microSOLUTIONS JULY 2009

In This Issue...

New High-Performance Family of Low-Power 8-bit PIC® MCUs with nanoWatt XLP Technology

The high-performance, low-power **PIC18F13K22, PIC18LF13K22, PIC18F14K22 and PIC18LF14K22 (PIC18F1XK22)** microcontrollers are available in 20-pin packages and provide 1.8 to 5.5V operation, with up to 16 Kbytes Flash program memory. The devices feature **nanoWatt XLP Technology**, which enables extremely low sleep currents, as well as an enhanced peripheral set that includes support for **mTouch™ capacitive touch sensing**. This new family is well suited for a variety of general-purpose applications.

nanoWatt XLP Technology allows the PIC18LF1XK22 MCUs to operate longer using less power, or with fewer battery changes, by enabling sleep current of 34 nA, typical at 1.8V; Timer1 oscillator currents of 800 nA, typical at 1.8V, 32 kHz; and Watchdog Timer currents of 300 nA, typical at 1.8V. Most low-power applications require one or more of these features, and nanoWatt XLP Technology combines all of them into one device in the "LF" versions of the PIC18F1XK22 family.

Features provided by the PIC18F1XK22 MCUs include:

- 64 MHz precision internal oscillator, which lowers total system costs by reducing the number of external components needed for complete designs
- Master Synchronous Serial Port (MSSP) with SPI/I²C™ interface and address masking
- 12-channel, 10-bit Analog-to-Digital Converter (ADC)
- S/R-latch module that supports capacitive touch-sensing (up to 4 buttons)
- Enhanced Capture/Compare/Pulse-Width Modulation [PWM (ECCP)] with steering capabilities
- Dual rail-to-rail comparators
- Programmable Brown-out Reset (BOR)
- Low-power 1.8 to 5.5V operation, with full analog peripheral functionality
- Small package options, including 4 mm x 4 mm QFN

Microchip offers engineers a complete suite of standard development tools to design with the PIC18F1XK22 microcontrollers. It starts with the unified, feature-rich, user-friendly and free **MPLAB® IDE**, along with a selection of **MPLAB C** and **HI-TECH C® compilers**. The **MPLAB C and**

HI-TECH Lite editions are completely free, fully-functional compilers, with no time limitations. For applications with limited program space, the Standard and PRO editions offer denser code and improved performance. There is also a variety of debugging hardware, from the popular **PICkit™ 3 Debug Express** ($69.99), to the new In-Circuit Debugger, **MPLAB ICD 3** ($219.99), and the **MPLAB REAL ICE™ In-Circuit Emulator** ($495.00).

Pricing for the PIC18F1XK22 devices starts at $1.27 each, in 10,000-unit quantities. All of the devices are available in 20-pin PDIP, SSOP, SOIC and 4 mm x 4 mm QFN packages.

Samples are available at **http://sample.microchip.com**. Volume production quantities can be ordered today, at **http://www.microchipdirect.com** or authorized worldwide distributor.

Learn more about these products at http://www.microchip.com/XLP

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New PIC18F87J93 Direct-Drive LCD Microcontrollers Feature Enhanced Analog and Capacitive Touch-Sensing Peripheral

Three New Devices Are Ideal for Medical and Metering Applications!

The **PIC18F87J93** 8-bit direct **LCD**-drive MCUs feature up to 16 channels of 12-bit Analog-to-Digital Conversion (ADC), the **mTouch™** Charge Time Measurement Unit (CTMU) peripheral for capacitive touch sensing, and a hardware Real-Time Clock and Calendar (RTCC). With this enhanced analog functionality and rich peripheral set, the PIC18F87J93 family enables the highly precise measurements and sensors, as well as the high levels of integration that medical and metering applications require.

The 64- and 80-pin PIC18F87J93 MCUs have memory options ranging from 64 to 128 KB Flash program memory and 4 KB RAM, and are pin-out compatible with Microchip's entire LCD-drive MCU portfolio. The on-chip 12-bit ADC with up to 16 channels performs auto acquisition and works during sleep mode, enabling a low-power, reliable analog interface. The on-chip hardware RTCC also works in sleep mode, to enable real-time clock and calendar functions with low power consumption. Additionally, the mTouch CTMU peripheral enables the addition of capacitive touch-sensing user interfaces or precise time measurements, and lowers system costs. The LCD charge pump provides contrast control and maintains low-power ratings even with advanced feature sets.

Example metering applications for the PIC18F87J93 microcontrollers include electricity, flow, gas and water meters. Example medical applications include blood-pressure meters, patient-monitoring systems, infusion pumps and CPAP devices. The new devices are also are well suited for applications in the consumer (Internet-enabled appliances, white goods, game controllers and coffee machines); industrial (home-alarm/security-system keypads, thermostats, power meters, security panels, data logging and central AC communication controllers); and automotive markets (control panels and body electronics), among others. The MCUs complement Microchip's new 12-bit Quad MCP4728 Digital-to-Analog Converter (DAC).

To get started with the PIC18F87J93 family, customers can use the **PICDEM™ LCD 2 Demo Board** (part # DM163030, $125) in combination with the **PIC18F87J9X Plug-In Module** (part # MA180025, $25), which includes capacitive-touch buttons. Both are available today.

Additionally, the PIC18F87J93 family is supported by Microchip's standard development tool suite, including the free **MPLAB® IDE Integrated Development Environment**, the **MPLAB C Compiler for PIC18** and the **MPLAB ICD 3 In-Circuit Debugger** (part # DV164035). The MPLAB IDE now comes with the free Segmented Display GUI, which makes it easy to generate the code needed to drive LCD displays.

For additional design support, Microchip offers online **Utility Metering**, **Medical** and **LCD** Design Centers. These comprehensive Web sites provide a wide range of technical tools and resources that designers can use for metering, medical and LCD applications—all in one, easy-to-reach place.

Pricing for the four-member PIC18F87J93 family starts at $2.71 each, in 10,000-unit quantities. The PIC18F66J93 and PIC18F67J93 MCUs are available in a 64-pin TQFP package, while the PIC18F86J93 and PIC18F87J93 MCUs are available in an 80-pin TQFP package. Samples are available today at **http://sample.microchip.com**, and volume-production quantities can be purchased today.

Learn more about these products at http://www.microchip.com/PIC18F87J93

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Industry's First 12-bit DAC with Non-Volatile EEPROM

The **MCP4728 Digital-to-Analog Converter** (DAC) enables the DAC's configuration to be loaded automatically on start up. With this capability, plus its four-channel architecture and internal voltage reference, the MCP4728 DAC reduces design size and cost for a variety of battery-powered and power-constrained applications.

Non-volatile EEPROM provides designers the flexibility to program MCP4728 DAC input codes, configuration bits and I2C™ address bits to the EEPROM using I2C serial-interface commands. The result is that this data is held during power-off time, making the MCP4728 DAC's configuration and outputs available immediately after power-up. Additionally, each channel in the MCP4728 DAC can be individually shut down, thereby reducing power consumption to as low as 0.04 microamperes, which helps to extend battery life. Further, the on-chip precision output amplifier enables a rail-to-rail analog output, for utilization of the entire voltage range.

The MCP4728 DAC is appropriate for applications in the consumer (personal media players, digital cameras and GPS devices); medical (portable glucose meters, blood pressure and heart-rate monitors); industrial (handheld instruments, motor-control applications, and temperature and light control); appliance (washing machines and espresso machines); and automotive (LED lamps and alarm/security systems) markets. The DAC complements Microchip's PIC18F87J93 8-bit MCUs for medical and metering applications, also announced today.

MCP4728 Evaluation Board (Part # MCP4728EV)

The **MCP4728 Evaluation Board** (Part # MCP4728EV, $15) is available to help designers quickly evaluate the MCP4728 DAC in their applications. The board works with Microchip's popular **PICkit™ Serial Analyzer** (part # DV164122, $49.99), or independently with the customer's application board. It can be purchased today.

The MCP4728 DAC is available in a 10-pin MSOP. Samples are available now. The DAC can be purchased for $1.36 each in 10,000-unit quantities.

For additional information, visit http://www.microchip.com/MCP4728

Smoking Not Allowed

Posted by AnalogAdvocate @ www.AnalogTalk.com

Have you ever looked at the blinking light on your smoke detector at home wondering, how does that thing work, and why does it always go off when I'm cooking? For most home smoke detectors there are two basic types, photoelectric and ionization. What is the difference between the two? Why is one preferred over the other in some regions? I heard that the ionization smoke detectors have some radioactive material in them. What is worse, the fire or being constantly bombarded by the radiation from my smoke detector?

Photoelectric smoke detectors operate on a simple principle of detecting smoke particles in a small chamber. Infrared LEDs shine light into the chamber and is detected by a photo-detector. If smoke particles enter the chamber, some of the infrared light is scattered and reflected to the photo-detector. After a specified amount of light is detected (relative to a specified amount of smoke particles), then an alarm is sounded.

Ionization smoke detectors have a small amount of americium-241 (about 0.2 mg or 1/5000 of a gram) that ionize the air between two plates causing free electrons to move through an electric field. If smoke is introduced, then the number of free electrons is reduced. This causes a change in the voltage across the plates and then an alarm is sounded.

So what is the difference between the two types? Essentially there isn't much difference because both types of smoke detectors have to meet the same standards for smoke detection. However photoelectric detectors are typically better at detecting smoldering fires with more particles vs. ionization detectors which are better at gas type fires. In this case, ionization detectors would sound an alarm with my cooking before the photoelectric detector.

Are you in danger of radiation poison from ionization smoke detectors? No, you have more chance of getting radiation poisoning from standing outside in the sun. The small amount of material radiates such a small amount that there is no danger for close exposure to the smoke detector. However, some regions are concerned about the disposal of this material after the smoke detector has reached its end of life. That is why Europe typically favors photoelectric smoke detectors and the Americas and Asia typically favor ionization smoke detectors.

For additional information, visit http://analogtalk.com/?p=190

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Discover Our High-Precision Op Amp Portfolio with Gain Bandwidth Product (GBWP) from 10 kHz to 50 MHz

Three new families of low-power, high-precision operational amplifiers (op amps);has been recently added to Microchip's extensive offering of high precision Op Amps with Gain Bandwidth Product (GBWP). The **MCP6051/2/4 (MCP605X)**, **MCP6061/2/4 (MCP606X)** and **MCP6071/2/4 (MCP607X)** op amps feature offset voltages of just 150 microvolts and are well suited for applications requiring low power consumption, low-voltage operation and high precision, such as those in the industrial, medical, consumer and other markets.

Developed in response to market demands for op amps providing low power and lower offset voltages, the MCP605X/6X/7X op amps are trimmed in-package to enable their low offset voltage, which results in reduced error at high gains. The devices feature operating voltage from 1.8V to 6.0V, making them ideal for portable applications; and their rail-to-rail input and output provides greater dynamic range, even at lower operating voltages. Additionally, they are unity-gain stable and operate over the extended temperature range of – 40° to 125°C.

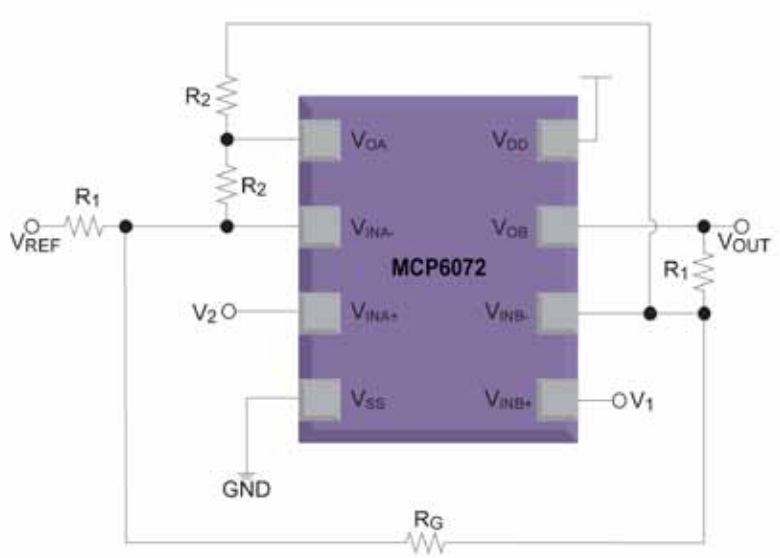
The MCP605X op amps have a GBWP of 385 kHz and a quiescent current of 30 microamperes. The MCP606X op amps have a GBWP of 730 kHz and a quiescent current of 60 microamperes. The MCP607X op amps have a GBWP of 1.2 MHz and a quiescent current of 110 microamperes.

All of the op amps are well suited for applications requiring low power consumption, low-voltage operation and high precision, such as portable instrumentation devices used in the industrial (portable gas detectors, pressure-monitoring devices, toll-booth tags, digital multimeters, RFID readers, bar-code scanners); medical (blood glucose meters, wearable heart-rate monitors and body-temperature measurement sensors); and consumer (gaming consoles, set-top boxes and portable audio players) markets.

PCB footprints and schematic symbols are expected to be available in August 2009 from Microchip's Web site at **http://www.microchip.com/CAD**.

The downloads will be available in a neutral format that can be exported to the leading EDA CAD/CAE design tools using the Ultra Librarian Reader from Accelerated Designs Incorporated.

Product	Package Option(s)	10,000-Unit Quantity Pricing
MCP6051	8-pin SOIC, 2 mm x 3 mm TDFN	$0.50
MCP6052	8-pin SOIC, 2 mm x 3 mm TDFN	$0.67
MCP6054	8-pin SOIC, TSSOP	$1.21
MCP6061	8-pin SOIC, 2 mm x 3 mm TDFN	$0.48
MCP6062	8-pin SOIC, 2 mm x 3 mm TDFN	$0.63
MCP6064	8-pin SOIC, 14-pin TSSOP	$1.18
MCP6071	8-pin SOIC, 2 mm x 3 mm TDFN	$0.46
MCP6072	8-pin SOIC, 2 mm x 3 mm TDFN	$0.62
MCP6074	8-pin SOIC, 14-pin TSSOP	$1.16



For additional information, visit http://www.microchip.com/OpAmps

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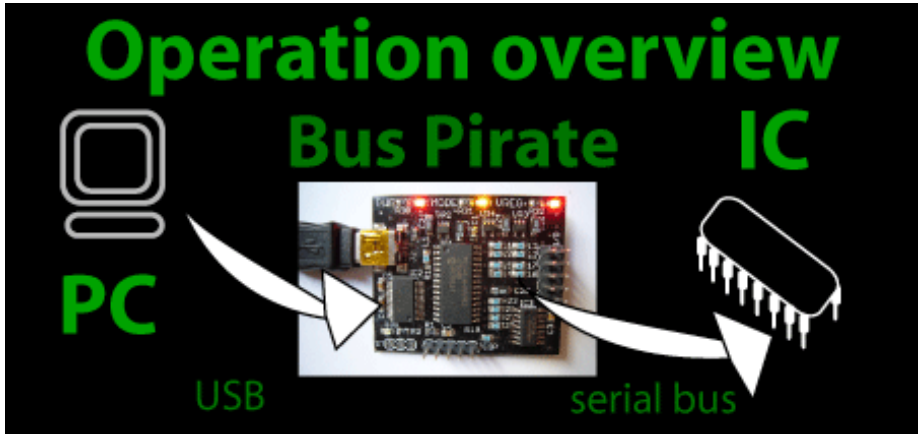
Blog-of-the-Month

HACK A DAY BETA

How To: The Bus Pirate v2 with USB

The bus pirate is a universal serial interface tool, we use it to test new chips without writing any code. It currently supports most serial protocols, including 1-wire® , I²C™, SPI, JTAG, asynchronous serial, midi, and more. We added some other features we frequently need, like pulse-width modulation, frequency measurement, voltage measurement, bus sniffers, pull-up resistors, and switchable 3.3V and 5V power supplies.

The new v2 family adds USB power and connectivity to the best bus pirate design yet. We also reduced the part count and cost wherever possible. If you want to get your hands on some bus pirate USB goodness, Seeed Studio has assembled hardware for $30 (including worldwide shipping).



The bus pirate connects to a PC USB port. the user send commands to the bus pirate from a serial terminal on the PC. Commands are translated to the bus protocols that control microchips. see our bus pirate page for full documentation.

The latest firmware supports 1-wire® , I²C™, SPI, JTAG, asynchronous serial, MIDI, and PC keyboards. Bit-wise 2- and 3-wire libraries can interface most proprietary serial protocols. More protocols are being added all the time, check out the source code on our Google code SVN page.

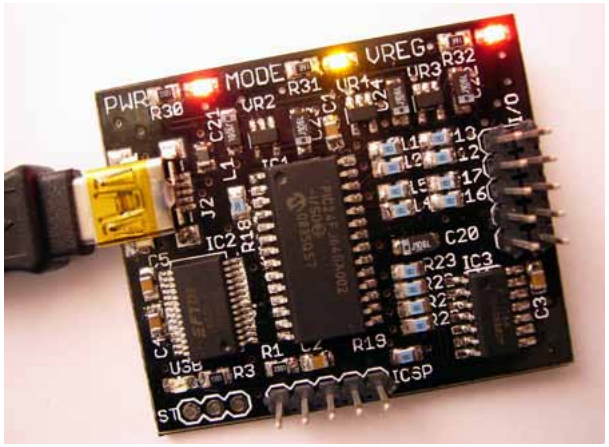
A Microchip PIC24F series microcontroller generates the user interface and translates input into bus communications. v2 uses the same **PIC24FJ64GA002** as the previous bus pirate versions. It's cheap, has a ton of memory, a couple 5V tolerant input pins, and the peripheral pin select feature lets us assign hardware modules anywhere we want.

The PIC® MCU (ic1) is powered by a 3.3V regulator (vr2, c23). each pic power pin gets a 0.1 µF bypass capacitor (c1,2). the internal 2.5V regulator requires a 10 µF tantalum capacitor (c20). the programming pins are brought to a five-pin header (ICSP™) on the edge of the PCB.

The bus pirate is powered from the USB 5V supply, which is first filtered with a ferrite bead (l1) and 10 µF tantalum capacitor (c21). We used the small, still-not-quite-common, USB Mini-B connector (j2).

To read the rest of this blog entry, visit
http://hackaday.com/2009/06/25/how-to-the-bus-pirate-v2-with-USB/

To pre-order the Bus Pirate v2go (assembled) from Hack a Day for $27.15, visit **http://www.seeedstudio.com/depot/preorder-2-bus-pirate-v2go-assembled-from-hack-a-day-p-416.html**. Assembled Bus Pirate V2go universal serial interface, constructed from files and firmware posted by Hack a Day. Programmed with latest firmware v0g.



The Bus Pirate has small components (0805, SSOP) and tight placement, this is an assembled board that doesn't require any advanced surface mount soldering.

The picture shows the Hack a Day hand-soldered prototype, the manufactured version may differ slightly in appearance. Like the Hack a Day prototype, the PCB is black, and serial header (ST) is unpopulated.

The Bus Pirate uses a USB mini-B connector. You can add a 0.8 meter USB cable to this order for $1.95.

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Featured Blog: www.Blog.NotesFromTheLab.com – a Human Interface Blog

Push button inputs on low power

Posted by Keith on May 7, 2009 in Uncategorized | Edit

In today's power-lean designs, the priority is to minimize current consumption without sacrificing performance, especially in the user interface where it would be most noticeable.

OK, so how do we minimize current while remaining responsive to the keyboard?
1. Reduce the clock frequency.
2. Put the part to sleep, basically set the clock to 0 Hz.
3. And minimize, or hopefully eliminate, any external current sinks.

Let's start with the reducing the clock, if we reduce the clock speed of the microcontroller when the system is idle, then we can see a significant reduction in the current consumption. Cutting the clock frequency in half will basically reduce the current of the microcontroller in half (barring current draw for reference voltage generators and any GPIO drive for external circuitry). Further more, when the system becomes active, we can return the clock to its normal frequency and restore all the processing power normally available to the system.

Alright, that reduces the current while maintaining the operation of the processor to monitor the buttons. However, we will need to speed up the button scanning rate to maintain the same responsiveness of the buttons. However, what if we put the processor to sleep? That produces a very dramatic reduction in current, but it also shuts down the processor so we won't be able to pole the button inputs. True, but there is a way around the limitation, we can use the interrupt on change or IOC function typically built into one or more of the GPIO ports.

The IOC latches the state of the inputs every time the microcontroller reads the port. If the input state of the GPIO ever changes, the miss-match triggers an interrupt, which wakes the microcontroller. So, if we connect our buttons such that they pull one of the pins on the port with IOC either high or low, we can wake up every time the user presses a button. The only caveat is that we have to make sure the button is completely released before we go back to sleep, or any bounce will wake the microcontroller again.

OK, that works for up to 8 buttons, but what if we have a larger group of keys. The current crop of microcontrollers typically has only one 8 bit port with IOC so we can only do a wake on IOC on the 8 buttons tied to the IOC port.

Well, that's not entirely true, there is a way to do a wake on more buttons, we just have to setup the buttons in a matrix. Yes, that's right, a matrix. We connect either the rows or columns to the port with IOC, and drive the other with a separate port configured as outputs. Normally, we scan the matrix of buttons by pulling each output low, one at a time, and look for a corresponding low on the inputs. But if the microcontroller is asleep, there is nothing to pull each line low individually.

So, what we do is pull all of the outputs low, read the IOC port, and put the microcontroller to sleep. Now if any of the buttons are pressed, the attached low output pin will pull the corresponding input on the IOC port low, which wakes the microcontroller, which then scans the matrix normally, and identifies which button was actually pressed. After the button is released, and the appropriate action is taken, the microcontroller can be put back to sleep and the current goes back into the uA range once more.

OK, so we can wake on individual button presses, and we can wake if the buttons are arrayed in a matrix, but what about inputs which are toggle or slide switches? They can remain closed for a very long time, and if we use a pull up resistor on the input pin of the GPIO port, that will burn current continuously.

Fortunately, there is another new feature, programmable Weak Pull Ups, or WPUs. The WPUs are basically pull up resistors that can be turned on and off under software control. Now if an input is low, we can turn off the WPU and save the current draw. Then periodically turn the WPU back on and check the actual state of the pin, before turning it back off. The only problem is that we can't generate an IOC, so we will have to have a periodic wake up call from a timer or the watch dog timer so the microcontroller can poll the state of the pin.

So, there you have it, a means of exploiting the low current consumption of the sleep mode, without loosing the ability to quickly respond to a button press. All you need is the IOC function on a GPIO port and you can wake up and read the state of the button, or wake up and scan a matrix of keys. Further, if we have more permanent low inputs, we can even turn on/off the WPUs on the inputs so we don't burn excess current on a steady state input.

For additional information, visit http://blog.notesfromthelab.com/?p=167

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MICROCHIP AUTHORIZED DESIGN PARTNER

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BiPOM Electronics, Inc. is a Houston-based manufacturer of high-quality embedded systems including single-board computers, custom micro-controller systems and peripheral boards. Our standard microcontroller boards have the versatility to serve both educational and engineering applications. Our custom microcontroller designs have been incorporated into oil rigs, medical equipment, evaluation kits, gas detectors, solenoid testers and military power supplies. BiPOM's unique peripheral architecture allows expanding the base microcontroller system with low-cost, stackable peripheral boards for unlimited applications. BiPOM is continuously expanding the microcontroller peripheral offering with the latest technologies such as Zigbee, Bluetooth, Organic LED (OLED), and Memory Cards. BiPOM has experience in Ethernet (TCP/IP, IPX, Embedded Web Servers), GPS, RS232, RS485, I2C, SPI, 1-Wire, X10, EEPROM, Flash, digital, analog, data acquisition, power supply design, motor control. For custom microcontroller designs, we offer manufacturing services including schematics capture, PCB layout (surface-mount and through-hole), prototyping, assembly, testing and turnkey manufacturing. Software capabilities include firmware development in C, BASIC and Assembly.

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BiPOM Electronics Inc. Helps Webasto "Feel the Drive"

BiPOM takes a great deal of pride in working with our innovative and technology based customers and suppliers, and the international companies, **Webasto** and Microchip are some of the very best. In 2005, Webasto's North American Engineering group asked us to support their development of the microcontroller based controls for a revolutionary truck sleeper cab cooling system. Our contribution was successful, as was the new total concept. The BlueCool Truck system provides overnight cooling for the truck bunk compartment without having to idle the engine, thus saving fuel and reducing emissions and operating costs. BlueCool was featured on **www.CNN.com/technology**.

Webasto Feel the drive

The BlueCool Truck system has become a highly acclaimed success and BiPOM Electronics continues to support Webasto with production units of the Control Systems and ongoing development.

Webasto's requirements for a fast time to market were achieved by initial rapid prototyping of the concept on BiPOM's **MINI-MAX** series of microcontrollers and peripheral boards using Microchip's PIC® microcontroller architecture. During pilot production and full production, low unit costs were achieved using Microchip's PIC16F819 microcontroller that is at the core of the BlueCool system. PIC16F819 packed a wide range of features such as analog inputs, timer, watchdog, reset circuit, EEPROM, internal oscillator, PWM, serial port and others in a small, low-cost package, reducing both parts and assembly costs of production units.

Click on the links below to learn more about the BlueCool Truck system:

www.bluecooltruck.com
www.webasto.us/am/en/am_trucks_aircon.html
Manufacturing Today - Featured Content

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Focus More on Your Goals and Less on Your Code with HI-TECH C Compilers by Microchip Technology!

HI-TECH C PRO compilers enabled with Omniscient Code Generation (OCG), provide a whole-program compilation technology, to facilitate more intelligent, state-of-the-art code generation and enhance product usability. Omniscient Code Generation has been developed to read and process all C source modules in one step and can deliver denser code, improve RAM utilization and reduce interrupt latency, saving you time, space, power and money.

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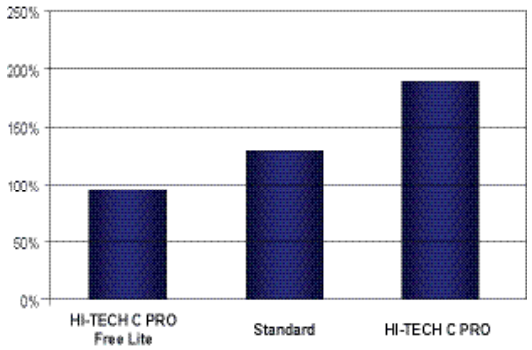

For more information visit us at www.microchip.com/HI-TECH

Move Up to an MPLAB® ICD 3!

As escalating microcontroller speeds quickly outpace traditional in-circuit emulating capabilities, the **MPLAB® ICD 3 In-Circuit Debugger** is designed for premium performance. Flash MCU programming times are 15X or faster than the MPLAB ICD 2. Improved speeds and features allow the design and debugging process to proceed quickly and efficiently.

Maintaining backward compatibility with Microchip's RJ-11 interface, the MPLAB ICD 3 can easily connect to target boards for quick device programming. Further, by integrating this new tool with the free and feature-rich MPLAB IDE, Microchip offers a familiar development environment. This integration also serves to shorten the learning curve as customers move up or down the 500-strong PIC® MCU and dsPIC® DSC portfolios to find the best device for their application.

For more information visit us at www.microchip.com/ICD3

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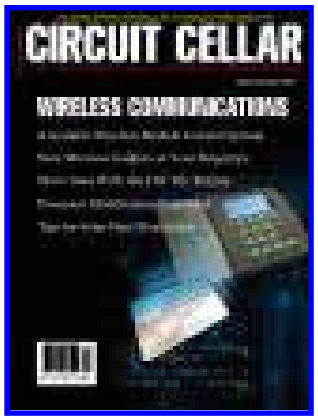
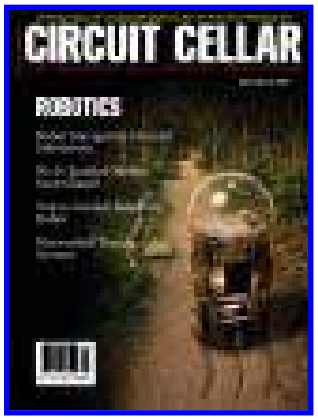
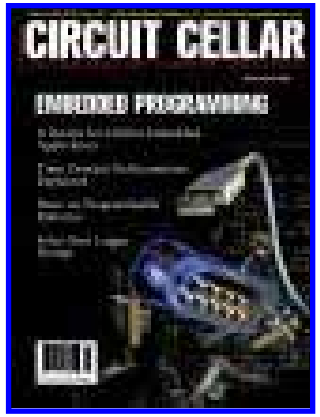
Do you have suggestions for future articles? **Let us know**!







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Microchip Mexico Two-day Technical Event

22-23 September 2009

Due to the overwhelming success of our technical event last year, we are pleased to announce that an extra day of training has been added for the 2009 Microchip Technical Event being held at the Tecnológico de Monterrey (Guadalajara Campus)

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Col. Nuevo México
45201 Zapopan, Jal. México

Participants can select up to 7 classes from a wide range of topics including PIC32, capacitive touch sense, motor control, lighting, USB, Ethernet, battery management, graphics displays and wireless technologies using Microchip products and free software libraries. The cost is only $99 for one day or $150 for both days. Presentations will be done in a mix of Spanish and English.

For more information, please e-mail **giselle.miller@microchip.com**.

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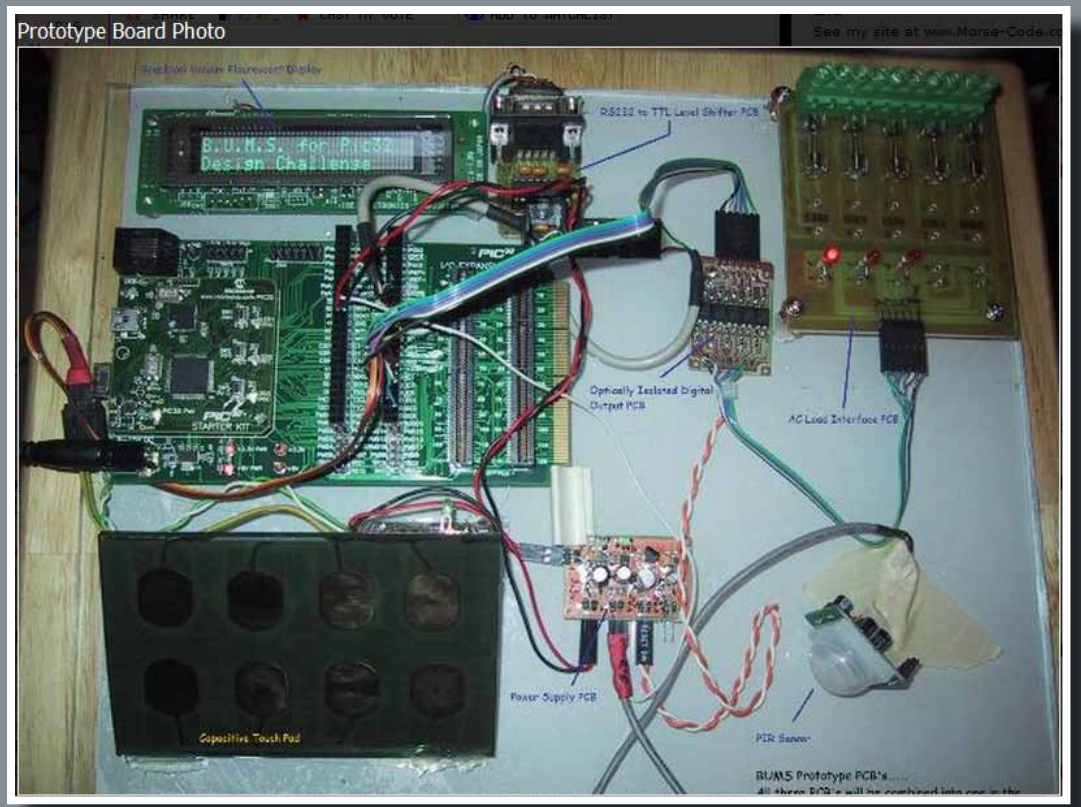
The Third-place Winner of the PIC32 Design Challenge was BUMS (Bathroom Utilities Management System) by Brent Morse.

I came up with this concept to try and save money on my utility bills, I have 3 teenagers in the house (one girl and 2 boys) , and My 15 year old Daughter can use up 80 gallons of hot water in one shower! When the kids brush their teeth or use the sink, they always leave the water running even when they are not using it! So with this system I would be able to limit water usage, turn off lights when not in use, etc. and possibly cut down on my utility bills. The PIR sensor is used to detect when someone enters the room, the system will then turn on the lights, the door contacts and the pressure sensor will be used in conjunction with the PIR to determine if someone is still in the room, (possibly sitting on the toilet!) so the lights wont turn off while the person is still in the room. Each user will have an RFID tag or iButton , so each users utility usage can be data logged on the PC. Each user will have a preset amount of time in the shower, the system will alert the user when their time is almost up. The Proximity sensor will be used to detect a user and control the faucet water flow. The humidity sensor will be used to control the exhaust fan, if someone is using the shower, or steam builds up in the room, the exhaust fan will be turned on automatically. An application on the PC side will enable the Administrator to override any functions remotely, or view utility usage per user.

View the complete design at **http://mypic32.com/web/guest/contestantsprofiles?profileID=13078**.



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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 (RTCs) 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. Contact information is available on the Microchip RTC web site.

MICROCHIP
Regional Training Centers

For a complete list of classes and locations, visit www.microchip.com/RTC

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WHAT'S *New* IN MICROCHIP LITERATURE?

Visit our **Technical Documentation** page on www.microchip.com to view the documents.

Doc. Type	Doc. Title	DS No.
Application Note	AN1277, Using C32 Compiler to Interface Serial SRAM	01277A
	AN1275, KEELOQ® with Advanced Encryption	01275A
	AN1271, Offline Power Converter for High-Brightness LEDs Using the PIC16HV785 MCU	01271A
Data Sheet	24AA64 Data Sheet	21189Q
	24LCS22A Data Sheet	21682E
	24AA512/LC512/FC512 Data Sheet	21754K
	25AA320A Data Sheet	21828F
	25AA128 Data Sheet	21831D
	25LCXXX Data Sheet	22131C
	25LC0X0 Data Sheet	22136B
	MCP2036 Inductive Sensor Analog Front End Device Data Sheet	22186A
	PIC24FJ256GA110 Family Data Sheet	39905C
	PIC18F87J93 Family Data Sheet	39948A
	PIC16F/LF1826/27 Data Sheet	41391A
	PIC32MX3XX/4XX Family Data Sheet	61143F
	dsPIC33FJ12GP201/202 Data Sheet	70264D
	dsPIC33FJ12MC201/202 Data Sheet	70265D
	PIC24HJ12GP201/202 Data Sheet	70282D
	dsPIC33FJ32MC202/204 and dsPIC33FJ16MC304 Data Sheet	70283E
	PIC24HJ32GP202/204 and PIC24HJ16GP304 Data Sheet	70289D
	MRF24J40MB Data Sheet	70599A
Errata	PIC12F510 Errata	80268F
	PIC18F24K20 Errata	80366F
	PIC18F45K20 Errata	80425C
	PIC18F46J11 Family Silicon Errata and Data Sheet Clarification	80435D
	PIC18F1XK22 Errata	80437B
	PIC24FJ128GA010 Family Silicon/Data Sheet Errata	80471A
	PIC24F16KA102 Family Silicon/Data Sheet Errata	80473A
	PIC16F506 Errata	80475A
	ENC424J600/624J600 Silicon/Data Sheet Errata	80477A
Programming Specification	PIC18F6XJXX/8XJXX Programming Specification	39644K
	PIC16F1826/LF1826/PIC16F1827/LF1827 Programming Specification	41390A
FRM Chapter	dsPIC30F FRM Section 30. Power Supply PWM	70270C
User's Guide	MRF49XA PICtail™/PICtail Plus User's Guide	51843A

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Microchip is "In the Zone" for Robotics.

The robots are coming and Microchip is "The Maker". Want to blog with fellow robot enthusiasts? Need to find a Microchip Design Partner who specializes in robotics so you can bring your idea to market? Looking for a place for you and your robot to go to meet others like you? Microchip has it all, with the new "Robotics Zone" (www.microchip.com/academic .

From a list of current "Robot Events" to links to sites about what's happening in the world of robotics, Microchip is your source for information. We've come a long way from the time when Leonardo da Vinci conceptualized the helicopter, submersible vehicles and his own design for a robot. Robots are used in industrial applications for manufacturing, for medical uses and prosthetics, and are even the theme of movies. Anyone seen "Transformers"? It's no wonder that Microchip is your source for anything to do with robotics. From the features seen on our Mechatronics site (CAN, USB, Sensors) to our many development tools like the PICDEM™ Lab Development Kit (DM163035), Microchip offers everything the robot enthusiast needs to bring your dreams to robotic life.

If you want to learn about robots, design robots, race robots, talk about robots, or just live on the vicarious robotic wild side, check out the blog,

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PIC24H Does Floating Point

Many of today's complex embedded problems are easier solved using floating-point arithmetic. But, this doesn't mean that an expensive floating-point MCU is required. Microchip has recently released the **PIC24 MCU/dsPIC® DSC Math Library** (Part Number: SW300020) that enables these cost-effective integer microcontrollers to calculate using floating-point arithmetic. The library contains advanced single and double-precision floating-point arithmetic and trigonometric functions from the standard C header file <math.h>. It delivers small program code size and data size, reduced cycles, all while maintaining the highest level of accuracy possible.

The Math library is C-callable from the **MPLAB® C Compiler for PIC24 MCUs and dsPIC DSCs** (formally known as the MPLAB C30 C Compiler) (Part Number: SW006012) or from PIC24 MCU/dsPIC DSC assembly language. All the functions are IEEE-754 compliant, with signed zero, signed infinity, NaN (Not a Number) and denormal support and operate in the "round to nearest" mode.

If you have a problem that is better solved using floating-point arithmetic, download the PIC24 MCU/dsPIC DSC Math Library from Microchip's web site today. More details can be found at **here**.

dsPIC® DSC Automatic Gain Control Library

Are you developing an application that requires speech processing? If so, you are likely to find the new dsPIC® DSC Automatic Gain Control (ACG) Library very helpful. This free software runs on dsPIC DSC to automatically adjust the amplitude of a speech signal to match a set level. This is useful, for example, in speech applications where the distance between the audio source and the microphone is not fixed. Typical applications include:

- Hands-free cell phone kits
- Speaker phones
- Intercoms
- Teleconferencing systems
- Headsets
- Front-end to a speech recognition system or speech encoding algorithm

The primary function of the AGC is to estimate the short-term peak amplitude of input speech and apply a gain factor so that is brought up to a desired level which has been set by the user. If no speech is detected the gain will gradually 'leak' back down to a pre-set default level. The AGC library maintains the input signal level to the subsequent processing blocks in the signal processing chain. The rate at which the gain changes are applied to the input signal can be controlled via software.

Learn more at: **http://www.microchip.com/speech**

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