TTECH

TTESwitch MYTHOS

Deterministic 12/20-port Ethernet switch for space applications

Key Benefits

- High-performance managed TTEthernet Switch
- Lightweight, compact and rugged
- 4x 1000BASE-T and 8x/16x 100BASE-TX Ethernet ports
- Supports standard Ethernet (IEEE 802.3), rate-constrained and time-triggered Ethernet traffic (SAE AS6802)
- Built-in rad-hard TTESwitch Controller as a core element
- Power input 22-38V
- Applications: launchers and space transportation, human and robotic exploration, LEO satellites
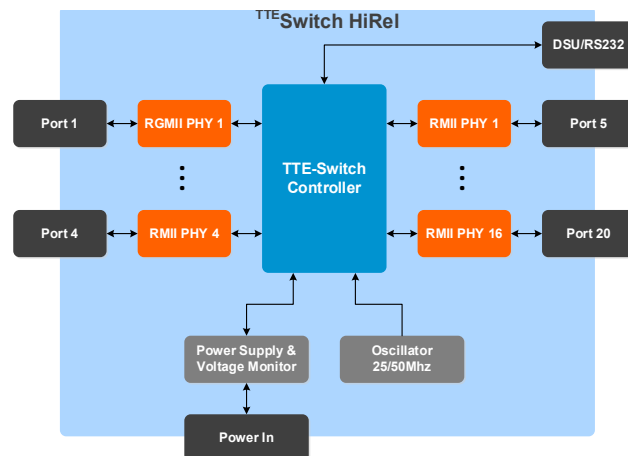
TTESwitch MYTHOS

The TTESwitch MYTHOS forms the core of a reliable TTEthernet® data network used to connect onboard avionics subsystems in spacecrafts ranging from the launchers, through space exploration vehicles up to the satellites. The switch is a standalone device built in a compact box and is available as an off-the-shelf product.

TTEthernet® supports standard IEE 802.3 Gigabit Ethernet, allowing easy interconnection of state-of-the-art space processors and FPGAs having Ethernet interface (MAC) on-chip. Moreover, it supports SAE AS6802 time-triggered Ethernet and ARINC 664 part 7 compatible rate-constrained Ethernet and thereby permits the use of synchronized and non-synchronized functions of distributed systems in the same Ethernet network. System-critical hard real-time functions enjoy reserved bandwidth, full determinism, and delivery jitter below 1 μs.

The switch is built using the industry proven TTESwitch Controller HiRel, implementing switching and management functions on the silicon using radiation hardening design techniques. The controller is latch-up immune up to 60 MeV/cm2/mg and radiation tolerant for a TID up to 300 krad.

Redundant Network Architectures

The TTESwitch MYTHOS offers four 1Gbps and eight 100Mbps Ethernet ports in the default configuration. When requiring more connected devices, the Switch can be extended by additional eight 100Mbps ports.

Block diagram of components in TTESwitch Mythos

TTEthernet® supports single to triple-channel multi-hop networks with system clock synchronization, redundancy management, fault-tolerance, fault isolation and recovery capability to enable a safety-critical system design. The three supported traffic classes allow a variety of mixed-criticality communication scenarios and user applications.

Application Fields

- Space application - launchers and space transportation, human and robotic exploration, LEO satellites
- Other harsh environments

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Quality of Service and Partitioning

The TTESwitch MYTHOS allows the configuration of up to 4096 virtual links for critical traffic as well as data flows for standard Ethernet. The configuration of the network is stored in the built-in non-volatile memory. As an option, IEEE 802.1Q VLANs can be configured. Redundancy management, traffic shaping and traffic policing are implemented in hardware.

Device and Network Management

The TTESwitch MYTHOS features an integrated management CPU (Leon 2) to perform device loading, management and diagnostic services. These internal monitoring functions allow the user to continuously assess the system health state over the network via SNMP. Monitored parameters include synchronization state, supply voltage, board temperatures, dropped/rejected frames and built-in self-test results. Both firmware and network traffic schedule can be updated safely via the TFTP network protocol without interruption of the network service.

General Product Features

- Suitable for high-performance, highly reliable, distributed real-time systems with guaranteed response time
- Light, low-power box with 22-38V power supply
- Support of the three TTEthernet® traffic classes:
  - Standard Ethernet   (IEEE 802.3)
  - Rate-constrained   (ARINC 664 part 7)
  - Time-triggered   (SAE AS6802)
- Device management and status monitoring over network using SNMP and TFTP protocol
- Available in preconfigured standard Ethernet version, allowing adding time-triggered and rate-constrained features on demand

Specifications

- Power supply 22-38V
- Weight (12 / 20-port variant): 1.16 / 1.41 kg
- Dimensions 134 x 113 x 62 / 76 mm
- Qualification temperature range: -40°C to +70°C
- Non-operational temperature: -55°C to +85°C

Network Connectivity

- 4x 100/1000 Mbit/s
- + 8x 100 Mbit/s in basic variant, or
- + 16x 100 Mbit/s in extended variant

- 1000 Mbit/s ports over 1000BASE-T
- 100 Mbit/s ports over 100BASE-TX

Applications

- Launcher vehicles
- New Space applications (landers, transportation)
- LEO satellites

Related Products

- **TTETools** – a PC-based toolchain to create switch configuration files. Required for configuration of Time-triggered and Rate-constrained traffic to support safety-critical real-time systems.
- **TTEEnd System Controller** – the network interface controller enabling processor access to the TTEthernet® data networks. Supports standard Ethernet, Time-triggered and Rate-constrained traffic classes. Interface to the CPU/FPGA over Quad/Dual/Single-SPI or SpaceWire.

Product Availability

- EM (Engineering Model): Q2/2025
- FM (Flight Model for launchers): Q3/2025