Silicon Sea Belt Fukuoka Project

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http://hdl.handle.net/2324/9153
Silicon Sea Belt Fukuoka Project

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Universities

Industries

Silicon Sea Belt Fukuoka
"The closest city to Asia": Fukuoka is the capital city of Japan’s southernmost island, Kyushu. Fukuoka is also the nearest big city in Japan to Shanghai or to Seoul.

Many big brands in Japan like Toyota, Sony, Toshiba and Canon continue to pour money into manufacturing in and around Fukuoka. All these companies say geography and fast shipping still matter. So does staying close to Japanese suppliers.

The result: investment in manufacturing on Kyushu has grown as fast as 52 percent in recent years (though it slipped to 4 percent last year). Locals now refer to Kyushu as Car Island, or Silicon Island.
Location of Fukuoka

Convenient Fright Routes

From Fukuoka
- 200km: Pusan
- 500km: Osaka, Seoul
- 1000km: Tokyo, Shanghai
- 1500km: Sapporo, Beigin, Taipei

Transport Hub of Japan and the rest of Asia
What is Silicon Sea Belt?
Silicon Sea Belt

- Silicon Sea Belt is a center of semiconductor fabrication.
- This area is also the world largest market of IT industries.
- Fukuoka is addressing to establish a Center of Excellence for SoC design in this area.

Collaboration in Silicon Sea Belt.
- Integration of SoC Industries
  > Marketing and system planning
  > SoC Design (SW and HW)
  > Fabrication (Silicon and board)
  > Testing (from chips to systems)
- IP exchange market
- Human resource sharing
Silicon Sea Belt Fukuoka

- Started in 2000
- **Motivation**
  - Kyushu has played an important role in the semiconductor industry and should change its role in the drastic growth of Silicon Sea Belt countries.
- **Vision**
  - Keep the leadership in SoC design and bridge between system design and fabrication technology.
- **Strategy**
  - COE of new SoC design technologies
  - Human resource for the SoC design industry
  - Integration of ventures and IDMs
Structure of SSB Fukuoka

Higher Peaks of R&D
- System Design
- SoC Design
- Fabrication
- Testing
- Applications

CLUSS Projects (2002-2007)
- Low Power, RF, EDA, SiP,
- Reconfigurable Systems,
- Embedded Software

COE Program, CREST

Wider Range of Technologies
- Marketing and System Design
- SoC Design
- Fabrication and Testing

Kyushu Semiconductor Cluster Project

Human Resource Development
- Students
- Engineers
  - Design/Fabrication
  - Sales/Investment
- Managers/Investors
- Researchers
- Teaching Stuffs

System LSI College and QUBE
Human Resource Development

College of System LSI Fukuoka
QUBE
System LSI College

**objective**
- Under liaising of Academy, Industry and Government, the college foster well-qualified System LSI design person, and train them pragmatically.

**characteristic point**
- Lecturers as 31 faculties from 18 Universities, and 20 qualified technologists from various enterprises.
- Pragmatically education consists of practical training (3 days - 4 weeks).
- High quality original teaching material.

Attendees companies
IP Square, Kyuki, Kyushu Electric, Kyushu Mitsumi, JMNet, Seiko Epson, Sony semiconductor Kyushu, TAM, Toppan Print, Toppan Technical Design Center, Hitachi ULSI systems, Logic Research etc.

1,000 design engineers (2001.12~2004.3)
Achievements

Accumulative Attendees Count
- 1,717 persons (Summation of attendees/lecture)
- Attendees of Analog Design Course ≒ Attendees of Digital Design Course × 2

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New Education Program for Codesign

**Q-shu University hardware/software Borderless system design Education program (QUBE)**

- **Purpose**: Educate highly qualified and skilled system LSI design engineers for VLSI design, embedded software design and HW/SW co-design
- **Period**: 2005.7 ~ 2010.3
- **Goal**: Totally 360 engineers

### Hardware Design
- System LSI Design Training Program
- Advanced Design Technology Program

### HW/SW Co-design

### Embedded Software Design

#### System LSI Research Center
*Graduate School of Information Science and Electrical Engineering, Kyushu University*

- **Cooperated Lecture**: Real Embedded Software Development Engineering
- **Fukuoka Innovative CLUSTER**
- **Design Method and Education Division**
- **System LSI Research Center**
- **21st Century Center of Excellence Program**

#### Basic Courses
- **College of System LSI, FUKUOKA**

#### Application/Practice Courses
- **Shift Upper-level Lectures**
Integration of Industries

Fukuoka Soft-Research Park
Small and medium ventures related to LSI design and verification continue to gather (within Fukuoka)
Research Activities

System LSI center of Kyushu Univ.
CLUSS Project
21st. Century COE Program
CREST
CLUSS: Innovative CLUSTER for Silicon Sea Belt 2001-2006

Fukuoka Pref.

MEXT
Grant 2.5 Billion Yen

Fukuoka IST

Joint Projects

Established Companies

Political Support

Joint Projects

Venture Companies

FLEETS (Research Center)

5 Projects
Proper Researchers
Researchers from Industries
Professors, and Grad. Students

Research Plan
Joint Projects

Kyushu Univ.
Kyushu Inst. Tech
ISIT, JST

Kyushu Univ.
System LSI Research Center
Graduate School of EEIS

Kitakyushu Project
Kitakyushu City Univ.
Waseda Univ.
Kyushu Inst. Tech
FAIS

Grant 2.5 Billion Yen

Center of Excellence
In Silicon Sea Belt

■ New SoC Design
Technologies
• RF and Low Power
• Reconfigurable Arch.
• Embedded Software
• System In a Package
• EDA Tech.

■ Venture Companies
■ Research Business

■ Research Business Center of Excellence
In Silicon Sea Belt
Research Projects in CLUSS

- Design Method for Low Energy Mobile System LSIs
  (Haruich Kanaya, SLRC Kyushu Univ.)
- Next Generation System LSI Architecture
  (Kazuaki Murakami, SLRC Kyushu Univ.)
- Design Methodology for SiP (System in a Package) Module
  (Hajime Tomokage, Fukuoka Univ.)
- EDA Technology for The Next Generation
  (Yusuke Matsunaga, SLRC Kyushu Univ.)
- Design Methodology for Embedded Software
  (Akira Fukuda, Kyushu Univ.)
- Application Specific SoC Design
  (Satoshi Goto, Waseda Univ. Joint Project with Kitakyushu)
Design of RF Communication Chip

Wireless LAN (0.25 mm CMOS)
- IEEE 802.11b
- 2.4 GHz
- Matching and Phase Shift by CPW
- Low Energy Digital Circuits

A New RF Front End Circuit
Establishment of SiP Module Design Technology

- EDA tools for high frequency SiP designs
  Noise and stress analysis using 3-dimension models for heat and microwave effects

- SIPOS: System Integration Platform Standards
  Standardization of SiP fabrication technology

- Establishment of test and verification technologies on SiPs
  Development of measurement equipment: Scaling Electron Laser Beam Induced Current (SELBIC)
EDA and Test Generation Systems

- New Technology for Logic Synthesis and Test Generation
  - Prof. Matsunaga: Kyushu University
  - Prof. Kajihara: Kyushu Institute of Technology
  - FLEETS and ISIT
  - System JD and Logic Research

- Logic Synthesis System
  - Special Function for Arithmetic Operation Module Generation
  - High Performance Technology Mapper

- Automatic Test Pattern Generation System
  - High Speed Pattern Generation by a New Algorithm
From needs in Society, find the solutions using System LSIs.

System LSI Research Center, Kyushu Univ.

17 Faculties
20 Grad. Students

VDEC University of Tokyo Test Chip Fab. Service

MOSIS (USA), CIC (Taiwan), IDEC (Korea), Euro Chip

Tohoku Univ. and Hiroshima Univ.

Requirement from Society
Consumer Electronics
Game
Communication
Automobile
Air Lines
Rail Road
E-Commerce
E-government
Medical Application
Vending Machines
Robots
Life Lines
Education

System LSI Design
Software
VLSI Design
Software + VLSI

From needs in Society, find the solutions using System LSIs.
Fukuoka System LSI Design and Development Center

Incubation
Research and Development
Education and Training
Collaborations
Oct. 2002: Visit Taiwan and report on Silicon Soft Project
Nov. 2002: Decision of the budget for the building (30 Million USD)
Open on Nov. 4, 2004
Budget from Central Government
Operated by Fukuoka Prefecture
System LSI Design and Development Center
Conclusion

- Silicon Sea Belt is the world largest production and consumption region of semiconductor products. We should be a COE of SSB.
  - Collaboration among Governments, Academia and Industry
  - Collaboration with SSB area
- Integration of Industry - Automobile and LSI
- Roles of University
  - Education and Research
  - Create Dreams and Technologies of the future society - Experimental fields of Social Information Infrastructure