3-bit Binary to Grey Code Converter using Low Voltage XOR Gates

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***Abstract*—This paper gives an idea of binary to gray code converter. The binary to gray code converter is based on a very common transmission gate technology. For operating at low supply voltages(2V), double pass-transistor(DPL) XOR and XNOR circuits have been developed to improve circuit performance. In this paper, the binary to gray code converter is achieved using such a transistor-based approach. Utilizing 6 transistors in place of the conventional 10, this circuit not only has low-power operational capability, but also a reduced area.**

***Index Terms*—CMOS Transmission Gate, design, CMOS logic gates**

I. Reference Circuit Details

Gray codes are very useful for creating a normal sequence of binary numbers that may result in an error when two successive values differ by only one bit (binary digit). Recognizing Gray codes is very easy since they refer to an ordering of binary numbers in which successive values differ by only one bit.

In a 3-bit binary number, the binary digits will be B2, B1, B0, where B2 is the most significant bit (MSB) and B0 is the least significant bit (LSB). The gray code digits are G2, G1, G0, where G2 is the most significant bit (MSB) and G0 is the least significant bit (LSB) of Gray code.

TABLE I
Truth Table for 3-bit Binary to Gray Code

Binary Code			Gray Code		
B2	B1	B0	G2	G1	G0
0	0	0	0	0	0
0	0	1	0	0	1
0	1	0	0	1	1
0	1	1	0	1	0
1	0	0	1	1	0
1	0	1	1	1	1
1	1	0	1	0	1
1	1	1	1	0	0

The basic building block of the binary to gray code converter is the XOR gate. For an n-bit converter, we require (n-1) XOR gates. Output G0 is the same as input B0. G1 and G2 are the outputs of the successive XOR gates.

II. Reference Circuit

Below is the circuit given.

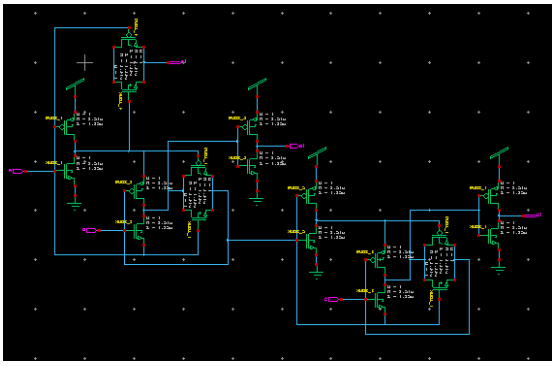

Fig. 1. CMOS-based 3-bit Binary to Gray Code Converter Circuit

III. Waveforms

Below is the waveform given.

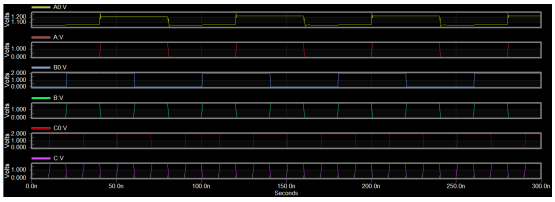

Fig. 2. Reference Waveform

References

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