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MICROCONTROLLER FAMILIES

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EMBEDDDED SYSTEM

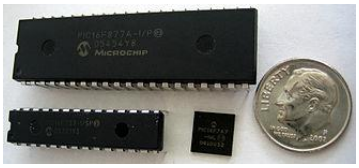
The different microcontroller families

Introduction

Microcontrollers (MCUs) are compact integrated circuits designed to govern a specific operation in an embedded system. They come in various families and brands, each with distinct features, architectures, and applications

Microcontroller Families

1.PIC Microcontrollers



- **Brand**: Microchip Technology
- **Architecture**: 8-bit, 16-bit, and 32-bit

2. AVR Microcontrollers

- **Brand**: Atmel (now part of Microchip)
- **Architecture**: 8-bit and 32-bit

3. ARM Microcontrollers

- **Brand**: Various manufacturers (e.g., STMicroelectronics, NXP, Texas Instruments)
- **Architecture**: 32-bit and 64-bit

4.MSP430 Microcontrollers

- **Brand**: Texas Instruments
- **Architecture**: 16-bit

5. 8051 Microcontrollers

- **Brand**: Various (Intel, Silicon Labs, NXP)
- **Architecture**: 8-bit

PIC16F877A vs. ARM Microcontrollers(Cortex-M4)

1. Overview of PIC16F877A

- **Architecture**: 8-bit
- **Clock Speed**: Up to 20 MHz
- **Memory**:
  - Flash: 14 KB
  - RAM: 368 Bytes
  - EEPROM: 256 Bytes
- **I/O Ports**: 33 I/O pins
- **Features**:
  - Integrated ADC (10-bit)
  - Timer modules (3)
  - PWM outputs
  - Serial communication (USART)
- **Power Consumption**: Low power modes available

2. Overview of ARM Cortex-M4

- **Architecture**: 32-bit
- **Manufacturer**: Various (e.g., STMicroelectronics, NXP, Texas Instruments)
- **Clock Speed**: Up to 180 MHz (varies by model)
- **Memory**:
  - Flash: Up to 1 MB (depending on the model)
  - RAM: Up to 128 KB (or more)
- **I/O Ports**: Varies by specific implementation (up to 168 pins)
- **Features**:
  - 12-bit ADC (or higher)
  - Floating-point unit (FPU)
  - Digital signal processing (DSP) capabilities
  - Multiple communication interfaces (I2C, SPI, CAN, USB)

- **Power Consumption**: Highly optimized for low power with various sleep modes.

3. Comparison of Features

Feature	PIC16F877A	ARM Cortex-M4
Architecture	8-bit	32-bit
Clock Speed	Up to 20 MHz	Up to 180 MHz
Flash Memory	14 KB	Up to 1 MB
RAM	368 Bytes	Up to 128 KB (or more)
ADC	10-bit	12-bit (or higher)
DSP Capabilities	No	Yes
I/O Ports	33	Up to 168
Development Tools	MPLAB IDE	Various (Keil, IAR, STM32)
Power Consumption	Low	Highly optimized
Applications	Basic control tasks	Complex, resource-intensive tasks