Experiment No: 7

Title: 8051 – Interfacing with ADC

Class: T.E. **Year:** **Semester: Five**

Roll No.: **Name:**

Date of performance: **Date of Submission:**

Signature:

AIM: **8051 – Interfacing with DAC**

S/W AND H/W TOOLS: Keil IDE, 8051 kit, Flash Magic

THEORY:

The Digital to Analog converter (DAC) is a device, that is widely used for converting digital pulses to analog signals. There are two methods of converting digital signals to analog signals. These two methods are binary weighted method and R/2R ladder method. In this article we will use the MC1408 (DAC0808) Digital to Analog Converter. This chip uses R/2R ladder method. This method can achieve a much higher degree of precision. DACs are judged by its resolution. The resolution is a function of the number of binary inputs. The most common input counts are 8, 10, 12 etc. Number of data inputs decides the resolution of DAC. So if there are n digital input pin, there are 2^n analog levels. So 8 input DAC has 256 discrete voltage levels.

The MC1408 DAC (or DAC0808)

In this chip the digital inputs are converted to current. The output current is known as I_{out} by connecting a resistor to the output to convert into voltage. The total current provided by the I_{out} pin is basically a function of the binary numbers at the input pins D_0 - D_7 (D_0 is the LSB and D_7 is the MSB) of DAC0808 and the reference current I_{ref}. The following formula is showing the function of I_{out}

The I_{ref} is the input current. This must be provided into the pin 14. Generally, 2.0mA is used as I_{ref}

We connect the I_{out} pin to the resistor to convert the current to voltage. But in real life it may cause inaccuracy since the input resistance of the load will also affect the output voltage. So practically I_{ref} current input is isolated by connecting it to an Op-Amp with R_f = 5KΩ as feedback resistor. The feedback resistor value can be changed as per requirement.

Generating Sinewave using DAC and 8051 Microcontroller

For generating sinewave, at first, we need a look-up table to represent the magnitude of the sine value of angles between 0° to 360°. The sine function varies from -1 to +1. In the table only integer values are applicable for DAC input. In this example we will consider 30° increments and calculate the values from degree to DAC input. We are assuming full-scale voltage of 10V for DAC output. We can follow this formula to get the voltage ranges.

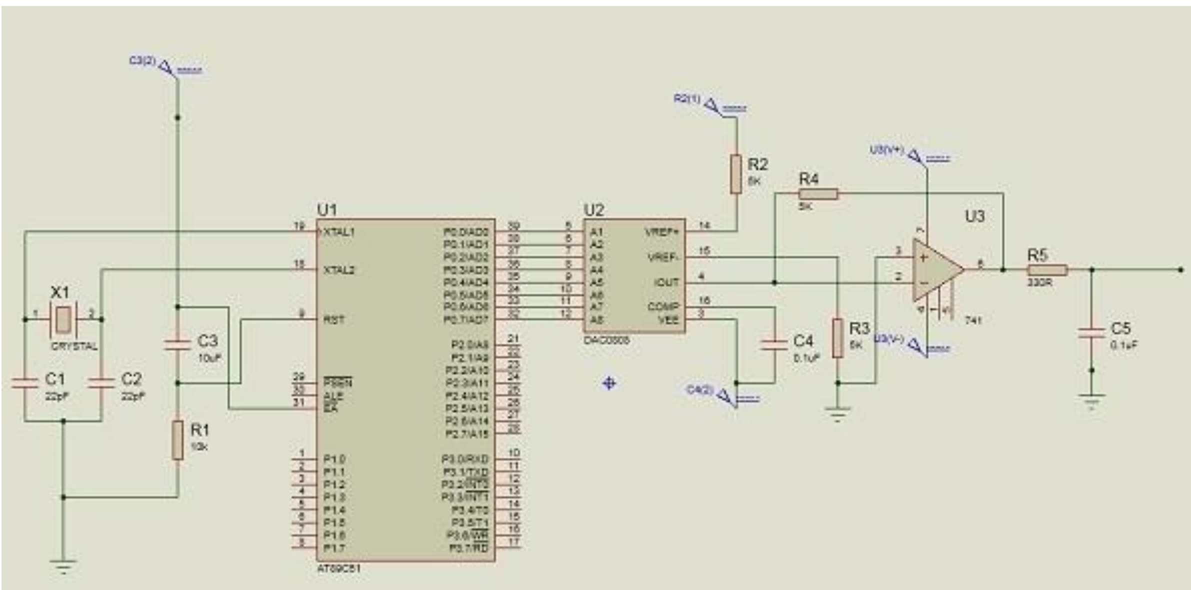
$V_{out} = 5V + (5 \times \sin\theta)$

Let us see the lookup table according to the angle and other parameters for DAC.

Angle(in θ)	**sinθ**	**V_{out} (Voltage Magnitude)**	**Values sent to DAC**
0	0	5	128
30	0.5	7.5	192
60	0.866	9.33	238
90	1.0	10	255
120	0.866	9.33	238
150	0.5	7.5	192
180	0	5	128
210	-0.5	2.5	64
240	-0.866	0.669	17

Angle(in θ)	**sinθ**	**V_{out} (Voltage Magnitude)**	**Values sent to DAC**
270	-1.0	0	0
300	-0.866	0.669	17
330	-0.5	2.5	64
360	0	5	128

Circuit Diagram −



CONCLUSIONS:

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