Lab 6 : *Part a: Analog to Digital Conversion*

Objectives

- To become familiar with analog to digital conversion

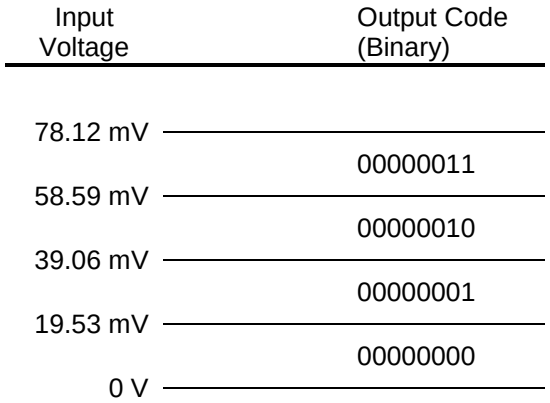
Apparatus

ADC0804,
Resistors 1.2 Kohm, 10 Kohm,
Capacitors 1 nf, 10 uf,
Connection wires or Jumper wires,
Wire Stripper / Cutter,

Background:

An analog-to-digital converter, or A/D converter, converts an analog signal to its digital form. In an analog-to-digital converter, the input analog voltage may have any value in a range and it will produce the digital output of 2^N number of discrete values for an N-bit converter. Therefore, the whole range of analog voltage is required to be represented suitably in 2^N intervals, and each of the intervals corresponds to a digital output. This process is called *quantization*.

ADC0804 is 8 bit A/D converter so the whole range of analog voltage is represented by 256 intervals. If the input voltage range is 5V (Vref=5V), then the step size is found as 19.53mV (=5V/256). It means that every 19.53mV rise in the analog input, the digital count increases by 1 step. See the figure below.



Procedure:

1- Connect the circuit given in Figure 1. Select R1=1.2 Kohm, R1=10 Kohm, C=1 nF. Also connect data outputs to LEDs.

2- Set Vref=5 V by connecting pin 9 to 2.5 V.

3- Set START switch HIGH.

4- Apply 0 V analog input between pin 6 and pin 7.

5- Set START switch LOW to tell the chip to start performing conversion. Read the 8 bit digital output and record it on table 1. Then set it back HIGH and leave it HIGH.

6-.Repeat Step 6 for the other analog input voltage values given in table 1.

7- Calculate the step size as given in the background section. By using this value, for the choosen Vref, calculate the 8-bit digital code that should be produced for each of the analog input voltages listed in table 1.

8- Set Vref=4 V by connecting pin 9 to 2 V.

9- Repeat Step 3, 4, 5, 6, 7.

Table 1.

ANALOG INPUT VOLTAGE	DIGITAL OUTPUT CODE							
	Vref=5V				Vref=4V			
	CALCULATED		MEASURED		CALCULATED		MEASURED	
	Binary	Decimal	Binary	Decimal	Binary	Decimal	Binary	Decimal
0 V								
0.1 V								
0.2 V								
0.5 V								
0.7 V								
1.0 V								
1.5 V								
2.0 V								
2.5 V								
3.0 V								
3.5 V								
4.0 V								
4.5 V								
5.0 V								

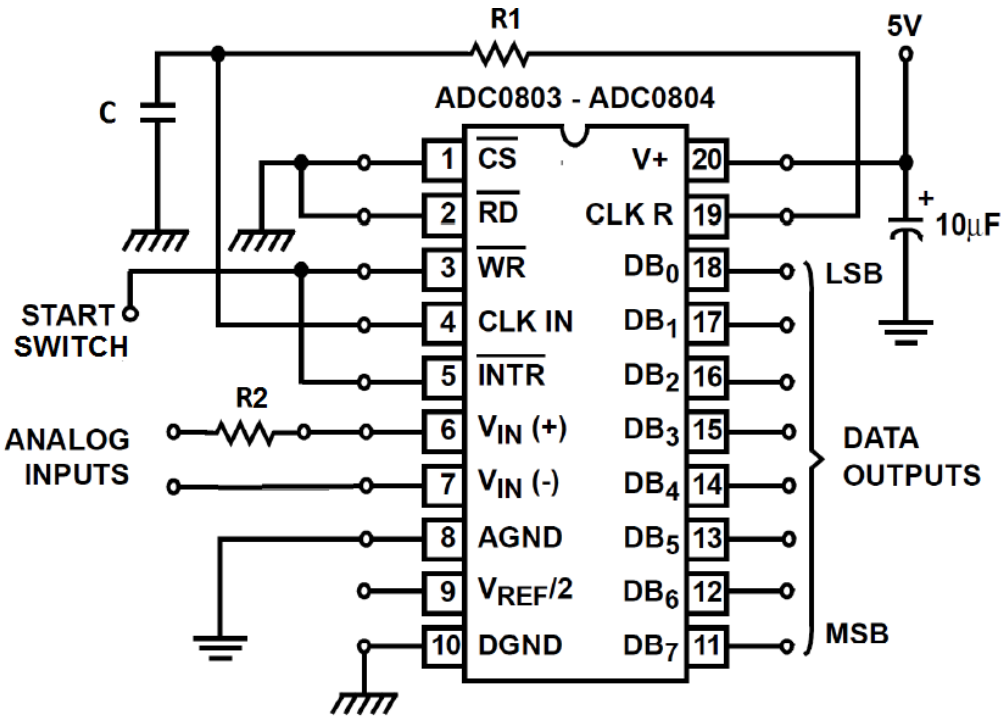

R1
5V
ADC0803 - ADC0804
C
1 CS
2 RD
3 WR
4 CLK IN
5 INTR
6 VIN (+)
7 VIN (-)
8 AGND
9 VREF/2
10 DGND
V+ 20
CLK R 19
DB0 18
DB1 17
DB2 16
DB3 15
DB4 14
DB5 13
DB6 12
DB7 11
+
10μF
LSB
START
SWITCH
R2
ANALOG
INPUTS
DATA
OUTPUTS
MSB

Figure 1