عنوان مقاله:

Ring Oscillator with Frequency Adjustment and Reconfiguration Capability Using Switched NAND-NOR

محل انتشار:

دوازدهمین کنفرانس ملی مهندسی برق مجلسی (سال: 1402)

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خلاصه مقاله:

In this paper, carbon nanotube field-effect transistor (CNTFET) based ring oscillator (RO) with reconfiguration and frequency adjustment capability is presented. The proposed delay cell in the ring oscillator is based on switched NAND and NOR gates, at each moment of time only one of these cells is activated using the considered switches so that the reconfiguration action occurs in the oscillator structure. Also, by applying a control signal to one of the input terminals of the NAND and NOR gates, the delay characteristic of these cells is changed, and in this way, the frequency adjustment is performed in the proposed oscillator. Three-, five- and seven-stage voltage-controlled ring oscillator (VCRO) circuits were designed based on the proposed delay cell. Based on the simulations made with HSPICE software and the results obtained in ۳۲ nm CNTFET technology and supply voltage of ۰.۸ V, by changing the control voltage and reconfiguration, the oscillation frequency in the ۳-stage VCRO varies from ۱۶.۶۹ GHz to ۴۳.۴ GHz, in the ۵-stage VCRO from ۹.۵۶ GHz to ۲۶.۱۱ GHz, and in the ۷-stage VCRO from ۶.۹۸ GHz to ۱۹.۱۵ GHz. Based on the results, the proposed method in this study leads to widening the range of frequency adjustment. The power-delay product (PDP) was evaluated as a figure of merit in this research and it was observed that the PDP of the proposed oscillators are extremely low compared to the state-of-the-art techniques. This design is very suitable for low power, .multi-standard and frequency spectrum applications in the high frequency (HF) and very high frequency (VHF) ranges

کلمات کلیدی:

Ring Oscillator (RO), Reconfigurable, Carbon Nanotube Field-Effect Transistor (CNTFET), Tunable, Voltage-.(Controlled Ring Oscillator (VCRO), Power-Delay Product (PDP