

100/1000Mbps Space-Qualified PHY for TTEthernet Data Network in Gateway

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Ethernet is becoming more common in spacecraft to enable hardwired communication speed, support higher data rates, and facilitate interoperability between satellites and other spacecraft. As Ethernet in space applications continues to expand, Microchip Technology has introduced a space-qualified Ethernet transceiver.

For decades, Microchip Technology Inc. provides one of the industry's most comprehensive space product portfolios of radiation-hardened and radiation-tolerant solutions, including MCUs, MPUs, FPGAs, memory, communication interfaces, mixed signal ICs and more.

Spacecraft and satellites are expanding in complexity to provide commercial and military operators with robust new communication and data capabilities, greater reliability, and faster speeds, while the operators continuously seek to reduce cost, size, and weight. In this environment, lowering system development costs while enabling greater capabilities and space system integration are even more critical.

The introduction of Ethernet technology for space applications opens-up new perspectives by enabling the use of the same ecosystem well in place in the consumer and industrial sectors. The VSC8541RT is the first radiation tolerant Gigabit Ethernet PHY available today on the market with Single Event Latch-up higher than 78MeV.cm²/mg and TID qualification up to 100krad (Si).

The VSC8541RT is tolerant to radiation thanks to Microchip proprietary hardening technics and is available in either ceramic CQFP68 or plastic VQFN68. The hermetic VSC8541RT is manufactured in compliance with MIL-PRF 38535 class Q or class V requirements: screening testing, qualification testing, and TCI/QCI-specifications. The plastic VSC8541RT is qualified in compliance with the AEC-Q100 automotive requirements, with specific additional tests necessary for space applications.

In the presentation, Microchip will introduce the VSC8541RT, European radiation tolerant Gigabit Ethernet PHY developed in collaboration with the CNES. Microchip will explain the qualification and radiation activities held during the qualification of the product and a review of the ceramic and plastic quality flow will be detailed.

To deploy TTEthernet (reliable deterministic protocol used in Ethernet-based networks) on the multiple mission elements of the Gateway and Artemis program, a need for space grade TTEthernet equipment was identified.

TTTech Aerospace develops TTEthernet network platform devices to enable the design of fault-tolerant and reliable network system architectures for deep space missions.

TTTech will present the usage and validation of Space Qualified PHY in a reference TTEthernet design (SONIC) with preliminary performance test results.

In the presentation, TTTech will explain the reference design of TTEthernet Equipment for Gateway. TTTech will then detail the system architecture as well as the main components of the reference design. Finally, TTTech will present the test setup and the preliminary results achieved.

With Rad Tolerant space qualified Ethernet Gbit PHY implemented in a TTEthernet Equipment reference design, Microchip and TTTech are providing a full system implementation which demonstrates the performances of the Ethernet Physical Layer device. This reference design is a good starting point to enable any TTEthernet system development for space applications like Lunar Gateway communication interface.