Microchip Expands XLP PIC® MCU Portfolio with Industry’s Lowest Active Current for 16-bit MCUs & New Low-Power Sleep Modes

PIC24FJ128GA310 Family Features VBAT Battery Backup, Low-Power Sleep With RAM Retention and an LCD Driver

Microchip announced the expansion of its eXtreme Low Power (XLP) microcontrollers (MCUs) with the PIC24F “GA3” family, featuring industry’s lowest active current for 16-bit Flash MCUs, as well as several flexible new low-power sleep modes. The PIC24F “GA3” devices feature 150 microamperes/MHz active current, as well as six DMA channels, which allow a routine to be executed with less power consumption and increased throughput. The family showcases continual advancement in Microchip’s XLP technology and adds a new low-power sleep mode with RAM retention down to 330 nA. Additionally, these are the first PIC® MCUs with VBAT for battery backup of the on-chip Real-Time Clock Calendar. With these features, plus an integrated LCD driver and numerous other peripherals, the PIC24F “GA3” devices enable more efficient, less expensive designs in the consumer (e.g. thermostats, door locks, home automation); industrial (e.g. security, wired and wireless sensors, industrial controls); medical (e.g. portable medical devices, diagnostic equipment); and metering markets (e.g. e-Meters, energy monitoring, gas/water/heat meters, automated meter reading), among others.

Designers often want to create applications where the battery life approaches the end product’s useful life. With its run currents of 150 microamperes/MHz, numerous low-power modes, and a low-power sleep mode with RAM retention down to 330 nA, the PIC24F “GA3” MCUs enable maximum battery life by reducing the overall amount of power that the application consumes. To allow the application’s Real-Time Clock Calendar (RTCC) to continue running when primary power is removed, a VBAT pin can be used to supply back-up power with only 400 nA. The integrated LCD display driver provides the ability to directly drive up to 480 segments, with an eight-common-drive capability, enabling more informative and flexible displays that include descriptive icons and scrolling. The MCUs also include a Charge Time Measurement Unit (CTMU) with a constant current source that can be used for mTouch™ capacitive sensing, ultrasonic flow measurement and many other sensors. The on-chip, 12-bit ADC features threshold detection and works in conjunction with the CTMU to perform proximity sensing while in sleep, to further reduce power consumption.

Microchip also announced the PIC24FJ128GA310 Plug-In Module [PIM (part # MA240029)] for the Explorer 16 Development Board. The PIC24F “GA3” family is available today for sampling and volume production. The PIC24FJ64GA306 and PIC24FJ128GA306 MCUs are available in 64-pin QFN and TQFP packages, with 64 KB and 128 KB of Flash, respectively. The PIC24FJ64GA308 and PIC24FJ128GA308 MCUs are available in an 80-pin TQFP package, with 64 KB and 128 KB of Flash, respectively. The PIC24FJ64GA310 and PIC24FJ128GA310 MCUs are available in 100-pin TQFP and 121 BGA packages, with 64 KB and 128 KB of Flash, respectively.

Learn more about the XLP family, visit:
http://www.microchip.com/XLP
Microchip’s MPLAB® X IDE Wins Elektra Electronic Industry Award 2011

Cross-Platform, Universal, Open-Source Integrated Development Environment Wins Design Tools and Development Software Award

Microchip announced that its free MPLAB® X Integrated Development Environment (IDE) won the prestigious 2011 Elektra Award, in the Design Tools and Development Software Award category.

MPLAB X is the industry's only IDE that combines industry-leading productivity features with universal, seamless migration through an entire product range.

“Microchip has successfully adopted an open-source software approach for its MPLAB X Integrated Development Environment, which supports its complete product range of 8, 16 and 32-bit PIC® microcontrollers, dsPIC® digital signal controllers and many of its memory devices in a single, multi-project environment,” the Elektra judges commented.

“Since the introduction of MPLAB X, customers around the world have experienced a substantial increase in productivity, as the IDE's full benefits are harnessed and explored,” said Steve Sanghi, Microchip’s president and CEO. “I would personally like to thank all those involved in developing this best-in-class design environment for embedded development, and the Elektra judges for presenting Microchip with another major international award.”

The free MPLAB X IDE includes a feature-rich editor, source-level debugger, project manager and software simulator, and supports Microchip’s popular hardware tools, such as the MPLAB ICD 3 in-circuit debugger, PICkit™ 3 debugger/programmer, and MPLAB PM3 programmer. Based on the Oracle Sponsored open-source NetBeans platform, MPLAB X runs on Windows® OS, Mac® OS and Linux, supports many third-party tools, and is compatible with many NetBeans plug-ins.

Watch the MPLAB® IDE introduction video

To learn more about the Microstick II tool, visit: http://www.microchip.com/microstick

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Seminar fee of $35 includes: seminar attendance, “One PIC® MCU Platform” Demo Board (DM164135), PICkit 3 programmer (PG164130) and a coupon good for a FREE Regional Training Class. This board includes PIC16, PIC24 and PIC32 MCUs, five capacitive touch pads, segmented LCD, LEDs and a single cell battery supply. Extra components are available through Digi-Key by ordering “Component Kit For PIC® MCU One Platform Demo Board” (AC160135).

This extra component kit includes: USB interface, speaker, audio jack, microphone input, buzzer, input switch, potentiometer and accelerometer.

Have you ever had the design requirements change in the middle of a project? Microchip presents a one-day seminar designed to give you the tools and knowledge needed to control your design cost.

In this economy, everyone is having to do more with less, so controlling your embedded design cost while differentiating your products is important. Learn how to apply these principles into your next design based on discussions and demonstrations led by Microchip’s expert staff. Sessions are packed with practical information and advice on how to reduce your development time, re-use your software and tools, and migrate your design up or down as requirements change.

✓ Watch how easy it is to migrate from 8-bit to 16-bit to 32-bit microcontrollers as requirements change.
✓ See how a simplified tool suite can help reduce development time.
✓ Learn how to re-use software by preserving your code investment.
✓ Topics will include the latest technologies in low power, human interface and connectivity.

DATES & LOCATIONS

For a complete list of worldwide locations, visit: www.microchip.com/2012seminars

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To learn more about Microchip’s 2012 training seminars, visit: http://www.microchip.com/2012seminars
Low Cost Controllerless Graphics Solutions using PIC32 MCUs

As the demand for graphical embedded applications becomes more popular, so does the need for developing cost effective solutions. One solution that is becoming more popular is to use a controllerless solution. This solution uses microcontroller (MCU) peripherals to create a “virtual” graphics controller for graphics rendering without taking up large amounts of CPU time.

The **Low-Cost Controllerless Graphics PICtail™ Plus Daughter Board** (referred to as the LCC Graphics Board), was designed to showcase a technique offered by Microchip that utilizes this low-cost controllerless method and is designed to work with many existing PIC32 starter kits and graphics display.

Figure 1 shows the setup of LCC Graphics Board with a **PIC32 USB Starter Kit II**, connected to a Graphics Display Powertip 4.3” 480x272 Board.

![Image of LCC Graphics Board and Graphics Display Powertip 4.3” 480x272 Board](image)

**Figure 1**

**SETTING UP A CONTROLLERLESS GRAPHICS SYSTEM**

In general, a controllerless graphics system needs to send a frame of pixel information to a display glass at a certain rate. This refresh rate is usually around 60 Hz. To do this, the system must constantly send frame data to the LCD panel. At first inspection, it seems like this task would take up most of the CPU time in an MCU. However, this is not the case for **PIC32** MCUs that contain a DMA for data transfer. With a DMA transferring the pixel data, less than 5% of CPU time can be used to achieve a “virtual” graphics controller.

PIC32 MCUs have a built-in Direct Memory Access (DMA) peripheral. This peripheral can transfer data from one location to another without CPU intervention. In a controllerless graphics method, the DMA is set up to transfer one line of frame data at a time through the Parallel Master Port (PMP). Each line consists of many pixels. The DMA sends a portion of the frame buffer during one transfer. A PMP or Timer interrupt request is used to trigger the next DMA transfer until a line is transferred. In PIC32 devices with non-persistent interrupts, a timer is used as the DMA trigger source. During data transfers, the PMP stokes a read or write signal after each pixel transfer. The read/write strobes of the PMP peripheral act as the pixel clock for the display glass. After each line of pixel data is transferred, the CPU is interrupted by the DMA and certain timing signals necessary for LCD panels are updated. This is repeated continuously until an entire frame has been drawn. The frame is stored in volatile memory so the image can be dynamic. In this setup, SRAM memory is used. This configuration is the foundation for a controllerless graphics system. The system can be set up to use internal SRAM memory or external SRAM memory. A diagram of each system can be seen below.

**External Memory Method**

- **DMA Read from PMP**
- **Frame Buffer**
- **PIC32**
- **Display Glass**
  - (Glass updated in parallel with DMA read)

**Internal Memory Method**

- **DMA Write**
- **Internal SRAM**
- **PIC32**
- **Display Glass**
  - (Data sent to glass during DMA PMP write)

Many companies today offer solutions involving an additional internal or external graphics controller as part of a system, which may result in higher costs and more complicated designs. In most cases, for a simple embedded Graphical User Interface (GUI), these graphics controllers are not necessary. The Low-Cost Controllerless (LCC) Graphics PICtail Plus Daughter Board enables development of graphics solutions without an external graphics controller, thus reducing system BOM cost for many applications.

For graphics libraries, webinars, demo code and more, visit: [http://www.microchip.com/lccg](http://www.microchip.com/lccg)
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- PIC32 Microcontrollers
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5. Enter promo code O44mf80fL and select “APPLY COUPON” (this will reduce the course registration fee).
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To learn more about Microchip’s Technical Training Discounts, visit:
http://www.microchip.com/training
Save More with Microchip


Microchip continues to introduce a wide range of innovative 8-bit products targeted at low power consumption, enabling designs with reduced component count, reductions in cost and board space and integration of enhanced features.

Save More Power With Low Active and Sleep Currents!

With each new generation of 8-bit products, Microchip has reduced quiescent current levels significantly. Microchip plans to continue doing so as evidenced by a number of recently released product families. These new products are the lowest power, lowest pin count devices with industry leading active current as low as 30 µA and sleep current for all products below 100 nA and some as low as 20 nA.

Save More Space With Small Package Options!

The miniaturization of electronic devices has gone mainstream and Microchip intends to stay ahead of the trend. For starters, Microchip has introduced Ultra Thin QFN (UQFN) packaging across our lineup. Not only are these new packages 50% thinner than the existing QFNs, they are smaller in every dimension. The UQFNs offer a very cost-effective method for reducing board size. A number of different packaging options are available in various pin counts:

- 64-pin, 9x9x0.9 mm (QFN)
- 40-pin, 5x5x0.5 mm (UQFN)
- 28-pin, 4x4x0.5 mm (UQFN)
- 14-pin, 3x3x0.9 mm (QFN)
- 6-pin, 2x3x0.9 mm (DFN)
- 6-pin, 1.6x2.9x1.2 mm (SOT-23)

Save More Money With Integrated Peripherals!

PIC® microcontrollers (MCUs) are often viewed as the most useful MCUs in the industry. This is due in no small part to the high levels of peripheral integration present in every product. These peripherals allow our customers to implement much of their system’s functionality into a single MCU saving on board space.

Several newly integrated peripherals have been introduced, including:

- **Configurable Logic Cell (CLC)** – Provides up to 16 different inputs for combinational and sequential logic (Boolean functions, Flip-flops, Latches) that is configurable under software control. A CLC Configuration Tool is available to streamline the setup process of the CLC module by simulating the functionality of the registers in a Graphical User Interface (GUI).

- **Numerically Controlled Oscillator (NCO)** – Dedicated 16-bit PWM that can be used for applications within lighting and power supplies.

- **Complementary Waveform Generator (CWG)** – Provides a complementary waveform with rising and falling edge dead band control, with auto-shutdown capability that provides improved switching efficiencies for applications such as synchronous power supplies and motor control.

- **Charge Time Measurement Unit (CTMU)** – Integrated constant current source that can be used with the ADC for capacitive, inductive or resistive, or precise time measurements and is extremely helpful in advanced sensing applications, reducing the need for external components and CPU overhead.

- **Real-Time Clock Calendar (RTCC)** – Maintains accurate time, date, day of week and year information for extended periods of time.

To learn more about Saving More with Microchip, visit:
http://www.microchip.com/8bit
Analog Focus
Boosting Your Design With the MCP1640

Single Cell Input Boost Converter Design

Currently, many portable battery-powered applications use multiple cell batteries for power. In some cases, the product form factor is driven by the size of the battery pack.

This application note introduces and details design equations and trade-offs that facilitate the use of single cell input synchronous boost converters from the Microchip MCP1640/B/C/D family of devices.

These single cell input boost converters enable startup from very low input voltage sources. The MCP1640/B/C/D converters will start from a 0.65 V source and operate down to 0.35 V, while boosting the output voltage from 2.0 V to 5.5 V.

Efficiency is maximized over the entire load range by auto switching from a Pulse Skipping, or Pulse Frequency Modulation (PFM) mode to a continuous 500 kHz Fixed Frequency mode by using MCP1640/MCP1640C devices. For applications that cannot tolerate the low frequency Pulse Skipping mode or the output ripple voltage associated with it, the MCP1640B/D devices switch at a continuous fixed pulse width modulation frequency of 500 kHz. In addition to dual switching modes, the MCP1640/B/C/D family of devices offers two disable options. In the True Output Disconnect option (MCP1640/MCP1640B devices), the output of the synchronous boost converter is open and the typical diode path from input to output is removed, isolating the input from the output. In the Input Bypass option (MCP1640C/D devices), the input is connected to the output using the synchronous P-Channel switch. During this mode, the quiescent current draw from the battery is less than 1 μA typical. The Input Bypass mode provides voltage to power a load in deep sleep with the ability to boost the voltage up to the levels that are necessary for normal operation.

Optimizing Battery Life in DC Boost Converters Using MCP1640

Microchip Technology Inc. has developed the MCP1640/B/C/D devices for battery-powered applications. These devices possess all the modern design features, such as high efficiency, low quiescent current, compact size, and low number of external components. The MCP1640 is a synchronous step-up DC-DC converter that provides up to 96% efficiency and runs at 500 kHz frequency. The device offers easy-to-use power supply solutions for applications powered by one, two or three-cell alkaline, NiCd, NiMH, or singlecell Li-Ion/Li-Polymer batteries. This application note details the practical considerations for more efficient use of the MCP1640 device in applications. It also gives ideas on how to increase battery life.

MCP1640/B/C/D FEATURES AND OPTIONS

The MCP1640/B/C/D features include:

- Low start-up voltage (typically 0.65V, at 1 mA load and 3.3V output) and continuous operating after start-up, until 0.35V input voltage is reached
- Output voltage range, from 2V to 5.5V
- PWM/PFM mode operation automatically selected (MCP1640/C)
- Low quiescent current (19 μA typical in PFM mode)
- Shutdown current less than 1 μA
- Integrated synchronous switch
- Internal compensation
- Low noise, anti-ring control
- Inrush current limit and soft start

To read more from this app note click here
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Reduce Your Manufacturing Costs with High-Speed, Production-Grade In-Circuit Serial Programmers

Softlog Systems specializes in In-Circuit Serial Programming (ICSP™) for Microchip microcontrollers. Since 1998, their high-performance, cost-effective programming solutions have been used to manufacture millions of products worldwide. Leveraging unmatched technical know-how and extensive field experience, Softlog’s production-grade ICP programmers reduce manufacturing costs and accelerate time-to-market.

Softlog programmers are fully compatible with the full range of Microchip PIC MCUs, including the high-performance PIC32 MCU, as well as Microchip peripheral components. Softlog programmers also seamlessly integrate with MPLAB® IDE via plug-in to enable integrated development of embedded applications.

Combining robust performance with proven reliability, the flagship ICP2 programmer is the ideal solution for high throughput, non-stop assembly line operations. ICP2 delivers true production-grade quality, fast programming and easy ATE integration at an affordable price. For heavy-duty programming, ICP2-GANG operates up to 64 independent channels of true parallel programming. This scalable product supports ultra-fast programming for round-the-clock, mass production operations.

Softlog’s ICP2(HC) is specially designed for programming target boards with high current requirements and scenarios where long programming cables are needed. ICP2-Portable is a production quality programmer with a compact and lightweight form factor. Supporting a wide array of power sources (battery, USB or adapter) and up to six different programming environments, this portable programmer is an ideal, low-cost solution for service technicians and field engineers.

But what truly sets Softlog programmers apart from other products is its patent-pending IP protection technology, known as "Secure Programming." This breakthrough security technology dramatically reduces the risk of unauthorized reconstruction of hex data. Several layers of protection – such as multiple encryption levels, anti-spoofing counter and secure buffer of "invisible" hex data - ensure that your business-critical hex files are never available for unsupervised pirated batch cycles.

Softlog works with its customers to achieve zero downtime on assembly line operations. They offer world-class programming solutions with 24x7 technical support. By responding immediately to any operational issues that may arise, Softlog helps you to ensure business continuity and maximize profitability.

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Electronic Design's Smart Grid Roundtable
The Smart Grid is without doubt a transformative technology that will change the way consumers deal with energy suppliers over the next ten years or so. At the heart of the Smart Grid is the smart meter, which extends all the way back to the electric utility on one side and all the electric appliances throughout the home on the other. There will come a day when appliances will be imbued with “smarts” so that each can talk, to the smart meter and then to the electric utility.

But getting from here to there demands a great deal of engineering savvy. In this Smart Grid Roundtable, presented by Electronic Design, two of the leading companies in the Smart Grid space, Microchip and Freescale answer questions from a leading authority on the Smart Grid, Electronic Design’s power editor, Don Tuite, about all facets of the Smart Grid and where the U.S. and most other countries around the globe are headed in the near future.

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Register online at: https://www.badgeguys.com/reg/2012/apec/register.aspx

ESC (The Embedded Systems Conference) is the global electronics industry's leading event. With cutting edge product demonstrations, visionary speeches and hundreds of essential technical training classes and accreditation opportunities, ESC is the ideal venue for the design engineering community to learn, collaborate and recognize excellence. In addition, ESC Silicon Valley celebrates decades of unique local electronics industry culture, innovation and significant contributions to the global technology industry.

Register online at: http://www.ubmdesign.com/esc/conference

Join Microchip's Patrick Heath, Senior Manager, Strategic Marketing, as he presents "New Motor Controllers Lead the Way With Analog Circuit Integration". Implementing sensorless motor-control algorithms requires measuring the phase currents from a three-phase motor. Currently, this is accomplished using shunt resistors and operational amplifiers (op amps) in circuits that are external to the Digital Signal Controller (DSC) or microcontroller (MCU) that is running the sensorless motor-control algorithms. Analog circuits such as op amps and analog comparators are now often integrated onto the DSC or MCU. This presentation will survey op-amp integration, and investigate the resultant motor-control-system cost impact and tradeoffs, along with other integration choices, such as integrated power modules.

Register online at: http://www.e-driveonline.com

Register for one or more of these great events at the links above!
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?**

Visit our Technical Documentation page at [www.microchip.com](http://www.microchip.com) to view the documents.

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