

RC Phase Shift Oscillator using FET

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Abstract

A RC phase-shift oscillator also known as sinusoidal oscillators is a linear electronic oscillator circuit that produces a sine wave output. The feedback network involves an inverting amplifier element such as a transistor or op amp with its output fed back to its input consisting of resistors and capacitors in a ladder network. The transistor used here is N-MOSFET. The requirements for oscillation are that the loop gain should be greater than unity and the RC stages is calculated so that the total phase shift is exactly 180 degrees. Therefore, the phase shift between input and output should be 360 degrees. Phase Shift oscillators are used in many applications like audio oscillators, Sine wave Inverter.

2 Implemented Circuit

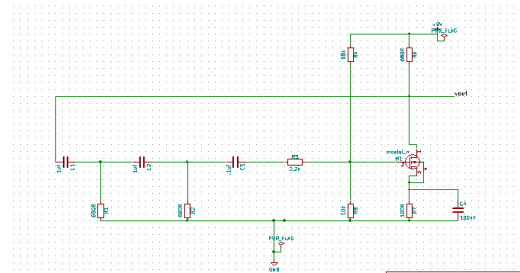


Figure 1: Implemented circuit diagram.

3 Implemented Waveforms

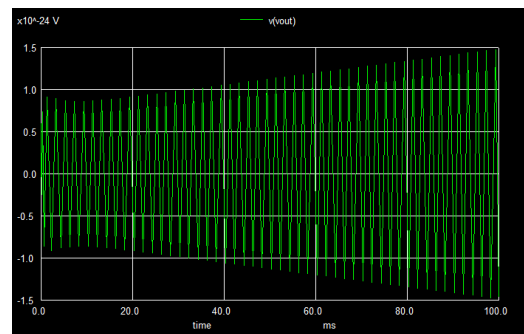


Figure 2: Implemented waveform.

1 Circuit Details

To create oscillation and sine wave output we need an active component, either Transistor or Op-amp in inverting configuration, and we need to feed back the output of those components to the input through the three pole RC network. It will produce a 360-degree phase shift at the output and produce a sine wave. To build the circuit we need the following things 1. Breadboard 2. 3 pcs of .1uF ceramic capacitors 3. 3 pcs of 680R resistor 4. 2.2k resistor 1 pc 5. 10k resistor 1 pc 6. 100R resistor 1 pc 7. 68k resistor 1 pc 8. 100uF capacitor 1 pc 9. BC549 Transistor 10. 9V power supply The output is provided as the input of the RC-networks which is again provided across the base of the transistor. If By cascading there RC network, we will get 180-degree phase shift. The RC networks are providing the necessary phase shift in the feedback path which is again altered by the transistor. The Phase shift oscillator can be made as variable phase shift oscillator which can produce a wide range of frequencies depending on the pre-set value determined. This can be done easily by changing only the fixed capacitors C1, C2, and C3 with a triple gang variable capacitor. Resistor value should be fixed and same in such cases. The initial starting point of the sinusoidal wave is 0 degree in phase and if we identify each positive and negative peak and 0 points, we will get 90, 180, 270, 360 degree phase. So, when a sinusoidal signal starts it's journey other than the 0-degree reference, we call it phase shifted differentiating from 0-degree reference.

References

- [1] R.V.Patron. Rc phase shift oscillators. https://www.researchgate.net/publication/325127555_RC_Phase-Shift_Oscillators.