Texas Instruments
Tech Day Chicago 2009
Session Titles and Abstracts

Track & Course	Abstracts
Track 1 – Low-Power Wireless	
Low-Power RF Basics and Modulation Techniques	This session is an overview of common specifications, technologies, functional blocks and networks for low-power RF sensor and networks.
Improving the Range of Your Low-Power Wireless (LPW) Design	The most common question that comes up in any wireless system is “What is my range going to be?” followed by the next most common question “How can I improve my range?”. This session will go through some of the ways that you can answer both of these difficult questions.
Adapting TI LPW Reference Designs	A fast way to implement a low-power wireless design is to duplicate a TI reference design on your own board. This seesion will discuss some of the common pitfalls in the board layout that can be avoided. We'll discuss the do's and don'ts of transferring the reference design to your own PCB.
Eliminating Wires Made Simple with SimpliciTI™	This presentation will address the use of the SimpliciTI network protocol as the heart of a truly robust and full-featured low-power wireless network. We'll review the power-saving features of the TI low-power wireless radio and MSP430 SOC microcontroller, followed by a hands-on demonstration of the low-power capabilities of an access point-based network based on the SimpliciTI network protocol stack.
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.

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Track 2 – Power Supply Solutions	
Illuminating Facts About High-Power LEDs, Both Visible and Invisible *by OSRAM*	Multiple topics about LEDs and solid state semiconductor devices will be discussed including the human vision influences and optical treatments of these high-power semiconductors . LEDs have a very steep brightness roadmap which will be highlighted along with the invisible aspects of LEDs. OSRAM is a leader in Illumination Visualization and Sensing and this session will introduce the audience to many application and key LED products attributes that can be applied across a vast array of applications and industries
Designing Power Drivers for Solid State Lighting (LEDs)	Advancements in solid state lighting (SSL) provide many interesting opportunities for engineers to design evolutionally and revolutionary differentiated products. A major part of fully utilizing SSL advantages is designing an appropriate power driver design. This session will cover lessons learned from TI power engineers who have solved various SSL driver issues. We will cover AC/DC and DC/DC topologies and ICs for low, mid and high-power SSL applications. Plus we will give real-world schematic examples of how to tackle SSL challenges.
Introduction to Digital Power	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 digitalpower conversion concepts and TI's digital power solutions.
Choose Your Weapon – Selecting an Optimal MOSFET	Ever spent hours selecting MOSFETs, calculating losses and comparing multiple possible devices only to be left wondering if you've selected the "best" MOSFET? Ever wish there was a way to quickly evaluate and compare a dozen MOSFETs relative losses in your application? There is. Here, we will discuss MOSFET switching characteristics, loss factors and key parameters, then justify and present a new method developed at TI for rapidly comparing and selecting a loss optimized MOSFET from a list of possible candidates. Generalized equations and specific synchronous buck controller equations will also be presented.
Li-Ion Battery Characteristics, Trends and Its' Fuel Gauge and Cell Balance in Multi-Cell Battery Packs	With all the different battery chemistries and constructions, it can be difficult to identify the best choice for your particular design. This session provides an overview of current and future technology trends, including tradeoffs based on current technologies (capacity, voltage, discharge rate and safety). Impedance Track™ fuel gauge will be introduced to accurately predict the battery remaining capacity and time to empty, and cell balance technique will be also discussed to improve the safety in multi-cell applications.

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Track 3 – Signal Chain Solutions	
Circuit Isolation Techniques and Implementations	Multiple options are now available to electronics designers to implement galvanic isolation. Apart from isolation technologies like capacitive, optical and inductive/magnetic to choose from, they must also contend with the various isolation standards regarding voltage ratings and creepage/clearance distances. This discussion intends to simplify the decision making associated with choosing the right isolation solution.
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.
Sensors and the Analog Interface	In this presentation we will discuss the way to monitor many different physical phenomena, such as temperature, air flow, humidity, and power. We will discuss numerous sensor characteristics and the various styles of sensor signal conditioning that you can implement in your systems. Throughout this presentation, the output of every sensor circuit will be suitable for a conversion to a digital signal. You will leave this session fully armed to tackle your on-board or remote-sensor challenges.
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.
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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Track 4 – Innovations in Embedded Processing	
FRAM: The Future of Embedded Memory for Microcontrollers	FRAM (Ferroelectric Random Access Memory) is the next-generation low-power, fast non-volatile 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 current non-volatile 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 sensoring, datalogging, motor control and security applications. TI has over nine years of experience with FRAM and has successfully produced large FRAM memory modules up to 4 MB.
Understanding 32-Bit MCU Peripherals Advanced Capability in Embedded Systems Using the Piccolo™ MCU ControlSTICK	This session will provide an overview of the Piccolo MCU C28x™ core and a deep dive into the functionality and benefits offered in its feature-rich peripheral set optimized for real-time control applications. Attendees will gain insight into the onboard ADC, ePWM, HiResPWM, analog comparator and more. Sample projects include generation of an asymmetric PWM output with period and duty variation, triggered ADC conversion using an onboard filtered PWM output, use of comparators to generate a CPU interrupt on a cycle-by-cycle basis and more. Attendees will leave with a comprehensive understanding of the performance and capability offered in the Piccolo MCU series of devices.
Introduction to Targeted Code Generation for TMS320C2000™ MCUs *by The MathWorks*	In this session, The MathWorks engineers will show how to develop power conversion applications for TI C2000™ microcontrollers using MATLAB, Simulink, and Target Support Package™ TC2. The steps illustrated in this presentation, depicted as incremental model refinements, suggest an example workflow for designing and implementing a DC to DC buck converter application on an embedded platform. This presentation highlights advanced processor-specific capabilities of Target Support Package TC2.
Digital Motion Control System Design – From the Ground Up *by D3 Engineering*	D3 Engineering staff will present a design outline and demonstrate working hardware for a 400-W PMSM controller. Topics covered include processor selection, isolation, interfaces (USB, CAN, RS-232) and driver electronics (power module vs. discrete FETs). The design is controlled through a TI F2806 DSP. D3 will demonstrate how to create a project for a custom board with MATLAB real-time workshop tools. The demos will include both sensored and sensorless control algorithms.
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 offer a longer lifespan and provide better light as well. Using digital control can further improve functionally by enabling features such as 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 C2000 MCU product family, and showcase the tools and software available to help you get started today.

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Track 5 – Innovations in Application Processors	
Power Consumption of Embedded Processors and the Advantages of SmartReflex™	Power has become a leading factor in today's design. Not only does a system designer need to consider the performance of the DSP but also must meet tight power budget for both processors and overall board power targets. TI has introduced SmartReflex technology that significantly limits power consumption while maintaining the optimum performance targets for each DSP. This presentation will discuss the various levels of SmartReflex that are available as well as how it is implemented. It will focus on various options a designer has to limit power consumption and improve heat dissipation through efficient board layout, use of SmartReflex, heat sinks, proper partitioning of software code, use of power planes, disabling certain DSP functions and other techniques.
Linux Development Tutorial on TI Processors	This presentation will explore the various Linux development options available for TI's embedded processors such as DaVinci™ and OMAP™. Both community and commercial offerings will be discussed including the benefits of each.
HD Digital Video Recorder Using TI DM6467 *by Ingenient*	A DM6467-based DVR reference design which handles HD encode and decode of the most commonly used video and audio standards is described here. It is designed with an efficient Linux Multimedia Application Framework which includes features crucial to DVR development such as: custom-written kernel routines for maximum performance, trick play and advanced A/V sync support, and sophisticated rendering to handle all different types of inputs and outputs. Multiple channel encode and decode with simultaneous encode and decode is also supported.
OMAP 3 Graphics Overview	This presentation will provide a detailed overview of the programmable 3D graphics core that is coupled with the ARM Cortex™ A8.
Introduction to Windows CE 6.0 on the OMAP35xx *by BSQUARE*	Windows Embedded CE 6.0 is a componentized real-time operating system designed to power embedded devices and help developers get to market fast. This session will provide an overview of Windows Embedded CE 6.0 and the Platform Builder development environment as well as features unique to the OMAP 35xx.