

Analog Ports

Embedded Software

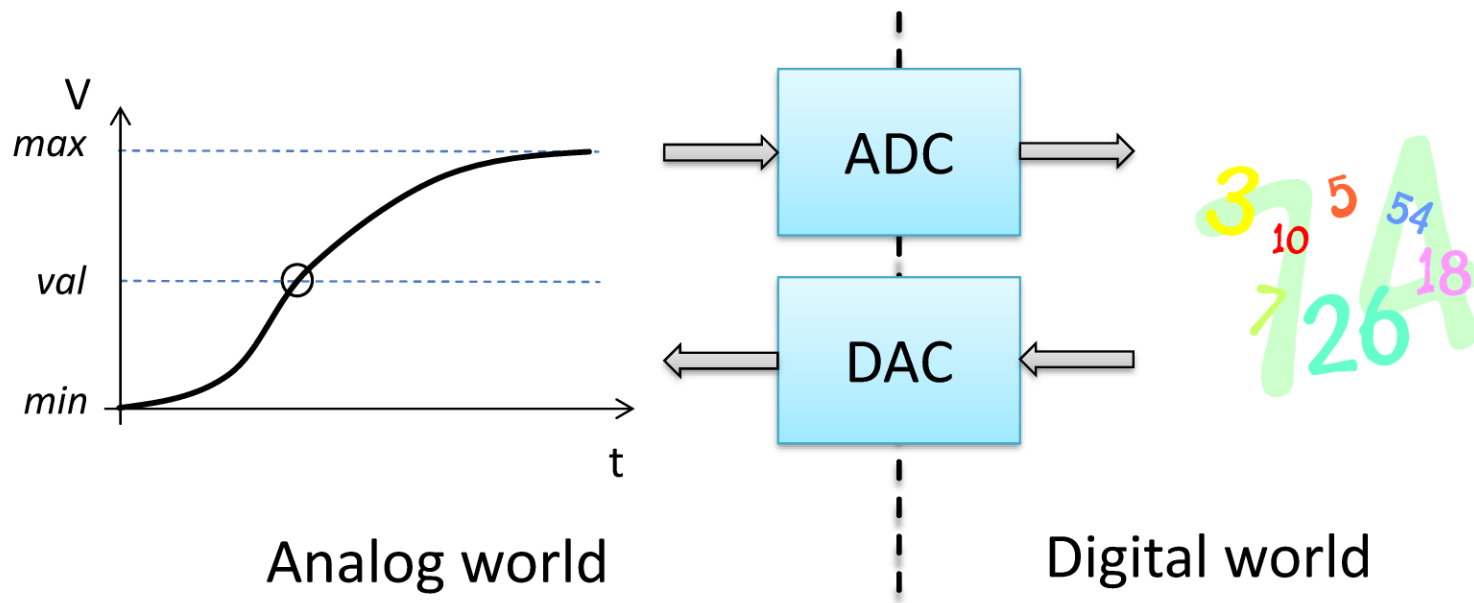
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Analog Ports (1)

- Basic Concepts
 - Most signals are analog (analog world)
 - Microprocessors are digital devices (digital world)
 - Conversion is necessary
 - Analog-to-digital converter
 - Digital-to-analog converter
 - Analog comparator

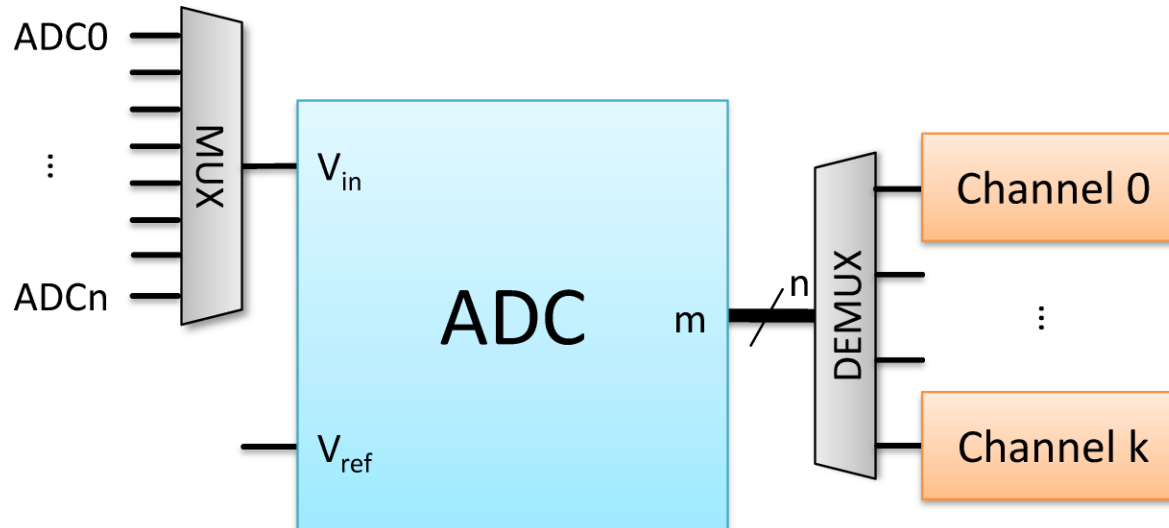
Analog Ports (2)

- Basic Operation
 - Physical values are converted to numbers



ADC (1)

- Architecture



ADC (2)

- Basic Formulas

- Range

- n bit $\rightarrow 2^n$ possible values

- Resolution

- $V_{LSB} = \frac{V_{ref}}{2^n}$

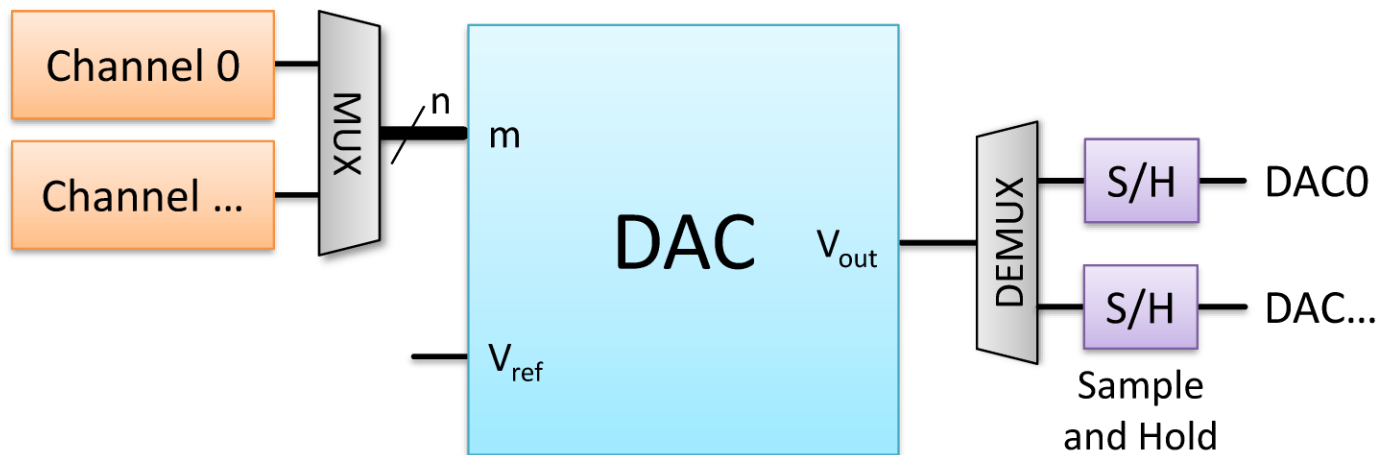
- Result

- $m = \left\lfloor \frac{V_{in}}{V_{LSB}} \right\rfloor$

Floor Function (Gauss's Bracket)
[x]: Greatest integer less than or equal to x. [2.6] = 2 (round down)

DAC (1)

- Architecture



DAC (2)

- Basic Formulas
 - Range
 - n bit $\rightarrow 2^n$ possible output voltages
 - Resolution
 - $V_{LSB} = \frac{V_{ref}}{2^n}$
 - Voltage
 - $V_{out} = m \cdot V_{LSB} \quad (0 \leq m < 2^n)$

AC

- Basic Formulas and Architecture

