3-bit Flash ADC

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Abstract

Flash ADC also known as the *parallel A/D converter*. It is formed of a series of comparators, each one comparing the input signal to a unique reference voltage. The comparator outputs connect to the inputs of a priority encoder circuit, which then produces a binary output. Due to the nature of the sequential comparator output states the same "highest-order-input selection" effect may be realized through a set of Exclusive-OR gates, allowing the use of a simpler, non-priority encoder. Flash converters are extremely fast compared to many other types of ADCs.

1 Reference Circuit Details

This three-bit flash ADC requires seven comparators. A four-bit version would require 15 comparators. With each additional output bit, the number of required comparators doubles.

It has seven op-amps and seven Exclusive-OR gates. V_{ref} is a stable reference voltage provided by a precision voltage regulator as part of the converter circuit.

An additional advantage of the flash converter, often overlooked, is the ability for it to produce a non-linear output. With equal-value resistors in the reference voltage divider network, each successive binary count represents the same amount of analog signal increase, providing a proportional response.
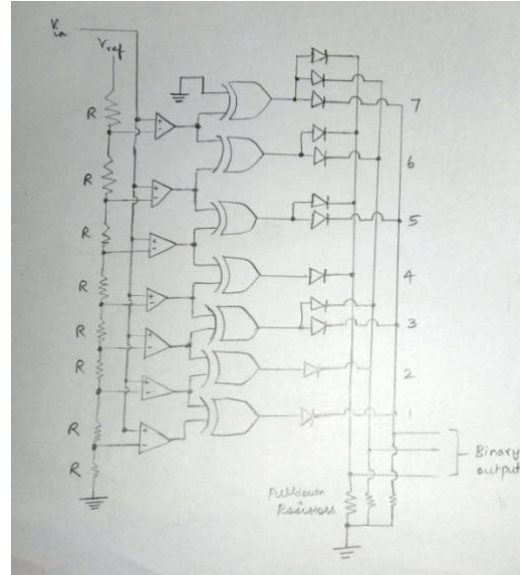
2 Reference Circuit

Figure 1: Reference circuit diagram.
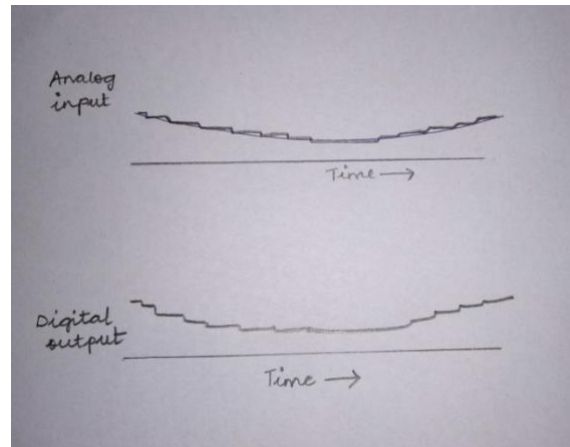
3 Reference Circuit Waveforms

Figure 2: Reference waveform.

References

1. https://instrumentationtools.com/topic/flash-adc/.