UNIVERSIDAD DE GUANAJUATO

D. I. C. I. S.

Microprocessors and Microcontrollers Laboratory

Laboratory session 2:

PIC18F45K50 A/D Converter

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PIC18F45K50 A/D Converter

Objetive:

To be able to configure and work with the PIC18F45K50 A/D converter

Resources:

1	Microcontroller PIC 18f45K50
8	LEDs
8	220Ω resistors
1	Potentiometer (any value)
1	MPLAB IDE software
1	Laptop
1	PIC Programmer
1	PIC18F45K50 data sheet

2.1 Introduction.

The analog/digital converter integrated in PIC18F45K50 is a successive approximations type. It has a 10-bit resolution and 25 analog input channels.

The main features are presented in the following list.

Resolution:	10 bits
Maximum Vref+:	VDD
Minimum Vref-:	VSS
Minimum voltage difference between Vref+ and Vref-:	3V (if VDD is greater than 3V) 1.8 V (if VDD is less than 3V)
Analog channels available:	25
Associated Registers:	ADRESH, ADRESL, ADCON0, ADCON1 ADCON2

A complete description of this converter and its operation is found in the Data Sheet.

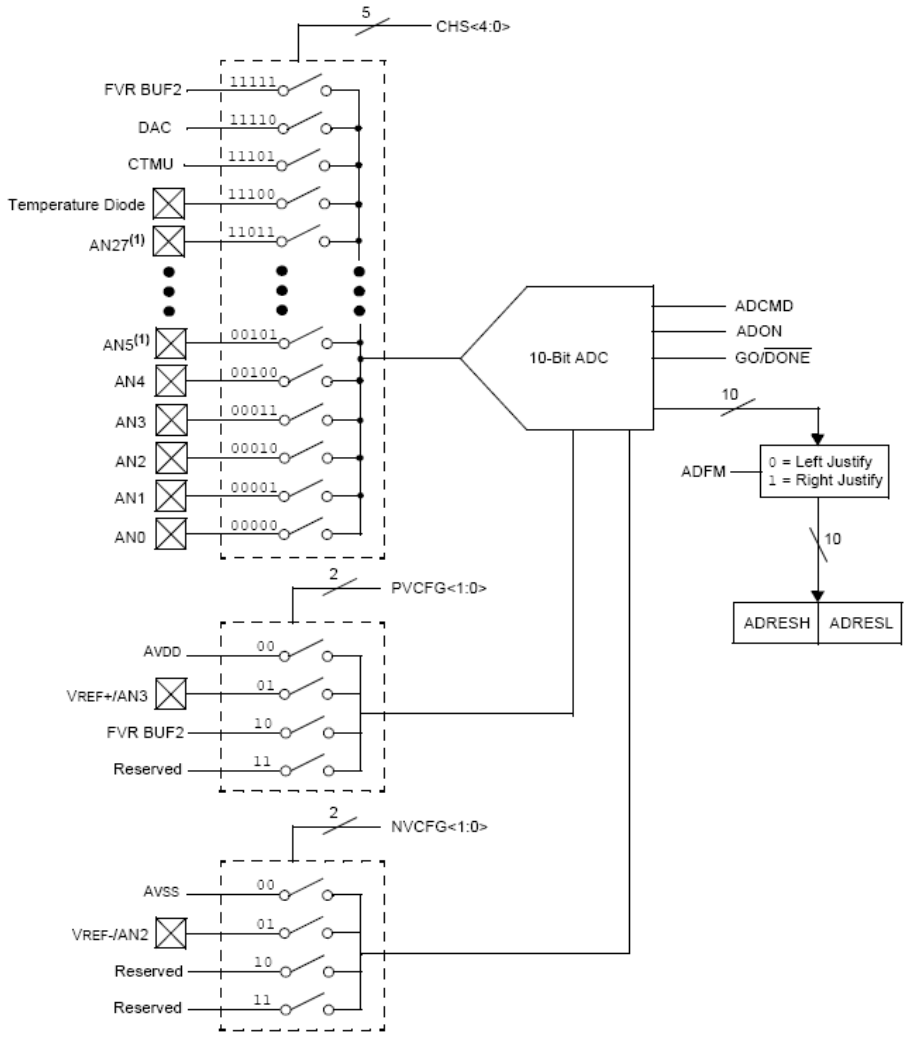

Fig. 1. Analog/digital converter diagram

2.2 Procedure.

A. For editing, debugging and simulating code, in order to program the microcontroller, it will be used the graphical software MPLAB X IDE (Integrated Development Environment).

The following code will be written and compiled in MPLAB IDE

```
; Program for operating the A/D converter

 LIST P = 18f45K50
        #include<p18f45k50.inc>

 CONFIG WDTEN = OFF              ; Disables the Watchdog
 CONFIG MCLRE = ON          ; Enables MCLEAR
 CONFIG DEBUG = OFF         ; Disables Debug mode
 CONFIG LVP = OFF           ; Disables Low-Voltage programming
 CONFIG FOSC = INTOSCIO     ; Enables the internal oscillator
```

```
  org 0                         ; Sets first instruction in address 00

Start:
...MOVLB    0x0F
  CLRF      ANSELB
  CLRF      PORTB
  CLRF      TRISB
  MOVLW     b'00110011'
  MOVWF     OSCCON
  MOVLW     b'00000001'         ; Channel A0 is selected and the module is enabled
  MOVWF     ADCON0
  MOVLW     b'00000000'         ; Vref-, Vref+ are defined
  MOVWF     ADCON1
  MOVLW     b'00010000'         ; ACQT = 4TAD, TAD = 2microS, and
  MOVWF     ADCON2              ; left justified

MainLoop:
  BSF       ADCON0,1            ; Starts conversion
conv
  BTFSC     ADCON0,1            ; Check for GO/DONE bit to clear
  GOTO      conv                ; Loop to check for bit 1 of ADCON0
  MOVFF     ADRESH,PORTB        ; Move ADRESH to PORTB
  GOTO      MainLoop            ; Jumps to instruction just after MainLoop tag
  END                           ; End of program
```

Once this code is written, compile it to generate the .hex file and program the microcontroller.

B. Once the PIC is programmed, place it on the proto-board and connect all components according to the diagram below. Be careful when handling the PIC because it can be damaged by static electricity. V_{DD} will be set at 5V and V_{SS} at 0V. Maximum current from each pin is 25 mA. If your LEDs cannot cope with this amount of current you should use a 220Ω resistor in series with the LED (as it is shown in the diagram).

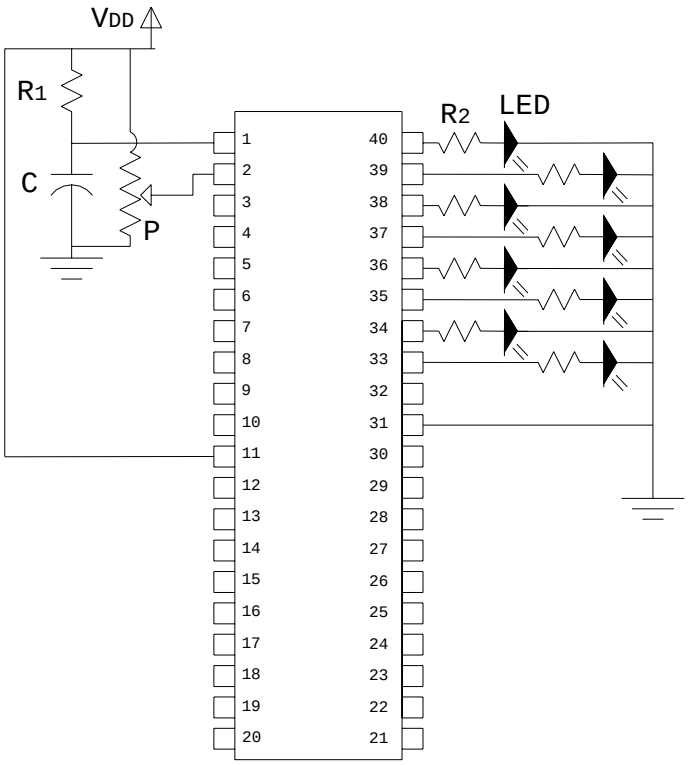

Table with recommended values for passive components:

Símbolo	Valor Min	Valor Max
V_{DD}	5V	5V
R_1	10KΩ	-
R_2	100Ω	220Ω
C	0.1μF	-
P	1KΩ	1MΩ

Resistor R1and capacitor C1 are recommended to avoid voltages outside range restart the device or it having high energy consumption. If you are using a regulated power supply, you can go without them.

2.3 Laboratory activities

1. See the instruction set and registers associated to the converter to modify the previous code for changing the selected channel to channel 1 (RA1/AN1). Select as well, as clock source, the RC oscillator of the converter.

2. Look at and present in your report the default values for registers ADCON0, ADCON1 and ADCON2.