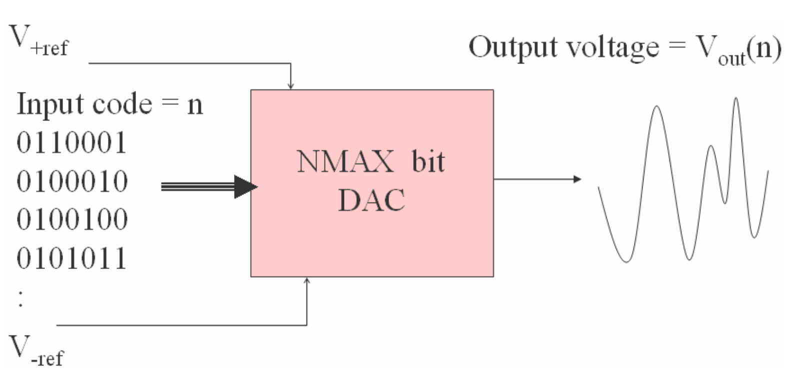
The Digital-to-Analogue Conversions (DAC) and Analogue-to-Digital Conversion (ADC)

Slide 1

Digital to Analogue Conversion



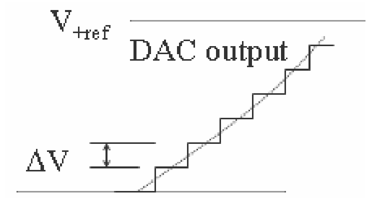
Slide 2

Digital to Analogue Conversion

- V_{+ref}, V_{-ref} are the high, low reference voltages respectively, NMAX=bit length of the DAC, n is the input code.

$$V_{out}(n) = V_{-ref} + n\left[\frac{V_{+ref} - V_{-ref}}{2^{NMAX}}\right]$$

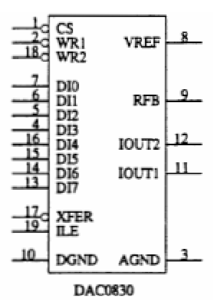
$$= V_{-ref} + n\Delta V$$



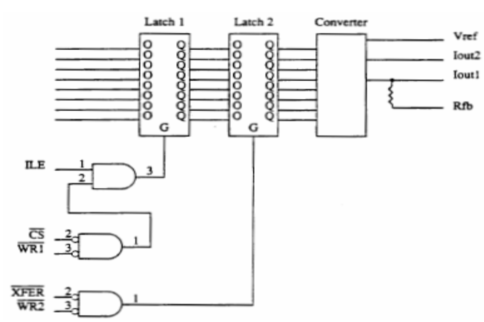
- At $n=0$, $V_{out}(0) = V_{-ref}$
- At max. $n= 2^{NMAX} -1$, V_{out} cannot reach V_{+ref} , (e.g., for NMAX= 4, n=0,1,2,..15)
- Some DACs have internal reference voltage settings, some can be set externally.

Slide 3

The DAC0830



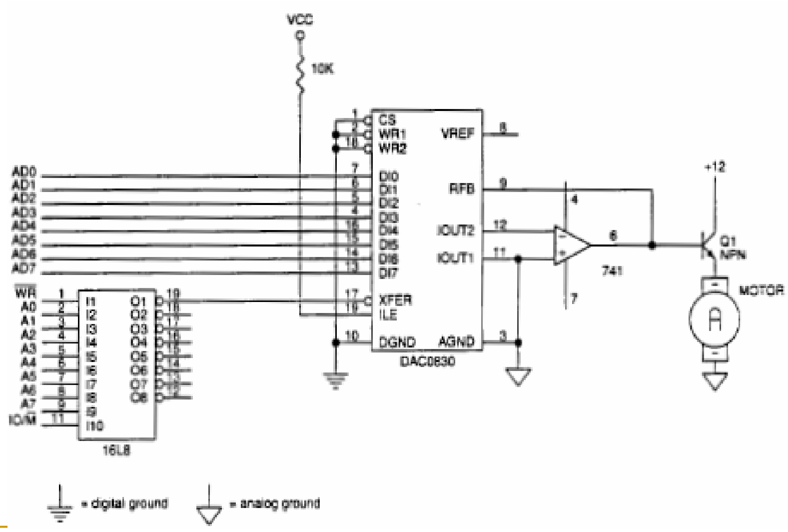
The Pin-Out



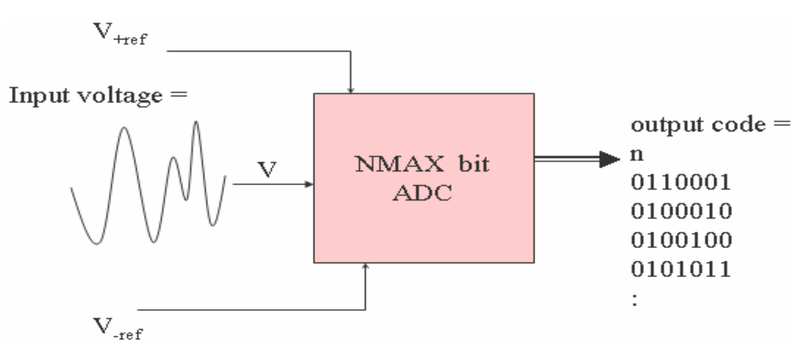
The internal circuit

Slide 4

The DAC0830 Interface to the Microprocessor



Analogue to Digital Conversion

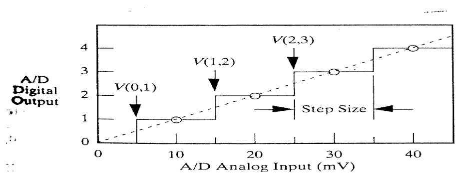


Analogue to Digital Conversion

- ***n*** **=converted code,** ***V*** **= input voltage,**

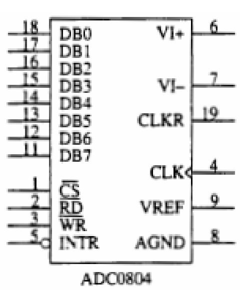
$$n = \left[\frac{V - V_{-ref}}{\Delta V} + \frac{1}{2} \right]_{\text{integer}} \text{, where } \Delta V = \frac{V_{+ref} - V_{-ref}}{2^N - 1},$$

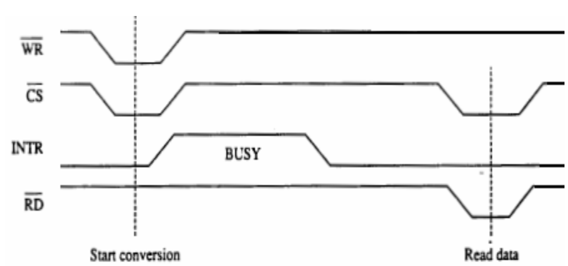
$$e.g., V_{-ref} = 0, \Delta V = 10\,mV \text{, as shown below :}$$



Slide 7

The ADC0804

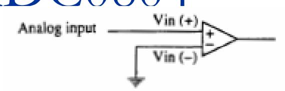




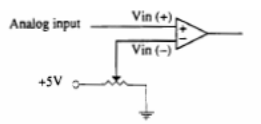
Timing Diagram

Slide 8

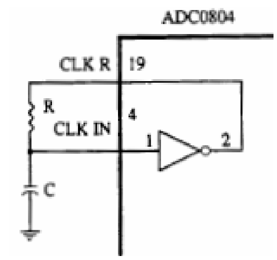
The Analogue Input to the ADC0804



(a) To sense a 0- to +5.0-V input.



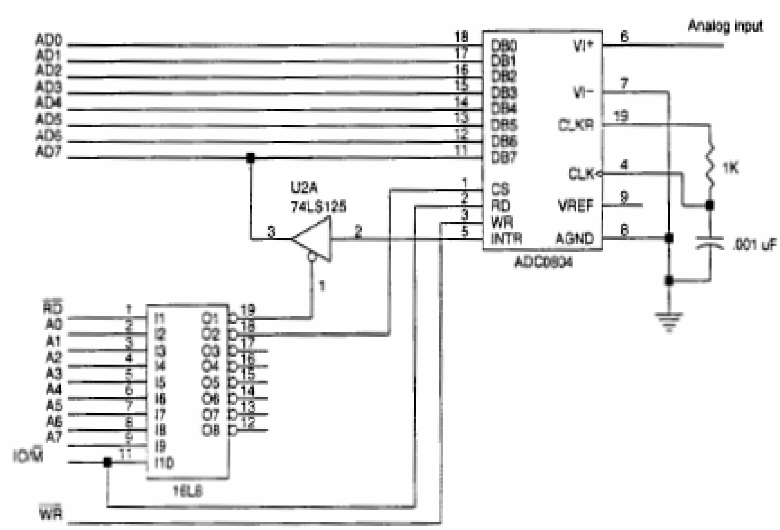
(b) To sense an input offset from ground.



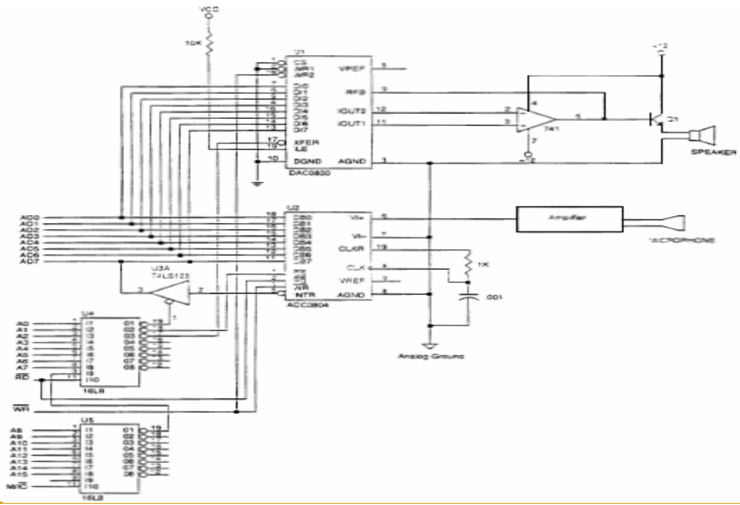
Connecting the RC circuit to the CLK IN and CLK R pins on the ADC0804.

$$Fclk = \frac{1}{1.1\,RC}$$

The Analogue Interface to the Microprocessor



Application Example



Slide 11