A REPORT ON
IC CD4033

Let's discuss some useful terms:

1. **Decoder:** It takes certain digital coded inputs and decodes it into required output. For example; IC CD4033 decodes the input signals into 7-segment display output.

2. **Clock signals:** It is a signal that oscillates between a **HIGH** and a **LOW** states produced by clock oscillator and is used like a metronome (a device used to mark time at certain rate by giving ticks). These type of signals are mainly used in synchronous digital electronic circuits.

3. **7 segment display:** It is an electronic device used in most of the digital equipment for converting digital signals into a form that all can understand. About this we had already learnt earlier in this project.

4. **Counter:** In digital logic and computing, a counter is a device which stores (and sometimes display) the number of times a particular event has occurred. Counters are a very widely used component in digital circuits.

5. **Johnson counter:** A Johnson counter is a modified ring counter in which the output from the last **FLIP FLOP** is inverted and fed back as an input to the first. It is also called as INVERSE FEEDBACK COUNTER.

6. **Flip Flop:** A flip flop is a circuit that has two stable states and can be used to store state information. The circuit can be made to change state by signals applied to one or more control inputs and will have one or two outputs. It is the basic storage element in sequential logic.

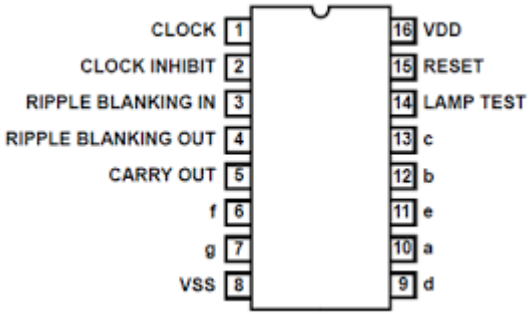
INTRODUCTION

CD4033 is a **JOHNSON COUNTER IC** commonly used in digital display. It is used in digital display. It is a 5-stage Johnson decade counter/divider with a decoder which converts the Johnson code to a 7 segment decoded output. It means it will convert the input into numeric display which can be seen on **7 segment display** or with the help of **LED's** or any other digital display components. It consists of 16 pins.

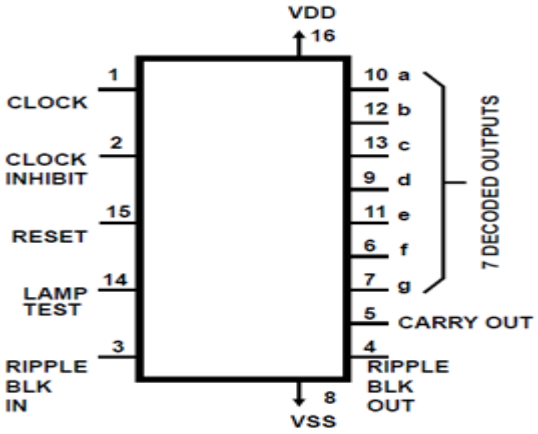
Advantage of this IC is it can be operated at high voltage of 20V. But it is highly sensitive. It can detect **EMF** present in the atmosphere and is sensitive to static charge also. It can detect earth leakage, switch board faults etc….

When you touch your finger at input terminal of it, its counter gets started. Therefore, care should be taken while using it. It can be used in various applications like in 7 segment decimal display circuit, in clocks, timer etc…It is also used to build **FREQUENCY COUNTER** about which we would study later in this project.

WORKING



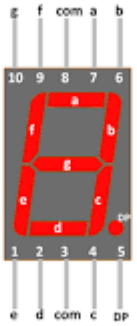
TOP VIEW OF IC CD4033



FUNCTIONAL DIAGRAM OF IC CD4033

1. **PIN 1 known as CLOCK IN:** It receives clock signals, and at every positive clock counter advances one by one. You can provide clock with the switch, **555 TIMER** or with the help of logic gates.

2. **PIN 2 known as CLOCK INHIBIT:** CD4033 counter advances one by one by receiving positive pulse at this time clock inhibit pin should be grounded. If it is connected to supply than counter advancement will be no meaning of clock pulse.
3. **PIN 3 and PIN 4 knowns as RIPPLE BLANKING IN and RIPPLE BLANKING OUT:** It is only used to display only one zero blanking the other zero. For this IC have ripple blanking in and ripple blankig out. For example you want to display 345 and you are using 7 segment display then it will display 00345 if blanking input and output is OFF. But if it is ON then we will receive 345. It improves the readability of the circuit.
4. **PIN 5 known as CARRY OUT:** It is used to complete one cycle for every 10 clock input cycle and it used to cascade more IC's.
5. **PIN 6 ,PIN 7 and PIN 9 to PIN 13:** These 7 decoded output from A to G used to illuminates the corresponding segment of 7 segment display to display the diagit from 0 to 9.



6. **PIN 14 known as LAMP TEST:** It is used to check that all segments of 7 segment is working properly or not. For testing momentarily make the pin LOW.

7. **PIN 15 known as RESET:** It is used to reset the counter. When it receives HIGH it clears the counter and counting again starts from 0. One important thing reset pin should again made LOW to start the counter once again.
8. **PIN 8 known as GROUND(VSS) and PIN 16 known as VDD:** It should be connected to power supply.

OPERATION:

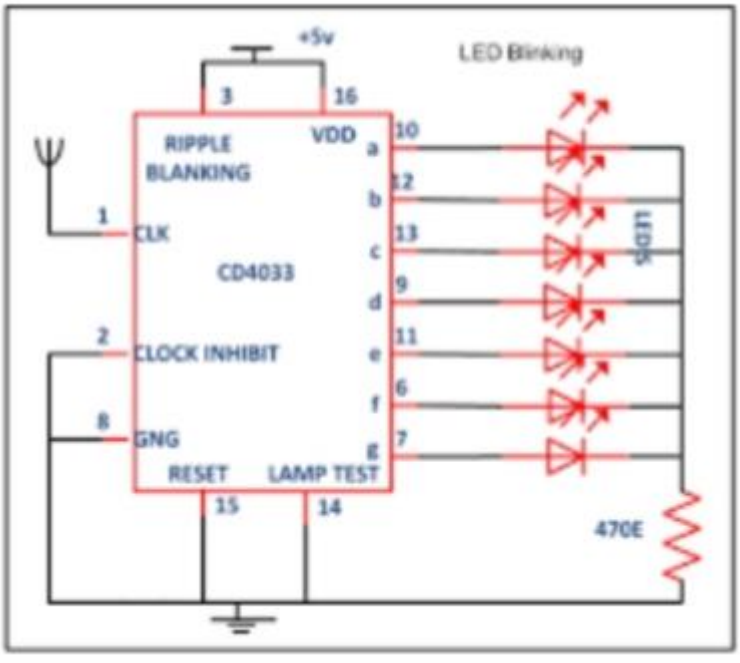
Maximum clock frequency is **5MHz** at **10 volts** and **2.5MHz** at **5 volts.** Total current at **1MHz** clock rate with unloaded output is **0.4mA** at **5 volts** and **0.8mA** at **10 volts**. In normal operation, the reset and clock enable pins are set to ground and the counter advances one count by every negative to positive transition of the clock pulse. The counter resets if the reset pin is HIGH which results in all 7 outputs to LOW and reset pin must be grounded again for restating the counter.

Let us understand the working of IC CD4033 with some example circuits:

1. **By interfacing IC CD4033 and LED's:**

This circuit is known as **RADIATION SENSOR.** The circuit shown below can be used to detect the electromagnetic radiations or EMF present around it. The radiations may be from TV, computer etc….

Working of this circuit is so simple. Whenever it detects radiations it receives clock at PIN1 and its counter starts glowing and the cycle repeats till the reset pin receives HIGH at its input.



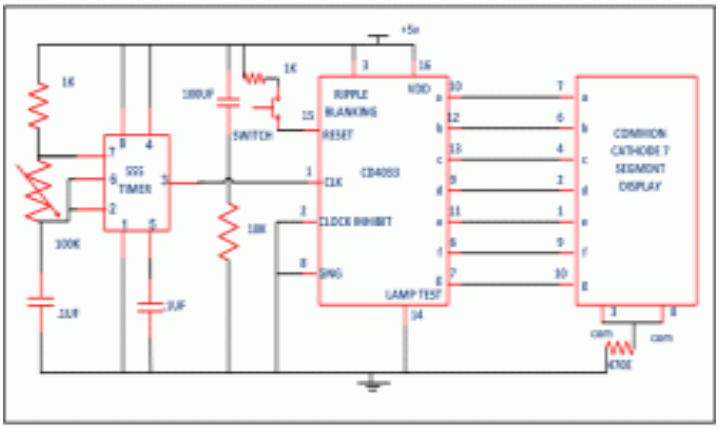
Here, the input is a sensitive Schmitt trigger and readily accepts pulsed electromagnetic radiations. This circuit detects radiations even from 2 feet distance. It also detects AC in wires and lightning strikes etc…

Finally, it is a very useful component in synchronous digital electronic circuits.

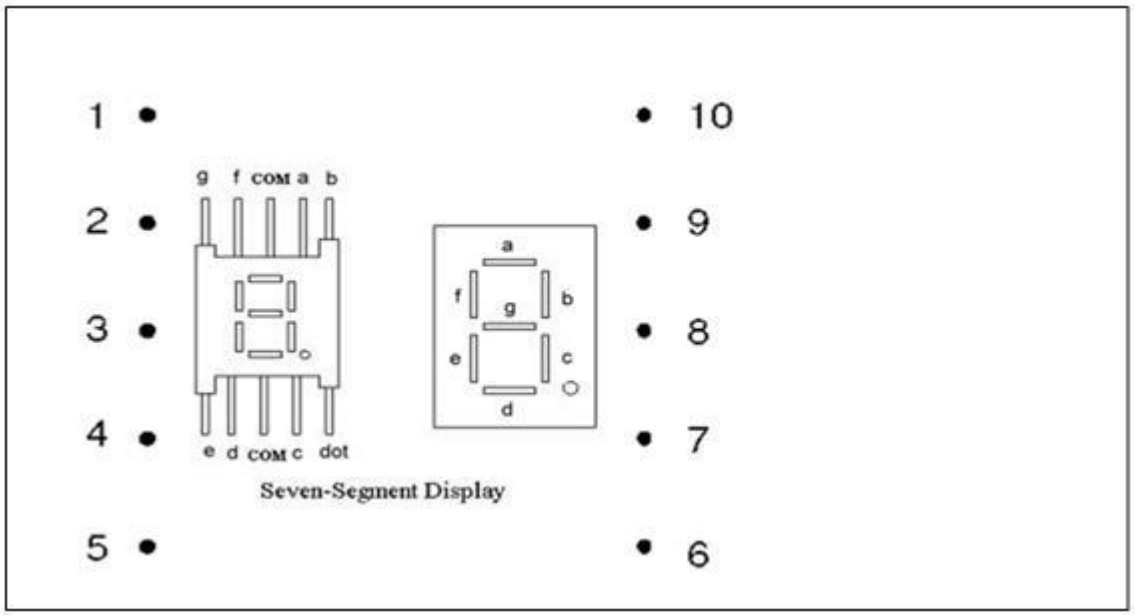
2. **By interfacing IC CD4033 with 7 Segment display :**

This circuit is known as **DISPLAY DIVIDER** . The circuit shown below describes count numbers and displays the same on 7 segment display.

Whenever you press the switch, clock input receives the signal and its counter advances one by one up to 9 and again starts counting from 0 on each successive pressing of switch. Pin configuration of 7 segment can be obtained by the below shown diagram.



In the above circuit , we have used a **555 TIMER** in astable oscillator made to provide clock signal to input of IC CD4033 to start its counting which can be displayed on 7 segment display. Here, Reset pin is used to reset counting at any time needed by the user.

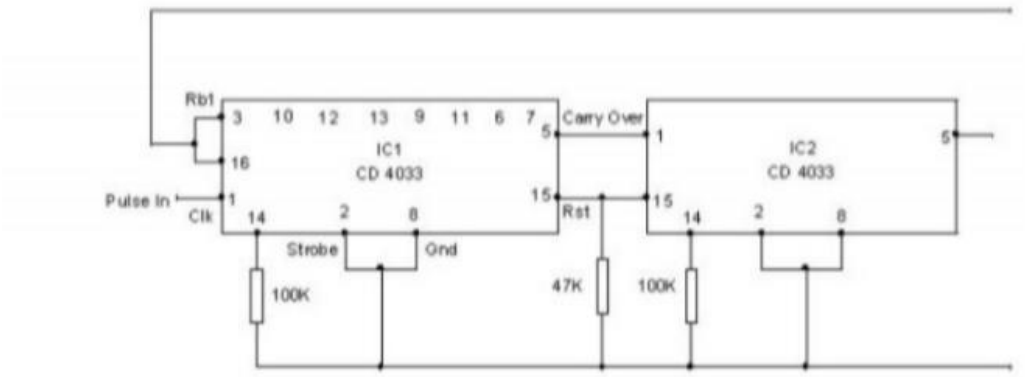


Cascading the IC's

We can also interface 2 CD4033 IC's if we want to increase the counting beyond 9, it displays up to 99. This can be done by cascading 2 CD4033 IC's, connect the carry out of first IC. Now, when first

IC completes its counting than second IC will start the counting. Connect reset pin of both the IC's together and ground it with the help of resistor.

Similarly, we can cascade more IC's.



Cascading of CD4033 IC's with LDR:

We can also add **LDR (LIGHT DEPENDENT RESISTOR)** to the IC. So, that it will start its counter when shadow falls on it or we can cascade two or more CD4033 IC's to make timer circuits etc….

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