

Space Equipment
Avionics

GEO MosaicGNSS Receiver

Stand-alone GPS receiver for GEO applications

The GEO MosaicGNSS receiver is a dedicated high quality radiation-tolerant GPS receiver for applications in geostationary orbit.

GPS receivers have become a standard equipment for orbit determination in LEO satellites. The GEO MosaicGNSS receiver provides the opportunity to use the full potential of the LEO technology in GEO: a new level of satellite autonomy, increased orbit determination performance, enhanced reliability, higher robustness, cost savings for satellite ground operations and the beneficial combination of a GPS Receiver with other AOCS sensors/actuators.

Due to the special nature of the use of GPS in GEO, the receiver has been equipped with unique features: it is designed to process weak signals and provides a navigation solution even in the case that only two GPS Satellites are visible at one time (conventional systems need at least four).

The GEO receiver is an adapted version of the highly successful LEO MosaicGNSS unit, which is currently used on a variety of missions worldwide. Following the first launch in 2006, there are beginning of 2014 17 MosaicGNSS receivers successfully operating in-orbit.

KEY FEATURES

- High inertial performance: high resolution and stability, very low noise from low to high frequency
- Unique features: Signal processing implemented in software
  - Processing of weak signals for GEO applications
  - Sequential estimation filter (Kalman filter) and orbit models
- Capability to maintain accuracy even in temporary phases when only two Navigation satellites are in visibility
- Configurable and patchable in orbit
- Class 1 version available

MAIN APPLICATION FIELDS

- All GEO applications

CUSTOMERS / APPLICATION

- First GEO MosaicGNSS receiver delivered for a standard GEO telecom platform

ENVIRONMENTS

- Thermal: -25°C, +60°C (operating), +40°C, +80°C (non-operating)
- Radiation: up to 100krad
- Lifetime: up to 15 years

BUDGETS

- Mass: 3.9kg
- Volume: 272 x 288 x 92mm^3
- Power: 10W

INTERFACES

- Power bus: 24-35V, 35-52V
- Dialog: SpaceWire, RS-422 UART, MIL STD 1553 Bus
- Antenna Interface: 50Ω, SMA connector, 9V for LNA

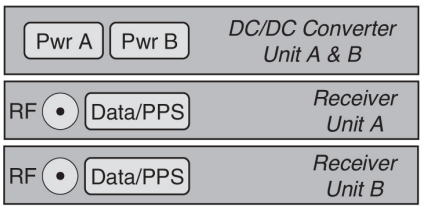
PERFORMANCES

- GPS Receiver performances (3D RMS)
  - L1 (1575.42MHz), C/A Code receiver
  - 8 channels, for spaceforne applications
- Accuracy
  - GEO: Position < 150m - Velocity < 0.02m/s - Time < 750ns
- Dynamic conditions
  - Doppler shift: ± 60kHz
  - Doppler rate: ± 60Hz/s
  - Max slew rate: 0.5°/s
- Sensitivity Threshold
  - Tracking: 26dBHz
  - Acquisition: 30dBHz
  - Data Output: PVT and raw measurements at 1Hz dynamic solution, ECEF or ECI, GPS Time
  - Pulse Output: RS-422 1Hz, synchronised to GPS Time

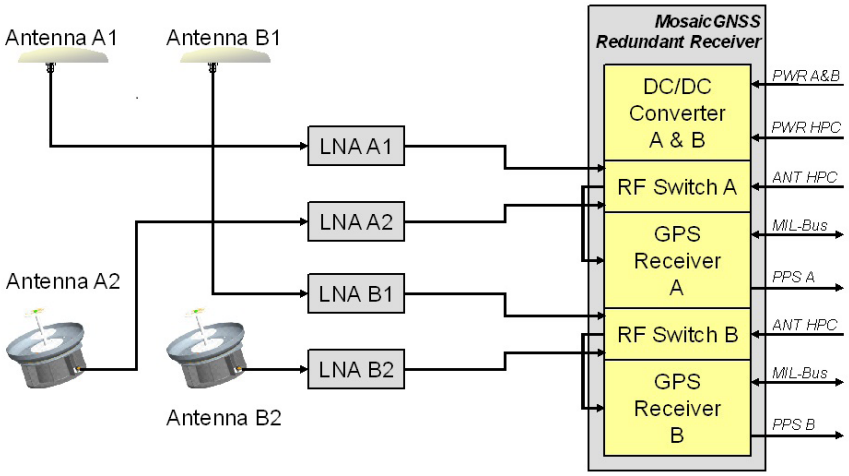
MosaicGNSS assembly

The complete redundant MosaicGNSS receiver assembly is composed of:

- Two GPS receiver modules
- Two DC/DC converter in one module
- Two LNAs
- Two GPS L1 PEC antennas; optional patch antennas for GTO
- Associated RF cables between above components

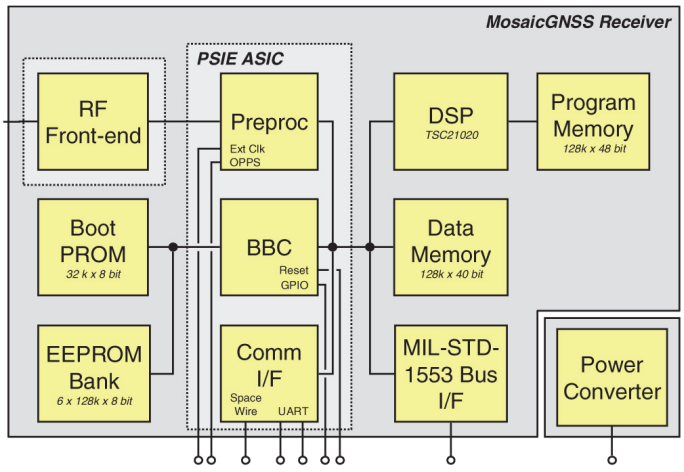


Side with connectors



MosaicGNSS receiver architecture

- The RF front-end performs analogue downconversion of the received RF signal to an intermediate frequency and subsequent A/D conversion.
- The boot PROM holds the primary boot loader which performs first hardware initialization and loads the main application either from the EEPROM bank or from a communication interface. The EEPROM bank contains the main application.
- The GPS pre-processing includes digital downconversion, filtering, decimation and packaging functions.
- The boot and boot controller maintains various interrupt signals, general purpose I/O lines and a power-on reset for the DSP.
- The communication interface inside the GPS ASIC provides three high speed serial communication channels: one SpaceWire interface and two UART interfaces. An optional MIL STD 1553 Bus interface is also available.
- The DSP used is a TSC21020F processor, the space qualified equivalent of the ADSP-21020. Program memory and data memory are separated (Harvard architecture).
- Furthermore, a separate power converter board has been added for the DC/DC conversion.



Hardware Components

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