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Academic Program

Academic Newsletter First Quarter 2011

Q1 2011

In This Issue...

CALLING ALL...

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Greetings Academics!

Welcome to our first Newsletter of 2011. In this edition, we are pleased to announce the addition of the Third Party Corner. Here, we will feature academic-friendly tools from manufacturers around the world. All items listed are available for sale on Microchip's e-commerce site, **www.microchipdirect.com**, and are eligible for our 25% academic discount.

This continues our commitment to finding the best solutions for educators and students that feature Microchip products and technologies. As always, for more information on these or anything else Microchip, do not hesitate to contact your Academic team at: **academic@microchip.com.**

As always, visit our Academic Exchange Landing Page at **www.microchip.com/academic** for information on free software tools, general purpose development boards, becoming a Microchip Academic Partner or joining the Microchip community on Facebook, Twitter and YouTube.

Thanks for reading!

Marc McComb, Editor

Prototypic Development of a Power-saving µC-sensor Module with a Wireless Interface

Submitted by: Prof. U. Metzler on behalf of Master's Student Sebastian Senneke, University of Applied Sciences (HTW) in Berlin, Germany (www.htw-berlin.de)

Hochschule für Technik und Wirtschaft Berlin
University of Applied Sciences

Introduction

I had developed in my bachelor thesis a sensor module with an operating time of one year and better. The power supply required a normal AA-battery. This three month project was part of the Informationstechnik/ Vernetzte Systeme (Information Technology/Networked Systems) course at HTW Berlin. To realize the operating time of one year, the consumption of electric current of the microcontroller and the transceiver module had to be minimal. Additionally, the microcontroller and the external peripherals, like the transceiver module, had to support power management modes. Furthermore, a wireless transmission, suited for low-power WPANs and Wireless Sensor Networks (WSN), was needed.

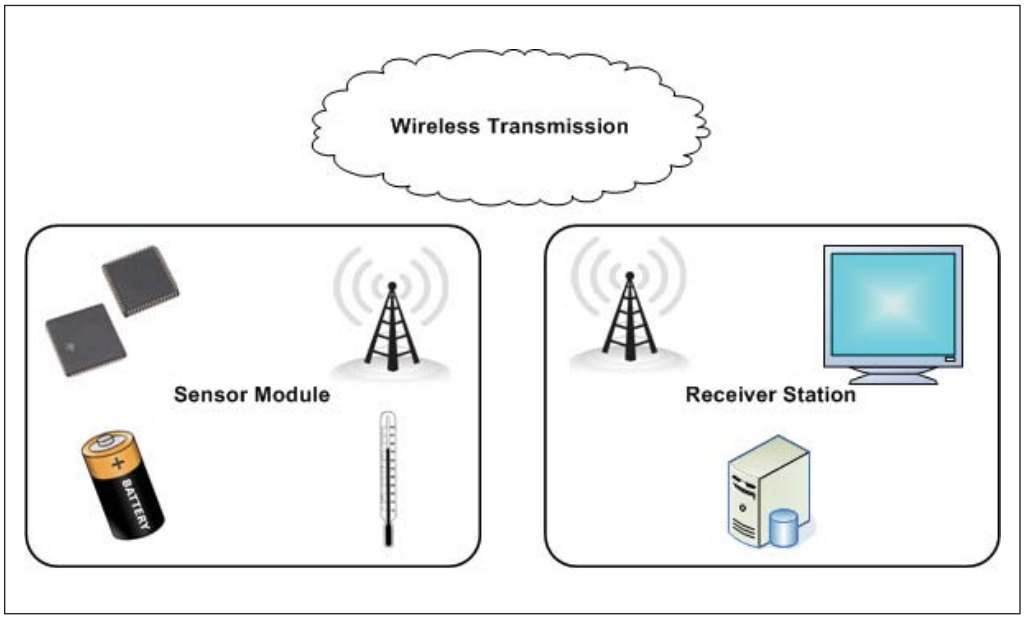
The principle construction consists of a microcontroller, transceiver module, sensor(s) and the power supply. The sensor module interprets the data from the sensor and transmits this data to a receiver station. After these steps, the module goes in to a power saving mode and the transceiver module is powered down. After a specific time period, which can be varied for different applications, the module wakes up.

Implementation

The PIC24FJ64GA102 was chosen for the microcontroller. This microcontroller features nanoWatt XLP Technology for extremely low power and the Deep Sleep Technology. Deep Sleep mode is the lowest power mode. Furthermore, the controller integrates such peripherals as SPI for sensor interface.

The preferred wireless technology is a protocol using the IEEE 802.15.4 specification. The IEEE 802.15.4 specification has become the de facto industry standard for low-rate WPANs with low-power and low-cost requirements. So in this project the MiWi™ P2P protocol was the preferred solution. The protocol provides reliable and low-power direct wireless communication via an easy-to-use programming interface. The supported topologies are the peer-to-peer and star topology. With the more complex MiWi protocol, you can implement complete WSNs. The used transceiver module is the MRF24J40MA. This module is compatible with Microchip's ZigBee® , MiWi and MiWi P2P software stacks and operates in the free 2.4 GHz ISM-band.

Figure 1: Application Overview



The sensor used is a temperature sensor with a one-wire protocol connected to a standard GPIO pin.

The software architecture is based on the simple example from Microchip's MiWi P2P stack version 1.01a. The Deep Sleep Mode power saving mode was used and the wake-up source is the DSWDT (Watchdog Timer in Deep Sleep Mode). Furthermore, to reduce the power consumption, unused peripherals, like the ADC, were deactivated. For this purpose the "HardwareProfile.c" and "P2PDefs.h" files were modified.

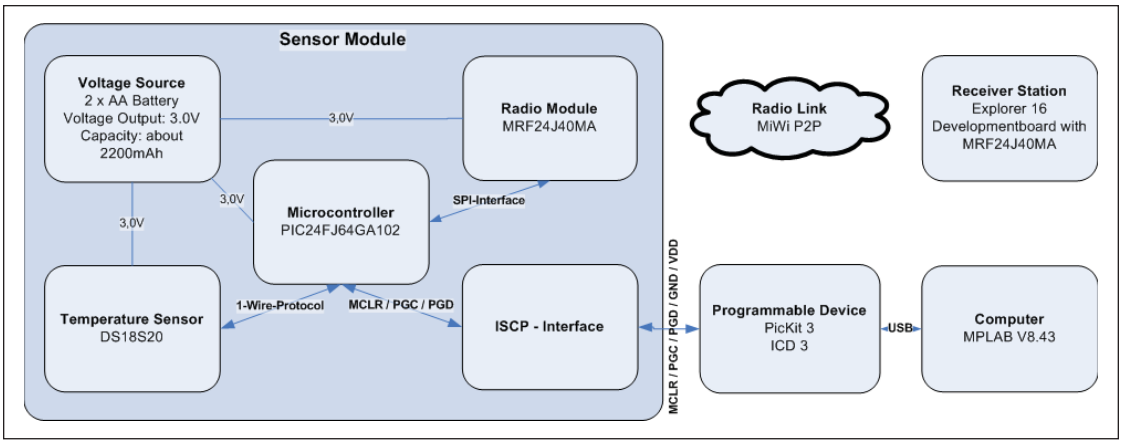
Results

Although this project is only a prototype and is built actually on a solderless breadboard, the results are very satisfying. The power consumption of the whole module is 28.26 mA in the active phase. During the sleep time I have measure 4.88 µA. Of this power consumption the µC used only 0.45 µA in the Deep Sleep and 3.8 mA in the active mode. In the datasheet you can find 500 nA for this PIC® MCU with DSWDT or RTCC. The transceiver module has the highest power consumption with 24,45 mA in the active phase and 3.85 µA in Sleep mode. Microchip specified the power consumption in the datasheet with 23 mA in TX-mode and 2 µA in Sleep mode.

The transmission power of the MRF24J40MA was, on a free terrain, very good with over 100 meters (328 feet). In buildings with Bluetooth and WLAN as interference source the transmission range was among 10 and 20 meters (32-65 feet). These results were obtained without the function energy scan and channel hopping.

The next steps in this project are to improve the power supply. It is planned to implement a step-up (boost) regulator like the MCP1640. So the module can operate with only one AA or AAA battery. In addition the sensor module will be manufactured in the surfaced mounted (SMD) technology. So the leakage current can be minimized. Furthermore the MiWi stack replaced the MiWi P2P stack so it is possible to implement multi-hop networks.

Figure 2: Application Block Diagram



The Truth about Power Consumption in PIC® MCUs with XLP Technology vs. TI's MSP430

This white paper will clarify the facts behind Texas Instrument's arguments that presented TI's MSP430 as a better low power device than Microchip's XLP technology.

In a white paper published online, Texas Instruments compared Microchip's PIC24F with extremely low power nanoWatt XLP technology with their own MSP430 with Ultra Low Power. TI's white paper makes reference to eight individual parameters, important in extremely low power applications, where they argue that its own technology out performs Microchip's XLP technology. This white paper discusses each of TI's eight claims, identifies the flaws in TI's arguments and presents the facts.

Claim 1: All MSP430 MCUs Are Consistently Low Power

The facts here do not support the argument. There are several MSP430 MCUs, such as the MSP430F2252, that consume 100 nA while in Sleep. There are also devices such as the MSP430F553X family that consume 1700% more current in sleep at 1690 nA. These numbers are an order of magnitude different from each other, and are therefore not consistent.

Claim 2: Operation From a 1.8V Power Source Is Not Relevant In Extremely Low Power Applications

This is an erroneous claim since it simply dismisses a serious design consideration: the operation of the MCU as the supply voltage is reduced due to battery voltage degradation.

For the majority of the embedded electronics industry, the trend towards extremely low power technology is based on the use of batteries as the prime power source. Extremely low power technology, therefore, is synonymous with battery power and, in today's applications, this typically translates to single or dual cell supplies comprising of either a coin cell battery such as the CR2032, or a pair of Alkaline AA/AAA batteries. In both cases, the usable voltage range falls below 3.0V. In the case of a 1.5V alkaline-based battery, the voltage remains usable down to 0.9V, or 1.8V for a system using two batteries. For the popular CR2032, its usable voltage range drops to 2.5V before the voltage begins to reduce significantly, as shown in the chart below.

TI claims that the MSP430 is designed specifically for battery powered applications. Their choice to not acknowledge that those applications must realistically continue to operate once the battery level has dropped below nominal, infers that the applications the MSP430 are best suited to are not battery powered applications.

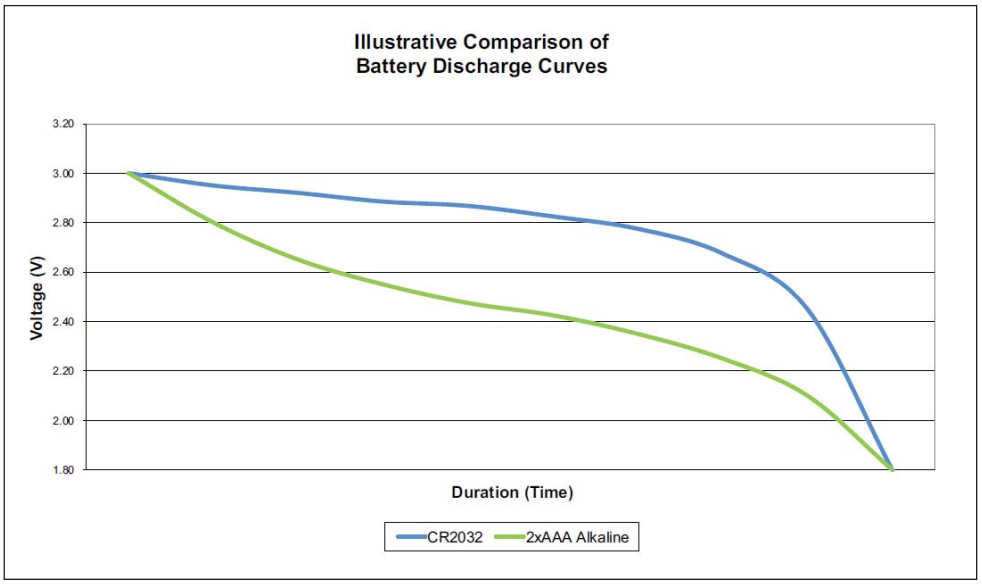
Claim 3: MSP Is The World's Lowest Power Microcontroller

TI's white paper claims that the MSP430 demonstrates lower power consumption in all modes of operation. However, TI can only support this claim by asserting that the Deep Sleep mode of the PIC24F with XLP technology is both 'dangerous' and 'inconvenient', and thereby discounts it.

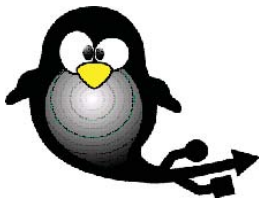
In truth, the MSP430s do not include a Deep Sleep mode, and it isn't possible to remove power to the RAM and recover.

Continue reading the full white paper to see all claims and clarifications.

To continue reading this Microchip white paper, and the claims made by TI visit:
http://www.eetimes.com/electrical-engineers/education-training/tech-papers/4210328/8-Bit-Microcontrollers-Solutions-for-Simple-Applications



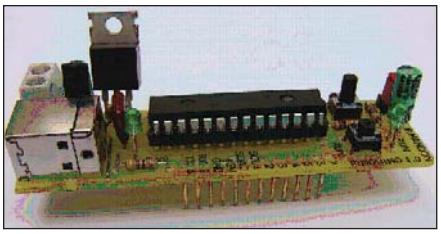
Pinguino *Development Board, Integrated Development Environment*



By: Jean-Pierre Mandon

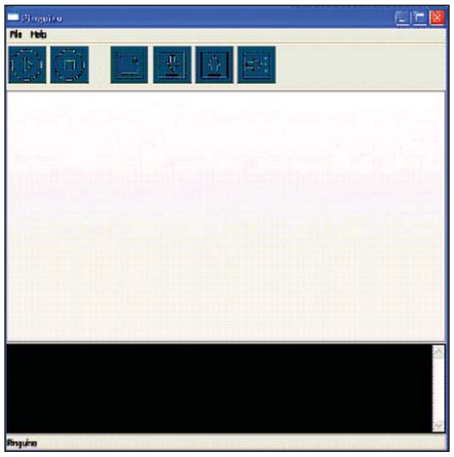
Pinguino is a set of tools based on the PIC18F2550 and designed to learn digital electronic and C programming on small systems. Originally used for teaching, it is now widely used by hobbyist, teachers or robotic enthusiasts. The board is a low cost solution which can be built in a garage. The IDE is coded in python and works on Linux (native development platform), Windows and MAC OSX.

Story



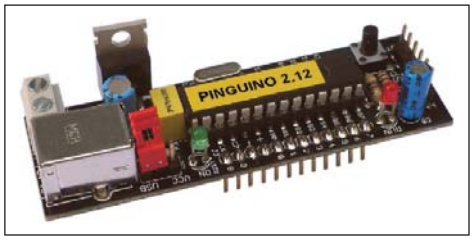
The story started in early 2008 when Jean-Pierre MANDON, Professor of robotics in the Aix-en-Provence School of Art (FRANCE), decided to build a platform similar to the Arduino only using a Microchip product and with its own specifications. The project began in June 2008 and the first version was available in September 2008 (Beta 1). Jean-Pierre Mandon with his colleague France Cadet, also a Professor with the robotics lab, presented the project to the public in February 2009 in the Medialab Prado Madrid. Due to its simple design, a lot of different versions have been built by the ever increasing community and now, 2 years later, the beta 9-04 is available.

Overview



Pinguino is based on PIC18F2550 or PIC18F4550 chips. With 18 I/O, the PIC18F2550 version has been built by many users. The IDE is coded in Python and uses sdcc as compiler and gputils as assembler and linker. A python pre-processor translates C++ instructions to C in order to remain relatively compatible with the Arduino environment. USB native is available in the application program and can be used as a CDC device since the Beta 9 version. The bootloader is based on the Vasco project.

Community



Pinguino, an open hardware and software project, is managed by its community. Most of the active users can be found in Spain and South America. New local user groups are coming everyday (Thailand, Swiss, North America....).

The Spanish robotic association ARDE (**http://www.webdearde.com/**) made its own design and is using this board to drive robots.

ARDE launched a Pinguino contest in November 2010 with the aim of expanding the popularity of the project. In Venezuela, PinguinoVE developed a lot of improvements for the IDE (multi-language and deb package).

Features

The next step for this project is to port Pinguino to PIC32. A first version of the IDE should be available at the end of November 2010 with PIC32MX460F512L support. The compiler used is from the microchipopen project and some files should be available with the support and Microchip agreement. This new 80 MIPs, peripheral-rich, board should be a fantastic improvement and a new, easy way for users to become familiar with 32-bit Microchip microcontrollers.

I think it is important to note that Microchip helped us during this development. The first contribution was the sublicense for the USB product ID in 2008. Sponsoring the first Pinguino contest and helping us to develop Pinguino PIC32 was really useful.

Website: **www.hackinglab.org**

Blog: **http://jpmandon.blogspot.com/**

Third Party Corner

By: Guy McCarthy, Microchip Third Party Support Manager

Microchip Technology is pleased to announce the following Third Party tools now available through our e-commerce site: www.microchipdirect.com.

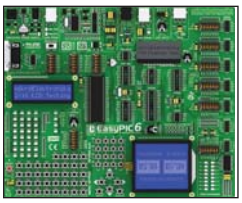
Don't forget…Academics receive a 25% discount when ordering development tools through MicrochipDirect. For more information on Academic Discounts, please visit: www.microchip.com/academic.

In this edition of the Academic Newsletter we feature three of our third party partners:

1. *MikroElektronika*
2. *MC Electronics*
3. *Tag-Connectors*

Three New Development Systems from MikroElektronika

EasyPIC 6 Development System

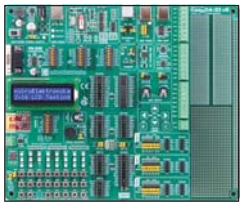


The EasyPIC 6 is a general purpose development system that is designed for maximum flexibility. This "swiss army knife" of development boards supports over 160 different PIC MCUs (PIC10/ 12/ 16/ 18) in DIP packages from 8 to 40 pins. It comes with a 16F887 installed. Every I/O pin is connected to a push button and LED, and can also be configured with pull-up/pull-down resistors. On-board components include a 2x16 display, 2 keypads, potentiometer, SPI port expander and connectors for USB, RS-232, PS/2, and all port pins. Optional components include a 128x64 graphic LCD with touch panel, a second 2x16 display, and a temperature sensor. The EasyPIC 6 can be programmed with any MPLAB compiler, or with MikroElektronika's own C, Pascal, and BASIC compilers. Demo versions of the MikroElektronika compilers are included (2K program limit), along with complete documentation and dozens of sample programs.

Available on microchipDIRECT for $139.

TMIK003: EasyPIC 6 Development System
TMIK004: Graphic LCD 128x64 with TouchPanel
TMIK005: LCD 2x16 and Temperature Sensor

Easy24-33 v6 Development System



The Easy24-33 v6 is a general purpose development system for low pin count PIC24 MCUs and dsPIC DSCs. It supports processors in DIP packages from 14 pins to 28 pins, and comes with a 24F16KA102 installed. Every I/O pin is connected to a push button and LED, and can also be configured with pull-up/pull-down resistors. On-board components include a 2x16 display, capacitive touch keypad, 2 potentiometers, serial SRAM, serial EEPROM, CAN transceiver, temperature sensor, UART/USB converter, and connectors for USB, RS-232, and all port pins. There is also space for an optional ZigBee transceiver module and a generous prototyping area. The Easy24-33 v6 can be programmed with any MPLAB compiler, or with MikroElektronika's own C, Pascal, and BASIC compilers. Demo versions of the MikroElektronika compilers are included (6K program limit), along with complete documentation and dozens of sample programs.

Available on microchipDIRECT for $154

TMIK003: EasyPIC 6 Development System

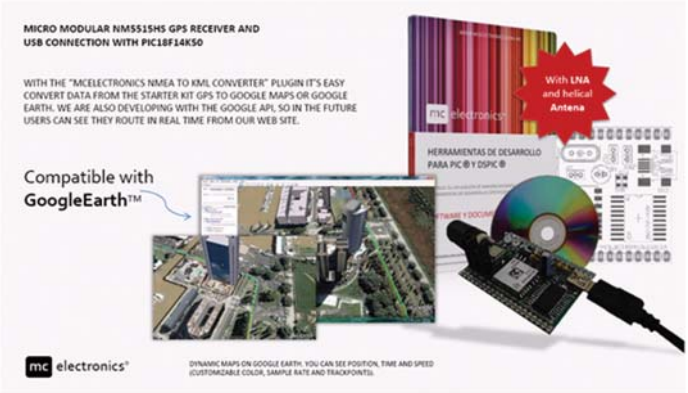
LV-32MX v6 Development System

The LV-32MX v6 is a general purpose development system for 64-pin and 100-pin PIC32MX MCUs. It supports removable MCU cards, with a PIC32MX460F512L MCU card included. Every I/O pin is connected to a push button and LED, and can also be configured with pull-up/pull-down resistors. On-board components include a 2x16 character display, TFT color display (320x240) with touch screen, stereo codec, serial EEPROM, serial FLASH, CAN transceiver, temperature sensor, joystick, MMC/SD card slot, and connectors for RS-232 (2), USB and USB host, headphones, microphone, and all port pins. The LV-32MX v6 can be programmed with any MPLAB compiler. Beta versions of MikroElektronika's own C, Pascal, and BASIC compilers will be available by end of the year. Complete documentation and 15 sample programs are included.

Available on microchipDIRECT for $169

TMIK002: LV-32MX v6 Development System

GPS Starter Kit from mcelectronics



Our premier training partner in Argentina has introduced a starter kit for GPS-based applications. The new MCE Starter Kit GPS combines a PIC18F14K50 MCU with Microchip's USB framework, NM5515HS GPS receiver, and helical antenna from Sarantel. When connected to a host PC, you can see current position, speed, and satellite information in the included demo software. You can also reprogram the PIC MCU to customize your application.

- Integrated LNA and Helical antenna
- Micro-modular MN5515HS GPS receiver
- USB connection with PIC18F14K50 MCU
- Protoboard compatible layout
- User manual in Spanish, English, and Portuguese
- Ready to use with Google Earth™

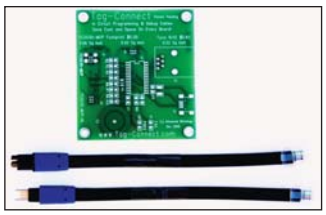
Important: You need an open view of the sky for the GPS receiver to work properly.

mc electronics®

Available on microchipDIRECT for $99

TMCE001: MCE Starter Kit GPS

Tag-Connect Starter Kit



Many customers are using Tag-Connect cables to save board space and component costs on their custom PCBs. A Starter Kit is now available for those who haven't yet made the switch. Two Tag-Connect cables (Legged and No Legs) are included, along with a sample printed circuit board to demonstrate the footprint for each type of cable. These cables use high-reliability spring pins which connect to a tiny footprint of pads and locating holes on your PCB. The Legged version has plastic legs that snap directly into the board to hold it securely in place. The No Legs version has three steel pins that ensure accurate alignment and correct orientation and is hand-held during a fast programming operation. Tag-Connect cables save the board space and expense of a mating header component on every PCB.

- Compatible with MPLAB® REAL ICE™, MPLAB ICD 2 and MPLAB ICD 3
- Legged cable is available separately as TC2030-MCP
- No legs cable is available separately as TC2030-MCP-NL

Tag-Connect

Available on microchipDIRECT for $59.90

TC2030-STK: Tag-Connect Starter Kit

For more information on Tag-Connect, please visit: www.tag-connect.com.

An On-line Guide to PIC® Microcontroller Documentation

By: Stuart Cording, Senior Technical Training Engineer for Microchip Technology

MAs a Technical Training Engineer with Microchip, I get to meet many people. Our aim, with our training, is always to build upon someone's previous knowledge. Therefore, we assume that visitors to our RTCs know how to use microcontrollers and debug tools, and we show them how to apply that knowledge with our products, our microcontrollers and our debuggers. This is a workable hypothesis for most of those people who visit me. However, there is a group for whom this does not apply. Graduates.

Many employers have a "the problem with graduates today" story. "Today's graduates are no longer fit for purpose," they moan. "They aren't coming out of college/university/higher education with the right skills. They know nothing." This is, I am happy to say, just a story. Today's graduates, and for that matter students too, are highly capable, well educated and teeming with energy and passion for using the skills they have developed. My amazement reawakens by the projects that the students who visit me build and bring to life. Electronic steering wheels for go-karts; wireless energy monitoring systems; colorful lighting control systems. The real story is they need some help gaining all those soft-skills that we, the long-time experienced engineers, have acquired in our decades in industry.

The primary question that is asked by my student and graduate visitors is "why?" Why are there only these three options in the Timer 1. Why is the RC oscillator not more accurate? Why can I only write/erase the flash so many times? Part of my answer to these questions lies in the philosophy of chip design. However, the other half of the answer is "because it says so in the datasheet". This leads us to one of the most curious and possibly dullest corner of world-literature that man has ever known. Datasheets, reference manuals and user's guides. An experienced engineer, when asked about temperature coefficients, pin loading, prescaler options or debugger connections has a highly developed thumb that can find exactly the right page in the correct document. When requested, she has the capacity to list several search terms for use in Acrobat Reader or Google that will result in finding relevant information. This is knowledge that we ought to share.

Someone much more insightful than me once said that you cannot buy knowledge, but you can share it. Because I believe that this is knowledge that we should share, and that we shouldn't charge for it, I have started writing an open-source book called "A Guide To Microchip PIC Documentation". It is not the world's most riveting read. Well, not for the experienced engineer. However, for a graduate or student it is a goldmine of practical knowledge. It answers many of the "whys" and helps them to develop their own "thumb of experience" and create their own "table of search terms". As an open-source book, it is as up-to-date as those who participate in it care for it to be. Moreover, it will be as useful as we, the world-wide-authors of the web, make it.

But here is the rub. I have created the framework for such a text. I have starting writing such a document. I am sharing my fifteen plus years of engineering wisdom in electronic form. However, I need some help. I need feedback. I need suggestions. I need contributions. I need you, the greater engineering community, to make this work come alive. I need you to share this with everyone you know, so that they may also know all that we know.

Take a short moment, over a coffee break or during lunch, to peruse the pages of knowledge thus created. Then, if you feel moved to contribute, drop me a line. Let's collaborate and contribute to changing the story of "the problem with graduates today".

For more information visit: **http://en.wikibooks.org/wiki/A_Guide_To_PIC_Microcontroller_Documentation**

REMEMBER
Academic Partners can attend RTC classes free of charge. For more information please visit www.microchip.com/academicpartner.

Microchip On-line Training Initiatives

In tough economic times, companies often look for ways to trim expenses as a way 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 a possibly stretched employee spends away from the job. During these times, however, competitive pressures and technology change don't stop and it is training that can help a company be better positioned to take advantage of the coming upswing.

Microchip, with its global network of regional training centers (RTCs) and third party training partners, is Here2Help 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 also be scheduled offering the most convenience. Time away can be managed more efficiently with the flexibility of half or full day class sessions.

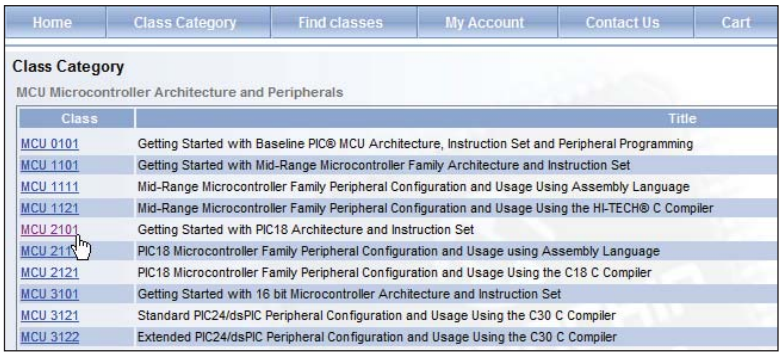
Call one of Microchip's RTCs and ask our experienced Technical Training Engineers, how Microchip can help you with your training investment.

New RTC Registration Web Site Launched

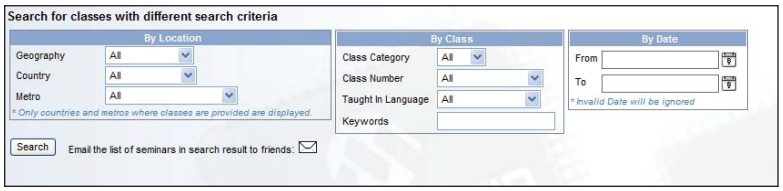
As part of the process to continually improve our customers' experience, Microchip recently re-launched its RTC registration web site (**www.microchip.com/rtc**). This version has a revamped user interface and new features that make it much easier to find and sign up for classes.

Returning visitors to the website will notice that there is a new log in system. The RTC website has been integrated with Microchip's other user sites (**www.microchipDIRECT.com, http://sample.microchip.com**) providing a common user profile. This integration allows customers to register one time on any of the sites and gain access to all.

To make it easier to see what classes Microchip offers and find scheduled sessions, the class numbering system has been changed. Classes are now grouped by common technology or application. For example all Development Tools classes are grouped with the TLS prefix while all architecture and peripherals classes share the MCU prefix. All groupings can be accessed through the 'Class Category' menu. All currently scheduled sessions of a class can be seen by clicking on a class number in the category.



A new search feature allows classes to be found by location, date, class number or any combination.

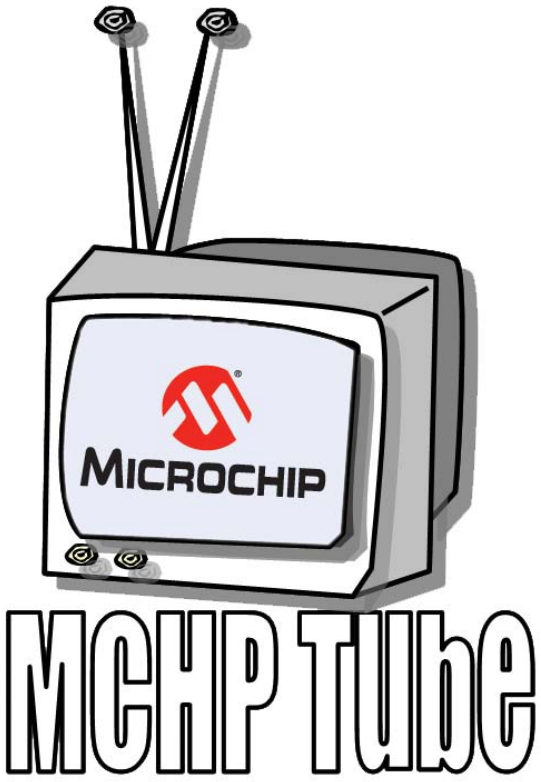


The inclusion of a new shopping cart function enables customers to register for multiple classes and select from an a la carte menu of development tools for each class when available for purchase.

Finally a new 'Request a Class Feature' has been added. Customers can request the scheduling of a class in location near them or provide ideas for new topics. When the requested class is scheduled in those locations, an email will be sent.

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

MICROCHIP
Regional Training Centers



Interact with Microchip at"MCHP Tube"

Microchip's Academic Program team has launched a brand new YouTube-based show called "MCHP Tube". MCHP Tube is an online video newscast for all things Microchip with a focus on Academia. Here you'll find the latest information on new products, technologies and software/hardware development tools from both Microchip and Third-party sources.

It will be a monthly show targeting academics worldwide and will be divided into four sections as follows:

Headliners – we will discuss new academic-friendly development resources brought to you by Microchip and our authorized Design Partners.

University Student Project – students can submit a video featuring a student project based on Microchip products.

Ask Microchip – viewers can ask a question and a qualified at Microchip support person will answer it.

Where in the World is Marc McComb? – Marc is Microchip's academic sales engineer and in each edition will talk about new products and tools that are a good fit for academics.

To submit a video on a student project or ask a question for the "Ask Microchip" section, email us at mchptube@microchip.com.

You can also visit **www.microchip.com/mchptube** for more information on the show.

MCHP Tube provides the opportunity for Students, Teachers and Professors to interact with Microchip directly!!

Click on the image above to view the fourth episode of MCHP Tube. To view Microchip's YouTube channel, click HERE.

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