

# A High Frequency Piezo-Electric Oscillator with Negative Resistance Enhancement Circuit

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In this paper, we have proposed a new piezo-electric oscillator circuit for the use in the frequency range from 100MHz to 1.24GHz. Fig. 1 shows the schematic diagram of the proposed oscillator circuit. A colpitts crystal oscillator is composed of transistor  $Q_1$ , capacitor  $C_A$ ,  $C_B$ , and a crystal resonator. The circuit surrounded by dotted line is a two stage common-emitter amplifier. The signal picked up at the emitter terminal of the colpitts oscillator is amplified by common-emitter amplifier and fed back to the base of the colpitts oscillator with adequate phase shift. The gain of the common-emitter amplifier at higher frequency is enhanced by adjusting the impedances of the parallel circuit of  $R_{E2}$ ,  $C_{E2}$  and  $R_{E3}$ ,  $C_{E3}$ .

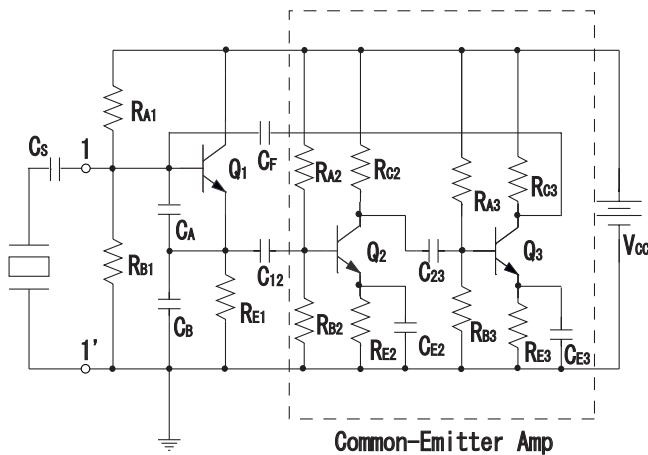


Figure 1: Proposed oscillator circuit.

The oscillator is designed at 311MHz and its performance is examined by simulation. Fig. 2 shows the frequency characteristics of the small signal negative resistance of the proposed oscillator comparing with that of a conventional colpitts oscillator. The same circuit parameters of a colpitts oscillator are used. The negative resistance of the proposed oscillator becomes sixteen times of that of the colpitts oscillator. Furthermore, the proposed oscillator is designed for 622MHz, 933MHz, 1.24GHz. Fig. 3

shows the frequency characteristics of the negative resistance of each oscillator. Each oscillator shows sufficiently large negative resistance at the designed frequency. Therefore, the proposed oscillator circuit is thought to be useful for the piezo-electric oscillator in the frequency range between 100MHz through 1.24GHz.

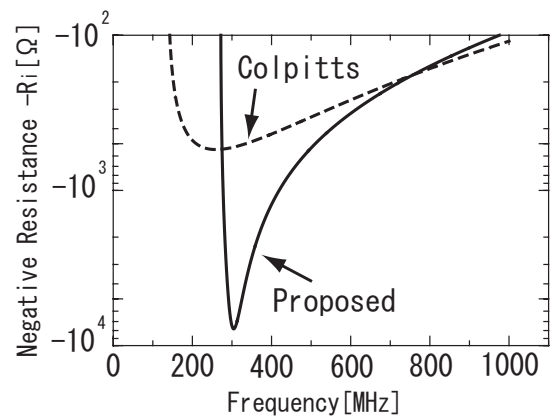


Figure 2: Negative resistance of proposed oscillator.

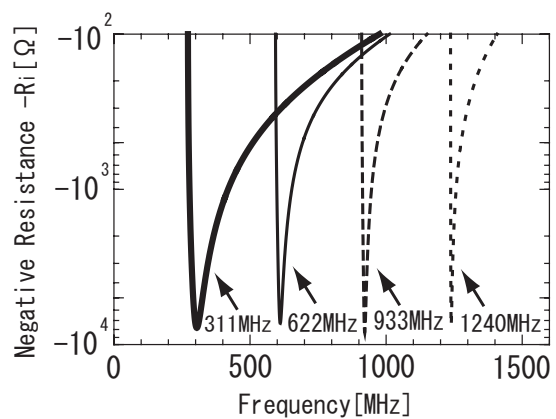


Figure 3: Frequency characteristics of negative resistance of proposed oscillator designed for 311MHz ~ 1.24GHz.