Texas Instruments
Technology Day New Jersey 2010
Session Titles and Abstracts

Track & Course	Abstracts
Track 1 – Power Supply Design	
Battery Management Basics	This session will cover charging, protection, chemistries, gas gauging and TI's battery management portfolio, including a technology overview, TI advantages and hot products (roadmap).
Power Supply Tips and Tricks	This power supply course will take you through years of tips and tricks that the TI power supply team has come up with after years of designing power supplies. You will come out of this session amazed.
Power Supply Layout Considerations	This session will address methods for keeping circuit parasitic components from degrading the operation of your designs. Techniques to minimize the impact of parasitic inductance and capacitance of filter components and PWB traces will be discussed, together with a description of the impact that PWB trace resistance can have on power supply regulation and current capacity. A general overview of thermal design is also included, as well as sample temperature rise calculations in natural and forced-air environments. Finally, we will review some practical examples of power stage and control IC layouts.
Designing Your Power Supplies to Be Green	With green being a major focus in the electronics industry today, this topic will first present some of the national an international initiatives that are driving requirements for new, more efficient or green power supply designs. The presentation will then take a look at some of TI's offerings to help achieve these requirements, covering their features, benefits and implementations.
FPGA Cookbook Solutions	Your FPGA needs power … where do you start? Why was a particular power solution chosen for the FPGA's development board and how do you determine whether it is the right choice for your product? Are there other options? This class will walk you through the types of power solutions and the benefits of each and arm you with a few basic tools to make designing your system easier.
Track 2 – High-Speed Analog Design Considerations	
High-Speed PCB Layout Considerations	This topic will discuss the high-speed models of common components and the key points to address in high-speed layout. When to use ground planes and when to clear them is discussed, along with optimum circuit routing, bypas capacitors, avoiding ground loops, vias and controlling impedance with transmission line techniques. Many high-speed signal chains involve a mixed-signal boundary where the analog domain will cross into the digital domain, and will require clocking to make it work. This seminar will provide guidance on how to ensure best analog signal integrity; the factors to consider when crossing domains; how to route digital signals to avoid data errors; and how to route clock signals for best performance, including EMI considerations. The goal is to give you guidance on creating a successful high-speed design using TI amplifiers, data converters and clocking solutions.
High-Performance Differential ADC Input Interface Design	Most emerging high-performance ADCs require a differential input interface. Designing that interface with minimal SFDR and SNR loss from the converter specifications is a task every data acquisition designer must face. A review of converter SNR and SFDR characterization will lead to a discussion of combining the SNR and SFDR delivered up to the converter with the ADC specifications. This can then be used to set a performance target in this last stage interface. Working from low to high frequency, a very low distortion interface suitable for 16- to 24-bit converters will be shown. Next, a wideband first Nyquist zone design will be described, as well as a high-performance IF interface for an undersampled application.
Clocking to Maximize High-Speed Signal Chain Performance	Selecting a clock driver for a high-performance sampling system involving high-speed data converters is a hard task and often underestimated. The designer must first understand the fundamentals of the analog-to-digital converter to design a clock solution that does not degrade performance of the entire signal chain. Clocking solutions range from simple fan-out buffers to sophisticated clock generators with the ability to control output frequencies, shape noise and control skew. As the input bandwidth of the ADC increases, the keystone of overall system performance can rely heavily on the jitter performance of the clock. This is particularly true for SNR and SRDR. This presentation will address sampling clock dependencies on the ADC performance metrics (namely SNR and SFDR), explain methods to calculate required sampling clock jitter, introduce TI high-performance synthesizers/jitter cleaners, and show demonstrations of achieving best possible SNR (and SFDR) with cost-effective yet high-performance clocking devices.
Understanding Clock Jitter	A communication system's performance is negatively affected by the generation and accumulation of jitter in the signal path. In general, system performance can be improved through jitter analysis, control and abatement. The causes of jitter are well understood, and the ability to predict the impact of clock jitter on system performance can be estimated. This presentation will enable attendees to gain an understanding of the principles involved as well as pragmatic solutions to common problems associated with clock jitter.
Interfacing High-Speed Data Converters to FPGAs	This presentation will address common issues with interfacing data converters with FPGAs. Information on device selection, interface support and communication will be covered.

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Track 3 – Precision Analog Design Considerations	
Deciphering Electrical Characteristics in an Op Amp Datasheet	The operational amplifier (op amp) is often the key analog gain block in acquiring and scaling real-world signals in any data acquisition system. To predict system accuracy when using op amps, it is important to understand the op amp data sheet and how individual specifications affect both the DC and AC transfer accuracy through the op amp. Both DC and AC limitations will be discussed in detail. With this knowledge, any engineer can design with op amps right the first time.
Instrumentation Amplifier Noise Analysis	This presentation covers calculation, simulation and measurement of intrinsic noise in an instrumentation amplifier. Intrinsic noise is noise generated by resistors, op amps and other active devices in the circuit. The presentation does not cover extrinsic noise (e.g., RFI and EMI pickup). The presentation does cover specific real-world examples where the peak-to-peak output noise is predicted, simulated and measured. In addition, using an instrumentation amplifier correctly to avoid internal node saturation will be presented.
Op Amp Stone Soup: A "Cookbook" Collection of Single Supply Op Amp Circuits	This presentation offers a “stone soup” collection of useful op amp circuits to solve linear application problems. Each op amp circuit (prebuilt in the 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 your exact application. A sampling of the ingredients includes the following circuits: voltag to-current conversion; drive circuits (bridge-tied load, parallel op amps, high-current cascade reference buffer); translation circuits (single-ended to differential, differential to single-ended, differential in to differential out); conditioning circuits (full-wave rectifier, supply splitter, integrator amp in feedback, isolation amplifier, G = 1/G = -1 amp); and comparator circuits (AC coupled, comparator with hysteresis).
Intro to Motors and Motor Control	This session will talk about the different types of motors used in the industry: DC, brushless DC, steppers, permanent magnet synchronous and AC induction. To gather a better understanding of motors, the differences between them, with advantages and disadvantages of each, will be shown. Basic motor drive circuits will be discussed, from full H-bridge drive to half-bridge for three-phase motors. Other drive concepts such as six-step commutation, along with drive issues such as current recirculation, will be discussed. Field-oriented control will als be discussed and how it has progressed with improving technology. This session will end with how to implement a motor control application using TI solutions from analog products, digital controllers and software to precisely control the position, velocity and torque of mechanical drives.
Digitizing Your Motor Control Design	Today’s motor control systems almost invariably use a microprocessor or microcontroller to close the control loop digitally. The economical advantages of this approach are obvious, but the impact to your system performance is much more subtle. How does quantization affect system performance? How can you analyze the stability of your composite analog/digital signal path? How do you know if your sampling frequency is high enough? What processor features are really important for optimized performance? Are there software tools and techniques to ease the development effort? This session discusses some of the analytical methodologies you can use to answer these questions (including several motor control simulation examples) that will take the guesswork out of designing your digital motor control system.
Track 4 – Embedded Processing Design	
Introduction to Code Composer Studio™ IDE v4 with Demo	Code Composer Studio™ IDE v4.0 is a major new release of Code Composer Studio software that is based on the Eclipse open-source software framework. Eclipse is becoming very popular in the embedded development community and is now a standard in many development environments. Join this session to learn how to get started today.
Considerations for Choosing the Right TI ARM-Based Microprocessor	TI has introduced many new processors based on the Cortex-A8 and ARM9 architectures. This session compares ARM-based MPU options and guides you through the decision-making process. Learn the technical components that are included as part of these cores. In addition, learn about the scalability of the different architectures.
Introduction to Stellaris® ARM Cortex-M3 MCUs	TI's Stellaris® MCUs pair the ARM Cortex-M3 core along with advanced communication capabilities, including 10/100 Ethernet MAC+PHY, CAN, USB On-the-Go, USB host/device, SSI/SPI, UARTs and I2C. TI also provides an extensive range of more than 20 superb reference design, evaluation and development kits starting at $49. Stellaris MCUs are targeted at highly connected applications including monitoring, building controls, network appliances and switches, factory automation, electronic point-of-sale machines, test and measurement equipment, medical instrumentation, and gaming equipment. This presentation provides an overview of Stellaris MCUs, software tools and kits, StellarisWare™ software, and applications. The session will close with a freeform Q&A session to handle your questions on the more than 140 microcontrollers in TI’s Stellaris family of MCUs.
Addressing Design Challenges Using System on Modules and Single-Board Computers	Embedded system designers today face the daunting challenge of reducing time to market, product development cost and risk at the same time. To help address these challenges, designers should consider buying production boards from outside vendors versus developing their own. This session will help designers understand the types of problems system on modules and single-board computers address and provide suggestions on how to pick a vendor offering products based on TI’s embedded processors.
CC430: MCUs for Space-Constrained, Ultra-Low-Power Wireless Applications	The CC430 platform is a highly integrated, monolithic SoC based on the industry-leading MSP430™ MCU architecture and TI’s ultra-low-power RF solutions. By making RF design easy, small, performance-rich and power-efficient, the CC430 platform helps advance applications including RF networking, energy harvesting, industrial monitoring and tamper detection, personal wireless networks, automatic metering infrastructure, and heat cost allocators.

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Track 5 – Applications Solutions	
TI's LED Lighting Solutions Overview	This training will present an overview of the LED general lighting solutions available from Texas Instruments for residential, commercial, outdoor and Infrastructure lighting. Both AC/DC and DC/DC solutions in the form of reference designs, EVMs and products will be discussed from both analog and embedded processing.
SuperSpeed USB (USB 3.0): What and When?	The SuperSpeed USB specification was released in late 2008; products are now becoming available and the market is on the verge of ramping up. Many customers are asking, "what is this, and what can I do with it"? The firs part of this session will look at what is new and better with SuperSpeed USB. How is it different than USB 2.0 beyond the obvious speed increase? Has power delivery changed? How is backward compatibility being maintained? The session will close with a look at what is happening as far as SuperSpeed USB development and roadmaps.
C2000™ DSP Digital Power Solutions: AC/DC and DC/DC	Digitally controlled power conversion is the enabling force of efficiency and performance improvements in today's power supply and power conversion designs. Texas Instruments 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. An introduction to 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 learn basic and advanced digital power conversion concepts and gain an understanding of TI's digital power solutions.
Leveraging TI's New Wi-Fi and *Bluetooth*® Offering for the OMAP35x Evaluation Module	This year, TI added Wi-Fi and *Bluetooth*® connectivity features to the OMAP35x EVM, making TI's connectivity solutions available to new markets. Come learn about TI's WL1271 combination Wi-Fi and *Bluetooth*® device. In this session, we will discuss the solution features, support structure and roadmap for additional connectivity support, as well as how to get started and successfully engage with customers. The WL1271-based module is shipping today with the OMAP35x EVM. It is a compact solution that opens the door for customers to innovate a wide range of applications requiring Wi-Fi and/or *Bluetooth*® connectivity. A live demonstration of the Wi-Fi and *Bluetooth*® sample applications included in the platform software will be shown during the session.
Low-Power RF Protocol Overview	Texas Instruments Low-Power RF (TI LPRF) offers RF solutions (transceivers and SoCs) that target many different RF frequencies and standards. For some of them, TI provides the hardware (sub-1 GHz and 2.4 GHz) and software (proprietary: SimpliciTI™ network protocol; standards: MAC 802.15.4, RemoTI™ network protocol and Z-Stack™ software for the ZigBee standard). For others, it provides the hardware only and cooperates with partners to provide the software (wireless M-bus, 6LoWPAN, SP100, WHART). This training helps attendees to better understand what questions to ask when making the decision on which software (RF protocol) to use. Although the main topic is software, hardware-related questions like "which frequency is targeted?" are discussed, as they have an influence on the software protocols available. The advantages and disadvantages of the different protocols will be discussed in more detail by looking at two different use cases: a point-to-point connection for a remote control and a multi-node network to control the temperature in a house.