

# PIC and Software Reference 9/5/2022 2:34:27 PM

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# MEET THE FAMILY PIC MICROCONTROLLERS

1. From Wikipedia, the free encyclopedia 2022

**PIC** (usually pronounced as "pick") is a family of [microcontrollers](#) made by [Microchip Technology](#), derived from the PIC1650 originally developed by [General Instrument's](#) Microelectronics Division. The name PIC initially referred to *Peripheral Interface Controller*, and is currently expanded as *Programmable Intelligent Computer*.

[https://en.wikipedia.org/wiki/PIC\\_microcontroller](https://en.wikipedia.org/wiki/PIC_microcontroller)

## Atmel acquired by Microchip Technology for \$3.56 billion

APRIL 2016

A large part of Atmel's revenue is from microcontrollers. These include the [AVR](#) 8- and 32-bit microcontrollers, [ARM architecture](#) microprocessors, and ARM-based flash microcontrollers. In addition Atmel still makes microcontrollers that use the [8051](#) architecture, albeit improved to do single-cycle instructions. Supporting the microcontrollers is the Atmel Studio 7 [integrated development environment](#) which Atmel offers for free. They also provide an Atmel Software Framework.

## WHAT IS NEEDED TO CHOOSE MICROCONTROLLER AND IDE

- KNOW YOUR REQUIREMENTS
- CHOOSE A CHIP 8, 16, OR 32 BIT
- CHOOSE MODULES NEEDED FOR I/O
- WHAT CAN BE PROVIDED BY THE VENDOR OF THE CHIP
  1. USE THE DATA SHEET TO DETERMINE THE CHARACTERISTICS
  2. DETERMINE THAT THE VENDOR HAS SUPPORT AND DOCUMENTATION
  3. LITERATURE, BOOKS, APPLICATION NOTES?
  4. AVAILABLE SPECIAL SOFTWARE – RTOS?
- 
- **Which Tools Do I Need To Develop Applications?**
  1. DEVELOPMENT SOFTWARE (USUALLY ON PC)
  2. INTEGRATED DEVELOPMENT ENVIRONMENT
  3. IN CIRCUIT DEBUGGER OR EMULATOR
  4. DEVELOPMENT BOARD OR TARGET HARDWARE



In-Circuit Serial Programming Interface

# 8-BIT

<https://ww1.microchip.com/downloads/en/DeviceDoc/30010068G.pdf>

## 8-bit PIC® Microcontroller Peripheral Integration

Quick Reference Guide

Product Family	Pin Count	Program Flash Memory (KB)	RAM (KB)	Data EE (B)	8-bit PIC® Microcontrollers																																				
					Intelligent Analog						Waveform Control											Logic and Math		Safety and Monitoring		Communications			User Interface		Low Power and System Flexibility										
					ADC (# of bits)	HSCComp	DAC (# of bits)	OPA	SlopeComp / PRG	ZCD	CCP/ECCP	10-bit PWM	16-bit PWM	COG	CMG	NCO	DSM	HLT (8-bit)	Universal Timer	NCO (20-bit)	SMT (24-bit)	RTCC	TEMP/TS	CLC	MULT	MathACC	CRC/SCAN	HLT	WWDT	USART	UART with Protocols	I2C/SPI	USB with ACT	LIN Capable	mTouch® Sensing	HCVD	LCD w/ charge pump	PPS	IDLE/DOZE/PMD	DMA/VI	DIA/MAP
PIC10(L)F3XX	6	384-896 B	0.064	HEF	8																																				
PIC16F152XX	8-40	3.5-28	0.5-2	-	10																																				
PIC12/16 LF155X/6X	14-20	7-14	1.024	HEF	10 <sup>(6)</sup>																																				
PIC16(L)F145X	14-20	14	1.024	HEF	10	✓																																			
PIC1X(L)F157X	8-20	1.75-14	1.024	HEF	10	✓																																			
PIC16(L)F153XX	8-48	3.5-28	2.048	HEF	10	✓																																			
PIC1X(HV)F752/53	8-14	1.75-3.5	0.128	-	10	✓			5/9	✓	SC																														
PIC1X(L)F161X	8-14	3.5	0.256	HEF	10	✓			8																																
PIC16(L)F161X <sup>(8)</sup>	14-20	7-14	1.024	HEF	10	✓			8																																
PIC18-Q40/1	14-20	16-32	1-4	512	12 <sup>(8)</sup>	✓			8	✓ <sup>(5)</sup>																															
PIC16(L)F170X/71X	14-40	3.5-28	2.048	HEF	10	✓			5/8	✓																															
PIC16(L)F176X/7X	14-40	7-28	2.048	HEF	10	✓			5/10	✓																															
PIC16(L)F183XX	8-20	3.5-14	2.048	256	10	✓			5																																
PIC16(L)F194XX	14-28	7-28	2.048	256	12 <sup>(8)</sup>	✓			5																																
PIC16(L)F188XX	28-40	7-56	4.096	256	10 <sup>(4)</sup>	✓			5																																
PIC18-Q10	28-40	16-128	1-3.6	256-1K	10 <sup>(8)</sup>	✓			5																																
PIC18-Q43	28-48	32-128	2-8	1024	12 <sup>(8)</sup>	✓			8																																
PIC18-Q84 <sup>(9)</sup>	28-48	64-128	8-13	1024	12 <sup>(7)</sup>	✓			8																																
PIC16(L)F191XX	28-64	14-56	4.096	256	12 <sup>(8)</sup>	✓			5																																
PIC18-K40	28-64	16-128	3.728	256-1K	10 <sup>(4)</sup>	✓			5																																
PIC18-K42	28-48	16-128	8.192	256-1K	12 <sup>(8)</sup>	✓			5																																
PIC18-J94	64-100	32-128	4.096	-	12	✓																																			

Notes: (1) In addition to standard 8-bit and 16-bit timers (2) Independent Dual ADC Modules (3) PIC16F1615/9 include an angular timer. (4) ADCC: Analog-to-Digital Converter with Computation (5) PIC18-Q41 has an OPAMP (6) CAN-FD & JTAG capable (7) Analog-to-Digital Converter with Computation and Context Switching

[www.microchip.com/8bit](http://www.microchip.com/8bit)



INTELLIGENT ANALOG: Sensor Interfacing and Signal Conditioning	
<b>ADC:</b> Analog-to-Digital Converter	General purpose 8-/10-/12-bit ADC
<b>ADC/ADCC:</b> Analog-to-Digital Converter with Computation	General purpose 10-/12-bit ADC with automated analog signal analysis (ex. oversampling, averaging, etc.)
<b>Comp:</b> Comparator	General purpose rail-to-rail comparator
<b>DAC:</b> Digital-to-Analog Converter	Programmable voltage reference with multiple internal and external connections
<b>HSComp:</b> High-Speed Comparator	General purpose rail-to-rail comparator with <math>\lt; 50\text{ ns}</math> response time
<b>OPA:</b> Operational Amplifier	General purpose op amp for internal and external signal source conditioning
<b>PRG:</b> Programmable Ramp Generator	Analog ramp generator (with slope compensation) for current/voltage mode power supplies
<b>SlopeComp:</b> Slope Compensation	Slope compensation for Peak-Current Mode power supplies
<b>VREF:</b> Voltage Reference	Stable fixed voltage reference for use with integrated analog peripherals
<b>ZCD:</b> Zero Cross Detect	AC high-voltage zero-crossing detector for simplifying TRIAC control, synchronized switching control and timing
WAVEFORM CONTROL: PWM Drive and Waveform Generation	
<b>CCP/ECCP:</b> (Enhanced) Capture Compare PWM	1. CCP/ECCP: 10-bit PWM control with 16-bit capture and compare 2. ECCP: Addition of auto shutdown control
<b>COG:</b> Complementary Output Generator	Automated complementary output with control of key parameters such as programmable rising/falling edge events, polarity, phase, precision dead-band, blanking and auto shutdown
<b>CWG:</b> Complementary Waveform Generator	Automated complementary output with control of key parameters such as dead-band and auto shutdown
<b>DSM:</b> Data Signal Modulator	1. Modulates up to two carrier signals with digital data to create custom carrier synchronized output waveforms 2. LED dimming engine functionality via interconnection with 10-/16-bit PWM, DSM and op amp
<b>NCO:</b> Numerically Controlled Oscillator and 16-/20-bit Timer/Counter	1. Precision linear frequency generator (@ 50% duty cycle) with 0.0001% step size of source input clock frequency 2. General purpose 16-/20-bit timer/counter
<b>PWM:</b> Pulse Width Modulation	General purpose 10-bit PWM control
<b>16-bit PWM:</b> Standalone 16-bit PWM and 16-bit Timer/Counter	1. High-resolution 16-bit PWM with edge- and center-aligned modes 2. General purpose 16-bit timer/counter
TIMING AND MEASUREMENTS: Signal Measurement with Limb and Oscillator Control	
<b>HLT:</b> Hardware Limit Timer and 8-bit Timer/Counter	1. Hardware monitoring for missed periodic events and fault detection 2. General purpose 8-bit timer/counter with external reset capabilities
<b>NCO:</b> Numerically Controlled Oscillator and 16-/20-bit Timer/Counter	1. Precision linear frequency generator (@ 50% duty cycle) with 0.0001% step size of source input clock frequency 2. General purpose 16-/20-bit timer/counter
<b>RTCC:</b> Real-Time Clock/Calendar	Maintains accurate clock and calendar timing with external 32.768 kHz crystal
<b>SMT:</b> 24-bit Signal Measurement Timer and 24-bit Timer/Counter	1. Accurate measurement of any digital signal including period, duty cycle, time of flight; instantaneous vs. average measurements 2. General purpose 24-bit timer/counter
<b>TEMP:</b> Temperature Indicator	Provides relative temperature measurements utilizing the ADC
<b>TS:</b> Temperature Sensor	Provides linear relative temperature measurements utilizing the ADC with two factory-calibrated reference values
<b>8-/16-bit Timer</b>	General purpose 8-/16-bit timer/counter
<b>UTMR:</b> Universal Timer	1. Timer modules with features of TMR0/TMR1/TMR2 (Gate, Hardware Limit) 2. Two 16-bit timers can be chained together to create a combined 32-bit timer

LOGIC AND MATH: Customizable Logic and Math Functions	
<b>CLC:</b> Configurable Logic Cell	1. Integrated combinational and sequential logic 2. Customer interconnection and re-routing of digital peripherals
<b>MULT:</b> Hardware Multiplier	MULTIPLY function of two 8-bit values with 16-bit result
<b>MathACC:</b> Math Accelerator	1. MULTIPLY, ADD, ACCUMULATE functions of 8-/16-bit values with 36-bit result 2. Calculate a 16-bit PID function based on configurable $K_p$ , $K_i$ , $K_d$ constants with a 34-bit result
SAFETY AND MONITORING: Hardware Monitoring and Fault Detection	
<b>CR/SCAN:</b> Cyclical Redundancy Check with Memory Scan	1. Automatically calculates CRC checksum of Program/Data/EE memory for NVM integrity 2. General purpose 16-bit CRC for use with memory and communications data
<b>HLT:</b> Hardware Limit Timer and 8-bit Timer/Counter	1. Hardware monitoring for missed periodic events and fault detection of external hardware 2. General purpose 8-bit timer/counter with external reset capabilities
<b>WWDG:</b> Windowed Watch Dog Timer	System supervisory circuit that generates a reset when software timing anomalies are detected within a configurable critical window
COMMUNICATIONS: General, Industrial, Lighting and Automotive	
<b>ACT:</b> Active Clock Tuning for Crystal-Free USB	1. Auto-tuning of internal oscillator when connected to USB host (eliminates need for external crystal) 2. Tunes internal oscillator to match accuracy of external clock source
<b>CAN:</b> Controller Area Network	Industrial- and automotive-centric communication bus
<b>LIN:</b> Local Interconnect Network	1. Industrial- and automotive-centric communication bus 2. Support for LIN when using the EUSART
<b>EUSART/AUSART:</b> Enhanced/Addressable Universal Asynchronous Receiver Transceiver	1. General purpose serial communications 2. Support for LIN when using the EUSART
<b>IC:</b> Inter-Integrated Circuit	General purpose 2-wire serial communications
<b>SP:</b> Serial Peripheral Interface	General purpose 4-wire serial communications
<b>UART:</b> Universal Asynchronous Receiver Transmitter	Supports LIN master and slave, DMX, DALI and device protocols
<b>USB:</b> Universal Serial Bus	Support for full-speed USB 2.0 device profiles
USER INTERFACE: Capacitive Touch Sensing and LCD Control	
<b>HCVD:</b> Hardware Capacitive Voltage Divider	Simplifies implementation and reduces overhead of mTouch sensing applications
<b>LCDD:</b> Liquid Crystal Display	Highly integrated segmented LCD controller
<b>mTouch:</b> Microchip Proprietary Capacitive Touch Technology	1. Capacitive sensing for touch buttons and sliders 2. Capacitive sensing for system measurements and detection (ex. water level, intrusion detection, etc.)
LOW POWER AND SYSTEM FLEXIBILITY: XLP Low-Power Technology, Peripherals and Interconnects	
<b>DIA:</b> Device Information Area	Dedicated memory area for data storage of temp sensor factory calibration values, factory ID and FVR values for ADC and COMP
<b>DMA:</b> Direct Memory Access	Moves data between memories and peripherals without CPU overhead, improving overall system performance and efficiency
<b>DOZE:</b> Power Saving Mode	Ability to run the CPU core slower than the system clock used by the internal peripherals
<b>HEP:</b> High-Endurance Flash	128B Non-volatile data storage with high-endurance 100k E/W cycles
<b>IDLE:</b> Power Saving Mode	Ability to put the CPU core to sleep while the internal peripherals continue to operate from the system clock
<b>MAP:</b> Memory Access Partition	Customizable Flash partitioning with bootloader write protection option
<b>PMOD:</b> Peripheral Module Disable	Peripheral power disable hardware to minimize power consumption of unused peripherals
<b>PPS:</b> Peripheral Pin Select	I/O pin remapping of digital peripherals for greater design flexibility and optimized board layout
<b>W:</b> Vectored Interrupts	Offers faster and more predictable interrupt response times, with lower software overhead
<b>XLP:</b> Extreme Low Power Technology	XLP technology devices with extreme low-power operation modes for battery/low-power applications



Learn more about 8-bit PIC Microcontrollers at [www.microchip.com/8bit](http://www.microchip.com/8bit).  
Learn more about Core Independent Peripherals (CIP) at [www.microchip.com/CIP](http://www.microchip.com/CIP).

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PDF version available for download at [www.microchip.com/8bitquickreference](http://www.microchip.com/8bitquickreference).

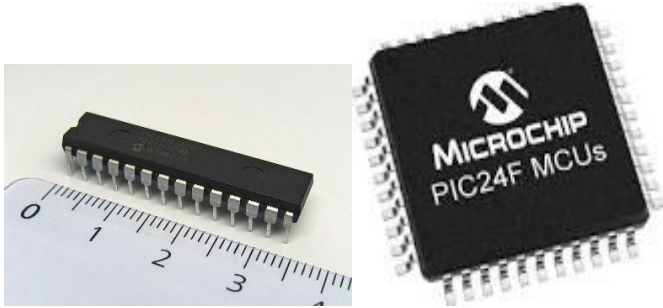
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## 8-bit Glossary

# 16-Bit 3 Pages of Chips SHOW



<http://ww1.microchip.com/downloads/en/DeviceDoc/30010109E.pdf>

## 16-bit PIC® Microcontroller Peripheral Integration

### Quick Reference Guide

Product Family	Maximum MIPS	Program Flash Memory (KB)	RAM (KB)	Pin Count	Peripheral Function Focus																																																																					
					Integrated Analog				Waveform Control				Clocks and Timers				Safety and Monitoring			Communications							User Interface		Secure Data		System Flexibility																																											
					ADC (resolution) <sup>1</sup>	DAC (resolution) <sup>1</sup>	CVREF	HS Comp	OPAMP/A	CCP/ECCP	SCCP	MC/CP	PWM	MC PWM	SMPS PWM	IC and OC	PWM Resolution (ns)	8-bit Timer	16-bit Timer	32-bit Timer	RTC	OEI	LVD	WDT	DMT	CRC	Class B Safety <sup>1</sup>	USB	CAN/CAN FD	UART	LIN	IRDA <sup>2</sup>	I <sup>2</sup> C	SPI	FS™	SENT	Parallel Port	CTMU and mTouch™ Sensing	LOD (Segments)	GFX	Cryptographic Engine	Secure Key Storage	RNG	Dual Partition Flash	CLC	PPS	PTG	DMA	IDLE, SLEEP and PMD	DOZE	XLP	V <sub>EXT</sub>																						
<b>PIC24 Family</b>																																																																										
PIC24F04KA20X <sup>RV</sup>	8	4	0.5	14–20	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																					
PIC24F04KL10X	16	4	0.5	14–20	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																				
PIC24F08KL20X	16	8	0.5	14–20	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																			
PIC24F08KL30X	16	8	1	20–28	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																				
PIC24FXXKL40X	16	8–16	1	20–28	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																		
PIC24FXXKA10X	16	8–16	1.5	20–28	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																			
PIC24FXXKM10X <sup>RV</sup>	16	8–16	1	20–44	12	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																		
PIC24FXXKM20X <sup>RV</sup>	16	8–16	2	20–44	12	8	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																
PIC24FXXKA30X <sup>RV</sup>	16	16–32	2	20–44	12	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																
PIC24FJXXGA00X	16	16–64	4–8	28–44	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓																
PIC24FJXXMC10X	16	16–32	1–2	20–44	10	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓														
PIC24EPXXGP20X	70	32–512	4–8	28–64	12	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓													
PIC24EPXXMC20X	70	32–512	4–8	28–64	12	4	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
PIC24FJXXGA10X	16	32–64	8	28–44	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓									
PIC24FJXXGB00X	16	32–64	8	28–44	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓						
PIC24FJXXGA0XX	16	64–128	8	64–100	10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	L2	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

1: 16-bit PIC<sup>®</sup> MCU offers SAR ADC, high-speed ADC and Delta-Sigma ADC      2: 16-bit PIC MCU offers general-purpose DAC and audio DAC  
 3: Class B Safety Features:  
 L1: Includes WDT, oscillator fail-safe, illegal opcode detect, TRAP, reset trace, register lock, frequency check, CodeGuard™ security, PWM lock\*  
 \*PWM lock available in devices with MCPWM/SMPS PWM peripheral  
 L2: Includes features of L1 + CRC      L3: Includes features of L2 + Flash ECC and/or DMT

(RV) 16-bit PIC MCUs and dsPIC DSCs with 5V operating Voltage  
 Note: Similar family of devices with fewer variations are grouped with the same color coding



# How to Read the Model Number

## PIC24FV32KA304 FAMILY

### PRODUCT IDENTIFICATION SYSTEM

To order or obtain information, e.g., on pricing or delivery, refer to the factory or the listed sales office.

	PIC 24 FV 32 KA3 04	
Microchip Trademark	_____	
Architecture	_____	
Flash Memory Family	_____	
Program Memory Size (KB)	_____	
Product Group	_____	
Pin Count	_____	
Tape and Reel Flag (if applicable)	_____	
Temperature Range	_____	
Package	_____	
Pattern	_____	

Architecture	24 = 16-bit modified Harvard without DSP
Flash Memory Family	F = Standard voltage range Flash program memory FV = Wide voltage range Flash program memory
Product Group	KA3 = General purpose microcontrollers
Pin Count	01 = 20-pin 02 = 28-pin 04 = 44-pin
Temperature Range	I = -40°C to +85°C (Industrial) E = -40°C to +125°C (Industrial)
Package	SP = SPDIP SO = SOIC SS = SSOP ML = QFN P = PDIP PT = TQFP MV = UQFN
Pattern	Three-digit QTP, SQTP, Code or Special Requirements (blank otherwise) ES = Engineering Sample

#### Examples:

- a) PIC24FV32KA304-I/ML: Wide voltage range, General Purpose, 32-Kbyte program memory, 44-pin, Industrial temp., QFN package
- b) PIC24F16KA302-I/SS: Standard voltage range, General Purpose, 16-Kbyte program memory, 28-pin, Industrial temp., SSOP package

### Download 366 Page Data Sheet **SHOW**

<https://www.microchip.com/content/dam/mchp/documents/OTH/ProductDocuments/DataSheets/30009995e.pdf>

### Buy Now Price, Any Volume **About \$4.00**

- 1-24
- 25-99
- 100+
- \$4.69
- \$4.30
- \$3.88

## Page 2 Data Sheet – quick selection

PIC24F Device	Pins	Memory			Timers 16-Bit	Capture Input	Compare/PWM Output	UART w/ IrDA®	SPI	I <sup>2</sup> C	12-Bit A/D (ch)	Comparators	CTMU (ch)	RTCC
		Flash Program (bytes)	SRAM (bytes)	EE Data (bytes)										
PIC24FV16KA301/ PIC24F16KA301	20	16K	2K	512	5	3	3	2	2	2	12	3	12	Y
PIC24FV32KA301/ PIC24F32KA301	20	32K	2K	512	5	3	3	2	2	2	12	3	12	Y
PIC24FV16KA302/ PIC24F16KA302	28	16K	2K	512	5	3	3	2	2	2	13	3	13	Y
PIC24FV32KA302/ PIC24F32KA302	28	32K	2K	512	5	3	3	2	2	2	13	3	13	Y
PIC24FV16KA304/ PIC24F16KA304	44	16K	2K	512	5	3	3	2	2	2	16	3	16	Y
PIC24FV32KA304/ PIC24F32KA304	44	32K	2K	512	5	3	3	2	2	2	16	3	16	Y

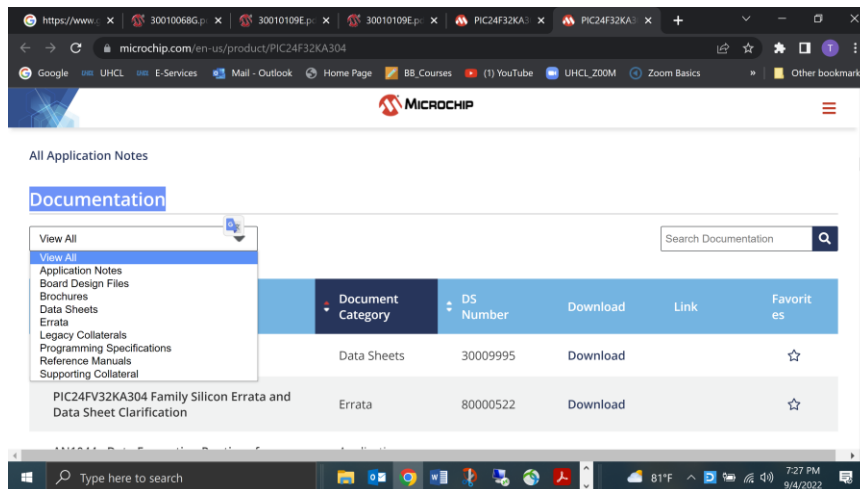
Look at Brief Data Sheet, Documentation, Embedded Software SHOW

<http://www.microchip.com/wwwproducts/en/PIC24F32KA304>

**Status:** In Production.

[Download Data Sheet](#)  
[Documentation](#)

**Symbols**  
[Recommended for Automotive Design](#)



**EX: AN1416 - Low-Power Design Guide**  
**Electronic Solutions for Medical and Fitness - And dozens of others**



## Embedded Software

Ex: 16-bit CPU Self-test Library

## Development Environment



<https://www.microchip.com/en-us/development-tool/DM240001-2>

MPLAB® ICD 4 In-Circuit Debugger



USD/unit: \$328.89

<https://www.microchip.com/en-us/development-tool/DV164045>

<https://microchipdeveloper.com/tools:what-do-i-need>

## QUICK Guide to Microchip Development Tools

<https://microchipdeveloper.com/tools:what-do-i-need>

Most development setups consist of three main components:

1. A computer running the [MPLAB® X Integrated Development Environment](#)
2. A programmer/debugger such as one of the following:
  - [MPLAB REAL ICE™](#)
  - [MPLAB ICD 3](#)
  - [MPLAB PICKit™ 3](#)
3. A target board with the PIC® MCU of your choice, such as:
  - Your own hardware
  - A Microchip demonstration board
  - A third-party demonstration board
  - A breadboard



## MPLAB® Development Ecosystem and Software Tools

<https://www.microchip.com/en-us/products/microcontrollers-and-microprocessors/16-bit-mcus/mplab-development-ecosystem-and-software-tools>

### MPLAB® X IDE

<https://www.microchip.com/en-us/tools-resources/develop/mplab-x-ide>

### PIC24F Microcontrollers

<https://www.microchip.com/en-us/products/microcontrollers-and-microprocessors/16-bit-mcus/pic24f-mcus-16-mips>

### EXPLORER 16 DEVELOPMENT BOARD

<http://www.microchip.com/Developmenttools/ProductDetails.aspx?PartNO=DM240001>

**MPLAB® Code Configurator** - graphical programming environment for C code.

<https://www.microchip.com/en-us/tools-resources/configure/mplab-code-configurator>

## Here we find a number of PIC24 Video Tutorials

Tutorial for the MPLAB® Starter Kit for PIC24F - Part 1 2009

<https://www.youtube.com/watch?v=S4jPTVjs92w>

MPLAB X and PIC24 #4 3,591 views Feb 8, 2017 11:22 (With Warts and All in C code)

<https://www.youtube.com/watch?v=nMSdSYsSMY0>

## Installing MPLAB® X IDE

<https://microchipdeveloper.com/mplabx:installation>

## MPLAB installation video (Older)

PIC Programming Tutorials Part 1 - Install MPLAB IDE & HITECH C Compiler



Saravanan AL

[https://www.youtube.com/watch?v=9aSL\\_FAF-Gg](https://www.youtube.com/watch?v=9aSL_FAF-Gg)

## PIC24 MCUs and dsPIC33 DSCs | Easy Migration in a Platform Design

1,578 views Jul 29, 2021 About 9 Minutes

<https://www.youtube.com/watch?v=5z2QLKyxTJo>

## How to program MICROCHIP PIC24 microcontrollers on LINUX

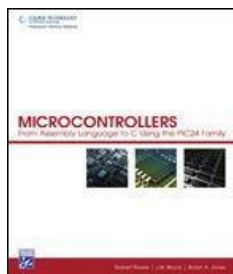
533 views Mar 11, 2021 About 20 Minutes

<https://www.youtube.com/watch?v=VdLbZJfQ6iQ>

## GENERAL REFERENCES- SOFTWARE:

Languages:

### A few references that discuss C and Assembly Language.



An excellent book I have used for the PIC family. On the web site there are excerpts from the book. If you program with a PIC24 chip, this is one of the best books available.

<http://www.reesemicro.com/Home/textbook>

**Python vs. C/C++ in Embedded Systems**

<https://www.activestate.com/blog/2016/09/python-vs-cc-embedded-systems>

<https://votepair.org/python-vs-c-in-embedded-systems/>

**Assemblers, Linkers & Loaders A brief review**

<http://www.cs.gmu.edu/~setia/cs365-S02/assembler.pdf>

(Real Programmers Program in Assembly Language! D.Hill Lockeed)