Texas Instruments
Tech Day Austin 2009
Session Titles and Abstracts

Track & Course	Abstracts
Track 1 – Low-Power Wireless, RFID, and DLP	
Low-Power RF Protocol Overview	TI's Low-Power RF (LPRF) protocol offers RF solutions (transceivers and SoCs) that target many different frequencies and standards. For some solutions, TI provides the sub-1-GHz and 2.4-GHz hardware along with software including the proprietary SimpliciTI™ network protocol; RemoTI™ software, compliant with the IEEE 802.15.4 Medium Access Control (MAC) standard; and Z-Stack™ software, compliant with the ZigBee® standard. For other solutions, TI provides only the hardware and cooperates with partners to provide software such as wireless M-Bus, 6LoWPAN, SP100 and HART. This session will help the designer to better understand what questions to ask when deciding which software (RF protocol) to use. Although the main topic is software, questions about hardware like "Which frequency is targeted?" are also discussed, as the answers influence which software protocols the designer can chose from. The advantages and disadvantages of the different protocols are then discussed in more detail for two different cases: • Point-to-point connection for a remote control • Multinode network to control the temperature in a house
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 for ham radio or cellular applications. This session covers the basics you need to know to decipher the data-sheet information available and select the appropriate antenna for your application.
Compliance by Design by LSR	This session will outline component selection and PCB layout techniques in RF systems and how they can be instrumental in achieving regulatory approval and optimal design performance. Included will be a brief discussion on the pros and cons of using RF modules; reducing risk with compliance prescans; and the insight provided through measurement of antenna-radiation patterns.
RFID Overview: Technology, TI Solutions and Applications	This session provides a high-level, comprehensive overview of the three globally accepted passive RFID technologies (LF, HF and UHF) and Texas Instruments TI-RFid™ products, solutions and application/usage examples.
DLP® Products - Introduction and Overview of New Applications	DLP Cinema® technology has become well-known and is used in digital-cinema projection systems for theaters and conference rooms around the world. At the core of DLP technology are millions of tiny mirrors used to modulate light at very high speeds, accuracy, and resolution. This unique ability to modulate light in the UV, visible, and IR spectrums is spurring hundreds of new applications for everyday life. This session provides an overview of how the DLP mirrors work and how DLP products are being used in some exciting new applications where DLP products are being used. A few of the many applications are spectroscopy, biometrics, 3D metrology, chemical analysis, and UV lithography.

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Track 2 – Signal-Chain Solutions	
High-Voltage Signal Conditioning for ADCs	Conditioning input signals from high-voltage sources to drive ADCs can be challenging. How can high-level signals like ±10 V be attenuated and level-shifted to match the significantly lower differential- and common-mode voltage inputs required by the ADC? This session will propose an architecture utilizing a fully differential op amp to accomplish the task. Circuit analysis will be performed to aid understanding of the key design points, and a design methodology will be presented for calculating the required component values. Spreadsheet examples will be presented along with example TINA-TI™ SPICE models to show how to implement the design methodology with these computer tools. This session will also include a short presentation of test procedure and performance results from using the THS4521 as an input amplifier to drive the ADS1278 24-bit ΔΣ ADC and the ADS8324 16-bit SAR ADC.
Op Amp Stone Soup: A "Cookbook" Collection of Single-Supply Op Amp Circuits	This session offers a "stone soup" collection of useful op amp circuits to solve linear application problems on a daily basis. Each op amp circuit (shown in an included TINA-TI SPICE schematic) is presented as a definition by example, with a brief overview of its functionality, applicable transfer function and/or waveforms, and key equations for rescaling the function to the exact application. A sampling of the "ingredients" includes the following circuits: • Voltage-to-current conversion • Drive circuits: Bridge-tied-load circuits, parallel op amps, high-current cascade reference buffers • Translation circuits: Single-ended to differential, differential to single-ended, differential input to differential output • Conditioning circuits: Full-wave rectifier, supply splitter, integrator amp in feedback, isolation amplifier, G = 1/G = –1 amp • Comparator circuits: AC-coupled circuits, comparator with hysteresis
Interfacing Between LVPECL, VML, CML and LVDS Levels	This session will introduce the various interface standards used in modern telecom and datacom systems and will describe the methods used to interface similar and different I/O structures used in TI's products for serial-gigabit solutions. This session will focus on the four logic levels that are now the most prevalent in today's communications systems—low-voltage positive emitter-coupled logic (LVPECL), current-mode logic (CML), voltage-mode logic (VML) and low-voltage differential signaling (LVDS). Various TI SERDES devices will also be covered, including input/output structures, high-speed drivers and receivers, receiver biasing, and termination schemes. Ways of interfacing different types of drivers and receivers via AC coupling will also be explained.
What is SuperSpeed USB (USB 3.0) and what can I do with It?	With the announcement of the next evolution in USB-wired connectivity, SuperSpeed USB, you may be asking, "What is this? And what can I do with it?" The first part of this session will look at what is new about SuperSpeed USB and why it is better than USB 2.0 beyond the obvious speed increase. The session will also discuss how backward compatibility is being maintained, as this will be critical to the continued success of USB with end users who believe that "USB is USB." The second half of the session will discuss what applications will benefit from this new technology, and an early look at the SuperSpeed USB product roadmap will be presented.
Circuit-Isolation Techniques and Implementations	Multiple options for implementing galvanic isolation are now available to electronics designers. Apart from having capacitive, optical, and inductive/magnetic isolation technologies to choose from, designers must also comply with the various isolation standards regarding voltage ratings and creepage/clearance distances. This session aims to simplify the decision making associated with choosing the right isolation solution.

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Track 3 – Power-Supply Design	
NexFET™, How To Design with Highly Efficient MOSFETs	TI's NexFET devices represent a breakthrough in low-voltage power MOSFETs, with incredibly low gate charge and resistance. These devices enable high-efficiency and high-frequency DC/DC converter designs. This session will cover the structure and characteristics of these MOSFETs and provide layout and gate-drive recommendations.
Optimizing High-Frequency Synchronous Switching Buck Converter Performance	External components, including inductors and capacitors, have a large influence on converter performance. If the recommended components from the data sheet are used, the promised performance can be expected. However, designers often need to deviate from these recommendations for various reasons, including preferred BOM parts, size constraints, and performance optimization. This session covers the key design points for selecting external components and helps the designer understand the trade-offs involved. This understanding is especially critical in the design of a high-frequency, integrated power supply. Measured data to show the effects of changing external components in the power supply is also provided.
Minimizing High-Frequency Noise from Switch-Mode Power Supplies	With high efficiency, small size and ease of use, switching power supplies are now finding a place in virtually every application. However, switching power supplies may produce conducted or radiated noise that interferes with surrounding circuits in some applications that are noise-sensitive or that require regulatory testing for high-frequency emissions. This session discusses sources of high-frequency noise, common system-level noise problems, and methods to reduce noise in switching power supplies.
Rechargeable Batteries and Their Optimized Chargers	The demand for battery-operated portable devices has been growing significantly, and charging a Li-Ion battery safely, quickly and efficiently has become a challenging task. In this session we will first discuss the charging requirements of NiMH, Li-Ion and $LiFePO_4$ batteries and how TI's chargers meet these requirements. Next we will discuss how power adapters and USBs will start to share the same connector as USBs gradually become a main power source to charge a battery. Various USB battery chargers with and without power-path-management functions will be presented. The bq24150/1, which is a 3-MHz, synchronous, switching single-cell charger, increases the effective charging current, reduces the heat usually generated from a charger, and minimizes the charging time compared with linear battery chargers. A few switching-mode chargers for multicell $LiFePO_4$ and Li-Ion batteries will also be presented.
Energy Harvesting by Cymbet	This session provides an overview of how to design autonomous wireless sensors by using various energy-harvesting transducers, energy-conversion circuits, energy storage and TI's MSP430 and CC2500. Various autonomous-sensor configurations based on energy harvesting will be detailed. Low-power, energy-harvesting RF system architectures will be discussed, and design examples will be shown. An example of a zero-power wireless sensor will be demonstrated with the eZ430-RF2500-SEH development kit.

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Track 4 – Innovations in Embedded Processing	
Advanced Digital-Lighting Control with C2000™ MCUs	Many lighting applications are now adopting LED technology due to demand for greater energy efficiency and lower power consumption. For example, LED streetlights are not only more efficient than standard high-pressure sodium streetlights but also offer a longer life span and provide better lighting. Digital control further improves functionality by offering intelligent dimming, adaptive behavior, and communication capabilities. This session will highlight the benefits of using digital control in lighting applications, discuss system architecture and partitioning, review TI's TMS320C2000™ MCU product family, and showcase the tools and software available to help you get started on your designs today.
Overview of the Ultralow-Power C5505	TI's latest TMS320C5504/05 low-power digital signal processors provide energy efficieny and longer battery life for portable applications such as voice recorders, vital-signs monitors, fingerprint biometric analyzers, handheld measuring and test instruments, and telephony including hands-free kits. The new DSPs offer very low power consumption, with standby power lower than 150 µW and active power lower than 0.2 mW/MHz. The C5505 DSP provides high levels of integration with up to 320 KB of memory, an FFT hardware accelerator, an integrated power-management LDO and user-friendly features like high-speed USB 2.0, a SAR ADC and an LCD bridge. The C5504 is a lower-cost DSP that is software- and pin-compatible with the C5505. Come to this session to learn more about these low-power DSPs and how you can begin using them today.
Integrated USB Connectivity with MSP430 MCUs	Modern MSP430s have integrated USB peripherals such as a single plug-and-play cable for serial communication, intelligent human-interface devices like mice and keyboards that don't require driver installation, or mass-storage devices for data retention. MSP430 devices that feature a USB peripheral will be discussed, as well as the software USB stacks required to create USB applications.
Perpetually Powered Energy-Harvesting Systems Using the MSP430 MCU	Modern ultralow-power microcontrollers such as the TI MSP430 consume so little energy that batteries aren't necessary even for sampling various sensors or communicating wirelessly. By properly managing low-power modes and adjusting your activity profile, you can scavenge energy from the environment to achieve infinite system uptime without the need for a battery. This session will present various methods of energy harvesting, including the use of vibration, solar energy, and heat. Also covered will be tips and tricks to enable an existing application to run from harvested energy.
FRAM: The future of Embedded Memory for Microcontrollers	Ferroelectric random access memory (FRAM) is the next-generation, low-power, fast nonvolatile-memory technology for embedded-microcontroller applications. Requiring no battery to retain data, it enables easy data access and features fast-write capability like DRAM. In addition, its ability to perform write operations at 1.5 V eliminates the need for an expensive charge capacitor that other nonvolatile-memory technologies such as Flash or EEPROM require. FRAM supports practically unlimited data-write cycles, unlike EEPROM or Flash, and this combined with its low power consumption and high reliability makes it ideal for sensing, data logging, motor control, and security applications. TI has over nine years of experience with FRAM and has successfully produced large FRAM memory modules of up to 4 Mbytes.

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Track 5 – Digging In with Hands-On Processor Workshops	
Embedded Web Server-Enabled Design Made Easy with Stellaris® MCUs (Part 1 of 2)	This session will demonstrate how to use the Stellaris LM3S6965 Ethernet Evaluation Kit with Code Red Technologies' Red Suite™ tools to set up embedded Web solutions for a remote-control application. The Stellaris LM3S6965 is an ARM® Cortex™-M3 microcontroller with integrated 10/100 Ethernet MAC+PHY. The Stellaris LM3S6965 Ethernet Evaluation Kit features several different implementations of embedded Web servers. The fully functional Red Suite evaluation tools also feature real-time code and interrupt trace capability with the Red Trace™ feature. The Web-server application will demonstrate how the provided royalty-free Stellaris libraries make it painless to have networking up and running in minutes, whether a real-time operating system (RTOS) is used or not. You will get a good understanding of how to start building even the most advanced applications with Stellaris microcontrollers quickly and with low risk.
Embedded Web Server-Enabled Design Made Easy with Stellaris MCUs (Part 2 of 2)	This session will demonstrate how to use the Stellaris LM3S6965 Ethernet Evaluation Kit with Code Red Technologies' Red Suite tools to set up embedded Web solutions for a remote-control application. The Stellaris LM3S6965 is an ARM Cortex-M3 microcontroller with integrated 10/100 Ethernet MAC+PHY. The Stellaris LM3S6965 Ethernet Evaluation Kit features several different implementations of embedded Web servers. The fully functional Red Suite evaluation tools also feature real-time code and interrupt trace capability with the Red Trace feature. The Web-server application will demonstrate how the provided royalty-free Stellaris libraries make it painless to have networking up and running in minutes, whether a real-time operating system (RTOS) is used or not. You will get a good understanding of how to start building even the most advanced applications with Stellaris microcontrollers quickly and with low risk.
Hands On OMAP™ L1x Boot Camp (Part 1 of 3)	The OMAP-L137 is a low-power applications processor based on an ARM926EJ-S™ and a TMS320C674x™ DSP core. The OMAP-L137 features robust operating-systems support, rich user interfaces, and excellent performance longevity due to the flexibility of a fully-integrated, mixed-processor solution. This hands-on workshop will provide a detailed technical overview of the device's architecture and will cover supporting hardware/software such as the Linux boot process and Codec Engine/DSPLink functionality.
Hands On OMAP L1x Boot Camp (Part 2 of 3)	The OMAP-L137 is a low-power applications processor based on an ARM926EJ-S and a TMS320C674x DSP core. The OMAP-L137 features robust operating-systems support, rich user interfaces, and excellent performance longevity due to the flexibility of a fully-integrated, mixed-processor solution. This hands-on workshop will provide a detailed technical overview of the device's architecture and will cover supporting hardware/software such as the Linux boot process and Codec Engine/DSPLink functionality.
Hands On OMAP L1x Boot Camp (Part 3 of 3)	The OMAP-L137 is a low-power applications processor based on an ARM926EJ-S and a TMS320C674x DSP core. The OMAP-L137 features robust operating-systems support, rich user interfaces, and excellent performance longevity due to the flexibility of a fully-integrated, mixed-processor solution. This hands-on workshop will provide a detailed technical overview of the device's architecture and will cover supporting hardware/software such as the Linux boot process and Codec Engine/DSPLink functionality.

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