



Technology Day Washington, D.C. October 18, 2011

Time	Session	High-Speed Data Acquisition	Embedded Processing	Power Management	Wireless Connectivity
8:30 to 9 a.m.	Registration				
9 to 10 a.m.	1	Interfacing Data Converters with FPGAs	Under the Hood of FRAM and the New MSP430FR57xx MCU Family	DC/DC Converters 101	Texas Instruments Wireless Products and What Works Best for Your Design
10 to 10:15 a.m.	Break				
10:15 to 11:15 a.m.	2	Practical Implementation of Clocking Solutions for High-Speed Data Converters	Making USB Design Simple with MSP430™ MCUs	Optimizing Your High-Input-Voltage (Up to 60 V) DC/DC Converter for Size and Performance	Adding Wi-Fi and Bluetooth® to TI Embedded Processors (MCUs and MPUs)
11:15 a.m. to 12:30 p.m.	Lunch				
12:30 to 1:30 p.m.	3	The Complex IF Transmitter	StellarisWare™ Software Advanced – Taking Your Knowledge to the Next Level	Achieving Better Transient Response with Less Output Capacitance from Your DC/DC Power Designs	Bluetooth® Low Energy and ANT™: Very Low Power Wireless Connectivity Solutions
1:30 to 1:45 p.m.	Break				
1:45 to 2:45 p.m.	4	High-Performance Differential ADC Input Interface Design	How to Select the ARM for Your Design	Switching Power Supplies Made Easy with SwitcherPro™ Software and the New, Powerful TINA-TI™ Software v9	Low-Power RF Design Tools to Help During Characterization and Testing of Your RF Products
2:45 to 3 p.m.	Break				
3 to 4 p.m.	5	Using Fully Differential Op Amps to Signal-Condition High-Voltage Signals to Drive ADCs	Enabling and Accelerating Android on Sitara™, Integra™ and DaVinci™ Devices	Energy Harvesting, Wireless Charging and Zero Power Devices	Fundamentals of Antenna Design by LSR



Texas Instruments

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Session Titles and Abstracts

Track & Course	Abstracts
Track 1 – High-Speed Data Acquisition	
Interfacing Data Converters with FPGAs	This presentation will address common issues with interfacing data converters with FPGAs. Information on device selection, interface support and communication will be covered.
Practical Implementation of Clocking Solutions for High-Speed Data Converters	Maintaining the ideal performance of high-speed data converters is very dependent on providing the proper clocking solution. This presentation will focus on understanding the clock performance requirements dependent on data converter device selection and operating frequency. Clock source devices are often specified by a jitter parameter; however, for data converter applications the phase noise parameter specified over an appropriate bandwidth is a better gauge to determine clocking suitability. The techniques for converting phase noise performance to jitter specs are explored to facilitate acquiring the required devices for clocking the data converter. The difference in clocking requirements is explored for DACs and ADCs and for system implementations that require clocks for both types of devices. For ADC applications where clock performance is especially critical, tools and techniques will be presented to predict expected SNR performance for a desired ADC, with a given aperture jitter and thermal noise floor at the selectable IF frequency. Practical device implementations with the use of TI's clocking solutions will also be presented, along with additional in
The Complex IF Transmitter	The complex IF transmitter is an alternative radio architecture using high-speed DACs and IQ modulators. Complex radio architectures have been traditionally used with the IQ modulator input signal centered at 0 Hz. This paper will present a complex IF transmitter architecture where the baseband signal is first digitally quadrature-modulated to a complex intermediate frequency (IF) using a high-speed DAC before being input to an IQ modulator. This architecture has the advantage of perfect IQ balance within the baseband signal (similar to a real IF radio) with the added benefits of sideband, LO and DAC image suppression at the modulator output. This allows the complex IF architecture to be implemented in most cases without IF filtering and relaxed RF filtering, resulting in reductions in components, size and power.
High-Performance Differential ADC Input Interface Design	High-performance ADCs used in high-speed data acquisition systems like test and measurement, wireless infrastructure, medical, and military applications require high-performance differential input drive circuits. Designing the drive circuit for optimum SFDR and SNR from the ADC is a challenge for design engineers. This presentation will provide an overview of how ADCs are characterized and show how SFDR and SNR can be combined with the amplifier drive circuit to estimate overall system performance. Different circuit architectures will be presented along with their strengths and weaknesses. To show achievable results, three example application circuits and performance will be shown: THS4521 interface to ADS1278 (24-bit, lower frequency, very high resolution, first Nyquist zone application), OPA695 interface to ADS5500 (14-bit, higher frequency, first Nyquist zone application), and THS4509 interface to ADS6148 (14-bit, narrowband IF second Nyquist zone undersampling).
Using Fully Differential Op Amps to Signal-Condition High-Voltage Signals to Drive ADCs	Signal-conditioning high-voltage input signals to drive ADCs from high-voltage sources can be challenging. Given a signal source that provides higher-level signals (like ± 10 V) that you want to interface to a lower-voltage ADC with significantly lower differential and common-mode voltage input requirements, how do you go about it? How do you attenuate and level-shift the voltage levels of the signal to match the input requirements of the ADC? In this session, we will propose an architecture utilizing a fully differential op amp to accomplish the task. We will perform circuit analysis to aid in understanding of the key design points, and present a design methodology for calculating the required component values. Spreadsheet examples will be shown along with TINA-TI™ software SPICE model examples to show how to implement the design methodology using computer-aided tools. This topic will also include a short presentation of test procedure and performance results using the THS4521 as input amplifier to drive the ADS1278 24-bit $\Delta\Sigma$ ADC and the THS4521 as input amplifier to drive the ADS8324 16-bit SAR ADC.



Track & Course	Abstracts
Track 2 – Embedded Processing	
Under the Hood of FRAM and the New MSP430FR57xx MCU Family	This session is intended to introduce MCU designers to the latest in nonvolatile memory technology: ferroelectric RAM (FRAM). You will gain experience with the MSP430™ MCU's first FRAM offering – the MSP430FR57xx family – and become familiar with key architecture blocks such as the new power management module, clock system and FRAM controller. Advantages unique to FRAM such as ultra-low active power, fast writes and unified code memory will be covered, and attendees will learn about tools available to aid in starting development with this new addition to the MSP430 portfolio.
Making USB Design Simple with MSP430™ MCUs	Modern MSP430™ MCUs have integrated USB peripherals, allowing easy connection to a PC or mobile host. This course begins with an overview of the MSP430 microcontroller's USB module, followed by a discussion of the tools TI provides to make USB design simple. This includes a robust API for the most common device classes, a utility that instantly configures the API according to your needs, and a turnkey Visual Studio application for the creation of customer-ready firmware update packages. Minimize the USB learning curve by basing your design on the MSP430 MCU.
StellarisWare™ Software Advanced – Taking Your Knowledge to the Next Level	In this advanced session, we will cover the specific components that make up StellarisWare™ software. StellarisWare components that will be covered include the Stellaris® peripheral driver library, USB library, graphics library, serial flash loader and boot loader. In addition, we will review the rich set of code examples provided in the Stellaris family and the in-system programming support.
How to Select the ARM for Your Design	You know you need a CPU in your system, and you're pretty sure you want to go with some form of an ARM core. But what form does that CPU take? Should it be a mainstream microprocessor, a DSP, an ASIC, an FPGA, a configurable core or something else? What are the advantages and disadvantages of each of the ARM options? What if you've already selected your OS? How does that affect your choice of CPU? How do you ensure that you're getting the maximum performance from your CPU? These are just some of the questions/issues we'll tackle in this track. Choosing the best ARM processor for your design can be a difficult decision. In this session, developers will gain insight into the trade-offs between varying ARM-based processors, including TI's Stellaris® Cortex-M3 based microcontrollers and Sitara™ Cortex-A8- and ARM9-based microprocessors. The session will address key design considerations, including power, interface, software support and performance requirements. The presenter will illustrate processor selection tips and tricks through industrial automation and human interface application examples.
Enabling and Accelerating Android on Sitara™, Integra™ and DaVinci™ Devices	With the availability of Android for TI's Cortex-A8-based devices, developers are now able to use the unique power of the Android application framework to create new, compelling designs. Attend this session to learn about Android fundamentals, including key benefits, architecture review, how Android can benefit different end equipments and applications (including voice/video applications), and the TI/Android roadmap.



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Track & Course

Abstracts

Track 3 – Power Management

DC/DC Converters 101

This presentation is an introduction to power supplies for non-power supply engineers. If you are an engineer that works on systems that require power but you don't design the actual power supply, this presentation is for you. We will define and explain some of the terminology surrounding power supplies and explain why you might use one topology over another; for example, efficiency considerations and how they relate to the differences between synchronous and nonsynchronous converters. We will also explain many terms you may have heard but not fully understood, such as split rail, PSRR, converter vs. controller, LDO vs. linear regulator, buck vs. boost, etc. This presentation will not show you how to design a power supply, but it will help you to understand what power-supply designers are talking about.

Optimizing Your High-Input-Voltage (Up to 60 V) DC/DC Converter for Size and Performance

A DC/DC converter switching at 1 or 2 MHz sounds like a great idea, but there is more to understand about the impact to the power supply system than size and efficiency. This case study compares the size and performance of multiple designs running at different operating frequencies. Three designs will be compared where switching frequencies varied from 100 kHz, 350 kHz and 750 kHz, examining the impact that has on output filter design, efficiency, stability, etc.

Achieving Better Transient Response with Less Output Capacitance from Your DC/DC Power Designs

The TPS54225, TPS54226, TPS54235 and TPS54326 are new product offerings in the switchers with integrated FETs (SWIFT™) power product line. They represent a significant addition to the product line with a totally different control mode from other SWIFT devices. They are very low cost and require a minimum number of external components to target cost-sensitive consumer or other applications. These devices use a proprietary DCAP2™ Mode control scheme that exhibits some very high performance characteristics not normally found in low-cost devices, while also eliminating bothersome external compensation. Transient response is extremely fast and the TPS54226 and TPS54326 feature a power saving auto-skip mode. This presentation fully explains the DCAP2 Mode control scheme, shows its advantages and high-performance features, and provides competitive analysis with both TI and competitor products.

Switching Power Supplies Made Easy with SwitcherPro™ Software and the New, Powerful TINA-TI™ Software v9

In this hands-on training session, you will learn to generate custom power solutions in minutes with SwitcherPro™ software from Texas Instruments. The SwitcherPro software tool allows you to select TI parts and real-world components; analyze designs for efficiency, stability, size and other design factors; modify designs to meet your needs with Design Options, What if Analysis and User Defined Parts; and review your designs in the design report, complete with a full bill of materials and notes for layout. Please bring a laptop if you wish to follow along.

Energy Harvesting, Wireless Charging and Zero Power Devices

New techniques and technologies are now available to create self-powered devices by harvesting ambient energy. Actual energy harvesting (EH)-based designs will be reviewed that use photovoltaic, piezoelectric, thermoelectric and electromagnetic EH transducers. New technologies in the areas of ultra-low-power MSP430™ MCUs; the CC430 combination MCU/integrated radio; wireless charging and communications using the TI passive low-frequency interface device (PaLFI); energy processors; solid-state batteries; and solar energy harvesting for the TI MSP430 LaunchPad kit will be detailed. The last portion of the session will include hands-on lab demos of various EH implementations.



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Track 4 – Wireless Connectivity	
Texas Instruments Wireless Products and What Works Best for Your Design	Ever wonder what wireless standard best fits into your embedded system? Texas Instruments supports a variety of wireless products from standards such as <i>Bluetooth</i> ® and ZigBee to proprietary radio hardware. How all the standards fit in a typical design can be confusing. This session covers the TI wireless portfolio and compares the operation of these radios and standards with the trade-offs of each. The discussion will touch on all of these standards: 6LoWPan, <i>Bluetooth</i> ®, <i>Bluetooth</i> ® low energy, ZigBee, ANT, Wi-Fi, RF4CE, the SimpliciTI™ network protocol, RFID and proprietary solutions. We will also talk about what modules are available for evaluation and design support.
Adding Wi-Fi and <i>Bluetooth</i> ® to TI Embedded Processors (MCUs and MPUs)	Quickly and easily add Wi-Fi and <i>Bluetooth</i> ® technology to systems using MPUs like the AM/DM37x and AM18x. In this session, we will start with a detailed overview of the WL1271-TiWi 802.11b/g/n + <i>Bluetooth</i> ® transceiver, and then go into the details of the platform. The platform provides complete system integration of all components including WLAN and <i>Bluetooth</i> ® hardware (WL1271-TiWi), host hardware (AM/DM37x, AM18x), Linux WLAN drivers, supplicant, TCP/IP integration, <i>Bluetooth</i> ® stack, profiles, example code for configuration, and sample source applications. We will walk through the sample applications and explain how you can get started developing Wi-Fi and <i>Bluetooth</i> ® applications.
<i>Bluetooth</i> ® Low Energy and ANT™: Very Low Power Wireless Connectivity Solutions	<i>Bluetooth</i> ® low energy (BLE) and ANT represent wireless standards operating in the 2.4-GHz arena, which are gaining lots of momentum due to their small size, reasonable cost and very low power requirements. They enable communication between self-powered devices in an extensible network environment. This session will present an overview of the BLE and ANT standards before diving into the key priorities and challenges when designing with these two protocols. The session will then cover how to set up a quick BLE and ANT link.
Low-Power RF Design Tools to Help During Characterization and Testing of Your RF Products	SmartRF™ Studio is a development tool designed to help you understand the operation and analysis of Texas Instruments Low Power RF products. The tool provides an easy-to-use graphical user interface to control all of the chip's main RF parameters. It can also be used for performance testing and for finding the appropriate RF configuration settings for your system. The goal for this session is to familiarize you with SmartRF™ Studio and learn how it works and what it can do. You will learn how to use the tool to measure the output power from an RF transmitter, how to check the link quality and measure the packet error rate, how to export settings from SmartRF Studio for direct integration in your software, and how to customize the tool for your own needs.
Fundamentals of Antenna Design <i>by LSR</i>	Antenna design is one of the most intimidating and important parts of any RF design. It is critical to understand the key factors involved when choosing an antenna topology, as well as what tools are needed for design, simulation and characterization. Designs must account for the effects of the enclosure material, the available space, the required radiation patterns, and EMC compliance rules and regulations. This presentation discusses the fundamentals of antenna design for short-range devices, as well as the trade-offs between size, cost and performance. An antenna that is properly designed and optimized will enhance the overall performance of any radio.

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