



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 – 80mmx52mm
- Low weight – 20g
- 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 time 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 a few centimeters for the position and of $0.25^\circ/\text{m}$ (baseline-length) for the heading 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

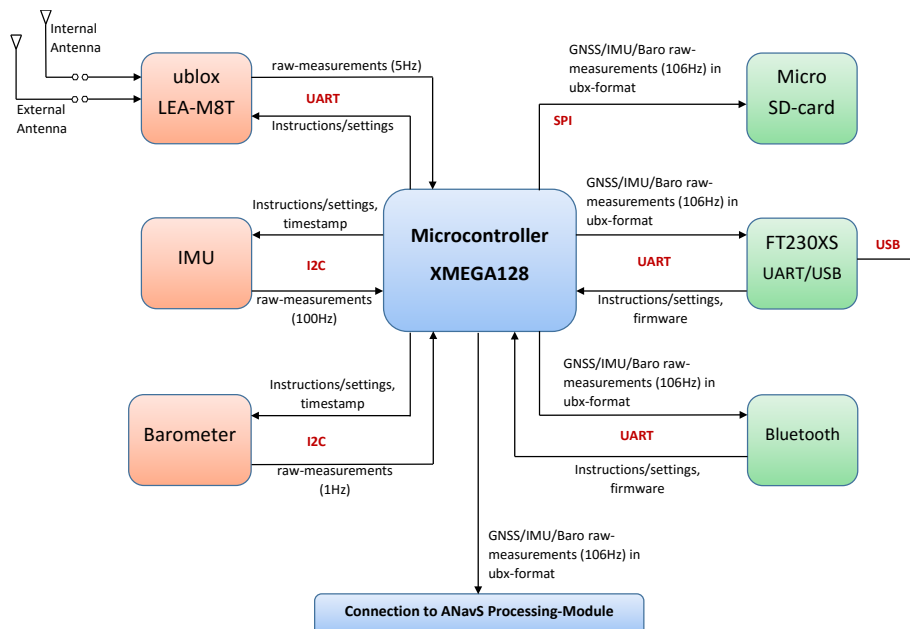
The accurately synchronized GNSS, IMU and barometric measurements can be fused for real-time kinematic (RTK) positioning. The ANavS Processing Module performs a tightly coupled fusion of the sensor data from at least one Multi-Sensor Module and a reference station. The correction data for RTK positioning can be generated by another Multi-Sensor Module or a virtual reference station in SSR (State Space Representation) or OSR (Observation State Representation).

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 1: 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.

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.

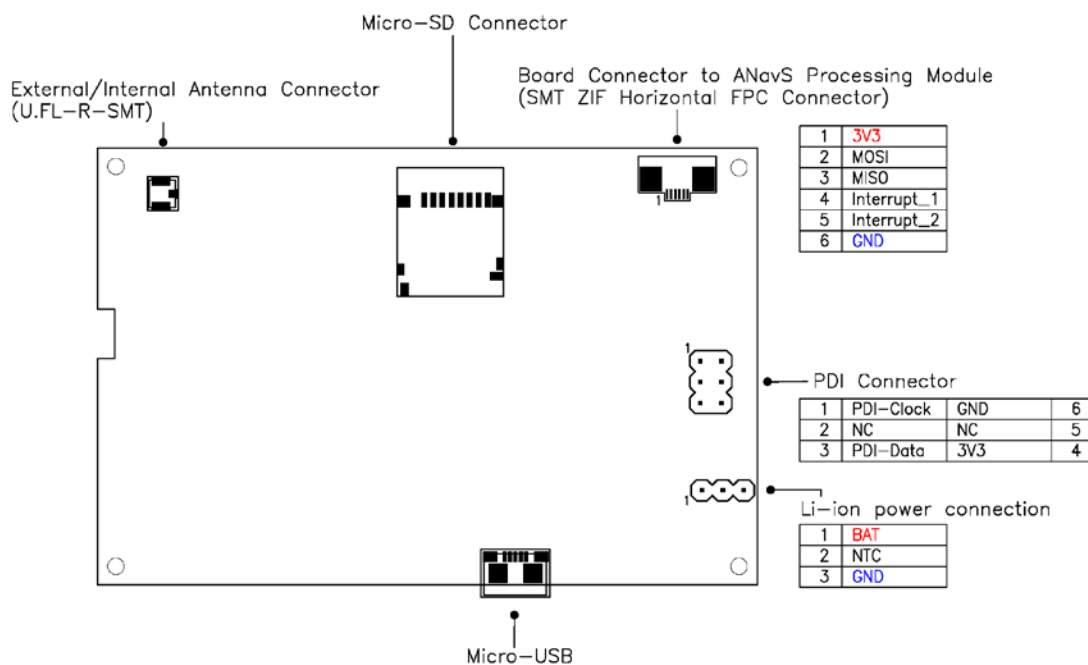


Figure 2: Multi-Sensor Module Connections

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.

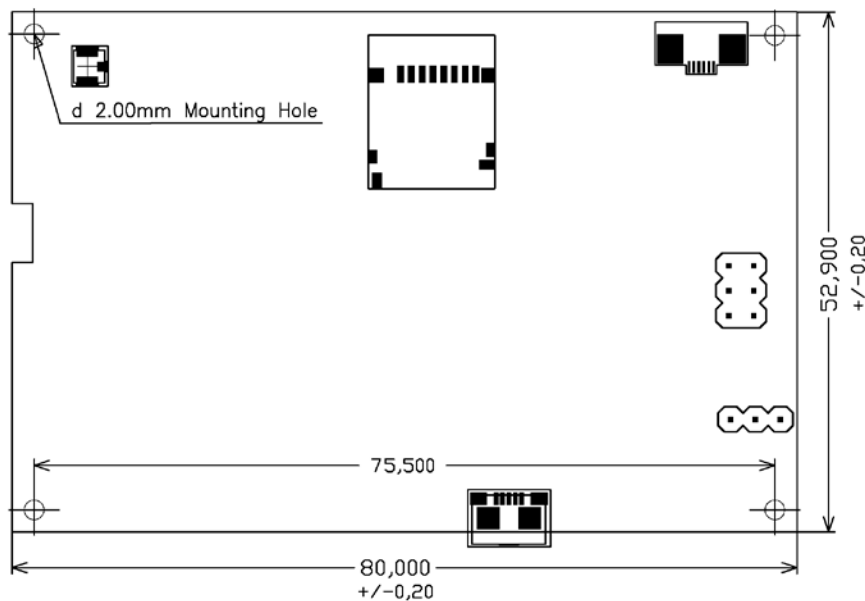
Electrical Specifications

Supply voltage	4.35 - 5.5 V
Maximum voltage rating	-0.3 - 6.0 V ⁽¹⁾
Power consumption	625 mW ⁽²⁾
Active antenna input impedance	50 Ω
Active antenna bias voltage	3.3 V

⁽¹⁾ Overvoltage protection is not provided

⁽²⁾ Typical, dependent on configuration

Mechanical Drawing



All dimensions are in millimeters. Drawing not to scale

Notes

1. Mass 20g
2. Mounting holes are not plated.