

Data Conversion Chain — 20-02-2017

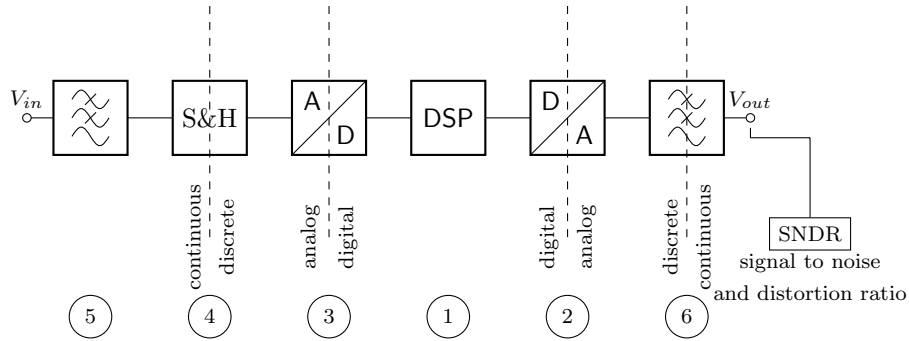


Figure 1: A typical signal chain

① DSP

The equivalent output voltage can be expressed with 1. It's maximum can be described with 2

$$V_{eq} = V_{ref} \left(\sum_{i=1}^N b_i 2^{-i} \right) \quad (1)$$

$$V_{eq} = V_{ref} (1 - 2^{-N}) \quad (2)$$

This is a representation in UINT. In most realworld implemntations INT using 2's complement is required. Sometimes if there is peak currents, Gray-Code is to be used to minimize peak currents!

The quantizer-error is defined with equation 3.

$$V_e = V_{in} - V_{eq} \quad (3)$$

Since the quantizer error has the probability density function of white noise¹, it can be depicted with the function seen in ??.

The white noise is assumed because the digital signal is a sequence of pulses. If this is fouriertransformed a constant spectral density is received.

② D/A

③ A/D

④ S&H

⑤ ⑥ LP

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¹White noise means that the noise has the same amplitude for every frequency.