



Design and Development of CMOS Oscillator Using RKTG Pair Amplifier

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Abstract: In the present investigation we have studied RKTG pair amplifier circuit with proper choice of elements. A new high frequency CMOS oscillator have been developed using RKTG pair amplifier together with additional circuit elements having very small power loss approximately 5 microwatt together with operating frequency range 0.01GHz to 1.47GHz. We have also studied variation of the amplitude of propose oscillator with respect to the time.

Keywords: RKTG Pair Amplifier, Feedback, Frequency response, voltage amplitude, Power losses.

I. Introduction

Now a day CMOS technology has played a major role in development of nano-science and nanotechnology with increased integration of VLSI and ULSI systems [1,2]. Due to large fan-out capability, low power dissipation, very high noise immunity, higher operating speed than NMOS which is compatible to TTL. Thus one can get benefit of high speed of TTL with high density of CMOS with suitable compromise between these two as per applications area [3-5]. Thus CMOS is very useful for rapid development of portable system as laptops; digital wrist watches, pace maker, ECG and high frequency cell phones in coming future which required low power consumption and high density of integrated circuits together with suitable speed. As a result there is need of innovations and development in low power devices and design techniques. In most cases the requirement for low power consumption is demanding goal with high chip density. Hence low power digital design, digital ICs and their simulation is very important field for research and development [6-10]. Seeing above merits of CMOS circuits and devices to achieve ultra low power and very high frequencies, we utilise RKTG pair amplifier recently developed by us to design high frequency oscillator with very low power loss and good temperature stability.

II. Circuit Analysis

The block diagram of RKTG pair proposed oscillator is shown in Fig.1 it consists of RKTG pair amplifier circuit, output circuit and feedback network which provide a close loop system. Fig.2 shows the proposed RKTG oscillator circuit with proper choice of circuit components. The circuit consist of a CMOS as a combination of NMOS (Length=180 nm, width=2 μ m threshold voltage= 800nm) and PMOS (Length=180 nm, width=2 μ m threshold voltage= 800nm) is used as an active component to design the circuit having proper biasing with resistance R1=47 K Ω and R2=10 K Ω . DC power supply (V_{dc}=2V), Drain resistance (dr=10K Ω) input capacitor (C_i=100 μ f), input resistance (R_i=500 Ω), source resistance (R_s= 2K Ω) bypass capacitor (C_s=10 μ f) load resistance (R_l= 80K Ω) and most important component of the circuit having tank circuit with C= 50 μ f and L= 50 μ H. Here we have study the transient analysis with stop time 100ns. All the simulation work have been carried out by cadence software, 180nm technology.

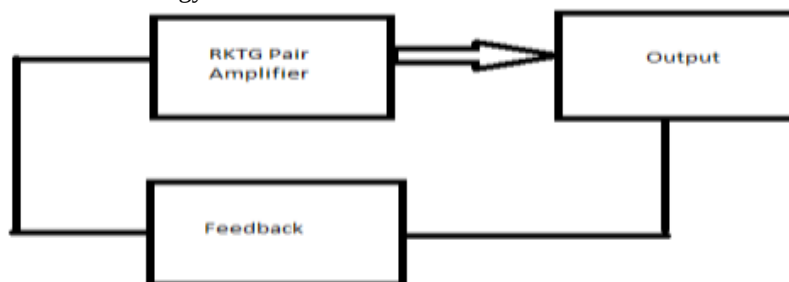


Fig.1 RKTG pair amplifier with feedback network block diagram of proposed Oscillator circuit.

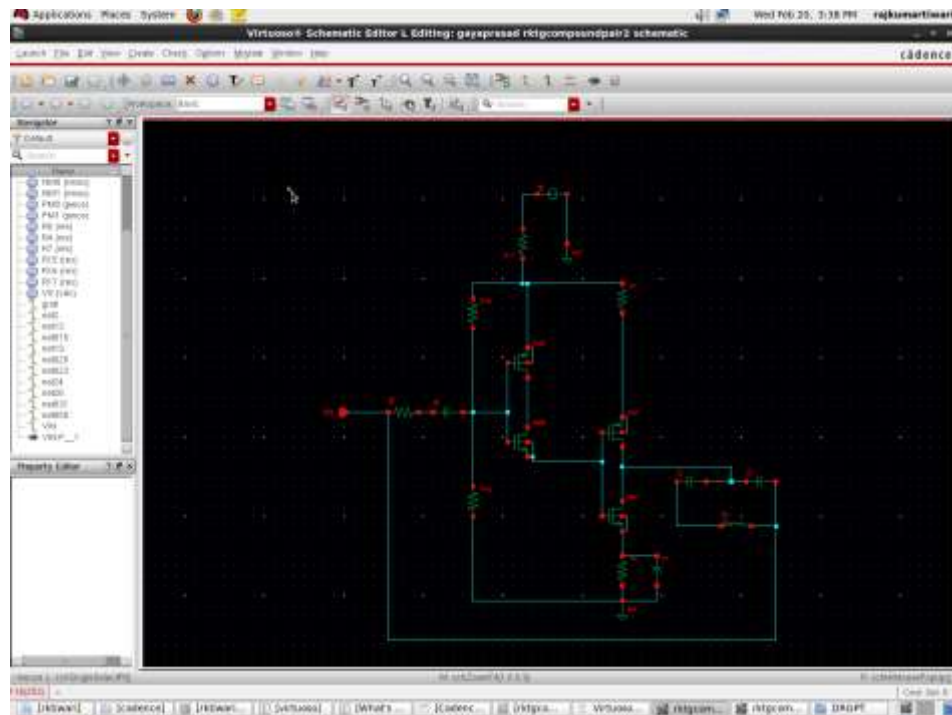


Fig.2 Proposed RKTG pair oscillator circuit.

III. Simulation Results

Proposed RKTG pair oscillator circuit provides good transient response with stop time 100 ns. Simulated result is shown in fig.3. So the proposed oscillator circuit is used with proper choice of component to provide the wide range frequencies. This circuit works at 5 microwatt power dissipation. Table-1 shows the Output voltage variation of RKTG pair oscillator circuit with time. Table-2 shows the Output voltage variation of RKTG pair oscillator circuit at with frequency.

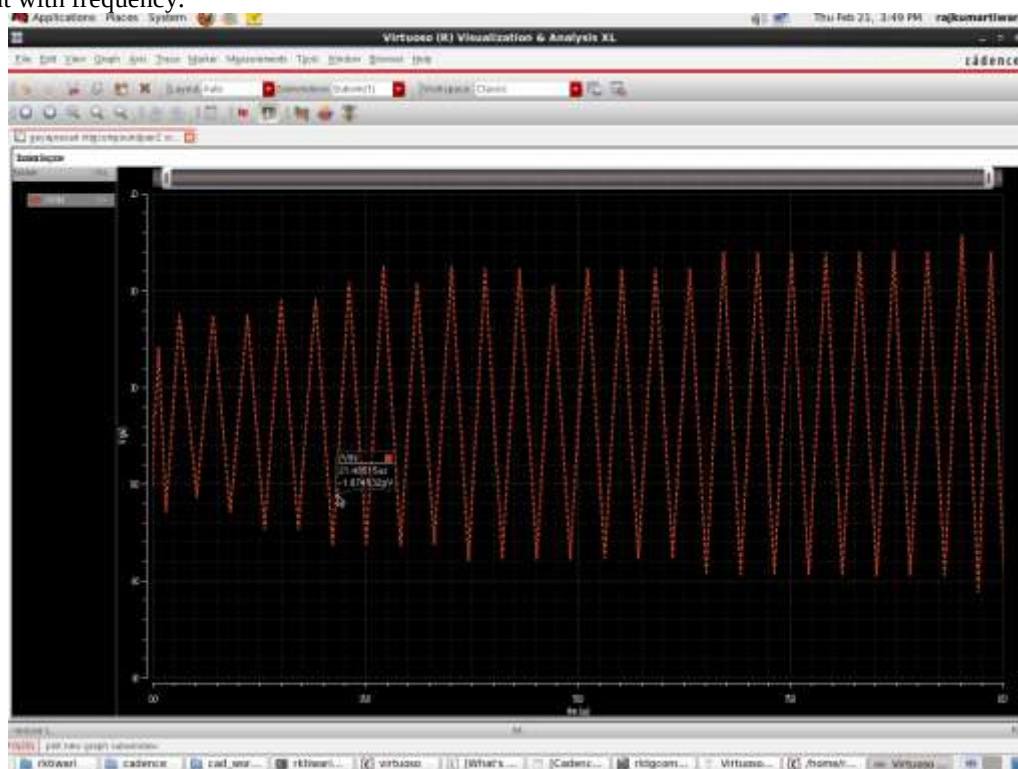


Fig.3 Output of RKTG Oscillator with time in nano second range.

V. Table

Time(ns)	0.6793	21.5312	22.8554	23.1372	67.1005	75.1453	95.1060	100.0000
Amplitude(nv)	8.7419	17.1122	19.1246	20.8136	20.6405	20.2087	20.2596	20.2135

Table:1 Variation of amplitude voltage with respect to time in RKTG pair oscillator.

Frequency(GHz)	0.010	0.011	0.013	0.014	0.042	0.043	0.046	1.472
Amplitude(nv)	20.2135	20.2596	20.2087	20.6405	20.8136	19.1246	17.1122	8.7419

Table:2 Variation of amplitude voltage with respect to frequency in RKTG pair oscillator.

VI. Conclusion

From above discussion it is concluded that the RKTG pair circuit played an important role with proper choice of the circuit element. The circuit work as an oscillator circuit for higher frequency with five microwatt power dissipation which can be useful for 5th generation mobile communication system in coming future and various communication system. Thus solving real challenges in the future we have designed and simulated RKTG pair circuit with the addition of few other circuit elements to yield high frequency high speed with low power loss oscillator with wide band of frequencies upto 1.472 GHz which may be extended upto 135 GHz or more for which further work is going on. It is seen that such circuit are useful for functional integration rather scale integration.

VII. Acknowledgments

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VIII. References

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