Texas Instruments
Tech Day Anaheim 2010
Session Titles and Abstracts

Track and Course	Abstracts
Track 1 – Signal Chain	
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 on a daily basis. Each op amp circuit (prebuilt in the included TINA-TI™ technology-based 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 include the following circuits: voltage-to-current conversion; drive circuits (bridge-tied load, parallel op amp, 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).
Inside the Delta-Sigma Converter: Practical Theory and Applications	This presentation will take you inside the true workings of a delta-sigma converter. Basic concepts to be discussed include sampling frequencies (modulator versus data), different types of digital filters and their advantages and disadvantages, settling times and latency, resolution, accuracy, and what "noise-free bits" really mean. This session will help debunk some of the myths around sampling, resolution, and latency. Also discussed will be the idea that a 24-bit delta-sigma converter might be the right part to consider for a 12-bit system and how it may simplify some designs.
Tackling EMI and RFI at the Board and System Level	Electromagnetic interference (EMI) and radio frequency interference (RFI) can affect any system in an undesirable manner, as the proliferation of unintentional radiators and receptors continues to increase. EMI and RFI, an undesirable byproduct of electrical systems, produce a wide range of frequency spectra that can affect otherwise properly operating circuits. During this seminar, we will review the fundamental principles of radiated interference and coupled interference, along with the respective allowed limits for both of these interference sources. We will describe transmitters and receivers, along with techniques to mitigate the effects of both culprits. The solutions we will cover will be effective power-line filtering, proper filtering for input signals of high-gain circuits and details on key components. Finally, we will discuss some common rules of thumb for wire and PCB routing to minimize EMI and RFI effects. With this seminar, you will learn some basic methods that will help reduce sources and receptors of EMI and RFI events in and near your circuits.
Sensors and the Analog Interface	In this presentation, we will discuss how 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 conversion to a digital signal. You will leave this session fully armed to tackle your on-board or remote-sensor challenges.

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Track 2 – Circuit Design and RF	
TI High Reliability, Defense and Aerospace Product Overview	The Texas Instruments Hi Reliability, Defense and Aerospace organization (TI-HiRel) brings the latest technologies, manufacturing capabilities and high-performance products to the industrial, geological, avionic, space and general defense market segments. TI-HiRel offers an expanding portfolio of QML Class-V (space-qualified to MIL-PRF-38535), enhanced products and known good die product lines, with extended-temperature and radiation-tolerant operating ranges. In addition, TI HiRel recently introduced a new line of high-temperature (HT) devices that can withstand operating temperatures from -55°C to 210°C to address extremely harsh environments such as geological exploration and downhole drilling. TI-HiRel continues to expand these offerings with new parts to provide a complete signal-chain solution for customers building HT electronics for harsh environments.
Low-Power RF Basics	This presentation gives a introduction to RF systems, reviewing a complete RF system as well as introducing the different building blocks. Important parameters such as sensitivity, selectivity, output power and link budget are discussed in detail, as well as compliance to frequency regulations around the world.
High-Speed Layout Considerations	This topic will discuss the high-speed models of common components and the key points to address in high-speed layout. We will discuss when to use ground planes and when to clear them, along with optimum circuit routing, bypass capacitors, and avoiding ground loops, vias and controlling impedance with transmission-line techniques. In addition, many high-speed signal chains will involve a mixed-signal boundary where the analog domain will cross into the digital domain. This seminar will provide guidance as to the factors you need to consider when crossing domains, with steps on creating a successful data converter layout for your high-speed design.
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 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.

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Track 3 – Power	
Battery Characteristics, Safety, Cell Balancing and Cell-Based Thermal Sensing	The Lithium-ion (Li-ion) battery has gained great popularity in recent years as the market for battery-powered portable devices grows rapidly. It has superior characteristics, including high gravimetric and volumetric energy density, low self-discharge, and no memory effect. On the other hand, a Li-ion battery pack requires mandatory safety features because of the battery's sensitivity to overcharge and high temperature. We will discuss the characteristics and safety of rechargeable batteries and emerging battery chemistries such as LiFePO4 and LiMn2O4. We will also present design considerations on connecting battery cells in parallel or in series in applications and review new trends toward designing safer battery solutions and achieving longer battery life, such as advanced cell-balancing technologies and cell-based thermal monitoring.
Optimizing High-Frequency Synchronous-Switching Buck Converter Performance	With all converters, the performance of the IC is only as good as the external components around it. The external components, including the inductors and capacitors, have a large influence on performance. When using the recommended components from the data sheet, promised performance can be expected; however, designers often need to deviate from these recommendations for various reasons, including preferred bill-of-material parts, size constraints and performance optimization. This topic covers the key design points for external component selection and helps designers understand the trade-offs associated with changing the external components in high-frequency integrated power supplies.
Power-Supply Layout Considerations	This topic will address methods for keeping circuit parasitic components from degrading the operation of your designs. We will discuss techniques to minimize the impact of parasitic inductance and capacitance of filter components and printed wiring board (PWB) traces, 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 a natural and forced-air environment. Finally, we will review some practical examples of power stage and control IC layouts.
Choosing the Right Devices to Power your Altera or Xilinx FPGAs	Your FPGA needs power … where do you start? Why was the 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 their respective benefits, and arm you with a few basic tools to make designing your system easier.

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Track 4 – Microcontrollers	
Introduction to Stellaris™ ARM Cortex-M3 MCUs	TI's Stellaris™ MCUs pair the ARM Cortex-M3 core with advanced communication capabilities, including 10/100 Ethernet MAC+PHY, CAN, USB On-The-Go, USB host/device, SSI/SPI, UART and I2C. TI also provides an extensive range of more than 20 superb reference designs, evaluation modules 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 Q&A session to handle your questions on the more than 140 microcontrollers in TI's Stellaris family of MCUs.
Introduction to Code Composer Studio™ IDE v4.0	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 becoming a standard in development environments. This session will provide an overview and explain advantages to using v4.0 of the Code Composer Studio IDE for your development.
Control and Drive Solutions for All Types of Motors	Whether you are trying to control a 12V brushed DC or a hundredths of kilowatt AC servo motor, TI offers a portfolio of microcontrollers and complementary integrated motor drivers, industrial interface and high performance analog-to-digital convertors that fit your needs. In this presentation we will discuss the different motor types and control techniques, then focus on the open-tooled hardware and software reference designs available for each motor type based on both our Stellaris™ 32-bit ARM Cortex-M3 and Piccolo™ 32-bit microcontrollers. We will also discuss the appropriate power stage and interface products. We'll also explore the overall methodology and ease-of-use features for motor control available from our microcontrollers, including start-up GUIs, modular software, hardware reference schematics/PCB/BOM, production ready modules, advanced communications and connectivity, and integrated digital power factor correction (PFC).
The Future of Low-Power Micros: Energy Harvesting and Ultra-Low-Power Memory (FRAM) *by Cymbet*	This session provides an overview of how to design autonomous wireless sensors using various energy harvesting transducers, energy conversion circuits, energy storage with permanent thin film battery technology, sensors and the TI MSP430™, CC2500 and CC430. Various configurations of autonomous self-power sensors based on energy harvesting will be detailed. Low-power EH RF system architectures will be discussed and design examples will be shown. An example of a Zero Power Wireless Sensor will be demonstrated using the eZ430-RF2500-SEH Demo Kit and the new DigiKey Self Powered CC430 Weather Station Reference design.

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Track 5 – OMAP™ Processors/DSP	
Video Codecs – What, How and Which	Our investigation of video codecs begins with examining how they work. Next, we'll see how these codecs are implemented on TI's OMAP™ and DaVinci™ processors. Finally, we will compare and contrast many of the popular codec standards, such as MPEG-2, MPEG-4, H.264 and VC1.
Linux Development Tutorial on TI Processors	This presentation will explore the various Linux development options available for TI's DaVinci™ and OMAP™ processors. We will discuss both community and commercial offerings, including the benefits of each.
Introducing the Graphics Capabilities of TI SoC's	This session will take a look at the graphics hardware capabilities across the OMAP™ and Davinci™ family of devices and will explain what software is provided to enable developers to easily write applications that can leverage these hardware features. This session will then demonstrate how the various hardware capabilities can be utilized within a higher level graphics framework such as Qt/embedded from Nokia. Such a framework can drastically reduce the time taken and the learning curve required for the creation of complex mixed 2D/3D user interfaces on TI SoC's.
TI's Community Linux Strategy and Partners for DaVinci™, OMAP™ and Sitara™ Processors	Initially TI offered only a single commercial Linux offering –MontaVista Linux – to customers requiring Linux on TI devices. Beginning with the OMAP3530, TI is now releasing community Linux kernels for its devices, along with the associated SDKs and DVSDKs. These community Linux kernels give customers full access to 'free Linux' and have enabled multiple commercial Linux companies to support TI devices. This presentation will begin by describing the community Linux distributions TI is releasing, when they will be available, how to obtain them, and the support model. It will conclude by overviewing TI's commercial Linux product and consulting partners and the additional value they offer beyond pure community Linux.
Track 6 – Workshops	
MSP430F5xx Hands-On Workshop (Parts 1 and 2)	This hands-on workshop is intended to educate the experienced MCU designer on the capabilities of the MSP430F5xx. You will experience embedded design with the MSP430™ MCU, get familiar with an MSP430 development environment, learn where to find and how to use resources, and better understand the MSP430 low-power concept. The course is perfect for those getting started or who need a refresher on MSP430 microcontrollers. You should have basic experience with general MCUs and knowledge of assembler and C language programming.
Code Composer Studio™ v4.0 Hands-On Workshop (Parts 1 and 2)	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 becoming a standard in development environments. Join this hands-on session to help you get started today.

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