SPACE-QUALIFIED 1.25GB/S NANO-TECHNOLOGICAL TRANSPONDER FOR SPACE WIRE OPTICAL/ELECTRICAL INTERCONNECTS

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Long Paper

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ABSTRACT

Achievement of high data transmission rates in space-oriented interconnect systems presents a significant challenge due to tight requirements for their stability in harsh operational conditions. Application of the existing techniques for stability improvement inevitably degrades the achievable speed-power performance. This paper presents a design of a new space-qualified low-power SW-compatible and Ethernet-compatible Transponder ASIC with a 1.25*Gb/s* LVDS (low-voltage differential signalling) serial input/output interfaces and 10-bit wide 125*Mb/s* CMOS parallel input/output interfaces. The presented parameters are achieved through the utilization of a special SCL (source-coupled logic) library of fully-differential basic cells and functional blocks optimized for space environmental conditions. The proprietary high-speed LVDS input/output buffers support the required serial data rate at very low level of power consumption. The selected multiplexation and demultiplexation ratio of 10 is optimal for the handling of 8B10B data encoding. The Transponder is compatible with SFP interface and features a clock multiplication unit on the transmitter side and a clock and data recovery block on the receiver side, which utilize a patented half-rate architecture with improved performance and stability. Three built-in test modes provide a possibility for a detailed self-testing of the part. The Transponder has been fabricated in a 90nm CMOS technology and packaged in a standard 64-pin QFN plastic package. The laboratory tests have demonstrated a reliable operation of the developed transponder in different environments and with the power consumption below 200*mW*.