Enhancement in oscillating frequency from FSK signal using CCCII+ Oscillator

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Abstract: This paper presents the increase in oscillating frequency using CCCII+ oscillator with minimum voltage less than ±1.5V

Key words: FSK (Frequency Shift Keying), oscillating frequency, CCCII+ oscillator

1. Introduction:
The first conveyor oscillator was proposed by in 1975 and was effectively limited to the audio frequency range, exhibition linked sustainability in the two conveyor form and also requiring extensive component matching in the single conveyor version.

![Block diagram of clocked CCCII+ Oscillator](image1)

Fig 1: Block diagram of clocked CCCII+ Oscillator

The fig 1, shows the CCCII based oscillator with C1=C2=10pf, R=5kΩ. The biasing current Ib=17uA, for which the frequency of oscillation is given as

\[ \omega = \frac{1}{2\pi RC} \]

(1)

Where: \[ R = \frac{C1+C2}{C1C2} \]

According to the analysis, firstly biasing current is applied (un-clocked CCCII+) to get the desired oscillations, fig 2

![Simple Oscillations (un-clocked CCCII)](image2)

Fig 2: Simple Oscillations (un-clocked CCCII)

The above waveform is taken with respect to time for oscillations up-to 2u seconds. The frequency is found to be 11MHZ. It is clear that the maximum amplitude for above oscillations is 0.64V which is less than the supply voltage i.e ±1.5V, also the total harmonic distortion (THD) =28%. After generating the oscillations, a clocked biasing current is applied with a time period of 2us and the transitions occur up-to 4u seconds, fig 3

![Clocked Oscillations](image3)

Fig 3: Clocked Oscillations

Oscillations, according to the analysis have the maximum output voltage is found to be same as when the oscillator was un-clocked i.e 0.64V. Therefore after applying a clocked biasing current, the oscillations are also occurring according to the clock with a biasing current of 17uA but now the total harmonic distortion increased to 73%.

2. Frequency Shift Keying (FSK)

For generating FSK signal the transition of a clock pulse is taken from 20uA to 60uA, Fig 4.

![FSK Signal](image4)

Fig 4: FSK Signal

From fig 4, there are two frequencies for each transition but still the amplitude is not fixed for the two transitions of clock pulses. So in order to keep the amplitude constant, biasing transistors length is varied to 0.7µm, fig 5. For the first clock the frequency is calculated to be 15MHz and for next clock pulse that is after 1µs the frequency is calculated to be 9.74MHz. THD=34%

![FSK with two different frequencies](image5)

Fig 5: FSK with two different frequencies
3. Conclusion
This paper shows the comparison of clocked CCCII oscillation and FSK. With a biasing current of 17µA, the oscillating frequency is found to be 10.4MHz. For FSK a high frequency of oscillation 20.4MHz is predicted with a biasing current ranging from 20µA-60µA. So, in order to increase the oscillating frequency, FSK technique is used due to which THD is reduced to 43% as the length of the biasing transistor is increased to 0.7µm.

Table 1: Conclusion

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<th>Oscillations</th>
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<th>Frequency of Oscillation</th>
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<td>Clocked Oscillations</td>
<td>0-17µA</td>
<td>10.4MHz</td>
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<td>FSK</td>
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<td>20.78MHz</td>
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References