Texas Instruments
Tech Day Cleveland 2009
Session Titles and Abstracts

Track & Course	Abstracts
Low-Power Wireless	
Getting Started with the TI Low-Power RF Portfolio	This presentation serves as an overview of the parameters and considerations a designer would use to select a low-power wireless (LPW) solution. It also highlights the devices and tools from TI and how they fit in a typical LPW design.
An Introduction to Antennas and the Theories Behind Them	The antenna can be one of the most daunting components of low-power RF design. Most information available relates to larger antennas related to HAM or cellular applications. This session covers the basics that most designers would need to know to start the antenna requirements and selection process for his/her next design. At the end of this session, the attendees should be able to decipher the datasheet information available and decide what the appropriate antenna for the application should be.
MSP430 in Low-Power RF Network Solutions	With a flexible peripheral mix and ultra-low-power architecture, the MSP430 is an ideal fit for mobile RF applications such as those supported by TI's low-power RF devices. The MSP430 and CCxxxx hardware pairing, software protocols, example applications, and the complete tool chain will be discussed for various markets including the industrial (sub-1 GHz), consumer (2.4 GHz) and IEEE 802.15.4/ZigBee®.
Introduction to ZigBee® Networking	This presentation will provide an overview of ZigBee networking and issues of RF environments, followed by an introduction to TI ZigBee hardware and software solutions.
Using the CC2500/CC1100 to Design a Wireless UART	The first half of this module covers the address and variable packet length features built into the CC2500/CC1100 radio. The second half is hands on and covers using the address and variable packet length features to set up a wireless UART application that can replace RS-232 or RS-485 networks.

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Power Management	
PoE Plus – The New Standard for Ethernet Power	The current generation of Power over Ethernet (PoE) was released in 2005 as IEEE-802.3af, and subsequently as IEEE-802.3-2005 clause 33. This standard provides for up to 12.95 W of usable plug-and-play power at any twisted-pair cabled ethernet enabled device. Since its inception, it is estimated that there are over 57 million PoE enabled switch ports, with continued growth. Virtually all major manufacturers of enterprise IP phones, surveliance cameras and access points provide PoE enabled products. Soon after the market embraced the technology, a movement for more delivered power arose and the IEEE-802.3at PoE Plus project was initiated. This standard will provide up to 25.5 W at the powered device (PD) and provide a framework for dynamic power allocation as well. This topic will present key aspects of the yet-to-be-released standard, how it relates to the existing standard and present TIs solutions.
Component Selection, Layout and Thermal Design Consideration for DC/DC Converters	DC/DC converters with internal transistors and compensation have become very popular due to their relative ease of use. This topic covers how to select the external components and properly lay out the circuit to achieve the maximum performance of the converter. Several good and bad layout examples are provided to show how layout impacts sensitive circuits. Thermal layout for linear regulators is also explored.
SwitcherPro™ Tool	SwitcherPro is a new online tool that allows the development of both internally and externally compensated power-supply designs and helps users to quickly achieve high-performance solutions. The SwitcherPro tool generates test-case schematics and loop responses, evaluates efficiency and analyzes circuit performance. This session will discuss and demonstrate how to: create new designs, calculate design efficiency, calculate loop responses, view stress information on all key parts in the design, customize designs by changing parts, part labels and outputs, change design parameters for what-if case analysis, and output a simple schematic and bill of materials for your design.
Transition Mode PFC Flyback for LED Applications	For LED lighting applications a single-stage Power Factor Correction (PFC) converter is the lowest-cost and smallest-size approach to achieving high power factor for 25-W to 75-W applications when isolation is required. Using a UCC28810 transition-mode PFC boost IC in a flyback converter yields a valley switching design that can achieve 90% efficiency and high power factor over a wide universal input range. There are a lot of design tradeoffs and ancillary circuits that are needed to achieve different goals, such as fast startup with low power loss in the startup circuit, 2-wire TRIAC wall dimmer operation and wide universal operation. The magnetics design is integral to the power-stage design, and cannot be “black boxed” or outsourced to a magnetics vendor. A method of achieving a compromise magnetics and power stage design using Mathcad will be discussed. ***Note:*** *The audience should have basic knowledge of PFC converters and flyback converter design.*
Safe and Fast Battery Charging for Portable Devices	A safe and fast battery charging system is critical for the end users. Li-Ion battery safety characteristics and its cycle life relationship with the charging conditions are first presented. Then, we will talk about the battery charge front end protector with over-voltage and over-current protections to prevent the failure due to use of unregulated cheap adapter and hot plug in. In addition, we are going to discuss USB battery charging and how to fully use USB output current capability and battery charging topology to speed up the battery charging. Finally, to improve the system reliability, a high-input-voltage (up to 52 V) battery charger will be presented for industry applications along with reverse input voltage protection and battery temperature monitoring technique.

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Signal Conditioning	
The New THS4521 Fully Differential Amp Driving 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 ±10V) 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. Circuit analysis is performed to aid understanding of the key design points, and a design methodology is presented for calculating the required component values. Spreadsheet examples will be shown along with TINA 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 ΔΣ ADC and the THS4521 as input amplifier to drive the ADS8324 16-bit SAR ADC.
High-Speed Layout Considerations	This presentation will consider proper layout of high-speed systems utilizing op amps, data converters and clock chips. The key points discussed are high-speed models of common passive and PCB components, managing ground planes, when to use and when to clear them, optimum circuit routing, controlling parasitic capacitance, using bypass capacitors, avoiding ground loops, vias, and controlling impedance with transmission line techniques. Many high-speed signal chains will involve a mixed-signal boundary where the analog domain will cross into the digital domain. This presentation will provide guidance on factors you need to consider when crossing domains and techniques to ensure proper clocking of data converters with the goal of giving guidance on creating a successful high-speed signal-chain design.
Op-Amp SAR Converter Drive: Effects of the Wrong R-C on the Op Amp	In the past, we have presented the inside track on how to choose the right op amp and R-C when driving a CDAC-SAR converter. In this session we will provide a review of the key points of this technique and then take a deeper dive into understanding the dynamics of the signal chain. In particular, we will investigate what happens when the wrong R-C is chosen without regard to the effects on op-amp stability. Excessive overshoot, ringing, and AC gain peaking may be masked in 12-bit systems but, as demands for 16+-bit systems become the norm, marginal stability is no longer acceptable. In this session, we will use a definition-by-example approach by including real data to back up our theoretical analysis. We will give you appropriate detailed design techniques for the CDAC-SAR op-amp drive circuits. All signal-chain designers will want to include this session in your day if you want the ultimate system performance from your SAR converter circuit.
Op-Amp Stability Analysis and Fixes	Any system that has gain is subject to stability issues. The basic conditions necessary for extended ringing and even sustained oscillation are connected with phase shift and gain. With information from the product data sheet with TINA simulation and bench tests a stable system can be realized.
Approaches to Multichannel, High-Resolution Data Acquisition	Data acquisition systems that require high resolution typically employ delta-sigma analog-to-digital converters. This architecture of converter has traditionally presented some challenges when used in multichannel systems; for example, multiplexer timing must be carefully considered to comprehend latency through the converter digital filter. In some cases, this led designers to using a converter-per-channel approach, which brings with it challenges in synchronization, especially if simultaneous sampling is required. Recent developments in integrated solutions make tradeoffs such as these easier. This presentation will examine these issues and tradeoffs in light of these new solutions, and suggest applications where different approaches may optimize the overall system performance.

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Board/System-Level Solutions	
Understanding Noise-Spreading Techniques and Their Effects in Switch-Mode Power Applications	A downside to all the many benefits of SMPS power conversion has always been the potential for noise generation from the high dv/dt and di/dt of the power pulses. When the many techniques for mitigating the generation of EMI still fail to provide the necessary noise margin, the application of spread-spectrum frequency dthering may well provide a solution. This topic explores the modulation techniques, models the behavior in SPICE and examines real-world behavior in two practical examples.
Digital Power Solutions: AC/DC and DC/DC	Digitally controlled power conversion is the enabling force of efficiency and performance improvement in today's power-supply and power-conversion designs. TI's digital power conversion controllers are the recognized leaders in this market. This presentation will focus on introducing TI's latest development solutions for both AC/DC rectifier power supply and DC/DC converters including Power Factor Correction (PFC), phase-shifted DC/DC, and highly efficient resonant DC/DC, etc. An introduction of basic power-conversion concepts and topologies such as PFC, DC/DC, interleaved PFC and DC/DC and resonant DC/DC, will also be presented. Attendees will be informed of basic and advanced digital-power conversion concepts and TI's digital power solutions.
Reducing EMI: Circuit and PCB Design Techniques	An application-based course that discusses circuit and PCB design techniques to reduce EMI. Actual design approaches, examples and measured EMC results are shown and discussed. Examples include Class D audio amplifier design and SMPS design. ***Note:*** *this course builds on the fundamentals discussed in "Understanding EMC Basics"; thus "EMC Basics" is a highly recommended prerequisite.*
Power-Supply Design for Digital Designers	In this session you will learn the art of converting higher voltages to lower voltages using linear devices and then progress to switch-mode power-supply design. Pros and cons are discussed along with numerous examples and details surrounding power-supply design. Following this topic the attendee should have a basic understanding of what to consider when deciding on his next power supply design. Tools to make the job easier are briefly discussed.
Design Considerations for the Analog Front End in Next-Generation Pulse Oximeters	Pulse oximetry is a technique used to measure the oxygen saturation in blood and other vital signs such as ECG and pulse rate. Aside from its obvious clinical uses, pulse oximetry has been implemented in various applications such as neo-natal care and the monitoring of jet-pilot consciousness at high altitudes. Pulse oximeters range from portable to industrial grade, the best of which require a unique marriage of high- performance analog and smart digital filtering. This presentation will cover the design considerations of the analog front end which includes the photodiode sensor, sensor conditioning devices and techniques, basic analog filtering and sampling, and the LED driver for the pulse circuit for both portable and industrial-grade applications.

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Embedded Processing	
Designing for Ultra-Low Power with MSP430	Realizing a low-power system design when every microampere counts is rarely an easy task to achieve. Such an effort requires detailed knowledge of everything your MCU offers in the way of enabling ultra-low power (ULP) as well as the features of any external components. This course gives practical instructions of how to realize a ULP application using the MSP430 family. Special focus is given to specific ULP features, how to select components for ULP applications and coding techniques that reduce the power consumption of your embedded application.
Stretching Your MCU Piccolo™ Bucks In Real-Time Control Design	The new F2802x/F2803x Piccolo family of C2000™ MCUs provides unparalled performance with increased integration to help drive processor intensive real-time control into cost-sensitive applications. Learn how to use the new Piccolo A/B series of the C2000 MCU family in real-time control design which offers greater system efficiency and precision through the implementation of advanced algorithms for applications such as solar power inverters, white-goods application, hybrid automotive batteries and led lighting.
Getting Started with Video and Imaging Application Development	From standard-definition to high-definition video, DaVinci™ technology offers integrated processors, software, tools and support that simplifies the design process and accelerates innovation. In this session, we will review current and future offerings in TI's portfolio. This session will explain the processor cores, hardware accelerator engines and associated tools that are available to get started with video and imaging development today.
Software Development for OMAP35x High-Performance Application Processors	TI's OMAP™ platform delivers a variety of high-performance application processors with portable power and a robust support network. OMAP35x processors feature an ARM Cortex-A8 core, 3D graphics, display subsystem, and video accelerators to provide laptop-like performance at handheld power levels. The complete platform allows for differentiation and rapid development of applications from multimedia enhancement to general-purpose computer applications that utilize Linux, Windows CE or QNX class operating systems. Learn more about the software components you will utilize in your application-processor development efforts.
Leveraging Adobe Flash Technology on DaVinci and OMAP *by DigiLink Software, Inc.*	Adobe flash player is very popular on PC platform for rich-media online applications. Recently, Flash technology is also finding a home for embedded platforms with a stripped-down version called Flash Lite. One popular use of Flash Lite is developing graphical user interfaces (GUIs), which eliminate the need for writing low-level graphics code. This approach has two main benefits: (1) greatly reduces the time for GUI development and (2) empowers graphic designers to have more control of the look and feel of the resulting GUI. Flash technology is also adopted by most of the online video sites. Both TI's DaVinci and OMAP technologies support Flash Lite. The C64x+™ core on DaVinci and OMAP can be used to greatly improve the Flash video performance. In our presentation, we will discuss the work flow of GUI development on TI DaVinci OMAP, as well as how to use the C64x+ core for Flash video playback.

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