

Ring Oscillator Using Sky130

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Abstract

The literature survey report show us the design for ring oscillator which can run within low power consumption and is implemented in Application Specific Integrated Circuits. The design uses the concept of CMOS capacitor and also uses a new arrangement of chain delay elements made by using current-starved CMOS inverters. The design uses Sky130 PDK which works on 130 nanometre technology. The circuit is provided with Reference voltage 1 Volt and Input voltage as 1 Volt pulse input. The reference simulated waveform shows us the behaviour of output which is applicable in low power sensing systems used in biomedical, chemical and other regions of expertise.

1 Circuit Details

The design of conventional ring oscillator is made up of odd number of inverters connected in series that form a closed loop path. The stated design uses the similar concept in addition to power switching current starved inverters. The generation of high current is done by the symmetrical load, through which circuit becomes sensitive to very light variations in the input. The circuit is driven by providing the input V_{in} voltage set to 1 Volt pulse input, and reference voltage V_{ref} is set to 1 Volt DC. MOS Transistor sizing is done with ratio of width to length as 240 nanometre to 130 nanometre respectively for nMOS and ratio of width to length as 600 nm to 130 nm respectively for pMOS in ideal conditions. The width of pMOS is double to overcome the drawbacks of pMOS and making pMOS work at almost the same speed as nMOS which in turn makes the resistance lower. If the input voltage is increased then the output of the circuit gets distorted. As the developed design circuit is used in applications which consume low power like biomedical appliances, chemical appliances, the lesser the provided voltage gives us the smoother output. With respect input, the output of the circuit is at the 0.06 percent of the input. For example, considering the input voltage as 1V, the oscillating output ranges between 0.7V to 1V. The output in real time simulation is not as same as the reference waveform, but is affected with high noise when there is transition from lower potential to higher potential.

2 Implemented Circuit

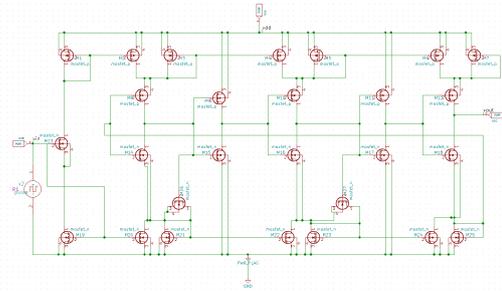


Figure 1: Implemented circuit diagram.

3 Implemented Waveforms

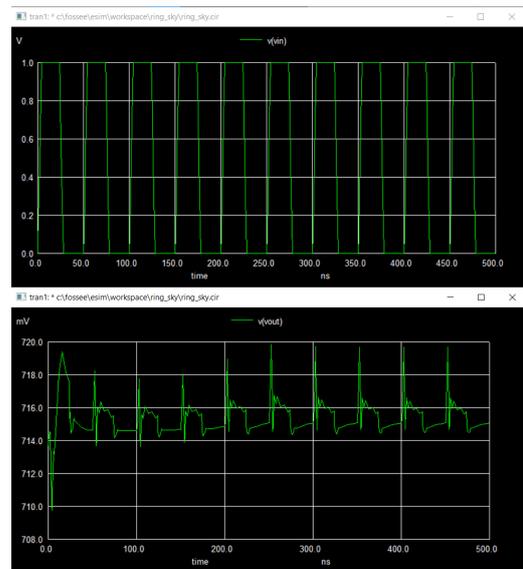


Figure 2: Implemented waveform.

References

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