



CDADIC

Center for Design of Analog-Digital Integrated Circuits



University-
Industry
Research
Consortium

Industry-Driven Research

Technology Breakthroughs

World-Class Faculty

A national leader in mixed-signal integrated circuit
development and design

Overview

The Center for Design of Analog-Digital Integrated Circuits (CDADIC) is a multi university-industry research center established as an NSF Industry-University Cooperative Research Center in 1989.

The **center's mission** is to advance the analysis, design, and methodologies of analog-digital integrated circuits and systems through research and education.

The center's **research goals** are to:

- Focus on long-term research necessary to develop and advance future technologies and short-term research relevant to current customer needs.
- Provide international leadership in mixed-signal integrated circuits and systems research.

CDADIC is a research consortium of four universities and industry/government partners. Faculty and their students work closely with center partners on research that is important to today's commercial and defense microelectronic needs – **solving today's problems and advancing future technologies.**

Affiliated Universities

Washington State University (headquarters)
University of Washington
Oregon State University
University of Tennessee

Recent Industry/Government Partners Supporting CDADIC Research

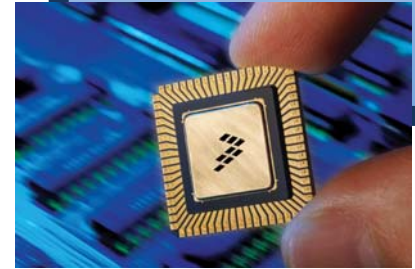
Advanced Micro Devices
AMI Semiconductor
Analog Devices*
Boeing*
Cadence
Cypress Semiconductor
Freescale Semiconductor*
Honeywell
Intersil
Jazz Semiconductor*
Kirtland Air Force Base*
Maxim Integrated Products

Micron Technology
Mindspeed Technologies
Motorola
National Semiconductor
Northrop Grumman
Qualcomm*
Sandia National Laboratories
Semiconductor Research Corp.*
Tektronix
Teradyne
Texas Instruments*
Wright-Patterson Air Force Base

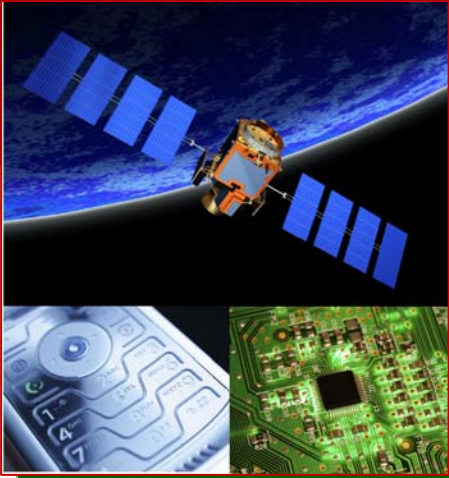
*current members

“CDADIC is an established national research consortium with an excellent reputation in analog and mixed-signal design research.”

Dale Edwards
Semiconductor Research Corporation



A research leader in mixed-signal integrated circuit design



Innovative Research Industry Driven ~ University Inspired

Since its inception, the Center for Design of Analog-Digital Integrated Circuits has funded over 200 industry-sponsored research projects and 40 defense-related projects in the areas of analog, RF, and mixed-signal integrated circuits. Through these efforts, CDADIC has made significant progress providing the electronics and semiconductor industries new design technologies that are effective and reliable.

Circuit Design

Developing new mixed mode circuit designs for high-precision, low-voltage, and high-speed applications.

Design Methodology

Developing systematic methods for designs that incorporate the reuse of existing designs, module generation, and automatic layout of analog-digital integrated circuits.

Modeling/Simulation

Constructing accurate computer models for circuits, devices, and interconnects. Developing methodologies to evaluate, test, and characterize new and existing circuit simulators and/or improve speed and efficiency for analog-digital simulation.

Building Next-Generation Microelectronic Circuits and Systems

CDADIC Circuits

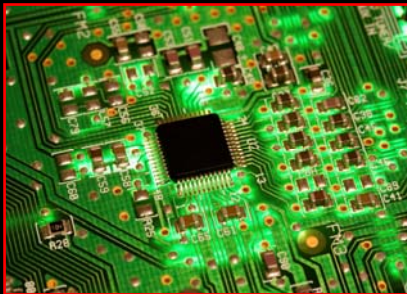
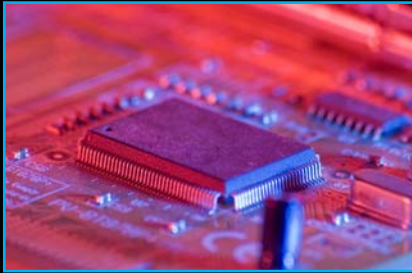
Analog-to-digital converters	Sample-and-hold circuits
Digital-to-analog converters	RF power amplifiers
Direct digital frequency synthesizer	RF low-noise amplifiers
Voltage controlled oscillators	SiGe data converter circuits
Silicon-on-insulator circuits	On-chip inductors
Switched capacitor filters	MIMO transceivers



Performance Attributes

High Speed * Low Power * Low Voltage
Self Calibration * Reconfigurable * Extreme Environments * Nanoscale

In 2005 and 2007, the National Science Foundation acknowledged CDADIC for research that has led to technology breakthroughs. Members from industry identified a number of significant accomplishments made by CDADIC researchers.



Applying Research

CDADIC Technology Breakthroughs

Increasing chip speed

Designing and implementing the world's fastest logic technique that will double computer speed and greatly enhance video and speech processing technology capabilities.

Analog-digital converters

Advancing the state-of-the-art in analog-digital converters, reducing power consumption while improving performance of mixed-mode integrated circuits.

Integrated circuit protection systems

Designing tools to predict the effect of static electricity on a chip that will provide industry with the ability to fabricate more reliable, secure integrated circuits and move products on the market more quickly and economically.

Phased-array antenna

Developing a low-cost phased array transmit/receive system on a monolithic microwave integrated circuit (MMIC) chip based on silicon germanium technology. This research will dramatically increase the use of phased-array antennas in applications that are critical in aerospace and satellite communication systems.

Low-voltage analog circuits

Designing new approaches to low-voltage CMOS analog circuits. Results will make more complex mixed-signal CMOS integrated circuits possible.

SOI technology

Using silicon-on-insulator (SOI) technology to develop next-generation circuits. These new circuits will operate at a much greater speed and require far less power to operate than others on the market.

Low-cost MIMO transceivers

Developing low-cost multiple-input multiple-output (MIMO) transmit/receiver systems that will dramatically increase the use of MIMO transceivers for next-generation defense communication applications and emerging cognitive radio systems.

"The ongoing research at CDADIC enables the semiconductor industry to leverage center innovations as new markets are explored and new products developed."

Paul Kempf
Iazz Semiconductor

Training Future Engineers & Leaders

Industry • Defense • Academia

CDADIC students learn in the classroom and in laboratories from world-class faculty. Real-world experiences are gained while working closely with industry partners solving problems in today's marketplace. Internships, fellowships, and networking opportunities are all available to CDADIC students. Valuable presentation skills are acquired at center semiannual meetings.

- **Trained over 400 students since 1989**
- **Over 90% are placed in industry**
- **Internships, fellowships, REUs available**
- **Real-world experience & industry problem-solving**
- **Networking opportunities with professionals**



“As a student, I benefited from CDADIC in many ways. The center funded my research, provided me with opportunities to improve my presentation skills, and connected me with important companies in the field.”

Jose Silva
Former CDADIC student
now engineer at Analog Devices



Industry Benefits

Key Benefits

- **Technology Transfer**
Use center research and new technologies to add value to products and services.
- **Patent Rights**
Secure non-exclusive, royalty-free licenses resulting from center research.
- **Research Results and Publications**
Access current (and past) research results and publications.
- **Enhancement Projects**
Benefit from additional opportunities to fund targeted research projects focusing specifically on your own company needs. Funding for directed projects is free of university overhead and provides center members significant added value to their CDADIC membership.
- **World-renowned Faculty Researchers**
Access to center faculty, many of whom are nationally and internationally renowned in their field. Industry partners have access to specialized faculty skills and in-person research reviews and consultation.
- **Direct Center Research**
Help set CDADIC's research agenda every year.
- **Exceptional Students – Excellent Employees**
CDADIC students have hands-on laboratory experience in state-of-the-art facilities, student-industry interactions solving real-world problems, and are mentored by leading research faculty in the field.
- **Leverage Research Funds**
Industry membership pays for a fraction of the price typically paid for one university project. (University overhead, typically 50%, is waived.)
- **CDADIC Semiannual Meetings**
CDADIC sponsors two national meetings a year for its faculty, students, and industry members. As an IAB member, you will vote on proposals to fund at our summer meeting and hear progress reports at our winter meeting. At each meeting, students present their posters and faculty are available to discuss research results and industry needs. Enjoy networking opportunities through center meetings and company visits.

“We feel CDADIC is one of the best buys in research consortia”

Matt Miller, Freescale Semiconductor

Industry Benefits

Industry Membership

What

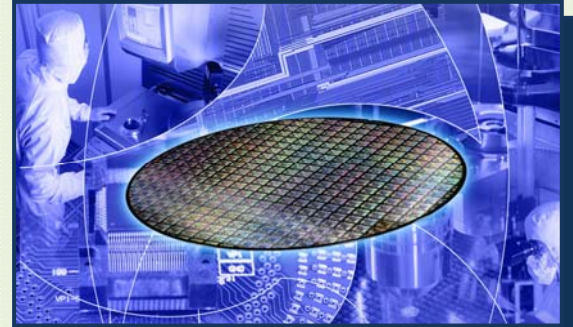
A seat on the Industrial Advisory Board (IAB)

- Makes recommendations on research projects and directs center research
- Votes on projects funded annually (~12 per year)

All benefits described on previous page

Fees

- Full membership: \$50,000 annually; 10 votes per membership
- Associate membership: \$25,000 annually (companies with \$25 million in annual gross sales); 5 votes per membership, rights to all other center benefits.



Delivering Value to its Members

"Access to CDADIC delta-sigma design tools that are much faster than our current tools have saved us months of time and has paid for our CDADIC membership many times over." Analog Devices

~

"We have gained an estimated cost savings of \$2 million from CDADIC research on the transfer of an analog-digital converter architecture for our use." Kirtland AFB

~

"Use of CDADIC-developed tools has saved us in excess of a million dollars and greatly helped the speed of product development. Some of the circuit designs have been incorporated into our own ICs."

Motorola

More Information

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Yes, I am interested in CDADIC and would like the following:

- ✓ More information.
- ✓ To attend the CDADIC Winter 2009 National Meeting as a guest.
 - When: February 3-4, 2009
 - Where: Bellevue Hyatt, Washington (Seattle area)
 - What: Faculty, students, and industry partners meet to hear research progress reports, view posters, and network with each other.
 - How: Obtain a registration form at www.cdadic.org or contact jbuteau@wsu.edu.
- ✓ Arrange a visit. CDADIC's director is available for site visits.

Please send your request to Joanne Buteau at jbuteau@wsu.edu or call 335-5379.
www.cdadic.org