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- Design & Test

COVER STORY

Speeding the development of embedded motor control
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Efficient and effective motor control is an important issue for a growing number of electronic engineers working in areas ranging from industrial control and building automation to domestic pumps and home appliances. However, there are many challenges to implementing effective motor control – especially when applications need to be delivered within short development schedules and constrained budgets. Not least is the fact that increasingly sophisticated control methodologies are needed to take advantage of the smaller, more efficient, more reliable variable-speed brushless DC (BLDC) motors that are now prevalent in low-to medium-power applications. Such challenges become magnified in projects where there is pressure to focus on ‘non-motor’ features and functions that are deemed to deliver more competitive advantage to the finished product or where designing motor control systems is not necessarily a ‘core competence’ of the team.

For a number of years semiconductor manufacturers have helped engineers simplify motor control designs by offering ASSPs that incorporate dedicated, hardware-based motor drive functions. While easy to use – typically all that is needed to change motor speed is to vary the input voltage signal – by definition the functionality of such parts cannot be changed. This limits design flexibility and necessitates further hardware and software development in the case of ‘non-standard’ target applications. Another limitation of the ASSP approach is that these devices typically do not have the intelligence needed to handle complex field oriented control (FOC) techniques that are required in modern BLDC designs. Also known as vector control, FOC overcomes the poor low-speed accuracy associated with traditional trapezoidal control while offering better efficiency at high speeds when compared with conventional sinusoidal techniques. FOC schemes are particularly popular thanks to their potential to reduce energy - deviation between target and actual speeds is meaning meaning there is little need for dramatic and acceleration and deceleration corrections. More energy, therefore, is directed at rotating the motor than heating the windings. In addition, less stress is placed on the motor, improving reliability.

The downside is that implementing the complex algorithms (FOC demands transformation of sensed stator currents into quadrature and direct vectors with respect to the rotor; comparison of the direct vector with zero and ‘requested torque’; integration of the error signals; transformation back into the stator domain; and generation of the corresponding PWM control signals) is far from trivial. That is why, until relatively recently, FOC implementations required the time-consuming development of resource-hungry software. Now, however, access to microcontrollers with on-board ‘vector engines’, motor drive functions and optimised peripherals – as illustrated by the block diagram in Figure 1 – is providing an alternative firmware-based approach. Such an approach delivers design flexibility that is not available from ASSPs, while minimising – or in some cases eliminating - the programming and resource overhead associated with software-based designs.
Figure 2 illustrates an embedded motor control application built around an ARM Cortex-M3 microcontroller. The ARM Cortex™-M3 32-bit processor core is ideal for highly deterministic real-time applications and has been designed to meet the challenges of low dynamic and static power constraints. The diagram shows the physical microcontroller hardware layer as the base of the implementation, progressing to the final application layer at the top via the ARM Cortex Microcontroller Software Interface Standard (CMSIS) hardware abstraction layer, the FreeRTOS and driver layers and the motor control elements of the implementation. Tasks A and Task B represent some application-specific motor control functionality developed by the engineer, which are implemented without changing the fundamental motor control functionality.

All of the other blocks below the application layer are provided by the firmware. For some engineers the attraction of the firmware-based approach is that they can choose just how much of the firmware to implement and what percentage of control will be managed by hardware and software. Many others, however, may simply want to treat the microcontroller as if it were a more intelligent ASSP and spend as little time as possible configuring the device or writing additional code. It is for this reason that the latest evolution in the world of firmware-based, microcontroller motor control designs is the dedicated and pre-configured motor control development board. Take, for example, the Toshiba ‘SigmaBoard’ shown in Figure 3a. This board measures just 2.5cm x 5cm and is designed for immediate ‘out-of-box’ use with low-voltage motors with ratings up to 36V and 2A.

In terms of hardware the SigmaBoard is a double-sided PCB that has been designed with an ‘analogue side’ and a ‘digital side’. The analogue side incorporates gate drivers; a current measurement circuit comprising a 50mΩ shunt resistor and amplifier for current sensing; an overcurrent comparator; and low-side MOSFETs. As well as Toshiba’s TMPM373 ‘SigmaDevice’ microcontroller, the digital side of the board features a USB-to-serial interface with a default transmission rate of 115kbps; a USB connector for a host PC; a DC-DC converter; an RGB LED to indicate each motor phase; interfaces for the U, V and W motor phase outputs; and the requisite high-side MOSFETs.

Toshiba’s TMPM373 is a miniature, 48-pin, low-power 32-bit ARM Cortex-M3 device that will operate from a 5.0V supply with a maximum core speed of 80MHz. The block diagram of Figure 1 that we referred to previously shows the key functional blocks of this device.

As well as the motor control functionality, these include NANO Flash memory for rapid programming and an OFD (Oscillation Frequency Detection) unit that simplifies compliance with the IEC 60730 standard. On the SigmaBoard this microcontroller is pre-programmed with Toshiba’s motor control firmware.

The SigmaBoard has been designed for use with Toshiba’s free MotorMind software. Running on a PC (or in the future an Android-based tablet with communication via a Bluetooth module, which offers the added advantage of galvanic isolation) this tool uses an intuitive graphical user interface (GUI) to simplify configuration of key FOC motor control parameters. Parameters such as Proportional-Integral (PI) control settings, deadtime and PWM frequency can be set then stored in internal memory for later standalone use. Once configured the PC can be disconnected and the bare minimum needed for an engineer to get a motor up and running is simply the motor itself, a suitable power supply for the motor and for the board, and an analogue speed input signal (Figure 3b). The pre-programmed microcontroller eliminates the need for any extra software development and, while additional signals for PWM speed input, fault...
detection and indication and a tacho signal can all be connected, they are not essential. Furthermore, the new board can also be connected to any other power boards via the relevant pins on the PCB, allowing engineers to use the same firmware and digital elements to develop systems for controlling larger motors or addressing different application requirements. Depending on application requirements the SigmaBoard can be used as a starter kit, as a reference system, or as a stand-alone BLDC motor control solution. The latter is likely to be particularly attractive to engineers who do not want to add additional features or have the need to rapidly implement motor control functionality in low-volume production runs. Furthermore, to support engineers looking to develop motor control applications, Toshiba recently created its own online forum at https://forum.toshiba-components.com. Designed to facilitate qualified discussion among engineers, this forum is free to join and no registration is needed for basic ‘read’ access.

![SigmaBoard: (a) Top and bottom of the SigmaBoard; (b) ‘Bare Minimum’ Connectivity](image)

**Product News**

**MSC: 91 new 16-bit low-power MCUs for automotive**

MSC now offers a total of 91 new products in the RL78/F13 Group and RL78/F14 Group of 16-bit microcontrollers from Renesas Electronics. The MCUs feature an extremely low standby mode current consumption of only 500 nA, improved safety functions, additional multiply-and-accumulate instructions, and a new extremely space-saving QFN package. The RL78/F13 MCUs have internal flash memory sizes from 16 to 128 kilobytes and are available in different versions with packages from 20- to 80-pins.

*News ID 17901*

**XMOS and SiLabs join forces to deliver next wave in programmable SoCs**

XMOS and Silicon Labs announce a technology partnership that allows XMOS to integrate energy friendly ARM technology into its xCORE multicore microcontrollers to produce the next wave in programmable system-on-chip products. The partnership builds on the configurable xCORE multicore microcontroller architecture from XMOS, which allows customers to program in software the exact mix of peripherals and interfaces that they need and provides timing-precise execution of high level software code, with multiple 32-bit processor cores available to share the work in parallel.

*News ID 17962*

**Freescale debuts ARM-based QorIQ LS series communications processors**

Freescale Semiconductor announces its new QorIQ LS1 family of communications processors based on the core-agnostic, software-aware LayerScape system architecture. The devices are engineered to support a broad range of power-sensitive networking applications, as well as additional fast-growing product categories including Internet of Things gateways and industrial automation and control equipment.

*News ID 17926*

**ADI: ARM Cortex-M4 based mixed-signal control processors**

Analog Devices launched a mixed-signal control processor that integrates an embedded dual 16-bit A/D converter with up to 14 bits of accuracy together with a 240-MHz floating-point ARM Cortex-M4 processor core. Equipment manufacturers require highly accurate, closed-loop control in servo, motor-drive, solar photo-voltaic inverter and other embedded industrial applications to improve the energy efficiency and performance of their products.

*News ID 17833*

**TI: Sitara AM335x ARM Cortex-A8 processor fuels newest Arduino board**

Texas Instruments announced that the Sitara AM335x ARM Cortex-A8 processor has been selected to power the newest Arduino board, the Arduino TRE. TI’s 1 GHz Sitara AM335x processor offers up to 100x more performance on the Arduino TRE, compared to the Arduino Leonardo or Uno. For the first time ever, Arduino users can use the full capabilities of Linux and gain access to a variety of new on-board connectivity options to develop a range of powerful, advanced applications while leveraging the simplicity of the Arduino software experience.

*News ID 17869*

**Renesas: RX631 32-bit MCUs implement CMOS camera functionality**

Renesas Electronics announced the expansion of its RX631 Group in the RX600 Series of 32-bit microcontrollers with the introduction of 15 new devices for commercial and building automation applications. The 15 new MCUs feature a built-in parallel data capture unit that also allows the direct connection of a CMOS camera module, making it easy and cost effective to build application with image capture.

*News ID 17881*

**Microchip introduces PIC32 Bluetooth Audio Development Kit**

Microchip announces the new PIC32 Bluetooth Audio Development Kit. The full-featured kit enables custom application development on the PIC32 microcontrollers for Bluetooth and USB digital audio solutions.

*News ID 17947*
One may well ask, what does the term embedded MPU actually mean? In order to answer this question, we have to have a brief look at the current offering across the MPU/MCU spectrum. Today, an MCU typically contains embedded flash and RAM, running code from the flash but somewhat limited in terms of performance, particularly when it comes to the area we are talking about – the performance level needed for a Human Machine Interface. The alternative today is the classical MPU or microprocessor system which achieves the performance level needed and can significantly exceed it; however, it typically will not have any internal flash and only a small amount of internal RAM. Typical MPUs have their place in the market as do MCUs, of this there is no debate. However, there is certainly a significant gap between the two areas.

Filling the gap is where the eMPU can be useful. The eMPU, like an MPU, does not contain any embedded flash and has a CPU core running at a performance that would not be possible with a typical MCU. This performance level can (as with the MPU) only be achieved by running from RAM. In contrast to the microprocessor system, which will use external RAM, the eMPU contains all the RAM that it will need for the application. The eMPU typically will boot from an external serial flash, compared to an MPU, which will typically use external NOR flash. This can have several advantages. It is possible to use the QSPI serial flash block which can achieve even faster performance than the standard NOR flash. It requires less PCB space and fewer pins on the eMPU than a 32-bit parallel NOR flash. The eMPU has enough RAM internally not to need to use external RAM, compared to an MPU which will typically use external DDR or SDRAM. This can also have several advantages. The application is decoupled from the RAM market, and although this is not likely to be seen as a positive point for the average hardware designer, any purchasing team will breathe a sigh of relief to be free of this. It requires less PCB space and also fewer pins on the eMPU, and coupled with the use of a serial flash can allow designers to use a much smaller QFP package, allowing for a 2-layer PCB instead of a multi-layer PCB. It eliminates the requirement for an additional power supply of 1.8V for the DDR supply.

Clearly the performance of an eMPU is not going to reach that of the quad core multi-gigahertz system residing in a desktop PC, but not every HMI system today needs to be built like a PC. There is another way.

The RZ/A features a Cortex A9 core which is clocked at 400MHz and includes the optional IEEE754 compliant double precision floating point unit architecture (VFP) and the optional general purpose 128-bit single instruction multiple data (SIMD) NEON extension. These extensions accelerate typical operations in DSP, multimedia and visualisation applications. The core, as is standard on Cortex A9 cores, has 32kB of instruction cache and 32kB of data cache. Additionally it includes 128kB of L2 cache to ensure that even if code is running from external non-volatile memory it can be executed at maximum performance.

The core alone is nothing unusual. The unique feature of this device is the inclusion of 10MB of internal RAM. This RAM is split into 4 separate blocks. Each block is 2MB in size and has a dedicated 128-bit-wide bus running at 133MHz. This means that each block can be addressed concurrently by the different peripherals on the chip. At the same time as the CPU can be running code from one block, it can be writing data to a second block, while the third block can contain the picture data to be written to the TFT screen and the final block can be used for some DMA access or as the communications buffer for a TCP/IP stack; all of these with no bus collisions. This is of course another major benefit of the eMPU architecture. Whilst an MPU has typically a fast bus to the external RAM, there is also only one of them. Thus the likelihood of a bus collision is high.
A feature of the 10MB of SRAM in the RZ/A family is the low-power RAM. In block zero of the RAM there is 128kB of data-retention RAM, which is also split down further into smaller blocks. These blocks can remain powered in low power modes and allow for a significantly faster wake-up from these modes. The start-up code and even the first screen to be driven to the TFT can be saved, thus as soon as the user presses a button or starts the system, it is as near as possible to a live state immediately. This is clearly another major advantage over MPU systems today which in order to achieve the lowest possible power consumption will remove power to the RAM and thus need to boot completely again from scratch.

Another unique feature of the RZ/A family is the SPI Multi-I/O. This peripheral can be thought of as a simple serial SPI block with a few extra enhancements. The first such improvement to the block is that it not only supports standard serial mode but also the new QSPI mode. This mode uses four parallel data lines as opposed to the standard 3-wire serial bus. With the new improved speed of this connection, initial benchmarks are showing a performance improvement in excess of 9 times when compared to the previous SPI modules. It also shows that it is possible to achieve even better performance (approximately 3%) than when accessing parallel external NOR-flash, for example. This has the upshot of allowing for a fast boot time without needing to connect a 32-bit bus to a device. The other feature of the SPI Multi-I/O block is the execute-in-place functionality. The block allows the CPU to access the QSPI serial flash as if it were an external linear address space. This feature is also supported by the L2 cache, such that code can be run directly from this external flash. The upshot of this feature is that any critical code that needs to be run fast and regularly can be run from the internal RAM, and then code that does not need to be run regularly can be run from external flash. So although designers are limited to only 10MB of RAM, the amount of code that can be written is limited only to the size of the available external SPI flash.

Finally, from a communications point of view, the device comes with everything that you would expect. There is an Ethernet MAC, two USB 2.0 interfaces supporting both host and device functionality, as well as up to 5 CAN channels. The RZ/A family is a fast processor which achieves high performance based on the 10MB of internal memory, and a wide bus avoiding collisions. It also supports a number of peripherals supporting all the standard interfaces one would expect, while also allowing system designers to design a system with a low bill of materials cost without compromising performance. All of this is nice, but it does not get to the real crux of the target application yet. How do you drive the screen?

The RZ/A has two features which make driving a screen very simple and allow for an impressive GUI. The first of these features is the VDC5. The VDC5 is the 5th generation of the video display controller from Renesas and is able to drive screens up to a maximum size of 1999 pixels x 2035 lines, making it the most impressive of its kind. The VDC5 actually supports up to 2 channels meaning that two screens can be driven concurrently. The VDC5 also supports standard digital interfaces as well as LVDS, so that the trend in larger screens to use the LVDS interface can also be supported.

The first portion of the VDC is the input controller, which can receive up to two video input signals up to a maximum size of 1440 x 1024. The input controller supports phase compensation as well as horizontal noise correction and contrast correction. The input signals are then passed to the scaler block. The scaler block (of which there are two per VDC5 channel) can be used to scale the two video inputs...
either up or down to create the correct size image for the screen. The images can also be rotated and the two video inputs can even be overlaid using alpha blending and a colour look-up table (CLUT). The final images (if both inputs are treated separately) or image (if only one input is used or the two inputs are overlaid) are then stored in a frame buffer in the RAM and passed to the image synthesiser.

The image synthesiser combines up to 4 individual layers to create a single image. When either only one or no video inputs are being used, these layers are free to be used for other parts of the GUI as separate overlay layer or icons. Through a process of alpha blending and the CLUT, the final single image is created for the screen, and driven to the output controller. Finally, the output controller takes the generated image and drives it to the TFT screen, either via the LVDS or the digital output, in one of many supported formats: RGB888 (24-bit parallel output), RGB666 (18-bit parallel output), RGB565 (16-bit parallel output) or RGB888 (8-bit serial output). The operation of the alpha blending and the combination of the multiple layers means that the CPU can be offloaded of this functionality. The second peripheral of the RZ/A devices that is useful for HMI development is the OpenVG-compliant graphics engine, which is a 2D vector graphics accelerator. The IP accelerates stages 2 to 8 of the OpenVG pipeline by using dedicated hardware and a compliance tested library. The OpenVG engine can be used to fill the frame buffers and the VDC5 can then be used to drive the image data to the screen. The advantage of using OpenVG is that it allows for the use of vector graphics, which can greatly improve the efficiency as well as the look and feel of a GUI. Two simple examples can be used: where an image has to be rotated, the easiest way to do this with a bitmap image is to save the image 360 times, each rotated by 1 degree, and then simply show each picture one after the other. This is clearly a significant overhead in terms of memory usage and also in terms of bandwidth of the device, while a vector implementation of the same picture can simply be rotated and the support for this rotation is included in hardware in the RZ device. The second example is that of scaling, and in this case a picture paints a thousand words, so picture 5 is left uncommented.

The new Renesas eMPU RZ/A is designed to fill the gap between the traditional MPU and the traditional MCU market spaces. It features up to 10MB of embedded SRAM, and supports a fast wake-up from lower power modes. The device only needs a simple and low cost serial flash from which it can boot directly. The 10MB of memory is enough to store both the front and the back buffer for a double-buffered HMI application. The RZ’s 10MB of internal RAM is connected to a multi-layered bus and is separated into 2MB blocks, such that the RAM can be both read from and written to by multiple sources concurrently. This enables a high performance Human Machine Interface application to run on a system that needs no external RAM and has a low number of pins, available in QFP packages such that designers are able to use a 2-layer PCB. The RZ/A will never achieve the simplicity of an 8-bit MCU with 16k of ROM, nor will it ever achieve the performance of a quad-core 2GHz processor, but new Human Machine Interface applications need just a little bit more performance than a standard MCU can offer, without making that big jump to a microprocessor architecture.

**Product News**

- **Mouser stocks Freescale’s Kinetis KL02 MCUs**
  Mouser Electronics is now stocking the Freescale Kinetis KL02 microcontroller that combines the smallest ARM Cortex-M0+ processor running at 48MHz with improved energy efficiency and feature integration. The Kinetis KL02 comes in a Chip Scale Package and uses 25% less PC board area than the nearest competing microcontroller and adds 60% more General Purpose I/O.
  **News ID 17819**

- **Infineon: IEC 60730 self-test library for XMC1000 and XMC4000 MCUs**
  Infineon Technologies announced the availability of a free VDE certified IEC 60730 self-test library for its XMC1000 and XMC4000 families of industrial 32-bit microcontrollers.
  With the Infineon Class B library packages, the XMC1000 and XMC4000 families satisfy the requirements defined by IEC 60730 Class B, a standard which is mandatory since October 2007 for the safety of household appliances sold in Europe.
  **News ID 17856**

- **AMD offers choice of ARM or x86 SoC, APU or CPU options with Radeon graphics**
  AMD disclosed its roadmap for the fast-growing embedded computing market. The new lineup includes two best-in-class x86 accelerated processing units and central processing units, a first look at a high-performance ARM SoC and a new family of discrete AMD Embedded Radeon graphics processing units expected to launch in 2014.
  **News ID 17817**
An accurate plant model is the linchpin of control system development using model-based design. With a well-constructed plant model, engineers can verify the functionality of their control system, conduct closed-loop model-in-the-loop tests, tune gains via simulation, optimize the design, and run what-if analyses that would be difficult or risky to do on the actual plant. Despite these advantages, engineers are sometimes reluctant to commit the time and resources required to create and validate a plant model. Concerns include how much time it will take to run a simulation, how much domain and tool knowledge will be required to build and validate the model, and what type of equipment will be needed to acquire hardware test data for building and validating the model.

We used the plant model to build and tune a closed-loop PMSM control system model. We ran step response and coast-down tests using the controller model in simulation and on hardware using an xPC Target turnkey real-time testing system. We found close agreement between the simulation and hardware results, with normalized root-mean-square deviation (NRMSD) below 2% for key signals such as rotor velocity and motor phase currents. The PMSM plant model, developed with SimPowerSystems, includes the motor and a load - in this example, an acrylic disc. The model has nine parameters that define its behaviour: one (disc inertia) associated with the load and eight associated with the motor.

We conducted five tests to characterize these parameters: the bifilar pendulum test, the back-EMF test, the friction test, the coast-down test, and the DC voltage step test. In this article, we will focus on the coast-down test and the DC voltage step tests. These tests demonstrate progressively more sophisticated methods of parameter identification, and illustrate extracting parameter values via curve fitting and parameter estimation, respectively. For each test, we describe the test setup and then explain how we conducted the test, acquired the data, extracted the parameter value, and verified it.

To characterize the rotor inertia (H) we spin the rotor up to an initial speed ($\omega_r$) and measure the rotational speed ($\omega$) as the rotor coasts to a stop. Using this measured result, the rotor inertia can be identified by curve fitting the equation for $\omega$ to the measured rotational speed during the period of time when the motor is coasting to a stop. The differential equation [1] describes the mechanical behaviour of the motor. The coast-down test is set up so that the load torque ($T_{load}$) is always 0. Once the motor is up to an initial, steady-state speed, the motor is turned off, so that the electromagnetic driving torque ($T_{em}$) is also 0. Under these conditions the solution to [1] is given by the equation for $\omega$ [2], where $r$ is the rotational speed of the rotor shaft, $\omega_0$ is the initial rotational speed of the rotor shaft, $J_0$ and $b$ are the Coulomb friction and viscous damping coefficients, respectively, characterized from a separate friction test, $T_{em}$ is the electromagnetic driving torque (0 during this test), and $T_{load}$ is the load torque (0 during this test).

In the lab we created an open-loop Simulink test model to drive the motor to an initial speed of 150 radians per second, at which time the motor drive was turned off and the rotor coasted to a stop. Throughout the test the model captured the output of the rotational speed sensor. Using Simulink Coder and xPC Target, we deployed this model to an xPC Target turnkey real-time system. We executed the model using xPC Target, and imported the rotor speed data into Matlab for analysis.
After running the tests, we plotted the measured speed data in Matlab and used Curve Fitting Toolbox to fit equation [2] for the rotor angular velocity (ω) to the measured speed data while the rotor was coasting to a halt. Using the value of H from the curve fit, we evaluated equation [2] from the point at which the motor started coasting and plotted the results with the original test data. The equation equation [2] with the value of H from the curve fit closely predicts the motor speed during the coast-down test.

We used a model to verify our parameter identification result. Using the rotor inertia value obtained from the coast-down test (3.2177e-06 Kg m^2 in our PMSM model), we ran a simulation of the coast-down test in Simulink. We then compared and plotted the simulated results with the measured results. The results matched closely, with a normalized root-mean-square deviation (NRMSD) of about 2%. In the DC voltage step test a DC voltage is applied across the motor phase A and phase B connections and the resulting current is measured. Electrically, under these conditions, a three-phase PMSM behaves like a circuit with two series resistors and two series inductors. The measured current (i) is used to find the resistance and inductance parameter values. During the test the rotor is held motionless to avoid complicating the analysis with back-EMF waveforms, which tend to oppose the current flow. To avoid burning out the motor with the rotor motionless, a current limiting resistor (R_{lim}) is added and a step pulse rather than a steady DC voltage is used.

We again used xPC Target and an xPC Target turnkey real-time system to conduct the test. In Simulink we developed a model that produced a series of 24-volt pulses roughly 2.5 milliseconds in duration. We deployed this model to our xPC Target system using Simulink Coder, and applied the voltage pulse across the phase A and phase B terminals of the PMSM. We measured the applied voltage and the current flowing through the motor using an oscilloscope, and using Instrument Control Toolbox we read the measured data into Matlab, where we plotted the results. Extracting the phase resistance from the measured data required only the application of Ohm’s law (R = V/I) using the steady-state values for voltage and current. For the PMSM we calculated the resistance as 23.26 volts / 2.01 amps = 11.60 ohms. By subtracting 10 ohms (the value of the current limiting resistor), and dividing the result by 2 to account for the two-phase resistances in series, we calculated the motor phase resistance to be 0.8 ohms.

Characterizing the inductance required a more sophisticated approach. At first glance, it looks as if we could have used curve fitting, as we did when characterizing the rotor inertia. However, due to the internal resistance of the DC supply, the measured DC voltage decays from an initial value of 24 volts at the start of the test, when the current into the circuit is 0, to a steady-state value of 23.26 volts after the current is flowing in the circuit. Because the input voltage is not a pure step signal, the results from curve fitting the solution to the series RL circuit equation would not be accurate.
To overcome this difficulty we opted for a more robust approach using parameter estimation and Simulink Design Optimization. The advantage of this approach is that it requires neither a pure step input nor curve fitting. We modelled the motor equivalent series RL circuit with Simulink and Simscape. Simulink Design Optimization applied the measured voltage as an input to the model, and with the value of the limiting resistor \( R_{\text{limit}} \) and the motor phase resistance \( R_{\hat{\text{hat}}} \) already known, estimated the value of the inductance \( L_{\hat{\text{hat}}} \) to make the current predicted by the model match the measured current data as closely as possible. To verify the values that we had obtained for phase resistance \( (0.8 \text{ ohms}) \) and inductance \( (1.15 \text{ millihenries}) \), we plugged the values into our PMSM model and stimulated the model with the same input that we used to stimulate the actual motor. We compared the simulation results with our measured results. The results matched closely, with an NRMSD of about 3%.

After identifying and verifying all key parameters, our PMSM plant model was ready to use in the development of the motor controller. We used Simulink Design Optimization to tune the proportional and integral gains of the controller outer loop, the velocity regulator. We ran closed-loop simulations to verify the functionality of the controller model, and used Simulink Coder to generate code from the model, which we deployed to an xPC Target turnkey real-time target machine. As a final controller verification step, we ran step response and coast-down simulations in Simulink and hardware tests using the deployed controller code on an xPC Target turnkey real-time system. We compared simulation and hardware test results for rotor velocity and phase current, and once again found close agreement between the model and the hardware, with NRMSD below 2% in both cases.

**Product News**

- Digia: Qt Mobile Edition offers true cross-platform mobile app development
  Digia announces the Qt Mobile Edition, a cross-platform development offering that provides everything needed to develop, deploy and host a mobile application at a low and affordable cost for Android, iOS and other mobile platforms. The Qt Mobile Edition enables hassle-free multi-platform application development and managing of apps with a built-in Qt-optimized cloud backend service, Enginio.
  News ID 17875

- Mouser offers TI WEBENCH online design tool
  Mouser Electronics is now offering an online software design tool from Texas Instruments that delivers customized designs in mere seconds. WEBENCH Designer lets designers generate, optimize, and simulate designs that conform to their unique specifications.
  News ID 17913

- SYSGO has achieved PikeOS SIL 4 certification on multi-core platform
  SYSGO has achieved to certify its PikeOS real-time OS and hypervisor within a multi-core platform according to EN 50128 SIL 4. The certificate has been delivered by TÜV-SÜD. Safety critical systems deployed on a multi-core processor have been so far using only a single core and made the other cores inactive.
  News ID 17956

- Microchip: cloud-based development platform available on Amazon
  Microchip announces a simple Cloud Development Platform that is available on the Amazon Web Services Marketplace and enables embedded engineers to quickly learn cloud-based communication. Microchip’s platform provides designers with the ability to easily create a working demo that connects an embedded application with the Amazon Elastic Compute Cloud service.
  News ID 17954

- Wind River unveils latest software platform for IoT
  Wind River introduced the latest version of Wind River Intelligent Device Platform, a complete software development environment used for building M2M applications and devices that communicate with the cloud. The platform provides ready-to-use components to secure, manage, and connect Internet of Things gateways.
  News ID 17889

- R&S: signal and spectrum analyzer covers frequency range from 2 Hz to 67 GHz
  The latest member of the R&S FSW high-end signal and spectrum analyzer family, the R&S FSW67, cover the frequency range from 2 Hz to 67 GHz in a single sweep. The R&S FSW67 simplifies test setups. It does away with external harmonic mixers and therefore requires no complex cabling.
  News ID 17886
**Product News**

- **PRQA updates key analysis products**  
  Programming Research announces that its products have received a major overhaul designed with the customer in mind, offering a greater consistency across products and ease of use through improved user interfaces alongside higher functionality. Central to the update is a new component-based, plugin architecture that encapsulates and decouples all the source code parsers from the generic framework.  
  **News ID 17862**

- **LiebelLieber: Enterprise Architect User Group Event**  
  Sparx Systems is the developer of the modeling platform Enterprise Architect, used by more than 300,000 users worldwide and around 60,000 in the German speaking countries. To improve in the exchange in this community an Enterprise Architect user group event will take place in Nuremberg on October 8, 2013. Goal is a vivid exchange of experiences and information around the modeling platform. Customers in Germany are Daimler, Continental, Deutsche Post, Lufthansa, Deutsche Bahn, Infineon and Siemens to name just a few.  
  **News ID 17847**

- **McObject: NVDIMMs as in-memory database storage**  
  In the industry’s first test of in-memory database system (IMDS) speed and recoverability using the emerging Non-Volatile DIMM technology, McObject and AgigA Tech announced McObject has successfully benchmarked its eXtremeDB IMDS using AgigA Tech’s AGIGARAM NVDIMM as main memory storage. The tests included “pulling the plug” mid-execution, which confirmed the AGIGARAM product’s ability to save data persistently in the event of system failure, and to facilitate recovery.  
  **News ID 17883**

- **SEGGER: portable in-field flash programmer**  
  Adding to the SEGGER Production Flash Programming line, the Flasher family, SEGGER announces the availability of the Flasher Portable. The Flasher Portable has been designed to fill the need of an extremely portable, production grade, Flash programmer used for in-field firmware updates. No need to be tethered to an outlet, it is powered by standard batteries. The Flasher Portable can be loaded with multiple firmware images. The user interface allows the user to select the firmware image which shall be programmed with a simple press of a button. LEDs indicate which image is selected.  
  **News ID 17812**

- **Express Logic: ThreadX with downloadable application modules for Cortex-M3/-M4**  
  Express Logic announced the immediate availability of ThreadX with Downloadable Application Modules (ThreadX with DAMs) for ARM Cortex-M3/-M4 systems. ThreadX with DAMs enables ThreadX-based applications to dynamically run application code that is not statically linked with the main system executable image. This enables selected application threads to be packaged into a module and guarded by the Cortex-M3/-M4 MPU.  
  **News ID 17863**

- **Altium introduces TASKING Software Platform Builder for ARM Cortex-M**  
  Altium announces its Software Platform Designer for ARM Cortex-M. Altium announces its Software Platform Designer for ARM Cortex-M as a free, downloadable tool for ARM Cortex-M based microcontrollers, at an unparalleled attractive cost level. The Software Platform - which Altium will be showcasing at the ARM TechCon Conference - includes a comprehensive range of middleware functionalities, such as an RTOS, CAN, USB, TCP/IP, I2C, HTTP(S), file systems, graphical user interface, and touch panel control.  
  **News ID 17968**

- **Rohde & Schwarz: new analysis options and new differential wideband probe**  
  Rohde & Schwarz has added power analysis options and a new differential wideband probe to its portfolio of analysis solutions for clocked power supplies. Developers can use the R&S RTO-K31 or R&S RTM-K31 option to automatically perform all major quality analyses and conveniently document the measurement results. The new R&S RT ZD10 probe is especially ideal for the characterization of switching power supplies with high clock frequencies.  
  **News ID 17853**

- **LDRA automates test generation and unit test management**  
  LDRA introduces LDRAUnit, an integrated framework for automating the generation and management of unit tests. By separating unit testing capabilities from the rest of the LDRA tool suite, LDRA delivers a focused test management tool that addresses a need for software unit test without requiring investment in a complete tool chain. Such flexibility forms an ideal solution for companies that are committed to software quality though not necessarily required to certify to a specific standard.  
  **News ID 17827**

- **AdaCore: free, online Ada educational resource**  
  AdaCore launched AdaCore University - a free, web-based resource centre for anyone interested in learning about, or how to program in, the standards-based Ada programming language. The new website offers pre-recorded courses and other learning materials on Ada, with access to AdaCore’s open source GNAT Ada toolset for writing and running example programs. It also utilises the latest in website design and learning tool features.  
  **News ID 17834**

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13 November 2013
Power line communication (PLC) technology is moving from the lab environment to the real world to enable the smart grid in the future. Lab networks with a few tens of smart meters are performing well under controlled conditions. However, the number of smart meters in the grid will increase while at the same time the power line quality is becoming more challenging. This article, based on recently performed field tests, will help to avoid common obstacles, providing tips to enable successful PLC field testing.

Ideally, the low-voltage (LV) grid in Europe is 230V AC with a 50Hz sinusoidal waveform. It is known that in real world this is not the case. Loads introduce noise (e.g. fluorescent lamps) and interference (e.g. rectifiers), distorting the waveform as well as decreasing the impedance of the network. For the loads itself this is mostly not an issue, but when communication is desired the performance of the data link over the power line is highly dependent on the grid quality. When the installation of a large number of smart meters is planned it is good practice to obtain detailed information of the grid with a field test to increase the probability of a first-pass deployment. But on the other hand, it is unrealistic to test each area prior to smart e-meter deployment. Based on past field test performances and the type of the grid, e.g. rural, urban, meshed, high rise area and combinations of these, a good assumption about what is necessary can be made. Good preparation will save a lot of time during the field test. Broken hardware, unsuitable test equipment, missing connectors or not being able to gain access to a test point are just a few examples of what can go wrong. Experience has shown that at least the morning of the first test day is needed to get up to speed. Normally, the test team consists of at least one high-voltage approved grid technician, usually a utility employee, who knows the locations of the test points, grants access to it and is familiar with the cabling etc of the grid under test, and two PLC specialists familiar with the PLC test equipment and the test procedure itself.

The tasks of each party have to be clearly defined days before the test takes place to enable effective preparation. The technician should provide a grid map and two sets of coupling equipment to connect the PLC hardware to the grid. This coupling equipment, ideally supporting all three phases at the same time, will be connected by the technician when approaching a new test point. Once connected the PLC specialist should be able to switch the test equipment between phases without attendance of the technician for efficiency reasons. Naturally, any connection between the test equipment and the grid must be protected with a fuse. The PLC specialists provide two sets of laptops with proper software and the PLC test hardware. An oscilloscope with storage capability is recommended for time domain measurements and later data processing. Other useful tools like a camping table and a sunshade make life easier for the people performing the tests.

All test points should be identified on the grid map. These points will most likely be transformer stations and cabinets. Since both facilities belong to the utility and do not require access to private premises, tests can be made at any time without permission of a third party. As a next step the point-to-point links can be defined, which are connections between the test points. It is recommended to leave one set of test equipment at the transformer station (the location of the base node, which is the PLC part of the data concentrator or gateway), and move the other through the connected cabinets since the communication of the smart meter will be towards the transformer station later on. It should be mentioned that this preparation is for LV PLC field tests only, sufficient in European countries where a large number of smart meter are connected to a transformer station. In other regions of the world, e.g. in the United States, the given topology of the grid requires MV/LV communication to be reasonable. Special MV couplers are required to inject the PLC signal and the handling with a much higher voltage in general...
makes a MV/LV PLC test more complex. The network quality depends on different parameters such as noise, impedance and all kinds of interference. Four kinds of measurements can be performed to obtain the grid quality: impedance, noise, channel characterization and data link test. All tests can be performed with the Texas Instruments PLC reference design (TMDSPLCKIT-V3, figure 1). This kit consists of two PLC modems, thus, allowing link tests with one kit. Due to its software flexibility, the two popular orthogonal frequency division multiplexing (OFDM) standards PRIME and G3 can be tested by the same hardware.

Bearing the limited test time in mind, not all tests may be performed on all links. Because the most important parameter for a utility is connectivity between the base node and the service node (smart e-meter), it is good practice to start with the data link test. Based on the result the remaining tests may be skipped. The data link test uses the PHY layer of the PLC stack, i.e. no network will be established. The transmitter will send a defined number of data packets with a known payload (e.g. ramp data), known payload length (e.g. 100 bytes), a certain modulation and maximum transmit level. The receiver decodes the packets and displays the number of received packets. If the transmitter sends 1000 packets and for example 999 are correctly decoded by the receiver, the PER of this link is 0.1%. For challenging links with high PER it may be interesting to know why the packet could not be decoded correctly. Did the packet header decoding fail (CRC of packet header did not match) or was the packet not detected at all (no packet preamble detected)? All these parameters and many more are provided by the PLC host tools running on the laptop. The PLC host tools are part of the G3/PRIME software package provided with the TMDSPLCKIT-V3 kit.

An A threshold for the PER should be defined separating good links from weak links. For instance, a link performing with PER <10% and most robust modulation (DBPSK+FEC for PRIME and ROBO for G3) might be already sufficient to rate the link good, because the later installed smart meter can connect to the base node. Starting from the most robust modulation each link should be tested against its limit by re-running the test with less robust modulations and allowing higher data rates at the same time. For proper documentation at least the following parameters should be captured: real name of access point and an abbreviation, link name, data transfer direction (up-link - towards transformer - and downlink), phase, PLC standard, modulation, SNR (signal-to-noise ratio), RSSI (received signal strength indicator), PER, data rate and link length. For each link at least six measurements are taken, both directions for each of the three phases (more if different modulations are tested). Colours can help distinguish good links (green) from weak links (red). See figure 2 for an example. Practical experience shows that a well-rehearsed team can perform four links (48+ measurements) in half a day.

In case a link needs more investigation it is worth looking at the impedance. If the grid is heavily loaded the power line impedance decreases and the line driver of the analog front-end may not be able to deliver sufficient amps to maintain the required voltage of the PLC signal. The lowest impedance can be seen at the source of the LV network, which is the secondary side of the MV/LV transformer - challenging the signal transmission for a base node located nearby.

Figure 3 shows a typical frequency-dependent impedance curve. The lowest impedance can be usually expected in the Cenelec A band. The Texas Instruments PLC analog front-end AFE031 was especially designed around the PRIME and G3 standards and clearly exceeds the performance requirements. To measure the impedance at the test point a resistor (here 5 ohms) can be connected between the AFE031 line driver output and the power line.

This resistor and the power line forms a voltage divider, thus the voltage drop over this resistor is dependent on the grid impedance. Another reason for a weak link can be an increased noise level or strong narrow band interference (NBI). The frequency spectrum of the power line can be captured with the oscilloscope and post-processed later for frequency and noise/NBI energy analysis. The channel characterization can help to unveil the grid structure. Stub lines may cause echo at the receiver. Both directions of a link should be tested because of link asymmetry. As described the MV/LV transformer usually presents low impedance. Downlink communication (transmitter at transformer) tends to perform better than uplink. If a link (let’s say T1-C2) is weak it is good practice to try to reach C2 using another cabinet (C1), which is closer (and has good connection) to T1.

Since both G3 and PRIME support the hop functionality, C2 can be reached with the help of C1, which acts as a hop here. To learn about the time-dependent quality of the grid, the same tests should be performed multiple times within 24 hours. During the day loads from customers will dominate the grid quality, and in the night street lights should be taken into account. This requirement asks for an automated test setup, which is beyond the scope of this article.
The integration of science, technology, engineering, and mathematics leads to an exemplary STEM discipline, computer science. It deals with the knowledge of computational tools and is considered as one of the most emerging fields in the world today. We live amidst computer-based systems where coding has come to every industry. Societies who realize this fact are taking measures to equip themselves with the knowledge on how to author computational tools to have a competitive edge over others.

Today after about one year after its launch, the Rasberry Pi is considered as a hit choice for Do It Yourself (DIY) electronic projects due to its strong processing capacity and open source, user-friendly peripheral driver libraries. It was created with the aim of helping students to take interest in programming at an early age, and develop simple and cost-effective projects on which they had been reluctant to work because high-priced devices were needed. This system-on-a-chip (SoC) uses a 32-bit 700 MHz ARM CPU with a GPU, 256MB of RAM and an SD card as a hard drive. The device comes with two USB ports, Ethernet and audio as well as HDMI (High-Definition Multimedia Interface) at 1080p. With such special characteristics, price, and size, the Raspberry Pi is widely used in educational and commercial applications. It went on sale in February 2012 for the first time and since then more than a million kits have been sold. The most recent launch in the world of Raspberry Pi is the Rasberry Pi camera board. It is a handy add-on that can easily be inserted in one of the sockets of the Raspberry Pi. The addition of this module to the Raspberry Pi has made it capable of capturing pictures and videos for security and VOIP purposes. Recently, a project employing the camera module of Raspberry Pi has been awarded a cash prize of £500,000 from Google. The project has been created by the Zoological Society of London and is aimed at stopping rhino killings in Kenya. Some of the cameras used are controlled by the Raspberry Pi. They are triggered such that the gunshots are pinpointed along with the transmission of the images of the trespasser to the security forces of the park. This helps to catch poachers before they escape.

The Raspberry Pi is a well-suited device for embedded applications. It has been used as a host for Arduino which is a single-board microcontroller. The combination of these two has resulted in cost-effective and useful embedded systems. The Embedded Pi is also one of the recent accessories launched. It is a device based on STM32F103RB (Cortex-M3) MCU which operates at 72MHz, with 128KB flash, 20KB and RAM and can be used to bridge between the Raspberry Pi board and Arduino shields. Due to the integration of the common footprint of Arduino and the power and functionalities of the Raspberry Pi, connecting digital and analog sensors is no longer a problem. The Embedded Pi is extendable with many extra interfaces like ADC (analog to digital converter) and CAN (controller area network) employing the full power and functionality of the STM32 family.

The Embedded Pi allows 100+ Arduino shields to interact with the Raspberry Pi. Embedded Pi connects to the GPIO pins on the Raspberry Pi and provides compatibility with both 5V and 3.3V Arduino shields. Complicated wiring and level compatibility issues are resolved in integrating an Arduino shield and an external board via Embedded Pi. The interface provided by the Embedded Pi enhances the control capability of the Raspberry Pi thanks to various sensors exhibiting a response to external physical events.

Simulink is a block diagram environment which supports system-level design, simulation, automatic code generation, and continuous test and verification of embedded systems. It has developed its support for the Raspberry Pi which includes designing and running its models as separate applications on the Pi. The Raspberry Pi in collaboration with Mathworks can prove to be an effective tool for understanding the concepts of an embedded system's
design. Various algorithms can be created for artificial intelligence and computer vision and can be implemented as standalone projects on the Raspberry Pi. The Raspberry Pi has also revived the feel of retro-arcade gaming. With the help of the Raspberry Pi video games can be played not only with full flash graphics and sound but also with industrial-grade joysticks and buttons. The General Purpose Input/Output (GPIO) pins of the Raspberry Pi can be used to connect Happ joysticks and microswitch buttons. Many games can be played using the Pi along with browsing the web and writing emails by using a wireless keyboard and mouse. In addition to this, the Raspberry Pi is also used to play multimedia. It can be transformed into the most popular embedded system, the MP3 player. This $35 media center exhibits full HD video playing capabilities along with easy configuration and modification of the software. The functionality of controlling music via smartphone and tablet PC can also be added to the Raspberry Pi media center. To sum up, the Raspberry Pi is an innovative product. Economical computing will mark a new era in the computational world along with the development of useful applications and increased access to technological advances in embedded design. It is expected not only to boost computer science education all over the world, but also to inspire and educate the next generation of embedded developers to come up with brilliant embedded systems.

Product News

- **Lauterbach: µTrace supports SmartFusion2 SoC FPGAs**
  Lauterbach’s new product µTrace now supports Microsemi SmartFusion2 SoC FPGAs. µTrace is an all-in-one solution supporting both debug and trace for SmartFusion2 SoC FPGAs. By the use of simple and complex breakpoints the developer can control the operation of the program and analyze the data in C and C++.
  News ID 17840

- **ARM extends DS-5 Development Studio for RTOS development**
  ARM announces the availability of ARM DS-5 Development Studio version 5.16, which adds support for debug and optimization of embedded software based on real-time operating systems. The new features in DS-5 Development Studio make it the only tool suite in the market supporting code generation, debug and performance analysis for any ARM Cortex processor, including the latest ARM Cortex-A50 series, running bare metal, RTOS or Linux-based software stacks.
  News ID 17970

- **Wind River enhances Embedded Linux Platform to support Open Source Innovation**
  Wind River has introduced the latest version of Wind River Linux. The new version includes expanded hardware support for the latest ARM, Intel, MIPS, and Power architectures. Wind River Linux is also updated with the current Linux kernel, tool chain, and user space based on the latest Yocto Project release. Developed from the Yocto Project open source development infrastructure, Wind River Linux uses the latest Linux kernel as its upstream source to ensure customers have commercially supported access to the newest advancements from the open source community.
  News ID 17959

- **PRQA: major update to High Integrity C++ Coding Standard**
  PRQA | Programming Research announces the publication of Version 4.0 of the High Integrity C++ Coding Standard (HIC++), which provides coding rules and best practices to help development teams to produce high quality C++ code. HIC++ was first published ten years ago, and pooled the best practice guidelines available at the time, along with language advice from PRQA’s own C++ experts.
  News ID 17867

- **LieberLieber: code generation from UML structures**
  EnAr Uml2Code is the product for code generation from UML Structures, State Machines and Activity models. The first version contains the uml2c module – ANSI-C code generator for the embedded market. The code generators for C, C++, Java are in development. The slogan of the product: „No Magic Code Generation“. This means: you need neither thousands of switches nor configuration parameters nor any frameworks. Decisions on the modeling level can be transparently traced down into the generated code, which is easily readable and well structured.
  News ID 17843

- **Express Logic adds kernel awareness for ARM DS-5 tools**
  Express Logic adds kernel awareness for the ARM Development Studio-5 (DS-5) tools. Kernel awareness, which provides greater levels of transparency into the thread and task management of a system, speeds the development and debug of applications. In adopting kernel awareness for the DS-5 tools, Express Logic’s ThreadX RTOS is among the first to provide this increased functionality.
  News ID 17964

- **PragmaDev: common laboratory for validation of communicating systems**
  The French national nuclear research center CEA-List and PragmaDev have created a common laboratory called PragmaList. Based on the combination of two efficient tools, Real Time Developer Studio from PragmaDev and Diversity from CEA-List, PragmaList will ease and secure the design and the development of communicating systems used in telecommunications, transportation, and energy, as well as the automatic generation of validation test cases.
  News ID 17945

- **Vector integrates VectorCAST with Freescale MQX RTOS**
  Vector Software announces support for the Freescale MQX Real-Time Operating System. The MQX RTOS provides real-time performance within a small, configurable footprint. This RTOS is designed to make it easy to configure and balance code size with performance requirements.
  News ID 17854

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You just have to type in the “News ID”. —
Maxim guards embedded designs with SHA-256 authentication and encryption

Designers can better protect their IP using the DeepCover Secure Authenticator from Maxim Integrated Products. The DS28C22 is a highly secure cryptographic solution for a host controller to authenticate peripherals or embedded designs, and it offers encrypted communication as an added benefit.

News ID 17820

Gleichmann: 15.6-inch and 19.0-inch industrial TFT-LCDs with white LED backlights

Gleichmann Electronics will offer the new 15.6-inch WXGA model NL13676AC25-01D and 19.0-inch SXGA model NL128102AC29-17 displays from NLT Technologies. These two high quality widescreen displays are suitable for use in demanding industrial and medical equipment applications.

News ID 17839

Digi-Key expands EMEA Sales Team

Digi-Key announced the recent expansion of its European sales team. Five new hires in customer-facing roles will strengthen Digi-Key’s position across all of Europe including Central and Southern Europe, the Nordic Region, the Baltics and the United Kingdom. As the next phase of Digi-Key’s international growth, the company is addressing increased demand from its growing customer base for local support within each region of Europe.

News ID 17936

Sierra Wireless acquires M2M Embedded module and modem assets of AnyDATA

Sierra Wireless has entered into an agreement with AnyDATA to acquire substantially all of the assets of AnyDATA’s machine-to-machine embedded module and modem business. Upon completion of the acquisition, AnyDATA’s M2M embedded module and modem portfolio will become part of the Sierra Wireless OEM Solutions product line, and a team of 16 sales and engineering staff from AnyDATA’s Korean subsidiary will join Sierra Wireless.

News ID 17918

Toshiba: unipolar stepping motor driver in small packages

Toshiba Electronics Europe has launched the TB67S14x series of constant current control motor drivers for unipolar stepping motors used in home appliances and industrial equipment. Home appliances and industrial equipment require high speed and high power motor drives for the unipolar stepping motors that are widely used in these applications. The operation of such motors requires a 60V or higher absolute maximum rating to protect the motors against reverse voltage.

News ID 17879

FTDI: USB GPS module enables integration of new navigation functions

FTDI Chip releases the FT-X-GPS, which allows precision positioning data to be derived - so that a computing platform (such as a laptop, tablet, or embedded PC) to which it has been connected, via its USB port, can benefit from this precise data to enable location-based services and applications that continue to emerge as mobility increases.

News ID 17804

Altium delivers new Altium Designer 14

Altium announces the new version of its flagship product, Altium Designer 14, delivering a new customer centric platform with heavy emphasis on core PCB design technologies. Altium Designer now features support for flex and rigid-flex design, including schematic capture, 3D PCB layout, analysis and programmable design – all in a single, unified solution.

News ID 17931

Green Hills expands INTEGRITY RTOS support to Renesas 2nd gen R-Car SoCs

Green Hills Software has announced its support of the INTEGRITY real-time operating system and comprehensive software development and run-time solutions for Renesas Electronics 2nd-generation R-Car series of SoCs. Green Hills Software offers a unique solution to the ARM Cortex-A15 and A7 architectures, including INTEGRITY Multivisor virtualization technology, the INTEGRITY RTOS, MULTI multicore debugger, TimeMachine trace suite, GPU-accelerated graphics, a rich suite of middleware and the Green Hills family of JTAG and trace probes.

News ID 17855

IAR is tool provider for new ADSP-CM40x processors from ADI

IAR Systems announced that Embedded Workbench has been selected by Analog Devices as the recommended toolchain for development of the ADSP-CM40x series of mixed-signal control processors. The new ADSP-CM40x series from Analog Devices integrates the high precision embedded dual 16-bit A/D converter together with the high performance floating-point ARM Cortex-M4 processor core at 240 MHz.

News ID 17851

R&S: RF test solution for LTE-Advanced carrier aggregation with MIMO

Rohde & Schwarz has enhanced its R&S CMW500 wideband radio communication tester with new options for RF tests and end-to-end testing of LTE-Advanced carrier aggregation. This is the only one-box solution on the market that allows RF tests with two component carriers in the downlink, including 2x2 and 4x2 MIMO.

News ID 17946
- **ams: simpler, more robust architecture for lithium cell monitoring and balancing**
  ams introduced a vastly simplified and more robust method of implementing cell monitoring and balancing in lithium battery systems. The innovative architecture developed by ams has been implemented in a new, highly integrated chip, the AS8506, to perform distributed cell monitoring and balancing operations for stacked cell modules, including Safe Operating Area checks and passive or active cell balancing.
  News ID 17925

- **Wibu-Systems: CmCard/CFast blends CodeMeter security with highly reliable fast memory**
  Wibu-Systems announce the new CmCard/CFast memory card with integrated CodeMeter protection at the automation expo SPS IPC Drives 2013. Maximum reliability is a prerequisite for storage solutions in safety critical applications. The solid state mass storage drives will therefore offer high reliability, robustness, shock and vibration resistance, as well as short access times and low error rates.
  News ID 17861

- **COG presents strategies for management of discontinued electronic components**
  At the COG expo 2013 on 4 December 2013, 20 members of the COG (Component Obsolescence Group) Deutschland will present the most effective active and reactive strategies for the efficient handling of discontinued, manipulated and counterfeit electronic components. Due to the increasingly shorter innovation cycles in the semiconductor industry, many manufacturers of durable goods — especially in the automobile, aerospace, military, railway, power station, healthcare and automation technology industries — find themselves confronted with completely new challenges.
  News ID 17939

- **Renesas: RX110 MCUs bring ultra low power and 32-bit performance to IoT**
  Renesas Electronics has expanded its 32-bit RX100 series of MCUs with the RX110 group. The new RX110 MCUs combine RX core performance along with market leading low power features, providing greater device scalability for these cost-sensitive applications. With best-in-class run-mode power consumption – as low as 100μA/MHz, 4.8μs wake-up time, and three low-power modes, including the lowest power-down mode with RTC, the RX110 MCUs enable extended life cycles for battery-powered applications such as blood glucose meters, remote control systems or POS terminals.
  News ID 17902

- **Atollic: embedded IDE with code testing and quality management features**
  Atollic launches TrueSTUDIO Premium edition. Built on TrueSTUDIO Pro IDE for embedded C/C++ development, the Premium edition extends the tool’s capabilities even further to include code testing and test quality measurement features as standard. The TrueSTUDIO Premium edition is designed to help embedded systems developers to achieve two important, but often mutually exclusive, goals: achieving higher software quality, while at the same time, meeting ever increasing time-to-market requirements for product releases.
  News ID 17941

- **HCC promoted to Renesas Gold Partner Status**
  HCC announces its elevation to Renesas Gold Partner Status on the basis of its strengthening relationship with Renesas Electronics Europe. Renesas partner program has been developed to make it easier for engineers to find software and tools required to implement their designs quickly and easily.
  News ID 17955

- **Xilinx and ADI achieve JEDEC JESD204B interoperability**
  Xilinx and Analog Devices have achieved JESD204B interoperability between Xilinx JESD204 LogiCORE IP in the Kintex-7 FPGA and the ADI AD9250 analog-to-digital high-speed data converter. Achieving JESD204B interoperability between logic and data converter devices is a significant milestone in promoting the widespread adoption of this new technology.
  News ID 17826

- **Maxim: smart grid reference platform**
  Designers of smart meters can now reduce time to market, raise the bar for higher accuracy, and secure their designs with Capistrano, a smart grid reference platform from Maxim Integrated Products. Powered by the company’s Zeus metering SoC, Capistrano protects designs with advanced cryptography, physical attack detection, and life-cycle security schemes. Protecting more than just the smart meter, the security technology is capable of securing any distributed node in the smart grid.
  News ID 17914

- **TI unveils inductance-to-digital converter**
  Texas Instruments unveiled an inductance-to-digital converter (LDC), a new data converter category that uses coils and springs as inductive sensors to deliver higher resolution, increased reliability, and greater flexibility than existing sensing solutions at a lower system cost. Inductive sensing is a contactless sensing technology that can be used to measure the position, motion, or composition of a metal or conductive target, as well as detect the compression, extension or twist of a spring.
  News ID 17798
Cadence: data converter IP for advanced 28nm node

Cadence Design Systems introduced a suite of ultra-fast, low-power analog intellectual property (IP) products designed to enable the next generation of high-speed wired and wireless communications applications. These new products uniquely meet the needs of designers working with emerging high-speed protocols such as WiGig (802.11ad), which runs on a 60 GHz spectrum with potential data throughput up to 7Gbps, as well as LTE and LTE Advanced.

News ID 17904

connectBlue releases new WLAN security feature

connectBlue made available the Extensible Authentication Protocol-Transport Layer Security (EAP-TLS) as a Wireless LAN security feature. EAP-TLS is particularly beneficial in mission critical applications when there is a need to increase security and / or to centrally authorize individual wireless units. In small embedded systems, WLAN security features applied are usually various forms of encryption such as WPA-PSK, WPA2-PSK. Typically, the assigned authentication key is the same for all distributed wireless units. However, with EAP-TLS, each wireless client is assigned a unique authentication certificate.

News ID 17909

Renesas: low-power RL78/L1C MCUs integrate LCD display functions

Renesas Electronics announced the expansion of its RL78 Series of microcontrollers with 40 new RL78/L1C devices that integrate LCD display functions, USB functions, and 12-bit A/D converters on a single chip. The new RL78/L1C MCUs can interface to a wide range of sensors such as pressure, temperature, and proximity sensors, and are ideal for portable monitors and mobile healthcare applications, such as blood pressure and blood glucose monitoring equipment.

News ID 17837

Telit ships LTE modules of xE910 form factor family

Telit Wireless Solutions announces the market roll-out of the LE910 LTE module series with initial variants for North America and Europe. The 3GPP Release 9 compliant products are positioned to expedite migration to 4G for new and existing designs including those already based on 2G or 3G members of the xE910 family. The new LTE modules deliver 100Mbps download and 50Mbps upload speeds making them ideal for applications in areas such as Telematics for in-vehicle infotainment, video security and surveillance, outdoor signs and displays, business terminals and consumer products such as mobile hot-spots.

News ID 17912

Synopsys introduces DesignWare ARC EM SEP processor

Synopsys announces availability of the new DesignWare ARC EM SEP (Safety Enhancement Package) Processor core for automotive safety compliant applications. The 32-bit ARC EM SEP processor is based on the highly efficient ARC EM4 core. It delivers performance up to 300 MHz and power consumption as low as 16 mW/MHz on typical 65nm low power silicon processes, with integrated hardware safety features that enable ASIL D compliance in support of the ISO 26262 standard.

News ID 17920

Xilinx: Virtex-7 FPGA VC709 Connectivity Kit for high-bandwidth applications

Xilinx announced availability of its Virtex-7 FPGA VC709 Connectivity Kit, a 40 Gbps platform that enables designers to accelerate design productivity for high-bandwidth and high-performance applications, such as network interface cards for security, network monitoring, and high frequency trading appliances.

News ID 17882

IAR Systems updates tools for MSP430 core from TI

IAR Systems introduces a new version of its development tool suite IAR Embedded Workbench for the ultra-low power 16-bit MSP430 microcontrollers. In addition to new libraries and integrations, support for numerous new devices has been added. For the new version, 5.60, the TI Math Library for MSP430 has been integrated into IAR Embedded Workbench.

News ID 17835

TI: digital current sensor and voltage monitor with simultaneous sampling

Texas Instruments introduced the industry’s first digital current sensor and voltage monitor with simultaneous sampling and SPI interface. The LMP92064 integrates a precision current sense amplifier and two 12-bit ADC channels that simultaneously capture voltage and current data, while the SPI interface transfers real-time data at up to 20 MHz.

News ID 17894

ams: noise cancellation speaker driver ICs with zero audible hiss

ams has introduced the AS3435 and AS3415 active noise cancellation ICs to feature integrated bypass switches, offering headset manufacturers the freedom to create sleeker – and cheaper – industrial designs. Incorporating new ultra-low noise amplifiers with a 900V input referred noise floor, the devices are the first ANC speaker drivers to produce no audible high-frequency hiss when paired with low-noise microphones.

News ID 17801
’The Quintessence’ of Internet of Things

EBV Elektronik Presents the 13th Edition of the Knowledge Magazine ‘The Quintessence’

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**Toshiba: Bluetooth IC supports multiple communication methods**

Toshiba Electronics Europe has launched TC35661DBG-S01, a Dual Mode Bluetooth IC that is compliant with the latest Bluetooth v4.0 communication standard. The new IC can support both Bluetooth Classic and Low Energy communication methods and will find applications in a range of wireless data communication devices such as remote controllers, sensor devices, toys, medical equipment and smartphone accessories.

News ID 17927

**Vector Software: Android-specific testing capabilities added to VectorCAST**

Vector Software announces support for the Android Development environment within the VectorCAST tool suite. These capabilities help developers who want to quickly port legacy C and C++ applications to an Android platform. The integration of VectorCAST/Cover, VectorCAST/C++, and VectorCAST/RSP, with the Android Native Development Kit and Android Developer Tools provides a turn-key solution for testing on either the Android mobile device emulator, or on Android-based hardware devices.

News ID 17940

**Renesas: RX111 evaluation tool with power measurement function**

Renesas Electronics Europe announces the availability of the new RX111 Promotion Board, a cost-effective evaluation platform designed to facilitate the evaluation of Renesas’ RX111 microcontrollers in a wide variety of applications. The RX111 RPB comes with all the software and hardware required to easily develop and evaluate applications on the RX111 MCUs. Designed to support a broad range of markets, the new RX111 group delivers a combination of ultra-low-power consumption, on-chip connectivity and superior performance at attractive price points.

News ID 17816

**Freescale expands analog portfolio for industrial market**

Freescale Semiconductor announced a major expansion of its analog portfolio for the industrial market, building on its expertise in automotive analog solutions to bring more than 20 products featuring outstanding performance, reliability and functional safety to the growing global industrial automation market. Freescale’s expanded industrial analog portfolio targets applications including factory automation systems, industrial networking power management equipment, portable medical products, smart home and building control, as well as energy storage systems.

News ID 17877

**Nordic: ANT+ and Bluetooth low energy combo chip**

Nordic Semiconductor released the nRF51922 System-on-Chip, a multiprotocol SoC solution offering concurrent ANT+ and Bluetooth low energy wireless communication in a single chip. The nRF51922 enables full flexibility in using one or both protocols concurrently in a product, enabling multiprotocol accessories and compatibility with ANT+ and Bluetooth Smart Ready hubs.

News ID 17850

**Mentor: Nucleus RTOS improves reliability in safety-critical applications**

Mentor Graphics announces a new version of the Nucleus real time operating system targeting high-performance, next-generation applications for connected embedded devices. The Nucleus RTOS introduces a lightweight and scalable process model that provides partitioned and protected memory regions for increased system reliability in safety-critical applications, including medical, industrial and aerospace.

News ID 17929

**ITTIA: standard SQL interfaces facilitate interoperability in IoT products**

ITTIA shares its recent success in addressing customer demand for M2M data management with new features and proven technology. ITTIA DB SQL is a promising technology for business-to-business sectors, such as manufacturing, retail, transportation, health care, and medical devices, that accumulate, manage and transmit massive dynamic data.

News ID 17846

**Micrium appoints Phaedrus as UK Reseller**

Micrium announces that Phaedrus Systems is now an official reseller in the UK for the company’s RTOS and other tools. Micrium’s flagship RTOS RTOS (μC/OS-III) is at the centre of a family of tools for the development of embedded applications, including communication software stacks and storage and display software.

News ID 17829

**Telit: cellular module delivers GSM/GPRS connectivity from 13 x 17 mm footprint**

Telit Wireless Solutions announces the introduction of the company’s smallest and first 2G-cellular module to employ leading-edge “Conformal Coating” encasing technology. The product which also incorporates a Python Script Language interpreter, is capable of running customer applications internally without the need for additional electronics, and delivers a fully functional cellular connected customer application from a 227 mm² footprint which is about half the size of a standard SIM card.

News ID 17878

**Mouser: Microchip’s SuperSpeed USB3 controller now available**

Mouser Electronic is now stocking Microchip’s new SuperSpeed Certified USB3 Controller Hub, an on-chip programmable memory and certified four-port USB3 Hub with 3 additional USB2 lanes. Microchip’s four-member USB553XB-5000 family includes a seven-port hybrid version with a certified four-port USB3 hub and three additional USB2 lanes.

News ID 17803

**Feabhas becomes ARM Accreditation Training Partner**

Feabhas announce that they are now an ARM Accreditation Training Partner (AAPT). This development builds on their current status as an ARM Approved Training Centre. As an Accreditation Training Partner, Feabhas will now be able to provide the necessary training for individuals wanting to become ARM Accredited Engineers (AAE).

News ID 17873

**Microchip: 2.4 GHz RF high-power amplifier supports 256-QAM modulation**

Microchip announces its latest 2.4 GHz RF high-power amplifier, the SST12CP12, which adds support for the 256-QAM ultra-high data rate modulation. With its high linear output power of up to 23 dBm at a dynamic EVM as low as 1.8% and MCS8 40 MHz bandwidth modulation, as well as 25 dBm linear power at 3% EVM, this amplifier significantly extends the range of IEEE 802.11b/g/n WLAN systems while providing excellent power at the maximum 256-QAM data rate.

News ID 17891
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