Crystal Oscillator with the CD4060

Vishwas Narendra Puniya
LMU Munich

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Abstract

This report presents the design and operation of a crystal oscillator circuit using the CD4060 IC. The circuit use a 1.8 MHz crystal to establish a stable frequency reference, which is then internally divided to provide multiple lower frequency outputs. The oscillator is configured with external components, including a resistor-capacitor network and the crystal, to ensure stable oscillations. Such a design is widely used in applications requiring precise timing, such as clocks, timers, and frequency generators, due to its simplicity and accuracy.

1 AIM

To design and implement a crystal oscillator circuit using the CD4060 IC, demonstrating its functionality and applications in generating stable frequencies.

2 APPARATUS

- CD4060 IC
- 1.8 MHz Crystal Oscillator
- Resistors (1MΩ, 10kΩ)
- Capacitors (10pF, 33pF)
- Breadboard and connecting wires
- otherbasic electronics components

3 circuit diagram

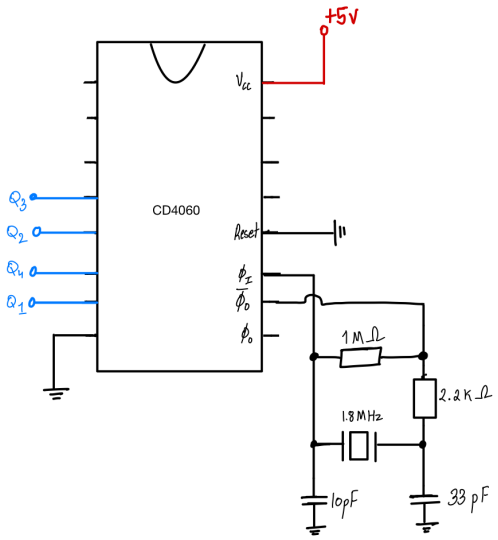

Figure 1: Circuit Diagram of the Crystal Oscillator using CD4060

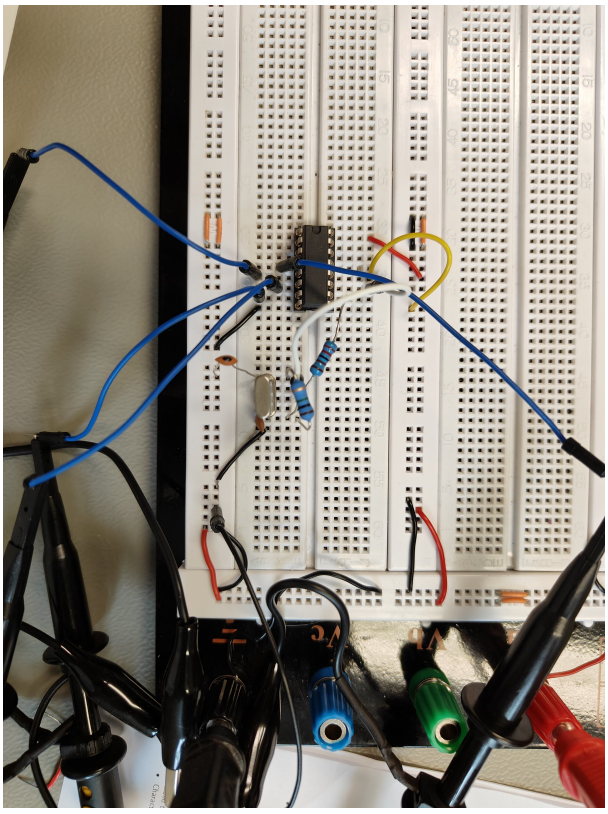

Figure 2: Crystal Oscillator using CD4060 on Breadboard

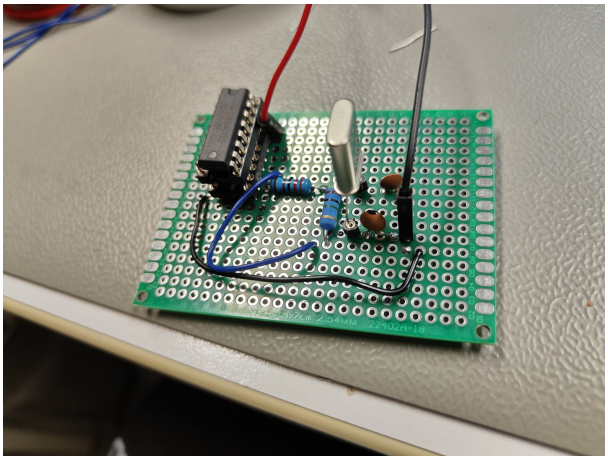

Figure 3: Crystal Oscillator Circuit on PCB

4 Working

The circuit employs a CD4060 IC, which integrates a 14-stage binary ripple counter along with an internal oscillator. The external crystal oscillator, connected to the ϕ_i and $\overline{\phi}_o$ pins, establishes a stable oscillation frequency of approximately 1.8,MHz. This frequency is determined primarily by the crystal, with fine tuning influenced by the external resistors and capacitors.

Once oscillations are initiated, the CD4060 feeds this clock into its internal binary counter stages. Each stage effectively divides the frequency by two, resulting in a series of outputs with progressively lower frequencies. The first few outputs provide frequencies as follows:

- Q_1: divides by 4, resulting in approximately 450,kHz.
- Q_2: divides by 8, yielding approximately 225,kHz.
- Q_3: divides by 16, giving approximately 112.5,kHz.
- Q_4: divides by 32, producing approximately 56.25,kHz.

These square wave outputs can be used in timing, clock generation, or sequencing applications. The reset pin can be pulled high to asynchronously clear the counter and restart the division sequence. Thus, this simple configuration provides a robust method to generate multiple stable lower-frequency clock signals from a single high-frequency crystal source.

5 RESULTS

The crystal oscillator circuit was successfully implemented using the CD4060 IC. The output frequencies were measured and confirmed to be as follows:

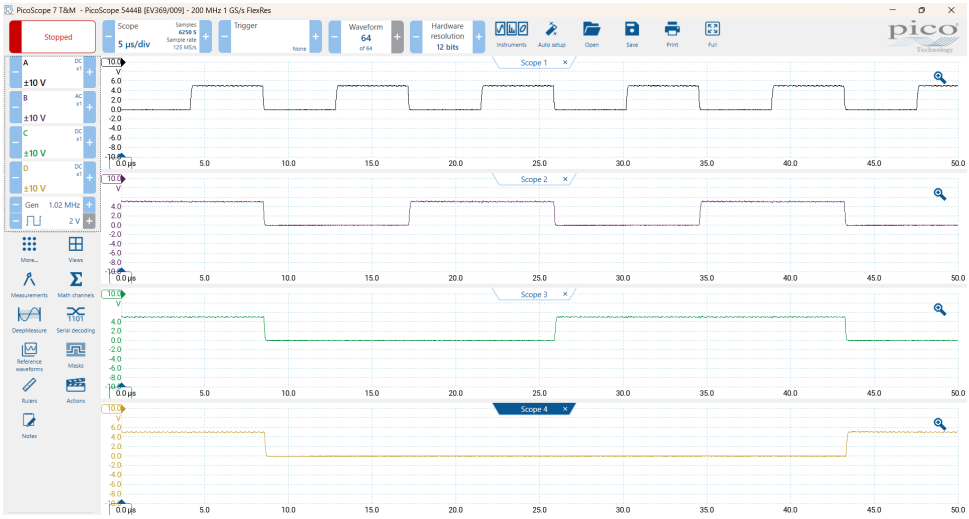

Figure 4: Output Waveform of the Crystal Oscillator

6 Conclusion

this report demonstrates the design and operation of a crystal oscillator circuit using the CD4060 IC. The circuit effectively generates stable frequencies, with the 1.8 MHz crystal providing a reliable reference(even without the perfect crystal oscillator of 1024 KHz)