

## ISIM2011

International Symposium on Integrated Microsystems  
Tsukuba



Feb.10, 2011

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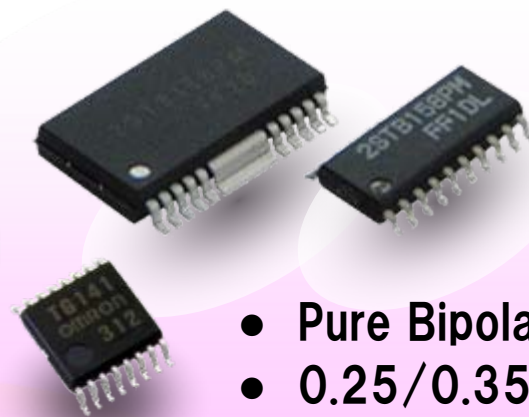


## MEMS



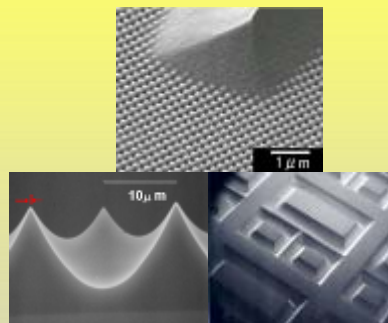
- Bulk MEMS
- Surface MEMS
- Bulk/Surface MEMS

## Integrated Circuits



- Pure Bipolar
- 0.25/0.35um CMOS
- 0.35um Mixed Signal

## NEMS



- Nano Imprinting
- 3D Lithography

## MEMS Line

### 5~8inch MEMS

- Microphone
- RF switch
- Flow
- Pressure

## Bipolar Line

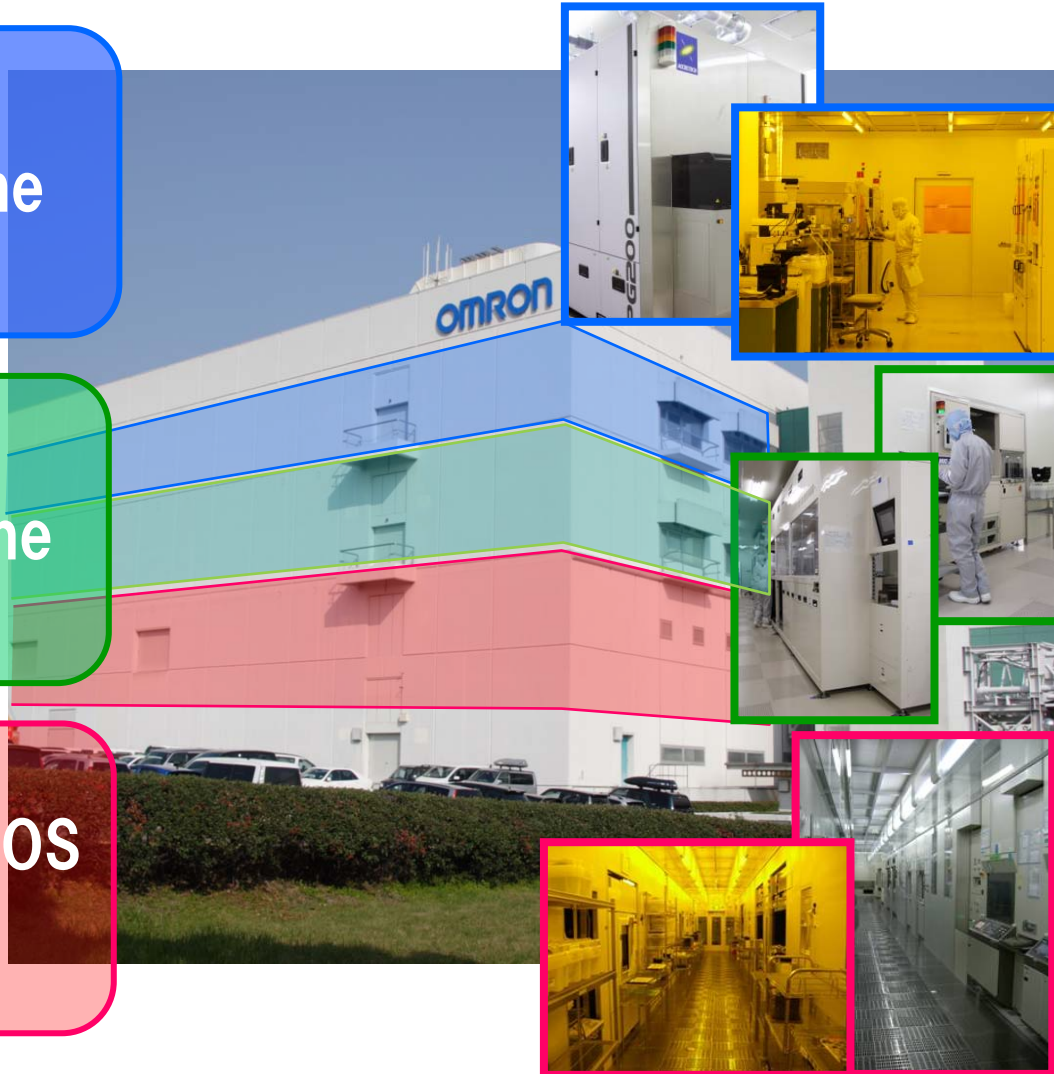
### 5inch Bipolar

- ANALOG IC
- Power IC

## MEMS-CMOS Line

### 8inch CMOS

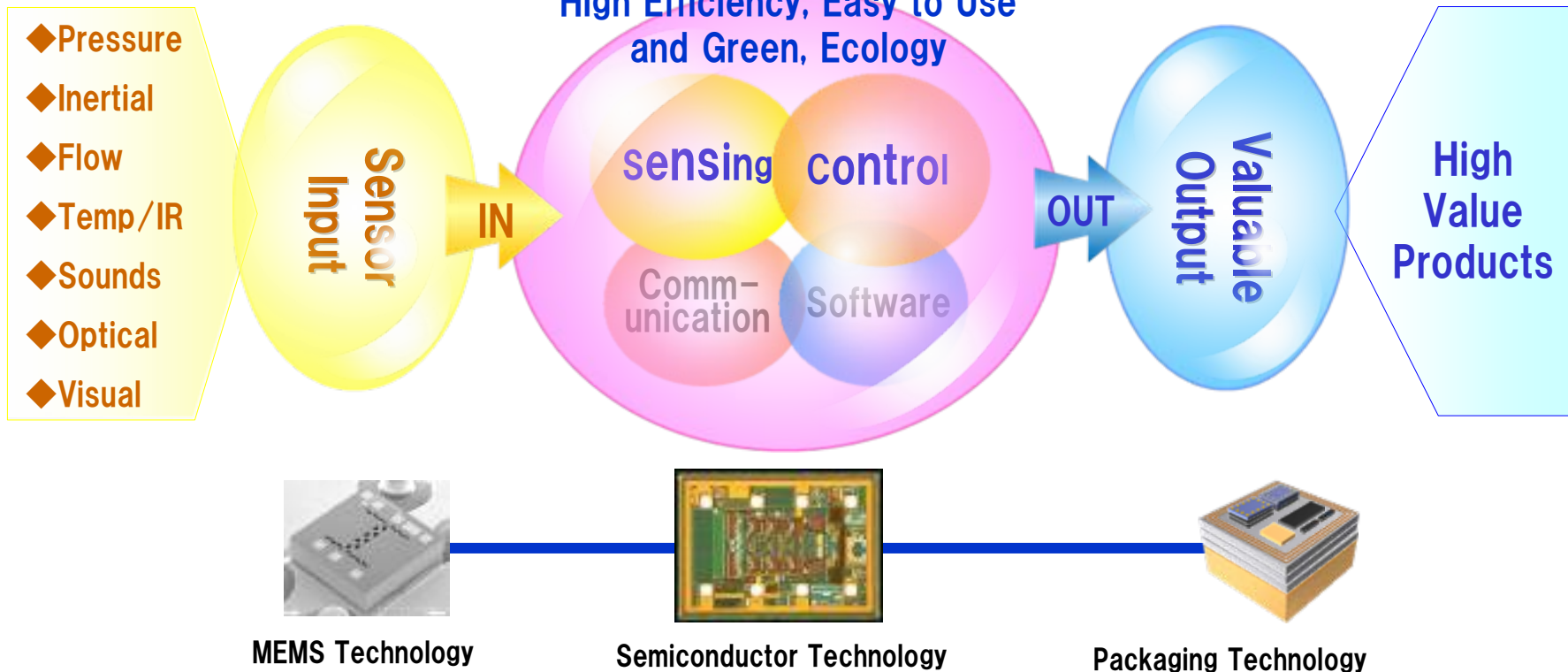
- ANALOG IC
- Power IC
- Power MOSFET
- NVM-Flash



## Beyond the Semiconductor

Make it **"SMART"**

Small, Light, Fast  
High Efficiency, Easy to Use  
and Green, Ecology





# MD Technology Changes

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Combination

Smart Sensing Module

High function Acoustic sensor

Combination sensor

Thermal sensor

Integration

Sensing Cell

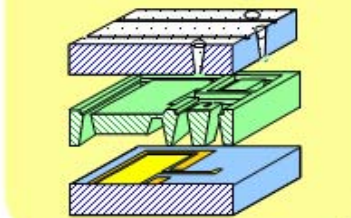
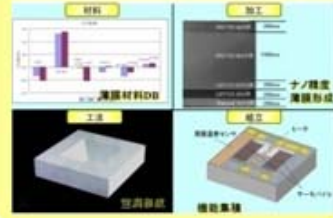
Vertical Integrated technology

8inches MEMS technology

Electrostatic Actuator technology

Thin Film Sensor technology

Electrostatic Sensor technology



2010

8inches Surface•Bulk MEMS technology

2008

4•5inches Bulk MEMS technology

2000

1995

# WW MEMS Market Growth

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MEMS Device  
10,000M\$US  
@2013-14

## 4<sup>th</sup> Wave: Environment / Safety / Security / Health



7,000M\$US  
@2010

## 3<sup>rd</sup> Wave: Consumer / Communication



5,000M\$US  
@2005

## 2<sup>nd</sup> Wave: Automotive



## 1<sup>st</sup> Wave: Industry



- For Autonomous Smart Sensing World -

**CAGR**  
2009 to 2014 : +12% or More  
Grow faster than Semiconductor

## Efficiency

### Optimum Energy Solution

Smart Grid  
FEMS/BEMS/HEMS  
(CO2, IR, Flow sensor)



## Sustainability

### Clean & Renewable Energy

Solar cell, Windmill, Biomass...  
Li-ion battery, Fuel cell...



(Current, Motion, Flow, Temperature sensor)

## Environment

### Environment Assessment

Sensing quality of air/soil/water  
(CO2, VOCs, PH sensor)



## Zero Carbon Society (Low)



**Faced Issues**

Resource shortage

Population explosion

**Carbon Society**



Global warming

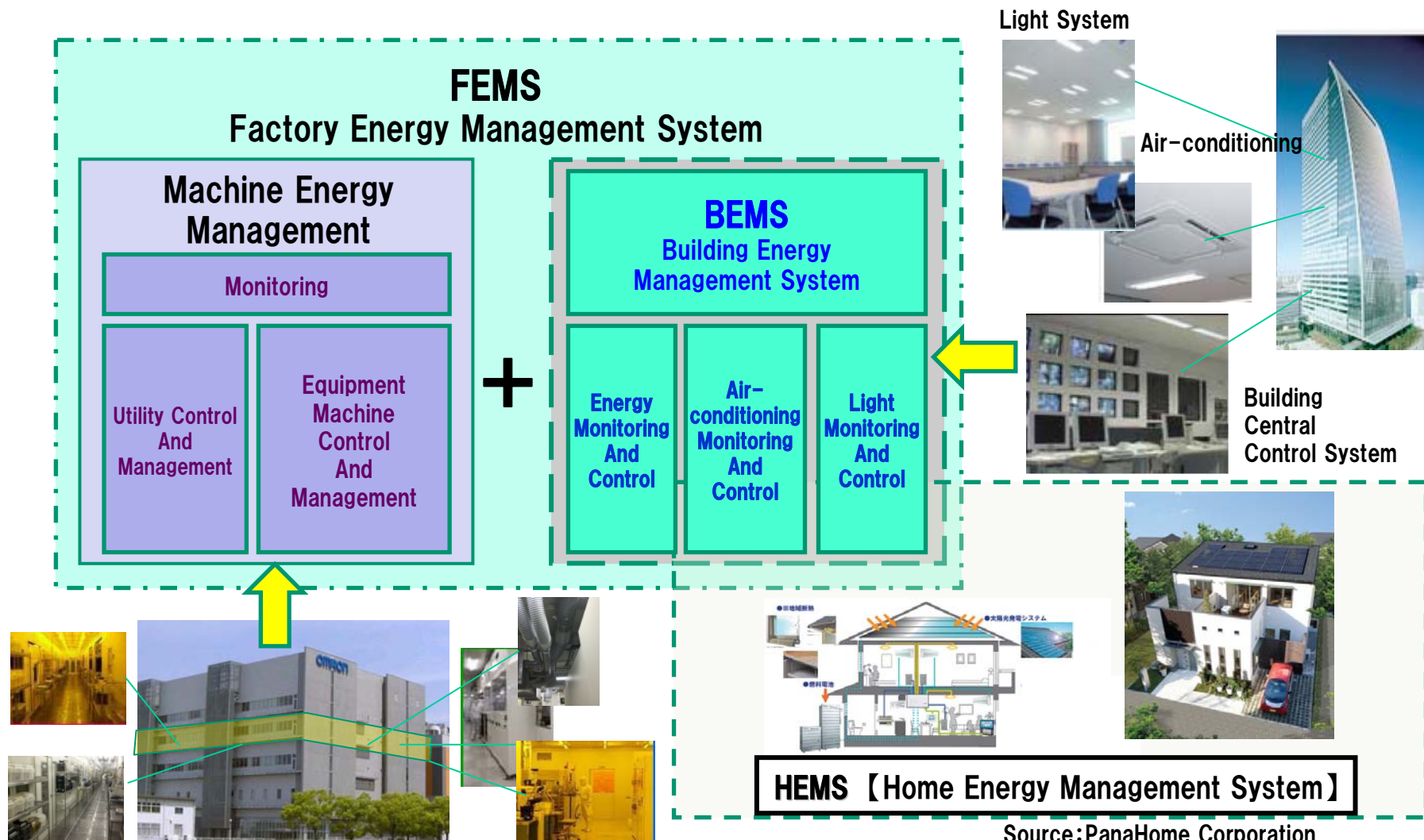
Nature destruction



# Energy Management System

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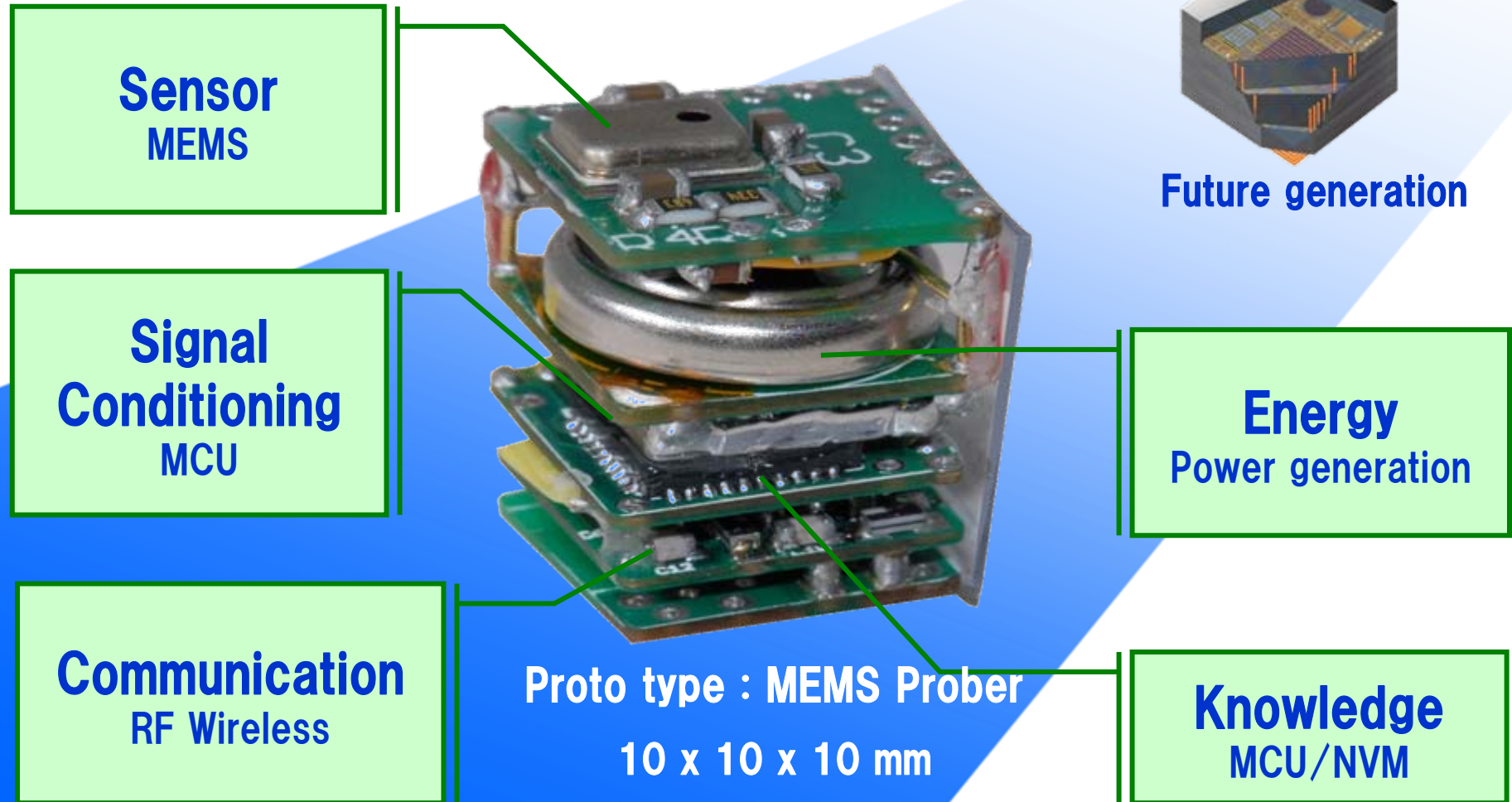




# SSM Conceptual Model

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# SSM “MEMS Prober” for FEMS

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## Experimental Demonstrations in Semiconductor Factory at OMRON

### Yasu Factory



SSM

Sensing  
&  
Control

### Real Time Monitor



### Sensor Variation

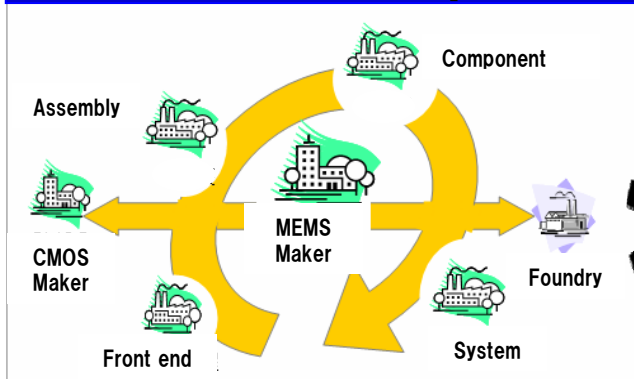
- Temperature
- Relative humidity
- Air flow
- Vibration
- Sound
- Particle
- Current
- Carbon dioxide

# 4 Key Elements to Grow

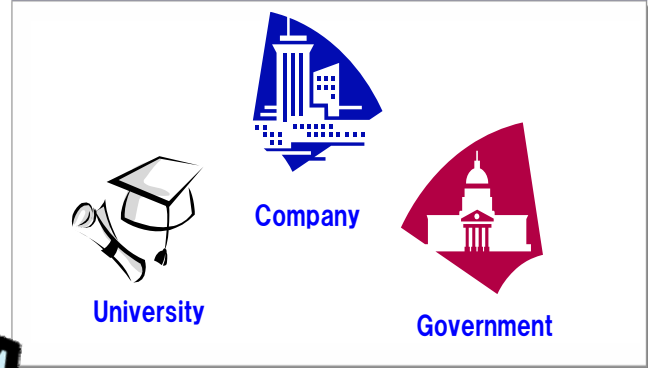
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## Partnership



## Collaboration



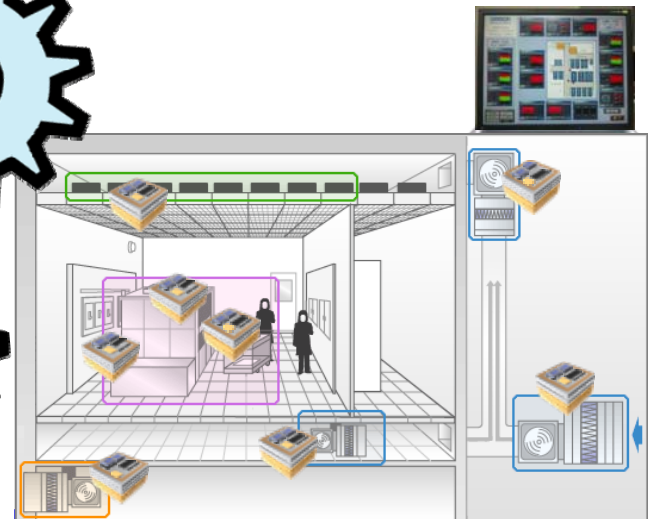
Process

Equipment

Specification

## Standardization

## Solution



A decorative graphic consisting of a series of colored shapes arranged in a semi-circular arc. From top-left to bottom-right, the shapes are: a light green square, a green square, a yellow square, an orange square, an orange circle, and a red circle.

# Beyond the Semiconductor