

# Performance Enhancement of VCO based Ring Oscillator by Increased Inverter Stages

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**ABSTRACT:** In this paper the design and development of ring oscillator is proposed using VCO for high frequency applications. Ring oscillator acts as an inverter. Basically, in ring oscillator the input is connected to next stage and output is connected to output stage. At last the final stage output is fed to the input. Here a reset pulse is given directly to the pulse and no external input is given. Hence compared to the design of ring oscillator the proposed design gives effective result.

**KEY WORDS:** Ring oscillators, System on Chip, frequency, VCO (Voltage Controlled Oscillator), delay.

## I.INTRODUCTION

The size of electronic devices has been greatly reduced after the introduction of the integrated circuit technology. While designing any integrated chip, designers have to take care of some parameters. They are power consumption, speed, silicon area and delay. The technology of complementary metal oxide semiconductor is widely used for constructing the circuits of integrated, as CMOS circuits provide low power consumption & smaller area. To implement any digital circuit, the pairs of both symmetrical & complementary of n-type, p-type are oxides of semiconductor metal of transistors field effect (MOSFET) are used [1].

Because of the various advantages, CMOS technology is widely used in commercial applications. Reliability is another important parameter which is also needed for designing of low power circuit as in [2].

In this era, most of the digital electronic systems show oscillatory behavior. Oscillators have now become the most important devices of all digital, communication systems of whole sight as in [3]. In the oscillator of ring, the complementary metal-oxide of semi conductor, the frequency of output, the inductors of on-chip are controlled easily which it is not required. An oscillator of ring is a loop of closed circuit which consists of stages of a number of odd inverters identical, a circuit of forming feedback.

The last stage of output from the feedback to the causes of input oscillations of desired. To start the oscillations it needs only a supply of energy & then thereafter it to operate on its own. The oscillation of frequency can be changed further either by supplying the voltage of changing the stages of number. The scaling frequency is another important factor in cell phones of low energy computers of mobile. The oscillator Ring is invented by using the designs of Chip System as they occupy the area of fewer chips and thereby it is producing and improving both the cost. If the numbers of even make cells are used, it can generate both in a distinct and the outputs of distinct quadrature. But the performance of distinct noise of oscillators of ring is poor because the quality of low factor as in [5].

The designs of very large scale integration are widely used because of its performance high and becoming apparent need for the manufacture of even smaller designs. Hence, the optimizing scale design of nanometers for the trade-off between the performances of the solution in the circuits of integrated. In the order of having low power supply of over indulgence voltage should be low and maintain the propagation makes slow. In the same way the voltage of threshold should be minimized as.

The signals of all oscillating are seen in electrical systems of different types. An oscillating signal can be used as a clock signal in order to synchronize the digital electronic system of an operation. The signals are used in the communication systems of radio. Electronic oscillators are designed in order to create these signals. There are two main types of oscillators, linear/harmonic and nonlinear/relaxation. A relaxation oscillator is a type of

ring oscillator that contains a number of odd inverters creating alternating between low & high voltage of non-sinusoidal signal. The output of the last inverter is connected to the first inverter; the name “ring” oscillator comes from this detail. Ring oscillators are interesting for many reasons including its design of simple, voltage of low operating. The last reason is especially important; by lowering the consumption of power of clock signal from the whole digital system of energy consumption is lowered. Changing the voltage supply can vary the consumption of the power of oscillator ring, although this will change the circuit frequency

## II. RING OSCILATOR

The inverter cell basic element is inverter cell ring oscillator. The complementary pairs of cell consist transistors of positive channel metal oxide semi conductor, in the same way negative channel metal oxide semiconductor. They are also in the way of symmetric of two cells like channel of length. It is same for both the devices of doping. When the low is input then inverting the output operation gets vice-versa.

The inverter is now almost used in all digital designs. The complex circuit behavior can be determined by estimating the results obtained for the inverters. Using CMOS technology all the digital as well as designs of analog can be fabricated. The combination of MOS transistors is the inverter of CMOS, PMOS, NMOS, where PMOS is called as pull-up network & NMOS is called as pull-down network. NMOS is off. Here PMOS gets on when input is low, by pulling the high transistor and NMOS gets ON when input becomes high, the network of driving becomes down similarly the output low. It is shown in figure 1.

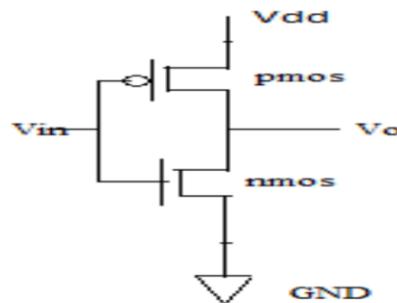


Fig. 1: CMOS INVERTER

In a ring oscillator, the gain stages are connected in a loop that output from the last stage is given to the input of first stage. The circuit must satisfy the Barkhausen criteria in order to provide sustained oscillation, where the circuit should provide unity voltage gain. It must have a phase shift of  $2\pi$ . The DC inversion provides  $\pi$  phase shift and the remaining  $\pi$  phase shift is divided equally among the stages in ring oscillator, so each delay gives phase delay of  $\pi/N$ , where N is number of stages in oscillator.

In digital and analog circuits oscillator of ring (RO) is used in large area. Voltage control oscillator (VCO) is used as recovery of clock circuits. The voltage control oscillator is very important blocks in the frequency of radio communication systems, instruments of musical etc. oscillator is key element in the electronic system to design the Locked Loop of Phase and Digital phase locked loop, the musical instruments of Frequency Cyclotrons, the systems of telecommunication. Designing the circuit in the oscillator which is used for providing the frequency of better performance and the noise of phase improvement. But the inductor implementation is very difficult which is limited by the effect of parasitic. Ring oscillator provides the tuning ranges or the selection of channels.

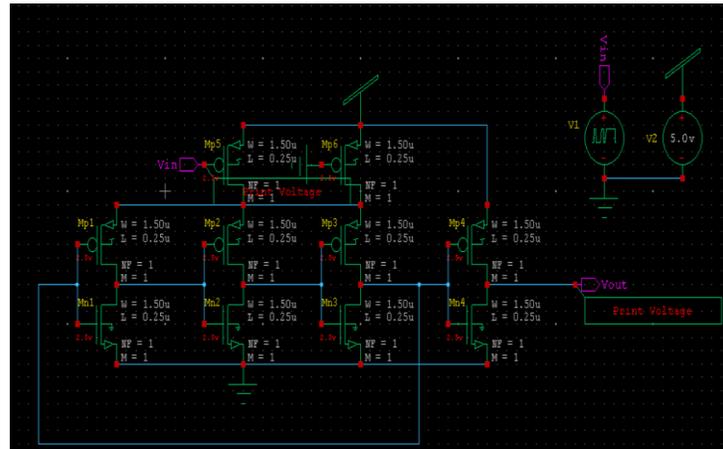


Fig. 2: EXISTED DESIGN

The above figure (2) shows the schematic design of ring oscillator. Generally, in an electronic circuit voltage control oscillator is a part that converts the voltage of input into the frequency of corresponding at the output. Voltage control oscillator is used in the phase locked loops, the digital phase locked loops. The Oscillator has maximum range of tuning phase noise & the frequency. Operating of frequency and the time delay is important in the path of feedback. The designing of reverse osmosis with the different process of complementary metal oxide of semi conductor technology and provide the different result in interest of area this provides the stability increment range of frequency variation optimization, of power and the variation of tuning range. Reverse osmosis consists of an odd number and inverters or stage delay.

### III. PROPOSED SYSTEM

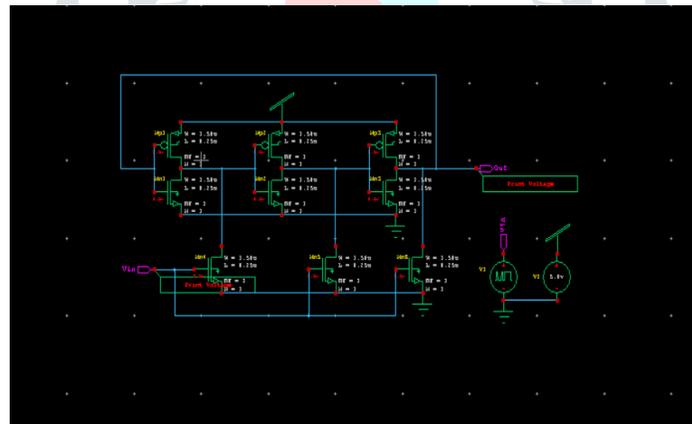


Fig. 3: PROPOSED DESIGN

The below schematic design shows the ring oscillator based VCO. In this the stages of inverter are downwards. Here the one stage of output is fed to the next stage of input. Finally the feedback of output is to the first stage of input. The sufficient supply voltage should be given and reset the voltage of input is applied to the circuit at once, so that the oscillations arise spontaneously. At every stage, the capacitor of an output 500 AF and the load, of a capacitor of 5fF has been used.

Different Oscillations are using in the stages of inverter addition and it provides the same range of frequency. Propagation delay increases the addition of more inverting stages in the circuit. The number of stages is related to the delay of Propagation which adds the oscillation frequency. When a stage of inverting goes beyond nine it is not practically acceptable to the addition. It increases the disappearance of the power circuit. The most important measurable factor is Power in the designing of very large scale integration.

Based on complementary metal oxide semi conductor produces signals of less frequency when the numbers of delay cells are added. Hence it ingests les energy. When hundreds of an inverting stage is added and it gives very low oscillating frequency then it is easy to design and invent. Frequency variation range is several in

voltage controlled oscillator from mega hertz to giga hertz. Voltage controlled oscillator is used to achieve the small frequency range oscillation. It overcomes some problem like manufacturing complexity, power of high consumption and noise of large phase. A good voltage controlled oscillator design more ideal characteristics and satisfy the noise of minimum phase, consumption of lower power, high gain factor and frequency linearity high.

In the design block voltage controlled oscillator is most important in the frequency of radio wireless communication system. It converts the voltage of input into frequency of output. Voltage controlled frequency are of two types one is oscillator of Waveform and the other is oscillator of resonant. Voltage controlled oscillator are having control to hold the range. Voltage controlled oscillator provides circuitry clock for design. It adjusts the phase locked loop frequency filter. It is similar to those frequencies of oscillation reverse osmosis that's controlled by current with the help of inverter. The design of proposed is mainly used to design the phase locked loop. Much reverse osmosis has wafers which acts like line structures of test scribed. The measuring effects are used for manufacturing the process of variation during the wafer testing.

#### IV. RESULTS

The below figure (4) shows the output waveform of proposed design. Here on x-axis time is taken and on Y-axis voltage is taken. From this from first graph it can observe that as the time takes less time then voltage increases to a certain level. In the same way from second graph it can observe that at a particular instant both time and voltage remains constant. Hence from this it can observe that within short period of time voltage is obtained to certain level. The proposed voltage controlled oscillator performs its operation at high speed.



Fig. 4: OUTPUT WAVEFORM

#### V. CONCLUSION

In the design paper of ring oscillator based VCO is implemented. The proposed ring oscillator placed in the PLL for the high speed communication applications. It is observed that the Current suffer design of Ring voltage controlled oscillator is better than the design of basic Ring voltage controlled oscillator. The number of stages in the conventional design increased the order to achieve higher frequencies, of voltage controlled oscillator. Hence the proposed design gives effective result.

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