

# 8-bit PIC® Microcontroller Peripheral Integration

## Quick Reference Guide

8-bit PIC® Microcontrollers																																											
Product Family	Pin Count	Program Flash Memory (KB)	RAM (KB)	Data EE (B)	Intelligent Analog							Waveform Control								Logic and Math			Safety and Monitoring		Communications				User Interface			Low Power and System Flexibility											
					ADC (# of bits)	Comp	HSComp	DAC (# of bits)	OPA	SlopeComp / PRG	ZCD	CCP/ECCP	10-bit PWM	16-bit PWM	COG	CWG	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																						1	✓	✓	✓				✓	✓			✓					
PIC12/16 LF155X/6X	14–20	7–14	1.024	HEF	10 <sup>(2)</sup>																						✓	✓	✓	✓	✓												
PIC16(L)F145X	14–20	14	1.024	HEF	10	✓																					✓	✓	✓	✓	✓												
PIC1X(L)F157X	8–20	1.75–14	1.024	HEF	10	✓	5																				✓			✓	✓												
PIC16(L)F153XX	8–48	3.5–28	2.048	HEF	10	✓	5																				2	✓	✓	✓	✓									✓			
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>(3)</sup>	14–20	7–14	1.024	HEF	10	✓	8																				✓	✓	✓	✓	✓									✓			
PIC18-Q40/1	14–20	16–32	1–4	512	12 <sup>(4)</sup>	✓	8	✓ <sup>(5)</sup>	✓	✓																	2	1	✓	✓	✓	✓	✓						✓	✓	✓		
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)F184XX	14–28	7–28	2.048	256	12 <sup>(4)</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>(4)</sup>	✓	5																				2	✓	✓	✓	✓	✓											
PIC18-Q43	28–48	32–128	2–8	1024	12 <sup>(4)</sup>	✓	8																				4	1	✓	✓	✓	✓	✓										
PIC18-Q84 <sup>(6)</sup>	28–48	64–128	8–13	1024	12 <sup>(7)</sup>	✓	8																				3	2	✓	✓													
PIC16(L)F191XX	28–64	14–56	4.096	256	12 <sup>(4)</sup>	✓	5																				✓	✓	✓	✓	✓												
PIC18-K40	28–64	16–128	3.728	256-1K	10 <sup>(4)</sup>	✓	5																				5	✓	✓	✓	✓	✓											
PIC18-K42	28–48	16–128	8.192	256-1K	12 <sup>(4)</sup>	✓	5																				1	1	✓	✓	✓	✓	✓										
PIC18-J94	64–100	32–128	4.096	–	12	✓																					4	✓	✓	✓	✓	✓											

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

INTELLIGENT ANALOG: Sensor Interfacing and Signal Conditioning	
<b>ADC:</b> Analog-to-Digital Converter	General purpose 8-/10-/12-bit ADC
<b>ADC<sup>2</sup>/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 < 50 ns 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 detection 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 Timing and Counter 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



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).

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 35-bit result 2. Calculates 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>CRC/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>WWDT:</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>I<sup>2</sup>C:</b> Inter-Integrated Circuit	General purpose 2-wire serial communications
<b>SPI:</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>LCD:</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, Peripheral 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>HEF:</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>PMD:</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>VI:</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

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