

Reliable Ultra-Low Power On-Board Computer



Description:

The On-Board Computer enhances the reliability of any CubeSat by implementing two redundant powerful 16-bit RISC microcontrollers on a single subsystem board. The redundant system consumes less than 15 mW in nominal operation. Besides advances in energy efficiency, the utilization of microcontrollers with task-optimized processing and clock frequency capabilities for satellite housekeeping and control naturally reduces the target for radiation induced SEUs or SETs. The design further avoids the need for bootloading and code execution from RAM which provides enhanced robustness regarding critical SEUs in the code section.

The core module realizes a warm-backup scheme to be able to automatically recover from failure conditions without the need for manual interaction. A data and programming cross-connection between the redundant devices further enables mutual aid, up to complete mutual re-configuration.

The redundancy scheme supports fail-safe in-orbit software updates, which has been successfully demonstrated.

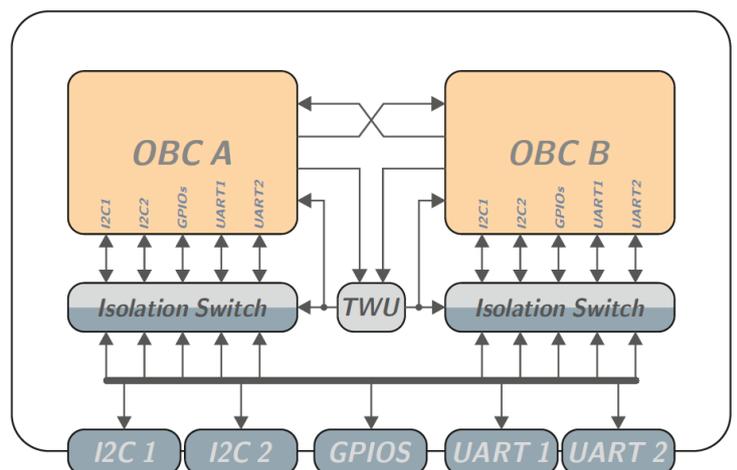
The OBC provides an independent power supply enabling the control of complete power cycles of the whole satellite. An additional independent redundant power cycling unit monitors the activity of the core module and can perform a controlled power cycle in case the system would be locked in a false state, e.g. caused by a latchup condition.

Unique Features:

- **Extremely robust:** since launch 2013 uninterrupted operations in orbit
- **Ultra-low power consumption** for efficient utilization on pico-satellites
- **Highest flexibility:** operations software can be completely updated in-orbit
- **Advanced fault detection, isolation and recovery (FDIR) software**
- **Easy integration:** compatible to UNISEC Europe electrical interface standard

Specifications:

Power consumption	< 15	mW
Power Supply	3.3	V
Backup power supply	3.3-9	V
Mass	38	g
Dimensions	90x90x6.9	mm
Program memory	2x256	KB
S-RAM	2x16	KB
MCU Clock	1-24	MHz
External Data Flash	2x4	MB
SD Card memory	< 32	GB



Further safety features include

- Dual-redundant micro-processors in warm-backup
- Latchup-Protection with automatic power cycling
- Partial power down support isolates the core from the bus during recovery
- Multi-level watchdog architecture