

ANALOG-TO-DIGITAL CONVERTER (ADC) MODULE

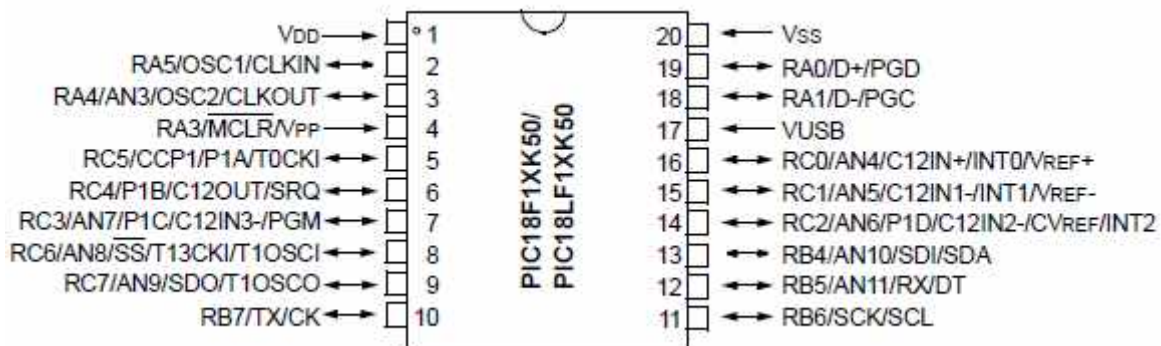
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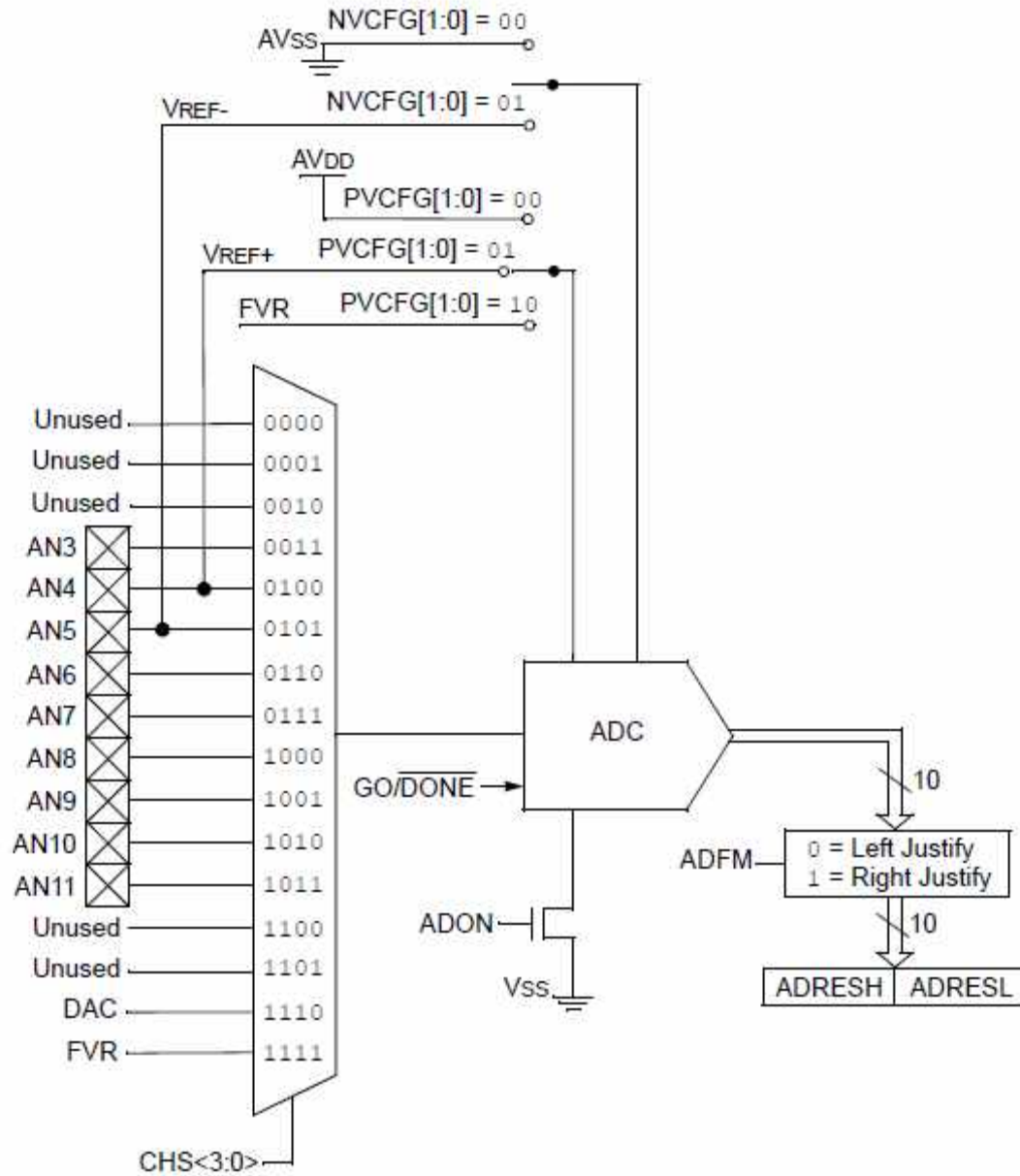
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Introduction

The Analog-to-Digital Converter (ADC) allows conversion of an analog input signal to a 10-bit binary representation of that signal. This device uses analog inputs, which are multiplexed into a single sample and hold circuit. The output of the sample and hold is connected to the input of the converter. The converter generates a 10-bit binary result via successive approximation and stores the conversion result into the ADC result registers (ADRESL and ADRESH).

The ADC voltage reference is software selectable to either V_{DD} , or a voltage applied to the external reference pins. The ADC can generate an interrupt upon completion of a conversion. This interrupt can be used to wake-up the device from Sleep.





Block diagram of the ADC.

The result of the conversion is

$$ADC = \frac{V_{IN} \times (2^{10} - 1)}{V_{REF}} = \frac{V_{IN} \times 1023}{V_{REF}}$$

where V_{IN} is the voltage on the selected input pin and V_{REF} the selected voltage reference. ADC value of $0x000$ represents analog ground, and $1023_{10} = 0x3FF_{16}$ represents the selected reference voltage where $V_{REF} = V_{DD} = 5V$.

There are 8 analog inputs, with a resolution of 10-bits, on the PIC18F14K50 labeled AN4 to AN11, AN4 is not usable. The analog input range is 0 to $5V_{DC}$.

Commands

The commands used to read analog inputs allow data to be retrieved is

RDn Returns value of analog port specified by n in decimal format. (n = 4 to 11)

Returns integer value from 0000 to 1023. (Input voltage range used for conversion is 0 to 5VDC)

Example: RD10<CR>
202

To convert ADC value to analog voltage;

$$V_{in} = \frac{ADC}{2^{10} - 1} \times V_{REF} = \frac{202}{1023} \times 5 = 0.987V$$

Sample java program to read 100 points of analog input data at AN11 and print the result at the console or terminal.

```
import app.*;

public class Main {

    public static void main(String[] args) throws Exception{
        /*** Open port COM3
        Parameters param = new Parameters();
        param.setPort("COM3");
        Com com = new Com(param);

        com.sendString("RESET\r",0);

        for(int i=0;i<100;i++) {
            com.sendString("rd11\r",1);
            String data =com.receiveToString('\n', 0);
            System.out.println(data);
            Thread.sleep(50);
        }

        /*** Close COM3
        com.close();
    }
}
```