



SNS COLLEGE OF TECHNOLOGY

Coimbatore-35
An Autonomous Institution



Accredited by NBA – AICTE and Accredited by NAAC – UGC with 'A+' Grade
Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

19ECT211 – MICROPROCESSOR AND MICROCONTROLLER

II YEAR IV SEM

UNIT 5 – ADVANCED MICROCONTROLLER

TOPIC 2 – PIC Microcontroller



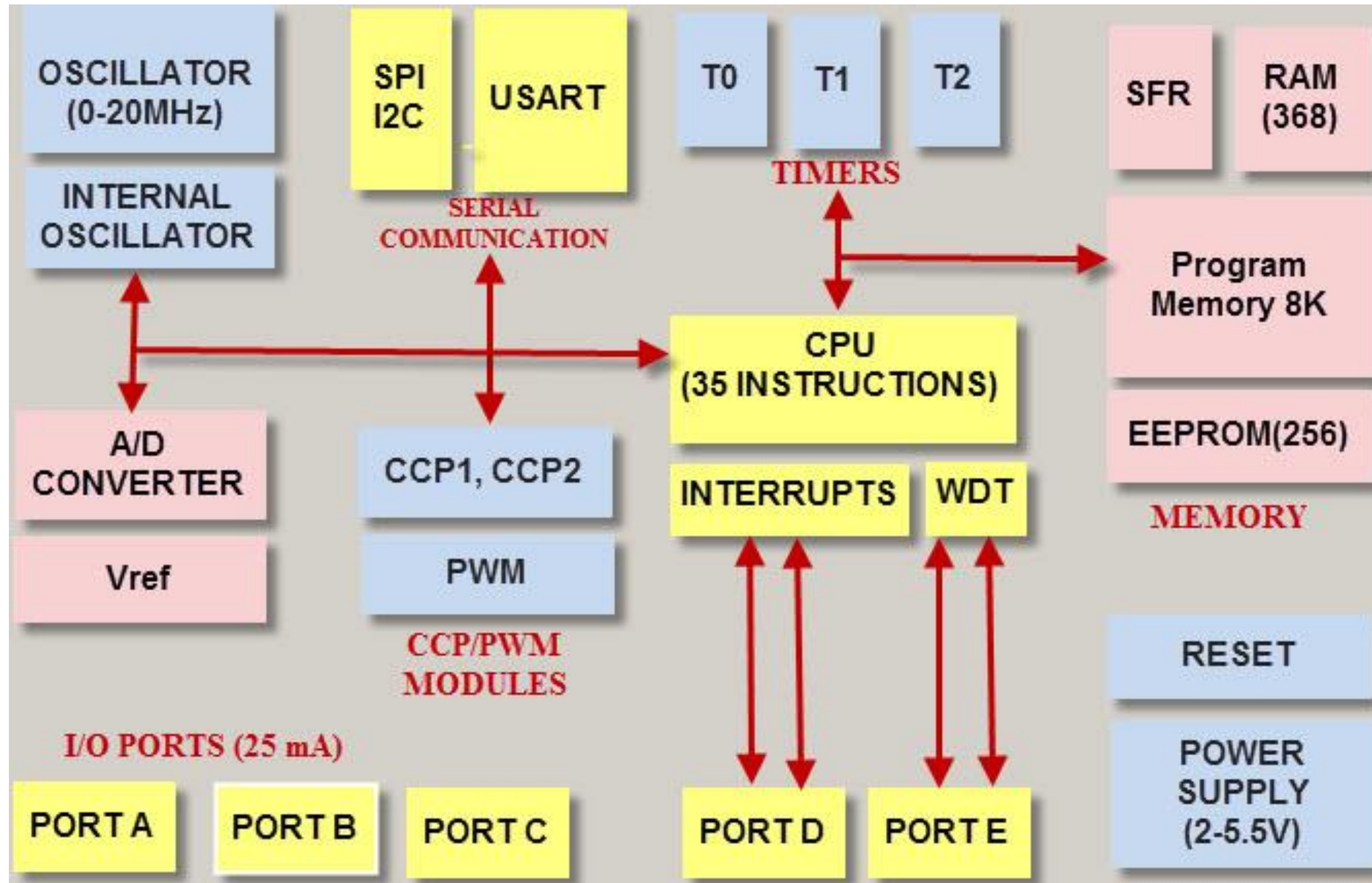
PIC Microcontroller



- PIC is a Peripheral Interface Microcontroller -developed in the year 1993 by the General Instruments Microcontrollers.
- It is controlled by software and programmed in such a way that it performs different tasks and controls a generation line.
- PIC microcontrollers are used in different new applications such as smartphones, audio accessories, and advanced medical devices.



PIC Microcontroller -Architecture

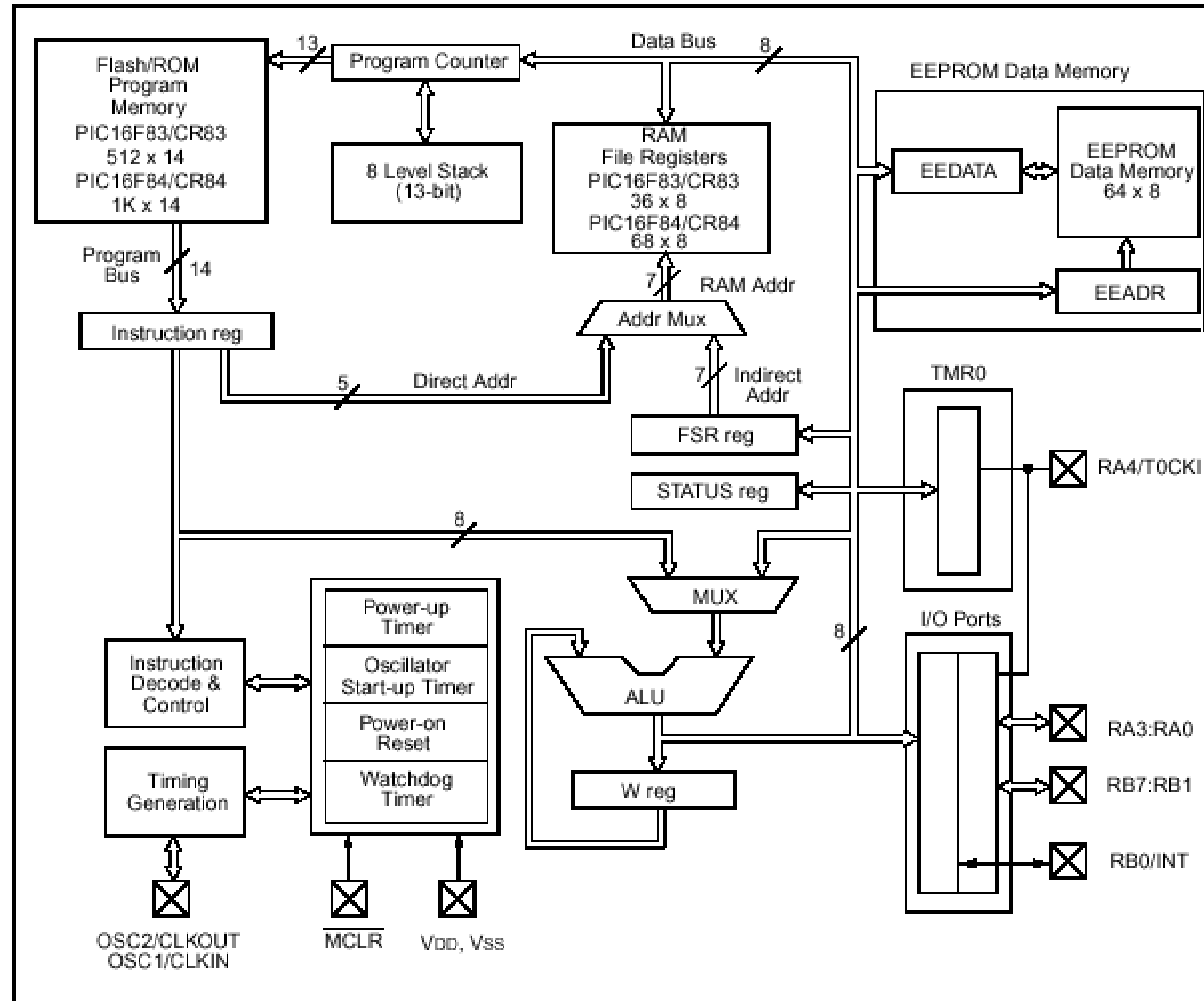




PIC MICROCONTROLLER -BLOCK DIAGRAM



FIGURE 3-1: PIC16F8X BLOCK DIAGRAM





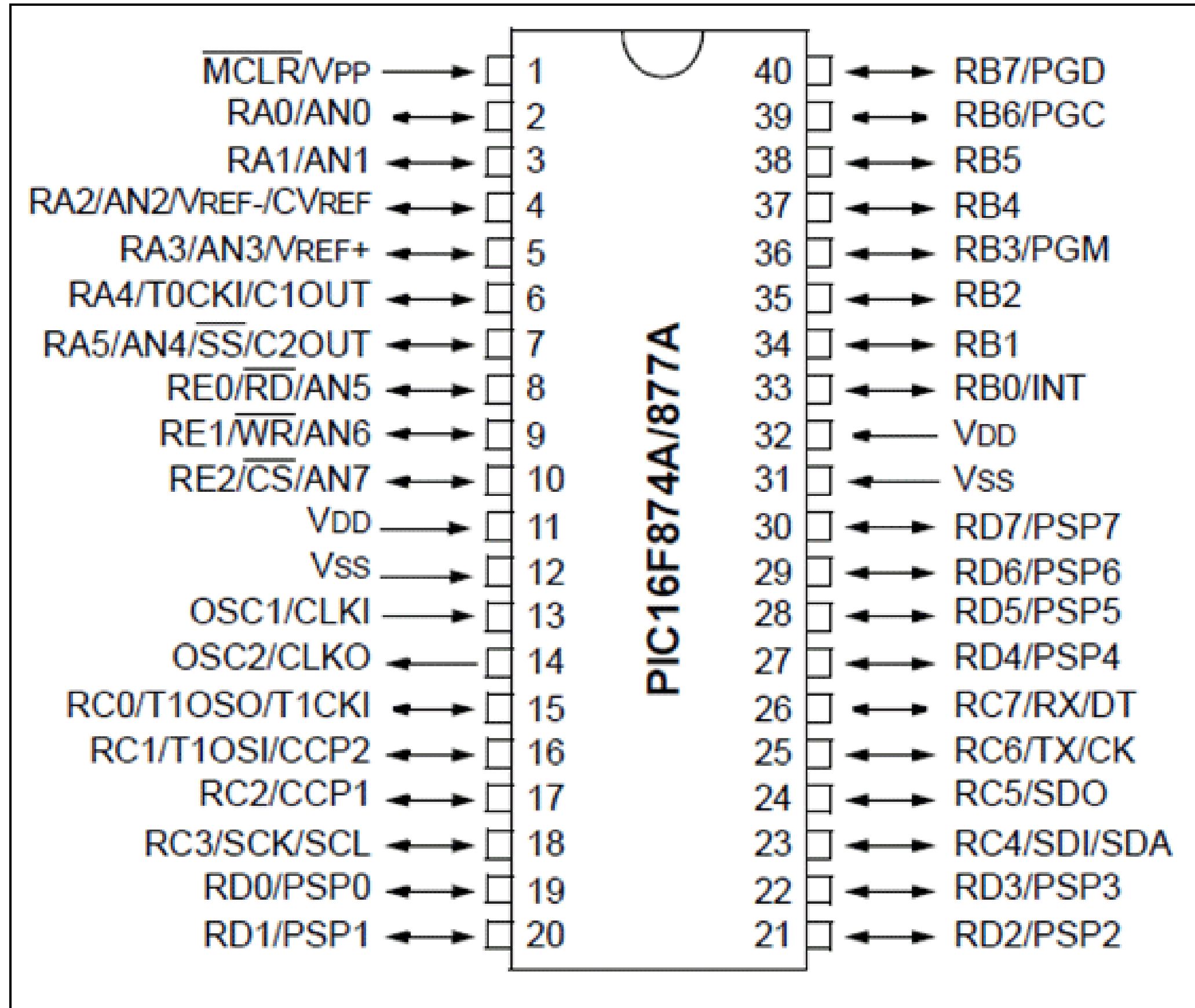
PIC MICROCONTROLLER –Peripheral Devices



- Timer0: 8-bit timer/counter with 8-bit prescaler
- Timer1: 16-bit timer/counter with prescaler, can be incremented during Sleep via external crystal/clock
- Timer2: 8-bit timer/counter with 8-bit period register, prescaler and postscaler
- Two Capture, Compare, PWM modules
 - Capture is 16-bit, max. resolution is 12.5 ns
 - Compare is 16-bit, max. resolution is 200 ns
 - PWM max. resolution is 10-bit
- Synchronous Serial Port (SSP) with SPI™ (Master mode) and I2C™ (Master/Slave)
- Universal Synchronous Asynchronous Receiver Transmitter (USART/SCI) with 9-bit address detection
- Parallel Slave Port (PSP) – 8 bits wide with external RD, WR and CS controls (40/44-pin only)
- Brown-out detection circuitry for Brown-out Reset (BOR)



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- It has a smaller **35 instructions set**.
- It can operate up to **20MHz frequency**.
- The operating voltage is between 4.2 volts to 5.5 volts. If you provide it voltage more than 5.5 volts, it may get damaged permanently.
- It does not have an internal oscillator like other [PIC18F46K22](#), [PIC18F4550](#).



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- The maximum current each PORT can sink or source is around 100mA.
- Therefore, the current limit for each GPIO pin of PIC16F877A is 10 milli ampere.
- It is available in **four IC packaging** such as 40-pin PDIP 44-pin PLCC, 44-pin TQFP, 44-pin QFN

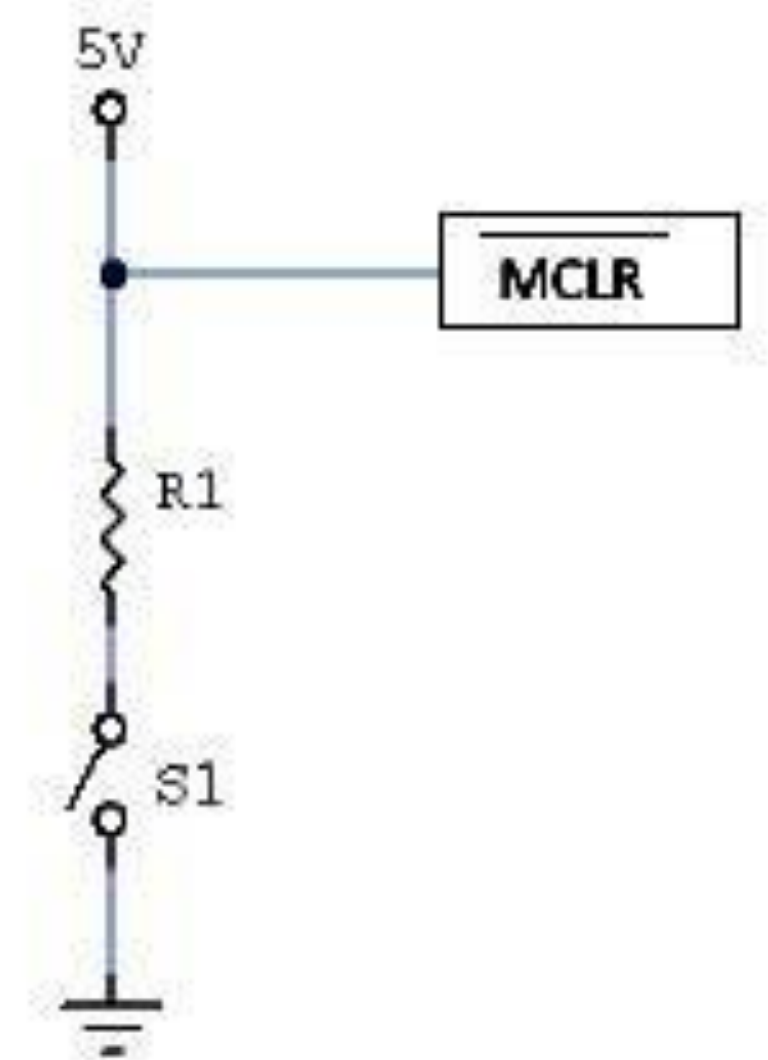


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PIN 1: MCLR:

- The first pin is the master clear pin of this IC.
- It resets the microcontroller and is active low, meaning that it should constantly be given a voltage of 5V and if 0V are given then the controller is reset.
- Resetting the controller will bring it back to the first line of the program that has been burned into the IC.





PIC 16F877A

- A push button and a resistor is connected to the pin. The pin is already being supplied by constant 5V.
- When we want to reset -push the button -bring the MCLR pin to 0 potential

PIN 2: RA0/AN0:

- PORTA consists of 6 pins, from pin 2 to pin 7, all of these are bidirectional input/output pins.
- Pin 2 is the first pin of this port.
- This pin can also be used as an analog pin AN0. It is built in **analog to digital converter.**



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- **PIN 3: RA1/AN1:** This can be the analog input 1.
- **PIN 4: RA2/AN2/Vref- :** It can also act as the analog input 2. Or negative analog reference voltage can be given to it.
- **PIN 5: RA3/AN3/Vref+:** It can act as the analog input 3. Or can act as the analog positive reference voltage.
- **PIN 6: RA0/T0CKI:** To timer 0 this pin can act as the clock input pin, the type of output is open drain.



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PIN 7: RA5/SS/AN4:

➤ This can be the analog input 4. There is synchronous serial port in the controller also and this pin can be used as the slave

PIN 8: RE0/RD/AN5:

➤ PORTE starts from pin 8 to pin 10 and this is also a bidirectional input output port.

➤ It can be the analog input 5 or for parallel slave port it can act as a 'read control' pin.



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PIN 9: RE1/WR/AN6:

- It can be the analog input 6.
- And for the parallel slave port it can act as the 'write control' which will be active low.

PIN 10: RE2/CS/A7:

- It can be the analog input 7, or for the parallel slave port it can act as the 'control select' which will also be active low just like read and write control pins.



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PIN 11 and 32: VDD:

➤ These two pins are the positive supply for the input/output and logic pins.

➤ Both of them should be connected to 5V.

PIN 12 and 31: VSS:

➤ These pins are the ground reference for input/output and logic pins.

➤ They should be connected to 0 potential.



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PIN 13: OSC1/CLKIN:

This is the oscillator input or the external clock input pin.

PIN 14: OSC2/CLKOUT:

- This is the oscillator output pin.
- A crystal resonator is connected between pin 13 and 14 to provide external clock to the microcontroller.
- $\frac{1}{4}$ of the frequency of OSC1 is outputted by OSC2 in case of RC mode.

This indicates the instruction cycle rate.



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PIN 15: RC0/T10CO/T1CKI:

PORTC consists of 8 pins. It is also a bidirectional input output port. Of them, pin 15 is the first. It can be the clock input of timer 1 or the oscillator output of timer 2.

PIN 16: RC1/T1OSI/CCP2:

It can be the oscillator input of timer 1 or the capture 2 input/compare 2 output/ PWM 2 output.

PIN 17: RC2/CCP1:

It can be the capture 1 input/ compare 1 output/ PWM 1 output.



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PIN 18: RC3/SCK/SCL:

It can be the output for SPI or I2C modes and can be the input/output for synchronous serial clock.

PIN 23: RC4/SDI/SDA:

It can be the SPI data in pin. Or in I2C mode it can be data input/output pin.

PIN 24: RC5/SDO:

It can be the data out of SPI in the SPI mode.

PIN 25: RC6/TX/CK:

It can be the synchronous clock or USART Asynchronous transmit pin.



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PIN 26: RC7/RX/DT:

It can be the synchronous data pin or the USART receive pin.

PIN 19,20,21,22,27,28,29,30:

All of these pins belong to PORTD which is again a bidirectional input and output port.

When the microprocessor bus is to be interfaced, it can act as the parallel slave port.



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PIN 33-40: PORT B:

All these pins belong to PORTB.

Out of which RB0 can be used as the external interrupt pin and RB6 and RB7 can be used as in-circuit debugger pins.



References

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Thank You