Microchip’s PIC18F97J60 is the smallest single-chip Ethernet family and offers 64-pin packages with onboard MAC and PHY.

Adding Ethernet to your design has never been easier and more cost effective. With Microchip’s new PIC18F97J60 family, the combination of an onboard Ethernet peripheral interface and a powerful PIC18F microcontroller creates an efficient single-chip solution which reduces total system cost and eliminates the need for a separate off-chip Ethernet transceiver.

Ethernet is the leading networking technology for local area networks (LANs) and can be used to connect embedded devices through a LAN to the Internet. By adding Ethernet connectivity to an embedded system, microcontrollers can distribute data over a network and can be controlled remotely. Ethernet’s infrastructure, performance, interoperability, scalability and ease of development have made it a standard choice for embedded communications.

Have you always wanted to add remote monitoring and communication to your embedded designs but found that the available solutions were expensive and complex?

With the integration of a PIC18 high-end 8-bit microcontroller, a complete Ethernet controller, including MAC, PHY and transmit/receive RAM buffer, you can now have network connectivity that is one of the most cost effective and easiest to use Ethernet solutions. And, Microchip offers a free TCP/IP software stack to reduce development time.

If your embedded application requires Ethernet connectivity for communication or monitoring, you can take advantage of Microchip’s nine-member PIC18F97J60 microcontroller family.

Key features of the PIC18F97J60 8-bit microcontroller family include:
- IEEE 802.3-compliant 10Base-T MAC and PHY
- Up to 128 Kbytes of Flash and 4 Kbytes SRAM
- 8 Kbytes dedicated Ethernet Buffer
- 16-channel, 10-bit ADC
- Two comparators
- 2x LIN-UART
- 2x SPI/I²C™
- 5x10-bit PWM
- 5x8/16-bit Timers

The PIC18F97J60 PICDEM.net™ 2 Development Board (part # DM163024), available now for $165. The latest version of Microchip’s free PIC18 TCP/IP Ethernet Stack can be downloaded from the Microchip web site. Additionally, Microchip’s world-class suite of development tools is compatible with this new family of microcontrollers, including the MPLAB® VDI visual device initializer, Application Maestro™ software, MPLAB ICD 2 in-circuit debugger and the MPLAB C18 C compiler.
The PIC18F4321 family offers enhanced Flash, 10-bit A/D and nanoWatt Technology in low pin count 28/40/44-pin packages

This family not only offers advanced peripherals, low pin count, small-footprint package options and low power consumption via nanoWatt Technology, but also increased performance and peripherals at a lower price – while maintaining a seamless upward migration path to more memory, peripherals and performance.

Many designs require a high-performance 8-bit microcontroller with advanced peripherals, but relatively small memory. The PIC18F4321 family provides two serial ports for expanded connectivity, a high-speed 13-channel, 10-bit Analog-to-Digital (A/D) converter with auto acquisitioning for faster measurements and lower code overhead, and nanoWatt Technology features to reduce power consumption and prolong battery life. Conversely, the PIC18F4321 offers the ideal amount of Enhanced Flash program memory – up to 8 Kbytes – to maintain cost-effective pricing.

The PIC18F4321 devices can be used in a variety of horizontal applications including: battery-powered devices, consumer electronics, industrial instrumentation, communications control, automotive and appliances.

Key features of the PIC18F4321 family include:

- 4 or 8 Kbytes of Flash program memory
- 256 Bytes of EEPROM data memory
- Two serial ports (1 synchronous, 1 asynchronous) for USART, I²C™ or SPI communication
- 10-bit A/D x 13 channels at 100 ksp
- 2 analog comparators
- Enhanced capture/compare/pulse-width modulation module with support for MOSFET H-bridges
- nanoWatt Technology low-power modes
- Flexible, low-power internal oscillator, with 32 MHz to 31 kHz operation

Looking for a more cost-effective entry point to Microchip’s PIC18 high-end 8-bit microcontroller family?

The PIC18F4321 family maintains compatibility with Microchip’s free MPLAB® Integrated Development Environment, MPLAB C18 C compiler, MPLAB ICD 2 in-circuit debugger and emulator, and the MPLAB PM3 universal device programmer. In addition, the PICDEM™ 2 Plus Demonstration Board (part # DM163022) demonstrates the capabilities of the PIC18F4321 family.

The PIC18F4321/4221 come in 44-pin QFN or TQFP and 40-pin PDIP packages, and the PIC18F2321/2221 are available in 28-pin QFN, SOIC, SPDIP and SSOP packages, all of which are RoHS-compliant.

For more information, visit http://www.microchip.com/PIC18F4321
Explore the PIC24F’s Parallel Master Port

For all of those embedded designers who have built a parallel interface and control out of digital I/O pins designed to interface with parallel peripherals, graphic LCD, TFT and STN display controllers, and memory such as SRAM and compact flash. The PIC24F now offers a simple and flexible parallel interface. The PIC24F’s Parallel Master Port (PMP), is specifically designed to interface with parallel peripherals, display controllers, and memory such as SRAM and compact flash. And it’s fully programmable so you select the interface options that best match your external device needs and total system I/O requirements. The PMP is available on all nine members of the PIC24F family. 

Key features include:

- **Address and Data Interface**
  - Up to 16 address lines
  - 8- or 16-bit data bus
  - Address and data multiplexed, software selectable
  - Address auto-increment/ auto-decrement

- **Control**
  - Up to two chip-select lines
  - Individual read and write strobe or read/write strobe with enable strobe
  - Programmable polarity on all control signals
  - Programmable wait states

Configuring the PMP is easy since it’s fully supported by the MPLAB® IDE VDI visual device initializer. Once you select the PMP, MPLAB VDI’s graphical interface leads you through the PMP configuration options and generates the appropriate configuration source code. MPLAB VDI also maintains the I/O pins that you have used for PMP, so you don’t mistakenly program another peripheral on the same device pin. You can learn more and download the MPLAB IDE for free at www.microchip.com/ide.

Products including user interface can capitalize on the PIC24F’s PMP, RTCC (Real Time Clock Calendar) 8 KB RAM for buffer space and multiple communications ports including IrDA® protocol support, including:

- Security system and alarm panels
- Appliance control and display panels
- Set top box and home entertainment front panels
- Medical and diagnostic equipment
- Hand held remote control
- Control panels in industrial, telecom gear and servers

For hands-on PMP training, visit Microchip’s Regional Training Center web site and learn about Course ADV 204. This class provides instruction and hands-on labs for several of the new PIC24F family peripherals including the PMP, Real Time Clock Calendar (RTCC) and Cyclic Redundancy Check (CRC) modules. For more information, including a complete course catalog, schedules, locations and registration details, please visit www.microchip.com/rtc.

For more information on Microchip’s 16-bit product offering, please visit http://www.microchip.com/16bit
Microchip brings 29 additional 16-bit devices to volume production, giving you more performance, memory and peripherals for your embedded designs.

Sixteen members of its 16-bit PIC24 Microcontroller (MCU) family and 13 members of its dsPIC33 16-bit Digital Signal Controller (DSC) family are now shipping in volume. This number includes nine of Microchip’s PIC24F series of 16-bit microcontrollers, which offer a cost-effective step up in performance, memory and peripherals for many applications that are pushing the envelope of 8-bit microcontroller capabilities. Also available are seven members of the PIC24H series, which has an industry-leading 40 MIPS throughput, more memory and additional peripherals, such as CAN communication modules.

Today’s embedded system designers are faced with the challenges of delivering projects on schedule while hitting cost goals, responding to new customer and marketing requests, and providing significant product differentiation. To meet these requirements, both of the 16-bit PIC24 microcontroller series maintain compatibility with Microchip’s universal MPLAB® Integrated Development Environment (IDE) development tool platform, and software compatibility with all dsPIC® DSCs for a simplified upward migration path. Further enabling efficient development cycles and migration, these 16-bit families are fully compatible in terms of pin and peripheral compatibility. Additionally, all of Microchip’s 16-bit MCUs and DSCs maintain the architectural efficiencies that embedded-control applications require, such as interrupt responsiveness, excellent bit manipulation and industry-leading C code efficiency.

“With their dsPIC DSCs and PIC24 MCUs, Microchip is the only company on the planet with truly unified DSP and MCU product lines. The dsPIC33 family gives MCU people an easy migration path to DSP performance.”


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“With their dsPIC DSCs and PIC24 MCUs, Microchip is the only company on the planet with truly unified DSP and MCU product lines. The dsPIC33 family gives MCU people an easy migration path to DSP performance.”

Need a low-cost service to program your PIC® microcontrollers?

With no minimum order quantity required, Microchip’s Production Programming Service through microchipDIRECt is your answer!

Benefits of Production Programming through microchipDIRECt:
- Seamlessly integrated into your microchipDIRECt account
- Code verification service prior to production
- One-stop point-of-purchase for product and production programming
- Cost-effective
- No unit minimum order requirements
- Quick-turn fulfillment (programmed orders typically ship within 48 hours)
- Available to all customers through microchipDIRECt

Now you can enjoy quick and inexpensive production programming of Microchip’s PIC® microcontrollers through microchipDIRECt.

The process is simple. Once you upload your application code into your secure FTP account, place your PIC microcontroller order through microchipDIRECt, apply the appropriate code to your order and Microchip does the rest.

Working directly with Microchip gives you more control of your project development by eliminating unnecessary steps within your design cycle and ultimately provides you with fast time-to-market.

Microchip’s Production Programming Service allows you to upload your application code and request verification sample orders, so that you may make certain your code works properly with the associated PIC microcontrollers within your platform. Once you have completed the verification process, you can place orders through microchipDIRECt and have your PIC microcontrollers programmed with your code as part of your order.

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microchipDIRECt continues to expand!

microchipDIRECt is happy to announce further territory expansion of services.

We have recently added the following countries to our service area for your convenience:
- Chile
- Argentina
- Venezuela
- Costa Rica
- Puerto Rico
- Dominican Republic
- Jamaica

We have also added labeling and ink dotting to microchipDIRECt – so now when you have devices programmed through us, you can utilize our easy and convenient labeling and ink dotting service to help you identify your program, rev number, part number, date programmed, etc. Please visit the microchipDIRECt Programming site today for more information (www.microchipdirect.com/programming).

Attention all valued customers:
If you do business in a country that enforces import, VAT, or GST taxes that can be reclaimed, we can set you up in our system accordingly when you apply for a microchipDIRECt business account with DDU (Delivered Duty Unpaid) terms.

To become a microchipDIRECt customer, simply complete an online application by clicking here. Applications are typically processed within 72 hours. Once approved, you immediately receive all benefits that microchipDIRECt has to offer, including:
- The ability to request quotes on select products not offered to other customers or for products in large quantities.
- The ability to relate quotes to products with a special “Apply Quote” control in the shopping cart that allows you to apply special price quotes based on order-quantities.
- Scheduling privileges can schedule deliveries to coincide with your production.

For more information, visit http://www.microchipDIRECt.com/Programming
In model aircraft parlance, kit bashing is defined as the practice of using the materials from a kit for one aircraft to build a similar, but different aircraft. So, bit bashing is the process of using the features of one or more simple peripherals to build a more complex custom peripheral.

This month’s Bit Bash:
I need a clock with a frequency I can vary, the control must be linear, and the design not too hairy.

Written by: Keith Curtis, Principal Applications Engineer

There are several methods for generating a linearly variable frequency output. The three most common are: Direct Digital Synthesis or DDS, Counter Based PWM, and a Voltage Controlled Oscillator or VCO. A DDS uses a phase accumulator system which adds a user-controlled phase increment into the accumulator latch, and the msb of the latch is then used as the output (Figure 1). The counter-based PWM uses control of the period register to vary the period of the output to control the frequency (Figure 2). And, the VCO uses a DAC to provide a control voltage, which varies the frequency of the analog oscillator (Figure 3).

Of the three, the VCO is the only practical system using our microcontrollers; the DDS requires custom hardware to implement, and the PWM will not have a linear frequency control due to the reciprocal relationship between period and frequency. While the VCO method also has challenges, it can provide linear frequency control of several reasonable range of frequencies, it maintains a consistent 50% duty cycle. The output frequency can even be locked to the main oscillator using Timer1 and a PID software routine.

Let’s start with the oscillator; it is constructed using a dual comparator module with the flip-flop output option (Figure 4). The two comparators are referenced to two symmetrical control voltages, centered on Vdd/2. The capacitor is then charged by the resistor until it reaches the high voltage, at which point the output goes low and the capacitor discharges to the low voltage. The output then goes high again, and the cycle starts over. By varying the high and low voltages we control the frequency of the oscillator.

Fortunately, there are several inputs to the comparator module which can be used to switch multiple “range” capacitors into the charge/discharge network (Figure 5). Using these different ranges, the oscillator can be switched from the linear portion of one range to the overlapping linear range of the next.

Now that we have the oscillator, we need a DAC capable of generating two symmetrical reference voltages for the oscillator. We could use two separate DACs and simply load them with symmetrical values, or we can use the ½ bridge output mode of the PWM to generate the control voltages. Because the DAC system is relatively simple, let’s concentrate on the PWM system here.

Continued on next page...
We start by setting up the PWM with ½ bridge output, and then we pass both PWM outputs through a low pass RC filter (Figure 6). This converts the symmetrical PWM outputs into symmetrical output voltages. Note: the corner frequency of the RC filter must be 2 to 3 orders of magnitude less than the PWM output frequency to prevent noise on the reference voltages. Also note: the duty cycle of the PWM must be limited to ½ its full range. This restricts the control voltages to VDD to VDD/2, and VDD/2 to 0. If the duty cycle is set to greater than 50%, the oscillator will lock high or low because the control voltages are reversed.

The final section of the design is the frequency monitoring and control function. This uses Timer1, and the T1CKI input, as a frequency counter (Figure 7). Timer1 counts the cycles out of the oscillator, with Timer0 or Timer2 operating as a time base. The resulting count is then subtracted from the desired count and the difference is fed to the PID. The PID then provides an offset to the PWM duty cycle register to fine tune the oscillator frequency. Note: because the process of measuring the frequency requires a relatively long time, the response of the system to a frequency error will be slow, requiring multiple frequency counts to correct the output frequency.

So, the final system is a combination of a RC oscillator, built around the comparators, a symmetrical reference voltage DAC, using the ½ bridge output of the PWM, and an optional frequency feedback control using Timer1 and a PID function.

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Whenever you see the icons on our site, they are links to RSS feeds that you can subscribe to via your RSS reader. Click here to view our ‘How To Use RSS’ page.
Microchip has expanded its portfolio of programmable amplifiers with a family of 900 kHz, selectable-gain amplifiers.

The MCP6G01, MCP6G02, MCP6G03 and MCP6G04 (MCP6G0X) are the first amplifiers with a gain-select pin in place of a negative-input pin. The new amplifiers can be used as drop-in replacements for op amps, microcontroller-controlled amplifiers or as stand-alone gain blocks and eliminate the need for external resistors. This leads to reduced component count, design size and costs.

The MCP6G0X amplifiers feature a low-voltage operation range of 1.8V to 5.5V, low quiescent current of 110 microamperes and a high bandwidth of 350 kHz for 10 V/V, 250 kHz for 50 V/V and 900 kHz at 1 V/V. With less than one percent gain error, they have lower gain error than traditional op amp solutions that use expensive one-percent resistors. The devices enable designers to select gains of 1, 10 or 50 V/V simply by driving the gain-input pin to the high, low or high “Z” state with the microcontroller, or connecting it directly to Vcc, Vss or No-Connect for op amp drop-in replacement or stand-alone operation. Additionally, the amplifiers adjust internal compensation when higher gain is selected, providing greater bandwidth at a lower current.

This family offers low-power performance as stand-alone devices or as microcontroller-controlled amplifiers, while still fitting the standard operational amplifier footprint. Additionally, they give you the ability to digitally control gain for improved system accuracy and dynamic range.

The internal feedback resistors of the MCP6G0X amplifiers are laid out in consideration of thermal gradient issues to reduce gain error over temperature. The devices are capable of extended-temperature operation and are ideal for battery-powered, handheld devices such as those used for industrial, consumer and medical applications.

The MCP6G01, MCP6G02 and MCP6G03 are available in 8-pin MSOP or SOIC packages, and the MCP6G04 is available in 14-pin TSSOP and SOIC packages.

For more information, visit http://www.microchip.com/MCP6G0X
Do you need a fully integrated charger to support multiple regulated output voltages with on-chip safety features?

Check out Microchip’s new MCP73833 and MCP73834 single-cell, high current, Li-Ion/Li-Polymer linear charge-management controllers.

These fully integrated charge-management controllers combine several key standard charge-management and safety features in a single chip for reliable charging of high-capacity Li-ion and Li-Polymer batteries. Available in small MSOP and thermally efficient 3 mm x 3 mm DFN packages, the MCP73833/4 chargers enable smarter, faster and safer battery charger designs.

Because they combine a pass transistor, current-sense and reverse-discharge protection on a single chip, the MCP73833/4 charge-management controllers eliminate the need for external components and enable smaller, more integrated charging solutions. Multiple combinations of key charging parameters, including pre-conditioning current threshold and ratio, charge-termination threshold and recharge threshold ratio are available, meaning the devices provide standard product support for a variety of high-current Li-Ion/Li-Polymer battery charger applications. Additionally, with high charging currents of up to 1A and support for multiple regulated output voltages (4.2V, 4.35V, 4.4V and 4.5V), the devices can be used with early generation batteries where output voltages are lower, as well as newer batteries where output voltages are higher.

Since different applications require different battery-charging voltage and current levels for ideal operation, these chargers provide better combinations of performance and safety features, with their ideal combination of high integration, high charging current, multiple standard parameter options and safety features in small, thermally efficient packages. At the same time, they can help you keep costs low and get your products to market faster.

Safety features onboard the MCP73833/4 include charge timers, battery-temperature feedback and thermal-current regulation. The charge timer shuts the charger off if a charge is not terminated before timeout is reached. The battery-temperature feedback reduces the charge current when the battery’s temperature exceeds safe levels. The thermal-current regulation feature decreases the charge current when the device reaches its thermal limits. All of these safety features keep the battery from overcharging and overheating.

Device-specific features include a power-good output on the MCP73833 and a timer-enable input on the MCP73834. The timer-enable input can disable the timer when the battery is charged at the same time that current is supplied to the system. Both devices offer a low dropout regulator (LDO) test mode that enables application system test even in the absence of a battery; and both feature two status outputs to provide the user with additional information about the battery chargers state. These features help to prevent battery-related system damage, resulting in safer, more efficient and more reliable charger designs.

Example applications for the MCP73833/4 charge-management controllers include portable DVD players, personal media players (PMPs) and portable GPS systems.

To support development using the MCP73833/4 charge-management controllers, Microchip offers the MCP73833 Li-Ion Battery Charger Evaluation Board (Part # MCP73833EV). The board is priced at $50.

The MCP73833/4 charge-management controllers are available in 10-pin MSOP and DFN (3 mm x 3 mm) packages. Sampling is available now at http://sample.microchip.com. Volume production orders are received today at www.microchipdirect.com.

For more information, visit http://www.microchip.com/MCP73833
Microchip makes it easy to create power-supply applications with its new Intelligent Power Supply Design Center at http://www.microchip.com/power.

This comprehensive site provides technical tools and resources for designing analog power supply applications, augmenting existing analog power supply applications with inexpensive microcontrollers or designing Switch Mode Power Supply (SMPS) applications involving digital control of the power conversion feedback loop. Now you can get complete access to Microchip’s power supply application notes and reference designs, which include everything from a pure analog approach to completely digital implementations. Links to Microchip simulation tools (including the Mindi™ simulation tool for battery charger and power supply circuits) and other technical documentation are featured, to help you get your products to market more quickly and efficiently and continue to develop your knowledge with up-to-date web seminars and design tips.

Please join Design News for an educational E2E (engineer to engineer) webcast, as application engineers describe in-depth how to simplify and save time throughout the design process. Watch real-life demos, access a library of downloadable resources and submit your questions to our experts.

Join Microchip’s Keith Curtis as he discusses the four levels of digital integration into power supplies. Level one involves an 8-bit microcontroller used to implement simple functions, such as soft start. At level two, the loop is still analog, yet an 8- or 16-bit microcontroller provides basic proportional control. The loop is also still analog at level three, yet an 8- or 16-bit microcontroller or Digital Signal Controller (DSC) can modify the topology of the power supply. At level four of digital integration into power supplies, the power conversion loop is fully digital and managed by a DSC with specialized peripherals.

For more information, visit http://www.accelacomm.com/jlp/microhp/47/10010567/
Are you looking to enhance your knowledge base and design skill sets?

New design methodologies, board-level “tips and tricks” and hands-on development tool training can make you more productive, while increasing your own professional value. If additional training interests you, then Microchip may be able to help with our global network of Regional Training Centers (RTCs) that provide workshops and seminars on a year-round basis. Each RTC offers a multitude of courses on a regular basis to fit your demanding schedule. You can benefit by learning in small hands-on classroom settings that focus on your specific needs.

Developed and taught by engineers, Microchip’s technical training provides the specific knowledge and tools for designers at any experience level. Attendees walk away armed with specific skills that can be applied immediately, increasing their own design productivity.

The RTCs offer a variety of highly targeted design topics that can help you add functionality to your current applications and take full advantage of new or unfamiliar technologies, applications or device peripherals. These classes can help you stay ahead of the competition in the world of embedded control and stay ahead of industry trends and design techniques. Class sizes allow plenty of time for one-on-one interaction with our expert instructors.

For those organizations who desire having a number of employees attend a course at the same time, Microchip can customize any curriculum to meet your specific needs. Our instructors arrive at your location with all presentation materials and equipment, making it easy for your whole team to benefit from a specific course topic in one setting.

Who Should Attend?

■ Design engineers of any experience level or discipline who have a need for embedded control in their products
■ Engineering managers seeking to stay current with the latest technologies and techniques available to their engineering staff

Microchip offers basic, intermediate and advanced classes in a wide range of topics.

Why Should I Attend?

■ Increase your design skills and productivity
■ Help solve your toughest business issues: enjoy faster time-to-market, lower total system cost and reduced development risk
■ Curriculum created by engineers for engineers
■ Substantial discounts offered on development systems

How do I Register?

You may register online for any of the RTC classes. After you have completed the online registration form, an E-mail confirmation is sent to you within 24 hours.

For a comprehensive list of classes, please click here.

For more information about Microchip Technology’s Regional Training Centers, visit www.microchip.com/RTC
<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
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<tr>
<td><strong>101 TLS:</strong> Getting Started with Microchip Tools, MPLAB® IDE, MPLAB SIM Simulator and MPLAB® ICD 2</td>
<td>3.5</td>
<td>This hands-on class covers the basics of getting started with Microchip tools. Following an introduction to all Microchip tools, hands-on exercises are conducted using the MPLAB® IDE and the MPLAB SIM simulator. Attendees go through a step by step creation of a project, editing and compiling a program, running a program and the use of the simulator. The MPLAB ICD 2 then be used to connect to the PC hardware and is used to program an actual device and run a program. The MPLAB ICD 2 Debug mode is then introduced and debugging basics taught – how to set a breakpoint, etc. Hardware used is a dsPICDEM™ 2 Plus demonstration board with a PIC18F452 device. Attendees leave with a basic knowledge of Microchip tools. They can use this knowledge to learn more on PIC16, PIC18 and PIC24 microcontroller families or dsPIC* digital signal controller devices.</td>
</tr>
<tr>
<td><strong>102 ASP:</strong> Getting Started with PIC18 Architecture, Instruction Set and Assembly Programming</td>
<td>3.5</td>
<td>This hands-on class covers the fundamentals of the PIC18 family’s architecture and instruction set. Basic concepts are reinforced through the writing of two simple assembly language programs. The first program turns on an LED connected to one of the I/O pins and the second program adds software loops and delay routines to make the LED blink at a specific rate. This process involves the use of MP simulator to simulate and debug the programs. Ultimately, a PIC18F4320 MCU is programmed using the MPLAB ICD 2 on a PICDEM™ 2 Plus demonstration board. The knowledge gained from this class forms a solid base from which the attendee can explore more advanced concepts with the PIC16, PIC18 and PIC24 microcontroller families or dsPIC digital signal controller families. Before attending this class, attendees should already taken 101 TLS &quot;Getting Started with Microchip Tools&quot; or have equivalent experience using MPLAB IDE to create a project and assemble code.</td>
</tr>
<tr>
<td><strong>107 OAF:</strong> Op Amp Fundamentals</td>
<td>7</td>
<td>The class will begin with basic Operational Amplifier (Op Amp) concepts and terminology. The key DC and AC characteristics found in an op amp data sheet are defined and discussed so the system designer can choose the right op amp for the application. Examples and analysis of op amp application circuits are presented. Written exercises are provided throughout the course to enhance understanding.</td>
</tr>
<tr>
<td><strong>201 PRC:</strong> Mid-range Peripheral Configuration and Hi-Tech C Compiler Programming Techniques</td>
<td>7</td>
<td>This hands-on class covers Mid-range peripherals usage and configuration using the Hi-Tech C compiler. Attendees go through hands-on exercises and learn how to program Mid-range devices in C using the MPLAB ICD 2 and PICDEM 2 Plus demonstration board. At the end of the class, attendees are knowledgeable on Mid-range peripherals and Hi-Tech C compiler. They can use their experience in the class to develop and debug an actual application using a Mid-range device and Hi-Tech C. NOTE: This course and 201 ASP cover the same content. This class uses C in the instructional material while 201 ASP uses assembly language.</td>
</tr>
<tr>
<td><strong>202 PRC:</strong> PIC18 Peripheral Configuration and MPLAB® C18 C Compiler Programming Techniques</td>
<td>7</td>
<td>This hands-on class covers PIC18 peripherals usage and configuration using the MPLAB® C18 C compiler. Attendees go through hands-on exercises and learn how to program PIC18 devices in C using the MPLAB ICD 2 and PICDEM 2 Plus demonstration board. At the end of the class, attendees are knowledgeable on PIC18 peripherals and the MPLAB® C18 C Compiler and Microchip tools. They can use their experience in the class to develop and debug an actual application using a PIC18 device using the MPLAB® C18 C Compiler. NOTE: This course and 202 ASP cover the same content. This class uses C in the instructional material while 202 ASP uses assembly language.</td>
</tr>
<tr>
<td><strong>203 PRC:</strong> Standard 16-bit Peripheral Configuration and MPLAB® C30 C Compiler Programming Techniques</td>
<td>7</td>
<td>This hands-on class covers the standard peripheral set of Microchip's PIC24 microcontroller and dsPIC digital signal controller product families and MPLAB C30 C compiler. Using hands-on exercises and the MPLAB C30 C compiler, students become familiar programming the I/O ports, ADC, timers, PWM, UART, and MSSP modules. Although based on the PIC24, these principles are directly applicable to Microchip's entire 16-bit family including the PIC24F, PIC24H, dsPIC30F and dsPIC33F devices. Attendees leave with a detailed knowledge of Microchip's 16-bit architecture and device peripherals.</td>
</tr>
<tr>
<td><strong>204 PRC:</strong> PIC24 Extended Peripheral Configuration, Libraries and Programming using MPLAB® C30 C Compiler</td>
<td>3.5</td>
<td>Using hands-on exercises, this class covers the extended peripheral set of Microchip's PIC24 product families and MPLAB C30 C compiler. Attendees learn to program the Parallel Management Port (PMP), Real Time Clock Calendar (RTCC) and CRC modules and leave with a detailed knowledge of Microchip's 16-bit extended device peripherals.</td>
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<tr>
<td><strong>301 MCW:</strong> dsPIC® DSC Motor Control Workshop</td>
<td>7</td>
<td>This workshop class provides a detailed overview of BLDC motor theory and control algorithms. The class also provides an introduction to the dsPIC digital signal controller architecture and motor control peripherals, along with an in depth look at Microchip’s BLDC motor control firmware and motor control graphical user interface.</td>
</tr>
<tr>
<td><strong>305 PKE:</strong> Smart Sensing and Passive Keyless Entry System Design</td>
<td>3.5</td>
<td>This class discusses the latest system solutions for implementing wireless communication in low frequency sensing applications. Key application examples include a Passive Keyless Entry (PKE) transponder for vehicles, a tire pressure monitoring system and hands-free access applications. The transponder can also determine the position and distance of the incoming signal source. You will learn how to use these features and how to implement them in a system application. Design examples of hands-free passive keyless entry and tire pressure monitoring applications are demonstrated.</td>
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<tr>
<td><strong>306 ASC:</strong> Analog Sensor Conditioning in Embedded Systems</td>
<td>3.5</td>
<td>Most sensor circuits provide some analog signal conditioning before conversion to digital. This class provides background information on the many types of sensors and sensor conditioning circuits, including active filters. Three common sensors, and their conditioning circuits, are then covered in some detail. Hands-on experiments will help illustrate these sensor circuits and the filter design theory. The three common sensors covered are: thermistor (temperature), photodiode (light), and capacitance (humidity). The filter designs will be generated by Microchip's FilterLab* filter design software.</td>
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Are you interested in advanced motor-control techniques for your designs? Mark your calendar for February 6, 2007 from 1:00 to 5:00 PM and attend the Motor & Drive Systems pre-conference workshop presented by Microchip’s Technical Training Manager, John Magrane. This workshop features example motor control applications for variable-speed, brushless DC, AC-induction and switched-reluctance motors using Microchip’s 8- and 16-bit PIC® microcontroller, dsPIC® digital signal controller and analog products. The workshop provides a review of many PIC microcontroller architectures, with emphasis on peripherals that are specifically integrated for motor control. Learn techniques and algorithms for forced commutation, variable-speed control, noise reduction, extending speed range with phase-advance phase control, sensorless control and much more. Attendees receive several Microchip motor control development tools, including a demonstration board, a copy of the MPLAB® IDE Integrated Development Environment, Microchip’s Motor Control Graphical User Interface, a demonstration version of the MPLAB C30 C compiler and additional firmware.

Are you interested in dramatic energy savings for your motor-driven equipment? Learn how sensorless Field Oriented Control (FOC) can be implemented to improve motor performance and efficiency at a very low cost, as Jorge Zambada, Microchip's Applications Engineer, presents “Low-Cost, High Efficiency Sensorless FOC for Permanent Magnet Synchronous Motors.” This presentation shows how using devices like Microchip’s dsPIC® digital signal controllers, sensorless FOC can be implemented at a very low cost, resulting in highly efficient motor-control applications with improved energy efficiency.

To register visit http://www.e-driveonline.com/motors_conf_registration.htm

Microchip is also participating in the following events:

Design News Electronics E2E Webcast
Online now for free download
http://www.accelacom.com/jlp/microhp/47/10010567/
Keith Curtis, Principal Applications Engineer, presents a free web cast called “Designing Intelligent Power Supplies.” Learn about the four levels of digital integration into power supplies.

Power Systems World
October. 24–26, 2006
Long Beach, CA
Product Marketing Manager, Bill Hutchings, is scheduled to present a paper entitled, “Achieving High-Performance, Reliable Digital Power Supplies,” on October 24 during the 8:30 AM to 9:30 AM session. Learn practical tips to achieve these goals, beginning with the selection of the appropriate hardware architecture.
Steve Bowling, Technical Staff Engineer, is scheduled to present a paper entitled, “Adding Intelligence to Lighting Applications,” at the same time. Learn how the addition of a small, low-cost microcontroller increases lighting system control and efficiency, and provides many other benefits for lighting systems.

Electronica Embedded Conference
November 13–15, 2006
Munich, Germany
http://www.global-electronics.net
Fanie Duvenhage, Engineering Group Manager for Microchip’s Security, Microcontroller and Technology Development division, is scheduled to present a paper entitled “Small Microcontrollers Provide Cost-Effective Housekeeping for Large Systems.” Learn practical examples of the functions that small microcontrollers can perform in larger computing systems to reduce total system cost and provide a more flexible alternative to general system management functions.
Join Principal Applications Engineer, Keith Curtis, as he presents a paper entitled, “Multitasking Without an RTOS,” which demonstrates a design methodology for writing multi-tasking embedded firmware and techniques for building and testing the blocks in order to explore integration testing and examine the conversion of the finished blocks into library functions.
The Weakness Principle

What is the Aggregate System?
The Aggregate System is a comprehensive system for building an exceptional corporate culture that enabled Microchip to align, integrate and unite all of the elements of the Company and improve employee performance across the board, saving the Company in the process.

In the book “Driving Excellence”, Chapter 10, we described “The Weakness Principle.” An abundance of literature on professional and personal development is readily available. The primary thesis articulated in such literature centers on encouraging individuals to develop strengths that will make them more valuable to the enterprise. What's seldom discussed in the literature is the profound role and impact your weaknesses play in limiting your success and derailing your career aspirations. Chapter 10 is dedicated to highlighting the impact of employees’ weaknesses on their ultimate success. The information is relevant to everyone from factory workers to vice presidents.

It’s quite common to see employees leveraging their strengths to achieve their career aspirations. Their strengths are the “upward force” that drives or advances their career. However, if your strategy is to enhance your strengths to advance your career, you’re addressing only half of the success equation. The lesser-known portion of the equation for success centers on eliminating your weaknesses. Your weaknesses represent the “downward force” that constantly acts to slow your career progression. Consequently, the downward force generated by your weaknesses eventually limits your opportunity to advance.

We call this profound impact employees’ weaknesses have on their eventual success The Weakness Principle. The Weakness Principle states: as employees progress upward through the company hierarchy, it’s their weaknesses that ultimately limit success and stall their career. This occurs when the upward and downward forces created by an employee's strengths and weaknesses reach equilibrium.

A strength is an aspect of one’s personality, or an ability, that is valued within a specific environment. A weakness is an aspect of one’s personality, or an inability, that is viewed unfavorably within a specific environment. Strengths and weaknesses are specific to environments and situations. They are based on the “judging” group’s values and norms. An individual’s strength in one environment

The Career Stall-Point

As illustrated in Figure 10.1, an employee’s career advancement stalls when “equilibrium” is reached between the employee’s strengths and weaknesses—as perceived by the judging group. The manager may or may not terminate employees based on the specifics of the situation. However, the result will be continued employment without the opportunity for advancement. In this case, the employee has reached the career stall-point.

The more senior the position, the more an employee’s weaknesses come into play. My experience indicates that the vast majority of senior managers in corporate America are highly competent. Typically, they reach their career stall-point based on consequences related to perceived undesirable personality traits. The more senior the position, the greater influence the manager’s personality has on operational performance, employee motivation, and employee job satisfaction. Therefore, the impact of your weaknesses increases in proportion to the level of responsibilities associated with the position.

Continued on next page...
When you’re evaluating the characteristics of employees who are top performers, it’s beneficial to begin the analysis by discussing their strength profile. This profile is useful in categorizing an employee’s overall strengths and weaknesses. The ideal profile is that of an employee with high strengths and low weaknesses. However, this profile is truly rare. If employees could maintain this profile as their careers advanced, they’d never experience the weakness principle. A more frequent profile is where the employee has high strengths and medium weaknesses. Here, not only does the employee possess high strengths, but his or her weaknesses seldom get in the way. If the employee can maintain this profile as responsibilities increase, the probability of continued success is high.

Unquestionably, many successful individuals have a high-strengths, high-weaknesses profile. This, by far, is the most common profile for high performers. Eventually, the careers of such high performers are limited by The Weakness Principle. Most high performers are driven to expand their strengths while consistently achieving excellence. This profile works well if the weaknesses don’t significantly impact the operational success, or employee morale.

As described in Chapter 10, the weaknesses of executives, not their strengths, usually keep them from advancing further. Therefore, the CEO and the Human Resources executives must understand the strength and weakness profiles of the firm’s executives. Utilize feedback from the executives’ peers, employees, supervisor, and so forth (i.e., the 360-degree process) to evaluate their strengths and weaknesses. Then, construct a plan to improve their weaknesses to at least an acceptable level. You’ll find that executives with high strengths and high weaknesses recognize their strengths, but rarely see and agree with your assessment of their weaknesses. A commitment to seeing your weaknesses and reducing them paves the path for further advancement.

— Steve Sanghi, President and CEO of Microchip Technology Inc.

For more information visit: http://www.drivingexcellence.biz/
Web seminars are a powerful tool for learning new skills.

Bill Hutchings
Product Marketing Manager, Digital Signal Controller Division

Learn about Switch Mode Power Supplies (SMPS) in general as well as time-saving techniques and product solutions as Microchip’s Bill Hutchings brings you through a series of eight related web seminars. For the complete listing, visit www.microchip.com/webseminars.

Introduction to Switch Mode Power Supplies (25 minutes)
This course is an introduction to switch mode power supplies. It compares the characteristics of linear and switch mode power supplies. The basic design features of some common DC to DC converter designs are explored along with some typical designs used in AC to DC converters.

SMPS Components and Their Effects on System Design (31 minutes)
The choice of components used in a switch mode power supply can greatly affect the performance and reliability of a design. Transistors are not ideal switches, the capacitors behave like resistors, and the inductors and transformers can transform themselves into “shorts.” This course will provide some insight into how transistor, diode, inductor, transformer, and capacitor characteristics can affect the overall design of SMPS applications.

Building a dsPIC® DSC SMPS System (10 minutes)
This course covers a wide variety of issues that arise during the design of a digital switch mode power supply. They include: methods for sensing current, bias supplies, gate drive issues, transient response, and how topology choices affect system design.

Introduction to the dsPIC® DSC SMPS (part 1) (20 minutes)
This course covers the basic features of the dsPIC DSC SMPS family. Then we will cover the Analog Comparator module featured on the SMPS devices. The unique features and capabilities of the dsPIC SMPS Analog to Digital Converter module is explored. And we will examine the features of the system clock module.

Introduction to the dsPIC® DSC SMPS (part 2) (25 minutes)
This course covers the dsPIC DSC SMPS PWM module. The PWM modes are described along with their typical usage. The PWM module’s control registers are reviewed. Then the new external features including fault handling and synchronization are presented. And finally, the PWM dither mode is discussed.

Introduction to SMPS Control Techniques (22 minutes)
This course will introduce some of the basic control methods that have been developed for use in SMPS applications. The course will focus on digital control techniques and how they are used to implement digital SMPS designs.

Web seminars make it easy to see new products in action.

Donald Schneider
Product Marketing Manager

Introduction to the PIC24F MCU (25 minutes)
Microchip offers 4 families of 16-bit controllers with performance ranges from 16 MIPS to 40 MIPS with digital signal control. These products cover Flash Memory from 64 KB to 256 KB; RAM from 512 Bytes to 16 KB; and pin counts from 18 to 100 pins and are one part of a total solution that includes development tools and software libraries. This presentation provides an overview of our 16-bit products, with a focus on the entry level PIC24F, tools and libraries.

Barry Blixt
Marketing Manager, Memory Products Division

SEEVAL® 32 Serial EEPROM Developer’s Kit: Powerful, Easy to Use, Inexpensive
This web seminar introduces you to the NEW SEEVAL 32 tool, shows you how easy it is to use, and demonstrates some of its functionality. The SEEVAL 32 kit is a very powerful debugger, as you will see during this seminar. Despite this, it is very easy to use in terms of set-up, usage, and updates. Finally, it is inexpensive at about $100 each.

Web seminars are a fast way to keep your skills up-to-date.

Mark Palmer
Principal Engineer, Analog and Interface Products Group

Digital Potentiometer Resistor Networks (15 minutes)
This seminar gives an overview of how the resistor network inside a digital potentiometer is configured.

Digital Potentiometer Serial Interfaces (15 minutes)
This seminar presents a brief overview of the common serial interfaces that are available on digital potentiometers and the operation, advantages and disadvantages of each.

New web seminars are being added regularly, see what’s new at: www.microchip.com/webseminars
## What's New in Microchip Literature?

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Check out the upcoming live WebSeminars, as well as some of our archived WebSeminars that are available for you to view whenever you want. Visit www.microchip.com/WebSeminars today!

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