LINEAR FEEDBACK SHIFT REGISTER

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ABSTRACT

The VLSI testing is a process that takes place after chip fabrication to detect possible manufacturing defects. Imperfections in the chip fabrication may lead to manufacturing defects. Hence, testing is important. Fault detection is a technique where a fault is sensitized by applying proper test vector values at the primary inputs of the circuit so that an error is generated at a circuit node, and afterwards this error is propagated to primary output to be observed. So LFSR (Linear Feedback Shift Register) is the circuit that generates pseudorandom test patterns which will be used for testing any IC (Integrated circuit). The implementation of CMOS based LFSR circuit is used for producing pseudorandom patterns. An LFSR is a shift register that advances the signal through the register from one bit to the next most-significant bit when clocked. Two or more of the outputs are combined and given as input to the exclusive-OR gate, to form a feedback mechanism.

REFERENCE CIRCUIT DETAILS

In a LFSR, D flip flops are used to form the shift register blocks and the output of few D flip flops is given to an EX-OR gate. Whose output id fed back to the first flipflop. This is called the feedback mechanism. Linear feedback shift registers make extremely good pseudorandom pattern generators. When the outputs of the flip-flops are loaded with a seed value (anything except all 0s, which would cause the LFSR to produce all 0 patterns) and when the clock signal is applied to the LFSR, it will generate a pseudorandom pattern of 1s and 0s. The only signal necessary to generate the test patterns is the clock. A n-bit LFSR produces the maximum number of PRPG patterns possible and has a pattern count equal to $2^n - 1$, where n is the number of register elements in the LFSR. The generation of patterns is done by transition. For example, for a 4-bit LFSR there will be 2^4-1=15 patterns generated and from 16^{th} it will return to its original seed value. The D flipflop used in the shift register can be designed using

REFERENCE CIRCUIT

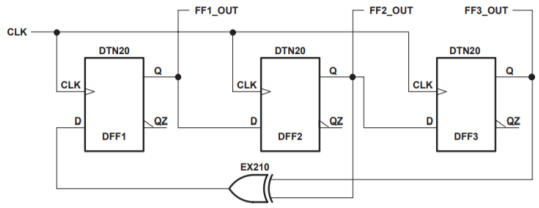


Figure 1: LFSR circuit from TEXAS instruments paper

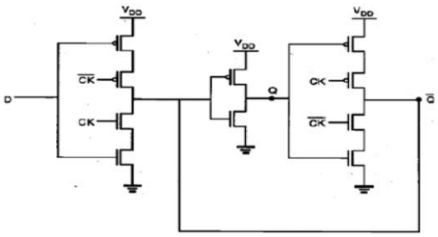
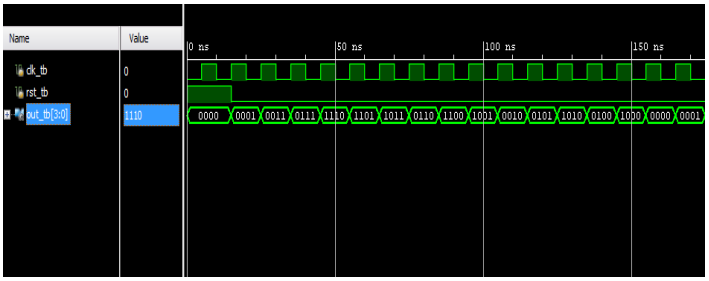


Figure 2: D flip flop, CMOS implementation.

REFERENCE WAVEFORM



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