Analog-to-Digital and Digital-to-Analog Converter
Analog-to-digital converter

Ideal sampler

Quantizer

$x(t)$ $x(nT)$ $x(n)$
Measurement and Control Loop

Analog inputs

- Operational amplifier
- Differential amplifier
- Instrumentation amplifier
- Isolation amplifier
- Line driver

Multiplexer

Analog signal processor

- Multiplier/divider/mixer
- Filter
- Log amplifier
- rms-to-dc converter
- Programmable gain amplifier

ADC

Microprocessor or DSP

N bits

Analog outputs

- Operational amplifier
- Differential amplifier
- Instrumentation amplifier
- Isolation amplifier
- Line driver

Multiplexer

Analog signal processor

Voltage reference

DAC

N bits
An ADC Carries Out Two Processes
Quantization Process

Any analog input in this range gives the same digital output code.
Transfer Function for an Ideal ADC
Flash Architecture

FS = Full scale analog input voltage
Sigma-Delta Architecture
A binary-weighted DAC

\[ V_{OUT} = -IR_F \]