

TITLE : Design and analysis of Crystal Oscillator using an Operational Amplifier

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Problem Statement :

Design and simulate the crystal oscillator using an op-amp in eSim which should produce sinusoidal output with high stability at a target frequency which is fixed by the crystal. Design that can provide a reliable start up, low power dissipation and least frequency drift at high accuracy and low distortion for the timing and communication applications, is expected.

Abstract :

Oscillators are a critical element of electronic systems and commonly employed for signal generation, timing, and communication. In this project we design and simulate a crystal oscillator using Op-Amp in eSim. Through use of the crystal's frequency-selective properties, the circuit provides an extremely stable and accurate sinusoidal waveform, with much less frequency drift over a wide range, than what can be achieved with a LC or RC oscillator. The op-amp offers the gain and worth shift essential to meet the Barkhausen criteria for oscillatory-driving and the crystal, providing exact frequency regulation. The emphasis is on low power dissipation, reliable start-up, low distortion, and frequency accuracy, making it suitable for practical applications like microcontroller clocking, communication systems and instrumentation. Simulated results will verify the stability and the quality of the output wave and the power efficiency.

Proposed Circuit :

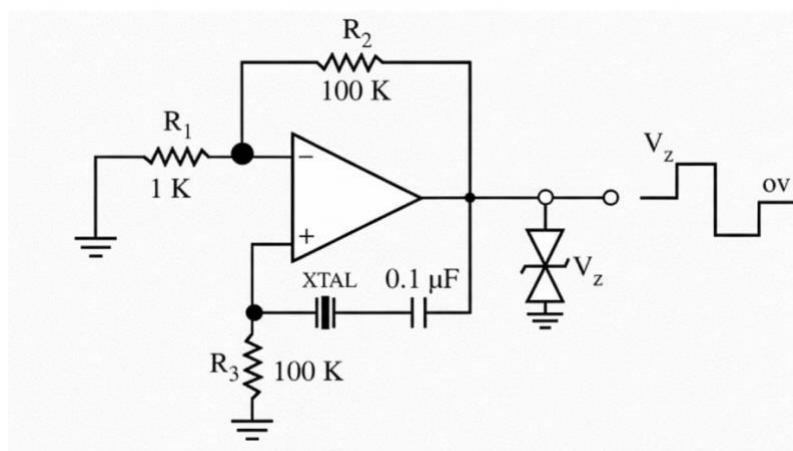


Fig 1 : Implementation of Crystal Oscillator

Refernces :

- 1) M. T. Abuelma'atti and A. Al-Ghazwani, "New quartz crystal oscillators using the current-feedback operational amplifier," Int. J. Electron., vol. 87, no. 5, pp. 547–555, May 2000.
- 2) "Op-Amps and Linear Integrated Circuits" – Ramakant A. Gayakwad.