Design of 3-Bit Flash Analog to Digital Converter

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Abstract

The world around us is analog, which includes all signals like sound, temperature, etc. For us to interpret these signals and work on them, we need to convert them into digital and then perform various functions on them. Converting analog signals into digital has multiple advantages, such as better noise rejection, easier to transmit, and many more. Hence, ADC (Analog to Digital Converters) is an important part of every integrated or front-end circuit.

Implemented Circuit

The reference circuit which I have used is based on the simple concept of the voltage divider and then comparing it to a reference voltage range if the inputted signal's amplitude is in that specified range, the corresponding binary is sent as the output. The output of the comparator is then fed into a priority encoder, which encodes it into a specified binary. Here, we are going to utilize 3 bits, so the full range of input would be divided into $2^3 = 8$ Levels. The Levels are specified in the truth table below,
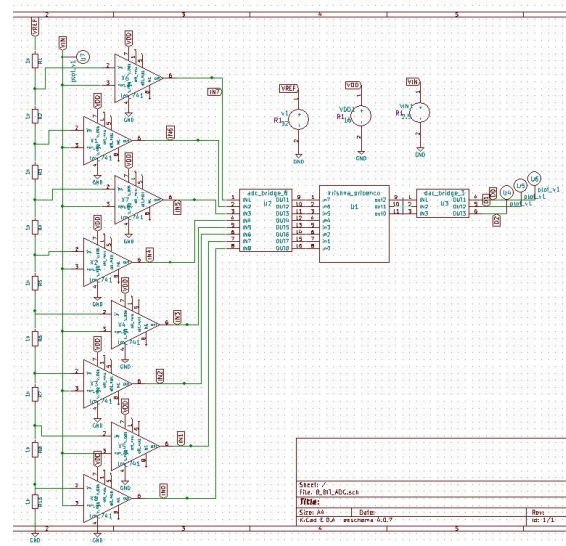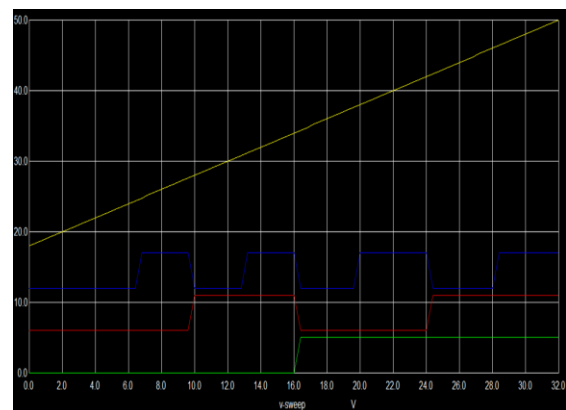

Fig. 2. Implemented Circuit

Fig. 3. Implemented Output

References

[1] Triveni Kalita, Basab Das "A 4-bit Quantum Voltage Comparator based Flash ADC for Low Noise Applications"13 Oct 2016 IEEE

[2] Afreen R. Kerur, et. Al, "Design and Analysis of low power 4-bit Flash ADC using Quantum Voltage Comparator", VIT TN.

Comparator Outputs								Digital Outputs		
D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0	Q_2	Q_1	Q_0
0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	1	X	0	0	1
0	0	0	0	0	1	X	X	0	1	0
0	0	0	0	1	X	X	X	0	1	1
0	0	0	1	X	X	X	X	1	0	0
0	0	1	X	X	X	X	X	1	0	1
0	1	X	X	X	X	X	X	1	1	0
1	X	X	X	X	X	X	X	1	1	1

Fig. 1. Truth Table