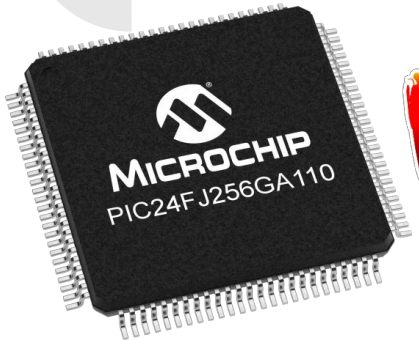
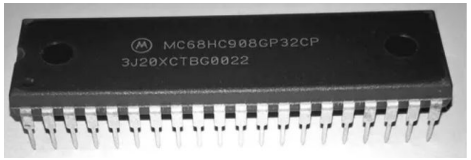
TRABAJO PRÁCTICO 3

Comparación de microcontroladores

ALFONSO - DELCOURT - DONIS - FUENTES



VS



VS

PIC24FJ256GA110 (MICROCHIP)

MC68HC908GP32 (FREESCALE)

STM32F103RCT6 (STMicroelectronics)

MICROCHIP

freescale semiconductor

life.augmented

PIC24FJ256GA110

Reloj de tiempo real (RTC) con precisión de al menos 1 ms.

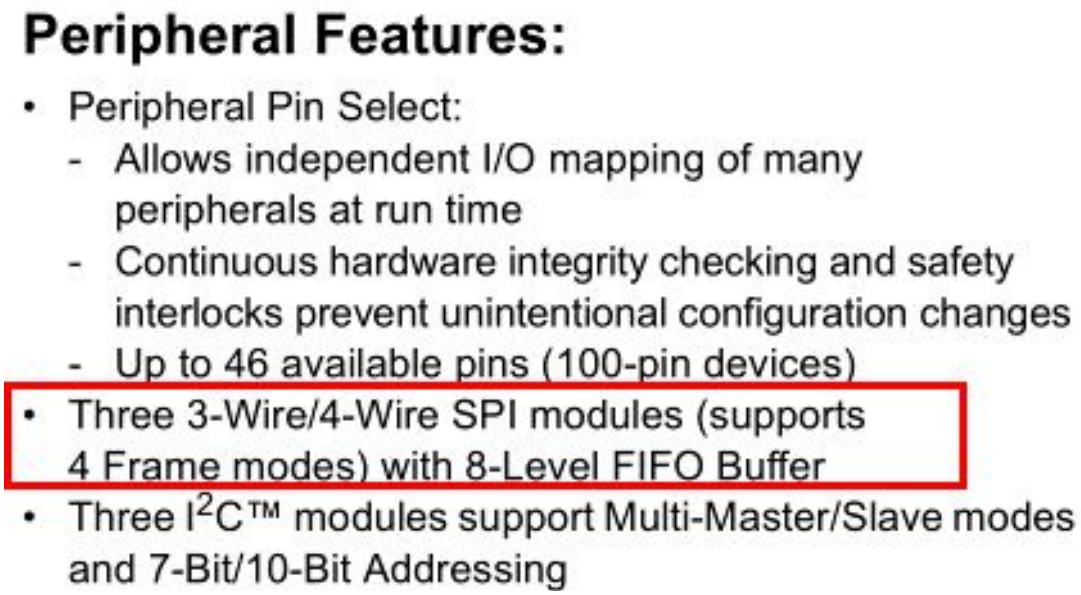
$$T = \frac{1}{8x10^6 Hz} = 0{,}125\mu s$$

High-Performance CPU:

- Modified Harvard Architecture
- Up to 16 MIPS Operation at 32 MHz
- 8 MHz Internal Oscillator
- 17-Bit x 17-Bit Single-Cycle Hardware Multiplier
- 32-Bit by 16-Bit Hardware Divider
- 16 x 16-Bit Working Register Array
- C Compiler Optimized Instruction Set Architecture with Flexible Addressing modes
- Linear Program Memory Addressing, Up to 12 Mbytes
- Linear Data Memory Addressing, Up to 64 Kbytes
- Two Address Generation Units for Separate Read and Write Addressing of Data Memory

PIC24FJ256GA110

Sensor de temperatura externo conectado por protocolo SPI hasta 1MHz de frecuencia de reloj.



Peripheral Features:

- Peripheral Pin Select:
  - Allows independent I/O mapping of many peripherals at run time
  - Continuous hardware integrity checking and safety interlocks prevent unintentional configuration changes
  - Up to 46 available pins (100-pin devices)
- Three 3-Wire/4-Wire SPI modules (supports 4 Frame modes) with 8-Level FIFO Buffer
- Three I^2C™ modules support Multi-Master/Slave modes and 7-Bit/10-Bit Addressing

PIC24FJ256GA110

Adquisición de cuatro señales analógicas de 0 a 3,3V con frecuencia de muestreo de 8kHz por canal.

- **Analog Features:** All members of the PIC24FJ256GA110 family include a 10-bit A/D Converter module and a triple comparator module. The A/D module incorporates programmable acquisition time, allowing for a channel to be selected and a conversion to be initiated without waiting for a sampling period, as well as faster sampling speeds. The comparator module includes three analog comparators that are configurable for a wide range of operations.

Analog Features:

- 10-Bit, Up to 16-Channel Analog-to-Digital (A/D) Converter at 500 ksps:
  - Conversions available in Sleep mode
- Three Analog Comparators with Programmable Input/Output Configuration
- Charge Time Measurement Unit (CTMU)

PIC24FJ256GA110

Adquisición de cuatro señales digitales tipo pulsos. Tiempo mínimo de ancho de pulsos 10µs.

1.3 Details on Individual Family Members

Devices in the PIC24FJ256GA110 family are available in 64-pin, 80-pin and 100-pin packages. The general block diagram for all devices is shown in Figure 1-1.

The devices are differentiated from each other in four ways:

1. Flash program memory (64 Kbytes for PIC24FJ64GA1 devices, 128 Kbytes for PIC24FJ128GA1 devices, 192 Kbytes for PIC24FJ192GA1 devices and 256 Kbytes for PIC24FJ256GA1 devices).
2. Available I/O pins and ports (53 pins on 6 ports for 64-pin devices, 69 pins on 7 ports for 80-pin devices and 85 pins on 7 ports for 100-pin devices).
3. Available Interrupt-on-Change Notification (ICN) inputs (same as the number of available I/O pins for all devices).
4. Available remappable pins (31 pins on 64-pin devices, 42 pins on 80-pin devices and 46 pins on 100-pin devices)

PIC24FJ256GA110

Generación de seis salidas del tipo modulación por ancho de pulso con frecuencia de 50Hz y resolución de 10µs.

TABLE 14-1: EXAMPLE PWM FREQUENCIES AND RESOLUTIONS AT 4 MIPS (F_{CY} = 4 MHz)(1)

PWM Frequency	7.6 Hz	61 Hz	122 Hz	977 Hz	3.9 kHz	31.3 kHz	125 kHz
Timer Prescaler Ratio	8	1	1	1	1	1	1
Period Register Value	FFFFh	FFFFh	7FFFh	0FFFh	03FFh	007Fh	001Fh
Resolution (bits)	16	16	15	12	10	7	5

Note 1: Based on F_{CY} = F_{OSC}/2, Doze mode and PLL are disabled.

TABLE 14-2: EXAMPLE PWM FREQUENCIES AND RESOLUTIONS AT 16 MIPS (F_{CY} = 16 MHz)(1)

PWM Frequency	30.5 Hz	244 Hz	488 Hz	3.9 kHz	15.6 kHz	125 kHz	500 kHz
imer Prescaler Ratio	8	1	1	1	1	1	1
eriod Register Value	FFFFh	FFFFh	7FFFh	0FFFh	03FFh	007Fh	001Fh
esolution (bits)	16	16	15	12	10	7	5

ote 1: Based on F_{CY} = F_{OSC}/2, Doze mode and PLL are disabled.

Peripheral Features:

- Five 16-Bit Timers/Counters with Programmable Prescaler
- Nine 16-Bit Capture Inputs, each with a Dedicated Time Base
- Nine 16-Bit Compare/PWM Outputs, each with a Dedicated Time Base
- 8-Bit Parallel Master Port (PMP/PSP):
  - Up to 16 address pins
  - Programmable polarity on control lines
- Hardware Real-Time Clock/Calendar (RTCC):
  - Provides clock, calendar and alarm functions
- Programmable Cyclic Redundancy Check (CRC) Generator
- Up to 5 External Interrupt Sources

PIC24FJ256GA110

Un Puerto serie asincrónico compatible con EIA232 que permita enviar comandos para configurar o solicitar datos medidos.

Un Puerto serie asincrónico compatible con EIA232 para debug concepto de administración tipo supervisor del puerto.

27.12 MPLAB PM3 Device Programmer

The MPLAB PM3 Device Programmer is a universal, CE compliant device programmer with programmable voltage verification at VDDMIN and VDDMAX for maximum reliability. It features a large LCD display (128 x 64) for menus and error messages and a modular, detachable socket assembly to support various package types. The ICSP™ cable assembly is included as a standard item. In Stand-Alone mode, the MPLAB PM3 Device Programmer can read, verify and program PIC devices without a PC connection. It can also set code protection in this mode. The MPLAB PM3 connects to the host PC via an RS-232 or USB cable. The MPLAB PM3 has high-speed communications and optimized algorithms for quick programming of large memory devices and incorporates an MMC card for file storage and data applications.

Peripheral Features:

- Three I^2C™ modules support Multi-Master/Slave modes and 7-Bit/10-Bit Addressing
- Four UART modules:
  - Supports RS-485, RS-232, LIN/J2602 protocols and IrDA®
  - On-chip hardware encoder/decoder for IrDA
  - Auto-wake-up and Auto-Baud Detect (ABD)
  - 4-level deep FIFO buffer

PIC24FJ256GA110

mercado libre

Nuevo

Pic24 Pic 24fj128ga010 24fj128ga010-i/pf 100tqfp ltytarg

$ 1.624[87]

en 12x $ 217[31]

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MC68HC908GP32

Reloj de tiempo real (RTC) con precisión de al menos 1 ms.

- Timebase module with clock prescaler circuitry for eight user selectable periodic real-time interrupts with optional active clock source during stop mode for periodic wakeup from stop using an external 32-kHz crystal

1.2.1 Standard Features of the MC68HC908GP32

- High-performance M68HC08 architecture optimized for C-compilers
- Fully upward-compatible object code with M6805, M146805, and M68HC05 Families
- 8-MHz internal bus frequency
- FLASH program memory security[1]

$$T = \frac{1}{8x10^6 Hz} = 0{,}125\mu s$$

MC68HC908GP32

Sensor de temperatura externo conectado por protocolo SPI hasta 1MHz de frecuencia de reloj.

Adquisición de cuatro señales analógicas de 0 a 3,3V con frecuencia de muestreo de 8kHz por canal.

Adquisición de cuatro señales digitales tipo pulsos. Tiempo mínimo de ancho de pulsos 10µs.

- Serial communications interface module 2 (SCI) with infrared (IR) encoder/decoder
- Serial peripheral interface module (SPI)
- System management bus (SMBus), version 1.0/1.1 (multi-master IIC bus)
- 8-channel, 10-bit analog-to-digital converter (ADC)
- $\overline{\text{IRQ1}}$ external interrupt pin with integrated pullup
- $\overline{\text{IRQ2}}$ external interrupt pin with programmable pullup
- 8-bit keyboard wakeup port with integrated pullup
- 32 general-purpose input/output (I/O) pins:
  - 31 shared-function I/O pins
  - 8 LED drivers (sink)
  - 6 × 25mA open-drain I/O w

Operating voltage range	V_{DD}	3.0 ±10% 5.0 ±10%			V
Input high voltage All ports, $\overline{\text{IRQ}}$, $\overline{\text{RST}}$, OSC1	V_{IH}	0.7 × V_{DD}	—	V_{DD}	V
Input low voltage All ports, $\overline{\text{IRQ}}$, $\overline{\text{RST}}$, OSC1	V_{IL}	V_{SS}	—	0.2 × V_{DD}	V

MC68HC908GP32

Generación de seis salidas del tipo modulación por ancho de pulso con frecuencia de 50Hz y resolución de 10µs.

- On-chip RAM
  - 2,048 bytes for MC68HC908AP64 and MC68HC908AP32
  - 1,024 bytes for MC68HC908AP16 and MC68HC908AP8
- Two 16-bit, 2-channel timer interface modules (TIM1 and TIM2) with selectable input capture, output compare, and PWM capability on each channel

Como tiene dos canales de Timer, frecuencia de reloj de hasta 8 Mhz y 26 pines de entrada y salida digitales, se podría cumplimentar el requerimiento.

- Clock generator module with on-chip 32-kHz crystal compatible PLL (phase-lock loop)
- Up to 33 general-purpose input/output (I/O) pins, including:
  - 26 shared-function I/O pins
  - Five or seven dedicated I/O pins, depending on package choice

MC68HC908GP32

Un Puerto serie asincrónico compatible con EIA232 que permita enviar comandos para configurar o solicitar datos medidos.

18.3.1 Functional Description

Figure 18-8 shows a simplified monitor mode entry flowchart.

The monitor ROM receives and executes commands from a host computer. Figure 18-9, Figure 18-10, and Figure 18-11 show example circuits used to enter monitor mode and communicate with a host computer via a standard RS-232 interface.

Simple monitor commands can access any memory address. In monitor mode, the MCU can execute code downloaded into RAM by a host computer while most MCU pins retain normal operating mode functions. All communication between the host computer and the MCU is through the PTA0 pin. A level-shifting and multiplexing interface is required between PTA0 and the host computer. PTA0 is used in a wired-OR configuration and requires a pullup resistor.

MC68HC908GP32

Un Puerto serie asincrónico compatible con EIA232 para debug concepto de administración tipo supervisor del puerto.

18.3 Monitor Module (MON)

The monitor module allows debugging and programming of the microcontroller unit (MCU) through a single-wire interface with a host computer. Monitor mode entry can be achieved without use of the higher test voltage, V_{TST}, as long as vector addresses $FFFE and $FFFF are blank, thus reducing the hardware requirements for in-circuit programming.

Features of the monitor module include:

- Normal user-mode pin functionality
- One pin dedicated to serial communication between MCU and host computer

MC68HC908GP32


mercado libre

Nuevo | 1 vendido

Integrado Mc68hc908gp32, Micro 68hc908 Gp32, 908gp32

$ 1.780

en 12x $ 238[06]

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STM32F103RCT6

Reloj de tiempo real (RTC) con precisión de al menos 1 ms.

$$T = \frac{1}{8x10^6 Hz} = 0{,}125\mu s$$

- Clock, reset and supply management
  - 2.0 to 3.6 V application supply and I/Os
  - POR, PDR, and programmable voltage detector (PVD)
  - 4-to-16 MHz crystal oscillator
  - Internal 8 MHz factory-trimmed RC
  - Internal 40 kHz RC with calibration
  - 32 kHz oscillator for RTC with calibration

STM32F103RCT6

Sensor de temperatura externo conectado por protocolo SPI hasta 1MHz de frecuencia de reloj.

- Up to 13 communication interfaces
  - Up to 2 × I^2C interfaces (SMBus/PMBus)
  - Up to 5 USARTs (ISO 7816 interface, LIN IrDA capability, modem control)
  - Up to 3 SPIs (18 Mbit/s), 2 with I^2S interface multiplexed
  - CAN interface (2.0B Active)
  - USB 2.0 full speed interface
  - SDIO interface

STM32F103RCT6

Adquisición de cuatro señales analógicas de 0 a 3,3V con frecuencia de muestreo de 8kHz por canal.

ADC (analog to digital converter)

Three 12-bit analog-to-digital converters are embedded into STM32F103xC, STM32F103xD and STM32F103xE performance line devices and each ADC shares up to 21 external channels, performing conversions in single-shot or scan modes. In scan mode, automatic conversion is performed on a selected group of analog inputs.

- 3 × 12-bit, 1 µs A/D converters (up to 21 channels)
  - Conversion range: 0 to 3.6 V
  - Triple-sample and hold capability
  - Temperature sensor

STM32F103RCT6

Adquisición de cuatro señales digitales tipo pulsos. Tiempo mínimo de ancho de pulsos 10µs.

- Up to 112 fast I/O ports
  - 51/80/112 I/Os, all mappable on 16 external interrupt vectors and almost all 5 V-tolerant

STM32F103RCT6

Generación de seis salidas del tipo modulación por ancho de pulso con frecuencia de 50Hz y resolución de 10µs.

- Up to 11 timers
  - Up to four 16-bit timers, each with up to 4 IC/OC/PWM or pulse counter and quadrature (incremental) encoder input
  - 2 × 16-bit motor control PWM timers with dead-time generation and emergency stop
  - 2 × watchdog timers (Independent and Window)
  - SysTick timer: a 24-bit downcounter
  - 2 × 16-bit basic timers to drive the DAC

TIM timer characteristics

The parameters given in *Table 49* are guaranteed by design.

Refer to *Section 5.3.13: I/O port characteristics* for details on the input/output alternate function characteristics (output compare, input capture, external clock, PWM output).

Table 49. TIMx(1) characteristics

Symbol	Parameter	Conditions	Min	Max	Unit
$t_{res(TIM)}$	Timer resolution time		1		$t_{TIMxCLK}$
		$f_{TIMxCLK}$ = 72 MHz	13.9		ns
f_{EXT}	Timer external clock frequency on CH1 to CH4		0	$f_{TIMxCLK}/2$	MHz
		$f_{TIMxCLK}$ = 72 MHz	0	36	MHz
Res_{TIM}	Timer resolution			16	bit

STM32F103RCT6

Un Puerto serie asincrónico compatible con EIA232 que permita enviar comandos para configurar o solicitar datos medidos.

Un Puerto serie asincrónico compatible con EIA232 para debug concepto de administración tipo supervisor del puerto.

- Debug mode
  - Serial wire debug (SWD) & JTAG interfaces
  - Cortex-M3 Embedded Trace Macrocell™

- Up to 11 timers
  - Up to four 16-bit timers, each with up to 4 IC/OC/PWM or pulse counter and quadrature (incremental) encoder input
  - 2 × 16-bit motor control PWM timers with dead-time generation and emergency stop
  - 2 × watchdog timers (Independent and Window)
  - SysTick timer: a 24-bit downcounter
  - 2 × 16-bit basic timers to drive the DAC

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CONCLUSIONES

La mejor opción: ***STM32F103RCT6***

- Cumple con los requerimientos
- Más económica
- Disponibilidad de placa programadora

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