MARKET LEADING SDR PLATFORM

for Remote Sensing and Communications Applications

GOMSPACE

SDR-MK3 platform

The SDR-MK3 platform is a Market leading SDR Platform for Remote Sensing and Communications Applications based on Powerful and Advanced FPGA Technology

The SDR-MK3 platform is a highly miniaturised, powerful embedded system, designed for solving challenges within

- High-speed space-to-ground communications over e.g. S or X band
- Long distance inter-satellite communications over e.g. S or K band
- Remote sensing applications for e.g. spectral characterisation or radio location.
- Space-based enhancement of terrestrial radio services or systems

The platform offers significant computational capacity, enabling advanced signal processing and detection techniques to be employed in a compact design.

SDR-MK3

The platform includes a system-on-chip (SoC) with a general-purpose processor, an SIMD co-processor and an FPGA. This combination allows rapid software prototyping and acceleration of custom hardware development. The SDR may also be used for other advanced processing requirements, such as image processing. The platform includes development kits for getting started with software application and FPGA firmware development. GomSpace also offers an SDR training program to kick-start and support your development process. The SDK is split between FPGA development, facilitated by Xilinx Vivado Design Suite, and Linux SW development, facilitated by a set of Yocto Project compliant meta-layers. The SDK is actively maintained against new BSP and tool releases from Xilinx and Analog Devices, as well as new features introduced by various open source components constituting the Yocto Project.

Highlighted features:

- Flight proven Software Defined Radio platform software for payload application development.
- GomSpace NanoDock – modular daughter board concept, with up to 4 modules
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- Optimised thermal design from chip to mounting interface
- System on Chip (SoC) module and transceiver modules
- Programmable in orbit
- Compliant with GomSpace CSP
- Delivered with a Yocto based Software Development Kit and complete source code support, allowing for complete mission customisation

Mechanical features:

- Dimensions 95 mm x 95 mm x 31.5 mm (with 3 x TR600)

APPLICATION CASES

Tracking
Track ships, aircraft & devices using the SDR with the relevant demodulator IP and antenna. GomSpace demonstrated the first aircraft tracking from a nanosatellite on the GOMX-1 mission in 2013.

Spectrum Monitoring
Monitor the spectrum and locate emitters, interference and signals. We demonstrated monitoring of transmissions from other satellites on our GOMX-3 mission in 2015.
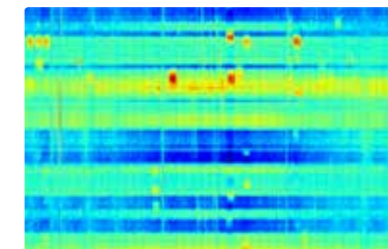
Communication
Implement flexible communication schemes and waveforms. We demonstrated inter-satellite linking using spread spectrum waveforms on our GOMX-4 mission in 2018.

Transceiver module
NanoCom TR600

Powerful SoC module
NanoMind Z7000

The **TR600** is a fully reconfigurable transceiver board compatible with the GomSpace NanoDock SDR.

The **NanoMind Z7000** is fully compatible with the GomSpace NanoDock SDR.

The TR600 has 2 RX and 2 TX transceiver RF Inputs/Outputs allowing up to four RF Front Ends/Antennas to be operated per module. Up to 3 TR600 transceiver modules can be fitted to a single NanoDock SDR.

Main features:
- AD9361 transceiver
- Frequency Band: 70 MHz to 6 GHz
- Channel bandwidth is tuneable from 200 KHz to 56 MHz
- 2 x 2 RF transceivers with integrated 12-bit DACs and ADCs.
- Supports TDD and FDD operation.
- Multichip synchronisation
- LVDS/single-ended digital BB interface

- SMPM RF connectors and Picoblade connector for Front End control (I2C, CAN, AuxDAC, AuxADC, +5 V)
- Flight proven
- Precision milled anodised aluminium heat sink controls thermal load and provides EMI sheilding
- Temperature and current sensors
- EEprom for persistent configuration storage

Mechanical features:
- Dimensions 68.4 mm x 43.2 mm x 11.8 mm

Main features:
- Xilinx Zynq 7030/7045 Programmable SoC. (7045 requires a Vivado license)
- Dual ARM Cortex A9 MPCore, clocked up to 800 MHz
- 1 GB DDR3 RAM (with ECC enabled 512 MB)
- 128 GB storage (4 GB reserved for system storage. eMMC devices w/ HW bit flip detection, PSU monitoring, redundant MCU FW image)
- 256 MB QSPI NOR flash
- Powerful FPGA module – 125K / 350K logic cells
- Perfect for on-board payload data processing
- Flight proven
- 75 LVDS pairs or 150 CMOS (combinable)

Mechanical features:
- Precision milled anodised aluminium heat sink controls thermal load and provides EMI sheilding
- Dimensions 68.4 mm x 43.2 mm x 11.8 mm

SDR-MK3
NanoDock Module

GomSpaces **NanoDock SDR-MK3** provides the modular connector backbone for your SDR system, offering connectivity with the NanoMind Z7000 and multiple NanoCom TR600 platforms.

The NanoDock SDR-MK3 is a standard GomSpace board that provides a platform for up to four daughter board modules combined on a single PC104-board.

Main features:

Supports up to four daughter boards.
- 1 x mandatory NanoMind Z7000
- 3 x optional daughter boards which can be one of the following:
  - TR600
  - External custom daughter board

128 GB storage (eMMC devices w/ HW bit flip detection, PSU monitoring, redundant MCU FW image)
Fits in less than 0.3U volume in a nanosatellite

Interfaces:
- Heat sink for both SoC and RF front end modules
- Compliant with GomSpace CSP
- 3 x SpaceWire, CAN, USB Device/Host and RS-422 interfaces
- SpaceWire interface is compatible with standard, so interfaces directly to 3rd party products

SDR-MK3 platform ordering options:
- 0 – up 3 transceiver boards (0 = option as 'computer')
- Xilinx Zynq 7045 or 7030 as default ordering options.

Mechanical features:
- Dimensions 95 mm x 95 mm

Software Defined Radio Training

We'll teach you how to develop custom applications for our SDR platform. Our **SDR training** courses give participants a thorough understanding of the platform, Linux and FPGA environments.

Training covers use of the GomSpace SDR Software Development Kit (SDK). Training is focused on providing students with the understanding and skills needed to develop custom software application and HDL code for our SDR platform. Training also provides an introduction to the interfaces typically used on GomSpace SDR's. Hands-on examples are invaluable, we integrate and include them to ensure participants become competent and comfortable with workflow. Our training is highly customizable, use-case and

hands-on examples can be tailored to focus on specific client needs. One day of every week-long training session is reserved specifically for customer selected use cases. After having completing training, participants are comfortable, competent and ready to develop SDR functionality for their missions.

Please contact us at sales@gomspace.com for more detailed information about GomSpace Software Defined Radio Training.

Software Support

We provide a complete source-code based SDK with our SDR hardware, allowing full mission customisation. The SDK is split between FPGA development, which is facilitated by Xilinx Vivado Design Suite, and Linux SW development, facilitated

by a set of Yocto Project compliant meta-layers. The SDK is actively maintained to new BSP- and tool releases from Xilinx and Analog Devices as well as new features introduced by various open source components constituting the Yocto Project.

GomSpace has over 12 years of cubesat and component experience, with multiple successful missions accomplished. Our engineers have developed profound knowledge and compentencies in Radio Technology, Nanosatellite Platforms, Project Management. GomSpace relentlessly innovates to reliably solve our clients' challenges.

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