TAKE CHARGE OF YOUR...

DIGITAL POWER DESIGN
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The MASTERS Experience

August is always an exciting month here at Microchip as we prepare to welcome embedded engineers from around the globe to our annual MASTERS Conference in Phoenix. This year is no different as we put the finishing touches on our 19th event, scheduled for the week of August 17–22. In fact, by the time this issue of MicroSolutions is published, MASTERS may very well be underway at the beautiful JW Marriott Desert Ridge Resort.

What can attendees expect to experience at MASTERS? They will receive an in-depth training on tools, devices and applications. Over 100 lecture and hands-on classes are available for them to choose from, covering the gamut of embedded control topics from beginner to advanced, taught by experts from Microchip. This unique learning experience will provide them with the knowledge and skills they need to design a wide range of exciting new products and outpace the competition.

While education is the primary goal of MASTERS, the back story is how this event fosters a sense of community among attendees. In contrast with the less personal option of online distance learning, MASTERS provides many opportunities for face-to-face interaction with peers, as well as with representatives from Microchip and its various partner companies. This networking assists attendees to build professional relationships, which can help increase their future business opportunities.

Fun social activities in the evenings allow attendees to relax and unwind after the rigorous days spent in technical sessions. New this year is our Inventor’s Showcase, where attendees can display their unique electronic/mechanical products, technical software or services.

As you can see even from this brief summary, MASTERS is an exceptional engineering event. While the Arizona event is the largest, other MASTERS Conferences are held in various locations around the world. Visit the MASTERS website for information on upcoming events. And keep an eye out for announcements about our 20th anniversary event next August in Phoenix. It is sure to be better than ever, and we would love to see you there.

As always, we would be happy to get your feedback on MicroSolutions. Feel free to email us at MSFeedback@microchip.com.

Microchip Technology Inc.
2355 W. Chandler Blvd. | Chandler, AZ 85224 | www.microchip.com
Sophisticated and Intelligent Solutions from Microchip Simplify Next-Generation Power Conversion Designs

Merging Analog Functions and Flexible Digital Control for Performance and Reliability

Is your next power conversion design already obsolete? Traditional power supply designs have relied primarily on analog ICs with fixed functionality to provide regulated power. While these have been very effective solutions, they do not contain the digital features and digital flexibility that is increasingly required in more and more power conversion circuits. An intelligent power supply integrates the intelligence of a microcontroller, monitoring the line, load, and thermal environment to elegantly adjust the power supply operation to match the circumstances. This boosts efficiency and reliability, improves system stability and eliminates variation from passive and ancillary analog components while preventing system damage in brown-out and fault conditions.

(continued on page 5)
Microchip makes a variety of controllers to facilitate this kind of flexible, future-proof design. Our 8-bit PIC® microcontrollers (MCUs) offer integrated, independent control loop functions while our dsPIC® Digital Signal Controllers (DSCs) offer state-of-the-art, high-performance signal processing for power supply control. These devices can be used to create sophisticated, fully programmable and flexible solutions. Using digital control to implement power conversion functions will provide a range of benefits that will help you meet your design goals as well as stay ahead of the competition.

For over a decade, Microchip has focused—and continues to focus—on fully digital control of power converters and inverters using DSP-based microcontrollers. Some of these products have dedicated high-speed, high-resolution peripherals attached to the processing cores. Other products use hybrid control systems combining microcontrollers with analog peripherals or completely analog control loops. The products complement each other to balance the application needs from both analog and digital perspectives, offering an array of functionality suitable to any application.

No matter which topology or approach you choose to implement the power conversion in your design, Microchip has a comprehensive portfolio of devices to meet your specific requirements.

Digitally Controlling the Analog Control Loop

For a simple and effective solution, an 8-bit PIC MCU core with the right on-board peripherals can make an excellent power supply controller. The internal, analog control loop is easy to set up and runs independently of the microcontroller core. At startup, or during operation, the microcontroller core can dynamically adjust the analog control loop. This can manage housekeeping functions like start-up or shutdown sequencing; adjust the output voltage for load management; increase or decrease the operating frequency to maintain efficiency with changes in line and load; or intelligently respond to fault and out-of-range conditions, preventing damage to the load.

The PIC16F176X family features sets of DACs, comparators, operational amplifiers, programmable ramp generators and 16-bit PWM generators with complimentary outputs. These peripherals can operate independently from the microcontroller core and can be configured to implement an analog control loop around the microcontroller core. The family of parts includes versions with multiple sets of peripherals capable of creating two core-independent analog control loops within one device.

The MCP19XXX family offers a single, dedicated analog control loop integrated with a supervisory microcontroller core. This combination seamlessly merges the analog control circuit with an 8-bit PIC MCU offering enhanced, flexible configuration. It also allows the integration of standardized or proprietary digital communication to align multiple converters within a higher-power management structure. The strengths of each technology are maximized to create a more cost-effective and configurable power conversion solution.

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While there are discrete implementations that can configure designs with both analog and digital components, the interface between analog control and digital control is more complex because a dedicated microcontroller, a dedicated analog controller and multiple other devices are needed. This adds to the cost and complexity of digital power designs. Typically, the level of flexibility is also limited by the number of adjustable parameters on the analog controller as well as the available board space to route connections to and from the microcontroller. Offering a digital controller on the same die as the analog switching regulator, Microchip’s integrated controllers make it possible to merge analog functions and digital control very tightly. This enables direct manipulation of the compensation circuit, switching frequency, dead-time control, system level thresholds and many other features during runtime.

The peripheral components or analog switching regulator cores cover all components of the analog control loop, including the MOSFET drivers, and may also contain the auxiliary supply for the MCU. Many internal signals, like the input voltage, output voltage or the inductor current, can be monitored directly on chip without the need for external sensing. The digital implementation even allows the duty ratio to be read in real time: a very useful feature that was—up to now and for many technical reasons—reserved to fully digital controllers only. The integrated chip gives you direct access to many parameters that were typically fixed in hardware. These include adjustable dead-time, the programmable compensators, internal feedback calibration, programmable protection thresholds and even the capability to switch over between current and voltage mode control during runtime.

This technology enables performance and functionality in applications such as power supplies, point-of-load, LED drivers, battery chargers and multi-rail power supply modules. In battery charger applications—which require voltage and current control similar to LED drive applications—the flexibility of the digital interface allows you to modify the behavior of that analog controller to charge any type of multi-chemistry cells. Depending on your application, Microchip products allow you to update tables in the microcontroller to get the current and voltage set points instead of programming in the analog domain with resistors and capacitors. This makes it easier to create, fix, update or reuse a design.

Flexible Solutions for Complete Digital Control

The dsPIC33EP “GS” family of DSCs delivers the performance needed to implement more sophisticated nonlinear, predictive and adaptive control algorithms at higher switching frequencies. These advanced algorithms enable power supply designs that are more energy efficient and have better power supply specifications. Higher switching frequencies enable the development of physically smaller power supplies that offer higher densities and lower costs. Compared with the previous generation of DSCs, the new dsPIC33EP “GS” devices provide less than half the latency when used in a three-pole three-zero compensator, and consume up to 80% less power in any application.

The new dsPIC33EP “GS” devices provide less than half the latency and consume up to 80% less power in any application

Other key features of this family include up to five 12-bit Analog-to-Digital Converters (ADCs) with as many as 22 ADC inputs, providing total throughput of 16 Mega samples per second (Mmps) with a 300 ns ADC latency. The dsPIC33EP “GS” devices include 12-bit Digital-to-Analog Converters (DACs) for each of the four analog comparators, for higher-precision designs. The two on-chip programmable gain amplifiers can be used for current sensing and other precision measurements. Including these advanced analog amplifiers on the device reduces the number of external components required, thereby saving cost and board space. Variants from this new digital-power-optimized DSC family are available in an industry’s-smallest, 4 x 4 mm
UQFN package for space-constrained designs. Products in this family range from 28 to 64 pin options and 16 to 64 KB Flash.

This new dsPIC33EP “GS” family includes advanced features such as Live Update Flash capability, which is especially helpful for high-availability or “always-on” systems. Live Update can be used to change the firmware of an operating power supply, including the active compensator calculation code, while maintaining continuous regulation.

Easier Digital Power Conversion Designs

The MCP19XXX products are supported by application notes, design analyzers, and two evaluation boards: the MCP19114 Flyback Standalone Evaluation Board (ADM00578) and the MCP19111 Evaluation Board (ADM00397). The dsPIC33EP “GS” family is supported by the Digital Power Starter Kit (DM330017-2), as well as several helpful software tools.

Microchip’s new Digital Compensator Design Tool helps you calculate the optimum compensator coefficients required to maximize the performance of your design.

These tools, combined with Microchip’s SMPS Control Software Library, award-winning programming tools and many royalty-free reference designs, make it easier than ever to design power-conversion applications. Microchip also partnered with Biricha Digital to offer in-depth digital power design workshops that help analog power supply designers, as well as embedded system programmers, leverage the capabilities of full digital control in their designs. Visit the Intelligent Power Design Center and the Digitally Enhanced Power Analog Design Center on the Microchip website for more information.

Microchip has teamed up with Biricha Digital Power to offer world-leading expertise and training in the field of digital power.

In this highly-technical design workshop, you will learn how to design and implement digital power supplies using Microchip’s dsPIC33F range of microcontrollers. This hands-on laboratory based workshop covers all of the theory necessary, reinforced through numerous labs, to design and implement digital power supplies over the course of just three days. The workshop is aimed at both power supply designers as well as embedded systems programmers needing to design and code digital power supplies.

Stockholm, Sweden
San Jose, CA, USA

Class: PWR 9101
Format: Hands-On
Schedule: 8:30 AM–9:00 AM Arrival and registration
9:00 AM–5:00 PM Presentation

October 6–8, 2015
October 27–29, 2015

The last day will finish early to facilitate travel.
A light lunch and refreshments will be provided all three days. Refreshments included.

Register Now
www.microchip.com/biricha
NEW PRODUCTS

Power Measurement for the Real World

World’s First High-Side Current/Power Sensor Features Both a Configurable Analog Output and a 2-Wire Digital Bus

Solutions that integrate both analog and digital capabilities provide a unique level of flexibility to designers of the latest embedded systems. Recognizing this, Microchip recently introduced the PAC1921, a combined analog and digital current sensor. This new device is the world’s first high-side current sensor with both a digital output as well as a configurable analog output that can present power, current or voltage over the single output pin. Simultaneously, all power related output values are also available over the 2-wire digital bus, which is compatible with I²C.

The PAC1921 is ideal for networking, power-distribution, power-supply, computing and industrial-automation applications that cannot allow for latency when performing high-speed power management. A 39-bit accumulation register and 128 times gain configuration make it ideal for both heavy and light system-load power measurement, from 0V to 32V. It has the ability to integrate more than two seconds of power-consumption data.

Additionally, the PAC1921 has a READ/INT pin for host control of the measurement period. This pin can be used to synchronize readings of multiple devices.

The PAC1921 is ideal for both heavy and light system-load power management

With its unique ability to output power measurements in both the digital and analog domains, the PAC1921 features the 2-wire bus to maximize data and diagnostic reporting and the analog output to minimize data latency. One of the benefits of the configurable analog output is the ability to adjust it for use with 3V, 2V, 1.5V or 1V microcontroller inputs. This can be done for multiple system power rails. The value can then feed any system’s Analog-to-Digital Controllers (ADCs) full range with power, current or voltage information.

Development Support

The PAC1921 High-Side Power and Current Monitor Evaluation Board (ADM00592), which is populated with a variety of devices from Microchip, allows you to evaluate the functionality of the PAC1921 and ease your product development.

Offered in a 10-lead 3 × 3 mm VDFN package, the PAC1921 is available now for sampling and volume production. It can be ordered from microchipDIRECT or from Microchip’s worldwide distribution network.
Down to the Nanosecond

New 8-bit MCU Family is First to Provide Multiple Independent, Closed-Loop Power Channels and System Management

Flexible Interconnections of Advanced Analog and Digital Integration Increase System Capabilities While Simplifying Design

Offering a level of capability not traditionally found on low-cost 8-bit PIC® MCUs, the new PIC16(L)F1769 family integrates up to two complete independent closed-loop power channels designed to optimally drive switch-mode power supplies and apply sophisticated modulation of the output for high-resolution, dimmable lighting applications.

The PIC16(L)F1769 family includes intelligent analog and digital peripherals, including tri-state op amps, 10-bit Analog-to-Digital Converters (ADCs), 5- and 10-bit Digital-to-Analog Converters (DACs), 10- and 16-bit Pulse-Width Modulators (PWMs), and high-speed comparators, along with two 100 mA high-current I/Os. The combination of these integrated peripherals helps support the demands of multiple independent closed-loop power channels and system management, while providing an 8-bit platform that simplifies design, enables higher efficiency and increases performance. This helps eliminate the need for many discrete components in power-conversion systems.

Additionally, the family includes the Programmable Ramp Generator (PRG) peripheral which eliminates the CPU burden related to slope and ramp compensation in power conversion applications, improving frequency stability and system efficiency.

This allows you to reduce latency and component counts while improving your system’s efficiency.

In addition to power-conversion peripherals, these PIC MCUs have a unique hardware-based LED dimming control function that eliminates LED current overshoot and decay. This is enabled by the interconnections of the Data Signal Modulator (DSM), op amp and 16-bit PWM. The synchronization of the output switching helps smooth dimming, minimizes color shifting, increases LED life and reduces heat.

Taking 8-bit PIC MCU performance to a new level, the PIC16(L)F1769 family’s Core Independent Peripherals—such as the Configurable Logic Cell (CLC), Complementary Output Generator (COG) and Zero Cross Detect (ZCD)—are designed to handle tasks with no code or supervision from the CPU to

The new PIC16(L)F1769 family integrates up to two complete sets of Core Independent Peripherals

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NEW PRODUCTS

NEW PRODUCTS

NEW PRODUCTS

NEW PRODUCTS

NEW PRODUCTS

NEW PRODUCTS

Development Support

The PIC16(L)F1769 family is supported by the Curiosity Development Board (DM164137). This fully integrated 8-bit development platform is targeted at first-time users, makers, and others who are seeking a feature-rich rapid prototyping board. It was designed to take full advantage of Microchip’s free MPLAB® X Integrated Development Environment and the integrated MPLAB Code Configurator (MCC), which provides a graphical method to configure 8-bit systems and peripheral features. MCC automatically generates efficient and easily modified C code for your application, allowing you to go from concept to prototype in minutes. Other development tools include the MPLAB ICD 3 (DV164035) and PICkit™ 3 (PG164130) In-Circuit Debuggers.

Contact microchipDIRECT or your local Microchip Sales Office for information on pricing and availability of samples and production quantities for various devices in the PIC16(L)F1769 family.

Unleash Your Innovative Side with PIC32 Value Family!

PIC32MX1/2/5 Helps Designers Differentiate Their End Products

• Large, scalable memory options
• Smart peripheral mix
• High-performance solutions and easy-to-implement software packages

25% OFF ON DEV TOOLS!
More Than Capable
Two New PIC® MCU Families with Core Independent Peripherals Enable Functions for a Broad Range of Applications

Features Include ADC with Computation, New Low-Power Modes and Four Independent Time-Based 16-bit PWMs

As Microchip continues to lead the way in the 8-bit microcontroller (MCU) market, two new families of devices have recently been added to our growing portfolio of innovative PIC MCUs with Core Independent Peripherals (CIPs) to enable functions and capabilities far beyond those of traditional 8-bit MCUs. Offering a broad range of intelligent and configurable peripheral options in many low pin count packages, plus a wide operating voltage range, these devices exemplify our ‘Flexible Intelligence Made Easy’ philosophy.

The number of intelligent, interconnected CIPs that combine to perform functions autonomously—without the core—continues to grow, allowing 8-bit MCUs to be used in a much broader range of applications. Because these functions are deterministically and reliably performed in hardware instead of software, CIPs not only enable a higher level of system performance, they also simplify the design process and reduce code size.

Featuring CIPs that enable functions in a broad range of applications such as LED lighting and motor control, the four new members of the PIC16F1579 family are offered in 14- to 20-pin packages with up to 14 KB of Flash. They are the first 8-bit PIC MCUs with four 16-bit Pulse-Width Modulators (PWMs)—each with an independent timer—for flexible output and signal generation functions, including edge, center-aligned and other output modes. System communication functions are supported via serial interfaces for LIN and DMX connectivity, while the family’s intelligent analog integration enables signal and sensor interface functions.

Designed to support consumer electronics, Internet of Things (IoT), safety-critical systems and other applications, the first 10 members of the PIC16F18877 family are available in 8- to 40-pin packages with up to 56 KB of Flash. They are the first MCUs to integrate an Analog-to-Digital Converter (ADC) with computation, which performs input and sensor interface functions such as accumulation, averaging and low-pass filter calculations in hardware instead of software, enabling the CPU to sleep or execute other tasks. They’re also the first PIC16 MCUs to augment Microchip’s eXtreme Low Power (XLP) technology with IDLE and DOZE modes for reduced active power consumption. Additionally, they’re the first 8-bit MCUs that can turn off unused peripherals with Peripheral Module Disable, which completely removes peripherals from the power rail and clock tree for zero power leakage. Other integrated CIPs, such as the Hardware Limit Timer (HLT) and Cyclical Redundancy Check with Scan, combine for easy implementation of safety-critical functions.

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Both families offer the Peripheral Pin Select feature, which enables flexible pin mapping and PCB routing to minimize EMI and crosstalk. Devices in these families serve a wide 1.8 to 5.5 V operating range and come in a variety of package sizes to help minimize the size of your design.

Development Support
Development with the PIC16F1579 and PIC16F18877 families is easy using our comprehensive platform of software and hardware tools, all of which are integrated under the MPLAB® X Integrated Development Environment (IDE). The Curiosity Development Board (DM164137) enables rapid prototyping with support for MikroElectronika click boards and Bluetooth® Low Energy communication. It also features an integrated programmer/debugger. You can also download the MPLAB Code Configurator for free from Microchip’s website. It provides a visual representation of an MCU’s peripherals, eliminating the need for you to look for this information in the product datasheets. It makes it easy to set up the CIPs and provides production-ready code with the click of a button, speeding the development efforts of both new and experienced users. Microchip’s MPLAB XC8 compiler and standard programmer/debuggers are also available for purchase.

Devices from both the PIC16F1579 and PIC16F18877 families are available for sampling and in production quantities from microchipDIRECT or from Microchip’s worldwide distribution network.
Add a Touch of Excitement

New Projected-Capacitive Touch Screen Controller Delivers Noise-Robust, Advanced Multi-Touch and Gesture Performance

Innovative, Turnkey MTCH6303 Supports Touch Screens up to 10” with the Possibility to Add 3D Air Gestures

Designing touchpads and touch screens just got easier. The latest addition to Microchip’s portfolio of Human Interface Solutions is the MTCH6303, an innovative, turnkey projected-capacitive touch controller. This device supports touch sensors with up to 1,000 nodes and diagonals of up to 10”, providing multi-touch coordinates as well as ready-made multi-finger surface gestures. The MTCH6303 allows you to add modern user interface elements—such as pinch, zoom, multi-finger scrolling and swipe gestures—to any embedded design with minimal host requirements.

The MTCH6303 touch controller’s advanced signal processing provides noise-avoidance techniques and predictive tracking for 10 fingers at scan rates of up to 250 Hz, with a minimum of 100 Hz each for five touches. For outstanding performance in noisy environments, the MTCH6303 combines with the MTCH652 High-Voltage Line Driver to achieve a superior Signal-to-Noise Ratio (SNR). To add free-space 3D gestures, the MTCH6303 can be combined with the MCG3130 to support 3D air gestures up to 20 cm away from the touch panel. The MGC3130 is an E-field-based 3D tracking and gesture controller based on Microchip’s GestIC® technology that enables user input via natural hand and finger movements in free space. With this unique combination, you can create exciting interface control in two and three dimensions, allowing your design to stand out from the competition.

The MTCH6303 provides an ideal solution for designs that require cost-effective and easy-to-integrate projected-capacitive touch capabilities. It is perfect for both touch screen- and touchpad-based user input solutions—such as keypads, machine controls, security panels, thermostats and other applications—targeting the industrial, home-automation and consumer markets.

Development Support

The MTCH6303 is supported by Microchip’s new Multi-Touch Projected Capacitive Touch Screen Development Kit (DV102013), which incorporates the MTCH6303 and the MTCH652. The kit also includes an 8” ITO touch panel for easy demonstration of the MTCH6303 touch controller’s capabilities and support of Graphical User Interface (GUI) functionality. Microchip provides a free MTCH6303 GUI which gives you complete access to the configuration and tuning parameters, as well as advanced visualization windows to assist with easy-to-comprehend feedback. Additionally, Microchip provides access to the firmware library to enable further customizations for maximum design flexibility and control.

The MTCH6303 is currently offered in a 64-pin TQFP or QFN package and is available through microchipDIRECT or from Microchip’s worldwide distribution network.
Harmonizing High-Quality Audio Design
Introducing the PIC32 Harmony Software Decoder Framework and Microsoft® WMA Decoder Library

Ease Development and Increase Flexibility of Consumer Audio Products

Developers of applications based on PIC32 microcontrollers have been successfully using Microchip’s MPLAB® Harmony Integrated Software Framework to accelerate their embedded software development and speed their products to market. This award-winning platform consists of Microchip and third-party middleware, drivers, libraries and real-time operating systems. Recently, the PIC32 Harmony Software Decoder Framework and Microsoft Windows® Media Audio (WMA) Decoder Library were introduced to assist with the development of high-quality consumer audio applications within the MPLAB Harmony environment.

The WMA Decoder Library includes a new modular framework for audio decoders, including support for MP3 and AAC audio formats. It is ideal for designing low-cost applications in consumer markets, such as audio docks, home audio receivers and automotive head units. You must be a Microsoft Windows Media Component Licensee to purchase the WMA Decoder Library from Microchip.

Intended to reduce the development time required for creating a multiple-format audio decoder application, the PIC32 Harmony Software Decoder Framework allows you to easily add audio software codecs to your PIC32 MCU-based design project. It eliminates the need to rewrite large sections of application code, and instead allows you to easily integrate it into an existing application using the WMA Decoder Library.

In addition to including the MP3 and AAC formats, the WMA Decoder Library increases the depth of the library for PIC32 MCU-supported audio decoders that can play back from both internal and removable media. This broadens the range of audio formats that you can choose to offer in your product. The Audio Decoder Framework then lets you easily add, subtract and switch among various software-based audio decoders, building upon existing USB and Bluetooth® streaming audio solutions.

Development Support
The Microsoft WMA Decoder Library is supported by Microchip’s free MPLAB Harmony Integrated Software Framework and the PIC32 Bluetooth Audio Development Kit (DV320032). MPLAB Harmony is available online at www.microchip.com/harmony. The PIC32 Bluetooth Audio Development Kit is available from microchipDIRECT or through Microchip’s worldwide sales network.
AUTOSAR Integrated with MOST® Infotainment and Advanced Driver Assistance Networking Technology

Designers using the Automotive Open System Architecture (AUTOSAR) to develop and reuse their in-vehicle software can now connect their systems not only to networking technologies such as CAN and LIN, but also to MOST networking technology. This means that Microchip’s MOST Intelligent Network Interface Controllers (INICs) can be used for cross-domain communication in an AUTOSAR system, such as Advanced Driver Assistance Systems (ADAS), simplifying automotive networking and diagnostics. More Information.

Kia Selects MOST150 Devices for Telematics Service in Flagship Kia K900 Model’s Infotainment Network

Kia Motors Corporation is enriching its infotainment system with powerful smartphone connectivity in its flagship Kia K900 luxury sedan (known as ‘Quoris’ in some countries), using the OS81110 Intelligent Network Interface Controller. Kia adopted the latest MOST150 standard for the 2015 K900 in order to take advantage of its Internet-connectivity capabilities. More Information.

H.264 Video I/O Companion ICs

Optimized for MOST® Technology

Streaming, MediaLB® and TSI ports
DTCP coprocessor
Supports I²C™ messages
Hot Deals on Some Cool Tools

It’s time for some summer savings! Our August Dev Tool Deals include a variety of products to help you with your design projects. To take advantage of these special sale prices, go to www.microchipdirect.com and add the item to your cart. Add the coupon code during checkout. These are limited-time offers so act quickly to get yours while the deals are still available and supplies last.

Softlog ICP2 Production Quality In-Circuit Programmer (TPG100001)

microchipDIRECT Coupon Code: TP1532

The Softlog ICP2 Production Quality In-Circuit Programmer is a cost-effective programmer that operates with a PC or as a standalone unit. It features fast programming of Microchip’s 8-bit PIC® MCUs and serial EEPROMs as well as support for four serialization schemes and a programmable clock/data speed (500 kHz to 2.5 MHz). Save $50 off the regular price of $399.99 during this sale.

MPLAB® REAL ICE™ Power Monitor (AC244008)

microchipDIRECT Coupon Code: TP1531

Now you can save $180 and optimize your code for low-power applications. The MPLAB REAL ICE Power Monitor helps you identify and eliminate code—in real time—that consumes high current. When used in conjunction with the MPLAB REAL ICE In-Circuit Emulator and MPLAB X IDE, it allows you to measure, graphically profile and optimize code power consumption for all of our 8-bit, 16-bit and 32-bit PIC MCUs.

PIC32 USB Digital Audio Accessory Board (DM320014)

microchipDIRECT Coupon Code: TP1533

The PIC32 USB Digital Audio Accessory Board showcases the capabilities of a PIC32 microcontroller (MCU). It can be used for 16-/24-bit stereo audio playback and recording with a sample rate of up to 48 kHz. This digital audio device is USB powered and can be used with any PC, tablet, gaming station or mobile device that supports the USB Audio Device Class. Get yours for $20 off the regular price.

(continued on page 17)
MCP1252 Charge Pump Backlight Demonstration Board (MCP1252DM-BKLT)

microchipDIRECT Coupon Code: TP1530

Used to demonstrate the use of a charge pump device in an LED application, the MCP1252 Charge Pump Backlight Demonstration Board can also be used for general evaluation of the MCP1252. It is on sale now for just $22.00.

Sometimes a smaller portion is all that you need...

Partial reel service is coming soon to microchipDIRECT

Microchip - Your Experienced Medical Device Design Partner

Get World-Class, Seamless Global Support

- Security and authentication solutions
- Innovative touch, input and gesture sensing
- IoT/cloud-based embedded design solutions
Create Custom Code for Your Application with 8-bit PIC® MCU Bootloader Code Generator

**Embedded connectivity is essential to growing markets such as the Internet of Things (IoT). It is not limited to a single communications protocol and takes many forms. As embedded devices for these markets evolve in both capability and connectivity, it becomes ever more essential for designers to be able to enable remote application updates. Remote firmware updates allow for simplified and efficient upgrades to an existing application while increasing a product’s useful life. The addition of new features to a product can be used to maintain a competitive advantage against new market offerings or to unlock existing fee-based premium content. Additionally, software fixes can be quickly propagated to ensure reliable system operation.**

**Bootloader Code Generator**

To take advantage of this connectivity, bootloader firmware must reside within Flash memory to provide self-programming capability to the microcontroller. Developing custom bootloader code can be a complex and time consuming process. Recognizing this, we developed our 8-bit PIC MCU Bootloader Code Generator to assist you in creating bootloader firmware to suit your specific application’s needs. The Bootloader Code Generator provides a simple Graphical User Interface (GUI), which allows you to develop a custom assembly source file that can be programmed into the microcontroller’s memory. This tailored approach minimizes bootloader code size and maximizes the amount of Flash memory space for application code.

Remote firmware updates allow for simple and efficient upgrades to an existing application while increasing a product’s useful life
To complement the Bootloader Code Generator, Microchip also provides a Bootloader Host application. This tool is used to transfer new application code to the embedded device that contains the bootloader code. The GUI application can communicate with the target device through UART, I²C, USB or Ethernet protocols. The Bootloader Host application can be used to program the Flash memory for 8-bit PIC MCUs and also supports EEPROM writes.

In addition to saving development time and cost, these tools assist you in creating secure and reliable bootloaders. This includes detecting and recovering from a failed boot load as well as restricting read access to the program memory. These tools will help ensure robust operation, enhancing the flexibility of an embedded application whether it is currently in development or already being used by your customers.

**PIC16F176X Power Supply MCUs**

- Multiple independent closed-loop power channels
- High integration of intelligent analog and digital features
- Programmable Ramp Generator (PRG)
  - Stabilizes power output, improves frequency and system efficiency

**AMP’TITUDES**

Amp’titudes is an ongoing video series that covers a variety of amplifier-related topics, such as bias and offset currents, voltage versus current noise, reducing electromagnetic interference and much more.

This series provides you with relevant, practical information to assist in the selection and use of amplifiers in today’s electronics.
DeviceLab’s New Wireless Medical Device Center Helps Bring Internet of Things Solutions from Concept to Commercialization

Contributed by DeviceLab Inc.

Although DeviceLab Inc. is one of the newest members of the Microchip Design Partner Program, they are anything but new to Microchip’s technologies. In the past several years, DeviceLab—which is based in Orange County, California—has collaborated on more than a dozen electronic medical product design projects with Microchip. With their new status as a Microchip Medical Design Partner, DeviceLab anticipates additional collaboration on many more projects.

Along with the diverse range of medical device development services for which DeviceLab has become known over the past two decades, the company has recently announced the launch of its new Wireless Medical Device Center and proprietary SmartDevices™ platform.

The center was created to meet rapidly growing interest and demand for innovative wireless healthcare devices, in particular those that take advantage of the healthcare Internet of Things ecosystem. Also known more simply as “IoT for healthcare,” this revolutionary mobile health technology is ideal for POC healthcare facilities as it enables clinicians and doctors to integrate medical devices—such as pumps, monitors, complex cart systems and other instrumentation—with hospital infrastructure for seamless, secure and continuous patient monitoring from virtually any location.

To learn more about how DeviceLab can help bring your wireless medical device from concept for commercialization, please visit the DeviceLab Wireless Medical Device Center.
Meet SmartPour, an automated beverage dispensing system designed to simplify owning and maintaining a home kegerator while ensuring quality and perfectly poured beverages. With a Microchip PIC18 at its heart, SmartPour automatically maintains appropriate pressure, monitors temperature and keg level, and automates the dispensing sequence to provide ease of use and professional quality pours at the touch of a button. RFID communication is used to pass ideal parameters for each beverage into the system, thus allowing this device to be adaptable to any keg based beverage on the market. Since the CO2 concentration in beverages can vary from brewery to brewery, and pressure is directly correlated with temperature, it is imperative that SmartPour monitors and adapts as these variables change.

Analog-to-digital conversion is used to convert data from a Microchip TC1046 temperature sensor and stored it on the PIC18 microcontroller. This data is then interpreted through a temperature/pressure lookup subroutine to identify the correct corresponding pressure. That data is then sent to an electro-pneumatic pressure regulator. SmartPour adjusts as the temperature varies, guaranteeing that CO2 is neither leaked nor absorbed, maintaining equilibrium within the installed keg. Once the system is initialized, a beverage is ready to be poured.

When desired, a drink is just a press of a button away. Using pulse-width modulation, a stepper motor tilts the glass to the appropriate angle and begins the pour sequence by opening a solenoid valve. As the beverage is dispensed, a flow meter calculates pulses, or counts how much liquid is dispensed. Simultaneously, as pulses are counted, the motor begins to return the cradle system to its starting position. Pour angle and speed vary with each beverage but SmartPour adapts, leaving the proper amount of foam at the top of the glass each and every time.
SmartPour has been developed with three main safety systems. A microswitch cup sensor is installed within the cradle system, which guarantees no pour sequence can begin without the installation of a cup. Additionally, a catch tray is designed to fit underneath the cradle and houses a moisture sensor. This sensor halts all functions in the event of a spill. After the tray is cleaned, normal operation resumes. As a failsafe for all operations, a stop button can be pressed at any time during a pour. The solenoid valve then closes and the stepper motor returns the cradle and glass to its initial position.

From its RFID communication to its pressure regulation, SmartPour was developed at The Citadel Military College of South Carolina as a prototype for a senior design project. For students William Creed, Joshua Decker, Joshua Kerr, and David Vandermolen, it has become much more than that. This automated beverage dispenser is not only useful but adds excitement to the craft beer or soda enthusiast. It ensures quality without prior knowledge and is even desirable in festivals. A year of integrating complex components into one centralized unit has led to the development of a fully functional prototype that is SmartPour.
New EZ App Lynx Library Makes it Easy to Develop Smartphone Apps

Contributed by CCS, Inc.

If your design uses a PIC® microcontroller (MCU) and you would like to take advantage of the expanding market for applications based on Bluetooth-enabled smartphones and tablets, the new EZ App Lynx platform from CCS can help shorten your smart Bluetooth app development process.

Using the CCS EZ App Lynx Library, you can quickly create an interface between a Bluetooth-enabled, PIC MCU-based project and a smartphone or tablet. This innovative software library controls what is displayed on the smart device screen so that, at run time, the Graphical User Interface (GUI) will appear on the companion mobile app. You can configure sensor interface components (status bars, gauges, sliders, etc.) and parameters (string fields, font sizes, colors, etc), and also specify where a string field originates.

The free EZ App Lynx Android™ or iOS® companion app allows you to view the status of inputs such as gauges, LEDs and switches and also enables you to remotely control outputs such as LEDs and relays. Simply open the app, scan for and select a nearby device, and you’re ready to go!

The Android and iOS app both support Microchip’s RN4020 Bluetooth Low Energy (BLE) Module in Microchip’s Low Energy Data Profile (MLDP) mode, which provides a serial data delivery similar to Bluetooth Classic’s SPP protocol. The Android app also supports any Bluetooth Classic module—such as Microchip’s RN42—that uses the SPP protocol.

The EZ App Lynx Library is included with the latest versions of the CCS compilers and, for MPLAB® XC Compiler users, the EZ App Lynx Library (SW500025) can be purchased from microchipDIRECT. The Android app is currently available for download from Google Play™ while the iOS app can be downloaded from the Apple App Store. To use the EZ App Lynx library and app, you will need any board that contains a PIC MCU and an MLDP or SPP-based Bluetooth module, like the EZ App Lynx Development Board (TDKEZWDB), available from microchipDIRECT.
Three Powerful Techniques for Cutting-Edge Embedded Development

Supercharge your hardware skills with the Logic series of USB logic analyzers from Saleae, a trusted Third-Party Tool provider. These logic analyzers can decode 24 different protocols like I2C and SPI, and can assist you with debugging timing problems, microcontroller peripherals, interrupts and bit-banging. All Logic models can record billions of samples at a minimum, while the new Logic Pro 8 and Pro 16 can sample at 500 Msps via USB 3.0. Over 20,000 embedded developers actively use Logic every month.

You probably know the basics to get you started, but here are a few killer use cases for the Logic series that may be a little less obvious:

1. Performance Optimization
Toggle GPIOs at the beginning and end of the code that you think may be a bottleneck, and record this GPIO (along with other key signals) with a Saleae logic analyzer. Measure how much time that suspected bottleneck is taking. Now, move the GPIO toggles to other places to zero in on the real problem. Once you’ve found the biggest culprit, you’ll be able to measure your progress as you work on optimizing that code.

2. Power Optimization
To optimize power consumption, start by using a GPIO to indicate your low-power state. Measure it with a Saleae logic analyzer and get the percentage of time that your application is active. Then, use the performance optimization technique above to zero in on that tiny part of your application that is burning all those cycles. Now you can optimize that code and measure your results. Have fun and challenge yourself to realize absurdly low power consumption!

3. Advanced Debugging – Without Breakpoints
If you’ve done much embedded development, you’ll know that using breakpoints often isn’t a great solution. Instead, toggle GPIOs at strategic locations, or write out variables or custom messages in real time, using SPI, serial, bit-banging—whatever is available and fast enough. Now you have rich information about exactly what is happening and when it is happening with respect to other signals in the system.

For more details and to find the Logic that will best suit your requirements, visit the Saleae website. Then order your Logic from microchipDIRECT.

Contributed by Saleae, Inc.
schools around the world are offering courses on robotics and programming as they seek to inspire students to pursue careers in engineering and science. For over 20 years, Matrix Technology Solutions (Matrix TSL)—a Microchip Third Party Tools provider—has provided a range of products that help promote electronics, science, technology and automotive education.

Their philosophy of “learning by doing” had recently led them to develop Formula AllCode, a state-of-the-art robot buggy and robotics course they are hoping to launch in early 2016. This all-in-one package includes a dsPIC® Digital Signal Controller (DSC) powered robot with Bluetooth® connectivity, a PDF containing the student tutorials, and a graphical map and maze walls to be used as learning accessories.

One of the primary benefits of Formula AllCode is that it enables students to learn about robotics using a variety of software and hardware platforms. The robot can be used with hosts that run on Windows® and Mac OS® operating systems, as well as on Raspberry Pi®, Android™ and iPhone® device platforms. You can program the AllCode using practically any software platform, including Flowcode, LabVIEW™, MATLAB®, Python® and AppBuilder™.

This low-cost robotic buggy is fun and motivating tool for introducing younger school children to programming and robotics. It also offers extended scope for developing more advanced projects and entering competitions. Makers who want to challenge their skills and knowledge will also enjoy working with this engaging robotics platform. A Kickstarter campaign for the Formula AllCode is underway now, so check it out today.
Helping to bridge the gap between buyers and electronics distributors, OEMsecrets.com is a UK-based start-up that has created a price comparison search engine for electronic components. This website lists an extensive range of products which includes hardware, test equipment and power tools from all types of electronics catalog distributors. OEMsecrets.com is working with more EMEA distributors than any other site, listing stock availability from providers such as microchipDIRECT, Farnell, Schukat, Rutronik, TME and many more. OEMsecrets also works with the leading distributors in North America, such as Future, Mouser, Arrow, Avnet, Digi-Key and TTI.

The OEMsecrets website is free and does not require users to login to search or buy from distributors. Engineers can compare component prices from hundreds of distributors in the electronics market. Users simply enter a manufacturer part number and the website quickly identifies which supplier is cheapest and displays the results in price ascending order. In addition to price, the results also include stock availability, links to datasheets, product images and a “Buy Now” link to purchase the product online.

The site also offers exclusive discount codes from a range of suppliers when they become available. For example, a coupon code may offer a 10% discount to be used at checkout when buying online through OEMsecrets.com.

Take a look and see how much money you could save when purchasing electronic components through OEMsecrets.com. You can also sign up for their newsletter or follow them on social media to receive regular exclusive offers.
Microchip’s Smart Hub Controllers are 4-port, SuperSpeed (SS)/Hi-Speed (HS), low-power devices that are configurable and fully compliant with the USB 3.1 Gen1 specification. They also support new functionality making them a lot “smarter” than the average USB hub.

Microchip’s smart hub controllers integrate system-level functions typically associated with a separate MCU or processor, while enabling communication to other peripherals in addition to traditional USB devices.

Features
- Lowest overall BOM cost using I/O bridging
- Expanded functionality with FlexConnect
- Easy configurability through application bootstrapping
- USB Type-C™ support

www.microchip.com/usb