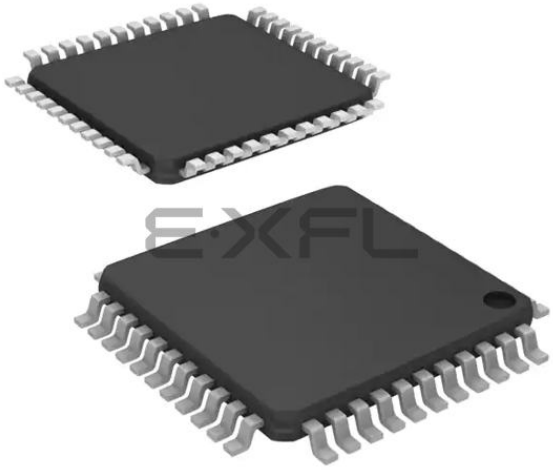


Welcome to E-XFL.COM

What is "Embedded - Microcontrollers"?

"Embedded - Microcontrollers" refer to small, integrated circuits designed to perform specific tasks within larger systems. These microcontrollers are essentially compact computers on a single chip, containing a processor core, memory, and programmable input/output peripherals. They are called "embedded" because they are embedded within electronic devices to control various functions, rather than serving as standalone computers. Microcontrollers are crucial in modern electronics, providing the intelligence and control needed for a wide range of applications.

Applications of "Embedded - Microcontrollers"

Details	
Product Status	Obsolete
Core Processor	dsPIC
Core Size	16-Bit
Speed	20 MIPS
Connectivity	I²C, IrDA, LINbus, SPI, UART/USART
Peripherals	Brown-out Detect/Reset, DMA, Motor Control PWM, POR, PWM, QEI, WDT
Number of I/O	35
Program Memory Size	16KB (16K x 8)
Program Memory Type	FLASH
EEPROM Size	-
RAM Size	2K x 8
Voltage - Supply (Vcc/Vdd)	3V ~ 3.6V
Data Converters	A/D 9x10b/12b
Oscillator Type	Internal
Operating Temperature	-40°C ~ 150°C (TA)
Mounting Type	Surface Mount
Package / Case	44-TQFP
Supplier Device Package	44-TQFP (10x10)
Purchase URL	https://www.e-xfl.com/product-detail/microchip-technology/dspic33fj16mc304-h-pt

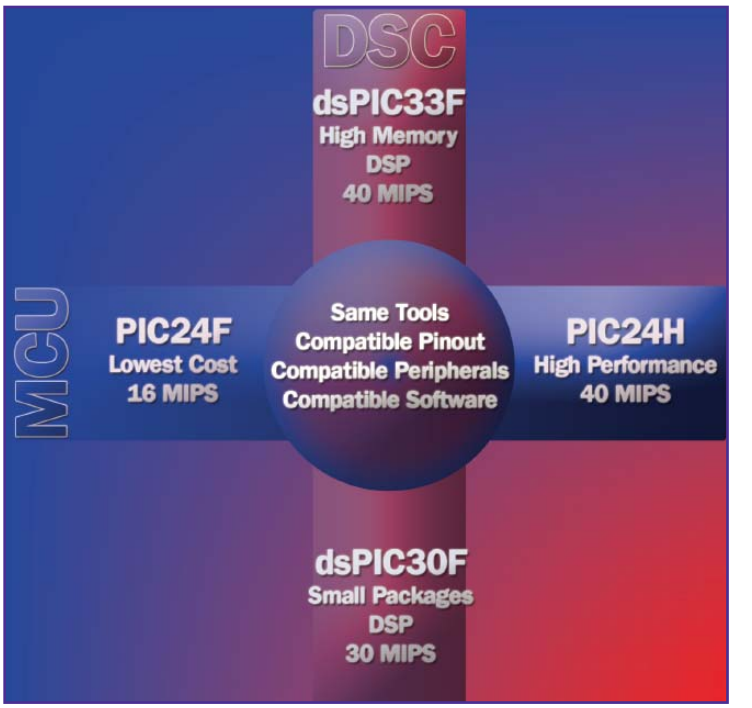
16-bit
Embedded Control Solutions

Do you need to add more performance or additional features to your products? Do you need more on-chip memory? Are you concerned with tight schedules and cost goals? How do you decide which embedded control solution will bring the most value to your overall embedded design?

Microchip's 16-bit solutions are designed to be a broad platform which will serve your needs for many years. If you have designed using our 8-bit PIC® microcontrollers (MCUs) you will be pleased to see that the same MPLAB® Integrated Development Environment used on our smallest 6-pin MCU also supports our most powerful 16-bit controllers. Plus our commitment for peripheral and pinout compatibility has been carried forward to our 16-bit product families. If you are new to Microchip's control solutions, you will see powerful, low cost development tools, a compatible lineup of products that range from low cost to high performance, and a Company dedicated to serving your needs.

Since 2002, Microchip has been #1 in worldwide 8-bit microcontroller shipments* with a product portfolio that continues to expand to meet the demands of our customers while solving many of their key business issues. With more than 70 16-bit products in our portfolio today and many more on the way, we are committed to offer similar value in the 16-bit realm.

**Gartner Dataquest, Top Companies Revenue from Shipments of 8-bit MCU - All Applications" April 2005.*



One Architecture, Four Families

Microchip offers two 16-bit Microcontroller (MCU) families plus two 16-bit Digital Signal Controller (DSC) families that give you compatible options across a wide spectrum of price, performance and feature sets. Common attributes among all 16-bit MCU and DSC families are:

- Pinout compatibility
- Software compatibility
- Peripheral compatibility
- Common development tools

Whether your design requires the lowest-priced 16-bit solution, the most powerful 16-bit MCU in the industry, or DSP capability, Microchip offers a broad range of products while preserving the compatibility that help save you time and money on subsequent designs.

Table of Contents

RoHS Compliant

Microchip has begun converting from tin-lead (SnPb)-plated product packaging to lead (Pb)-free product packaging across the entire portfolio of PIC® microcontrollers, dsPIC® digital signal controllers, serial EEPROMs, stand-alone analog and other devices. This enables our customers to achieve early compliance with new regulations around the world such as the European Union Restrictions on Hazardous Substances in Electrical and Electronic Equipment (RoHS) directive.

16-bit Microcontroller (MCU) Portfolio

Are cost or performance important considerations for your next design? PIC24 MCUs offer the variety of peripherals, memory sizes and packaging choices you have come to expect from our 8-bit products. Microchip offers two compatible Flash-based 16-bit PIC24 MCU families. The 16 MIPS PIC24F family is designed for cost-sensitive applications. The 40 MIPS PIC24H family is designed for high performance applications. Both families have the same instruction set, share basic peripherals, have common pinouts and use the same tools for development. Despite the similarities, the PIC24F and PIC24H were designed by independent teams, one targeting lowest cost and the other creating the highest performance 16-bit MCU in the industry. The PIC24 families are highly compatible with dsPIC DSCs for easy migration when additional performance or DSP capability is required.

16-bit Digital Signal Controller (DSC) Portfolio

Are you looking to add DSP capability to your application? DSCs blend the features of both MCUs and DSPs into a single chip solution enabling you to add DSP features to your embedded application. Microchip offers two compatible Flash-based 16-bit DSC families. The 30 MIPS dsPIC30F family is designed for applications where 5V operation is important, and the 40 MIPS dsPIC33F family is suited for applications preferring 3.3V or need more on-chip memory. Both DSC families and the PIC24 families have the same base instruction set (DSCs add DSP instructions), share basic peripherals, have common pinouts and use the same tools for development.

The Capability You Need

Optimized C Compiler:

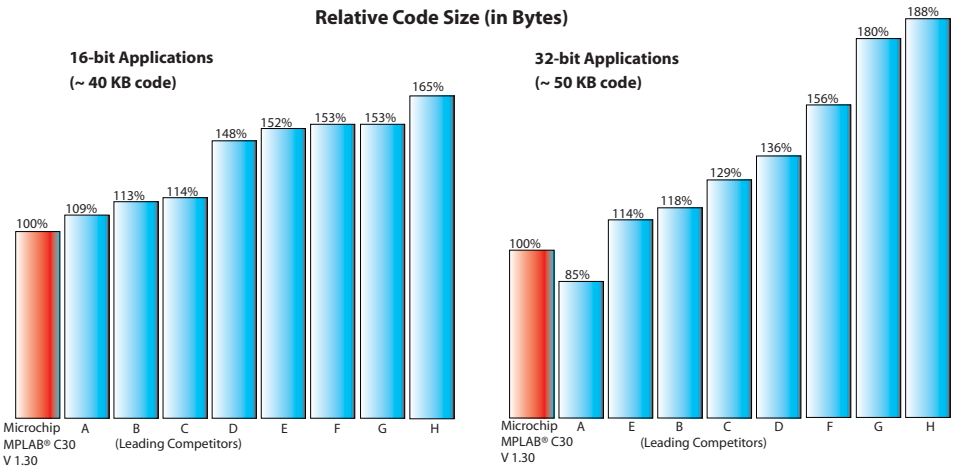
Supporting the PIC24 MCU and dsPIC DSC families, Microchip's 16-bit architecture was designed to optimize C language code size. The architecture was co-developed by compiler writers who emphasized the need for an orthogonal instruction set, many general-purpose registers, powerful indirect with off-set addressing and a software stack. Now you can achieve leadership code size in applications, helping your project team to hit schedule and code size targets. Reduced code size provides the opportunity to use a smaller memory device at a lower price, reduce time spent optimizing and fine-tuning code size to fit the memory space, and also responding to those marketing requests for "just one more feature."

Powerful 16-bit CPU:

The PIC24 MCU and the dsPIC DSC families execute most instructions in one cycle. Interrupts are serviced quickly and are deterministic. Bit manipulation is native. Add latest generation features, such as zero overhead looping, single-cycle multiply and a barrel shifter, and you have the most powerful 16-bit MCU for your embedded control designs. If your current need is lowest cost rather than performance, the PIC24F family reduces the available MIPS while offering a very cost-effective solution with these many attributes.

Looking to Add DSP?

If you are one of the many MCU users looking to add DSP features to your embedded design, the dsPIC DSCs make the process easy and straightforward. The dsPIC DSC retains a MCU look and feel from the architecture to the tools you use for development.



If you don't have the time to become immersed in DSP technology, you can use one of the many libraries developed by DSP experts. Or you can use the available graphical tools to develop digital filters. For DSP experts, Microchip includes many attributes that are typical of true DSPs in this class: dual 40-bit accumulators, single cycle 16x16 MAC, dual operand fetches, saturation and rounding modes, and zero overhead looping. This is not simply a MCU with a MAC attached as an after thought.

Flexible Flash:

All of Microchip's 16-bit products employ flexible and secure Flash memory. You can use the Flash memory to store programs or data tables. Additionally, all devices can self-program their own Flash memory in a finished product. The PIC24H and dsPIC DSC families offer advanced security features that enable you to secure your base code and allow OEMs to "customize" the application or alternatively work with encrypted data.

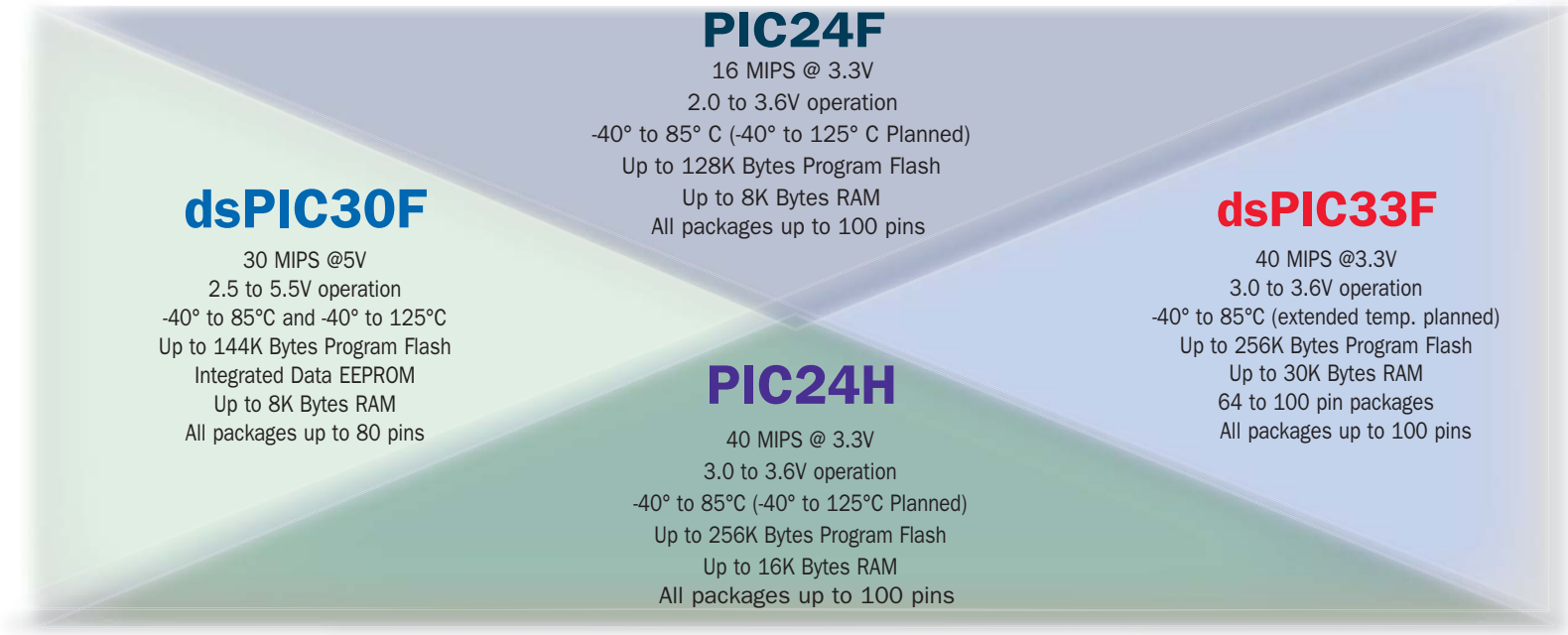
Migration Options:

Once you have designed our 16-bit products into your application, future designs are simplified. You can select from a broad range of memory, pin count, peripheral, performance and price options without changing architecture or development tools. The pinout, software and tool compatibility helps make stepping to different performance or memory points very straightforward. This is also beneficial if you design in an environment of rapidly evolving requirements.

Considering a 32-bit MCU?

Has your current MCU run out of steam? Microchip's performance-oriented 16-bit solutions can significantly outperform low cost 32-bit controllers for many MCU applications. Why abandon 16-bit deterministic performance, native bit manipulation, fast fixed-latency interrupts and low cost tools to gain inferior 32-bit performance? Many 32-bit customers have reverted to Microchip's 16-bit products after discovering performance issues during the course of their design.

One Architecture: Four Compatible Families



Highly Cost-Effective PIC24F 16-bit MCUs

With 16 MIPS performance and an extensive peripheral set, the PIC24F MCUs are a highly cost-effective solution for all but the most demanding 16-bit applications. The PIC24F also offers a new migration option for design engineers whose applications may be outgrowing the performance offered by 8-bit MCUs and need to stay cost competitive.

Highest Performance PIC24H 16-bit MCUs

For more demanding applications, the PIC24H offers 40 MIPS performance, more memory and additional peripherals. The PIC24H family adds up to 2 CAN communication modules, user selectable 10/12-bit Analog-to-Digital (A/D) converter and enhanced timer functions. Integrated Direct Memory Access (DMA) between peripherals and dual-port RAM provides zero overhead data transfers, optimizing CPU throughput.

Versatile 5 Volt dsPIC30F DSCs

The 30 MIPS dsPIC30F family is developed for applications that benefit from a wide operating voltage (2.5 to 5.5 volts), extremely low standby current, integrated EEPROM, above-average Flash endurance for those that prefer 5V operation for system considerations. The dsPIC30F family includes robust peripheral options including up to 2 CAN modules, motor control peripherals and a Codec Interface which supports I²S and AC97 protocols.

High Performance, Cost Effective 3.3 Volt dsPIC33F DSCs

The 40 MIPS dsPIC33F family is developed for high performance embedded control applications. Compared to the dsPIC30F family, the dsPIC33F family offers larger RAM and Flash memory options, adds DMA and will be more cost effective in larger memory configurations.

16-BIT COMPARISON

	PIC24F	PIC24H	dsPIC30F	dsPIC33F
Best in Class C Compiler Efficiency	√	√	√	√
Same Instruction Set	√	√	*Adds DSP*	*Adds DSP*
Same Base Peripherals	√	√	√	√
Same Pinout	√	√	√	√
Same Development Tools	√	√	√	√
Fixed Fast Interrupt Latency	√	√	√	√
Universal Bit Manipulation	√	√	√	√
Full Speed from Flash	√	√	√	√
Single-Cycle Multiply	√	√	√	√
32/16 & 16/16 Divide	√	√	√	√
Deterministic Instruction Execution	√	√	√	√

16-bit Product Features Overview

Operating Range PIC24F

- DC to 16 MIPS
- VDD range: 2.0 to 3.6V
- Ind.(-40° to 85° C) Extended temp. planned

Operating Range PIC24H & dsPIC33F

- DC to 40 MIPS
- VDD range: 3.0 to 3.6V
- Ind.(-40° to 85° C) Extended temp. planned

Operating Range dsPIC30F

- DC to 30 MIPS*
- VDD range: 2.5 to 5.5V
- Ind. (-40° to 85° C) and ext. (-40° to 125°C)
- *30 MIPS @ 4.5 to 5.5V, -40° to 85° C

High Performance CPU

- Single cycle execution (most instructions)
- C compiler optimized instruction set
- 16-bit wide data path
- 76 base instructions: mostly 1 word/1 cycle
- 16 16-bit general purpose registers
- Software stack
- 16 x 16 fractional/integer multiplier
- 32/16 and 16/16 divide
- 40-stage barrel shifter
- DSC additions (dsPIC30F & dsPIC33F):
  - Adds 8 base DSP instructions
  - 2 40-bit accumulators with rounding and saturation options
  - Single core combines MCU & DSP features
  - Adds Modulo and Bit-reverse address modes

Hardware DMA PIC24H & dsPIC33F

- 8 channel DMA
- 2 KB dual port RAM

Power Management

- Switch between clock sources in real-time
- Programmable power-on reset start up
- Programmable low-voltage detect (dsPIC30F)
- Programmable brown-out reset
- Idle and Sleep modes with fast wake up

System Management

- Flexible clock options:
  - Primary external clock, crystal, resonator
  - Secondary lower power 32 kHz oscillator
  - Internal RC: fast or low power
  - Integrated low jitter PLL
    - PLL sourced by ext. & int. clock sources
- Programmable power-up timer
- Oscillator start-up timer/stabilizer
- Watchdog Timer with its own RC oscillator
- Clock switching/fail-safe clock monitor

Interrupt Controller

- 5 cycle fixed latency
- Up to 118 interrupt sources, up to 5 external
- 7 programmable priority levels
- 4 processor exceptions and software traps

Digital I/O

- Up to 85 programmable digital I/O pins
- Wake-up/Interrupt-on-change on up to 24 pins
- High current sink/source (PIC24F & dsPIC30F)

On-chip Flash, Data EE and RAM

- Flash program memory: up to 256 KB
- dsPIC30F Data EEPROM: up to 4 KB
  - 1 million erase/write cycles typical
- Data RAM: up to 30 KB

Timers/Capture/Compare/PWM

- Timer/counters: up to nine 16-bit timers
  - Can pair up to make 32-bit timers
  - 1 timer can run as real-time clock
- Input capture: up to 8 channels
  - Capture on rising, falling or both edges
  - 4-deep FIFO on each capture
- Output compare: up to 8 channels
  - Single or dual 16-bit compare mode
  - 16-bit glitchless PWM mode

Communication Modules

- 3-wire SPI: up to 2 modules
  - Framing supports I/O interface to simple codecs
- I²C™: up to 2 modules
  - Full Multi-master and Slave mode support
  - 7-bit and 10-bit addressing
- UART: up to 2 modules
  - Interrupt-on-address bit detect
  - Wake-up on Start bit from Sleep mode
  - 4-character TX and RX FIFO buffers
- Codec interface module
  - Supports I²S and AC97 protocols
- CAN/ECAN 2.0B active: up to 2 modules
  - 3 transmit, 2 receive buffers (dsPIC30F)
  - 8 transmit, 32 receive buffers (PIC24H & dsPIC33F)
  - Wake-up on CAN message

Motor Control Peripherals

- Motor Control PWM: up to 8 outputs
  - 4 duty cycle generators
  - Independent or complementary mode
  - Programmable dead time settings
  - Edge or center-aligned
  - Manual output override control
  - Up to 2 fault inputs
  - A/D samples triggered by PWM module
- Quadrature encoder interface module
  - Phase A, Phase B and index pulse input

Analog-to-Digital Converters

- 10-bit A/D converter:
  - dsPIC24F: 500 Ksps, 1 module
  - PIC24H: 1.1 Msps, 1 or 2 modules
  - dsPIC30F: 1 Msps, 1 module
  - dsPIC33F: 1.1 Msps, 1 or 2 modules
- 12-bit A/D converter:
  - PIC24H: 1.1 Msps 1 or 2 modules
  - dsPIC30F: 200 ksps, 1 module
  - dsPIC33F: 500 ksps, 1 or 2 modules
- Common features:
  - Users can select 10- or 12-bit A/D (PIC24H & dsPIC33F)
  - Buffered output or DMA
  - 16-deep result buffer
  - dsPIC30F & PIC24F: up to 16 channels auto scanning
  - PIC24H & dsPIC33F: up to 32 channels auto scanning

16-bit Packages


P: 18-pin PDIP
(22.81 x 7.95 x 3.3 mm)


MM: 28-pin QFN
(6 mm x 6 mm x 0.9 mm)

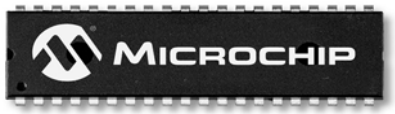

ML: 44-pin QFN
(8 mm x 8 mm x 0.9 mm)


ML: 28-pin QFN
(6 mm x 6 mm x 0.9 mm)


PT: 64-pin TQFP
(10 mm x 10 mm x 1 mm)


SO: 18-pin SOIC
(11.53 x 10.34 x 2.31 mm)


SP: 28-pin SPDIP
(34.67 x 7.87 x 3.3 mm)

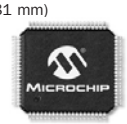

P: 40-pin PDIP
(52.27 x 15.24 x 3.81 mm)


PF: 64-pin TQFP
(14 mm x 14 mm x 1 mm)


SO: 28-pin SOIC
(17.88 x 10.34 x 2.31 mm)


PT: 44-pin TQFP
(10 mm x 10 mm x 1 mm)


PT: 80-pin TQFP
(12 mm x 12 mm x 1 mm)


PF: 80-pin TQFP
(14 mm x 14 mm x 1 mm)


PT: 100-pin TQFP
(12 mm x 12 mm x 1 mm)


PF: 100-pin TQFP
(14 mm x 14 mm x 1 mm)

PIC24F Family

16 MIPS, lowest cost

The PIC24F family is ideal for cost sensitive applications or applications migrating from 8-bit designs for a boost in performance or memory.

Product	Pins	Flash Kbytes	SRAM Kbytes	Timer	Capture	Output Comp. PWM	Real Time Clock Calendar	A/D 10-bit 500 ksps	Compar-ators	UART	SPI	I²C™	JTAG	Package Code
PIC24FJ64GA006	64	64	8	5	5	5	Y	16	2	2	2	2	Y	PT
PIC24FJ64GA008	80	64	8	5	5	5	Y	16	2	2	2	2	Y	PT
PIC24FJ64GA010	100	64	8	5	5	5	Y	16	2	2	2	2	Y	PT, PF
PIC24FJ96GA006	64	96	8	5	5	5	Y	16	2	2	2	2	Y	PT
PIC24FJ96GA008	80	96	8	5	5	5	Y	16	2	2	2	2	Y	PT
PIC24FJ96GA010	100	96	8	5	5	5	Y	16	2	2	2	2	Y	PT, PF
PIC24FJ128GA006	64	128	8	5	5	5	Y	16	2	2	2	2	Y	PT
PIC24FJ128GA008	80	128	8	5	5	5	Y	16	2	2	2	2	Y	PT
PIC24FJ128GA010	100	128	8	5	5	5	Y	16	2	2	2	2	Y	PT, PF

PIC24H Family

40 MIPS, highest performance

The PIC24H family is ideal for applications with greater performance or memory requirements or require extensive data movement.

Product	Pins	Flash Kbytes	SRAM Kbytes	Timer	Capture	Output Comp. PWM	Compar-ators	A/D 10-/12-bit* 1.1 Msps/ 500 ksps	UART	SPI	I²C™	CAN	JTAG	Package Code
PIC24HJ64GP206	64	64	8	9	8	8	2	18	2	2	1	—	Y	PT
PIC24HJ64GP210	100	64	8	9	8	8	2	32	2	2	2	—	Y	PT, PF
PIC24HJ64GP506	64	64	8	9	8	8	2	18	2	2	2	1	Y	PT
PIC24HJ64GP510	100	64	8	9	8	8	2	32	2	2	2	1	Y	PT, PF
PIC24HJ128GP206	64	128	8	9	8	8	2	18	2	2	2	—	Y	PT
PIC24HJ128GP210	100	128	8	9	8	8	2	32	2	2	2	—	Y	PT, PF
PIC24HJ128GP306	64	128	16	9	8	8	2	18	2	2	2	—	Y	PT
PIC24HJ128GP310	100	128	16	9	8	8	2	32	2	2	2	—	Y	PT, PF
PIC24HJ128GP506	64	128	8	9	8	8	2	18	2	2	2	1	Y	PT
PIC24HJ128GP510	100	128	8	9	8	8	2	32	2	2	2	1	Y	PT, PF
PIC24HJ256GP206	64	256	16	9	8	8	2	18	2	2	2	—	Y	PT
PIC24HJ256GP210	100	256	16	9	8	8	2	32	2	2	2	—	Y	PT, PF
PIC24HJ256GP610	100	256	16	9	8	8	2	2 x 32	2	2	2	2	Y	PT, PF

* PIC24H features a user-selectable 500 mbps 12-bit A/D or 1.1 Msps 10-bit A/D

dsPIC30F Product Families

General Purpose Family

The dsPIC30F General Purpose Family is ideal for a wide variety of 16-bit embedded control applications. In addition, the variants with codec interfaces are well suited for speech and audio applications.

Product	Pins	Flash-Memory Kbytes	RAM Bytes	EEPROM Bytes	Timer 16-bit	Input Capture	Output Compare/ Standard PWM	Codec Interface	A/D 12-bit 200 ksps	UART	SPI	I²C™	CAN	I/O Pins (max.)†	Package Code
dsPIC30F3014	40/44	24	2048	1024	3	2	2	—	13 ch, 1 S/H	2	1	1	—	30	P, PT, ML
dsPIC30F4013	40/44	48	2048	1024	5	4	4	AC97, I²S	13 ch, 1 S/H	2	1	1	1	30	P, PT, ML
dsPIC30F5011	64	66	4096	1024	5	8	8	AC97, I²S	16 ch, 1 S/H	2	2	1	2	52	PT
dsPIC30F6011[1] dsPIC30F6011	64	132	6144	2048	5	8	8	—	16 ch, 1 S/H	2	2	1	2	52	PF PT
dsPIC30F6012[1] dsPIC30F6012A	64	144	8192	4096	5	8	8	AC97, I²S	16 ch, 1 S/H	2	2	1	2	52	PF PT
dsPIC30F5013	80	66	4096	1024	5	8	8	AC97, I²S	16 ch, 1 S/H	2	2	1	2	68	PT
dsPIC30F6013[1] dsPIC30F6013A	80	132	6144	2048	5	8	8	—	16 ch, 1 S/H	2	2	1	2	68	PF PT
dsPIC30F6014[1] dsPIC30F6014A	80	144	8192	4096	5	8	8	AC97, I²S	16 ch, 1 S/H	2	2	1	2	68	PF PT

Motor Control and Power Conversion Family

This dsPIC30F family supports motor control applications, such as brushless DC motors, single- and 3-phase induction and switched reluctance motors. These are also ideal for UPS, inverters, switched mode power supplies and power factor correction.

Product	Pins	Flash-Memory Kbytes	RAM Bytes	EEPROM Bytes	Timer 16-bit	Input Capture	Output Compare/ Standard PWM	Motor Control PWM	Quadrature Encoder	A/D 10-bit 1 Msps	UART	SPI	I²C™	CAN	I/O Pins (Max.)†	Package Code
dsPIC30F2010	28	12	512	1024	3	4	2	6 ch	Yes	6 ch, 4 S/H	1	1	1	—	20	SP, SO, MM
dsPIC30F3010	28/44	24	1024	1024	5	4	2	6 ch	Yes	6 ch, 4 S/H	1	1	1	—	20	SP, SO, 44-pin ML
dsPIC30F4012	28/44	48	2048	1024	5	4	2	6 ch	Yes	6 ch, 4 S/H	1	1	1	1	20	SP, SO, 44-pin ML
dsPIC30F3011	40/44	24	1024	1024	5	4	4	6 ch	Yes	9 ch, 4 S/H	2	1	1	—	30	P, PT, ML
dsPIC30F4011	40/44	48	2048	1024	5	4	4	6 ch	Yes	9 ch, 4 S/H	2	1	1	1	30	P, PT, ML
dsPIC30F5015	64	66	2048	1024	5	4	4	8 ch	Yes	16 ch, 4 S/H	1	2	1	1	52	PT
dsPIC30F6015	64	144	8192	4096	5	8	8	8 ch	Yes	16 ch, 4 S/H	2	2	1	2	52	PF
dsPIC30F5016	80	66	2048	1024	5	4	4	8 ch	Yes	16 ch, 4 S/H	1	2	1	1	68	PT
dsPIC30F6010 dsPIC30F6010A	80	144	8192	4096	5	8	8	8 ch	Yes	16 ch, 4 S/H	2	2	1	2	68	PF PT

Sensor Family

The dsPIC30F Sensor Family products have features designed to support high-performance, cost sensitive and space constrained applications. Offered as small as 6x6 mm and with pin counts as low as 18 pins, this family provides industry leading performance in a small form factor.

Product	Pins	Flash-Memory Kbytes	RAM Bytes	EEPROM Bytes	Timer 16-bit	Input Capture	Output Compare/ Standard PWM	A/D 12-bit 200 ksps	UART	SPI	I²C™	I/O Pins (Max.)†	Package Code
dsPIC30F2011	18	12	1024	—	3	2	2	8 ch, 1 S/H	1	1	1	12	P, SO, 28-pin ML
dsPIC30F3012	18/44	24	2048	1024	3	2	2	8 ch, 1 S/H	1	1	1	12	P, SO, 44-pin ML
dsPIC30F2012	28	12	1024	—	3	2	2	10 ch, 1 S/H	1	1	1	20	SP, SO, 28-pin ML
dsPIC30F3013	28/44	24	2048	1024	3	2	2	10 ch, 1 S/H	2	1	1	20	SP, SO, 44-pin ML

† I/O pin count includes pins shared by the peripheral functions
1 Suggest "A" version for new designs

dsPIC33F Product Families

General Purpose Family

The dsPIC33F General Purpose Family is ideal for a wide variety of 16-bit embedded control applications. In addition, the variants with codec interfaces are well suited for speech and audio applications.

Product	Pins	Flash Memory Kbytes	RAM Kbytes	DMA # Ch	Timer 16-bit	Input Capture	Output Compare/ Standard PWM	Codec Interface	A/D* 12-bit 500 ksps	UART	SPI	I²C™	CAN	I/O Pins (max)†	Package Code
dsPIC33FJ64GP206	64	64	8	8	9	8	8	1	1 ADC, 18 Ch, 1 S/H	2	2	1	—	53	PT
dsPIC33FJ64GP306	64	64	16	8	9	8	8	1	1 ADC, 18 Ch, 1 S/H	2	2	2	—	53	PT
dsPIC33FJ64GP706	64	64	16	8	9	8	8	1	2 ADC, 18 ch, 2 S/H	2	2	2	2	53	PT
dsPIC33FJ128GP206	64	128	8	8	9	8	8	1	1 ADC, 18 Ch, 1 S/H	2	2	1	—	53	PT
dsPIC33FJ128GP306	64	128	16	8	9	8	8	1	1 ADC, 18 Ch, 1 S/H	2	2	2	—	53	PT
dsPIC33FJ128GP706	64	128	16	8	9	8	8	1	2 ADC, 18 ch, 2 S/H	2	2	2	2	53	PT
dsPIC33FJ256GP506	64	256	16	8	9	8	8	1	1 ADC, 18 ch, 1 S/H	2	2	2	1	53	PT
dsPIC33FJ64GP708	80	64	16	8	9	8	8	1	2 ADC, 24 ch, 2 S/H	2	2	2	2	69	PT
dsPIC33FJ128GP708	80	128	16	8	9	8	8	1	2 ADC, 24 ch, 2 S/H	2	2	2	2	69	PT
dsPIC33FJ64GP310	100	64	16	8	9	8	8	1	1 ADC, 32 Ch, 1 S/H	2	2	2	—	85	PT, PF
dsPIC33FJ64GP710	100	64	16	8	9	8	8	1	2 ADC, 32 ch, 2 S/H	2	2	2	2	85	PT, PF
dsPIC33FJ128GP310	100	128	16	8	9	8	8	1	1 ADC, 32 Ch, 1 S/H	2	2	2	—	85	PT, PF
dsPIC33FJ128GP710	100	128	16	8	9	8	8	1	2 ADC, 32 ch, 2 S/H	2	2	2	2	85	PT, PF
dsPIC33FJ256GP510	100	256	16	8	9	8	8	1	1 ADC, 32 ch, 1 S/H	2	2	2	1	85	PT, PF
dsPIC33FJ256GP710	100	256	30	8	9	8	8	1	2 ADC, 32 ch, 2 S/H	2	2	2	2	85	PT, PF

Motor Control and Power Conversion Family

This dsPIC33F family supports motor control applications, such as brushless DC motors, single- and 3-phase induction and switched reluctance motors. These are also ideal for UPS, inverters, switched mode power supplies and power factor correction.

Product	Pins	Flash Memory Kbytes	RAM Kbytes	DMA # Ch	Timer 16-bit	Input Capture	Output Compare/ Standard PWM	Motor Control PWM	Quadrature Encoder Interface	A/D* 10-bit 1.1 Msps	UART	SPI	I²C™	CAN	I/O Pins (max)†	Package Code
dsPIC33FJ64MC506	64	64	8	8	9	8	8	8 ch	Yes	1 A/D, 16 Ch, 4 S/H	2	2	2	1	53	PT
dsPIC33FJ64MC706	64	64	16	8	9	8	8	8 ch	Yes	2 A/D, 16 ch, 8 S/H	2	2	2	1	53	PT
dsPIC33FJ128MC506	64	128	8	8	9	8	8	8 ch	Yes	1 A/D, 16 Ch, 4 S/H	2	2	2	1	53	PT
dsPIC33FJ128MC706	64	128	16	8	9	8	8	8 ch	Yes	2 A/D, 16 ch, 8 S/H	2	2	2	1	53	PT
dsPIC33FJ64MC508	80	64	8	8	9	8	8	8 ch	Yes	1 A/D, 18 Ch, 4 S/H	2	2	2	1	69	PT
dsPIC33FJ128MC708	80	128	16	8	9	8	8	8 ch	Yes	2 A/D, 18 ch, 8 S/H	2	2	2	1	69	PT
dsPIC33FJ64MC510	100	64	8	8	9	8	8	8 ch	Yes	1 A/D, 24 Ch, 4 S/H	2	2	2	1	85	PT, PF
dsPIC33FJ64MC710	100	64	16	8	9	8	8	8 ch	Yes	2 A/D, 24 ch, 8 S/H	2	2	2	2	85	PT, PF
dsPIC33FJ128MC510	100	128	8	8	9	8	8	8 ch	Yes	1 A/D, 24 Ch, 4 S/H	2	2	2	1	85	PT, PF
dsPIC33FJ128MC710	100	128	16	8	9	8	8	8 ch	Yes	2 A/D, 24 ch, 8 S/H	2	2	2	2	85	PT, PF
dsPIC33FJ256MC510	100	256	16	8	9	8	8	8 ch	Yes	1 A/D, 16 ch, 4 S/H	2	2	2	1	85	PT, PF
dsPIC33FJ256MC710	100	256	30	8	9	8	8	8 ch	Yes	2 A/D, 24 ch, 8 S/H	2	2	2	2	85	PT, PF

† I/O pin count includes pins shared by the peripheral functions
* The A/D is 10 or 12-bit (user configurable)

Designed for real-time control, Microchip's 16-bit controllers offer outstanding reliability, robustness and reduced system cost

On-chip oscillator eliminates crystal, reduces cost

Most 16-bit devices permit the on-chip precision oscillator to be the clock source for your designs. The associated low-jitter PLL can boost the clock to full speed and may eliminate the need for an external crystal. Now you can eliminate the external crystal, save board space and reduce system cost.

Reliable watchdog timer

Microchip's watchdog timer runs from its internal oscillator independent of the system clock.

Power save modes optimize power consumption

You have many choices to optimize power consumption inspired by our nanoWatt Technology. Switch to a low frequency on-chip oscillator or divide down the system clock during periods of inactivity. Or you can "power down" core and selected peripherals. Or simply operate at slower speed to conserve power.

Microchip's 16-bit product line is designed to meet the rigorous demands of real-time systems. Not only is its real-time performance superior to other 16- and 32-bit controllers, it also offers a number of highly enabling features specifically designed to enhance system reliability and robustness, and reduce system cost by eliminating external components.

On-chip system clock monitor adds safety

The on-chip clock monitor detects a system clock failure and forces a chip-reset. Restarting the system with the on-chip oscillator provides a graceful way to handle such a catastrophic failure.

Low Jitter PLL for reliable system operation

On-chip PLL with crystal oscillator input offers low jitter, < ±0.75% over VDD and temperature for reliable operation of CAN, UART or other forms of communication.

Extended temperature

Currently many dsPIC DSCs offer 125°C options, making Microchip's 16-bit products ideal for industrial applications that run "hot" such as motor control, power conversion, lighting control and "under-the-hood"automotive systems, such as EPS, electronic gearbox, cooling fan control, etc. Most of the 16-bit lineup is expected to offer extended temperature options.

Small package, big performance

Several dsPIC DSCs come in QFN packages as small as 6x6 mm. PIC24 MCUs are expected to follow shortly. Now you can add 16-bit performance and save board space too.

High-current I/O drives save cost

The dsPIC30F and PIC24F families have I/O pins that can drive LEDs directly or eliminate pre-drivers for external FET switches to save you space and cost.

Power-on reset and brown-out reset add robustness, save cost

Intellligent on-chip Power-on Reset eliminates external reset circuitry in most systems. Brown-out can reset the chip in the event of a power glitch. All this adds up to a robust system at a reduced cost.

Self-monitoring CPU protects against software glitches

Code execution flow is continually monitored to prevent catastrophic failures due to software malfunction. Accesses to non-existing memory locations are trapped, as are stack overflow, stack underflow and un-initialized pointer accesses. Now your real-time system has an added level of safety.

Hardware Development Tools

MPLAB ICD 2
In-Circuit Debugger

The MPLAB ICD 2 In-Circuit Debugger is a powerful, low-cost development tool. Running under MPLAB IDE, MPLAB ICD 2 can debug ASM or C source code, watch and modify variables, single step and set breakpoints. Key features of the MPLAB ICD 2:

- Full speed operation
- USB or serial port connection to PC
- Can be used as an inexpensive programmer
- Smart watch variable windows
- Advanced breakpoint features

MPLAB PM3
Device Programmer

MPLAB PM3 Device Programmer is a full-featured, production quality universal device programmer. Using interchangeable socket modules, the MPLAB PM3 supports virtually all programmable devices from Microchip. MPLAB PM3 has improved programming time for many devices and offers a built-in interface for robust In-Circuit Serial Programming™ (ICSP™).

MPLAB ICE 4000
In-Circuit Emulator for the dsPIC30F*

The powerful, full-featured real-time MPLAB ICE 4000 In-Circuit Emulator for the dsPIC30F is capable of debugging the most demanding real-time systems. Key features of the MPLAB ICE 4000 In-Circuit Emulator:

- Full-speed, real-time emulation
- Supports full dsPIC30F supply voltage range
- 64K deep by 216-bit wide trace memory
- Unlimited breakpoints
- Complex break, trace and trigger logic
- Multi-level trigger up to four levels
- 48-bit time stamp
- USB connection to PC
- Stopwatch

* A low cost in-circuit emulator family is planned for the dsPIC33F

Hardware Development Boards: Jump-start Your Design

A variety of hardware development boards are available for the dsPIC DSC, enabling you to shorten your design cycle. These boards are designed to allow easy connection to an MPLAB ICD 2, MPLAB ICE 4000 or MPLAB PM3. All development boards include documentation and example source code to accelerate your design.

Explorer 16 Development Board

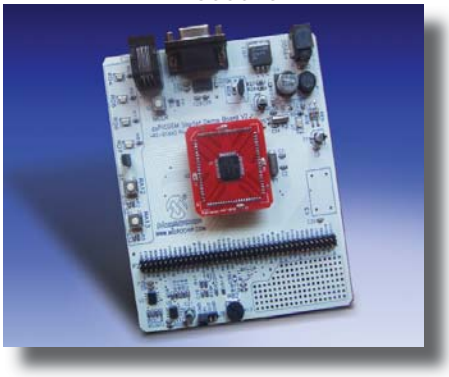
DM240001

The Explorer 16 is a low cost, efficient development board to evaluate the features and performance of Microchip's new PIC24 microcontroller and dsPIC33 digital signal controller families. The board is an ideal prototyping tool to help you quickly develop and validate key design requirements. Key features:

- Supports PIC24F, PIC24H and dsPIC33F general purose and motor control products
- Modular design for plug-in demonstration boards, expansion header
- Future demonstration boards include Flash cards, Ethernet, IrDA® protocol, wireless communications and voice playback
- Two interchangeable Plug-In Modules (PIMs), one each for the PIC24F and the dsPIC33F

dsPICDEM™ 80-Pin Starter Development Board

DM300019

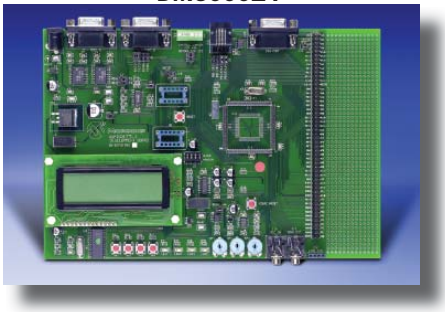


This development board offers a very economical way to evaluate the 80-pin dsPIC30F General Purpose and Motor Control Familes as well as the dsPIC33F devices. Key features:

- Includes a 80-pin dsPIC30F6014A General Purpose plug-in module (MA300014)
- Accommodates 80-pin dsPIC30F6010 Motor Control plug-in module (MA300013)
- Accommodates the 100- to 80-pin dsPIC33F General Purpose plug-in module (MA330012)
- Power input from 9V supply
- LEDs, switches, potentiometer, UART interface
- A/D input filter circuit for speech-band signal input
- On-board DAC and filter for speech-band signal output
- Circuit prototyping area
- Assembly language demonstration program and tutorial
- Includes a selectable voltage regulator with outputs of 5 to 3.3V

dsPICDEM 1.1 General Purpose Development Board

DM300014



This board provides development support for speech and audio-related applications. Key features:

- Includes a dsPIC30F6014A plug-in module (MA300014)
- Serial communication channels (two UART, SPI, CAN)
- Si3000 codec with MIC IN/Speaker OUT
- General purpose prototyping area and expansion header
- Digital potentiometer, LEDs, switches, etc.

Motor Control Development System

This system provides quick prototyping and validation of BLDC, ACIM, PMSM, SR and UPS applications. The system consists of the dsPICDEM MC1 Motor Control Development Board and one of two optional power modules. The dsPICDEM MC1H 3-Phase High-Voltage Power Module (DM300021) supports AC line-powered applications, while the dsPICDEM MC1L 3-Phase Low-Voltage Power Module (DM300022) supports DC-powered applications up to 48V. Key features:

- Heat sink for ambient cooling of power sections
- Full automatic protection of power circuits
- Electrical isolation from power circuits
- Many options for motor feedback signals

DM300021/22

Note: Power module shown with dsPICDEM MC1 Development Board DM300020

DM300020

Includes a dsPIC30F6010 plug-in module (MA300013)

Advanced Development Boards: Complex Designs Made Simple

A variety of hardware development boards are available for the dsPIC DSC, enabling you to shorten your design cycle. These boards are designed to allow easy connection to an MPLAB ICD 2, MPLAB ICE 4000 or MPLAB PM3. All development boards include documentation and example source code to accelerate your design.

PICDEM™ MC LV Motor Control Development Board

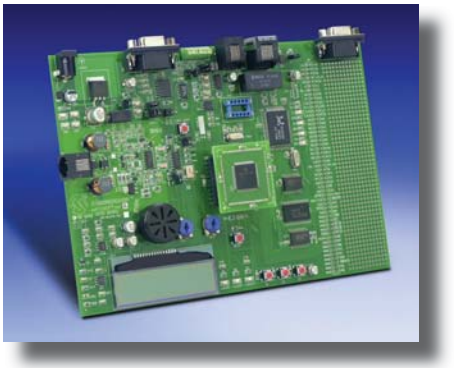
DM183021

This development board provides a cost-effective method of evaluating and developing sensored or sensorless Brushless DC (BLDC) motor control applications. A 28-pin, dsPIC30F3010 device is used with this board. Key features:

- Over-current protection and temperature sensor with I²C™ interface
- 3-phase voltage source inverter bridge
- 9 LEDs, 3 for generic status indication and 6 for PWM indication
- Test points for motor current and back EMF sensing
- Speed control potentiometer
- Supports maximum motor ratings of 48V and 2.2A
- Also supports 28-pin PIC18 MCUs; specifically the PIC18F2431
- Power supply and motor are available (optional) for out-of-the-box experience

dsPICDEM.net™ Connectivity Development Board

DM300004-1/2



This board provides development support for soft modem and connectivity-related applications. Key features:

- dsPICDEM.net 1 (DM300004-1) supports FCC/JATE PSTN countries
- dsPICDEM.net 2 (DM300004-2) supports CTR-21 PSTN countries
- Includes a dsPIC30F6014 plug-in module (MA300011)
- 10-Base T Ethernet MAC and PHY interface
- PSTN interface with DAA/AFE chipset
- Serial communication channels (UART and CAN)
- External EEPROM and RAM memory for storing constants
- General purpose prototyping area and expansion header
- LEDs, switches, potentiometers and LCD display

dsPICDEM 2 Development Board

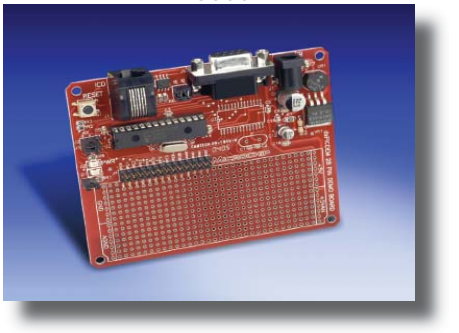
DM300018

This development board provides a cost effective way to start designing solutions for all 18-, 28- and 40-pin DIP-packaged dsPIC DSC devices. Key features:

- Development platform for 11 dsPIC DSC devices in 18-, 28- and 40-pin DIP packages including Motor Control, Sensor and General-Purpose family devices
- On-board CAN and UART support
- On-board support for multiple oscillator options
- Example source code and a User Guide is provided to jump-start application development for all 11 devices

dsPICDEM 28-Pin Starter Development Board

DM300017



This development board provides an economical solution to get started with the 28-pin dsPIC30F devices, including Motor Control, Sensor and Power Conversion families. Key features:

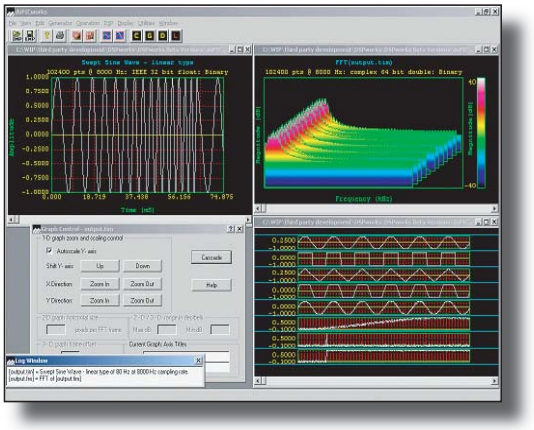
- Includes a 28-pin dsPIC30F2010 device
- Power input from 9V power supply
- UART interface
- Header for access to all device I/O pins
- Circuit prototyping area
- Assembly language demonstration program and tutorial
- Accommodates all dsPIC30F 28-pin DIP or SOIC devices

Develop DSP Algorithms: The Easy Way

dsPICworks™ Data Analysis and DSP Software

The dsPICworks Data Analysis and DSP Software makes it easy to evaluate and analyze DSP algorithms. You can run a variety of DSP and arithmetic operations and analyze your data in both time and frequency domain. Key features of the dsPICworks Data Analysis and DSP Software:

- Visually analyze time and frequency domain data
- DSP operations: FFT, convolution, correlation, DCT and filtering
- Waveform synthesis
- Tool generates one-, two- and three-dimensional frequency graphs
- Data import/export options to interface with MPLAB IDE and MPLAB ASM30
- Support for fractional, integer and IEEE floating point data in decimal and hexadecimal notation



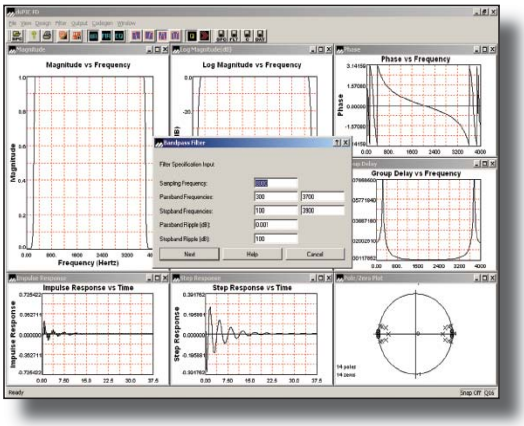
Digital Filter Design Tool

The Digital Filter Design Tool makes designing and analyzing FIR and IIR filters easy. Enter frequency specifications and filter code and coefficients are generated automatically. Graphical output windows provide the desired filter's characteristics.

Digital Filter Design Lite Tool

Not ready to purchase the whole Digital Filter package? Why not start Lite? The Digital Filter Design Lite Tool includes most of the features of the full-featured version at a fraction of the cost.

	Filter Design	Filter Design Lite
List Price	$249	$29
Low-pass	√	√
High-pass	√	√
Band-pass	√	√
Band-stop	√	√
FIR Taps	Up to 513	Up to 64
IIR Taps for LP, HP	Up to 10	Up to 4
IIR Taps for BP, BS	Up to 20	Up to 8
Generate ASM Code	√	√
Export to MPLAB® IDE	√	√
Export to MPLAB® C30 C Compiler	√	√
MATLAB® Support	√	—



Operating Systems and Communication Drivers

RTOS

If you need a Real-Time Operating System (RTOS) to handle multitasking, we have a three-tier solution for you.

- CMX-RTX™: full-featured fully preemptive multi-tasking OS
- CMX-Tiny+™: fully preemptive scaled-down version of the RTX OS
- CMX-Scheduler™: fully preemptive multi-tasking mini OS (FREE)

All three operating systems are fully preemptive and written in assembly language optimized for maximum performance. These RTOS products are developed by CMX and available from Microchip and CMX.

RTOS features:
- Small program memory footprints
- The fastest context switch times
- The lowest interrupt latency times
- True Preemption

OSEK and CAN Drivers

Vector Informatik GmbH provides automotive operating systems, sometimes labeled as an OSEK operating system. The Vector Informatik osCAN operating system, which is based on the OSEK/VDX® standard, provides a multitasking operating system with optimal features for use on MCUs. This product represents a small, sturdy operating system kernel.

The companion support for managing the CAN interface drivers on the dsPIC30F family of products is the CANbedded CAN driver suite from Vector Informatik. This product consists of a number of adaptive source code modules that cover the basic communication requirements in automotive applications.

Some of the CAN functions supported:
- Initialize CAN Module
- Set CAN Operational Mode
- Set CAN Baud Rate
- Set CAN Mask
- Set CAN Filter
- Send CAN Message
- Receive CAN Message
- Abort CAN Sequence
- Random Number Generator

Plug and Play with Our Connectivity Libraries

TCP/IP Protocol Stack

MicroNet™ TCP/IP Stack by CMX
MicroNet TCP/IP Stack by CMX is specifically designed for optimized use of Flash and RAM resources on the dsPIC DSC. The software runs directly on the processor with no gateways or PCs required. The stack can be run in stand alone mode or work in conjunction with an RTOS. Using only industry standard protocols, CMX-MicroNet offers true TCP/IP networking via direct, dial-up or Ethernet connectivity and wireless Ethernet (802.11b) as well. This library can be readily implemented on the dsPICDEM.net™ Connectivity Board. This stack supports Point-to-Point Protocol, E-mail support and modem control, which are not currently supported on the free Microchip stack

MicroNet™ TCP/IP Stack by CMX
- RFC compliant protocol stack
- Supports CMX RTOS
- Ethernet NIC driver
- Small Flash/RAM footprint
- Source code provided

Microchip Free TCP/IP Stack
The Microchip TCP/IP Stack is a free suite of programs that provide services for standard TCP/IP-based applications (HTTP server, FTP server, etc.) or it can be used in a custom TCP/IP-based application. The stack is optimized for size and is designed to run on the dsPIC DSC. While this particular implementation is specifically targeted to run on the dsPICDEM.net Connectivity Development Board, it can be retargeted to any hardware equipped with a dsPIC DSC. HTML web pages generated by the digital signal controller can be viewed with a standard web browser such as Microsoft® Internet Explorer.

Microchip Free TCP/IP Stack
- Out-of-box support for MPLAB C30 compilers
- Implements complete TCP state machine
- Modules provided: MAC, SLIP, ARP, IP, ICMP, TCP, SNMP, UDP, DHCP, FTP, IP Gleaning, HTTP, MPFS (Microchip File System)
- RTOS independent

Soft Modem Libraries

V.22bis/V.22 Soft Modem Library
This library is available free of charge from the Microchip web site. The V.22bis Soft Modem Library is a collection of algorithms for ITU-T compliant V.21/Bell 103, V.22 and V.22bis modems and V.42 recommendations. The V.22bis library comes with full source code and archives that contain object code modules required for linking with your application. The transmit and receive data pump code modules are coded in assembly language for optimal speed and smallest code size, while the AT, V.42 and Data Pump APIs are coded in C. Hardware component drivers, such as UART and Data Converter Interface (DCI) for Analog Front End (AFE) I/O are provided. This library can be readily implemented on the dsPICDEM.net™ Connectivity Board.

V.32bis/V.22bis by Microchip
- Data Pump coded In assembly for optimal size and speed
- V.32bis (4800 thru 14,400 bps)
- V.22bis (1200 thru 2400 bps)
- V.42 (LAPM, error correction procedure)

V.32bis Soft Modem Library
The V.32bis Soft Modem Library is a collection of algorithms for ITU-T compliant V.21/Bell 103, V.22, V.22bis, V.32 and V.32bis modems and V.42 recommendations. The V.32bis library is provided with archives that contain object code modules required for linking with your application. The transmit and receive data pump code modules are coded in assembly language for optimal speed and smallest code size, while the AT, V.42 and Data Pump APIs are coded in C. Hardware component drivers, such as UART and DCI for AFE I/O are provided. This library can be readily implemented on the dsPICDEM.net Connectivity Development Board.

V.32/V.22/V.22bis by VOCAL Technologies, LTD
- VOCAL's proven solution on a dsPIC30F
- V.32 (9600 and 4800 bps, non-trellis encoding)
- V.22/V.22bis (2400, 1200 and 600 bps)
- V.42 (LAPM, error correction procedure)

V.32/V.22/V22bis Soft Modem Library by VOCAL Technologies, LTD
The Soft Modem Library is a collection of data modulations and protocols (V.32, V.22, V.22bis, V.23, V.21, Bell 103, Bell 212A and Bell 202). This library is provided with archives that contain object code modules, which link to your application. The data modulation is coded in C with inline assembly language optimization for speed and code size. Hardware component drivers, such as UART and DCI for AFE I/O are provided. This library can be readily implemented on the dsPICDEM.net Connectivity Board.

More Application Libraries Ready to Use

Encryption Libraries

Implement reliable secure applications using the Symmetric and Asymmetric Key Embedded Encryption Libraries. Developed for Microchip by NTRU Cryptosystems Inc., these libraries are both proven and optimized. These library functions can be easily called by your C or assembly code.

The algorithms included in these libraries have emerged as de facto standards for many large scale secure applications such as web access (SSL/TLS), E-mail (S-MIME), secure XML transactions and virtual private networks (IPsec). These algorithms are also recommended by Federal Information Processing Standards (FIPS) and the Internet Engineering Task Force (IETF).

Symmetric Key Embedded Encryption Library features:
- 128-bit AES in ECB, CTR, CBC, CBC-MAC and CCM modes
- Triple DES in ECB, CTR, CBC and CBC–MAC modes
- SHA-1
- MD5
- Random number generator (DRBG X9.82)

Asymmetric Key Embedded Encryption Library features:
- RSA (1024-bit and 2048-bit modulus) for encyption/decryption and signing/verification
- DSA (1024-bit modulus) for signing/verification
- Diffie-Hellman Key Agreement (1024-bit and 2048-bit modulus)
  - Private/public key generation
  - Shared-key generation
- SHA-1
- MD5
- Random number generator (DRBG X9.82)

Motor Control Application Software

The Motor Control Family is suited for advanced AC Induction Motor (ACIM), Brushless DC (BLDC) and Switched Reluctance (SR) motor applications. Two advanced applications are available that run on the dsPIC30F Motor Control Development System. Full documentation and source code are available for free on the Microchip web site for all application notes. For more information about Microchip's motor control solutions, please visit the Motor Control Design Center at www.microchip.com/motor.

Vector Control of an ACIM

This application note describes a fully-tested vector, or field oriented, control algorithm for a 3-phase ACIM. The motor currents, torque and velocity are regulated in control loops. Full documentation and source code are available for free on the Microchip web site (Application Note: AN908).

Introduction to ACIM Control

This application note is an introductory approach to the methods described in Application Note: AN908. Code is provided in an example that offers basic variable speed control of a single or three-phase ACIM (Application Note: AN984).

Sensored BLDC Motor Control

This application note describes a fully-tested 3-phase BLDC motor control algorithm with 3 hall-effect sensors. Code is available with and without a PI speed control loop (Application Note: AN957).

Sinusoidal PMSM Motor Control

This application note provides a fully working and highly flexible solution for using the dsPIC30F2010 to control a permanent magnet synchronous motor using all shunt windings to predict rotor position. The application is fully described in AN1017.

Sensorless BLDC Motor Control Using the dsPIC30F6010

This application note describes a fully-tested sensorless control algorithm for a 3-phase BLDC motor. Motor current, motor velocity and bus voltage are regulated in control loops. An LCD menu interface provides adjustment of all sensorless motor control parameters. This application solution utilizes a dsPIC30F6010 device and the dsPICDEM MC1 development system (Application Note: AN901).

Sensorless BLDC Motor Control Using the dsPIC30F2010

This application note describes how to provide sensorless BLDC motor control with the dsPIC30F2010 device. The technique used is based on another Microchip application note: Using the dsPIC30F for Sensorless BLDC Control (AN901). This application solution and AN957 present a low pin count solution with minimal I/O and use the PICDEM MC LV system with a dsPIC30F2010 device (Application Note: AN992).

Motor Type	Control strategy	Application Note	Source Code P/N
ACIM	Vector Control	AN908	SWAN0908
ACIM	Introduction	AN984	SWAN0984
BLDC	PI Loop	AN957	SWAN0957
BLDC	Sensorless PI Loop	AN901	SWAN0901
PMSM	Observer	AN992	SWAN0992

$5 Evaluation License for Evaluation and Development

A common issue with software libraries is that in order to evaluate the complete library, you must enter into a complex and expensive license arrangement. Any Microchip dsPIC DSC library can be licensed for $5.00 for evaluation and development purposes. These libraries are complete and unchanged from the production libraries, not reduced function evaluation versions. Evaluation licenses are available from the microchipDIRECT web site (http://www.microchipDIRECT.com). Licenses for production are based on a simple low cost one-time license fee. Production licenses are available from Microchip or from our authorized distributors.

Resources for Self-paced Learning

Web Seminars

Microchip offers extensive online resources for designers ranging from downloadable documentation to web seminars (webinars) to online discussion groups. All of these helpful resources are accessible on ***www.microchip.com/webseminars*** and are updated frequently with the most current information on our products and services.

Workshop in a Box

Periodically Microchip or our sales channel partners offer a fee-based, instructor-led Workshop in a Box, a full day, hands-on training session. The registration fee includes a "box" containing a dsPIC DSC development board and related training material, that is yours to keep to help you further your development skills.

If you have interest in a dsPIC DSC Introductory Workshop in a Box or a dsPIC DSC Motor Control Workshop in a Box, please contact your sales representative. In-house workshops can be arranged to accommodate larger design teams.

Webinar Topic	Duration
Introduction to the dsPIC® Digital Signal Controller	20 min
Introduction to Microchip's Development Tools	25 min
Introduction to dsPIC30F Architecture - Part 1	20 min
Introduction to dsPIC30F Architecture - Part 2	20 min
Introduction to MPLAB® IDE Integrated Development Environment	25 min
Basic dsPIC30F Development Tools	25 min
dsPIC30F Addressing Modes - Part 1	20 min
dsPIC30F Addressing Modes - Part 2	20 min
Introduction to dsPIC30F DSP Engine and ALU	30 min
Introduction to dsPIC30F Interrupts	25 min
dsPIC30F 12-bit ADC Module - Part 1	20 min
dsPIC30F 12-bit ADC Module - Part 2	20 min
dsPIC30F 10-bit ADC Module - Part 1	20 min
dsPIC30F 10-bit ADC Module - Part 2	20 min
Introduction to the MPLAB® VDI Visual Device Initializer	30 min
Serial Communications using the dsPIC30F - Part 1 (UART)	20 min
Serial Communications using the dsPIC30F - Part 2 (SPI)	20 min
Serial Communications using the dsPIC30F - Part 3 (I²C™)	30 min
Serial Communications using the dsPIC30F - Part 4 (CAN)	30 min
General Purpose Timers	20 min
dsPIC30F Motor Control Peripherals - Part 1 (MCPWM)	20 min
dsPIC30F Motor Control Peripherals - Part 2 (QEI)	20 min

For more information about additional self-paced learning resources, please visit www.microchip.com/training.

Getting Started

When time is of the essence, it is helpful to get the hints you need when you need them. Use these "getting started" documents for specific techniques, you can use to jump-start your applications. Getting Started documents are "Application Notes from 40,000 Feet."

CE001 Using dsPIC30F A/D Converters and the DSP Library for Signal Filtering (DS92001A)	CE006 Address Error Traps for Easy Debugging (DS92006A)	CE011 Dynamic Clock Division for Low-Power Operation (DS92011A)	CE016 Interfacing to 12S Audio Codecs Using dsplC30F DCI Module (DS92016)
CE 002 Configuring 10-Bit dsPIC DSC A/D Converters for 1 Msps Conversion Rate (DS92002A)	CE007 Stack Error Traps for Easy Debugging (DS92007A)	CE012 Dynamic Clock Switching for Low-Power Operation (DS92012A)	CE017 Reading, Erasing and Writing to dsPIC30F Data EEPROM (DS92017)
CE003 Driving a BLDC with Sinusoidal Voltages Using dsPIC30F (DS92003A)	CE008 Oscillator Failure Traps and Fail-safe Clock Monitoring (DS92008A)	CE013 External Interrupt Pins - Configuration and Use (DS92013A)	CE018 Using the Fast Fourier Transform (FFT) for Frequency Detection
CE004 Timer 1 Used in Real-Time Clock Applications (DS92004A)	CE009 Math Error Traps for Robust Operation (DS92009A)	CE014 Fast Wake-up from Sleep Mode (DS92014A)	CE019 Proportional Integral Derivative (PID) Controllers and Closed-loop Control
CE005 Using FIR Filters from dsPIC DSC Filter Design and DSP Library (DS92005A)	CE010 Performing A/D Conversions in SLEEP (Low-power) Mode (DS92010A)	CE015 Dynamic Tuning of Internal Fast RC Oscillator (DS92015A)	

Software Development Tools

Development Tool	Product Name	Description	Part#	List Price (1)	Devices Supported			
					PIC24F	PIC24H	dsPIC30F	dsPIC33F
Software	MPLAB® IDE	Integrated Development Environment	SW007002	Free	√	√	√	√
	MPLAB® ASM30	Assembler (included in MPLAB® IDE)	SW007002	Free	√	√	√	√
	MPLAB® SIM	Software Simulator (included in MPLAB® IDE)	SW007002	Free	√	√	√	√
	MPLAB® VDI	Visual Device Initializer (included in MPLAB® IDE)	SW007002	Free	√	√	√	√
C Compilers	MPLAB® C30	ANSI C Compiler, Assembler, Linker and Librarian	SW006012	$895	√	√	√	√
	Embedded Workbench for dsPIC30F	ISO/ANSI C and Embedded C++ compiler in a professional, extensible IDE, (Windows® NT/2000/Windows XP®) special DSP support included.	EWdsPIC 1	Contact IIR	—	—	√	—
	dsPICC	ANSI C compiler	dsPICC	Contact HI-TECH	—	—	√	—

Development Boards and Reference Designs

Development Tool	Description	Part#	List Price (1)	Devices Supported			
				PIC24F	PIC24H	dsPIC30F	dsPIC33F
General Purpose Development Board	dsPICDEM™ 1.1 Development Board for 80L TQFP devices	DM300014	$299.99	—	—	√	—
Starter Development Boards	dsPICDEM™ 80-pin Starter Development Board	DM300019	$79.99	—	—	√	—
	dsPICDEM™ 28-pin Starter Development Board	DM300017	$79.99	—	√	√	√
	dsPICDEM™ 2 Development Board	DM300018	$99.99	—	—	√	—
	Explorer 16 Development Board	DM240001	$129.99	√	√	√	√
Motor Control Development Boards	PICDEM™ MC LV Development Board	DM183021	$129.99	—	—	√	—
	dsPICDEM™ MC1 Motor Control Development Board	DM300020	$300	—	—	√	—
	dsPICDEM™ MC1H 3-Phase High Voltage Power Module	DM300021	$800	—	—	√	√
	3-Phase ACIM High Voltage Motor (208/460V)	AC300021	$120	—	—	√	√
	dsPICDEM™ MC1L 3-Phase Low Voltage Power Module	DM300022	$700	—	—	√	√
	3-Phase BLDC Low Voltage Motor (24V)	AC300020	$120	—	—	√	√
Connectivity Development Boards	dsPICDEM.net™ 1 with FCC/JATE-compliant and Ethernet NIC support	DM300004-1	$389.99	—	—	√	—
	dsPICDEM.net™ 2 with CTR-21-compliant and Ethernet NIC support	DM300004-2	$389.99	—	—	√	—

Plug-in Modules for Development Boards

A Plug-in Module (PIM) is a daughter board with a dsPIC DSC soldered on top and header socket strips on the bottom. The PIMs use the device header pins on the dsPIC DSC development boards, which also support the MPLAB ICE 4000 emulator device adapters. This method allows for easy swapping of devices onto the various development boards, without having to unsolder and resolder parts.

Development Tool	Description	Part#	List Price(1)	Devices Supported			
				PIC24F	PIC24H	dsPIC30F	dsPIC33F
Plug-in Modules	PC board with 80-pin dsPIC30F6014 general purpose DSC sample; use with DM300004-1, DM300004-2 Development Boards	MA300011	$25	—	—	√	—
	PC board with 80-pin dsPIC30F6010 motor control DSC sample; use with DM300019 and DM300020 Development Boards	MA300013	$25	—	—	√	—
	PC Board with 80-pin dsPIC30F6014A general purpose DSC sample; use with DM300014 and DM300019 Development Boards	MA300014	$25	—	—	√	—
	PC Board with 80-pin dsPIC30F6010A motor control DSC sample; use with DM300019 and DM300020 Development Boards	MA300015	$25	—	—	√	—
	PC Board with 100-pin dsPIC33FJ256GP710 DSC sample; use with DM240001 Development Board	MA330011	$25	—	—	—	√
	PC Board with 100-pin dsPIC33FJ256GP710 DSC sample; use with DM300019 Development Board	MA330012	$25	—	—	—	√
	PC Board with 100-pin PIC24FJ128GA010 MCU sample; use with DM240001 Development Board	MA240011	$25	√	—	—	—

(1) List price may change without notice.

Hardware Development Tools

Development Tool	Description	Part#	List Price (1)	Devices Supported			
				PIC24F	PIC24H	dsPIC30F	dsPIC33F
MPLAB® ICD 2	In-Circuit Debugger and Device Programmer	DV164005	$159.99	√	√	√	√
	In-Circuit Debugger and Device Programmer with dsPICDEM™ 1.1 General Purpose Board	DV164032	$399.99	—	—	√	—
MPLAB® ICE 4000	In-Circuit Emulator Pod for dsPIC30F	ICE4000	$2560	—	—	√	—
	Processor Module for dsPIC30F	PMF30XA1	$595	—	—	√	—
	Device Adapter for 80L/64L TQFP Devices	DAF30-2	$295	—	—	√	—
	Device Adapter for 44L TQFP Devices	DAF30-3	$225	—	—	√	—
	Device Adapter for 44L/40L/28L/18L DIP and SOIC Devices (ML and MM)	DAF30-4	$225	—	—	√	—
	Transition Socket for 18L SOIC	XLT18SO	$75	—	—	√	—
	Transition Socket for 18L DIP	ACICE0202	$20	—	—	√	—
	Transition Socket for 28L SOIC	XLT28SO	$75	—	—	√	—
	Transition Socket for 28L DIP	ACICE0204	$30	—	—	√	—
	Transition Socket for 28L ML/MM	XLT28QFN3 or XLT28QFN4	$175	—	—	√	—
	Transition Socket for 40L DIP	ACICE0206	$40	—	—	√	—
	Transition Socket for 44L ML	XLT44QFN2	$175	—	—	√	—
	Transition Socket for 44L TQFP	XLT44PT or XLT44PT3	$125	—	—	√	—
	Transition Socket for 64L TQFP (PF Package)	XLT64PT3 or XLT64PT4	$125	—	—	√	—
	Transition Socket for 64L TQFP (PT Package)	XLT64PT2 or XLT64PT5	$125	—	—	√	—
	Transition Socket for 80L TQFP (PF Package)	XLT80PT2	$125	—	—	√	—
	Transition Socket for 80L TQFP (PT Package)	XLT80PT or XLT80PT3	$125	—	—	√	—
MPLAB® PRO MATE® II	Socket Module for 18L DIP/SOIC Devices	AC30F005	$189	—	—	√	—
	Socket Module for 28L DIP/SOIC Devices	AC30F004	$189	—	—	√	—
	Socket Module for 40L DIP Devices	AC30F003	$159	—	—	√	—
	Socket Module for 44L TQFP Devices	AC30F006	$159	—	—	√	—
	Socket Module for 64L TQFP Devices (PF Package)	AC30F002	$159	—	—	√	—
	Socket Module for 64L TQFP Devices (PT Package)	AC30F008	$159	—	—	√	—
	Socket Module for 80L TQFP Devices (PF Package)	AC30F001	$159	—	—	√	—
	Socket Module for 80L TQFP Devices (PT Package)	AC30F007	$159	—	—	√	—
MPLAB® PM3	Full Featured Device Programmer, Base Unit	DV007004	$895	√	√	√	√
	Socket Module for 18L/28L/40L DIP Devices	AC164301	$189	√	√	√	√
	Socket Module for 16L (.150)/28L (.300) SOIC Devices	AC164302	$189	√	√	√	√
	Socket Module for 28L ML Devices	AC164322	$189	√	√	√	√
	Socket Module for 44L ML Devices	AC164322	$189	√	√	√	√
	Socket Module for 44L TQFP Devices	AC164305	$189	√	√	√	√
	Socket Module for 64L TQFP Devices (PF Package)	AC164313	$189	—	—	√	—
	Socket Module for 64L TQFP Devices (PT Package)	AC164319	$189	√	√	√	√
	Socket Module for 80L TQFP Devices (PF Package)	AC164314	$189	—	—	√	—
	Socket Module for 80L TQFP Devices (PT Package)	AC164320	$189	√	—	√	√

Software Libraries and Application Development Tools

Development Tool	Description	Part#	List Price(1)	Devices Supported			
				PIC24F	PIC24H	dsPIC30F	dsPIC33F
dsPIC30F Math Library	Standard math and floating point library (ASM, C Wrapper)	SW300020	Free	√	√	√	√
dsPIC30F Peripheral Library	Peripheral initialization, control and utility routines (C)	SW300021	Free	√	√	√	√
dsPIC30F DSP Library	Essential DSP algorithm suite (Filters, FFT)	SW300022	Free	—	—	√	√
dsPICworks™	Data analysis and DSP software	SW300023	Free	√	√	√	√
Digital Filter Design	Full featured graphical IIR and FIR filter design package for dsPIC30F	SW300001	$249	—	—	√	√
Digital Filter Design Lite	Graphical IIR and FIR filter design package for dsPIC30F	SW300001-LT	$29	—	—	√	√
CMX-Tiny+™ for dsPIC® DSC	Preemptive Real-time Operating System (RTOS) for dsPIC30F (from CMX)	CMX-Tiny+ for dsPIC30F	Contact CMX	√	√	√	√
	Preemptive Real-time Operating System (RTOS) for dsPIC30F	SW300032	$3000	√	√	√	√
CMX-RTX™ for dsPIC® DSC	Fully preemptive Real-time Operating System (RTOS) for dsPIC30F (from CMX)	CMX-RTX for dsPIC30F	Contact CMX	√	√	√	√
	Fully preemptive Real-time Operating System (RTOS) for dsPIC30F	SW300031	$4000	√	√	√	√
CMX Scheduler™	Multi-tasking, preemptive scheduler for dsPIC30F	SW300030	Contact CMX	√	√	√	√
Symmetric Key Embedded Encryption Library	Security encryption software support for AES, triple-DES, SHA-1, RNG and MD5	SW300050 - 5K*	$2500	—	—	√	√
	Evaluation copy of security encryption software support for AES, triple-DES, SHA-1, RNG and MD5	SW300050-EVAL	$5	—	—	√	√
Asymmetric Key Embedded Encryption Library	Security encryption software support for RSA, DSA, Diffie-Hellman, SHA-1, RNG and MD5	SW300055 - 5K*	$2500	—	—	√	√
	Evaluation copy of security encryption software support for RSA, DSA, Diffie-Hellman, SHA-1, RNG and MD5	SW300055-EVAL	$5	—	—	√	√
Noise Suppression Library	Function to suppress noise interference in speech signals	SW300040 - 5K*	$2500	—	—	√	√
	Evaluation copy of function to suppress noise interference in speech signals	SW300040-EVAL	$5	—	—	√	√
Acoustic Echo Cancellation Library	Function to eliminate echo generated from a speaker to a microphone	SW300060 - 5K*	$2500	—	—	√	√
	Evaluation copy of function to eliminate echo generated from a speaker to a microphone	SW300060-EVAL	$5	—	—	√	√
Acoustic Accessory Kit	Accessory Kit (includes: audio cable, headset, oscillators, microphone, speaker, DB9 M/F RS-232 cable, DB9M-DB9M Null Modem Adapter)	AC300030	$87.50	—	—	v	√
Line Echo Cancellation Library	Function to cancel electrical line echoes caused by 2- or 4-wire conversion hybrids	SW300080-5K	$2500	—	—	√	√
	Function to cancel electrical line echoes caused by 2- or 4-wire conversion hybrids	SW300080-EVAL	$5	—	—	√	√
TCP/IP Library	TCP/IP connectivity and protocol support	CMX-for dsPIC30F	Contact CMX	—	—	√	√
	TCP/IP connectivity and protocol support	SW300024	Free	√	√	√	√
Soft Modem Library	V.22bis/V.22 Soft Modem Library	SW300002	Free	—	—	√	√
	V.32bis Soft Modem Library	SW300003*	$2500	—	—	√	√
	Evaluation copy of V.32bis Soft Modem Library	SW300003-EVAL	$5	—	—	√	√
	V.32 (non-trellis) Soft Modem Library		Contact Vocal	—	—	√	√
Speech Recognition System	Automatic speech recognition system including a PC-based speech training sub-system and a speech recognizer software library (16:1 compression)	SW300010 - 5K*	$2500	—	—	√	√
	Evaluation copy of automatic speech recognition system including a PC-based speech training sub-system and a speech recognizer software library (16:1 compression)	SW300010-EVAL	$5	—	—	√	√
SPEEX Speech Encoding/ Decoding Library	Speech library to perform speech compression and decompression	SW300070 - 5K*	$2500	—	—	√	√
	Evaluation copy of speech library to perform speech compression and decompression	SW300070-EVAL	$5	—	—	√	√
G.711 Speech Encoding/ Decoding Library	APCM speech compression and decompression (2:1 compression)		Contact Microchip	√	√	√	√
G.726A Speech Encoding/ Decoding Library	Speech compression and decompression (8:1 compression)		Contact Microchips	—	—	√	√
CANbedded for dsPIC® DSC	CAN driver library for dsPIC30F		Contact Vector	—	√	√	√
osCAN for dsPIC® DSC	OSEK/VDX v2.2		Contact Vector	—	√	√	√

(1) List price may change without notice; * To license for production quantities greater than 5,000 pieces for a project's lifetime—contact Microchip.

Documentation

Note that all the latest revisions of these documents are available from the Microchip web site.

Document Type	Document Title	Document Number
Overview Documents	dsPIC30F High Performance 16-bit Digital Signal Controller Family Overview	DS70043
	dsPIC33F High Performance 16-bit Digital Signal Controller Family Overview	DS70155
Data Sheets	PIC24FJ128GA Family Data Sheet	DS39747
	PIC24H Family Data Sheet	DS70175
	dsPIC33F Family Data Sheet	DS70165
	dsPIC30F2010 Data Sheet	DS70118
	dsPIC30F2011, dsPIC30F2012, dsPIC30F3012, dsPIC30F3013 Data Sheet	DS70139
	dsPIC30F3010, dsPIC30F3011 Data Sheet	DS70141
	dsPIC30F3014, dsPIC30F4013 Data Sheet	DS70138
	dsPIC30F4011, dsPIC30F4012 Data Sheet	DS70135
	dsPIC30F5011, dsPIC30F5013 Data Sheet	DS70116
	dsPIC30F5015, dsPIC30F5016 Data Sheet	DS70149
	dsPIC30F6010 Data Sheet	DS70119
	dsPIC30F6011, dsPIC30F6012, dsPIC30F6013, dsPIC30F6014 Data Sheet	DS70117
	dsPIC30F6011A, dsPIC30F6012A, dsPIC30F6013A, dsPIC30F6014A Data Sheet	DS70143
	dsPIC30F6010A, dsPIC30F6015 Data Sheet	DS70150
Reference Manuals	dsPIC30F Programmer's Reference Manual	DS70030
	dsPIC30F Language Tools Quick Reference Guide	DS51322
	dsPIC30F/33F Programmer's Reference Manual	DS70157
	dsPIC30F Family Reference Manual	DS70046
Application Notes	AN901 - Using the dsPIC30F for Sensorless BLDC Control	DS00901
	AN908 - Using the dsPIC30F for Vector Control of an AC Induction Motor	DS00908
	AN957 - Sensored BLDC Motor Control Using dsPIC30F2010	DS00957
	AN962 - Implementing Auto Baud on dsPIC30F Devices	DS00962
	AN984 - An Introduction to AC Induction Motor Control Using the dsPIC30F	DS00984
	AN992 - Sensorless BLDC Motor Control Using dsPIC30F2010	DS00992
	AN1017 - Sinusoidal Control of a PMSM Motor with the dsPIC30F DSC	DS01017
Technical CD	dsPIC30F Technical CD-ROM (contains all of the above)	DS70084

Third Party Contact Information

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