MICROCHIP
Academic Program

Academic Newsletter
Second Quarter 2010

Q2 2010

In This Issue...

CALLING ALL...

Students, Professors & Third Party Tool Developers, want to submit an article for the Academic Newsletter?

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Focus on... IEEE SECON

Microchip's Academic Program was pleased to participate in this year's IEEE SECON (Southeast Conference) held in Charlotte, North Carolina. SECON features a series of workshops, presentations and a forum for the Academic community to exchange ideas. Part of the event featured a hardware competition in which teams of students created an autonomous robot that was required to navigate an obstacle course…the clincher…no on-board stored energy sources such as batteries were allowed. In this edition of the newsletter, we have a featured article from one of the teams from Mississippi State University providing a student perspective on the event.

This year our Academic program will be attending a number of these types of events, including the American Society of Engineering Education (ASEE) Annual Conference held this year in Louisville, Kentucky from June 20-23. These events not only provide an opportunity for us to showcase our Academic-friendly tools, but more importantly, is a chance for us to talk to professors and students to help us better serve the needs of the Academic Community.

If you know of an event in your community that you would like to share with us by submitting an article or find out about upcoming events that Microchip's Academic Program will be visiting, please drop us a line.

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.

We can be reached via email at: **academic@microchip.com.**

Thanks for reading!

Marc McComb, Editor

Student-built Robot Powers Through Design Competition

Starkville, MS – A team of eight Bagley College of Engineering seniors earned its place in the sun with a third-place finish at a solar-powered robot competition.

The renewable energy-themed IEEE Southeastern region hardware competition took place in Charlotte, N.C. Each participating team was asked to create an autonomous robot. Using no on-board stored energy sources, such as batteries, the machines had to maneuver through an obstacle course as many times as possible within three minutes.

Out of 42 registered teams, MSU's SPIDR – Solar-Powered Intelligent Driving Robot – was bested only by the University of Western Kentucky and University of Florida's entries.

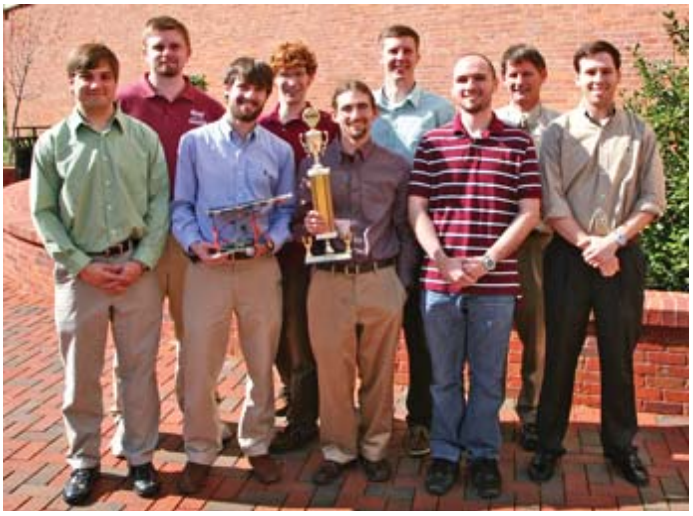
"I was proud of the team's hard work this year. The zero-energy problem was a tough one that none of our previous hardware teams had faced," explained Dr. Bob Reese, team adviser.

Since 2003, six MSU teams have finished in the top three of this annual IEEE competition. These previous challenges focused primarily on navigation and controls.

"We were surprised when we learned that this was a power challenge," said Ryan Wood, a senior in computer engineering. "It caused us to learn a lot about solar panels and problem solving."

When faced with the power challenge, the team decided to use the PIC24F microcontroller by Microchip as the brains of the robot due to its low power consumption and more than adequate processing ability. The microcontroller made an easy task of interfacing sensors for intelligent navigation."We knew up front that we wanted to use the PIC24F because of the in-house knowledge and ease of use – that was the one component we didn't have to research and test," senior team lead William Cleveland said.

Getting started in August paid off in March as the team tested, implemented, and then later removed several components on the robot. At the outset, the team planned on implementing a scissor lift, but later decided to remove it due to its increased complexity and weight.



MSU 2010 IEEE hardware competition team. From L to R: Jacob Morgan, Gary Weasel, Tim Pitts, William Cleveland, Brad Reaves, Austin Lee, Jacob Bowen, Dr. Bob Reese, Ryan Wood.

At competition, the MSU team used a fixed platform to hold the solar panels and navigated the course using one infrared and one sonar sensor. Small-scale, geared DC motors made the MSU robot one of the fastest there, taking an average of approximately ten seconds to complete a lap around the course.

The team was sponsored by the Mississippi State University Department of Electrical and Computer Engineering and SmartSynch, Inc. of Jackson, Mississippi. In addition to competition success, the students earned classroom credit from this project as part of the capstone senior design course.

Six of the eight students plan to stay at MSU to complete master's degrees.

Team members by hometown:

Amroy, MS – Electrical engineering senior **Jacob Morgan,** a 2005 graduate of Hatley High School and son of Wesley and Julia Morgan of Aberdeen.

Belden, MS – Senior computer engineering major **Jacob Bowen,** a 2005 graduate of Morro Bay High School in California. He is the son of Greg Bowen of Belden and Kathy Fiene of Santa Fe, TN.

Byram, MS – Computer engineering senior **Ryan Wood,** a 2005 graduate of Hillcrest Christian School and the son of Dwain and Cindy Wood of Byram.

Gulfport, MS – **William Cleveland,** a senior double majoring in aerospace and computer engineering and 2005 graduate of the Mississippi School for Math and Science. He is the son of Peter and Faye Carole Cleveland of Gulfport.

Horn Lake, MS – Senior computer engineering major **Brad Reaves,** a 2006 Horn Lake High School graduate. He is the son of David and Angela Reaves of Dyersburg, Tenn., and Dale and Gary Morris of Jonesboro, AR

Lucedale, MS – Senior computer engineering major **Tim Pitts,** a 2006 George County High School graduate and son of Greg and Nancy Pitts of Lucedale.

Rayville, LA – Computer engineering senior **Austin Lee,** a 2005 graduate of Riverfield Academy. He is the son of Hayes and Kathy Lee of Pineville, LA.

Southaven, MS – **Gary Weasel,** a senior in computer engineering and a 2005 graduate of Southaven High School. He is the son of Gary and Nancy Weasel of Las Vegas, NV.

According to its web site, IEEE, the Institute of Electrical and Electronics Engineers, is the largest professional association advancing innovation and technological excellence for the benefit of humanity. The organization boasts more than 395,000 members in more than 160 countries.

Related Links

See more pictures from IEEE SECON on Microchip's Academic Program Facebook page.

IEEE SECON Home Page: **http://www.ieee-secon.org/**

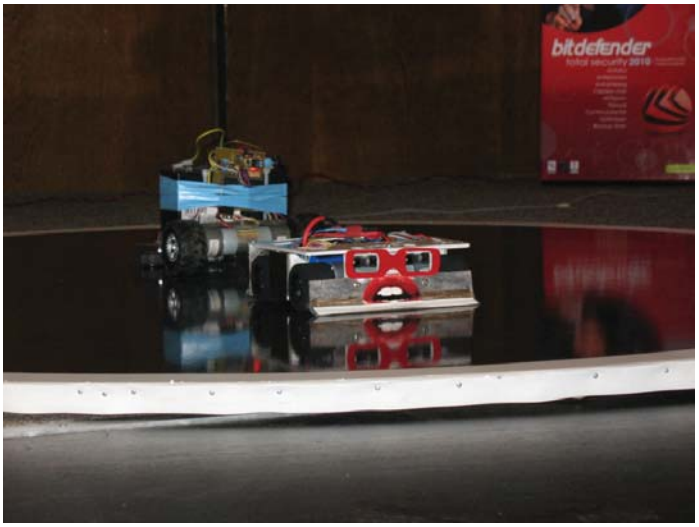
Mississippi State University Home Page: **http://www.msstate.edu/**

Note: Dr. Bob Reese co-authored one of the quintessential textbooks on Microchip's 16-bit Microcontrollers. Additional information on Dr. Reese's book can be found at **www.reesemicro.com.**

RoboChallenge in Bucharest, Romania

The Robotics competition at the Faculty of Electronics, Telecommunications and Information Technology has reached the third edition.

RoboChallenge is the annual robotics competition held by the **Polytechnics University of Bucharest, Romania** at the Faculty of Electronics, Telecommunications and Information Technology. The competition took place on March 24, 2010 in the Lecture Hall of the Faculty of Electronics, Telecommunications and Information Technology.



Two robots get ready to do battle.

This year's edition has brought together 23 teams of students with a passion for Robotics from the universities in Bucharest for the local stage of the competition. The small robots will continue their "battle" on May 8-9 on a national level. Teams from the most important technical universities in the country will participate. So far, teams from Iasi, Cluj, Timisoara and Craiova have announced their participation.

The event is organized by the Electronics Students' League.

The theme of last year's competition was football, while this year the robots have competed in sumo. The competition entails constructing autonomous robots, capable of performing specific tasks, without any human intervention or a remote control. The participating teams have built such robots, including the design and the implementation, but also the programming of the system so that it can act in an independent manner.

The autonomous robots enrolled in the contest are placed inside a (fighting) ring. They must avoid falling or getting pushed outside the ring by the challenging robot. The first robot to touch the surface outside the ring loses the round. The first robot to be triumphant for two rounds in a row wins the match. The robot to win the most matches wins the championship.

The competition was won by the Brutus team, with a small, but energetic robot. The six finalists will participate in the national stage of the competition, which will take place in May.

Microchip Technology is proud to have been able to be a sponsor for this event. The company provided the competitors with electronics components for the robots and will offer performant Microchip products to all the participants so as to fuel their passion.

Related Links

RoboChallenge Home Page: http://www.roboarena.ro

Video Links

http://www.youtube.com/watch?v=8fNgMJrJYeY

http://www.youtube.com/watch?v=8BOnDB7rKiw&feature=related

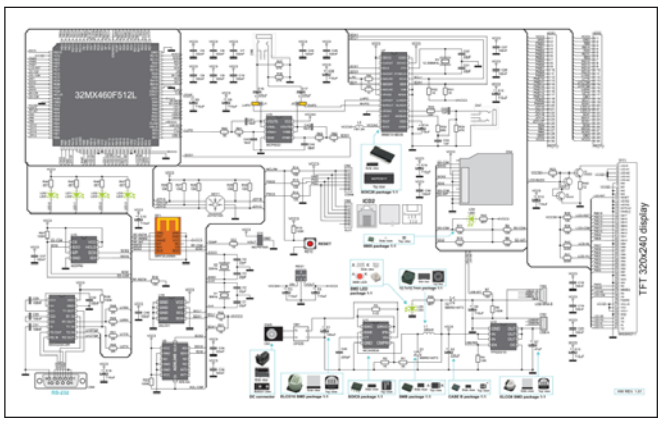
A Complete Multimedia Development System: The 32-bit Multimedia Board by mikroElektronika

MICROCHIP AUTHORIZED DESIGN PARTNER

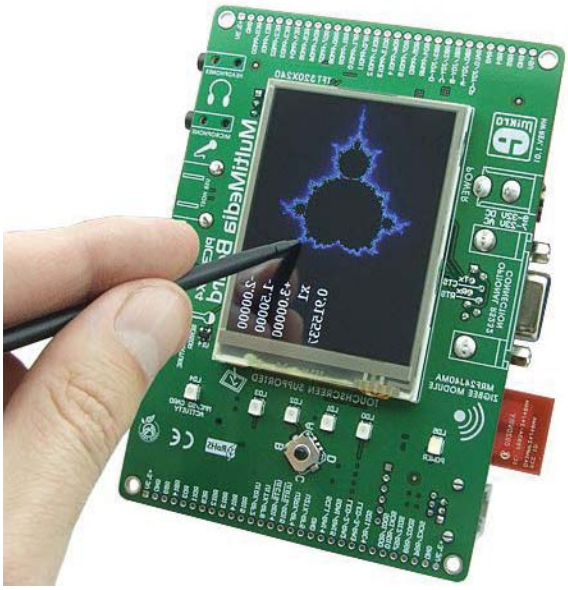
The 32-bit Multimedia Board from mikroElektronika is a compact, all inclusive development board for complete, high quality multimedia development. The board comes packaged with printed user manuals and schematics and a CD full of example projects that are easy to use, and really show the power of the PIC32. The 17+ MB of included code examples are written using Microchip's software stacks, making them easy to port with few modifications. The board has enough power to stream 16bit color video at 15 frames per second, off of an SD Card.

The back side reveals the brains of the board - a PIC32MX460F512L device. The back side also has USB Host and Device connectors, M25P80 Flash device, a 24LC01 Serial EEPROM, External ICD Connector, SD Card Slot, Stereo Codec chip with integrated Headphone driver and a digital accelerometer.

The board contains a 320x240 Touch Screen Panel, 4-way joystick, Microchip's MCP9700A Temperature Sensor, optional MRF24J40MA ZigBee® Module, headphone and microphone connectors, RS-232 port and prototyping pins.



Easy to use schematics, included with the board, make using and prototyping with the board a breeze!



The mikroElektronika board is available for $149.00 at **microchipDIRECT** (**Part #TMIK001**).

The optional 802.15.4 ZigBee Radio Module is available for $9.95 (**Part #MRF24J40MA**).

MikroElektronika
DEVELOPMENT TOOLS | COMPILERS | BOOKS
...making it simple

mikroElektronika manufactures high-quality development tools for microcontrollers. In addition, they develop sophisticated, comprehensive compilers and tools for PIC MCU users who want to get a quick start.

mikroElektronika also distributes many of books and articles, many of which are available for browsing and download, absolutely free of charge.

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Email: **office@mikroe.com**
Get more information at: **http://www.mikroe.com**

FLEX Boards

Fast prototyping with Microchip dsPIC® DSCs and PIC24 MCUs

By: Paolo Gai – Evidence

The FLEX Platform enables easy and fast development of embedded applications for Microchip's dsPIC® DSCs. The modular architecture allows compounding of the number of boards, to achieve the desired application with different features on one single device.

The most useful feature of the boards is that most of the pins on the dsPIC device are available on an easy to use 2.54 mm pitch connector. That is, it is very easy to connect and try sensors on the thru-hole board provided!

FLEX can be readily used for quickly developing applications in the field of electronics, mechatronics, robotics, control engineering, simulation, etc.

FLEX Demo Board

FLEX boards are small in dimension, they are equipped with resettable safety fuses, and can be directly programmed using the standard Microchip debug connector. The basic configuration of a FLEX device is made by the main board only. The base board mounts a dsPIC DSC, and exports almost all the pins of the controller. The user can easily connect the desired components to the dsPIC DSC ports in order to build the specific application.

The thru hole prototyping board has several common pinholes of standard 2.54 mm, 1.27 mm, 5.08 mm patterns, that allows development of small, homemade, custom circuits, which can be transparently interfaced with the FLEX base boards i.e., they can be extended using custom daughter boards to accommodate a number of additional functionalities e.g. sensors, network connections, actuators, etc.

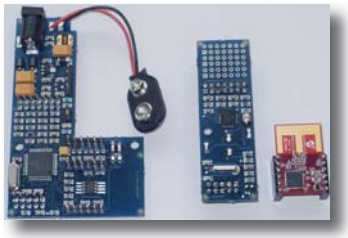
Advantages of using FLEX in an educational environment:

- 2.54 mm pitch that is ideal for hand made prototypes
- Switching power supply and resettable fuses resistant to improper input power sources
- Small form factor that is ideal for small robots and demonstrators
- USB connection for data exchange, logging and calibration with PCs
- Demo applications for using sensors, accelerometers, ZigBee® , A/D, PWM, serial, Ethernet, CAN, etc.

Available additional boards

- Demo board, with 3 axis accelerometers, 1 serial module, LCD, buttons, LEDs, light and temperature sensors, potentiometer, buzzer, ZigBee connector
- Demo board 2, with 3 axis accelerometer, 2 DC motors or 2 servomotors, 4 wire touchscreen, Ethernet, I²C™, CAN, serial connection, ZigBee connector
- Multibus board, with 2 serial modules, 2 CAN, 1 SPI, 1 Ethernet (Note: serial modules can be RS232, RS485, RS422 or TTL)

FLEX Mini Board



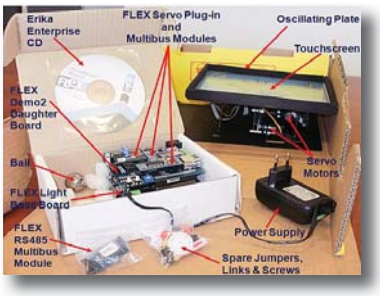
FLEX Mini Kit

The FLEX mini kit is a complete pack targeted specifically for ZigBee users and educational institutions e.g., schools and universities.

FLEX mini is ideal for developing a WSN (Wireless Sensor Network), and provides a completely independent, battery powered device with basic sensors in a commercial plastic box.

The FLEX mini hosts an EEPROM memory and a ZigBee slot, and it is already equipped with a sensor board hosting a 3 axis accelerometer, buzzer, real-time clock and light sensor. The Microchip MRF24J40MA module is included in the package.

Amazing Ball



Amazing Ball

The "Amazing Ball" is a low-cost "Ball and Plate" plant to learn automatic control with ease.

The device is powered by Microchip's dsPIC DSC and the FLEX hardware with Demo2 daughter board. It offers full Scilab/Scicos support providing the possibility of designing control algorithms without writing source code.

The device offers two servo motors, and the ball position is read using a touchscreen. Data sampled by the system is sent back to the PC using an Ethernet port. Videos of the Amazing ball are available at: http://www.youtube.com/group/flexboards

Software, Demos, Communityl

The FLEX boards are currently used by more than 25 universities around the world to teach embedded control, wireless networking, and Real-Time Operating systems, creating a unique educational environment for universities and teaching.

A lot of demos are already available for the FLEX boards and a set of university applications and demonstrators are available with accompanying videos. Moreover, to simplify application development on the FLEX boards, all the boards comes with the following open-source software:

ERIKA Enterprise and RT-Druid – a small, efficient and modular open source real-time kernel for embedded applications. Main features include:

- Full support for the Microchip C30 compiler, the MPLAB IDE debugging environment, and the Microchip MPLAB ICD 2 debugger
- Full support for dsPIC DSC series 30 and 33, and PIC24
- Complete software support for FLEX boards and daughter boards
- Support for the 802.15.4 (ZigBee) wireless communication using MiWi and the open-source uWireless stack

Scilab/Scicos – an open source development flow for the design, simulation and automatic code generation of control systems. Main features include:

- Design of a control system in Scilab/Scicos (more than 100 blocks available!)
- Simulation and tuning of the control system in Scicos
- Single-click code generation for Erika Enterprise for FLEX
- Automatic flashing of the FLEX board
- Integration in the Scicos HIL support using the FLEX USB/wireless connection

Links

1. *http://www.evidence.eu.com/content/view/114/204/ - FLEX products on Evidence web site*
2. *http://www.evidence.eu.com/content/view/361/432/ - Flex mini*
3. *http://erika.tuxfamily.org/ - the ERIKA Enterprise RTOS and Scilab/Scicos support*
4. *http://erika.tuxfamily.org/applicationnotes.html - Application notes coming from Universities and research centers*
5. *http://www.youtube.com/group/flexboards - Youtube videos*
6. *http://www.evidence.eu.com/content/view/362/433/ - Amazing Ball*

About Evidence Srl

http://www.evidence.eu.com

Evidence Srl, based in Italy, was established at the end of 2002 as a spin-off of the ReTiS Lab of the Scuola Superiore Sant'Anna (Pisa, Italy) by a group of researchers expert in real-time scheduling analysis, operating systems, control systems and multiprocessor scheduling techniques. Evidence operates in the field of software for embedded real-time systems and provides innovative software solutions for the design and development of real-time embedded systems, with a special focus on multi-core hardware platforms. Today, Evidence is a dynamic company having collaborations in the field of electronics, telecommunications, automotives and industrial automation markets. Evidence has developed Open-Source Real-Time Operating Systems (RTOSs) for small microcontrollers (It is leading the development of the ERIKA Enterprise RTOS) and other operating systems (Embedded Linux) for embedded devices.

About Embedded Solutions Srl

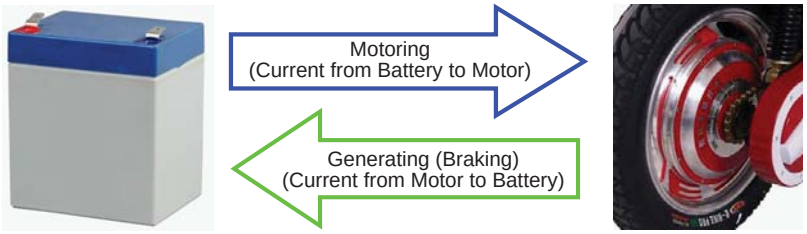
http://www.es-online.it

Embedded Solutions is an Italian company specialized in hardware and software design.

Embedded Solutions develops electronic devices based on microprocessor and microcontroller architectures, and it offers the possibility of having not only the hardware and software design of a product, but also the prototyping of multilayer boards with SMT and PTH technologies. The application fields covered by Embedded solutions starts from small applications with 8-bit microcontrollers, up to complex applications involving 32-bit general purpose microprocessors.

Regenerative Braking with the dsPIC® Digital Signal Controller

In mobile applications a battery is typically used to power electrical circuits such as lights and ignition. In hybrid cars the battery may also run a Permanent Magnet Synchronous Motor (PMSM). In these applications, recharging the battery can significantly extend the running time or improve the vehicle's efficiency. When braking for a stop or when going downhill, no power is required from the motor. Treating the motor as a generator at these times, we can capture the energy in a process called regenerative braking.

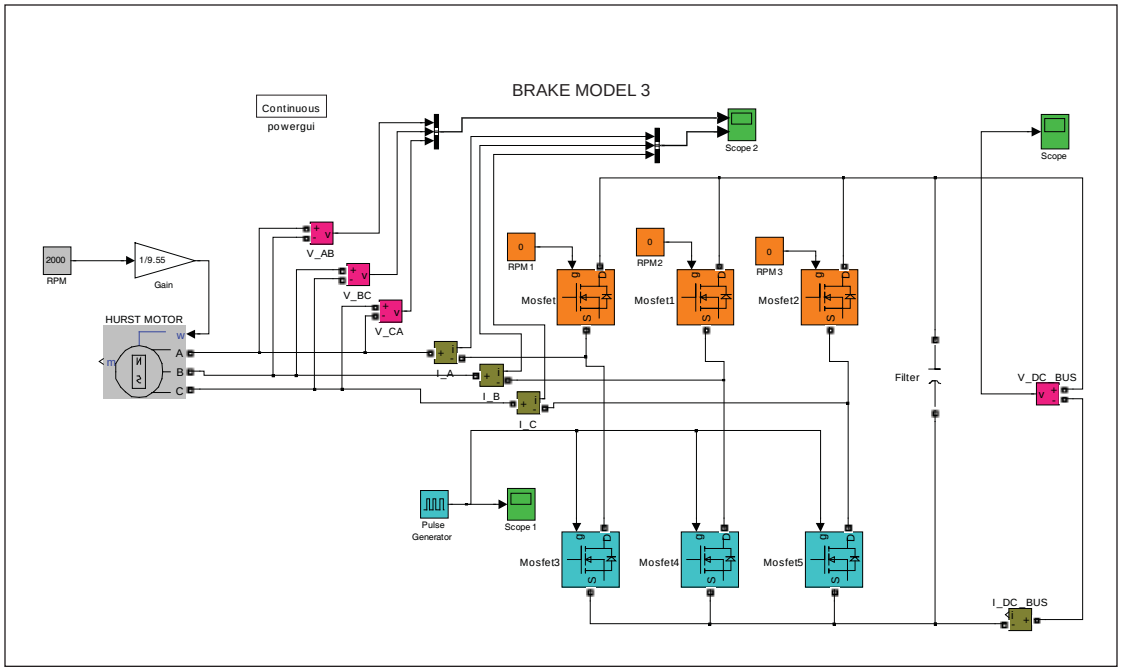


Acting as a generator, the 3-phases of the Brushless DC (BLDC) motor will output a sinusoidal voltage waveform that is called Back Electromotive Force (BEMF). In order to charge the battery, it must first be converted to a DC voltage. Using the existing motor control drive circuitry, the dsPIC® DSC can turn off the MOSFETs. Doing this routs the voltage through their freewheeling diodes implementing a diode bridge rectifier. The resulting DC voltage output can be filtered and fed directly to the battery.

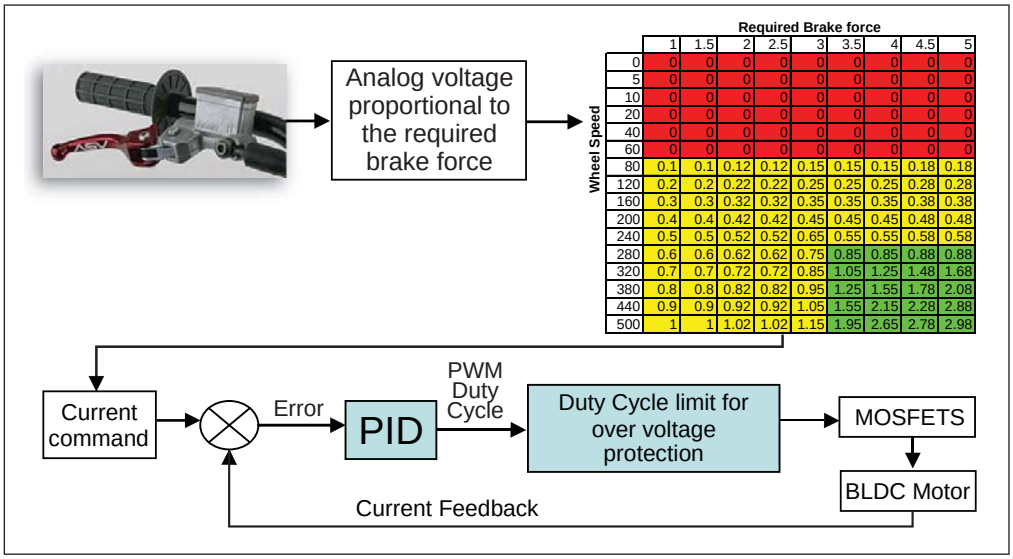
However, in order to actually make current flow from the motor to the battery requires that the DC voltage output from the rectifier be greater than the battery terminal voltage. Based on the specific voltage constant parameter (Ke or Voltage Peak/Krpm) of the motor, it will most likely need to run at a very high speed in order to produce sufficient voltage. The problem is that braking creates a load on the motor and causes its speed to quickly drop out of the recharging range!

Using the dsPIC DSC we can also solve this problem. In addition to rectifying the voltage, the dsPIC DSC offers Pulse Width Modulation (PWM) of the low-side MOSFETs in the motor drive electronics creating a boost converter circuit using the motor coils. Depending on the PWM duty cycle, this will increase the voltage by as much as 400% and allow us to recharge the battery over a wide range of motor speeds. Doing this will also load the motor and slow it down, similarly to mechanically applying brakes.

The recharging current will vary linearly with the PWM duty cycle up to about 70%. Beyond that, the current drops due to motor construction issues. While the brake force will be proportional to the recharging current, we can't just set the duty cycle at 100%. The dsPIC DSC will need to actively adjust or limit the PWM duty cycle. This can be accomplished by implementing a software PID loop to control the recharging current.



There are two reasons for the control loop. The first is to ensure that the voltage seen on the MOSFETs are kept within their specification limits to prevent component failure! The second is that by maintaining a constant brake force as the motor speed changes, the driver will feel a controlled linear response and allow them to better judge when to apply the mechanical brakes to finally stop the vehicle.



Wheel Speed \ Required Brake force	1	1.5	2	2.5	3	3.5	4	4.5	5
0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0
40	0	0	0	0	0	0	0	0	0
60	0	0	0	0	0	0	0	0	0
80	0.1	0.1	0.12	0.12	0.15	0.15	0.15	0.18	0.18
120	0.2	0.2	0.22	0.22	0.25	0.25	0.25	0.28	0.28
160	0.3	0.3	0.32	0.32	0.35	0.35	0.35	0.38	0.38
200	0.4	0.4	0.42	0.42	0.45	0.45	0.45	0.48	0.48
240	0.5	0.5	0.52	0.52	0.65	0.55	0.55	0.58	0.58
280	0.6	0.6	0.62	0.62	0.75	0.85	0.85	0.88	0.88
320	0.7	0.7	0.72	0.72	0.85	1.05	1.25	1.48	1.68
380	0.8	0.8	0.82	0.82	0.95	1.25	1.55	1.78	2.08
440	0.9	0.9	0.92	0.92	1.05	1.55	2.15	2.28	2.88
500	1	1	1.02	1.02	1.15	1.95	2.65	2.78	2.98

For more information, visit: http://www.microchip.com/motor

WHAT'S *New* IN MICROCHIP LITERATURE?

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

Doc. Type	Doc. Title	DS No.
Application Note	How to Use the Capacitive Sensing Module	01171C
	High-Speed Bootloader for PIC16 and PIC18 Devices	01310A
	Single Cell Input Boost Converter Design	01311A
Data Sheet	25AA1024 Data Sheet	21836G
	PIC18F85J11 Family Data Sheet	39774D
	PIC18F46K22 Data Sheet	41412A
	PIC32MX5XX/6XX/7XX Family Data Sheet	61156C
Errata	PIC24FJ256GB110 Family Silicon/Data Sheet Errata	80369G
	dsPIC30F2011/2012 Family Silicon Errata and Data Sheet Clarification	80450C
	dsPIC30F2010 Family Silicon Errata and Data Sheet Clarification	80451C
	dsPIC30F5011/5013 Family Silicon Errata and Data Sheet Clarification	80453C
	dsPIC30F4011/4012 Family Silicon Errata and Data Sheet Clarification	80454C
	dsPIC30F3014/4013 Family Silicon Errata and Data Sheet Clarification	80455C
	dsPIC30F6011/6012/6013/6014 Family Silicon Errata and Data Sheet Clarification	80456C
	dsPIC30F6010 Family Silicon Errata and Data Sheet Clarification	80459C
	PIC16F/LF1826/27 Errata	80485B
	PIC24FJ64GB004 Family Silicon/Data Sheet Errata	80487C
	PIC16F/LF1933 Errata	80490B
	PIC18F87J11 Family Silicon/Data Sheet Errata	80495A
	PIC18F2480/2580/4480/4580 Silicon/Data Sheet Errata	80496A
Programming Specification	PIC16F505 Memory Programming Specification	41226G
	PIC16F506 Memory Programming Specification	41258C
	PIC16F72X/PIC16LF72X Programming Specification	41332C
User's Guide	MCP1640 Synchronous Boost Converter Evaluation Board User's Guide	51880A
FRM Chapter	dsPIC33E/24E FRM Section 20. SPI	70067E
	dsPIC33F/24H FRM Section 24. Programming and Diagnostics	70207B
Packaging Specification	Packaging Specification	00049BD

USB-to-UART Protocol Converter Makes it Easy to Add USB to Existing Systems

Microchip has introduced a complete, out-of-the-box solution that makes it easy to add USB connectivity to existing systems. The MCP2200 USB-to-UART protocol converter, with its low-cost evaluation tool, software libraries and Windows® based configuration tool, enables designers to quickly and easily add USB connectivity to their application without completely redesigning the system. The whole solution is designed to shorten time-to-market for a variety of applications in the industrial (e.g. data loggers, instrumentation, data-acquisition systems and smart-card readers) and medical markets (e.g. heart-rate, blood-sugar and blood-pressure monitors), in addition to legacy RS-232 applications.

End users increasingly want to connect their embedded applications to PCs for data collection, transfer and analysis, as well as for system networking/connectivity. One of the simplest ways to add this capability to existing systems is via a USB-to-UART protocol converter, such as the MCP2200. By simply connecting the MCP2200 UART interface to any microcontroller UART peripheral, USB connectivity can be added. Additionally, the MCP2200 includes 8 general-purpose I/O pins that can be controlled by the PC using the Windows-based configuration tool that comes with the MCP2200. As a result, a wider range of applications can be supported.

Microchip also announced the MCP2200 USB-to-Virtual Communications Port Demo Board, today (part # MCP2200EV-VCP, $23.99). Along with software libraries and a PC-based configuration tool, the board removes the burden of thoroughly understanding the USB protocol from system designers, which simplifies the addition of customizable USB functionality to existing designs. It serves as a complete USB-to-RS232 converter solution (dongle) and provides USB-to-GPIO capability, enabling designers to manipulate the on-chip I/O from the included PC software, so that they can program and test different functional configurations.

The MCP2200 USB-to-UART protocol converter is available in 20-pin SSOP and SOIC packages for $1.39 each, in 10,000-unit quantities (for both package options). It is also available in a 5 x 5 mm QFN package, for $1.50 each, in 10,000-unit quantities.

For more information, visit: http://www.microchip.com/wwwproducts/Devices.aspx?dDocName=en546923

Feature Your Cool Demo Software on the PIC18 Starter Kit

Share your creative ideas on how to showcase the USB, touch sensing, accelerometer and OLED display on the new PIC18 Starter Kit.

USB • Touch Sensing • Low Power • SD Memory Card • Accelerometer • OLED Display

Get Your Code Featured

1) Use the PIC18 Starter Kit from Microchip to develop cool new demos.
2) Submit your code by June 30th, 2010 to **PIC18starter@microchip.com**. Include your name, company name and a short description of the demo.
3) Several winners will be chosen. Their demo code will be included on the SD card that ships with the next version of the PIC18 Starter Kit and will be available for download on the **www.microchip.com/PIC18starter** web site! Your name and company name can be included.

About the PIC18 Starter Kit:

- Functions as a USB mouse, joystick or mass storage device all using the on-board capacitive touch sense pads
- Includes a MicroSD™ memory card, potentiometer, acceleration sensor and OLED display
- On-board debugger and programming
- Completely USB-powered
- Demonstrates PIC18 Family:
  - PIC18F46J50 8-bit MCU
  - 64 KB Flash and 4 KB RAM
  - nanoWatt XLP for extreme low power
  - mTouch™ capacitive touch sensing
  - USB communication
- Microchip's FREE downloadable USB bootloader and software framework available at: **www.microchip.com/USB**

Submission Restrictions:

1) Code runs without modifications to board.
2) Code should be loadable using the SD card bootloader.
3) Demo cannot destroy, delete or format the existing SD card data. It can read, write and erase files that the demo itself creates but should not touch the other files.
4) Code must be functional and deemed relevant and appropriate to be featured on the PIC18 Starter Kit.

All winners will be notified by August 15th, 2010.

For additional terms and conditions, visit: www.microchip.com/PIC18starter

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 2nd episode of MCHP Tube. To view Microchip's YouTube channel, click HERE.

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