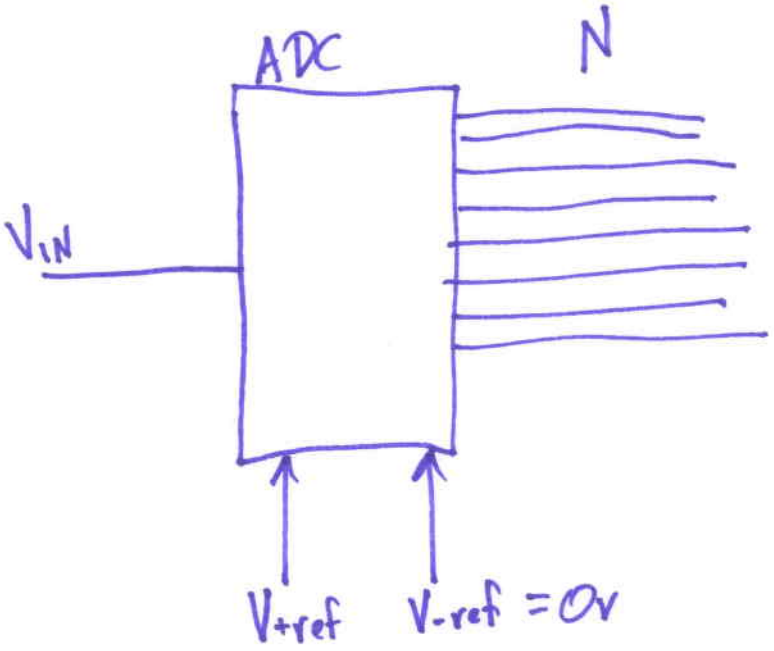
Embedded Systems

Analog to Digital Conversion



2^N possible values

$= 0000\ 0000$ to $1111\ 1111$

$= 256$

$$n = \text{int}\left(\frac{V_{IN} * 2^N - 1}{V_{+ref}} + \frac{1}{2} \right)$$

rounding

(2)

$N = 10$

$V_{+ref} = 3.3v$

$V_{in} = 1.2v$

$$n = int\left(\frac{1.2v}{3.3v} * 1023 + 1/2\right)$$

$$= int(372 + 1/2) = int(372.5)$$

$$= 372$$

Range 10bit ADC 0 to 1023

$N = 8$

$V_{+ref} = 5V$

$V_{IN} = 4.5V$

$$n = int\left(\frac{4.5v}{5V} * 255 + 1/2\right)$$

$$= int(229.5 + 1/2) = int(230)$$

$$= 230$$

Embedded Systems ADC

(3)

$$n = \text{int}\left(\frac{(V_{IN} - V_{-ref}) * (2^N - 1)}{(V_{+ref} - V_{-ref})} + 1/2\right)$$

$N = 12$

$V_{in} = 8.7v$

$V_{+ref} = 12v$

$V_{-ref} = -12v$

$$n = \text{int}\left(\frac{(8.7 + 12v) * 2^{12} - 1}{12v + 12v} + 1/2\right)$$

$$= \text{int}\left(\frac{20.7v * 4095}{24v} + 1/2\right)$$

$$= \text{int}(3531.9375 + 1/2)$$

$$= 3532$$