Texas Instruments
Technology Day Toronto – October 20
Session Titles and Abstracts

Track and Course	Abstracts
Track 1 – Microcontrollers	
Introduction to Stellaris® ARM Cortex-M3 MCUs Hands-On Workshop Parts 1 and 2	This presentation will demonstrate 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 using an RTOS or not. Attendees will get a good understanding of how they can start building even the most advanced applications with Stellaris microcontrollers quickly and easily.
FRAM: Opening New Horizons for Embedded Developers	Ferroelectric random access memory (FRAM) is the next-generation non-volatile memory technology for ultra-low-power embedded microcontrollers. Its fast write capability (like DRAM), practically unlimited write endurance (>1,014 cycles) and ultra-low-power consumption benefit developers and end users alike. This presentation will describe FRAM's ability to function as universal memory, helping ease the life of developers and reducing development time (faster time to market) and costs. In addition, FRAM enables several new, exciting ultra-low-power applications such as batteryless intelligent sensors. The presentation will include a look at the power-consumption advantages of FRAM in one such application. FRAM also offers significant advantages over incumbent technologies in several other applications, such as energy harvesting, sensoring, datalogging and motor control.
Energy Harvesting *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™ MCU, 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.
Bringing TI's Bluetooth Technology to Embedded MCU Platforms	As TI expands the reach of our connectivity platforms, we are putting new tools in the hands of customers to quickly and easily add connectivity to products based on TI embedded processors such as the MSP430™ microcontroller. In this session we will introduce the newest platform offering that integrates TI's BlueLink™ product family with the MSP430 solution. You will learn about the platform's features, capabilities, differentiators and how to position this offering with your customers. You will also get to see the platform in action as we demonstrate a gaming and a health care sample application running on an MSP430F5438 experimenter board.
Track 2 – Embedded Processing	
Getting Started with Android Today and Maximizing Your Effectiveness	With the availability of Android for the Texas Instruments OMAP35x, developers are now able to utilize the unique power of the Android application framework to create new, compelling designs. Attend this session to learn about the fundamentals of the Android architecture, the advantages of Android for designs relative to Linux, Mentor developer tools to assist Android developers, and how Android and TI OMAP35x work together.
Introducing the Graphics Capabilities of TI SoCs	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 learning curve required for the creation of complex mixed 2-D/3-D user interfaces on TI SoCs.
Introduction to TI's Latest High-Performance Processors with Speeds of 1 GHz and Beyond	In this overview presentation, see how TI combines 1 GHz plus ARM Cortex-A8 and 1 GHz plus fixed-/floating-point DSP cores with sophisticated memory and display subsystems as well as high-speed peripherals to provide optimized SOC solutions for leading-edge applications. Learn how to create compelling user interfaces with 3-D graphics and how to manage high-bandwidth data flows with a range of connectivity options. Find out how TI's latest software development kit (SDK) makes it easy to harness the flexibility and scalability of TI SOCs by reducing development time while protecting your software investment.
Video Analytics on TI Processors	TBD
Skype D1 Videophone Solution Based on DM365	Skype has changed the videophone industry. OEMs and manufactures are now able to directly connect to the consumer without interoperability and operator concerns. To meet this challenge, TI offers a DM365-based D1 videophone that runs Skype software stacks for encryption and streaming. This session will address some of the unique challenges facing hardware and software designers, such as how to share the hardware design with the DM365-based USB camera to maximize hardware reuse, challenges when running Skype software on the DM365, how to solve acoustic echo-cancellation issues, and audio and video synchronization.

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Track 3 – Power and Analog	
DC/DC Converters 101	This presentation is an introduction to power supplies for non-power supply engineers. If you are an engineer who works on systems that require power, but you don't design the actual power supply, this presentation is for you. It defines and explains some of the terminology surrounding power supplies and explains why you might use one topology over another. Example topics are efficiency considerations and how they relate to the differences between synchronous and non-synchronous converters. It explains many terms you may have heard but not fully understood, such as split rail, PSRR, converter vs. controller, LDO vs. linear regulator, buck vs. boost, etc. This presentation will not show you how to design a power supply, but it will help you to understand what the power supply designers are talking about.
DC/DC Converters 102	This presentation details point-of-load switching regulators, focusing on the choices designers have in accommodating various design priorities and the compromises to be made. System-level considerations such as sequencing, output noise and load transient, ground bouncing and noise mitigation approaches are explained. New ICs geared toward ease of use and enhanced functionality are presented, together with recommended layout examples for performance improvements.
NexFET™ Technology Applications and Selection	This presention will provide a detailed review and inspection of MOSFET parameters, how they effect circuit performance, and how to choose the right MOSFET. A review of MOSFET configurations and applications highlighting key operating considerations of MOSFETs in the buck and boost topologies.
Battery Management Basics	This session will cover charging, protection, chemistries, gas gauging and TI's portfolio, describing advantages and hot products (roadmap).
New, Differentiated Audio-Enabled Products from TI for 2011 that Solve New Market Trends	Trends in markets using audio change overnight. This presentation highlights recent audio products that have been released by TI to address these new market challenges, how (specifically) TI solved the challenges, and how we are making it easy for our customers to speed their time to advantage with new products/features and the resulting user-perceivable benefits.
Track 4 – Wireless	
Low-Power RF Protocol Overview	Texas Instruments Low Power RF (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, both proprietary (the SimpliciTI™ network protocol) and standards-based (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 which 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 which software protocols one can chose from. Then the advantages and disadvantages of the different protocols are 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.
Everything You Wanted to Know About the SimpliciTI™ Network Protocol	This course will cover the SimpliciTI v1.1.1 stack and how it can be used to develop simple but very robust wireless networks. The data-hub configuration typically used by most customers will be covered in detail. We will also cover the basics of the SimpliciTI network protocol data hub, as well as give a hands-on demo of how to set up the network.
6LoWPAN: How to Connect LPRF Solutions to the Internet	We have all heard the industry buzz about connecting sensors to become "the Internet of things." This course will present an overview of 6LoWPAN technology and how it can be configured with LPRF products to connect a wireless industrial sensor network to the Internet (IPV6 portal). Typical real-world applications will be discussed, as well as solutions from our LPRF developer network in use today.
Improving the Range of Your Low-Power RF Designs	How far can it go? This course will go through the standard calculations for estimating the range of an RF system. The course will also discuss a variety of enhancements and trade-offs that can be made to a design to improve the range and throughput of a RF system. The course will review link budgets, LNA and PA solutions, and will touch on modulation schemes, forward error correction, path loss and network topologies.
Fundamentals of Antenna Design by LSR	Antenna design is one of the most intimidating and important parts of any RF design. It is critical to understand the key factors involved when choosing an antenna topology, as well as what tools are needed for design, simulation and characterization. Designs must account for the effects of the enclosure material, the available space, the required radiation patterns, and EMC compliance rules and regulations. This presentation discusses the fundamentals of antenna design for short-range devices, as well as the trade-offs between size, cost and performance. An antenna that is properly designed and optimized will enhance the overall performance of any radio.

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Track 5 – Signal Chain Solutions	
Instrumentation Amplifier Noise Analysis	This presentation focuses on the 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 pick-up) but will cover specific real-world examples where the peak-to-peak output noise is predicted, simulated and measured, and how to use an instrumentation amplifier correctly to avoid internal node saturation.
Data Conversion, Specs to Systems	Many resources exist that define analog-to-digital converter (ADC) errors, but few relate these errors to a system design and identify how they will have an impact on the end product. This presentation will relate ADC specifications to real-life system designs and gauge their impact on the end product performance, features and specifications. You will leave this presentation with a good working knowledge of the relationship between ADC specifications and the impact they have in end product designs.
Easy-to-Use, Low-Noise Crystal Buffer and VCXO	Crystal oscillators (XO) or voltage-controlled crystal oscillators (VCXO) are easy to use, feature very low noise, and are available in a wide range of frequencies. Often, however, there is a need for one frequency only but multiples copies of it, so a simple clock buffer or crystal-based clock buffer solution pays off. But can a single crystal-buffer solution keep up with the low-noise performance of a discrete crystal? The first part of this presentation takes a closer look into low-noise clock generation and buffering and shows measurement results of the jitter performance. The second part goes into VCXO details like pulling range and frequency sweeping. It explains how the VCXO works and how the pulling range can be tuned analogically and digitally, showing examples using the CDCE9xx TI clock generator family.
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. When to use ground planes and when to clear them is discussed, along with optimum circuit routing, bypass 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.
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 (pre-built 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 re-scaling the function to your exact application. A sampling of the ingredients includes the following circuits: voltage-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).

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Track 6 – Power Supply Design	
Incorporating Active-Clamp Technology to Maximize Efficiency in Flyback **and** Forward Designs and Under the Hood of Flyback SMPS Designs	For telecom and PoE applications up to 25 W, single-ended forward and flyback topologies offer the lowest potential cost; however, utilizing active-clamp technology can increase the efficiency of both, particularly when synchronous rectification is appropriate for the outputs. Subjects to be addressed in this topic include obtaining zero-voltage switching; selection and driving of synchronous rectifier FETs; optimizing transformer design; and a side-by-side comparison of equivalent forward and flyback solutions, emphasizing the performance benefits of each topology that can be achieved as a trade-off against circuit complexity and cost. A basic review of the flyback switching topology as applied to low-voltage DC/DC converters will be presented in the second part of the session, with an emphasis on not-so-obvious design issues, including the effects of parasitics, fault protection and EMI mitigation. Modeling and analysis will be demonstrated and compared with physical hardware measurements. A major subtopic will be the understanding and characterization of the flyback transformer, considering leakage inductance, cross regulation, parasitic capacitance and other performance-defin
Designing an LLC Resonant Half-Bridge Power Converter	Although half-bridge power stages have commonly been used for isolated, medium-power applications, efficiency requirements with high-voltage inputs encourage the use of resonant switching, an improvement that comes with added design complexity. However, the LLC half-bridge converter topology offers several performance benefits. This session provides detailed design information on its implementation, eased with a unique analysis tool for frequency modulation control, that of first harmonic approximation (FHA). This FHA method is used to define circuit parameters and predict performance, which is then verified through comprehensive laboratory measurements.
Power Factor Correction Using the Buck Topology: Efficiency Benefits and Practical Design Considerations **and** New Product Offerings from Texas Instruments	Although active power factor correction is typically accomplished with a boost power topology, this topic will show that there are significant efficiency advantages offered by a buck power stage, particularly when universal line operation is required. Specific design and performance issues such as bus voltage choice, achievable total harmonic distortion and power factor, control algorithms, and design practicalities will be discussed. Design choices and their implications will be illustrated with a practical buck PFC design example based on a 90-W high-density notebook power adapter demonstrating a PF >0.9 over a 20- to 90-W load range and >96 percent full load efficiency over a 100-230 Vac line. In the second part of this session, information on significant new power control products will be solicited from TI business managers, with the criteria for selection that a data sheet and samples will be available by September 2010.
Designing Magnetic Components for Optimum Performance in Low-Cost, AC/DC Converter Applications	With the assumption that the attendee is familiar with basic magnetic design theory, this session provides design guidance to achieve high efficiency, low EMI and ease of manufacturing for the magnetic components found in typical offline power converters. Magnetic component designs for a 90-W notebook adapter and a 300-W “silver-box” power supply are used as examples. Applications to be considered include the input EMI filter, PFC inductor, high-voltage level-shifting gate drives, and single- and multiple-output forward-mode transformers in both wound and planar formats. The techniques are also applied to flyback transformers and will enable lower profile designs with lower intrinsic common-mode noise generation.
A New Dual Half-Bridge DC/DC Converter with Wide-Range ZVS and Zero Circulating Current **and** Designing a Solar-Cell-Driven LED Outdoor Lighting System: A Comparison of Digital and Analog Power Control Solutions	A new digitally controlled high-power converter topology combines two half-bridge inverters to operate as a full-bridge power stage using phase-shifting control, but with zero circulating current. Each power switch operates with a nominal 50 percent duty cycle to achieve zero-voltage switching over a widely varying load, but can also function in PWM mode for increased voltage range. A 1-kW, 400-V/48-V converter designed to validate the concept will be shown achieving a 96+ percent efficiency and a high power density. The second part of this session will use a medium-power solution to illustrate the many considerations of designing a complete solar-powered LED light, homing in on the unique demands of both the solar array and LED lamps and integrating them with a storage battery, charger and control circuitry. Both analog and digital solutions will be proposed and compared on the basis of functionality, complexity and cost.