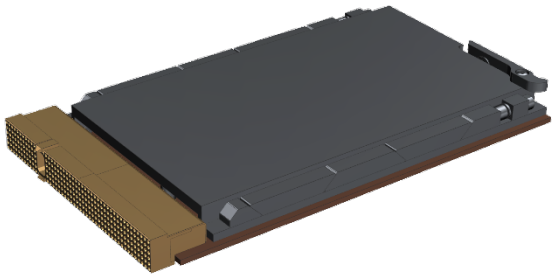
Ensuring Reliable Networks TTTech

TTEEnd System Space cPCI

Space qualified 3-port TTEthernet interface card



Key Benefits

- 3x 1000Base-T/100Base-TX Ethernet ports
- Safe partitioning between IEEE 802.3, rate-constrained and time-triggered Ethernet traffic (SAE AS6802)
- Interfaces TTEthernet to PCI, SPI or SpaceWire host devices
- Fault-tolerant high-speed communication with > 80 % effective bandwidth

The TTEEnd System Space cPCI connects your subsystems to TTEthernet and was specifically designed to meet the challenges of harsh space environments. TTEthernet simplifies the design of complex distributed systems by enabling safe processing of critical and non-critical Ethernet traffic on a single network.

TTEEnd System Space cPCI

The TTEEnd System Space cPCI interface card connects user data-processing hardware to the TTEthernet network. The card is provided in a compact cPCI 3U form factor allowing the reuse in a standard 3U cPCI chassis. TTEthernet permits the use of synchronized and non-synchronized functions of distributed systems in the same Ethernet network. System-critical real-time functions enjoy reserved bandwidth, full determinism and delivery jitter below 1µs. The network can transfer high data rates of non-critical data at the same time – with no impact on critical traffic. This is achieved by a combination of SAE AS6802 time-triggered, rate-constrained and IEEE 802.3 Ethernet. The end system has an internal frame memory of 512kB to buffer incoming traffic.

Host Interfaces

The following host interfaces are supported:

- PCI 32 Bit V2.1 33MHz
- SPI/QSPI up to 250Mbit/s
- SpaceWire RMAP 100MHz

A UART/DSU interface is available for debugging and on-ground configuration.

Built for modular cPCI Architectures

The TTEEnd System Space cPCI was designed for maximum ease of use and reduced development cost. In the development phase, it can be placed in a standard cPCI rack, enabling access to all interfaces via a rear-I/O break-out board. The PCI slave interface can be accessed as specified in the cPCI standard at the connector J1. The power supply is set up according to PICMG 2.0 R3. The other host interfaces and Ethernet signals are provided at the cPCI J2 Connector and can be routed through a customized backplane for each specific use case.

Redundancy

The TTEEnd System Space cPCI supports single to triple channel multi-hop Ethernet networks with

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Application Fields

- Human Space Flight
- Telecommunication
- Earth observation
- Reconnaissance

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system synchronization, redundancy management, fault tolerance, fault isolation and recovery capability. TTEthernet is specifically designed for active-active redundant systems and the handling of redundant frames (e.g. first valid frame, or triple-voting) can be configured for each device. The TTEEnd System Space cPCI supports up to 256 “send” and up to 512 “receive” virtual links which can be separated via the 8 memory partitions.

Device and Network Management

The TTEEnd System Space cPCI provides an integrated LEON2 management CPU to perform data loading and diagnostic services. These internal monitoring functions allow the user to continuously assess the system health and the status of the network. Monitored parameters include synchronization state, supply voltage, board temperatures, dropped/rejected frames and built-in self-test results.

With the TTEEnd System Space cPCI, firmware and network traffic schedule can be updated safely via the TFTP network protocol without interruption of the network service. The internal monitoring data and health state can also be retrieved via SNMP v1 requests.

Product Variants

- Engineering Model (Available Q1/2020): Functionally representative model for laboratory use.
- Flight Model (Available Q2/2021): Design qualified according to ECSS and acceptance tested. Flight-grade model for safety-critical space applications.

Applicable Documents

PICMG 2.0 R3 – compact PCI® specification
S-311-P-822 – NASA specification, Connectors, PWB, 2 mm cPCI™ Style
ECSS-Q-ST-60C Rev.2 – ECSS, Electrical, electronic and electromechanical (EEE) components
ECSS-Q-ST-70 – ECSS, Qualification of PCBs
ECSS-E-ST-40C – ECSS, Software
ECSS-E-ST-10-03C – ECSS, Testing
ECSS-Q-ST-30C Rev.1- ECSS, Dependability

Related Products

- TTESwitch Space cPCI
- TTETools

Connectors	cPCI Connector J1	cPCI Connector J2
	✔ Power Supply (+3.3V) ✔ PCI bus	✔ 3x 1000Base-T /100Base-TX (magnetics not included) ✔ SpaceWire ✔ QSPI ✔ UART/DSU I/F for laboratory use
Lifetime	15 years	
Environmental	**Vibration (random, all axes, qualification test levels):** 20 – 60 Hz: +3db/oct, 60-1000 Hz: 0.273 g^2/Hz, 1000-2000 Hz: -6db/oct **Shock, all axes (qualification test levels):** 100 Hz: 15g, 1000 Hz: 1000g, 2000 Hz: 3000g, 10000 Hz: 3000g **Temperatures (qualification test levels):** Operational range: -35 °C to +85 °C, Storage range: -40 °C to +85 °C **Radiation:** TID for 15 years GEO Missions, all components SEL free up to 60MeV/cm2/mg & SEE tested up to 60 MeV/cm2/mg **EMC** Compliant to PICMG 2.0 R3	
Power supply	Supply voltage: 3.3V (according to PICMG 2.0 R3) Power consumption: < 6W	
Dimensions	3U cPCI form factor (PICMG 2.0 R3), conduction-cooled (ANSI/VITA 30.1-2008)	
Mass	400 g	

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