

Qumtrix MAX5 Technical Datasheet

Multi-Band RTK GNSS Receiver with Integrated 6-DOF Industrial IMU

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Product Overview

The Qumtrix MAX5 is an industrial-grade, multi-band RTK GNSS receiver integrated with a high-precision 6-DOF IMU system. Built upon the Septentrio Mosaic-X5 GNSS core and Analog Devices ADIS16505 IMU, the MAX5 is engineered for high-precision autonomous navigation in GPS/GNSS-denied and heavy-EMI environments. It offers seamless centimeter-level positioning (via RTK/PPK & Dead Reckoning), high-bandwidth raw measurement logging, and ultra-wide power input for harsh industrial architectures.

1. System Architecture & Key Components

Subsystem / Function	Component Model	Core Specification	Function / Description
GNSS Engine	Septentrio Mosaic-X5	Multi-frequency, 468 Channels, 100 Hz update rate	Delivers full-constellation RTK tracking with AIM+ anti-jamming and spoofing detection.
Inertial Measurement (IMU)	ADI ADIS16505-1	6-DOF MEMS Combo (3-axis Gyro, 3-axis Accel)	Factory-calibrated digital sensor providing Dead Reckoning and angular rate tracking.
Main Microcontroller (MCU)	STM32H743VIHx	Arm Cortex-M7 @ 480 MHz, 1027 DMIPS	Executes sensor fusion algorithms, protocol bridging, and high-speed data parsing.
High-Speed Cache (RAM)	ESP-PSRAM32	4 MB Serial PSRAM (66 MHz SPI/QSPI)	Ultra-low latency buffer preventing packet loss during concurrent SD logging and streaming.
Firmware Storage	W25Q128JVS	128 Mbit (16 MB) Quad-SPI NOR Flash	Supports Execute-in-Place (XIP) for instantaneous boot-up and secure code execution.
Data Logging	MicroSD Card Slot	4-bit SDIO Interface (up to 32 GB TF)	Continuous raw GNSS/IMU observation logging for PPK (Post-Processing Kinematic) workflows.
Power Management (PMIC)	TI TPS54260DRCR	Step-Down Regulator, 3.5 V to 60 V Input	Delivers 2.5 A continuous output with Eco-mode for low power during standby.

2. Detailed Technical Specifications

2.1 GNSS & Positioning Performance

- Constellations Tracked: GPS (L1C/A, L1C, L2C, L2P, L5), GLONASS (L1CA, L2CA, L3), Galileo (E1, E5a, E5b, AltBOC), BeiDou (B1I, B1C, B2I, B2a, B3I), QZSS (L1C/A, L1C, L2C, L5), NavIC (L5).
- Positioning Accuracy:
 - Standalone (Single): Horizontal 1.2 m / Vertical 1.9 m
 - RTK (Centimeter-Level): Horizontal 0.6 cm + 0.5 ppm / Vertical 1.0 cm + 1 ppm
 - Post-Processed (PPK): Horizontal 0.5 cm + 0.5 ppm / Vertical 0.8 cm + 1 ppm
- Time-to-First-Fix (TTFF): Cold Start < 45 s | Hot Start < 2 s
- Velocity Accuracy: 0.03 m/s
- Anti-Interference Technology: Septentrio AIM+ (Advanced Interference Mitigation and spoofing detection with dynamic notch filtering).

2.2 Inertial Sensor Specifications (ADI ADIS16505-1)

- Gyroscope (Triaxial):
 - Dynamic Range: $\pm 125^\circ/\text{s}$, $\pm 500^\circ/\text{s}$, $\pm 2000^\circ/\text{s}$ (Software configurable)
 - In-Run Bias Stability: $2.3^\circ/\text{hr}$ (Typical)
 - Angular Random Walk (ARW): $0.13^\circ/\sqrt{\text{hr}}$ (1σ)
 - Axis-to-Axis Misalignment: $\pm 0.25^\circ$
- Accelerometer (Triaxial):
 - Dynamic Range: $\pm 78.4 \text{ m/s}^2$ ($\pm 8 \text{ g}$)
 - In-Run Bias Stability: $26.5 \mu\text{m/s}^2$ (X/Y-axis)
 - Velocity Random Walk (VRW): $0.035 \text{ m/s}/\sqrt{\text{hr}}$
- Sampling & Output Rate: Up to 2000 Hz internal sampling, filtered output down to 100 Hz/200 Hz.

2.3 System Protocols & Interface

- Protocols Supported: NMEA 0183 (v4.10), SBF (Septentrio Binary Format), RTCM 2.x/3.x, UBX-compatible pass-through, NTRIP Client/Server.
- Physical Communication Interfaces:
 - 2× UART (3.3V TTL, up to 921,600 bps)
 - 1× USB 2.0 High-Speed (Type-C / Header) for local Web GUI configuration and streaming
 - 1× CAN Bus 2.0B / CAN-FD (Optional transceiver onboard)
 - 1× PPS Output (Time Pulse, < 20 ns accuracy)

3. Electrical & Physical Characteristics

Parameter	Min	Typical	Max	Unit	Notes / Conditions
Input Supply Voltage (VIN)	3.5	12 / 24	60	V	Integrated reverse-voltage protection
Power Consumption	-	1.8	2.5	W	RTK Active + IMU Streaming + SD Logging
Operating Temperature	-40	+25	+85	°C	Industrial grade
Storage Temperature	-45	-	+105	°C	Component safe range
Dimensions (L × W × H)	-	45 × 35 × 12	-	mm	Mainboard dimensions (PCB only)
Weight	-	32	-	g	Base board without antenna

4. Target Application Scenarios

- Autonomous Agriculture & Ag-Robotics: Tractor auto-steer, field spraying, robotic harvesting (maintains path lock under heavy orchard canopies).
- Surveying & Construction Machinery: Excavator grade control, drone-based LiDAR/Photogrammetry mapping (PPK zero-loss raw data logging).
- Unmanned Ground Vehicles (UGVs) & Autonomous Driving: Centimeter-level dead reckoning in urban canyons, tunnels, and high EMI industrial complexes.