Report

The different brands of

microcontrollers and its families

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There are many microcontrollers manufacturers and there is a variety of options available from every manufacturer to meet the needed requirements of the market.

1. Microchip Technology

a. PIC

- Architecture: Modified Harvard that separates program and data memory
- Peripherals: They support Timers, ADC and interfaces like UART, SPI, and I2C
- Families: the most popular ones are PIC10, PIC12, PIC16, PIC18, PIC24, and PIC32
- Features: they are low cost and easy to program and that makes them very popular.

b. AVR

- AVR was first developed by ATMEL then acquired by microchip in 2016
- Architecture: Harvard Architecture with an 8-bit RISC
- Peripherals: ADC, serial UART, EEPROM and PWM
- Families: tinyAVR , megaAVR, AVR Dx, XMEGA and 32-bit AVR
- Features:
  - 32 general purpose registers.
  - greatly optimized target code size
  - using RISC overcomes the bottleneck caused by single ACC (Accumulator) in multistep calculations

2. STMicroelectronics (STM32)

a. STM32 is a 32-bit MCU based on ARM processor core

b. Architecture: 32-bit RISC ARM Cortex-M series

c. Families: there are variety of options available

- High Performance: STM32F7, STM32H7 and STM32F2
- Low-Power: STM32L4+, STM32L0 and STM32L5
- Wireless: STM32WL, STM32WB0 and STM32WBA

d. Features: high performance, Digital signal processing, Graphic features

3. ESP32

a. It's a low cost , low power system on chip MCU produced by Espressif Systems

b. Architecture: 32-bit RISC

c. Families: ESP32-S2, ESP32-C6 and ESP32-c61

d. Features: Ultra-low-power co-processor, supports wireless connectivity, GPIOs, I2C, Ethernet, IR remote controller

4. MSP430

a. It is a mixed-signal MCU built by Texas Instruments

b. Architecture: 16-bit RISC

c. Families: MSP430G2xx, MSP430F5xx/6xx and MSP430FR5xx/FR6xx

d. Features: Low power consumption, Internal Oscillator, Timer and PWM, Watchdog Timer, Brownout reset circuit , I2C and ADC

The difference between the summer training and this course that we used **PIC16F877A** in the summer training and we are using **Cortex M4**

1- Cortex M4

    a. Architecture: 32-bit built with ARMv7E-M (Harvard)

    b. Memory:

        i. Flash Memory: 32KB up to 2MB

        ii. SRAM: 4KB to 512KB

    c. Power Consumption: Efficient power Consumption so it's suitable for IoT and low power applications like watches. Also, it supports sleep mode

    d. Features: 3-stage pipeline, 16/32-bit MAC, NMI, JTAG, Optional FPU

2- PIC16F877A

    a. Arctiecture: 8-bit RISC based on Harvard developed by Microchip Technologies

    b. Memory: It contains 3 types of memory

        i. Program memory (Flash): 14KB to store program code

        ii. Data memory (RAM): 368b of SRAM to store application temporary data

        iii. EEPROM: 256b non-volatile memory to store data and will be kept even after powering off

    c. Power Consumption: it supports sleep mode and low power mode and has low power consumption

    d. Features: 33 I/O pins, 2 PWM channels, two 8-bit timer/counter, Eight Level Deep Hardware Stack and Programmable Code Protection.