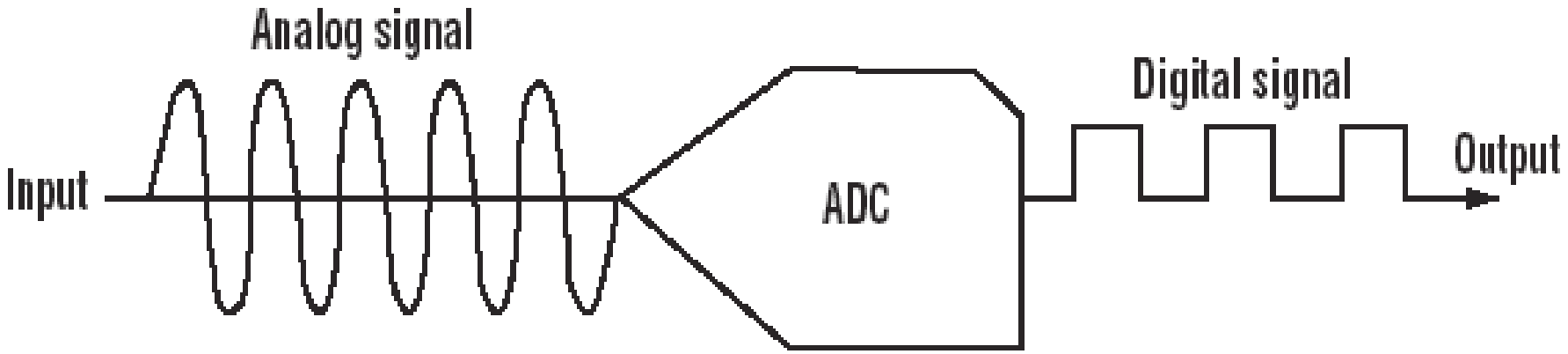
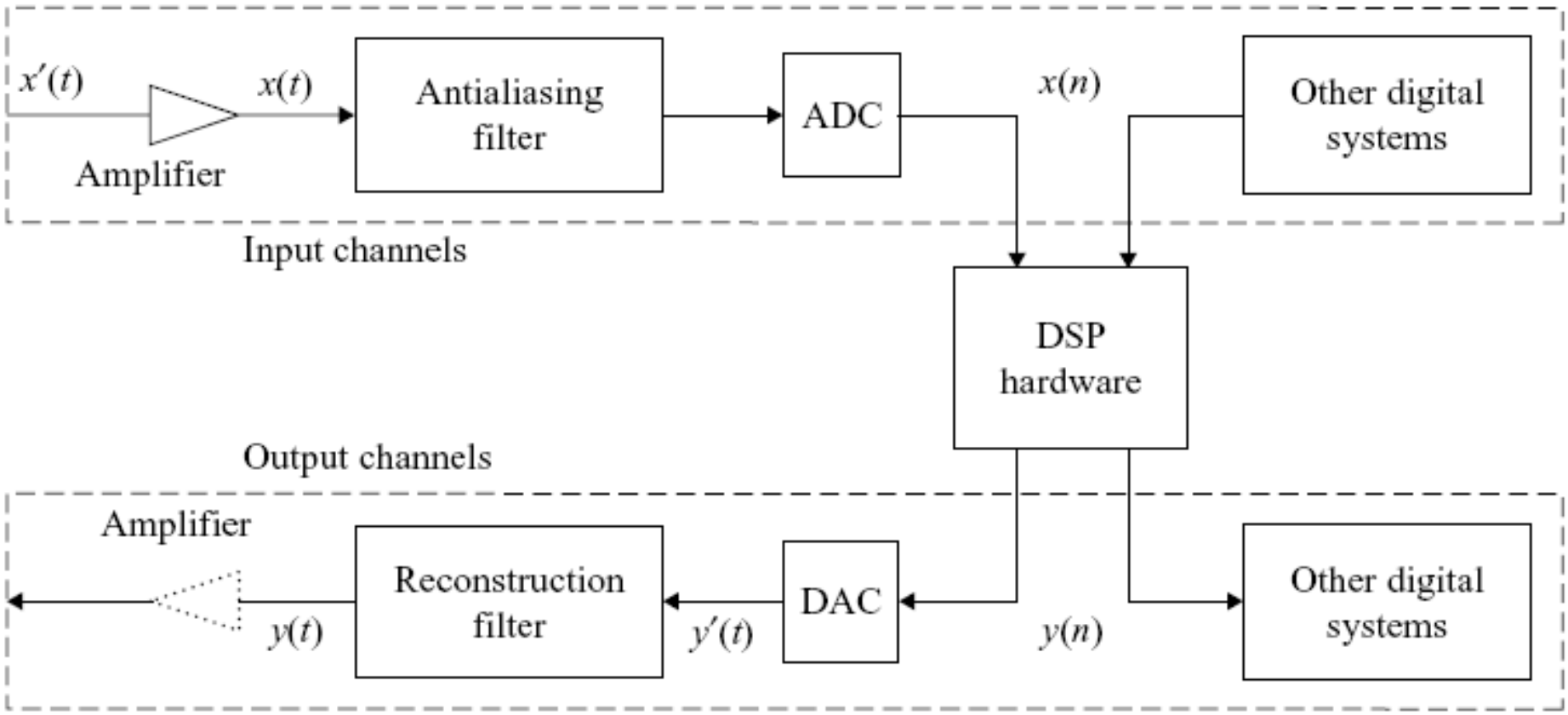
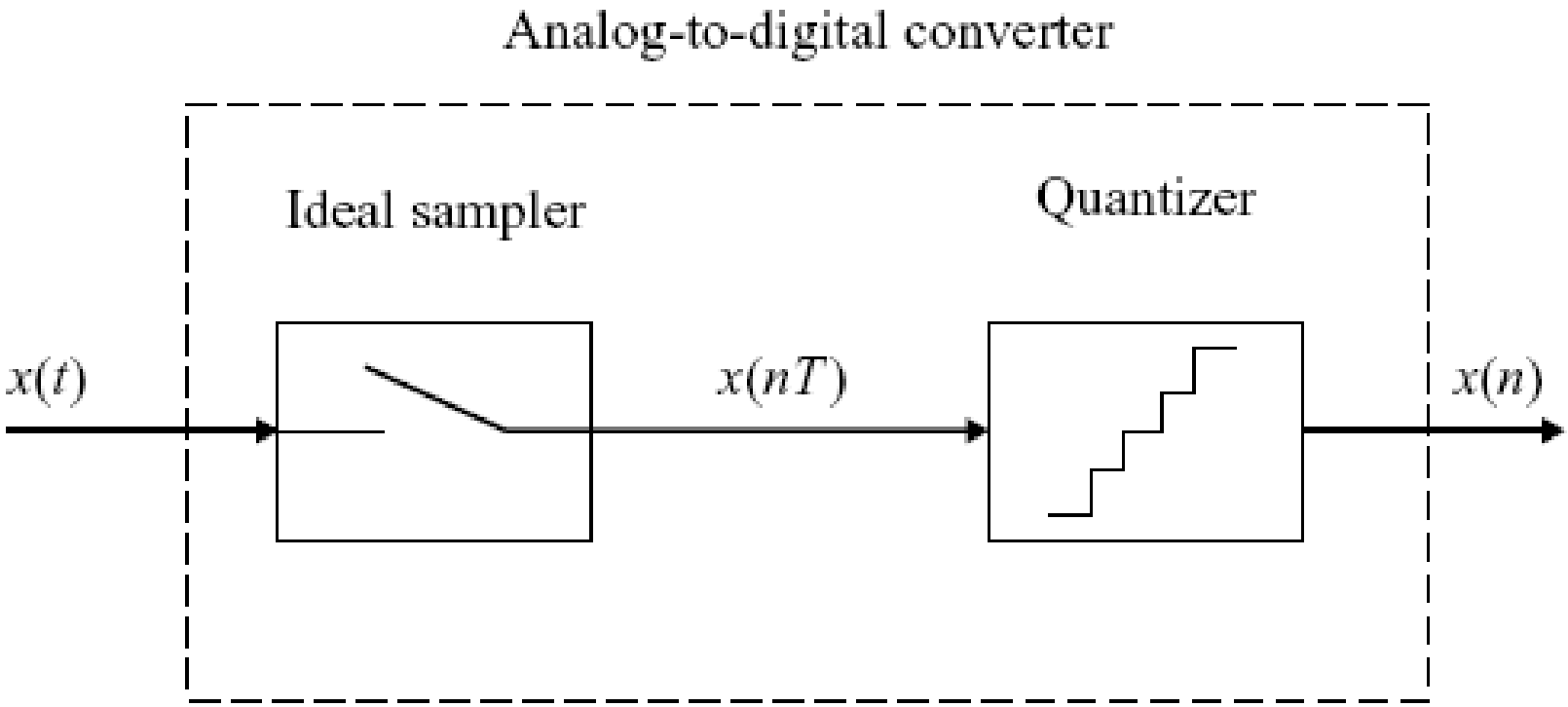
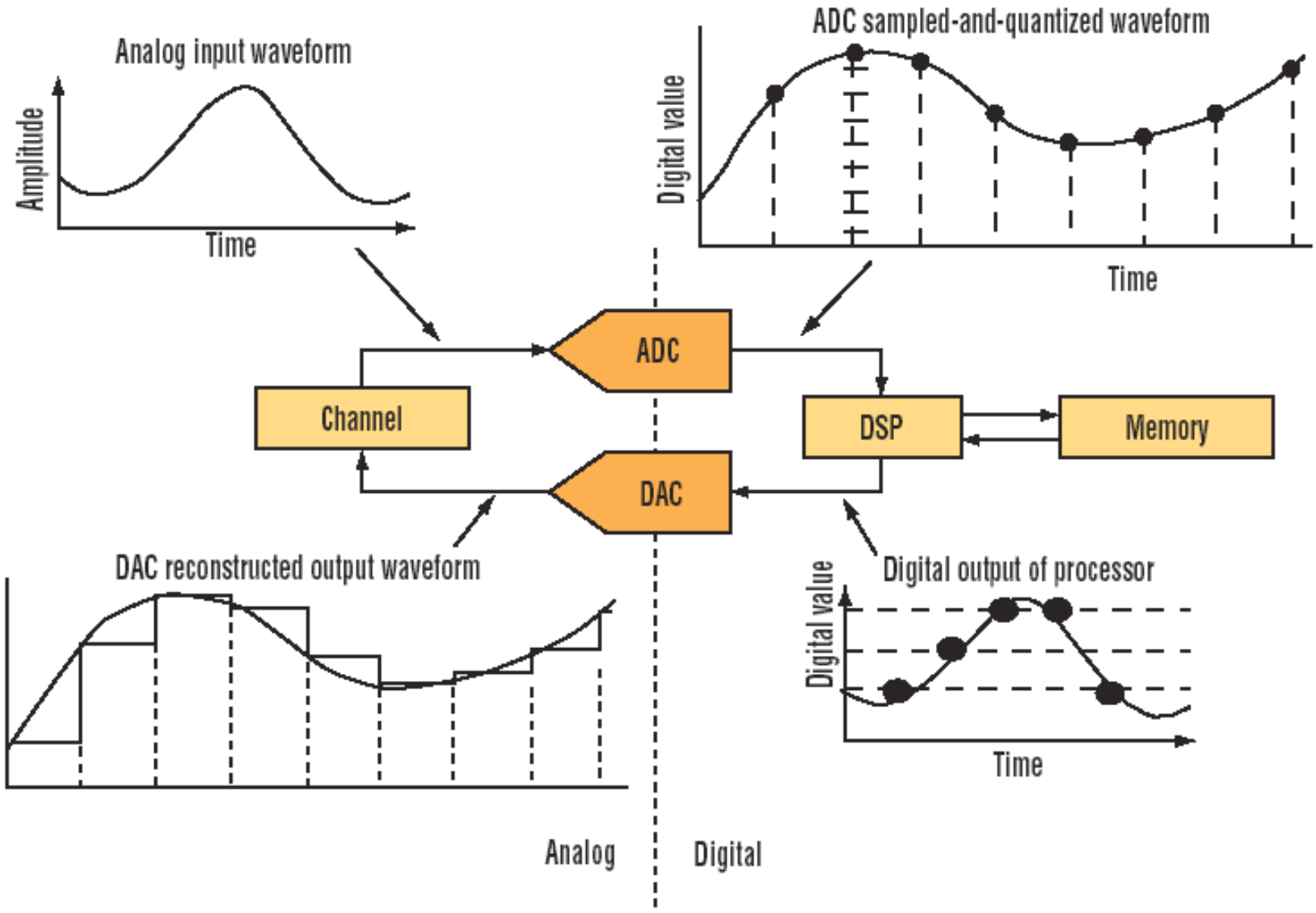
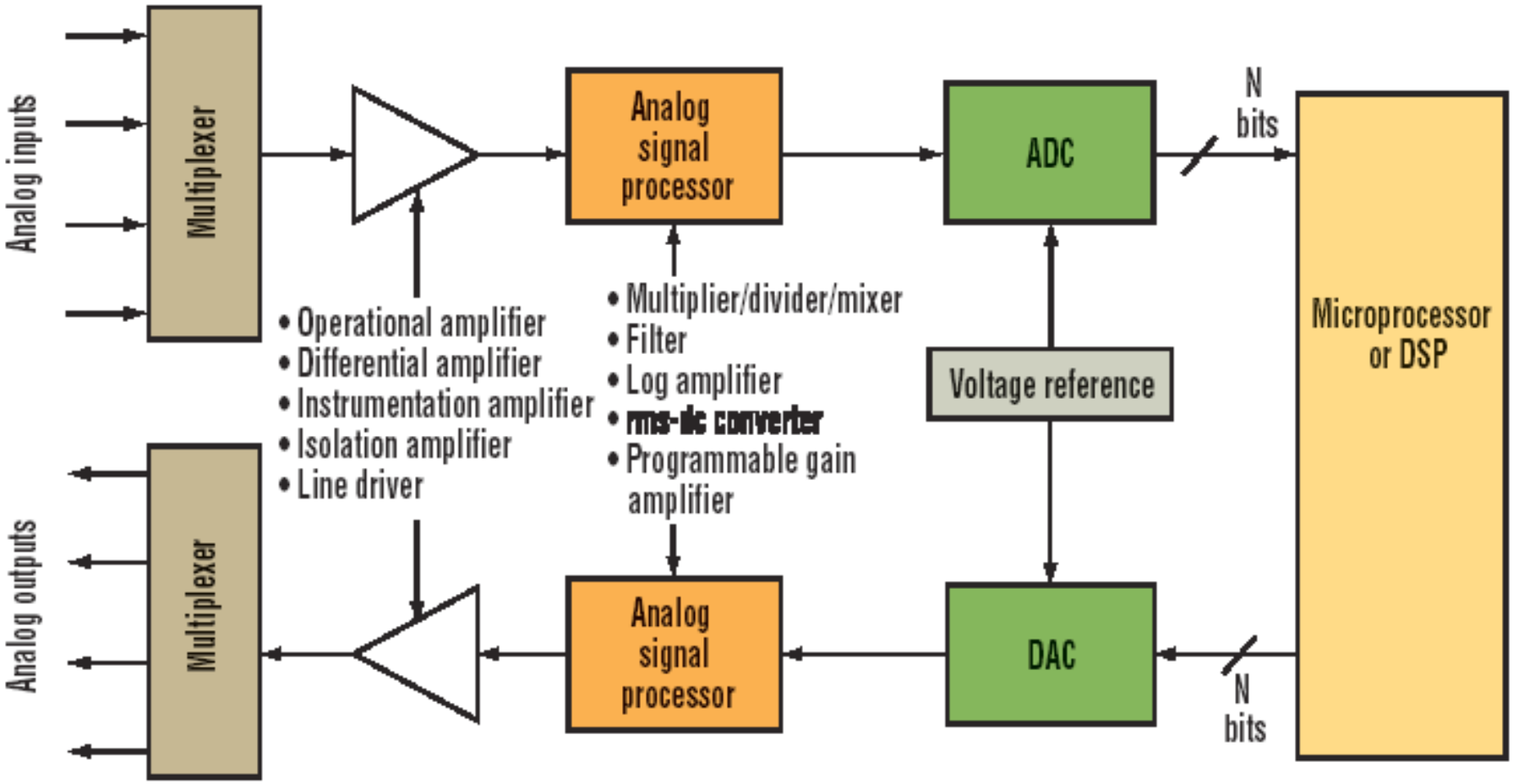
Analog-to-Digital and Digital-to-Analog Converter


Analog signal
Input
ADC
Digital signal
Output


x′(t)
x(t)
Amplifier
Antialiasing filter
ADC
x(n)
Other digital systems
Input channels
DSP hardware
Output channels
Amplifier
y(t)
Reconstruction filter
y′(t)
DAC
y(n)
Other digital systems

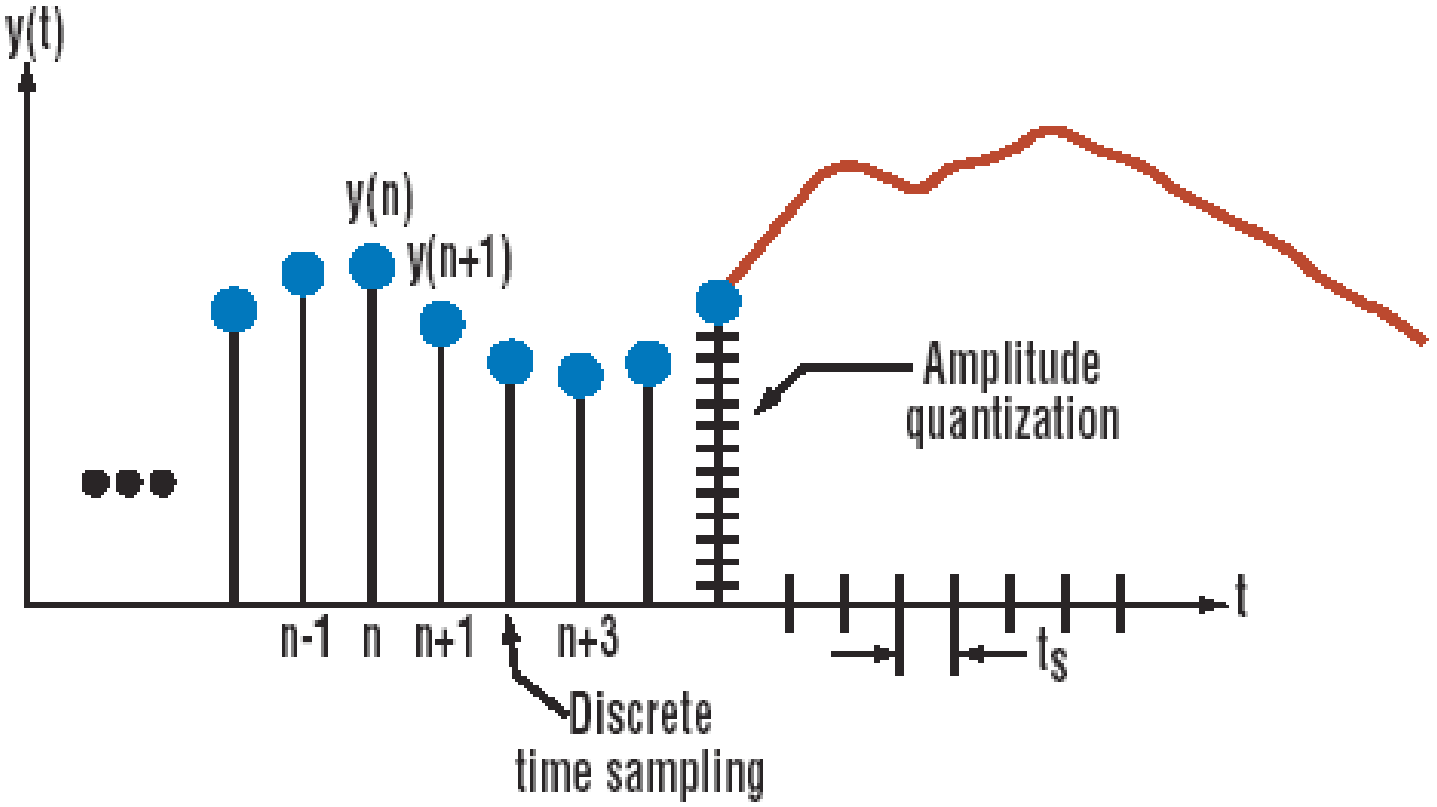

Analog-to-digital converter
Ideal sampler
Quantizer
x(t)
x(nT)
x(n)


Analog input waveform
Amplitude
Time
ADC sampled-and-quantized waveform
Digital value
Time
ADC
Channel
DSP
Memory
DAC
DAC reconstructed output waveform
Digital output of processor
Digital value
Time
Analog
Digital

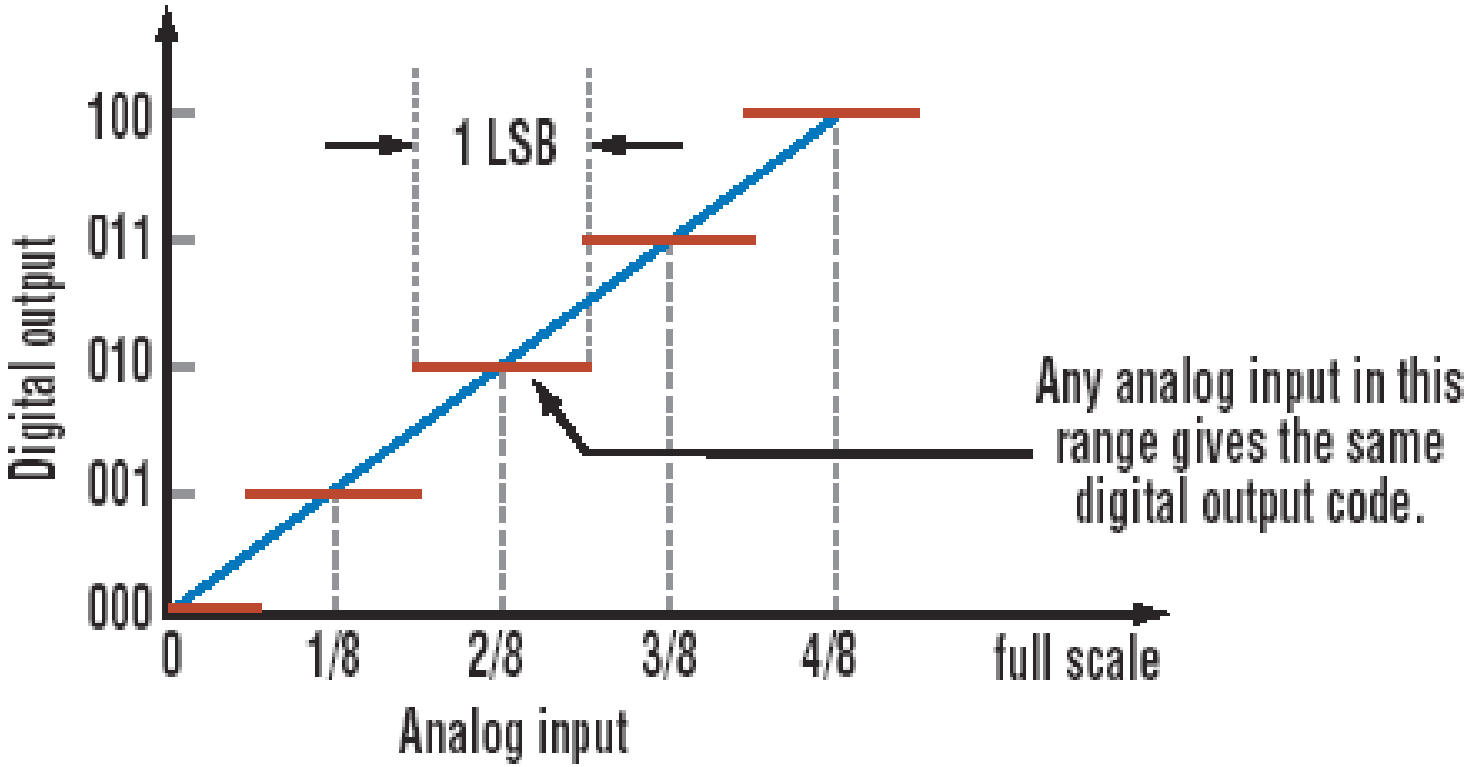


Measurement and Control Loop

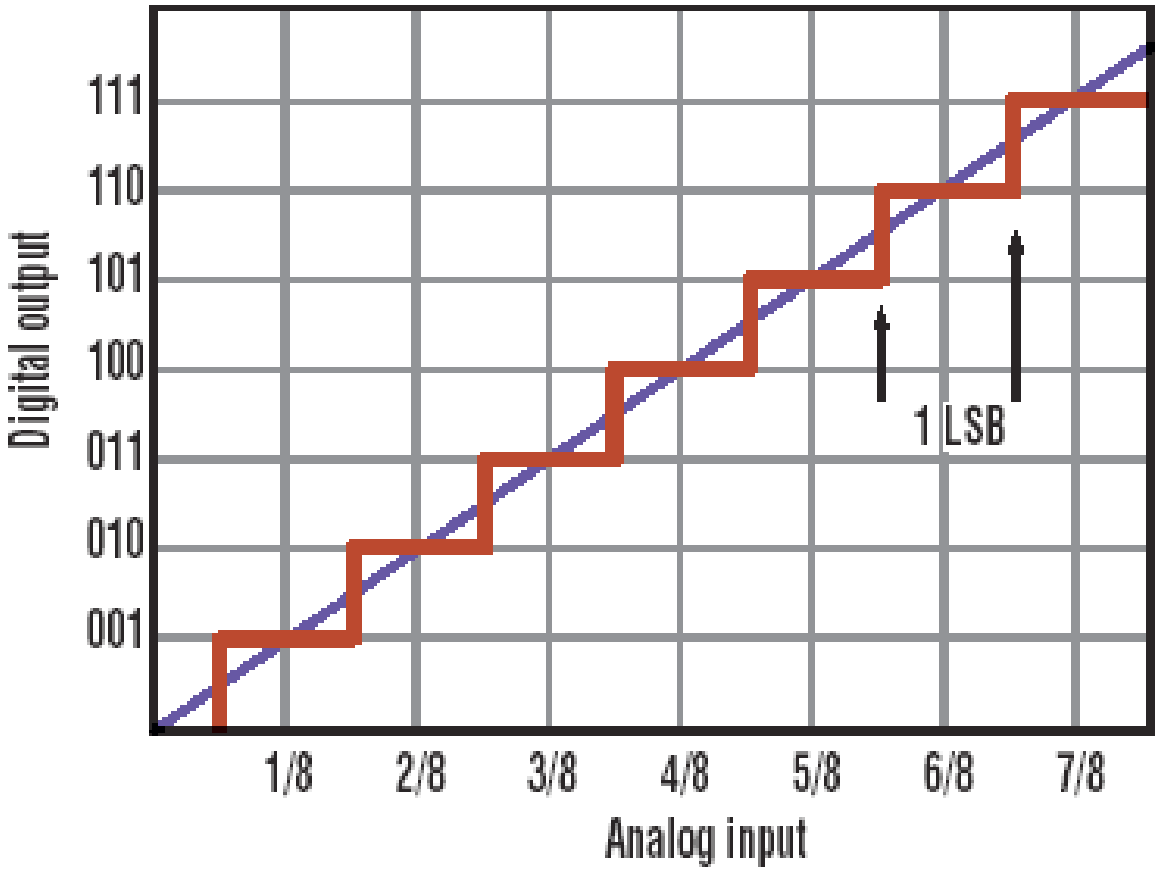
An ADC Carries Out Two Processes



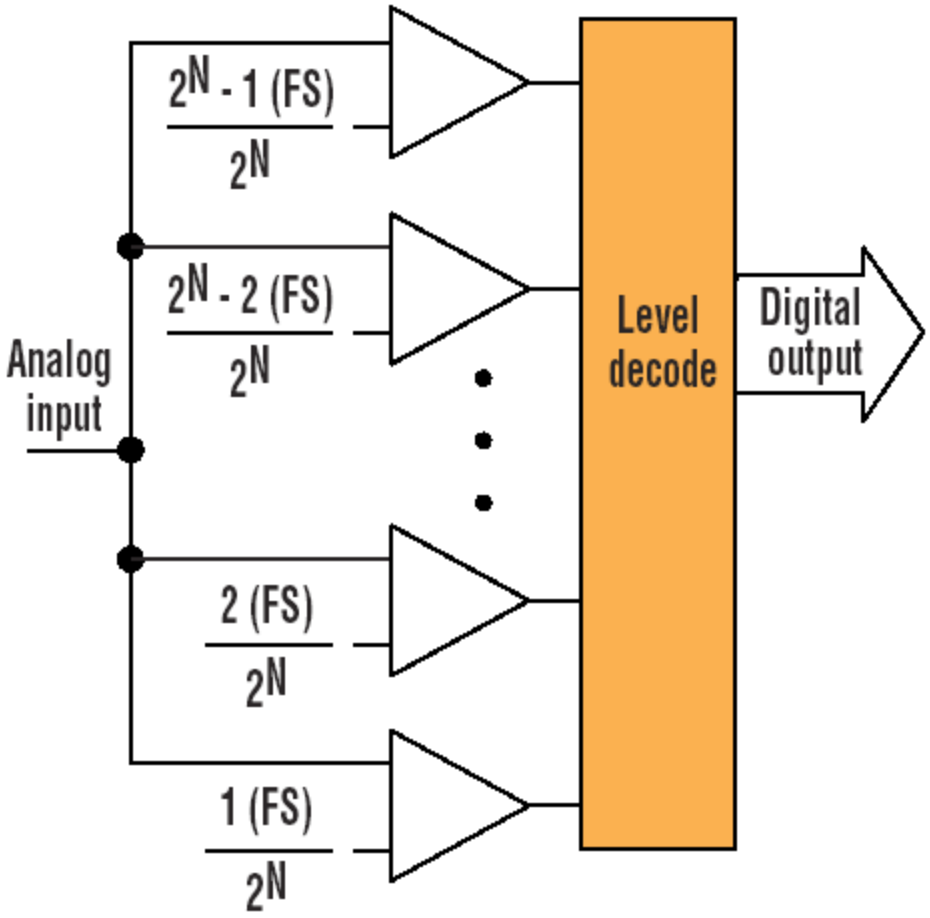
Sampling Process



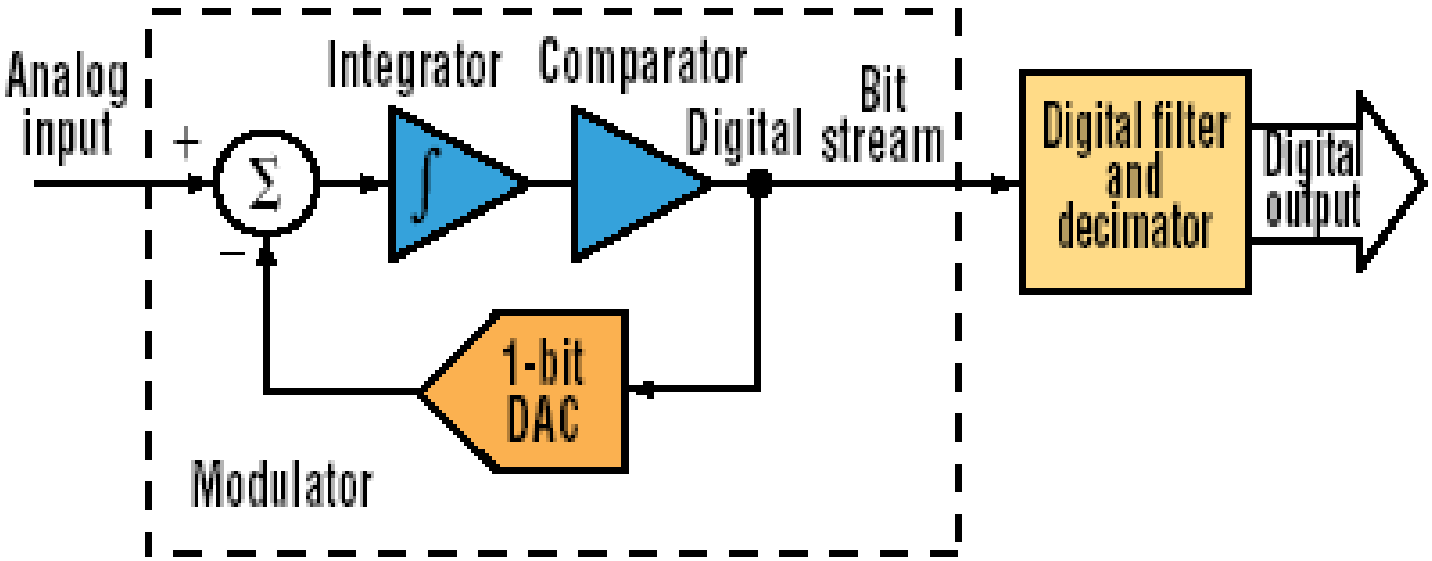
Quantization Process



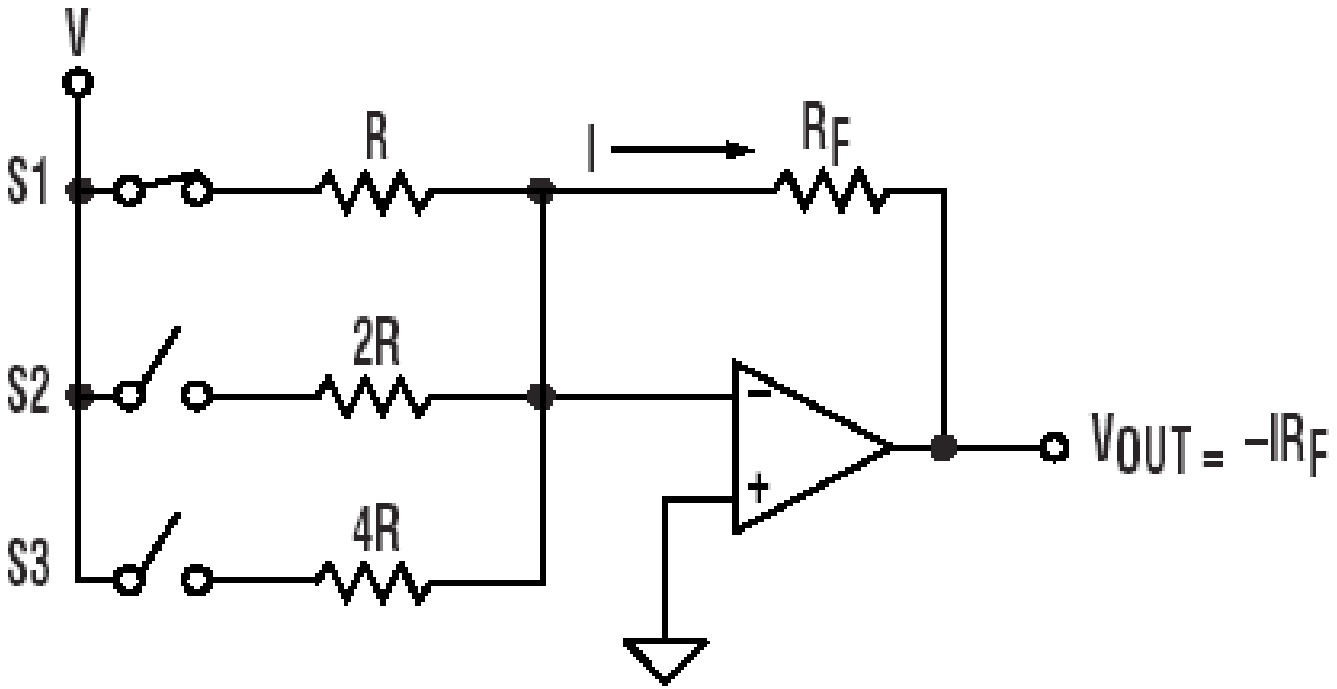
Transfer Funtion for an Ideal ADC



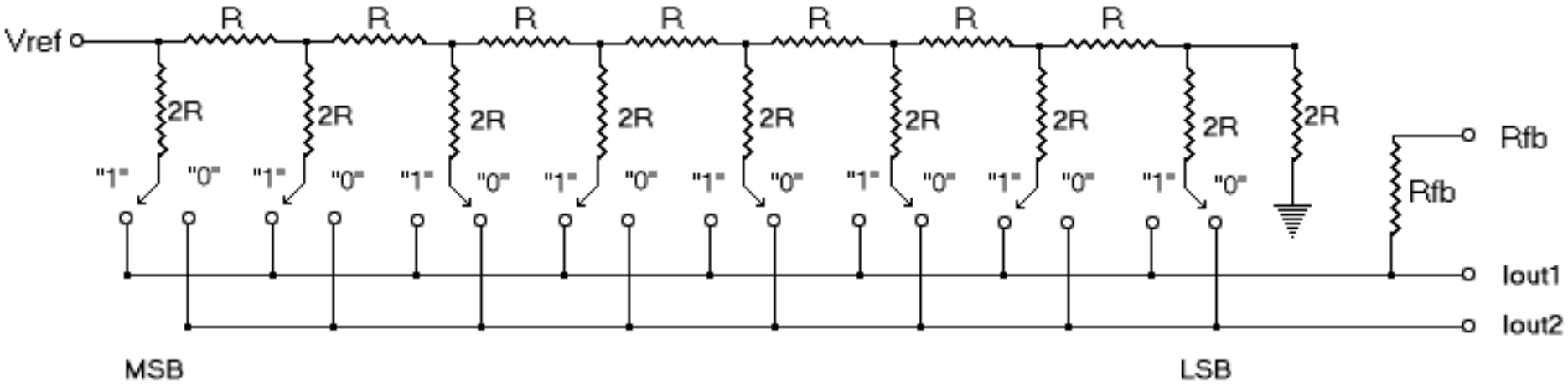
Flash Architecture



Sigma-Delta Architecture



A binary-weighted DAC


Vref
R
R
R
R
R
R
R
2R
2R
2R
2R
2R
2R
2R
2R
"1"
"0"
"1"
"0"
"1"
"0"
"1"
"0"
"1"
"0"
"1"
"0"
"1"
"0"
"1"
"0"
Rfb
Rfb
Iout1
Iout2
MSB
LSB