Dual-Rail Logic Unit in Double Pass Transistor Logic

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Abstract : In this paper we present a low power, low cost differential logic unit (LU). The proposed LU receives dual-rail inputs and generates dual-rail outputs. The proposed circuit can be used in Arithmetic and Logic Units (ALU) of processor. It can be also dedicated for self-checking applications based on dual duplication code. Four logic functions as well as their inverses are implemented within a single Logic Unit. The hardware overhead for the implementation of the proposed LU is lower than the hardware overhead required for standard LU implemented with standard CMOS logic style. This new implementation is attractive as fewer transistors are required to implement important logic functions. The proposed differential logic unit can perform 8 Boolean logical operations by using only 16 transistors. Spice simulations using a 32 nm technology was utilized to evaluate the performance of the proposed circuit and to prove its acceptable electrical behaviour.