Name : Mohamed Abdelmoneim Mahmoud
Sec:2
B.N:29

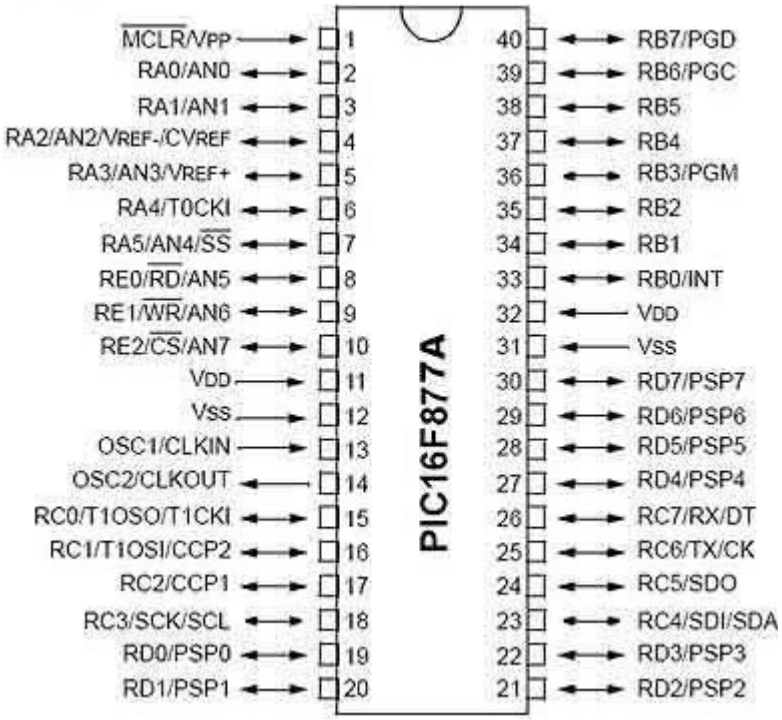
Comparison between PIC16F877A and TM4C123GH6PM Microcontrollers

1. Introduction

Microcontrollers (MCUs) play a vital role in embedded systems, with each MCU tailored to specific applications. In this report, we will compare two popular microcontrollers: the Summer training Microcontroller PIC16F877A, developed by Microchip Technology, and the This course Microcontroller TM4C123GH6PM, developed by Texas Instruments. The comparison will cover the architecture, features, power consumption, and applications of each MCU.

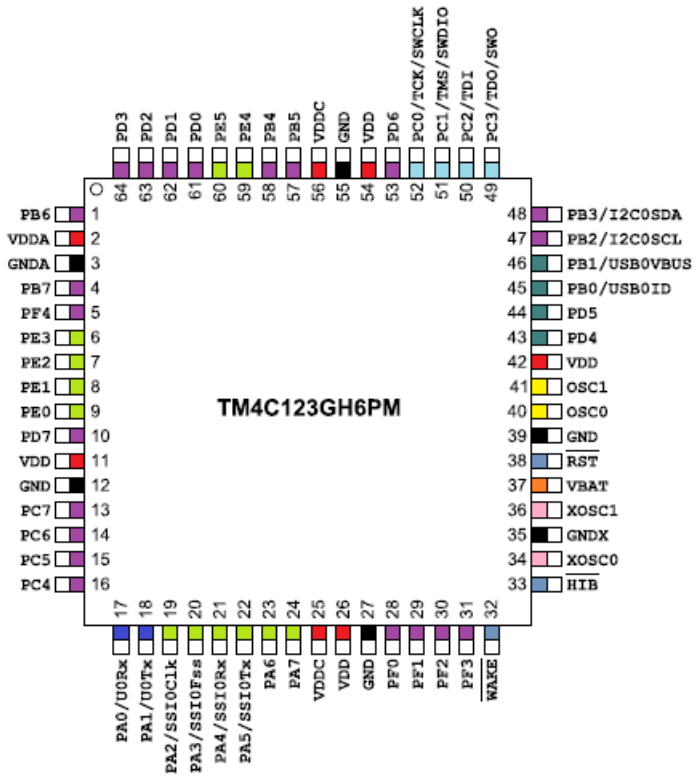
2. Architecture

PIC16F877A:



- 8-bit microcontroller based on the Harvard architecture.
- It has a Reduced Instruction Set Computing (RISC) design with a limited number of instructions (35).
- Operates at a maximum clock frequency of 20 MHz.
- Contains a total of 368 bytes of RAM and 256 bytes of EEPROM.

TM4C123GH6PM:



- 32-bit microcontroller based on the ARM Cortex-M4 architecture.
- It features a complex instruction set (CISC) but is optimized for speed and efficiency.
- Operates at a maximum clock frequency of 80 MHz.
- Contains 32 KB of RAM and 2 KB of EEPROM, making it significantly more powerful in terms of memory capacity.

3. Peripherals and Features

PIC16F877A:

- 5 I/O ports and supports up to 33 I/O pins.
- Includes features such as an Analog-to-Digital Converter (ADC), USART, and PWM.

- Suitable for smaller and simpler tasks.
- Limited interrupt capability, with only 14 interrupts.

TM4C123GH6PM:
- 6 I/O ports with 43 I/O pins.
- Comes with a wide range of peripherals, including USB 2.0, CAN, SPI, and I2C.
- Features advanced functionalities like floating-point unit (FPU) support, Nested Vector Interrupt Controller (NVIC) with 43 interrupt lines.
- Built for more complex tasks, supporting applications like motor control, sensors, and communication systems.

4. Power Consumption

PIC16F877A:
- Power-efficient and operates at a voltage range of 2.0V - 5.5V.
- Typically used in battery-powered applications due to its low power consumption.

TM4C123GH6PM:
- Operates at a voltage range of 3.3V and includes multiple power-saving modes.
- Power consumption is higher than PIC16F877A due to its higher clock frequency and enhanced functionalities.

5. Programming and Development

PIC16F877A:
- Typically programmed using Assembly language or C, and tools like MPLAB IDE.
- Simpler to program due to its smaller instruction set.

TM4C123GH6PM:
- Can be programmed using C/C++ or Assembly. It is compatible with popular IDEs like Code Composer Studio (CCS) and Keil uVision.
- Offers more flexibility in development due to its support for RTOS (Real-Time Operating Systems) and a wide range of third-party libraries.

6. Applications

PIC16F877A:
- Used in simpler embedded systems such as home automation, security systems, and sensor interfacing.

TM4C123GH6PM:

- Suitable for more complex applications like automotive systems, industrial automation, Internet of Things (IoT) devices, and communication systems.

Key Difference

Feature	PIC16F877A	TM4C123GH6PM
Maximum speed	Up to 20 MHZ	80 MHZ
Memory	14 kB flash	Up to 256 KB flash
Peripherals	UART,SPI,I2C	UART,SPI,I2C,USB
Cost	Lower	Higher
Architecture	Risk 8-bit	ARM CORTEX-4M 32bit
EEPROM	256 Bytes	Not built in
I/OPins	33	43
Application	Robotics Control	Real-time Systems

The PIC16F877A is a reliable and widely-used microcontroller for simpler, cost-effective embedded systems, while the TM4C123GH6PM is more powerful, capable of handling more complex tasks with higher computational demands. The choice between them depends on the specific requirements of the application, including memory needs, speed, and peripheral support.