Project # 5

A/D and D/A Converters

EE 254 / Fall 2013

In this project goal was to build an A/D 3-bit flash converter, and to demonstrate the performance of the converter. Figure 1 showed the design used for this A/D 3-bit flash (or parallel) converter. The design was taken from the textbook pg. 1230.

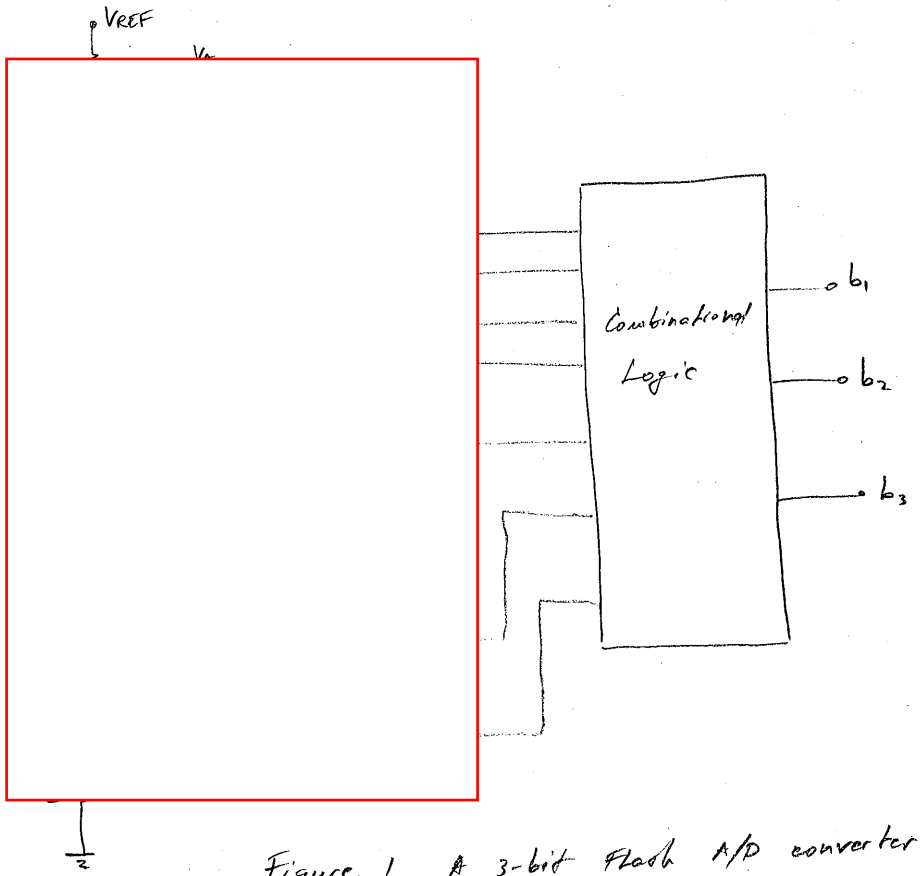

Figure 1. A 3-bit Flash A/D converter [1]

This type of converter used seven op-amps, in this case LF 347 ICs were used. Input voltage (V_A) was compared to reference voltage (V_{REF}) or better, the LSB value of the reference voltage determined by the voltage divider circuit. The voltage divider circuit was build using R=

input voltage rises, the number of binational Logic circuit rises as well, was in this case:

The

Since $V_{REF} = 5V$ was used, and the highest V_A input was also 5V, calculated LSB was 0.3125V. Table 1 below showed the ideal and measured values of digital output vs. analog input values.

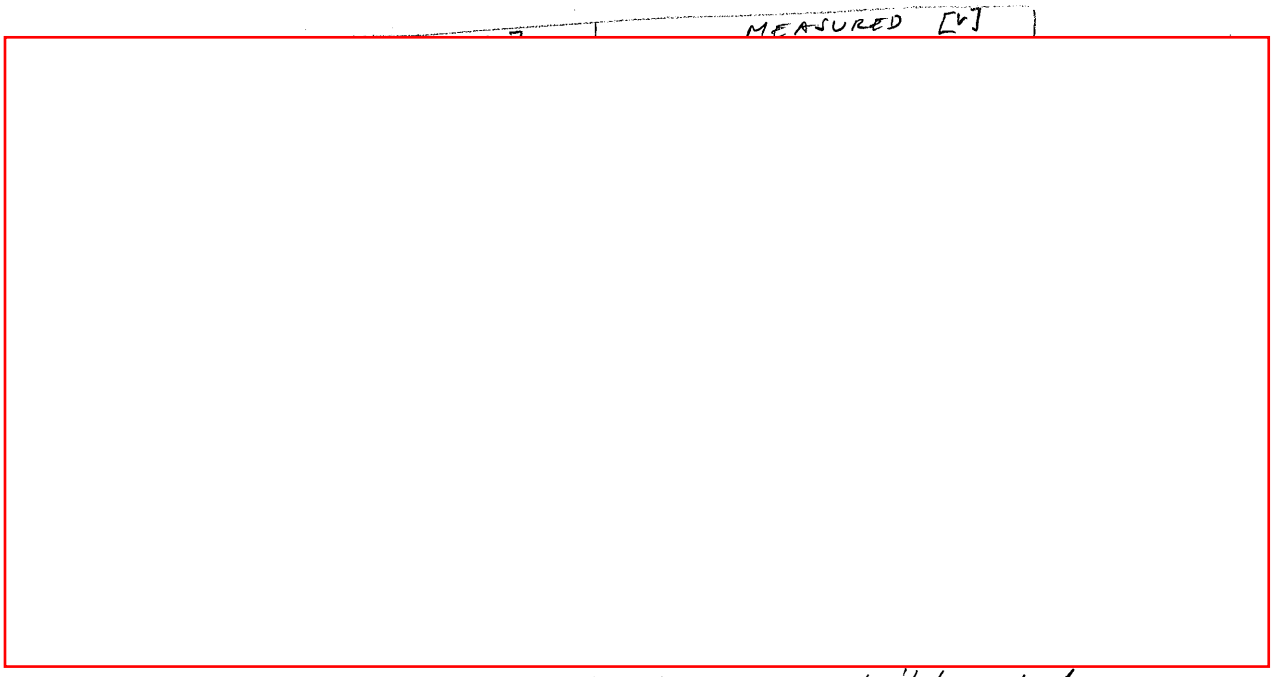

Table 1. Ideal and Measured digital output vs. Analog input values

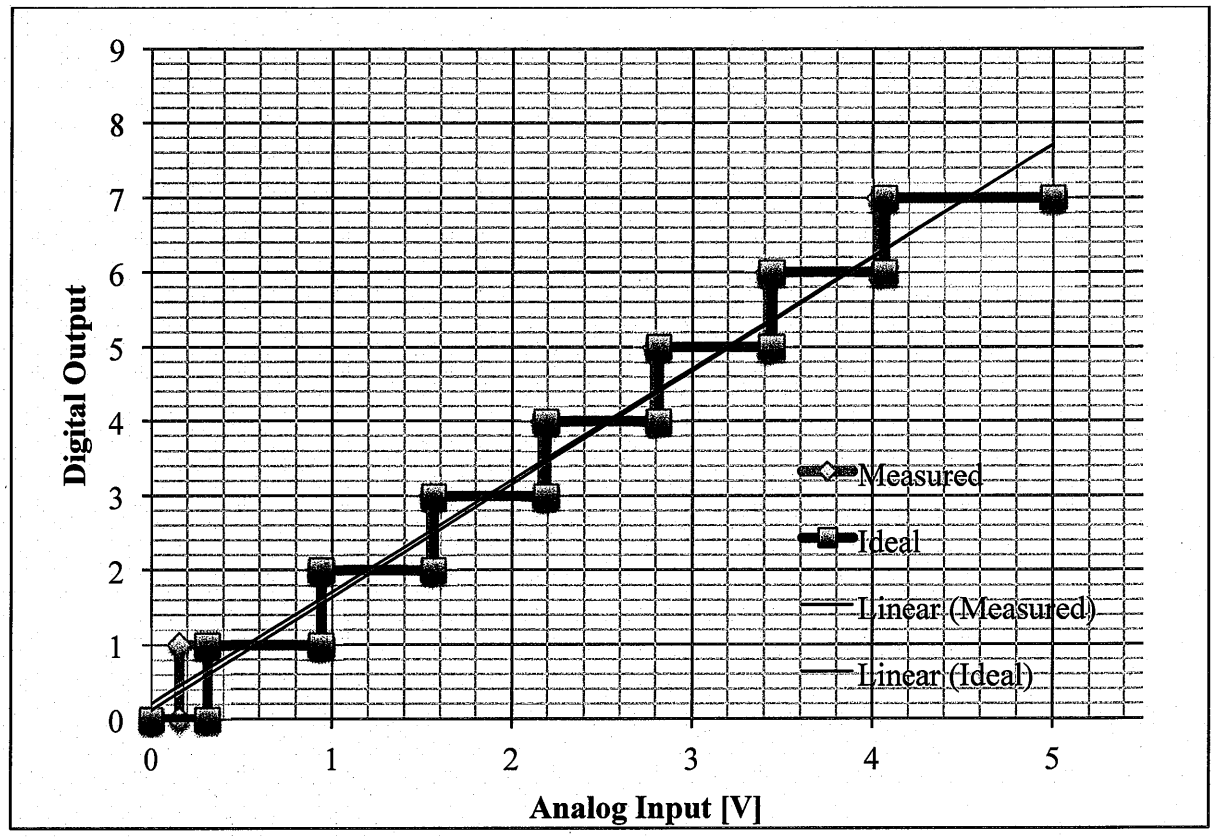

Figure 2. Ideal and measured digital output vs. analog input values

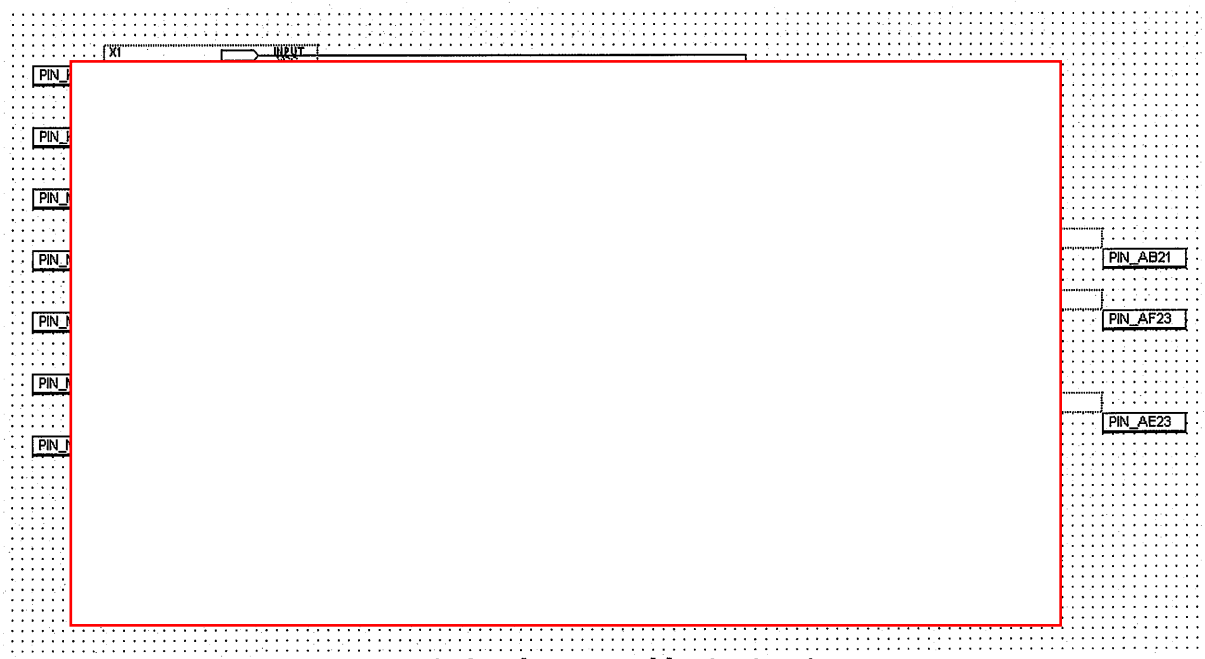

Figure 3. Combinational logic circuit

It was [redacted] Table 1 and the graph in figure 2, the measured [redacted] plotted (ideal) values.

In summa[redacted] combinational Logic c[redacted]der and opamp [redacted] analog input V_A to [redacted] was higher The opamp [redacted] was lower, the opamp [redacted] were fed into the [redacted] 3. The Logic circ[redacted]

V_1	V_2	V_3	V_4	V_5	V_6	V_7	b_1	b_2	b_3
0	0	0							
0	0	0							
0	0	0							
0	0	0							
0	0	0							
0	0	1	1	1	1	1	1	0	1
0	1	1	1	1	1	1	1	1	0
1	1	1	1	1	1	1	1	1	1

$x_1 \bar{x}_6$

In this case b_1 was MSB and b_3 was LSB for the output digital value. The circuit was built on a breadboard as shown in figure 4. Red LED were used to test the input into the combinational logic circuit. The logic circuit was designed in Quartus software and uploaded to an Altera board. The board was then used for the combinational logic and binary output.

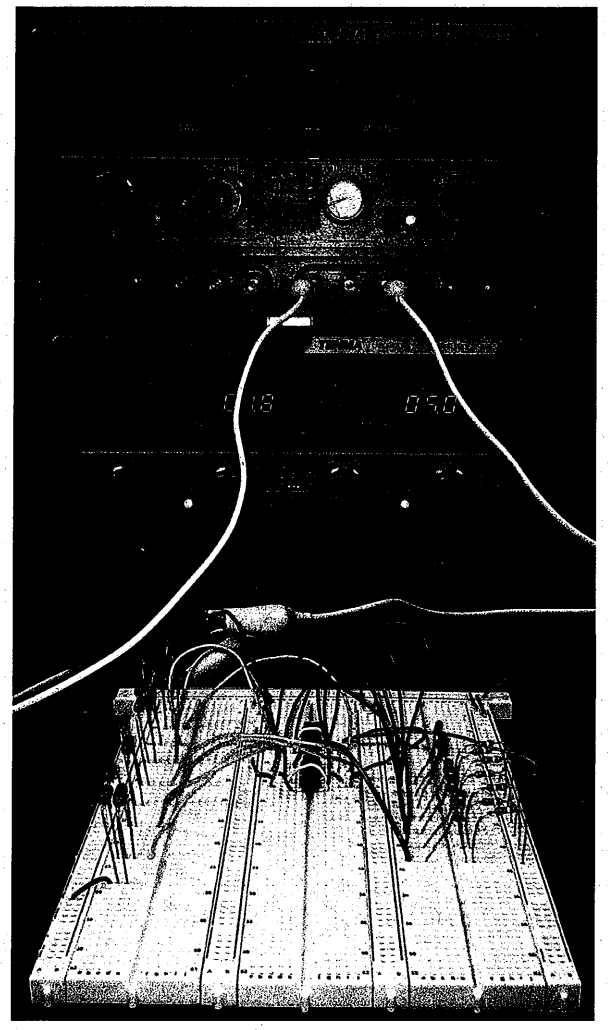

Figure 4. A/D 3-bit Flash circuit

References:

1. Neamen, Donald A. Microelectronics: Circuit Analysis and Design. Fourth ed. New York: Mc Graw Hill, 2010. 1230. Print.