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公開講演会　（群馬大学アナログ集積回路研究会）

VLSIのためのパワーマネージメント　－　スマートパワーICの視点から

Power Management for VLSIs ― a Smart Power IC Perspective

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日時： 2015年3月5日（木） 15:00～16:30

場所： 群馬大学理工学部（桐生キャンパス）図書館２F多目的ホール

Seminar Abstract:

The aggressive scaling of CMOS technology has allowed rapid increase in the gate density and gate counts in modern VLSIs. The power consumed by today's VLSI chips under maximum performance situation could cause over-heat and even become destructive. This is especially critical in portable multimedia and telecommunication products where form factor, cooling and battery life impose very stringent limitations. Power management is currently one of the most critical enabling technologies to further increase VLSI performance and integration density. Dynamically scaling of the power supply voltage and clock frequency according to performance needs has been investigated for more than 10 years. Most of the previous work focused only on saving power at the VLSI chip level. The design of the power efficient variable output power supplies (DC-DC Converters) is often assumed to be trivial and as an afterthought. While significant power saving has been reported at the VLSI chip level, the overall power saving at the system level is often not realized. In this talk, we will examine some of the design techniques used to broaden the power conversion efficiency.

With the increasing needs to incorporate more complex mixed-signal controller for switched mode power supplies, CMOS compatibility becomes a very important consideration in monolithic Smart Power ICs. Designers need to examine various design considerations for the implementation of integrated DC-DC converters, which include switched mode power supply topology, digital vs. analog controller, power conversion efficiency, dead-times, choice of components, and power transistors for the output stages. In particular, EDMOS device structures, fabrication techniques and compatibility issues with CMOS process must be considered. Key device characteristics such as ruggedness, on-resistance, gate capacitance, switching speed and layout strategies are required for optimum power conversion efficiencies. This talk will also present integrated DC-DC converters with novel features such as segment output stage, digital spread spectrum for EMI suppression, and dead-time control. This talk will conclude with an example, showing the benefit a true power management system for portable audio applications using integrated DC-DC converters.

Brief Biography:

Wai Tung Ng (吳偉東) is a Professor at The Edward S. Rogers. Sr. Department of Electrical & Computer Engineering, University of Toronto. His current research work covers smart power semiconductor devices and fabrication processes. In particular, his main focus is in the development of power management circuit, integrated SMPS (Switched-Mode Power Supplies), integrated class D audio power amplifiers. After he obtained his Ph.D. degree from the University of Toronto in 1990, Prof. Ng joined Texas Instruments, Dallas TX to work on LDMOS power transistors for automotive applications. He started his academic career with the University of Hong Kong in 1992. In 1993, Prof. Ng joined the University of Toronto and established the Smart Power Integration & Semiconductor Devices Research Group. He was promoted to associate and full professor in 1998 and 2008, respectively. He has extensive experience in working with the industry to modify standard CMOS technology for smart PIC and RF applications. Prof. Ng is the director of the Toronto Nanofabrication Centre, and open access research facility at the University of Toronto. Prof. Ng has also been serving as an associate editor for IEEE Electron Device Letters since 2009.

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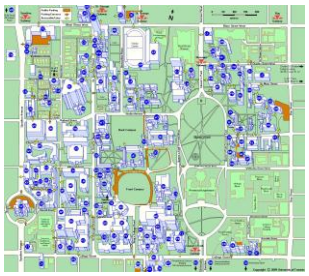

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Power Management for VLSIs
—
a Smart Power IC Perspective
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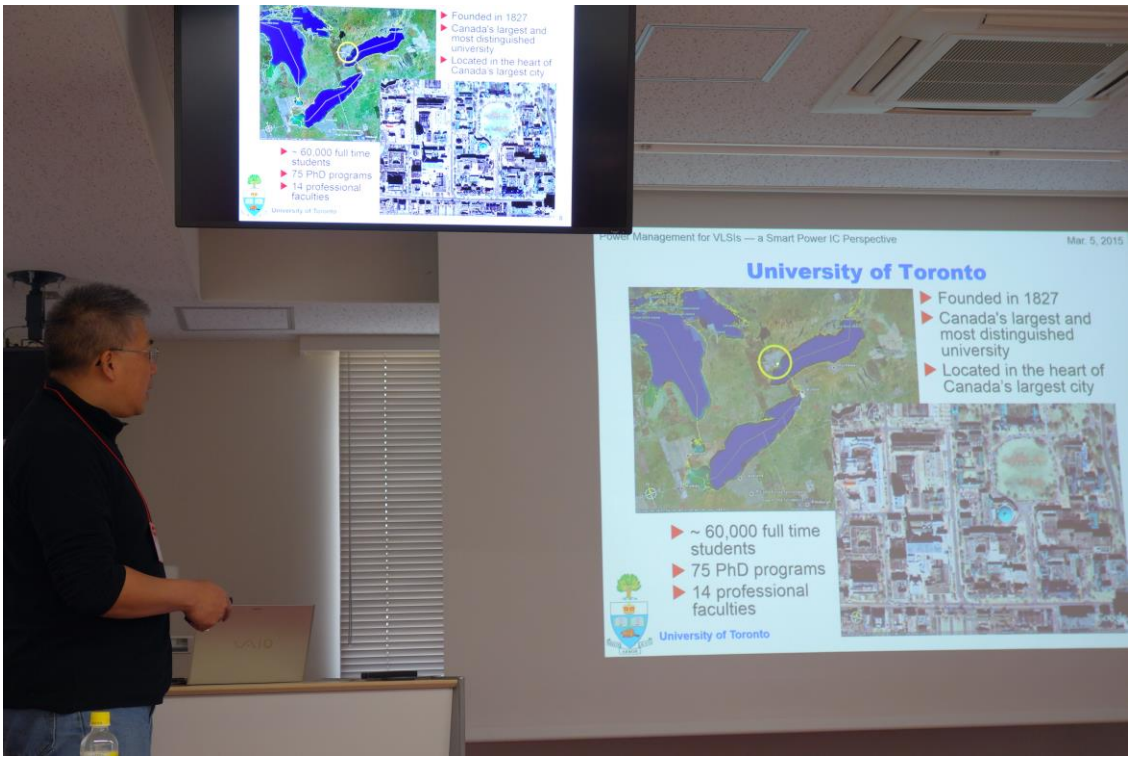
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Canada's largest and most distinguished university
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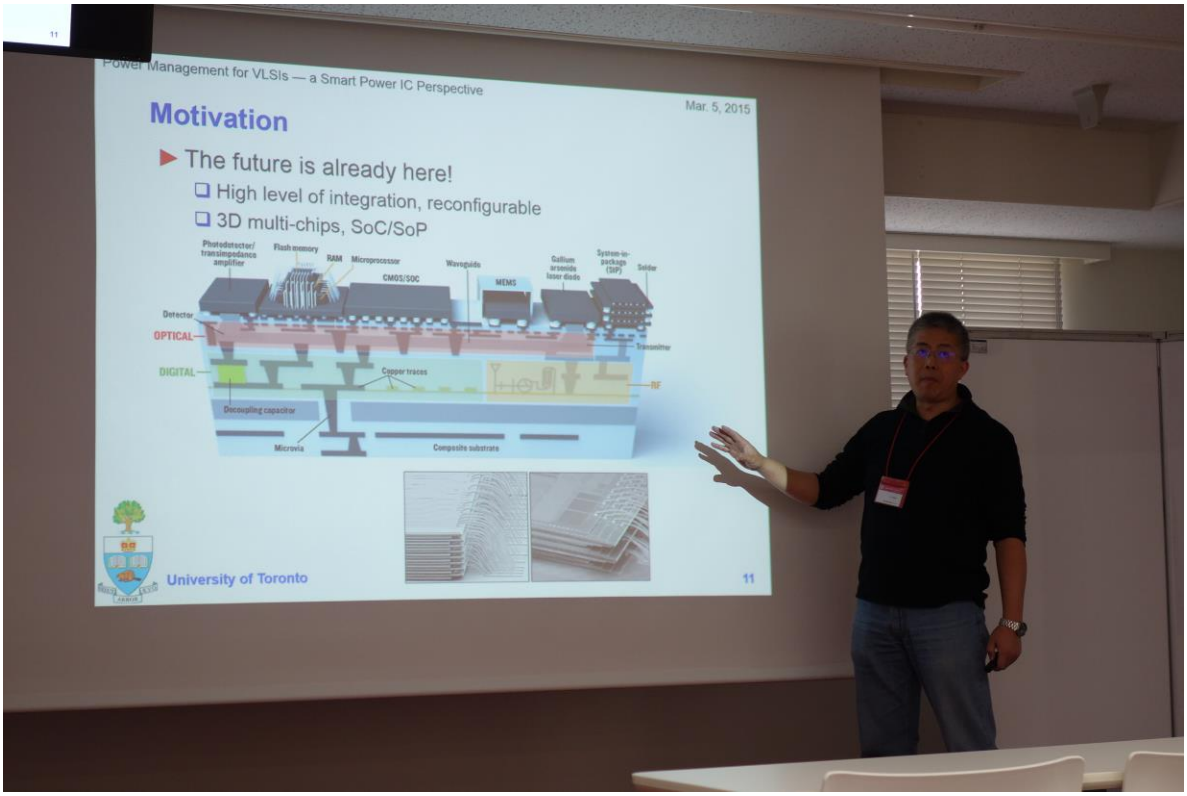
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Mar. 5, 2015
Motivation
The future is already here!
High level of integration, reconfigurable
3D multi-chips, SoC/SoP
Photodetector/ transimpedance amplifier
Flash memory
RAM
Microprocessor
CMOS/SOC
Waveguide
MEMS
Gallium arsenide laser diode
System-in-package (SiP)
Solder
Detector
OPTICAL
DIGITAL
Copper traces
Transmitter
RF
Decoupling capacitor
Microvia
Composite substrate
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