Microcontroller brands and families

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1- Microchip Technology

- PIC
  Is a family of microcontrollers made by microchip technology.
  PIC initially referred to peripheral interface controller and currently expanded as programmable intelligent computer
  PIC micro chips are designed with Harvard architecture
  The baseline and mid-range families use 8-bit wide data memory.
  The latest series, PIC32MZ, is a 32-bit MIPS based microcontroller
  The PIC architecture is one operand accumulator machine like the PDP-8 it has:
  A small number of fixed- length instructions with mostly fixed timing (2 clock cycles or 4 clock cycles in 8-bit model)
  A small amount of addressable data space (32,128,256 bytes depending on the family)
  separate code and data space (Harvard architecture)

- AVR
  Is a family of microcontrollers developed by Atmel, acquired by microchip technology in 2016
  These are modified Harvard architecture 8-bit RISC single chip microcontroller families to use one chip flash memory for program storage
  Basic families (tinyAVR – megaAVR – AVR Dx- AVR DD- series – AVR EA- series)
  AVRs have 32 single byte registers and are classified as 8-bit RISC devices
  Flash, EEPROM and SRAM are integrated into a single chip removing the need of the external memory in most applications

2- STMicroelectronics

- STM32
  Is a family of 32 bit microcontroller
  The STM32 chips are grouped into related series that are based around the same 32-bit RISC ARM processor core cortex m0, cortex m0+ cortex m3 cortex m4 cortex m7 cortex m33
  Consists of many series of microcontrollers , C0, F0, F1, F2, F3, F4 ,F7, G0, G4, H5, H7, L0, L4, L4+, L5, U0, U5, WBA, WB, WL
- STM8
  Is an 8 bit microcontroller family
  It is a low cost for full featured 8-bit microcontroller
  The STM8 is very similar to ST7 but better suited as a target for C due to its 16 bit index registers and stack pointer relative addressing mode
  It depends on Harvard architecture
  Subfamilies (STM8AF automobile – STM8AL automobile low power- STM8L low power- STM8S general purpose- STM8T touch sensing- STLUX lighting control – STNRG Pulse width modulation controllers)

3-Texas Instruments

- MSP430
  Is a mixed signal microcontroller. Build around a 16-bit CPU
  It was designed for low power consumption embedded applications and low cost
  The first MSP430s had a consumption around 400 uA/MHz and less than 2 uA in low power mode with active basic timer and LCD driver
  The MSP430s use up to seven different low power modes
  The device comes in variety of generations featuring the usual peripherals (internal oscillator- timer including PWM- watchdog timer – USART- serial peripheral interface bus- analog to digital converter- brownout reset circuitry)

4- ARM

- ARM Cortex-M
  is a group of 32-bit RISC ARM processor cores licensed by ARM Limited. These cores are optimized for low cost and energy efficient integrated circuits
  the Cortex-M family consistes of Cortex-M0, Cortex-M0+, Cortex-M3, Cortex-M4, Cortex-M7, Cortex-M23, Cortex-M33, Cortex-M35p, Cortex-M52, Cortex-M55, Cortex-M85
  All cortex m cores implement a common subset of instructions that consists of Thumb-1 and Thumb-2, including a 32-bit result multiply
  Most cortex m3 and m4 chips have bit band and MPU
  Interrupts 1-32 for (M0, M0+, M1) 1-240 for (M3, M4,M7,M23) 1-480 for the rest of the families
  Instructions fetch width 16-bit or 32-bit

5-Renesas Electronics

- RL78
  Low power 8/16 bit microcontroller
  The RL78 family is an accumulator-based register bank CISC instruction set architecture
  It has 3 three stage instruction pipelining
  All arithmetic operations are performed on a single accumulator
  It covers wide range of application area for mechanical system controls and for user interfaces

The difference between PIC16F877A and ARM cortex -M4

	PIC16F877A	ARM cortex-M4
Architecture	Based on an 8-bit modified Harvard architecture Use RISC architecture	Based on a 32-bit ARMv7-M architecture (Harvard architecture) Use RISC architecture
Processing power	8-bit microcontroller Maximum clock speed 20 MHz Single cycle instruction execution, limited instruction	32-bit processor Clock speed from 80MHz to 200+MHz Support FPU and DSP instructions and advanced interrupt handling
Memory	14 KB flash memory 368 bytes SRAM 256 bytes EEPROM	From 64 KB to several MB flash From 8 KB to 512 KB SRAM
Power consumption	Low power applications About 20mA at 5V and 20MHz	More efficient in terms of performance with power saving modes Good choice for energy efficient designs
Peripherals	Limited 10-bit ADC, timers, UART, I2C, SPI	More advanced and larger variety of peripherals 12-bit ADC or higher, timers, PWM, UART, I2C, SPI, CAN, USB, ethernet
Interrupt handling	Basic interrupt handling Limited number of interrupts	Advanced nested vector interrupt controller (NVIC) Up to 240 interrupt
Cost	Lower cost for simple applications	Higher cost but still affordable