

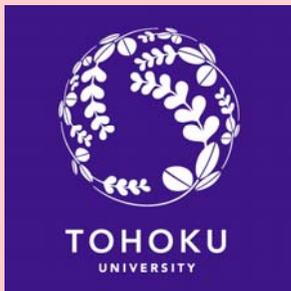
# ISIM2011

International Symposium on Integrated Microsystems



## Hands-on Access Fabrication Facility

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Tohoku University



# Requirement for MEMS development

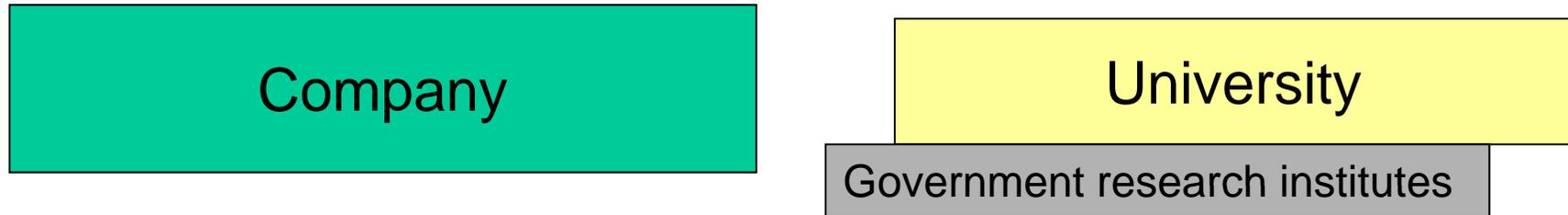
- Development of design, process and evaluation in individual cases > No standard !
- Expensive facility (clean room) and equipment
- Trained engineer
- Much know-how
- Human network

Much time and cost

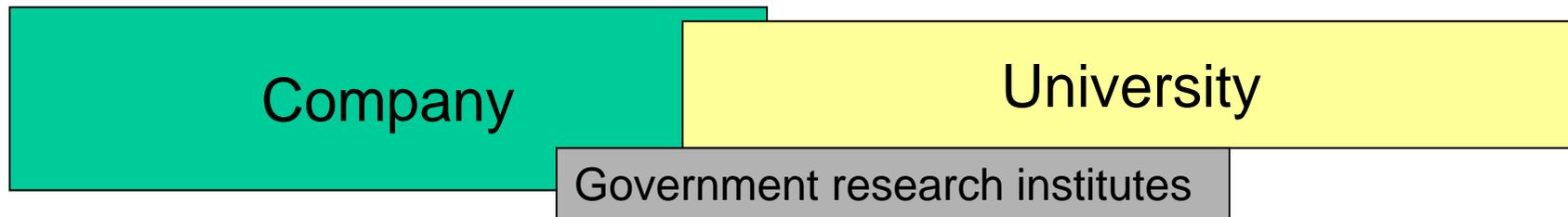
In the past



At present



In future



Application

Facility for prototyping

Basic

# Hands-on access fab.

The “Hands-on access fab.” is a facility that companies can easily access and utilize for their prototyping or small volume production. The fab. is shared with other users and managed with best efforts.

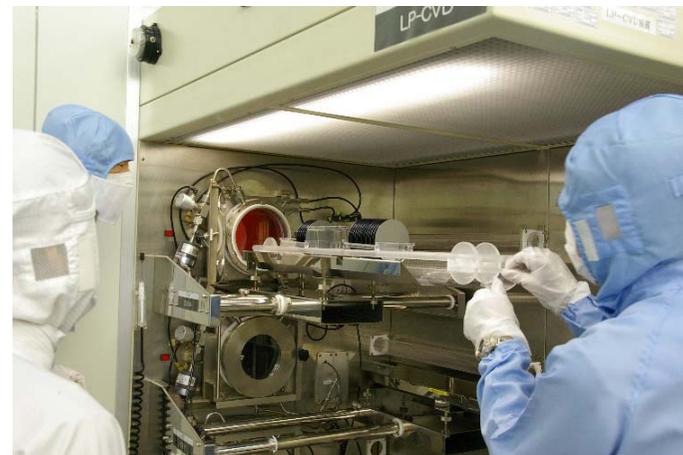
The fab. will not make contract development like MEMS foundry. Companies which have not own facility can dispatch their people to operate equipments by themselves.

The contract development can be made in MEMS foundries as “MEMS Core Ltd.” <http://www.mems-core.com/> .

The fab. is equipped with 4 and 6 inch facilities for semiconductor and MEMS. Companies pay fee depending on usage.

Companies can access accumulated know-how at Tohoku University.

Skilled engineer staffs coach the user.





Aoba-yama Campus, Tohoku University

# Jun-ichi Nishizawa Memorial Research Center

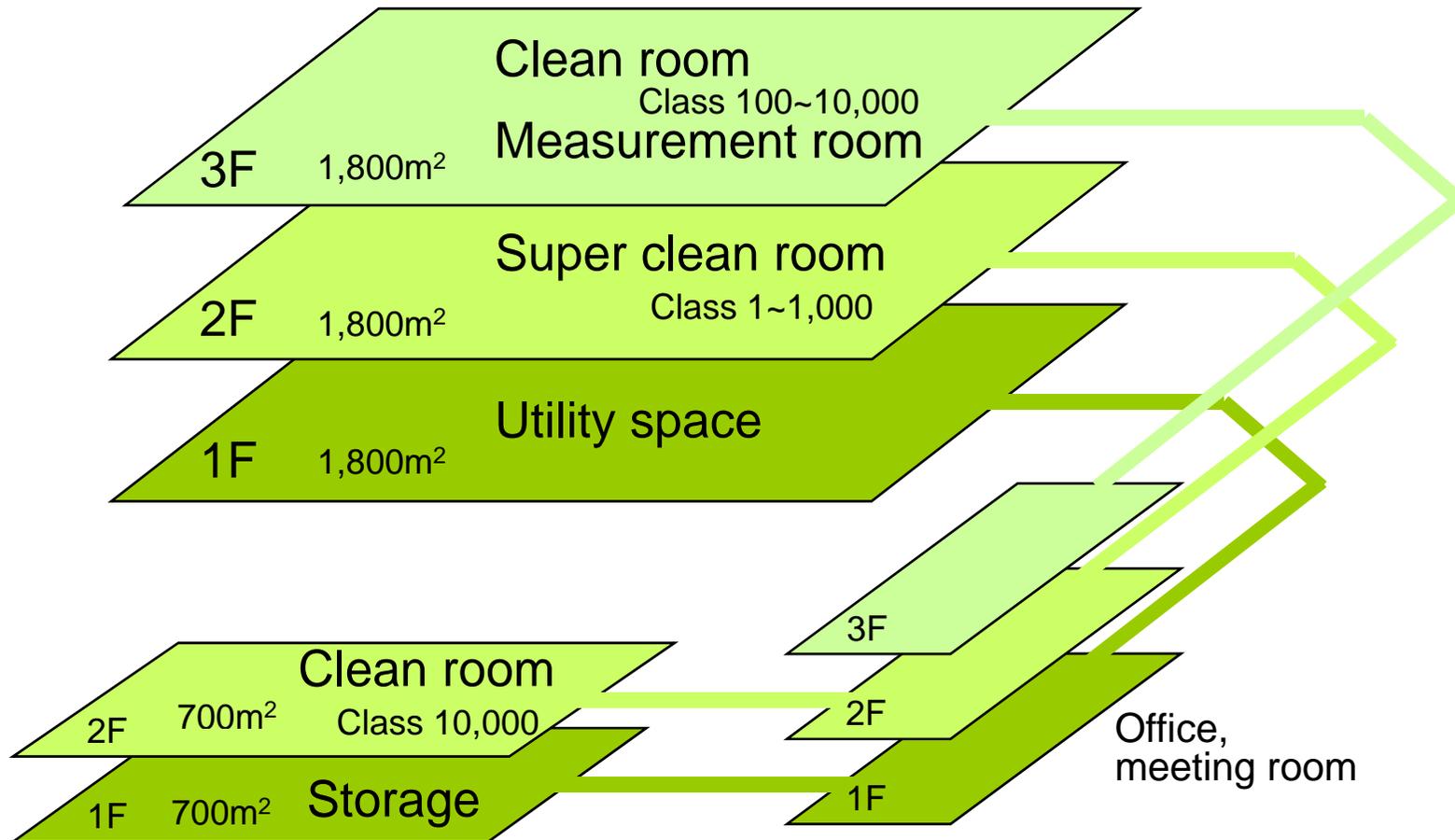
Semiconductor Research Foundation has dissolved in Mar. 2008. Then the property including Semiconductor Research Institute directed by Dr. Jun-ichi Nishizawa was donated to Tohoku University.

Jun-ichi Nishizawa Memorial Research Center has started in Apr. 2008, aiming to contribute advanced and interdisciplinary R&D.

The research center can be utilize for not only internal research at the University, but also development conducted by a company, as well as industry-university collaborative R&D.

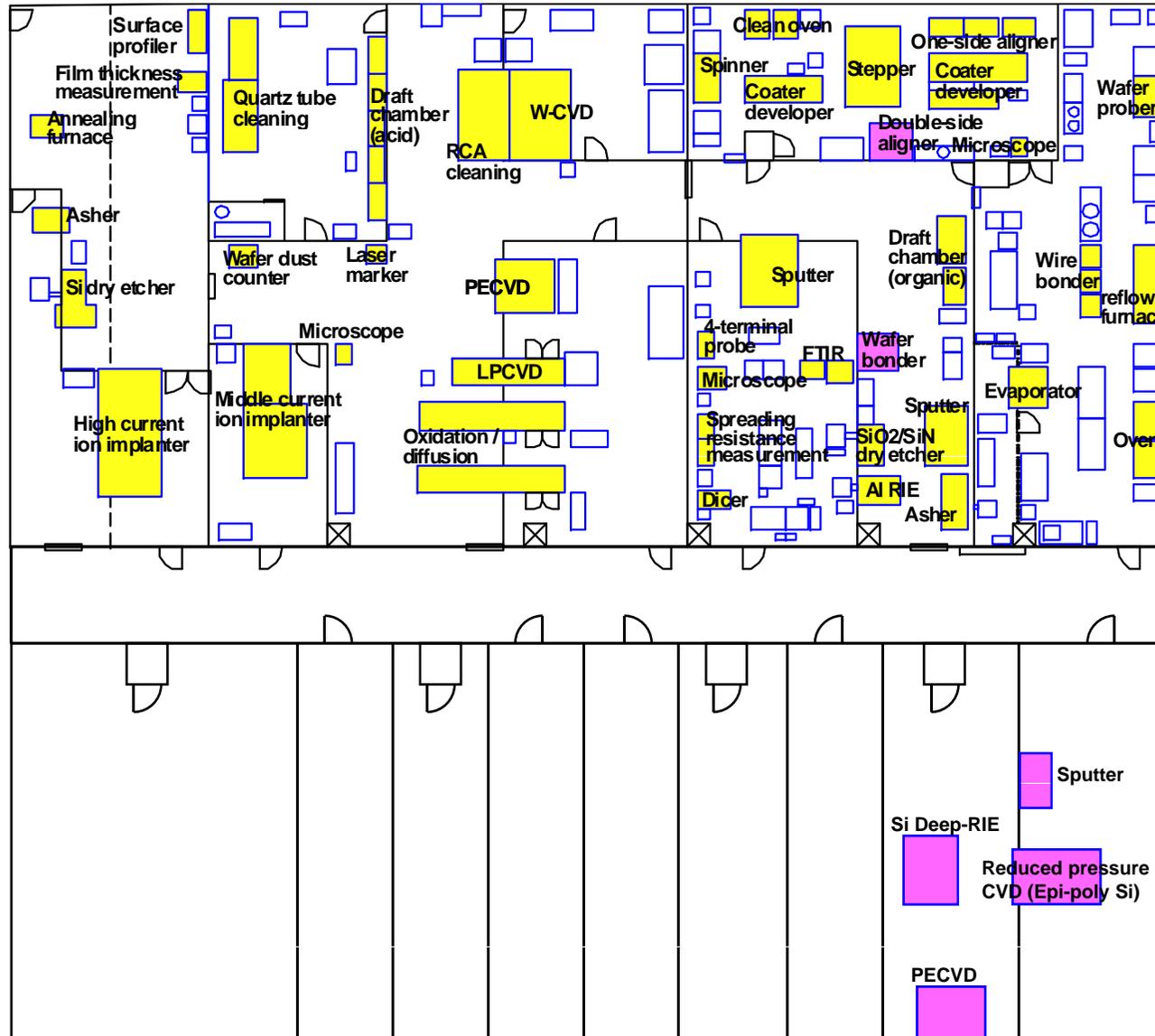


# Jun-ichi Nishizawa Memorial Research Center



Total clean room space: ~4,000m<sup>2</sup>

# Layout of the Hands-on access fab. (2nd floor of the Research Center)



1800 m<sup>2</sup>  
Super clean room

# 2nd floor of the research center



# 2nd floor of the research center



# 3rd floor of the research center



# 3rd floor of the research center



# Cleaning, drying



RCA cleaner

ELEC WET-23



Draft chamber

HF/HNO<sub>3</sub>/H<sub>2</sub>SO<sub>4</sub>/HCl etc.



Draft chamber

Organic solvent,  
resist removing



Spin dryer

SEMITOOL PSC101



CO<sub>2</sub> critical point  
dryer

SCFluids CPD1100



Inert oven

Yamato DN63H



Vacuum oven

Yamato DP-31

# Photolithography



Pattern generator

NSK TZ-310  
For emulsion / Cr mask  
making, up to 7inch



Spin coater

Mikasa 1H-DXII etc.



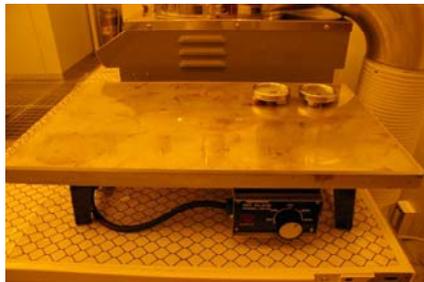
Coater/developer

Canon CDS-630  
For positive resist



Coater/developer

Screen  
For negative resist



Hot plate



Clean oven

Yamato DE62



Curing furnace

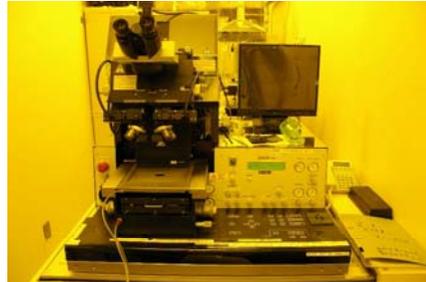
Yamato DN43H  
For polyimide



Stepper

Canon FPA1550M4W  
g-line, 0.65 $\mu$ m, 4inch

# Photolithography



Double-side aligner

Suss MA6/BA6



Single-side aligner

Canon PLA-501-FA



EB lithography

Reith 50  
30nm, up to 3inch



Draft chamber

For development



UV curing

Ushio UMA-802



Asher

ULVAC UNA2000  
2.45GHz, 1kW



Asher

Branson IPC4000  
13.56MHz, 600W

# Oxidation, diffusion, ion implantation, annealing



Oxidation/diffusion  
furnace

TEL XL-7



Middle-current ion  
implanter

Nissin ion NH-20SR  
200keV, 0.6mA



High-current ion  
implanter

Sumitomo eaton nova NV-10  
80keV, 6mA



Annealing

AG Associates AG4100  
1000°C



Automatic sol-gel  
deposition

Technofine PZ-604

# CVD, sputtering, evaporation



LP-CVD

Kokusai  
SiN, Poly-Si, NSG



Reduced-pressure-CVD

Kokusai  
Epi-Poly Si, 1200°C



PE-CVD

JPEL VDS-5600  
SiN, SiO<sub>2</sub>



PE-CVD

Sumitomo MPX-CVD  
SiN, SiO<sub>2</sub>



W-CVD

Applied materials  
Precision 5000



Sputtering

Anelva SPF-730  
5inch target x 3



Sputtering

Shibaura CFS-4ESII  
3inch target x 3



EB evaporation

Anelva EVC-1501

# Etching



Si Deep-RIE

Sumitomo MUC-21



Dry etcher

Anelva DEA-506  
For SiN, SiO<sub>2</sub> etching



Dry etcher

Anelva L-507DL  
For Si etching



Al RIE

Shibaura HIRRIE-100



Draft chamber

For acid



Draft chamber

For alkaline

# Measurement



Wafer dust counter

Topcon WM-3



Film thickness measurement

Nanometric  
NanoSpec 3000



Surface profiler

Tenchor AlphaStep 500

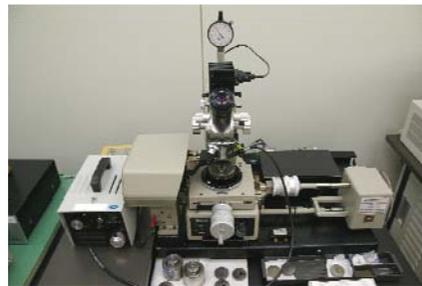


Depth measurement

Union Hisomet



4-terminal probe



Spreading resistance measurement

Solid State Measurements  
SSM150

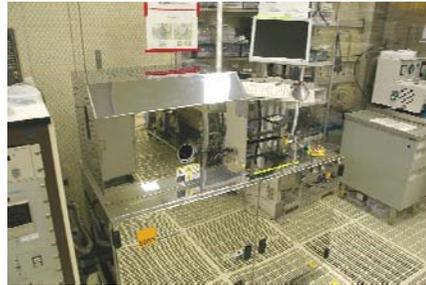


Wafer prober

Accretech EM-20A

SEM for up to 8inch wafer will be installed soon

# Bonding, packaging, etc.



Wafer bonder

Suss SB6e



Dicer

Accretech



Wire bonder

West Bond  
Al, Au



Cap sealing

Daihen RPT-155



Reflow furnace

Shinko FB-260H/TE



Laser marker

GSI WM-II

# How to use Hands-on access fab.

1. Consultation
2. Send application to the Univ.
3. Use facility at Hands-on access fab.
4. Receive bill from the Univ.
5. Payment



## Fees

Facility (CR, office, etc.) usage fee : ¥500 /h

Technical assistant fee : ¥2,415 /h

Equipment usage fee : max. ¥7,000 /h

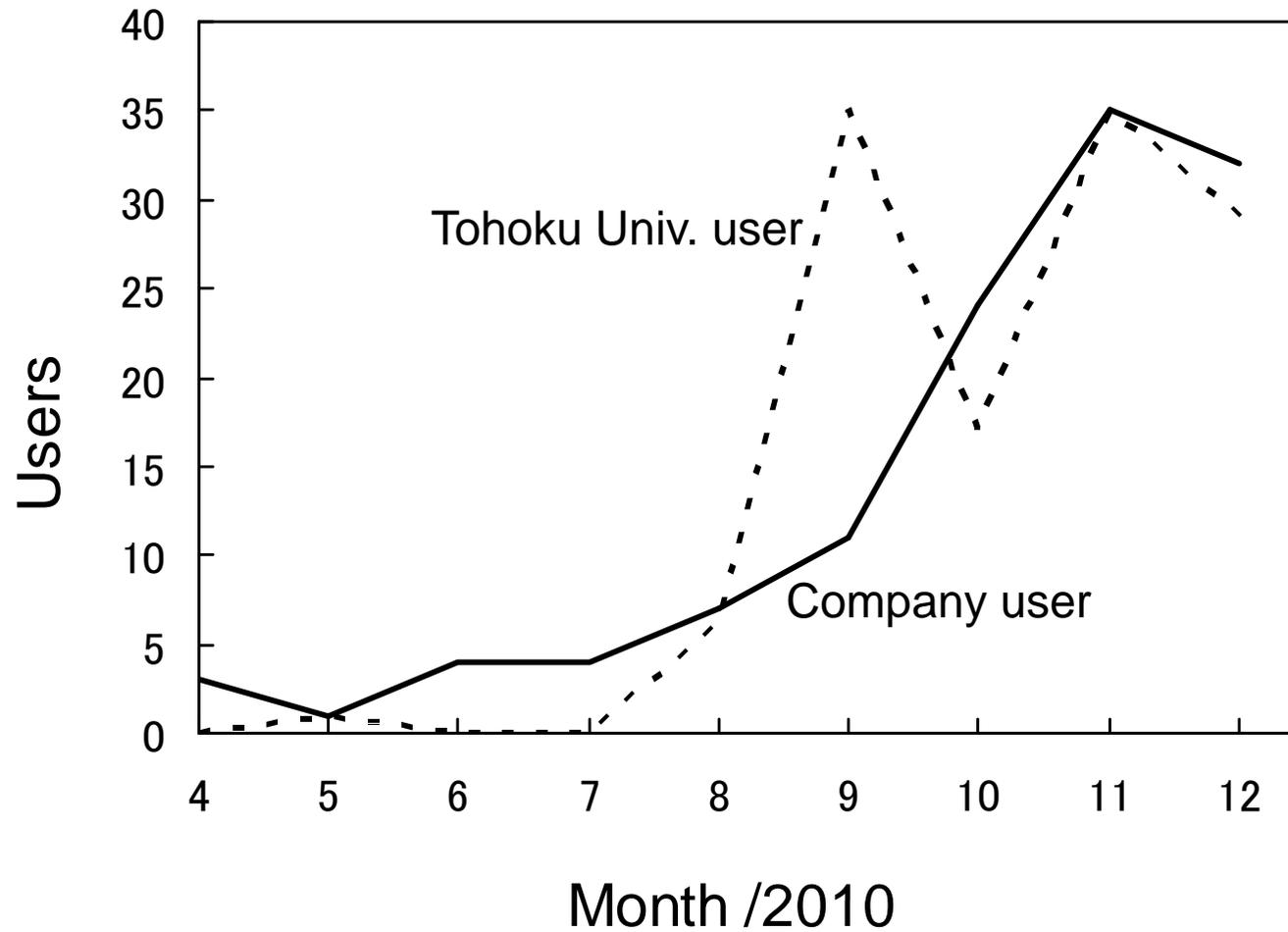
Materials cost

Visit tour is welcome, at any time !

[totsu@mems.mech.tohoku.ac.jp](mailto:totsu@mems.mech.tohoku.ac.jp) +81-(0)22-229-4113

[www.mu-sic.tohoku.ac.jp/coin](http://www.mu-sic.tohoku.ac.jp/coin)

# Utilization of equipment



# Activity

Providing the fab. service  
Installation, modification and maintenance

Development of system including software  
Information sharing, safety course

Process development  
Fundamental technology (CVD, photolithography, etching, etc.)  
New materials  
Evaluation

Training  
On the job training  
Practical training program organized  
by MEMS Park Consortium  
Training program for semiconductor  
industry in Tohoku region

