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In today’s B2C world, consumers expect the e-commerce sites they visit to be easy to use and flexible enough to support a variety of mobile devices. The increasing number of customers who buy semiconductors via mobile, tablet and gaming console devices shows how comfortable users are becoming at making semiconductor purchases through their non-desktop devices.

Recognizing that this expectation exists, and leading the way in the semiconductor purchasing process, we have recently launched our new, mobile-optimized microchipDIRECT e-commerce website. This new website provides an improved user experience on desktop as well as mobile devices. microchipDIRECT offers a B2C-like experience that allows you to check product stock quantities, see pricing, track orders or download a datasheet directly from your mobile device.

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Take Your Embedded Project to the Next Level with MikroElektronika click boards™ and MPLAB® Code Configurator

Add a Whole New Dimension of Easy to Your Software Development

Get ready for great new way to bring your innovative ideas to life. We have just launched an initiative to provide support for MikroElektronika click boards within MPLAB Code Configurator, our award-winning and free graphical configuration and code generation tool for PIC® microcontrollers (MCUs). The addition of quick-start libraries for click boards into MCC allows you to easily incorporate sensing, control or communication functionality into your prototype design without the stress and hassle of low-level code development and validation.

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A Wealth of click boards

The click board ecosystem, currently consisting of over 250 boards, is based on MikroElektronika’s open and popular mikroBUS™ standard. When placed on a development board, the mikroBUS socket offers a high level of system expandability and flexibility. Our popular Curiosity, MPLAB Xpress, Explorer and PICDEM™ Lab development boards for 8-, 16- and 32-bit PIC MCUs all include mikroBUS sockets, making it easy to add sensors, wireless modules and other capabilities to your design.

There are plenty of options to help boost your creativity as you develop solutions for the Internet of Things and other applications. You can add Wi-Fi®, Bluetooth®, LoRa® and other wireless connectivity, or CAN, Ethernet, USB and other interfaces. There are sensor click boards that measure acceleration, temperature, light, altitude and more. Develop interactive human interfaces that use buttons, touchpads and joysticks. There are click boards for many other functions like power management, motor control, displays and mixed-signal applications. The possibilities are virtually endless. Visit the click boards page on MikroElektronika’s website to spark your imagination.

About MPLAB Code Configurator

MPLAB Code Configurator (MCC) is a software plug-in for MPLAB X Integrated Development Environment (IDE) and the cloud-based MPLAB Xpress IDE. Developed for novice to expert users alike, MCC features an intuitive graphical interface that enables and configures a rich set of peripherals and functions specific to your application. With just a few mouse clicks, it generates easily modifiable, production-ready application C code for many 8-, 16- and 32-bit PIC MCUs. This allows you to add functionality to your design without the need to write any code.

50 Clicks in 50 Days

In early March, Microchip began incorporating new click board modules into the quick-start software libraries in MCC, with the goal of adding support for 50 clicks in 50 days. To introduce this exciting project, we launched an online “50 Clicks in 50 Days” campaign that offered weekly video overviews on featured click boards, tutorial videos, several Facebook Livestream events and the opportunity for participants to win free click boards. Although this campaign is currently winding down, the resources will remain available online to assist you with developing your projects.

We’re not anywhere near done with this project. Over the coming months, we will continue to add support for yet more click boards within MCC, giving you even more options for inspiration and innovation.

How to Get Started

When you are ready to begin your design, the first thing you need to do is select the right Microchip development board with a mikroBUS connector to suit your requirements. If you don’t already have one of these boards, a Curiosity HPC Development Board (DM164136) or a MPLAB Xpress Evaluation Board (DM164140) provides a great starting point.

You will then need to get MCC, which is available inside both the free, downloadable MPLAB X IDE and the cloud-based MPLAB Xpress IDE. No matter which option you choose, you get the same great ease of use and capability. Download the MCC Click Library and then follow the instructions to add click board support to MCC. Select your click board(s) and our brief tutorials will walk you through the steps required to use the library corresponding to the click board(s) you have chosen.

Now, all sorts of solutions are just a click away. Pick out your development board, select your click boards and have fun!

Want More Information?

Visit the website at: www.microchip.com/50in50
Very Versatile

Latest 8-bit PIC® MCU Family Brings Ease of Design with More Core Independent Peripherals

Applications well-suited for 8-bit microcontrollers (MCUs) are continuing to emerge. Over the years, Microchip has developed a large base of PIC MCU users who have looked to our diverse portfolio of products to help solve their design challenges. In response to requests for additional features and peripherals, including the need for flexibility in memory size and package options, we have recently introduced the PIC16F15386 family, the most powerful launching point into our 8-bit PIC MCU portfolio.

With their high level of Core Independent Peripheral (CIP) integration, devices in the PIC16F15386 family are able to perform system functions (signal generation, motor control, safety monitoring, system communications and human interface) outside the core while consuming as little power as possible. This family also includes a high-accuracy 32 MHz internal oscillator and memory features like Memory Access Partition (MAP) with bootloader-friendly write protection to prevent accidental over-write. Device Information Area (DIA) offers protected storage for unique device identification and calibration values.

This scalable family offers up to 28 KB Flash and 2 KB RAM in 8- to 48-pin package options. It is the first 8-bit PIC MCU family to offer the 48-pin package, adding more Analog-to-Digital Converter (ADC) channels and I/Os. The new MCUs also contain power management features (IDLE and DOZE modes and Peripheral Module Disable) that allow you to optimize the balance between power consumption and performance. All these features make these cost-effective devices suitable for a broad range of general-purpose and low-power applications.

Development Support

The PIC16F15386 is supported by a family-specific MPLAB® Xpress series development board, as well as the Curiosity HPC (DM164136) and the Curiosity (DM164137) Development Boards. Speed up your development with the cloud-based MPLAB Xpress Integrated Development Environment (IDE) along with MPLAB Code Configurator (MCC).

The PIC16F15386 family includes 13 unique products that are offered in PDIP, SOIC, DFN, UDFN, UQFN and SSOP packages. All products can be ordered from microchipDIRECT or from Microchip’s worldwide distribution network.

Want More Information?

Visit the website at: www.microchip.com/153XXLaunch
Zero Down Time

New Additions to dsPIC33EP128GS808 Family of Live Updateable Controllers for Digital Power Now Available

These devices offer high-resolution pulse width modulators optimized for digital power applications. In addition, they include advanced analog features and peripherals. There are five separate high-speed 12-bit Analog-to-Digital Converter (ADC) modules, each with 300 ns conversion latency. Up to 22 input channels are shared across these five ADC units. There are also four analog comparators, each with its own dedicated 12-bit reference Digital-to-Analog Converter (DAC), and two programmable gain amplifiers to reduce external component count.

Some devices in the dsPIC33EP128GS808 family are offered in an 80-pin package for increased memory and more interface pins.

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Select new variants in this family of dsPIC® DSCs are offered in an 80-pin package, giving you increased memory and more interface pins to fulfill the requirements of your more sophisticated designs.

Development Support
The family is supported by our free Digital Compensator Design Tool (DCDT), advanced SMPS libraries, evaluation platforms and reference designs, which all help accelerate the overall process of designing your digital power supply. The dsPIC33EP128GS808 family is also supported by MPLAB® X Integrated Development Environment (IDE) and MPLAB XC16 Compiler.

The dsPIC33EP128GS808 family is available in a variety of package options including TQFP, QFN and SOIC with 28-, 44-, 48-, 64-, and 80-pin variants. All 14 devices are available today and can be ordered from microchipDIRECT or from Microchip’s worldwide distribution network.

Want More Information?
Visit the website at: www.microchip.com/dsPIC33EP128GS808

Atmel Products Available on microchipDIRECT
› Get AVR®, SAM MCUs and development tools DIRECT from the manufacturer for the first time
› Large-volume pricing, scheduled orders, credit lines and more

Light Up the Future
Microchip Defines Quality, Healthy Lighting with Energy-Saving LED Driver Products
Do More with Less

PIC18 “K42” Family Offers More Memory Along with Versatile Array of Core Independent Peripherals

Features DMA and Vectored Interrupts for Improved System Performance with Less Code

If you thought that 8-bit microcontrollers (MCUs) couldn’t keep up with today’s increasingly complex designs, then you might want to reconsider and check out the new PIC18F “K42” product family. Offering up to 128 KB Flash and 8 KB RAM, the PIC18F “K42” family features the largest total memory of any 8-bit PIC® MCU. Devices in this family combine an extensive array of Core Independent Peripherals (CIPs) and Intelligent Analog features, as well as on-chip Direct Memory Access (DMA) and vectored interrupts for fast processing. Given their large memory and high performance, they are ideal for extensive range of applications and markets, including automotive, industrial control, Internet of Things (IoT), medical and white goods.

The PIC18F “K42” family also provides a full suite of CIPs for safety critical applications—Cyclic Redundancy Check with Memory Scan, Windowed Watchdog Timer, 24-bit Signal Measurement Timer, Hardware Limit Timer, and Complementary Waveform Generation—plus up to eight hardware PWMs and multiple communications interfaces.

These MCUs also offer a 12-bit ADC with computation, which automates analog signal analysis for real-time system response. Other features include Configurable Logic Cells, low-power modes (IDLE, DOZE and Peripheral Module Disable) to reduce power consumption, and improved serial communications including UART, DMX, DALI and LIN protocols along with higher-speed, standalone I²C and SPI.

The DMA controller enables data transfers between memory space and peripherals without Core Processing Unit (CPU) involvement, improving system performance and lowering power consumption. When interrupts are required, vectored interrupts provide faster response times with fixed latency reducing software overhead.

Development Support

These new MCUs are supported by the Curiosity HPC Development Board (DM164136). Code development is simplified using MPLAB® Code Configurator (MCC) along with MPLAB X or MPLAB Xpress Integrated Development Environments (IDEs).

Devices in the PIC18F “K42” family range from 16–128 KB of Flash memory and can be ordered from microchipDIRECT or from Microchip’s worldwide distribution network.

Want More Information?

Visit the website at: www.microchip.com/K42
Secure Your World

CEC1702 Hardware Cryptography-Enabled Microcontroller Streamlines Security Implementation

Simplifies Development of Smart, Connected and Secure Solutions

In today’s vast interconnected world, security threats are increasing exponentially in terms of frequency, targeted devices, malignancy and costs of attacks. The acceleration of the Internet of Things (IoT) has brought higher visibility to the security considerations that today’s designers face. To stay one step ahead of the criminal element and prevent theft of software and/or hardware, intellectual property and data, or communications services, developers need to provide robust, connected and secure systems.

One of the hardest security challenges to solve in a connected system is the ability to ensure that the boot code has not been compromised. The new CEC1702, a full-featured ARM® Cortex®-M4-based microcontroller (MCU) with a complete hardware cryptography-enabled solution in a single package, addresses the increasing need for security measures, such as secure boot, driven by the substantial growth of IoT applications.

This low-power, but powerful, 32-bit MCU offers easy-to-use encryption, authentication, private and public key capabilities and allows custom programming flexibility to minimize your risk. The CEC1702 also provides significant performance improvements when compared to firmware-based solutions. The device’s hardware cryptographic cipher suite reduces compute time by orders of magnitude over software solutions. For example, its performance is 20 to 50 times better for PKE acceleration and 100 times better for encryption/decryption. This robust hardware-based feature set results in applications that can run security measures quickly, effectively and with significantly lower cost and power consumption.

Protecting system integrity has never been more important. Whether it’s being used as a security coprocessor or a stand-alone microcontroller, the CEC1702 delivers a multi-dimensional defense against attacks, including:

- Pre-boot authentication of system firmware: Providing an immutable identity and a root of trust to ensure that the firmware is untouched and hasn’t been corrupted
- Firmware update authentication: Verifying that the firmware update has not been corrupted and is from a trusted source
- Authentication of system-critical commands: Attesting that any system-critical command is from a known source with authorization to make the given change, preventing potentially devastating actions
- Protection of secrets with encryption: Safeguarding code and data to prevent theft or malicious activities

(continued on page 11)
Development Support

A complete set of hardware and software tools is available to help you get started with adding authentication and encryption to your connected designs using the CEC1702. Peripheral libraries and crypto Application Program Interfaces (APIs) are also offered to speed up design cycles. The CEC1702 is also featured on two compact development boards from MikroElektronika: the CEC1702 Clicker and the Clicker 2 for CEC1702.

The CEC1702 comes in an 84-pin WFBGA package and can be ordered from microchipDIRECT or from Microchip’s worldwide distribution network.

Want More Information?
Visit the website at:
www.microchip.com/promo/CEC1702
NEW PRODUCTS

Mini But Mighty

Three New tinyAVR® Devices Added to Microchip’s AVR® Microcontroller Portfolio

R

einforcing our commitment to continue the AVR microcontroller (MCU) family, we have expanded our 8-bit product portfolio by adding three new devices to the tinyAVR MCU family. The new ATtiny1617 series of MCUs increases the number of AVR devices that feature Core Independent Peripherals (CIPs), which help increase system throughput while lowering overall power consumption. These new devices extend the memory offering for these next-generation tinyAVR MCUs with new 16 KB Flash options, while remaining pin and code compatible with the recently released ATtiny817 series of devices.

These new MCUs offer 16 KB Flash, 256B EEPROM and 2 KB RAM in 14-, 20- and 24-pin packages. They contain key features of other tinyAVR MCUs including the Event System Controller, which allows peripherals to communicate without using the Central Processing Unit (CPU) and enables you to customize the configuration of the MCU for your specific application. The on-chip Peripheral Touch Controller (PTC) simplifies the development of capacitive touch systems. Other integrated features include a 20 MHz internal oscillator, high-speed serial communication with USART, SPI, and I²C, configurable custom logic blocks, a 10-bit Analog-to-Digital Converter (ADC) with internal voltage references, operating voltages ranging from 1.8V to 5.5V, and picoPower® technology for sleep currents as low as 100 nA.

Development and Support

The new devices are fully supported by Atmel Studio 7 Integrated Development Environment (IDE), the ATSTK600 Starter Kit and development system and Atmel START, a free online tool that enables the intuitive graphical configuration of peripherals and software for easy development.

The ATtiny1617 is available in a 24-pin QFN package and can be ordered from microchipDIRECT or from Microchip’s worldwide distribution network. Future devices in this family include the ATtiny1614 (14-pin SOIC) and the ATtiny1616 (20-pin QFN), which will be available for purchase at a future date.

Want More Information?

Visit the website at: www.microchip.com/1617Series

For building future applications, the new ATtiny1617 MCUs offer 16 KB Flash, 256B EEPROM and 2 KB RAM in 14-, 20- and 24-pin packages.
A Need For Speed

Comprehensive Portfolio of Advanced Gigabit Ethernet Products Offers Ease of Design

Applications requiring high-speed Ethernet connectivity are continually emerging, as the demand for streaming video, cloud-based services and social media interactions grows daily. Developing and deploying high-speed networks can be challenging. With the aim of reducing complexity and opening up new uses and applications, we recently announced a new compliance-tested portfolio of 48 Gigabit Ethernet chips that features advanced capabilities, comprehensive software support and copy-ready evaluation tools. These solutions offer ease of use and fast time to market for industrial, automotive and consumer applications.

This new suite of three families of products, known together as GigEpack, includes the industry’s first single-chip Gigabit Ethernet switches with integrated HSR/DLR redundancy for ultra-high reliability in critical manufacturing applications. Also included is the industry’s first automotive-grade USB 3.1 Gen 1 to Gigabit Ethernet bridge which supports Advanced Driver Assistance Systems (ADAS) and infotainment systems on a variety of physical network layers.

The new KSZ9477/9567/9897 switch family offers features that allow you to create ultra-reliable networks with HSR/DLR redundancy and transport audio and video with Audio/Video Bridging (AVB). The KSZ9567 switch, for example, has seven ports, an SGMII interface and also features EtherSynch® technology, providing support for real-time Ethernet, IEEE 1588 v2 precision time protocol (PTP), AVB, and Time Sensitive Networking (TSN). The new LAN7800/LAN7850/LAN7801 bridge family enables you to add Gigabit Ethernet to embedded processors via USB 3.1 Gen 1, USB 2.0 or High Speed Inter-Chip (HSIC) bridging to a variety of physical layers such as 1000Base-T, or 100Base-T1 and HDBaseT via RGMII. These products join our existing KSZ9031 family of Gigabit PHYs featuring automotive-grade robustness and low power consumption.

All GigEpack products are University of New Hampshire InterOperability Laboratory (UNH-IOL) compliance tested. They come with free software drivers that are certified or third-party approved for use with all major operating systems running on smartly engineered, copy-ready evaluation boards. They are also backed by our free LANCheck® online design service to review customer designs and ensure that best practices are used. Devices can be ordered today from microchipDIRECT or from Microchip’s worldwide distribution network.

Want More Information?

Visit the website at:

www.microchip.com/GigEpack
Fast and Flexible

MCP19215 Digitally Enhanced Power Analog Solution is Ideal for DC-DC Power Conversion

Offers Flexible Control for Applications Needing Variable Output Power Supplies and Dynamic Reconfiguration

Designers of complex power control applications need unique and reliable solutions that support a wide diversity of power management methods. Devices in our portfolio of Digitally Enhanced Power Analog (DEPA) controllers combine the power and performance of an analog-based controller with the flexibility of a digital interface. These products provide you with better options for analog power conversion applications that require digital communication or dynamic reconfiguration.

Our newest addition to this portfolio is the MCP19215 dual-channel, low-side PWM controller with an integrated 8-bit PIC® microcontroller (MCU). This single-chip solution controls DC-DC converters and is capable of accepting a high voltage input of up to 42V, while simultaneously regulating a wide output voltage range from 300 mV up to several hundred volts, depending on topology. It is ideal for industrial and automotive environments and is particularly well suited for battery charging and LED drive applications.

As a dual controller, the MCP19215 enables the simultaneous control of two flyback, SEPIC, boost and/or Ćuk circuits. The two circuits can even be different topologies. Alternatively, it can be configured to control one power train bidirectionally, maintaining voltage or current regulation in either direction through the power converter. This allows the circuit to dynamically switch between constant voltage and constant current operation, while also switching the direction of the power conversion. The benefits of this capability include the ability to use the same power supply to control both power in to and power out of a storage device—like a battery or a super-capacitor—while fuel gauging. In addition, it can switch automatically between sourcing and sinking power with a fast response time. This will maintain power on critical system voltage rails in a server or automation application, or conserve power in a renewable energy or automotive application.

The MCP19215 can be configured to control one power train bidirectionally.
All of the major performance parameters are completely configurable within the MCU core that is managing the analog control loops within the device. Current limit, operating frequency, fault responses, and over- and under-voltage lockouts can all be tailored to the application.

The MCP19215 also features low quiescent current sleep modes and the ability to survive load dump transient conditions, making it ideal for automotive applications. It can be programmed to shut down other loads and enter sleep mode, allowing direct connection to the battery with minimal power consumption when the engine is not running.

Using the configurable internal registers allows for a programmable operating frequency, with a programmable phase shift, to coordinate the two power conversions. This reduces electromagnetic radiation in the application, preventing interference problems.

Development Support
The MCP19215 is supported by Microchip’s comprehensive suite of programming and development tools including

**MPLAB® X Integrated Development Environment (IDE) and MPLAB XC8 Compiler.** The MCP19215 Dual Boost/SEPIC Evaluation Board (ADM00799), controlled with an accompanying graphical user interface, demonstrates how the MCP19215 operates in boost and SEPIC topologies and offers power conversion examples which can easily be adapted for your application’s requirements.

The MCP19215 is available in a 5 x 5 QFN package and can be ordered from **microchipDIRECT** or from **Microchip’s worldwide distribution network.**

Want More Information?
Visit the website at: [www.microchip.com/MCP19215](http://www.microchip.com/MCP19215)
Hi-Rel Qualified or Space-Grade MCU Reduces Recurring Costs, Improves Time to Market

Developers of electronics for use in the space industry face some unique challenges in creating systems that are intended for use in high-altitude flight or missions to outer space. Most space applications are for Low Earth Orbit (LEO) missions, where radiation levels are lower than those encountered with Geostationary Orbit (GEO) and Medium Earth Orbit (MEO) missions. However, to minimize the possibility of damage or malfunction due to radiation, designers still need solutions that can be scaled to meet the requirements of the target mission, application and environment. Space equipment manufacturers are looking for cost-effective solutions that limit the maximum development investment in order to reduce risk, costs and time to market.

Designers of applications intended for use in other aerospace markets, like avionics, are also concerned with the effects of radiation, especially the damage that might be caused by neutrons. These critical missions require more robust solutions that are qualified for an extended temperature range from −55°C to 125°C and that are supported by a long-term supply chain.

Microchip’s new Radiation Tolerant—known as Rad Tolerant—ATmegaS128 microcontroller (MCU) was developed to meet all these market requirements. It can be used for a range of satellite and other space applications including platform and payload data storage, Remote Terminal Units (RTUs), propulsion system control, robotics, motor control, On Board Computers (OBCs) for nano-satellites and in a variety of sensor and instrumentation functions. It can also be used for external actuators or critical instrument applications in avionics designs, as well as in civil and military equipment.

The ATmegaS128 can be used for a range of satellite and other space applications including platform and payload data storage.

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Derived from the commercial ATmega128, the ATmegaS128 is a high-performance, low-power 8-bit AVR® MCU. It reuses the full metal mask set of the ATmega128 while offering epitaxial improvements to make it immune to latch-up when exposed to ionizing radiation. Since this modification does not affect the ATmegaS128’s functionality, it is fully compatible with our ecosystem of development tools and evaluation boards that is offered for the commercial version of this device.

Key Features
- Advanced RISC architecture – up to 8 MIPS
- On-chip 2-cycle multiplier
- Operating voltage of 3V–3.6V; 0–8 MHz
- High-endurance nonvolatile memory
  - 128 KB of Flash program memory
  - 4 KB EEPROM
  - 4 KB internal SRAM
  - Up to 64 KB of external SRAM
- Dual programmable serial USARThs
- Master/slave SPI serial interface
- On-chip analog comparator
- Six PWM channels
- Up to 53 programmable I/O lines
- Two 8-bit timers and two 16-bit timers
- 8-channel, 10-bit ADC
  - Eight single-ended channels
  - Seven differential channels
  - Two differential channels with programmable gain
- Programmable watchdog timer
- External and internal interrupt sources
- Internal RC oscillator
- Power-on reset and programmable brown-out detection
- Six different sleep modes

Preliminary Radiation Performance
- Total ionizing dose: up to 30 krad (Si)
- Single event latch-up LET > 62.5 MeV/mg/cm²
- Single event upset LET > 3 MeV/mg/cm²
- SEU 10-3 to 10-1 error/device/day

Following the same quality requirements that have been established for Microchip’s other space-grade devices, this Rad Tolerant MCU offers full wafer lot traceability, space screening and a space qualification flow that complies with MIL-PRF-38535 and MIL-STD-883 standards and QML-Q and QML-V level fabrication processes. It comes in a 64-lead ceramic hermetic package (CQFP64) for improved radiation performance, but is also available in a 64-lead non-hermetic, plastic version (TQFP64) for general aerospace and other applications.

Development Support

The ATSTK600 Starter Kit (ATSTK600), routing board (ATSTK600-RC09) and the socket board (ATmegaS128-ZC-EK) can be used for developing projects based on the ATmegaS128. The ATSKT600’s advanced features for prototyping and testing new designs provide a quick way to get started with your code development. The ATmegaS128 is also supported by Atmel Studio Integrated Development Environment (IDE) and the Atmel-ICE (ATATMEL-ICE) debugger/programmer.

For more information about the ATmegaS128, please contact your local Microchip sales office. To learn more about Microchip’s solutions for aerospace and space applications, visit our Rad Hard Design Center.
Going Green

Microchip Unveils Industry’s First ‘zigbee® PRO with Green Power Certified Platform’

Based on the IEEE 802.15.4 specification, the wireless zigbee protocol was developed to allow embedded products to interconnect via a low-power radio for command and control operations. Designed for large networks that may be comprised of hundreds of nodes, the zigbee PRO stack offers the lowest power characteristics, allowing for products powered by energy harvesting techniques.

As a member of the zigbee alliance, Microchip offers solutions that will help you develop zigbee-compliant products and ensure their interoperability with the zigbee industry standard. Therefore, we are proud to be the first silicon manufacturer to offer a zigbee alliance certified platform with zigbee PRO and Green Power features (formerly known as zigbee 3.0). Featuring greater interoperability and lower latency than ever before, this software stack and the corresponding BitCloud 4.0 Software Development Kit (SDK) are ideal for the design of home automation, commercial lighting, and Internet of Things (IoT) applications.

This zigbee certified solution enables cross-functional device support and will be backward-compatible with existing zigbee certified products for seamless interoperability. Along with the zigbee PRO (2015) feature set, this solution offers low latency suitable for RF remote applications, mesh networking for large networks such as lighting applications and the Green Power benefits of an energy harvesting switch.

The zigbee PRO Green Power feature, making its debut on the new certified software stack, enables battery-less devices to securely join a network while leveraging eco-friendly energy sources such as light, vibration or motion. Additionally, zigbee Light Link and zigbee Home Automation device types can be fully supported. Our hardware and SDK provide best-in-class functionality for a wide range of applications from large-scale commercial lighting to ultra-low-power battery-less devices.

Development Support

To assist you with bringing your zigbee design to market faster, the BitCloud 4.0 SDK enables application development on the SAM R21 Xplained Pro Evaluation Kit (ATSAMR21-XPRO), which features a Cortex® M0+-based 32-bit microcontroller with an integrated 2.4 GHz 802.15.4 compliant radio. The SAM R21 zigbee Light Link Evaluation Kit (ATSAMR21ZLL-EK) is also available.

Ready to get started? First, contact your local Microchip sales representative or one of our Wireless Design Partners to learn how to access the BitCloud 4.0 SDK. Next, order your evaluation kit from microchipDIRECT or from Microchip’s worldwide distribution network. Then, use your creativity to develop amazing zigbee connected applications!
Game Changer
Introducing an Advanced Motor Control Tool with Auto Tuning and Self-Commissioning Capability

motorBench™ Development Suite Available Now with Initial Board and Motor

The motorBench Development Suite currently supports the dsPICDEM™ MCLV-2 Development Board (DM330021-2) with a dsPIC33EP256MC506 External Op Amp Motor Control Plug-in-Module (MA330031-2) and a 24V 3-phase Brushless DC Motor with Encoder (AC300022). You can purchase these tools today from microchipDIRECT or from Microchip’s worldwide distribution network. Additional development boards, including customer-designed boards, will be included in future releases of the software.

Want More Information?
Visit the website at: www.microchip.com/motorbench

This free software plug-in collects all the information relevant to the motor control system and automatically tunes the control algorithm gains. The software then uses this information to generate MPLAB X IDE project code ready to run on the dsPIC33EP family of Digital Signal Controllers (DSCs). The generated code can then be reviewed and edited as needed and flashed as motor control firmware.

Developing solutions that use Permanent Magnet Synchronous Motors (PMSM) can be challenging. Even skilled designers can find tuning the control loops for speed and torque to get the motor spinning reliably to be a time consuming and complicated process. Our new motorBench Development Suite is just the start of what we believe will be a true game changer for implementing motor control designs.

The motorBench Development Suite is an advanced motor control software plug-in for MPLAB® X Integrated Development Environment (IDE) with auto tuning and self-commissioning capability. It is a Graphical User Interface (GUI)-based tool with automatic tuning of feedback control gains and offline accurate measurement of critical motor parameters such as resistance, inductances and the back Electromagnetic Force (EMF) constant.

The free software plug-in automatically tunes the control algorithm gains.
Plug and Play
MPLAB® XC Compiler Licensing Just Got More Flexible

Unlock the Potential and Performance of Optimizations for PIC® Microcontroller Families

Our award-winning line of MPLAB XC Compilers, used in conjunction with MPLAB X Integrated Development Environment (IDE), offers a comprehensive solution for developing software for projects that use our 8-, 16- and 32-bit PIC microcontrollers (MCUs) and 16-bit dsPIC® Digital Signal Controllers (DSCs).

Our newly released MPLAB XC PRO C Compiler Dongle License unlocks the full potential and performance of all possible optimizations of our MPLAB XC C compilers, allowing you to reduce your code size or get better speed from your project’s software. This highly portable solution is not tied to a PC, workstation or a network and is interchangeable among users. You just plug it into the USB port on your workstation or device and go. One dongle license is needed for each compiler type.

Compiler License Types
- **MPLAB XC8 Compiler PRO Dongle License** (SW006021-DGL)
- **MPLAB XC16 Compiler PRO Dongle License** (SW06022-DGL)
- **MPLAB XC32/XC32++ Compiler PRO Dongle License** (SW006023-DGL)

Features
- License file is installed on a USB device
- Intended for multiple users and mobile use
- Includes unlimited updates to new compiler versions without the need for a High Priority Access (HPA) license
- Replaceable for a fee with registration in the user’s mySoftware account

Note: This compiler license can only be used with the following versions of MPLAB X IDE and MPLAB XC C Compilers:
- MPLAB X IDE version 3.55 or later
- MPLAB XC8 C Compiler version 1.41 or later
- MPLAB XC16 version 1.31 or later
- MPLAB XC32 version 1.43 or later

Visit the [MPLAB XC Compilers](#) page on our website to find helpful information and download documentation to help you get started.

The MPLAB® XC Compiler License is fully installed on a USB drive, so you can take it with you anywhere.
Visit Microchip’s One-Stop-Shop for Developing Graphical User Interfaces Based on 32-bit Microcontrollers

Are you ready to add an interactive graphical user interface (GUI) to your new product? Microchip offers a broad portfolio of 32-bit microcontrollers (MCUs) that enable you to add feature-rich and aesthetically pleasing GUIs to your design. Our comprehensive software and hardware and software solutions include our Visual Design Tools, a free graphics library, low-cost and full-featured development tools, documentation and application notes and videos and training resources.

To help you get started, our online Graphics Guided Selection Tool walks you through the process of selecting the best combination of solutions to meet your specific design requirements. Developed to accommodate the needs of beginners through experienced designers, this resource will help you learn about graphics applications and jump start your development using our 32-bit MCUs and the supporting software and hardware tools.

The “Basic Concepts” section provides an interactive key to help beginners understand the basic components that are required to build a graphics subsystem. You can use the “GFX Advisor” to select the display resolution and display driver options that will help you zero in on the right 32-bit MCU for your application. You can then click on the “32-bit MCUs” link to find the detailed specifications on your selected device.

The next step is to review the “Development Tools” section to find the right solution to help you develop your concept and look through the “Application Demos” to find software that will speed your application development. Finally, in the “Resources” section, you’ll find a list of helpful documentation and training resources for learning more about implementing graphics in your embedded design.

We hope you find this new tool an easy and user-friendly way to start on your path to developing attractive and compelling user interfaces for your next design. Be sure to also visit the other resources in our Graphics Design Center to learn more about our easy and cost-effective solutions for graphics displays.
Where Are You?

Smart Building Demand Smarter Sensors

Contributed by Novelda AS

It’s a fact. Existing occupancy sensor technology is not capable of supporting the intelligent buildings of the future and the increasing demands for greater energy efficiency. However, a solution that integrates a new breed of Ultra Wide Band (UWB) radar transceiver with the right choice of microcontroller (MCU) is now available to deliver the performance that the latest presence monitoring applications require.

Novelda’s XeThru X4 impulse radar transceiver, combined with Microchip’s high-performance ATSAMS70Q20 32-bit MCU, lies at the heart of a radical new presence sensor module that is ready for deployment today. It tackles all of the technical limitations of existing Passive Infrared (PIR), ultrasonic, acoustic, video and microwave solutions and is perfectly optimized for presence and even respiration sensing.

The Limitations of Old Sensor Technology

Passive Infrared (PIR)
For security applications, there’s no doubt that PIR sensors do a good job of detecting presence. They are designed to detect human (heat) movement. Since an intruder is likely to oblige in this area, they work just fine for some types of applications. However they fall short for detecting the presence of somebody who is mostly stationary, for example, when someone is sitting and watching TV or perhaps working at a desk.

To maximize building energy efficiency and to help reduce the carbon footprint, occupancy sensors need to be able to provide more detailed information—such as the number of people and their exact locations even when they aren’t moving—to automatically control lighting, heating and air conditioning. Some advances have been made over time. PIR makers have added mini receptors and lenses to mitigate false tripping, but sensitivity still remains a major issue in building automation applications. PIRs also require a direct line of sight to the target. While multiple switching zones help, they don’t eradicate this shortcoming.

Ultrasonic
Working on the sonar principle, ultrasonic sensors flood a building space with high-frequency sound and look for a disturbance in the reflected sound pattern caused by occupancy. This technology effectively manages obstacles, however, its failure to separate human from non-human sound and to ignore sound from an area outside of the monitored space is a disadvantage and causes false tripping.

Sensitivity adjustments can help to mitigate this problem but they will also reduce the coverage area or reach. Furthermore, the constant emission of high-intensity ultrasonic frequencies runs the risk of interfering with sensitive office equipment and even hearing aids.

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Audio
Since they don’t transmit sound waves into a room space, audio- or microphone-based sensors don’t cause interference. They handle obstacles, detect different kinds of human occupancy sounds and can filter out regular background noises of the building environment. Sensitivity however is still rather limited and false triggering can occur.

Video
For healthcare applications and monitoring the elderly, video-based sensing has its merits. It is effective in providing the ability to check on a patient’s safety and location. However, many people consider video surveillance to be intrusive and unacceptable in the majority of building automation applications.

Radar
Radar-based sensors have also long been used to detect building occupancy. Low-power microwave transceivers have hit price points that make them viable options for smart building applications. Compared to the other solutions, they offer far more advanced sensing capabilities.

Historically, microwave solutions have used Continuous-Wave (CW) Doppler ultrasound, where known frequency CW radio energy is transmitted and bounced back to the receiver from reflecting objects. Broadcasting continuously, the transmitter maximizes power on a target.

CW implementations in occupancy sensing, however, have primarily been all-analog in design and are rather limited in their usefulness. Their drawbacks include a lack of distance information, the inability to differentiate objects at different distances and the inability to differentiate objects based on movement patterns (frequency content). They also present a power/range trade off.

Impulse Radar Technology for a Brave New World
Novelda’s XeThru X4M300 presence sensor module has been developed to address the weaknesses of existing occupancy sensor technologies and to deliver the wealth of data that is needed for effective, energy-saving building automation applications.

The module has been built around Novelda’s new X4 System on a Chip (SoC), a UWB impulse radar transceiver delivering sub-mm sensing accuracy at distances up to 10 meters, and

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Figure 1: The XeThru X4 Single-Chip UWB Impulse Radar Transceiver
with a total reach of up to 30 meters. A block diagram of the X4’s principal device components is shown in Figure 1.

Operating at sub 10 GHz, the sensor can effectively “see through” obstacles. It employs bi-phase coding on transmitted pulses for spectrum spreading, while its ultra-high spatial resolution facilitates simultaneous multi-object tracking.

The X4M300 module, shown in Figure 2, integrates all the components required by commercial occupancy sensing products, including home security, lighting and HVAC control and elderly monitoring. It incorporates the X4 SoC, PCB antennas, the ATSAMS70Q20 MCU, glue logic, PSU, USB interface, GPIO and LED status indicators.

**Invisibility**
The complete sensor module measures in at under 60 mm x 40 mm. Its small physical size, −40°C to +85°C operating temperature range and ability to see through obstacles combine to offer another key advantage over other sensor technologies. It can be installed out of sight within a wall, a ceiling void or cupboard space. For large, multi-sensor building applications, the aesthetic and architectural benefits are obvious.

**Efficiency**
Low-power operation was, of course, a prerequisite in designing the module for energy-saving building automation applications. While continuously sampling data, the X4 has a power consumption of 120 mW. With on-chip power management enabling automatic duty cycling, it can achieve far lower figures.

**High-Level Integration**
As illustrated in Figure 1, the X4 also boasts an incredibly high level of component integration housed in a 0.4 mm pitch 48-pin WLCSP. On the receive path, components include a low-noise amp, Digital-to-Analog Converter (DAC) and 1536 parallel digital integrators. On the transmit path, they include a pulse generator capable of producing pulses at a rate up to 60.75 MHz, a system controller and the power and clock management unit.

**Microcontroller Matching**
In selecting a microcontroller to partner with the X4 radar transceiver in the X4M300 sensor module design, Novelda’s aim was to identify a companion device that would not compromise any of the X4’s unique performance attributes. It needed to match up with the X4 in terms of processing power and data throughput, low-power performance and package integration. The ATSAMS70Q20 Flash MCU provided the overall performance that Novelda required.

Based on the high-performance 32-bit ARM® Cortex®-M7 processor and integrated floating point unit and operating at speeds of 300 MHz, the ATSAMS70Q20 provides the X4 with the fast data processing and throughput it needs to ensure immediate, high-fidelity occupancy sensing. Fast Fourier transforms are also not a problem. The microcontroller’s 1 MB of embedded Flash memory and 384 KB of multi-port SDRAM were also more than sufficient for the application. Additionally, the ability to assign 256 KB of the SRAM as tightly coupled data and instruction memory accommodated the necessary higher data throughput.

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In terms of connectivity and interfacing, the ATSAMS70Q20’s quad SPI connects directly to the X4 radar transceiver, while its high-speed USB interface and integrated PHY provide a transparent connection to any building system host device.

Low-power operation is a given with the ARM processor. The core can be run at 1.2V and the DMA helps to offload significant CPU processing to achieve further energy savings. And, just like the X4 transceiver, a high level of integration and the smallest possible footprint are standard fare for the ATSAMS70Q20, which is available in 144-pin QFP and BGA package options.

Occupancy presence detection modules that are only capable of reliably sensing major human movement are of little use in the advanced, data-centric energy-saving building automation schemes that are evolving. Even the most minor human movements need to be taken into account, and the chances of any false triggering need to be eliminated. The blending of a state-of-the-art UWB impulse radar transceiver and an off-the-shelf 32-bit MCU provides all the capability and performance that these applications need.

To learn more about Novelda’s solutions for occupancy sensing and monitoring, visit [www.xethru.com](http://www.xethru.com).
Get Launched Event Features Hands-on Training, Expert Consultants and Presentations on Bringing Concepts to Production

On the first weekend in March, Microchip, Arduino® and Arrow Electronics joined together to create a unique event for entrepreneurs, called Get Launched SB! It was hosted by Impact Hub, a membership-based community located in beautiful Santa Barbara, California, that provides a collaborative work environment and event space for entrepreneurs, activists, creatives and professionals who are taking action to drive positive social and environmental change.

This was the inaugural event to introduce Microchip’s “Get Launched” initiative, which specializes in bringing hardware-based startup companies through the Maker-to-Market process, connecting them with technical assistance, distributors and other strategic partners to ensure a successful product launch.

The event, which was held on Friday evening and all day on Saturday, was a huge success. Hundreds of visitors were on hand to see and experience Microchip’s latest technology offerings. Members from the local hardware startup community exhibited their products and connected with Microchip’s engineering team. Representatives from the University of California San Diego’s Electrical and Computer Engineering (ECE) Department even drove four hours north to pitch their project-based curriculum.

Keynote speakers from across the industry offered valuable advice and encouragement to aspiring start-up founders. Topics ranged from scaling up a hardware company, to developing an...
IP strategy and filing for a patent, to implementing security for Internet of Things applications. Kathy Giori, Arduino’s vice president of operations, discussed how the Arduino platform is accelerating IoT growth and innovation. Attendees also learned about how to bring their hardware products from concept to prototype to production from Guy McCarthy, senior manager of third-party support at Microchip.

On Saturday, attendees were guided through hands-on workshops led by engineers from Arduino and Microchip. These trainers also provided one-on-one mentoring to help entrepreneurs overcome engineering design obstacles. Microchip’s Wizard of Make, Bob Martin, was on hand to talk about using the sketch import function in Atmel Studio 7 to debug Arduino projects, while Mamun Ahmed discussed how to develop applications based on the latest PIC® microcontrollers (MCUs) using MPLAB® Xpress Integrated Development Environment and MPLAB Code Configurator. Tenaya Hurst from Arduino discussed how to develop creative IoT projects using the Arduino UNO board, which is based on the ATmega328P MCU.

The Microchip team was extremely impressed by the sheer enthusiasm of the tech scene and the quality of support Impact Hub provides the Santa Barbara hardware development community. It is a fantastic space for the local community of entrepreneurs and innovators to collaborate, share startup ideas and get access to design resources supported by our Get Launched program.

Stay tuned for information about future Get Launched events that we are planning to hold in other locations during 2017 to help hardware startups successfully take their concepts to prototype to production.

Photo credit: Sarita Relis Photographer

Reinventing Pipelined Analog-to-Digital Converters
Lower Complexity, Power, Cost and Size
Microchip’s new portfolio of Gigabit Ethernet devices, the GigEpack, embodies advanced design techniques to ensure reliable operation under extreme conditions while stripping away complexity and advancing ease of use. To ensure fast time to market, the GigEpack provides these key elements: certified products, free drivers, copy-ready evaluation boards, and Microchip’s free LANCheck® design check service. Together, they ensure interoperability, rapid development and robust customer board design.

- Complete portfolio of Gigabit Ethernet switches, bridges and PHYs
- Advanced switch features like EtherSynch® technology (IEEE 1588v2, audio/video bridging), authentication and HSR/DLR network fault redundancy
- Fast USB 3.1 Gen1 (5 Gbps) to Gigabit Ethernet bridge with automotive support
- Available low-power Gigabit Ethernet transceiver (PHY) with industrial/automotive support

www.microchip.com/GigEpack