

TTEnd System Space 3U cPCI (EDU)

TTEthernet® interface card for lab use



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 high bandwidth

The TTEnd System Space 3U cPCI (EDU) connects spacecraft subsystems to the TTEthernet® network and was specifically designed to meet the engineering needs during the development of space applications.

TTEnd System Space 3U cPCI (EDU)

The TTEnd System Space 3U cPCI (EDU) 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 1 μ s. 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 512 kB to buffer incoming traffic. Being manufactured and qualified using consumer-grade processes while providing full space-grade functionality, the card allows for an increased availability during critical development phases.

Host Interfaces

The following host interfaces are supported:

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

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

Built for Modular cPCI Architectures

The TTEnd System Space 3U cPCI (EDU) 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.



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Application Fields

- Human Space Flight
- Telecommunication
- Earth observation
- Reconnaissance

Similarity to Flight Equipment

The TTTEnd System Space 3U cPCI (EDU) is designed to be equivalent to the TTTEnd System Space 3U cPCI (FLIGHT) in function and electrical properties.

TTTEar-I/O 3U cPCI (EDU)

To accelerate the creation of functionally equivalent avionics set-ups, the TTTEar-I/O 3U cPCI (EDU) was developed. It can be used to efficiently interface with the TTTSwitch Space and TTTEnd System Space 3U cPCI (EDU). Placed in a cPCI chassis with a Rear-I/O capable backplane, it provides access to all relevant functional interfaces of the cards, such as Ethernet RJ45 ports, QSPI, SpaceWire, and a debug interface.



Product Variants & Accessories

13866 – TTTEar-I/O 3U cPCI (EDU)

Break-out board, to use the EDU products efficiently in an off-the-shelf chassis.

13586 - TTTEnd System Space 3U cPCI (EDU) - H:

Engineering model for development purposes, form, fit and function equivalent to PROTO/FLIGHT models; equipped with Hypertronics Hypertac connectors.

14033 - TTTEnd System Space 3U cPCI (EDU) - C:

Engineering model for development purposes, functionally equivalent to PROTO/FLIGHT models; equipped with standard COTS cPCI connectors

Applicable Documents

PICMG 2.0 R3 – compact PCI® specification

S-311-P-822 – NASA specification, H-Variant connectors, PWB, 2 mm cPCI™ Style

ECSS-E-ST-40C – ECSS, Software

Connectors	cPCI Connector J1	cPCI Connector J2
	<ul style="list-style-type: none"> ✔ Supply voltage (+3.3 V) ✔ PCI bus 	<ul style="list-style-type: none"> ✔ 3x 1000BASE-T/100BASE-TX (magnetics not included) ✔ SpaceWire ✔ QSPI ✔ UART/DSU I/F for laboratory use
Environmental	<p>Designed for lab environments; do not use for flight environmental loads. Temperature range: Suitable for room temperature range: +15 °C – +35 °C EMC: Compliant to PICMG 2.0 R3</p>	
Power supply	<p>Supply voltage: 3.3 V (according to PICMG 2.0 R3) Power consumption: < 6 W</p>	
Dimensions	<p>3U cPCI form factor (PICMG 2.0 R3)</p>	
Mass	<p>165 g</p>	
Additional product variants	<p>13550 - TTTEnd System Space 3U cPCI (PROTO):</p> <p>13266 - TTTEnd System Space 3U cPCI (FLIGHT):</p>	<p>Flight model design, but with reduced parts and process quality. Design qualified according to ECSS and acceptance-tested. Flight-grade model for safety-critical space applications.</p>

