CD4060

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What is IC CD4060

- CD4060 IC is a 14-stage counter and counter is a binary ripple carry type.
- It is a CMOS logic-based binary counter belonging to a CD4000 series of integrated circuits.
- It consists of a 14-stage ripple carry binary counter along with an internal oscillator.

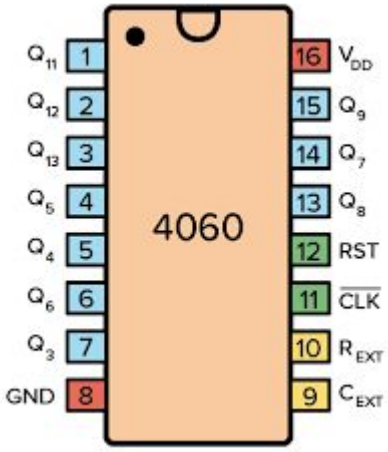
CD4060 IC Features

- Schmitt triggered inputs which allows unlimited rise and fall times.
- Fully Static operation with buffered inputs and outputs.
- Counting range: 0 to 16383 (In decimal)
- Maximum Clock Frequency is 30MHz at 15V.
- Medium speed operation: 8MHz typ. at VDD = 10V.
- Pins and function compatible with TTL series.
- Reset Propagation Delay: 25ns at 5V
- RC Oscillator Frequency of 690kHz Min. at 15V.

Pin Configuration

- Pin number 1, 2, 3, 4, 5, 6, 7, 13, 14, 15 i.e Q11, Q12, Q13, Q5, Q4, Q6, Q3, Q8, Q7, Q9 respectively are the output pins.
- Pin number 8 - is the ground of the IC.
- Pin number 9 - is for External connection with capacitor for setting clock frequency.

- Pin number 10 - is for External connection with resistor for setting clock frequency or Oscillator pin.
- Pin number 11 - Clock pulse for setting frequency of clock.
- Pin number 12 - is to Reset the value of counter to 0 and disables the oscillatorPin number 16 - Is the Vcc of IC.



Pinout of IC CD4060

Application of CD4060

- CD4060 is an oscillator and counter IC with 14 outputs and can be used in applications that require discrete and accurate variable time delays.
- Where The first 4 pins Q0 Q1 Q2 and Q10 are not visible on the IC but they are internally used.
- It can also be used for acquiring high grade and accurate oscillations of frequencies.
- It is best for use in timing applications.

Working Principle

- The CD4060 IC has an in-built oscillator module.

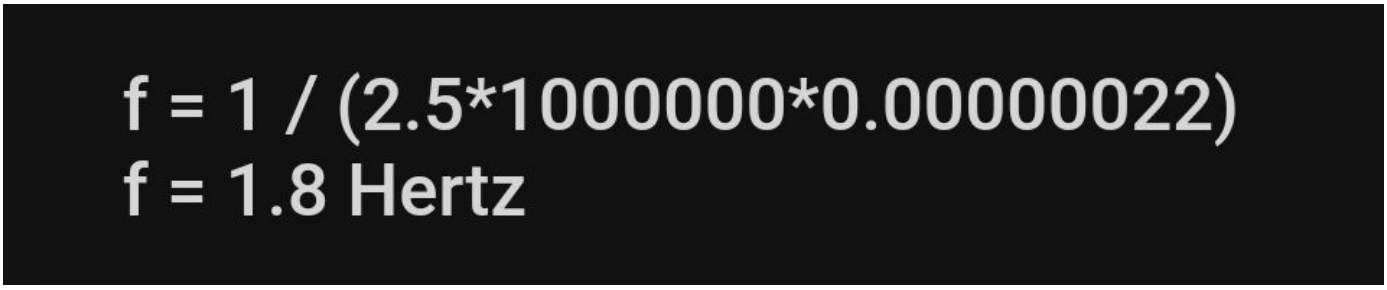
- As it is a binary counter, therefore on every negative transition of clock pulse, the counter value gets incremented by 1 in binary numbers.
- The reset input should always be grounded or connected to the negative power supply. If a positive signal (1 or HIGH) is applied to this input, it will reset the counter or oscillations to start from beginning.

> *Setting up the Frequency*

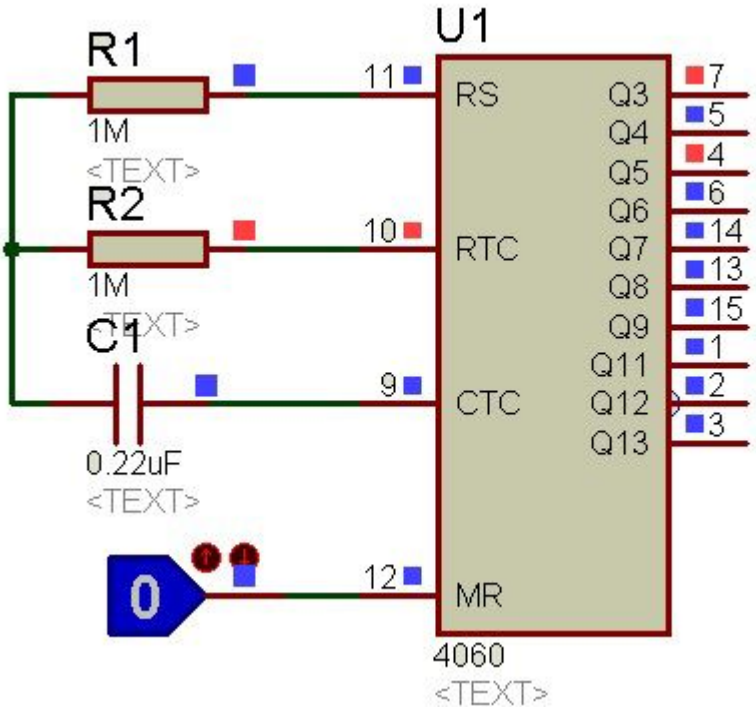
- CD4060 has an inbuilt oscillator whose value is determined by the external capacitor connected to pin 9 and resistances connected to its pin 10 and pin 11.
- Time delay can be changed by varying the value of capacitor or resistor. The value of the resistor at pin 11 should be roughly 10 times that of pin 10 resistor's value and the free ends of all these components are joined together. The formula for finding the oscillation frequency is:

Frequecy Of Operation

- For example, we use R1=1M ohm and C1=0.22uF. Now, let's put these values into frequency formula:



Example



Ckt made with proteus demonstration software

- Therefore, with these capacitors and resistor values, the clock frequency is 1.8Hz.
- In the same way, the clock period is 1/f that is 1/1.8 = 0.56 Seconds. But all output pins states will not change according to this time period.
- However, they will change state in multiple of this oscillator time period.

> *How to calculate timing of Output pin?*

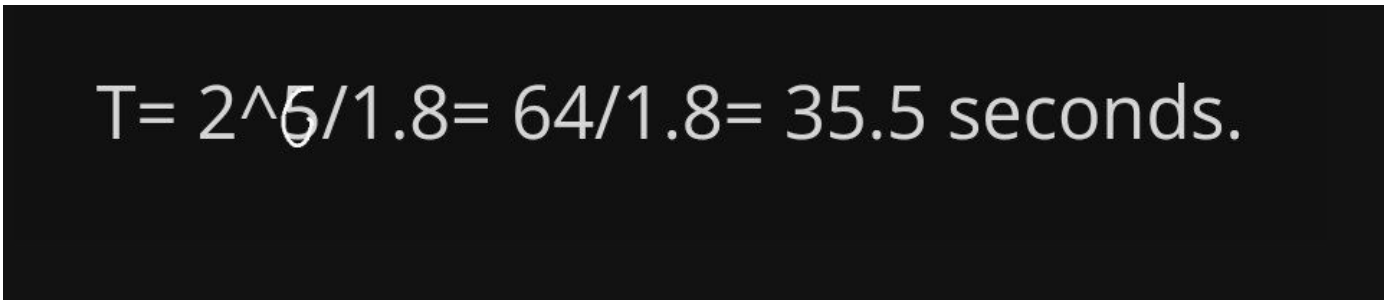
- The frequency of each output pin of CD4060 obtained will be double the previous one. If the frequency at pin 3 is 4Hz, then at pin 2 it will be 8Hz and so on. In addition to it, we can calculate the time period of each pin by this formula:

$$T = 2^n / fosc$$

Timing Formula To calculate for each pinout

- In this formula, fosc is the frequency of the oscillator. Also, n is an output pin number.

- For example, if we want to determine the transition time of pin Q6. Consequently, n will be equal to 6. Now just put these values in above formula.
- We get



Time for output pin Q6

> *CD4060 Applications*

- Timers
- Time Delay Circuits for creating long time delays.
- Frequency divider.
- counter circuit.

> *Time Delay Circuits for creating long time delays will be explained in next part click here : https://telegra.ph/CD4060-as-Time-Delay-Ckt-02-22*