Microchip and Digilent Launch First Arduino-Compatible 32-bit Microcontroller Development Platform

Platform Includes Dev. Boards, Open-Source Software; 32-bit Performance and Low Cost Enable Hobbyists & Academics Of All Disciplines to Integrate Electronics Into Projects

Microchip Technology, and Digilent, Inc. launched the first 32-bit-microcontroller-based, open-source development platform that is compatible with Arduino™ hardware and software. Designed and manufactured by Digilent, a Microchip Authorized Design Partner, the chipKIT™ platform is the first and only 32-bit Arduino solution in the industry to enable hobbyists and academics to easily, and inexpensively, integrate electronics into their projects, even if they do not have an electronic-engineering background. The platform consists of two PIC32-based development boards and open-source software that is compatible with the Arduino programming language and development environment, thanks to the incredible work done by Mark Sproul and Rick Anderson through Fair Use Building and Research Labs. The chipKIT hardware is compatible with existing 3.3V Arduino shields and applications, and can be developed using a modified version of the Arduino IDE and existing Arduino resources, such as code examples, libraries, references and tutorials. The platform provides an unprecedented level of features for the Arduino community, and four times the performance of any existing Arduino solution at a low price.

Hobbyists and academics from many disciplines, such as mechanical engineering, computer science and even art, want easy-to-use, low-cost solutions for creating projects. The PIC32-based chipKIT boards enable 80 MHz performance, and provide up to 512 KB Flash, with up to 128 KB RAM. The boards feature connectivity peripherals, including Ethernet, CAN and USB (Full-Speed Host, Device and OTG); plus peripherals such as multiple timers, a 16-channel 1 MSPS Analog-to-Digital Converter (ADC), two comparators, and multiple I2C™, SPI, and UART interfaces. Not only is chipKIT the first Arduino-compatible platform to provide 32-bit performance, but Microchip’s PIC32 microcontroller is also the highest performance 32-bit microcontroller in its class, featuring the industry-leading MIPS32® M4K® core from MIPS Technologies, Inc.

To order your boards, visit www.digilentinc.com/chipkit

To learn more about chipKIT visit: http://www.microchip.com/chipKIT
To purchase your chipKIT boards, visit microchipDIRECT or Digilent Inc.
Does Your Design Call For A 30V Buck Switching Regulator?

Microchip announced the **MCP16301** – Microchip’s first 30V-input, buck switching regulator with 600 milliampere (mA) output capability. The MCP16301 features a wide input voltage range, from 4V to 30V, an output voltage range from 2V to 15V and provides up to 95 percent efficiency. The 600 mA MCP16301 is offered in a 6-pin SOT-23 package with an integrated high-side switch, and requires a minimal number of external components. It is ideal for applications in the industrial, telecommunications, consumer and automotive markets, such as set-top boxes, LED lighting, HVAC systems and power meters.

The MCP16301 provides an efficient and compact solution for stepping down 12V to 24V DC power rails, for use with **PIC® microcontrollers** and other low-voltage devices in a wide range of applications. The high-speed peak current mode control allows fast responses to sudden input-voltage and load transients encountered in power applications. The MCP16301 also delivers excellent line and load regulation, while the integrated control-loop compensation and slope compensation make the complex task of stabilizing the converter control system simple and reliable. Additionally, the MCP16301 decreases the power demand, and the amount of heat dissipated within the application and in the corresponding cooling requirements, when compared to a low drop-out (LDO) regulator. These decreases enable longer battery life and make meeting power requirements easier.

The MCP16301 continues Microchip’s focus on high-efficiency power products providing yet another competitive, compact solution for a wide variety of applications. Customers can implement a complete MCP16301 solution within the footprint of a typical D2PAK LDO, while dissipating much less heat and providing higher efficiencies.

The MCP16301 is supported by the MCP16301 300 mA D2PAK Footprint Demo Board (part # ARD00360) and the MCP16301 600 mA Demo Board (part # ADM00352). Customers can also access a component-selection

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**MCP16301 Features**

- Up to 96% Typical Efficiency
- Input Voltage Range: 4.0V to 30V
- Output Voltage Range: 2.0V to 15V
- 2% Output Voltage Accuracy
- Integrated N-Channel Buck Switch
- 600 mA Output Current
- 500 kHz Fixed Frequency
- Adjustable Output Voltage
- Low Device Shutdown Current
- Peak Current Mode Control
- Internal Compensation
- Stable with Ceramic Capacitors
- Internal Soft-Start
- Cycle-by-Cycle Peak Current Limit
- Under Voltage Lockout (UVLO): 3.5V
- Overtemperature Protection
- SOT-23-6 Package

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To learn more about the MCP16301, visit:  
Need A Low Pin, Low Power, Mid-Range 8-bit Microcontroller?
Peripheral-Rich Devices Are Highest-Memory PIC® MCUs in 8- and 18-pin Packages; Include eXtreme Low Power Technology and mTouch™ Capacitive Touch Sensing

Microchip announced the latest additions to its Enhanced Mid-Range core 8-bit PIC® microcontroller (MCU) family – the peripheral-rich, low pin count PIC12F(LF)1840 and PIC16F(LF)1847. Featuring 7 KB and 14 KB of on-chip Flash memory, respectively, and up to 1K RAM, the new devices are the highest-memory PIC MCUs in 8- and 18-pin packages. The “LF” versions feature eXtreme Low Power (XLP) Technology, for active currents of less than 40 µA/MHz and sleep currents down to 20 nA. With their high level of peripherals and features, including mTouch™ capacitive touch-sensing and multiple communications peripherals, these general-purpose MCUs are well suited for a wide range of applications in the appliance (e.g. coffee makers, blenders, dishwashers); consumer (e.g. battery chargers, vacuum cleaners, printers, remote controls); and automotive markets (e.g. LED lighting, keyless entry, body electronics), among others.

Microchip’s eXtreme Low Power Technology remains the industry standard for battery-friendly MCUs, helping to improve overall energy efficiency in a variety of applications. The PIC12F(LF)1840 and PIC16F(LF)1847 MCUs are highly integrated, featuring multiple PWMs with independent time bases, a LIN-capable EUSART, and up to two I²C™/SPI interfaces. The on-chip, 32-level voltage reference can be used as a simple digital-to-analog converter, and the data signal modulator enables designers to create custom bit patterns using a broad spectrum of inputs.

The PIC12F(LF)1840 and PIC16F(LF)1847 demonstrate our commitment to low power, and providing our customers with the most energy-efficient devices on the market. The new MCUs’ combination of large memories, low power consumption and innovative peripherals give our customers the tools they need to extend battery life, reduce board space and, most importantly, lower their bill-of-materials costs.

The PIC12F(LF)1840 MCUs are supported by the PICkit™ 2 Low Pin Count Demo Board (part # DM164120-1), while the PIC16F(LF)1847 MCUs are supported by the PICkit 18-pin Demo Board (part # DM164120-4). All of the devices are supported by the PICkit 3 (part # PG164130) and MPLAB® ICD 3 (part # DV164035) debugger/programmers, as well as the PICDEM™ Lab Development Kit (part # DM163035). The latter comes complete with a development board containing five popular 8-bit PIC MCUs; a bag of discrete components; a debugger/programmer and a CD containing a User’s Guide, labs and application examples.

To learn more about these latest 8-bit Microcontrollers, visit:
Simplify The Design and Control of HID Ballast Using a dsPIC® Device

High Intensity Discharge (HID) Lamp

Gas is a good insulator under normal conditions. However, special conditions such as a strong electric field, x-ray radiation, ion bombardment and high temperature heat could lead to ionization of gas molecules and produce free-charged particles. These charged particles can conduct current under an electric field, which is known as gas discharge. The light source made by this principle is called a gas discharge lamp. A High Intensity Discharge (HID) lamp is one kind of gas discharge lamp with a higher luminous efficacy. Recently these HID lamps have become increasingly popular due to their superior performance over conventional halogen lamps.

Working of an Automotive HID lamp

The HID lamps need smart digital ballasts which can tackle their inherent complex six-stage start-up process to ensure proper ignition and steady state operation. Typically HID ballasts require a large set of analog controllers to properly control the HID lamp. However, using digital control techniques a single Microchip dsPIC device can control the entire HID ballast, reducing the ballast’s components and costs.

The digital ballast shown in the block diagram (right) consists of DC/DC converter, DC/AC inverter, igniter and digital signal controller. The DC/DC converter boosts the battery voltage to a high level for the ignition circuit first, and then drops to a lower level for steady state operation. The DC/AC inverter converts the DC current to a square wave current to energize the two lamp electrodes equally. The high voltage igniter generates high voltage pulses to strike the lamp. Both the DC/DC converter and the DC/AC inverter can be controlled by a single GS-series 16-bit digital signal controller.

Role of Digital Signal Controller

The dsPIC® Digital Signal Controllers (DSC) detects the lamp voltage and lamp current through the analog-to-digital converter. The current reference of the DC/DC converter is calculated according to the lamp voltage. The controller adjusts the PWM duty cycle of the DC/DC converter to control the lamp current. Meanwhile, several fault signals are monitored by the digital signal controller. Open circuit protection and short circuit protection need rapid response, so the internal comparators are selected to implement these two protections. At the same time, the digital signal controller measures the battery voltage through the ADC. If the battery voltage is outside the normal operation range, the ballast will stop working. In addition, the timer of the DSC is used to control the operation frequency of the full-bridge inverter, and the inverter drive signal is produced through an I/O port.

Advantages of dsPIC DSC

- Interrupt driven control with multiple priorities
- High performance math and DSP engine to perform complex calculations
- Built-in comparators to provide high-speed, reliable protection
- Simultaneous sampling ADC for accurate power measurements

Digital High Intensity (HID) Ballast Reference Design

Microchip’s Digital High Intensity Discharge (HID) Ballast Reference Design showcases the benefits digital control can bring to HID ballast; it is designed to interface to a standard automotive HID lamp. The reference design uses 9-16 VDC and outputs 35W of steady state power and reaches an efficiency of over 85%. The reference design implements under voltage, over voltage and over current protection. Using the reference design, a standard HID automotive bulb is able to reach steady state light output in less than 150 seconds.

Comparison Chart

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<td>Color Temperature</td>
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<td>Light Output (Lumens)</td>
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<tr>
<td>Life</td>
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To see the full HID Ballast Reference Design visit: http://www.microchip.com/stellent/idcplg?IdcService=SS_GET_PAGE&nodeId=1406&dDocName=en553545

www.microchip.com  Microcontrollers • Digital Signal Controllers • Analog • Memory • Wireless
ENC624J600 Standalone Fast 10/100 Ethernet Controller

Embedded developers who need a standalone Ethernet network interface prefer Microchip's **ENC624J600 Fast Ethernet Controller** to deliver Internet connectivity to any 8/16/32-bit microcontroller equipped with an industry standard SPI or parallel port. It enables secured network- and Internet-connected embedded applications and delivers reduced board space, cost and design complexity. The ENC624J600 offers a low-cost stand-alone 10/100 Base-T Ethernet interface controller with integrated MAC and PHY, hardware cryptographic security engines and factory preprogrammed unique MAC address. Combined with a free production-ready TCP/IP software stack, a complete Ethernet solution is provided to enable a wide range of remotely monitored and controlled embedded applications.

**Features & Benefits**

- Connect to any microcontroller via an industry standard SPI or a flexible parallel interface to enable remote monitoring and control of embedded applications
- Free, optimized TCP/IP stack accelerates time-to market and preserves significant headroom for the application
- Unique, factory preprogrammed Ethernet MAC address simplifies the design and manufacturing process
- Hardware cryptographic security engines enable secure data transmissions with reduced code size, faster connection establishment and throughput, and reduced firmware development efforts

**Technical Specs**

- IEEE 802.3™ Compliant Fast Ethernet Controller
- Integrated 10/100Base-T MAC and PHY
- Hardware Security Acceleration Engines
- Factory Preprogrammed Unique MAC Address
- Supports one 10/100Base-T Port with Automatic Polarity Detection and Correction
- Supports Auto-Negotiation
- Supports Half and Full-Duplex Operation
- Programmable Automatic Retransmit on Collision
- Packages: 44-Pin (TQFP and QFN) and 64-Pin (TQFP)

**Application Areas**

**Consumer:** Vending Machines, Hotel Mini Bars and Home Control/Automation

**Communications:** VoIP Phone Adaptors, Point-of-Sale Terminals, and Servers/Nets

**Industrial:** Control/Automation, Power Supplies, Lighting Control and Environmental Control

**Security:** Asset Monitoring, Fire and Safety, Security Panels, Access Control and Fingerprint Recognition

**Appliance:** General Appliances

**Availability**

Microchip’s ENC624J600 Standalone 10/100 Ethernet Controller, free TCP/IP stack, design collateral and fast 100 Mbps Ethernet PICtail™ Plus daughter board (part # AC164132) are available now.

Learn more and get samples today at: [http://www.microchip.com/ethernet](http://www.microchip.com/ethernet)
Design A Low-Cost Lithium Iron Phosphate (LiFePO4) Battery Charger With The MCP73123

Demand of fast-discharge rated energy storage sources for Electrical Vehicle (EV), Hybrid Electrical Vehicle (HEV) or portable power tools have driven the commercial development of Lithium Iron Phosphate (LiFePO4) batteries. The traditional LiFePO4 battery systems usually require high voltages or large capacities. However, the nature of its characters, such as longer cycle life than typical Li-Ion (Lithium Iron) batteries, better resistance to thermal runaway and higher output and peak current rating make them ideal candidates to RC (remote control) toys and backup power applications.

The typical capacity of LiFePO4 battery cells are available in ranges from 500 mAh to 2300 mAh. They are usually rated at 3.2V. There are systems or applications that do not require large capacity (multiple cells in parallel) or high voltage (multiple cells in series) battery packs.

Most LiFePO4 battery manufacturers have different charge and discharge specifications for their batteries. However, all LiFePO4 share Constant Current-Constant Voltage (CC-CV) algorithm with Li-Ion batteries. The preferred charge voltage is typically 3.6V. The termination current can be either fixed value or ratio of fast charge current. Unlike Li-Ion chemistry, LiFePO4 can be charged with higher C rate.

The MCP73123 family is developed to simplify the design for mid-to low-range capacity LiFePO4 batteries or if the total charge time is not critical for larger capacity applications.

**MCP73123 Device Description**

The MCP73123 is a highly integrated Lithium Iron Phosphate (LiFePO4) battery charge management controller for use in space-limited and cost-sensitive applications. The MCP73123 provides specific charge algorithms for LiFePO4 batteries to achieve optimal capacity and safety in the shortest charging time possible. Along with its small physical size, the low number of external components make the MCP73123 ideally suitable for various applications.

The MCP73123 employs a constant current-constant voltage charge algorithm. The 3.6V per cell factory preset reference voltage simplifies design with 2V preconditioning threshold. The fast charge, constant current value is set with one external resistor from 130 mA to 1100 mA. The MCP73123 also limits the charge current based on die temperature during high power or high ambient conditions. This thermal regulation optimizes the charge cycle time while maintaining device reliability. The PROG pin of the MCP73123 also serves as enable pin.

To read the full application note visit:

**MCP73123 Device Features**

- Constant Current / Constant Voltage Operation with Thermal Regulation
- 4.15V Undervoltage Lockout (UVLO)
- 18V Absolute Maximum Input with OVP:
  - 6.5V - MCP73123
- Battery Charge Voltage Options:
  - 3.6V - MCP73123
- Resistor Programmable Fast Charge Current:
  - 130 mA - 1100 mA
- Preconditioning of Deeply Depleted Cells
- Integrated Precondition Timer
- Automatic End-of-Charge Control
- Automatic Recharge, Available Options: 95% or Disable
- Two Charge Status Output Available – On or Flash
- Soft Start
- Packaging:
  - DFN-10 (3 mm x 3 mm)
Join Microchip at The Society for Information Display Show, in Los Angeles, CA on June 15th – 20th, 2011, Booth #722

Display Week, the Society for Information Display’s Symposium, Seminar, and Exhibition, is the essential yearly meeting for everyone involved in the technology, business and application of cutting-edge displays. It is also the top North American exhibit venue for display industry products and services. As the must-see event for the worldwide electronic-information-display industry, Display Week is host to hundreds of exhibitors and thousands of attendees each year.


WEPAN’s first annual national conference was held in 1990 in Washington, D.C. Today, both recurring and emerging issues are addressed each year as 200-plus professionals gather to consider the most current research, experience, and best practices. Participants enthusiastically share knowledge and resources with others – and come away inspired and invigorated.

Microchips Academic Program team will be in attendance, drop by, say "Hi" and ask Microchips knowledgeable team members your academic and engineering questions.

Register online at: http://www.wepan.org

Then Join Microchip’s Academic Program Team in Vancouver, BC on June 26th – 29th, 2011, Booth #647

The ASEE Annual Conference and Exposition is the only conference dedicated to all disciplines of engineering education. It is committed to fostering the exchange of ideas, enhancing teaching methods and curriculum, and providing prime networking opportunities for engineering and technology education stakeholders such as deans, faculty members and industry and government representatives.

Register online at: http://www.asee.org

MASTERs 2011, in Phoenix, AZ, August 24th – 27th

Now in its 15th consecutive year, Microchip’s MASTERs Conference has become the premiere technical training conference for embedded control engineers. Engineers can choose from classes about Microchip’s products as well as general embedded control topics such as motor control, power supply design, lighting control, communication protocols like USB and TCP/IP, C programming, graphic display technologies, touch sense methods and analog system design. Most of these classes are taught by the same application and design engineers who create the products.

So come join us for the unique engineer-to-engineer experience that Microchip’s MASTERS Conference provides.

Register online at: http://www.microchip.com/masters
Looking to Enhance Your Embedded Control Designs?

In tough economic times, companies often look for ways to trim expenses as a means to cope with a downturn in sales. One of the areas often targeted for cutbacks is employee training. There is not only the direct cost of the training to contend with, but also travel expenses and time an employee spends away from the job. During this challenging business climate, however, competitive pressures and technology changes don’t stop and it is training that can help a company be better positioned to take advantage of the potential upswing.

Microchip, with its global network of Regional Training Centers (RTCs) and third-party training partners, is here to help companies stay competitive with cost-effective, local training. To help companies deal with issues of travel expense and time, classes are given not only in Microchip’s facilities, but are also taken on the road. Customized customer premise sessions can be scheduled offering the most convenience. Time away can be managed more efficiently with the flexibility of half or full day class sessions.

To be effective in teaching, instruction must take into account the needs and expertise level of the attendee. Microchip’s Regional Training Center classes are developed to provide a coordinated flow, enabling engineers to implement a solution to their product development needs. Instruction is developed and presented in product, technology and implementation classes that are grouped into application based curriculum.

Each curriculum flow enables the individual to engage with the training at a level that meets his or her current knowledge and needs. The intent is to provide training that is relevant to each attendee while eliminating the frustration often associated with attending classes that present too much known information or assume a level of knowledge beyond what the attendee currently possesses.

Product/tool classes provide knowledge on how Microchip’s products and development tools operate. This knowledge provides the foundation upon which all application instruction is based. Attendance at one of these classes can provide significant value through the reduction in time associated with instruction manuals and data sheet review or trial and error attempts to learn individually. Market forces constantly press companies to add functionality and features to their products often outside their areas of core competence. As a result, engineers must continually broaden their knowledge base. Microchip’s technology classes are intended to help engineers gain an understanding of a new field.

Implementation classes combine elements of product and technology instruction to teach engineers how to design a real world application. Classes at this level provide how-to instruction rather than what or why instruction.

Microchip is currently offering classes in the following curriculum: DSP, Ethernet, Human Interface, Motor Control, Power Management, Signal Chain, System Design and USB. Future curriculum is expected to include CAN/LIN, IrDA®, Lighting and RF.

With a worldwide network of Regional Training Centers and certified third-party trainers, Microchip makes it easy to enhance your technical skills, with locations in nearly every metropolitan area across the world!

For those organizations who desire to have 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. In addition to the instruction, most Regional Training Center classes offer the opportunity to purchase a set of the development tools used in the class at a discounted price.

If the class you are interested in is not scheduled in your area, you can sign up to receive an alert when a session is scheduled. For information on scheduling custom in-house training, contact your local RTC directly or visit the Microchip RTC web site: www.microchip.com/RTC

For a complete list of classes and locations, visit www.microchip.com/RTC
# What's New in Microchip Literature?

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## User's Guide

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