

Sensors development for under sea water study

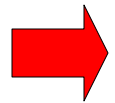
Dr. Amporn Poyai

Thai Microelectronics Center (TMEC)

National Electronics and Computer Technology Center (NECTEC)

ISO9001:2000 Certified

Contents



1. Why

2. Benchmark

3. Temperature sensor

4. Pressure sensor

5. Conductivity sensor

6. Fabrication facility

7. Summary

Sea food export 2009-2010

March 2009

Sea food except shrimp

296

Shrimp

150

March 2010

Sea food except shrimp

343

Shrimp

215

UNIT: Million US dollar

Why



741 Oyster farm in Surat-ta-ni
province with 4,866 Rai

Global warming: Causes and effects

Earth's temperature has risen about 1 degree Fahrenheit in the last century. The past 50 years of warming has been attributed to human activity.

Burning fuels such as coal, natural gas and oil produces greenhouse gases in excessive amounts.

Greenhouse gases are emissions that rise into the atmosphere and trap the sun's energy, keeping heat from escaping.

The United States was responsible for 20 percent of the global greenhouse gases emitted in 1997.

Most of the world's emissions are attributed to the United States' large-scale use of fuels in vehicles and factories.

During the past 100 years global sea levels have risen 4 to 8 inches.

Some predictions for local changes include increasingly hot summers and intense thunderstorms.



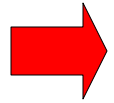
Damaging storms, droughts and related weather phenomena cause an increase in economic and health problems. Warmer weather provides breeding grounds for insects such as malaria-carrying mosquitoes.

Source: Environmental Protection Agency

NATE OWEN/STAFF

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CTD Sensor



Conductivity

Pressure balanced cell eliminates effect of cell volume changes at depth.

Range: 0 - 80mS/cm
 Accuracy: ± 0.01 mS/cm
 Resolution: 0.002mS/cm

Temperature

Fast response PRT for high accuracy profiling.

Range: -5°C to $+35^{\circ}\text{C}$
 Accuracy: $\pm 0.005^{\circ}\text{C}$
 Resolution: 0.002°C

Pressure

Strain Gauge transducer in a choice of ranges. Valeport suggests using the minimum range above expected working depth for greatest accuracy and resolution.

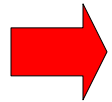
Range: 20, 100, 1000 or 5000dBar (others on request)
 Accuracy: $\pm 0.1\%$ FS
 Resolution: 0.005% FS

1dBar = 0.1 Bar

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3. Temperature sensor

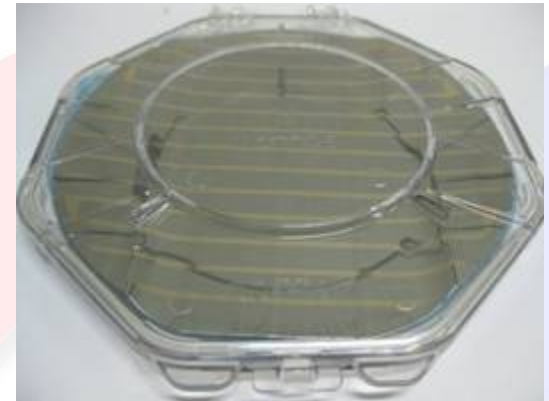
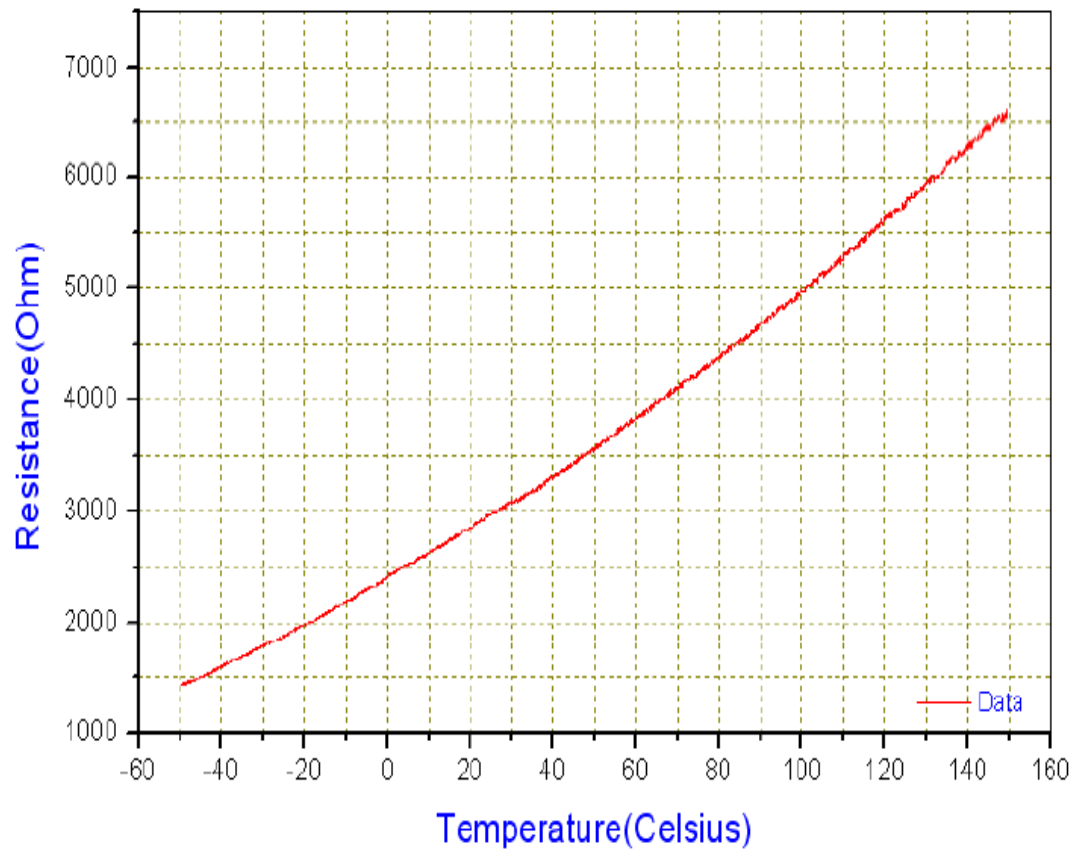
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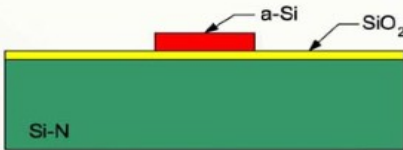
Temperature Sensor



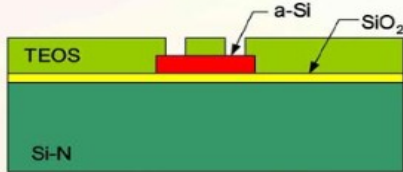
Temperature Sensor



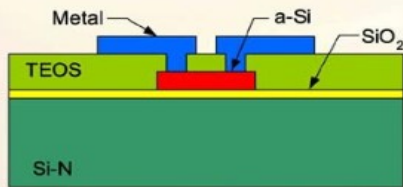
N-Type Silicon Substrate



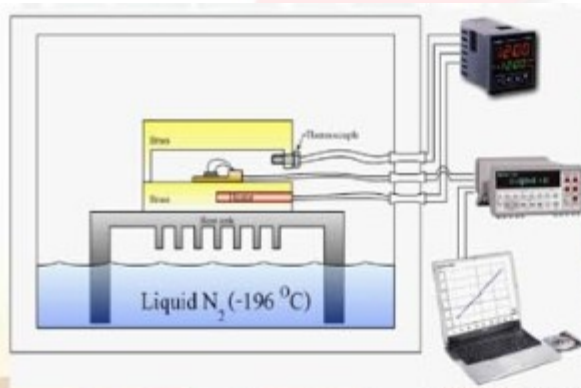
1. SiO² Oxidation
2. a-Si Deposition & Boron Dope
3. a-Si Resistor Patterning



1. TEOS Deposition
2. Contact Hold



1. Metal Deposition
2. Metal Patterning



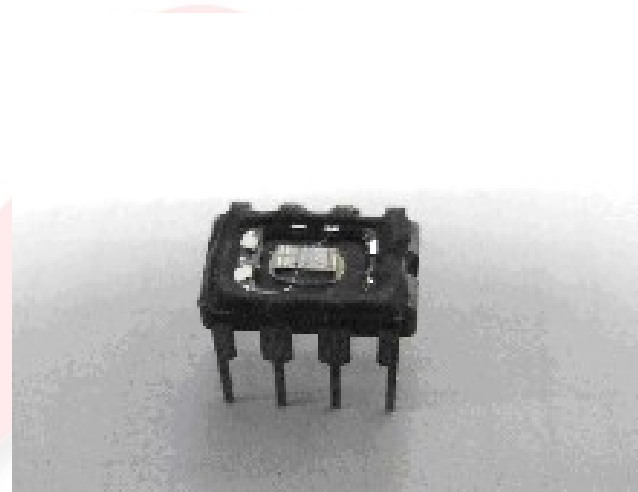
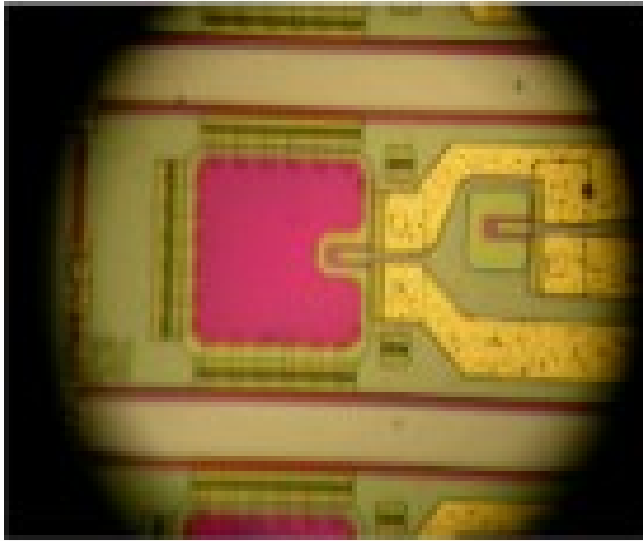
Temperature Sensor



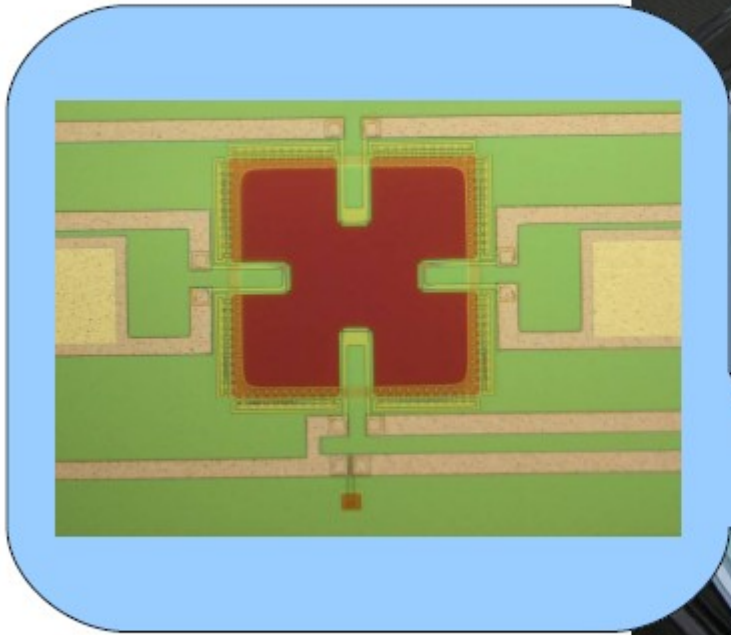
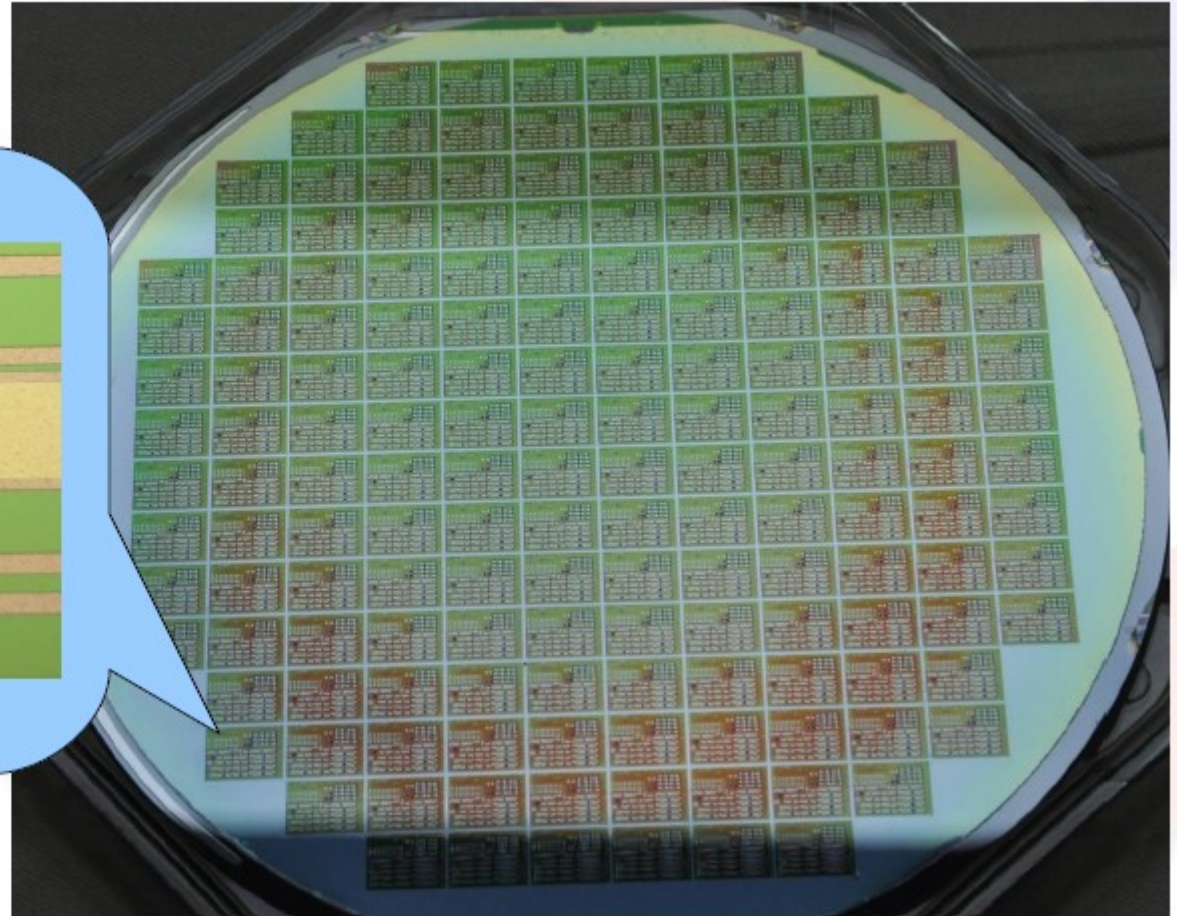
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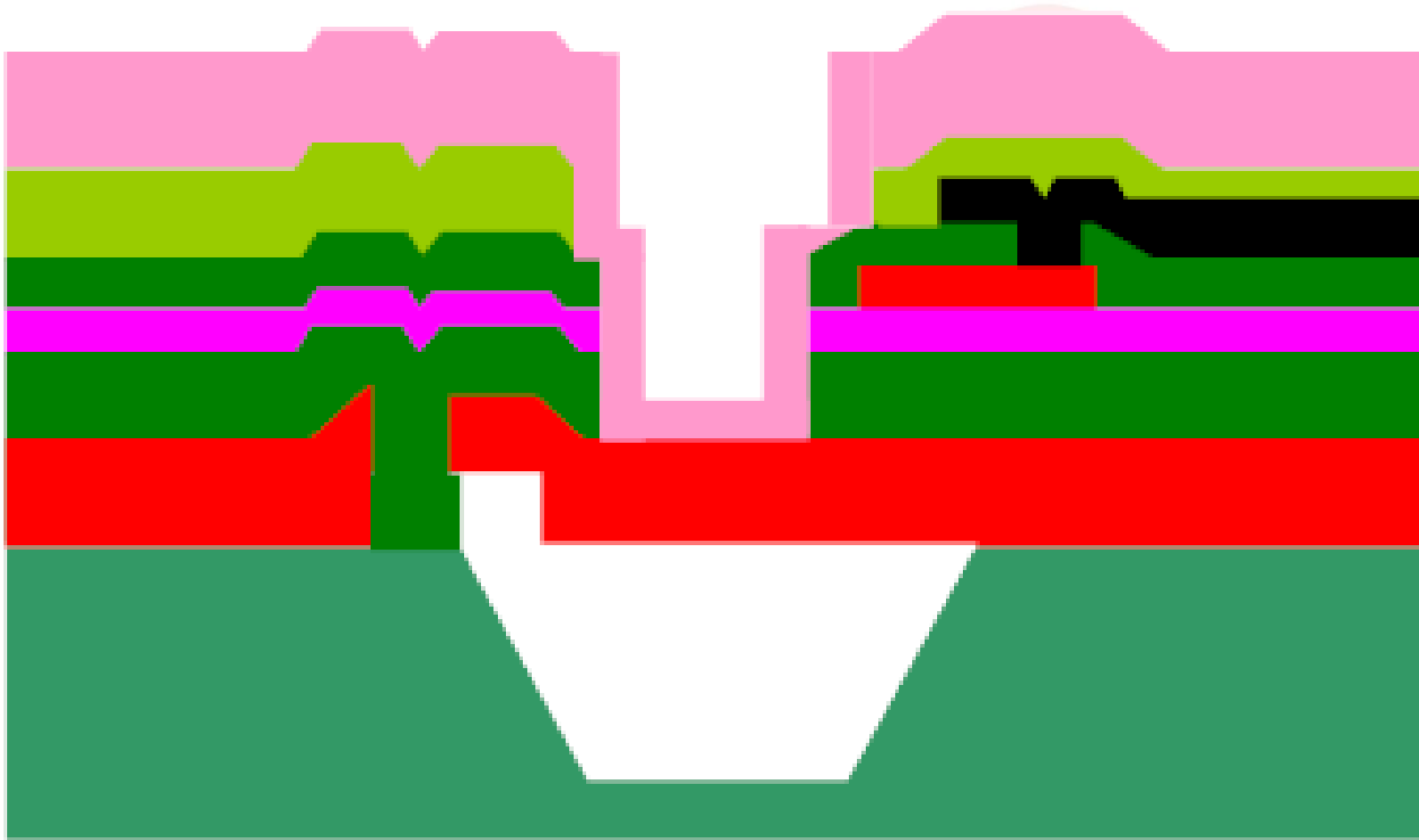
Pressure Sensor



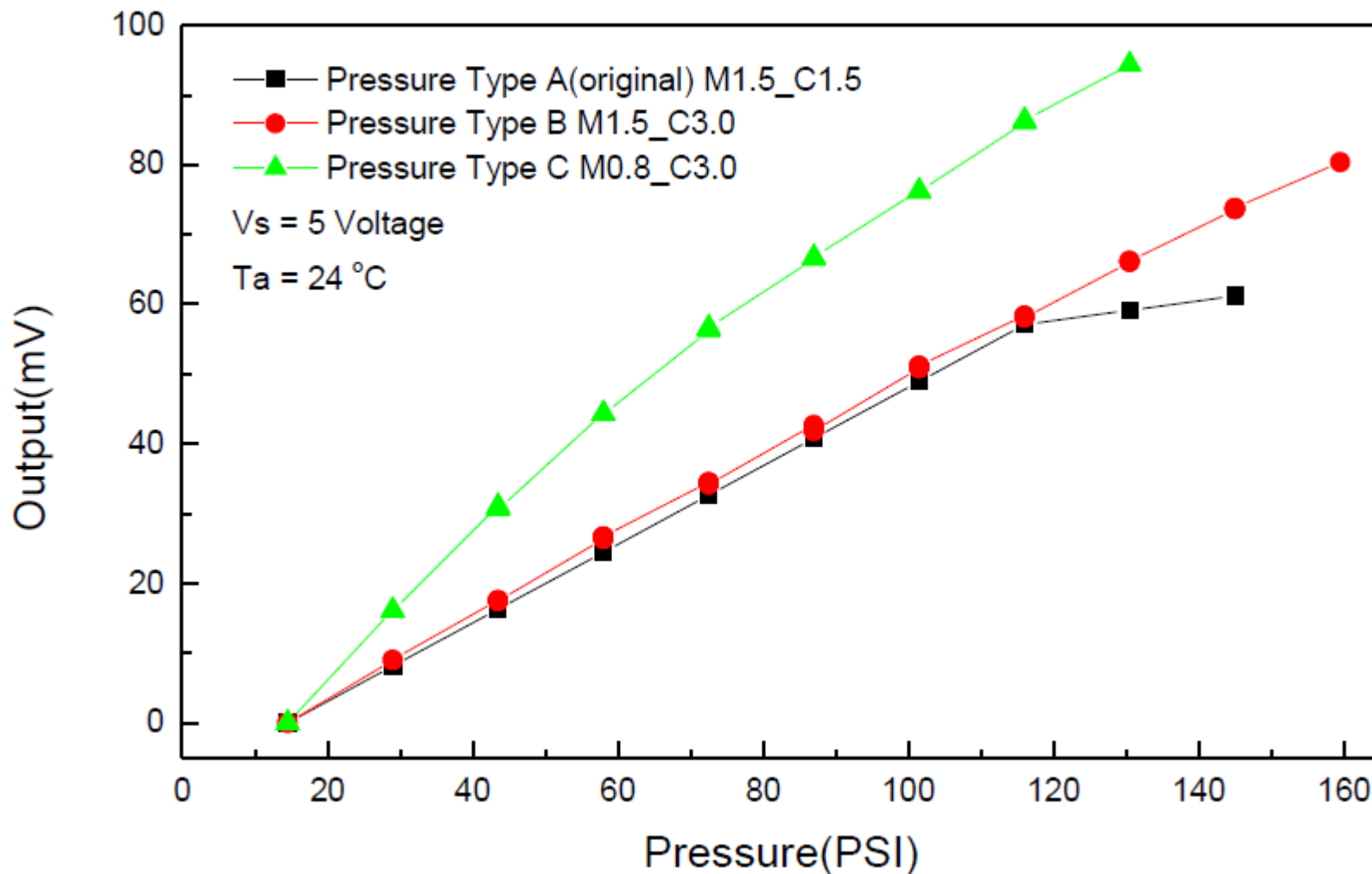
Pressure Sensor



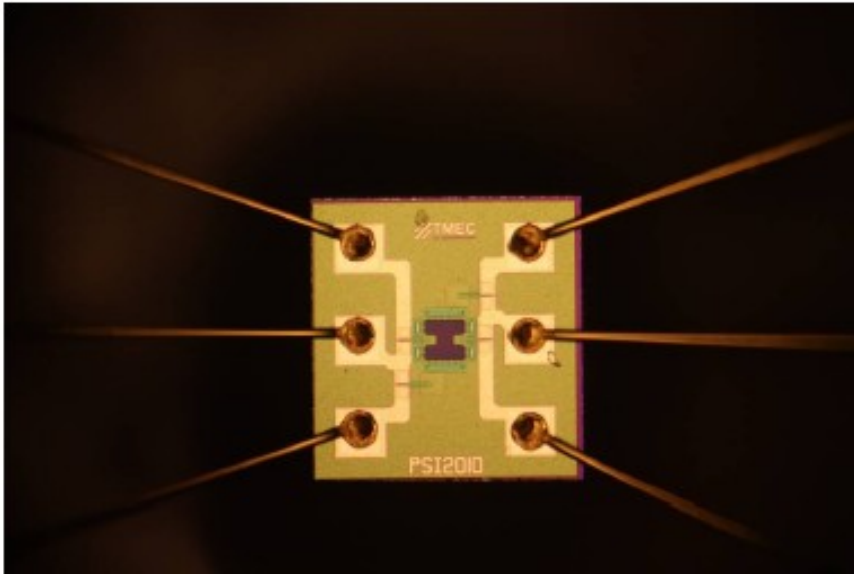
Pressure Sensor



Pressure Sensor



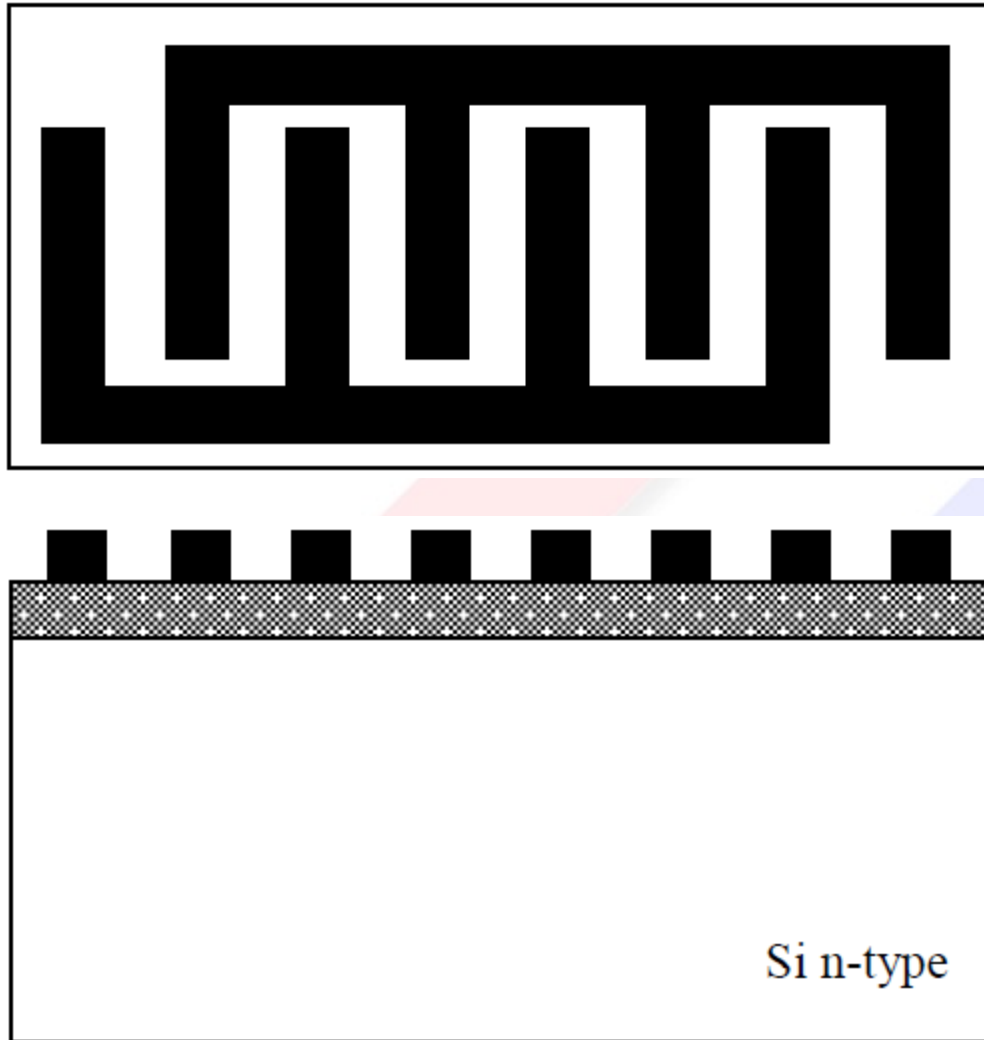
Pressure Sensor



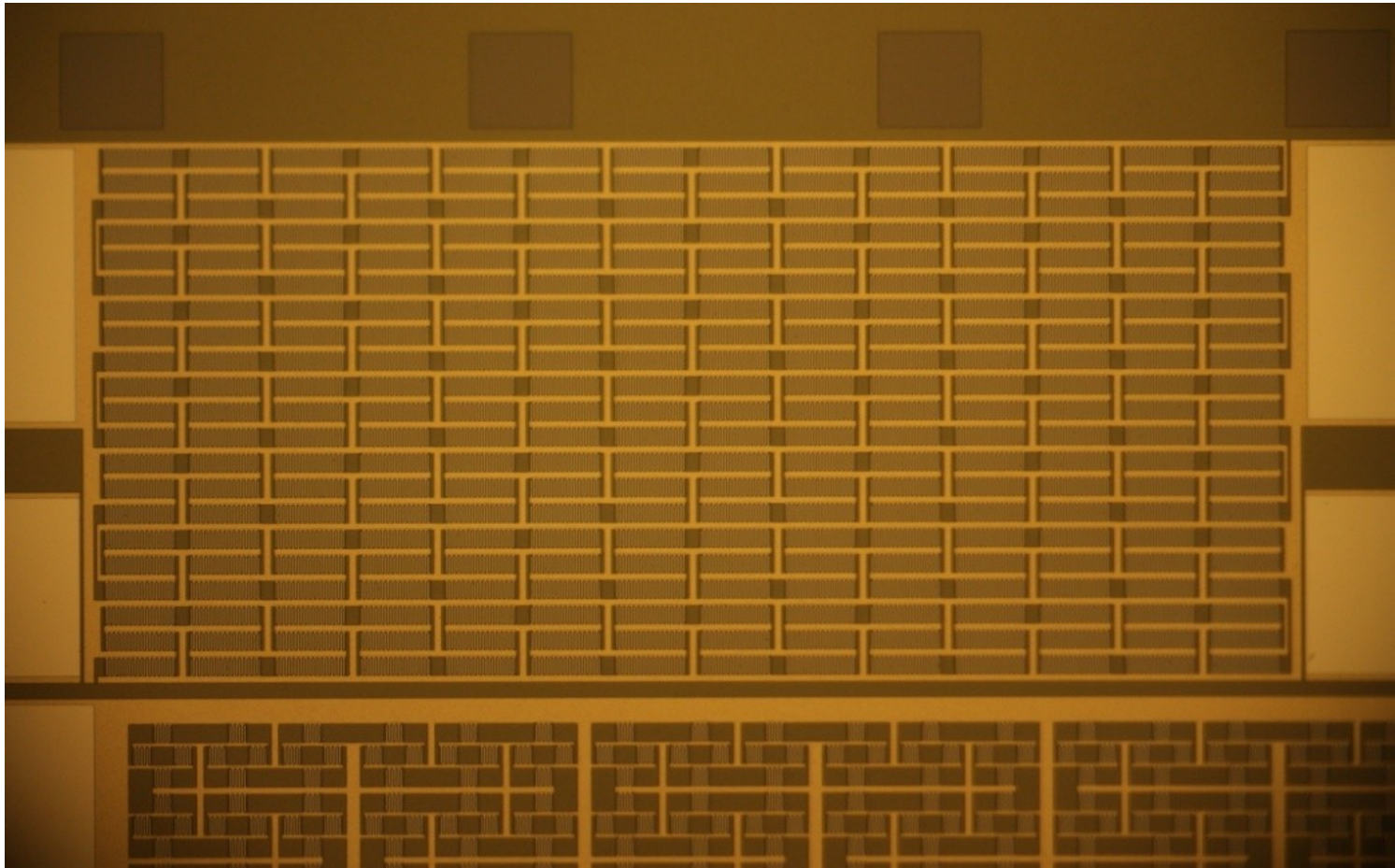
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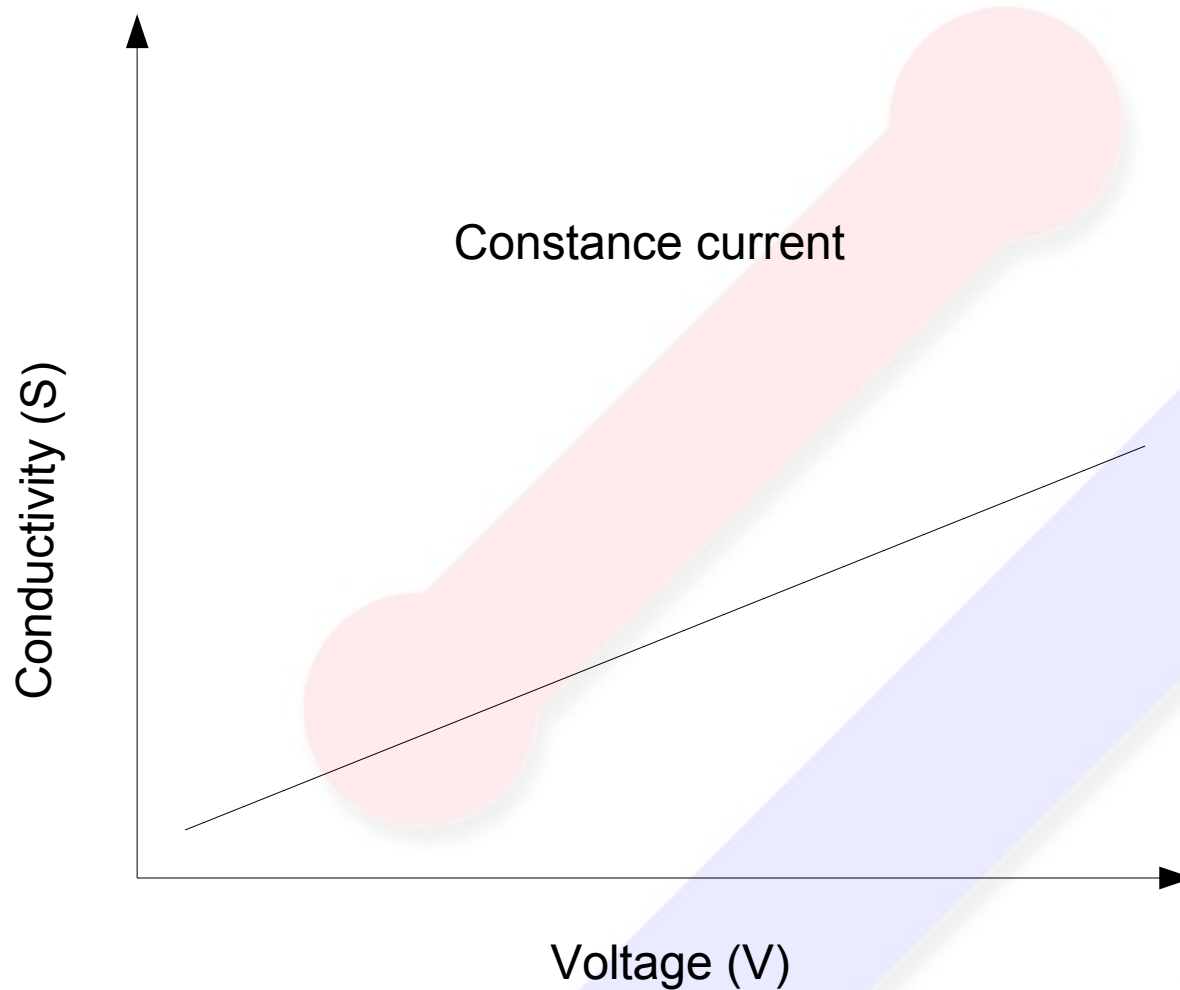
Conductivity Sensor



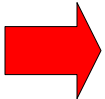
Conductivity Sensor



Conductivity Sensor



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TMEC is ready

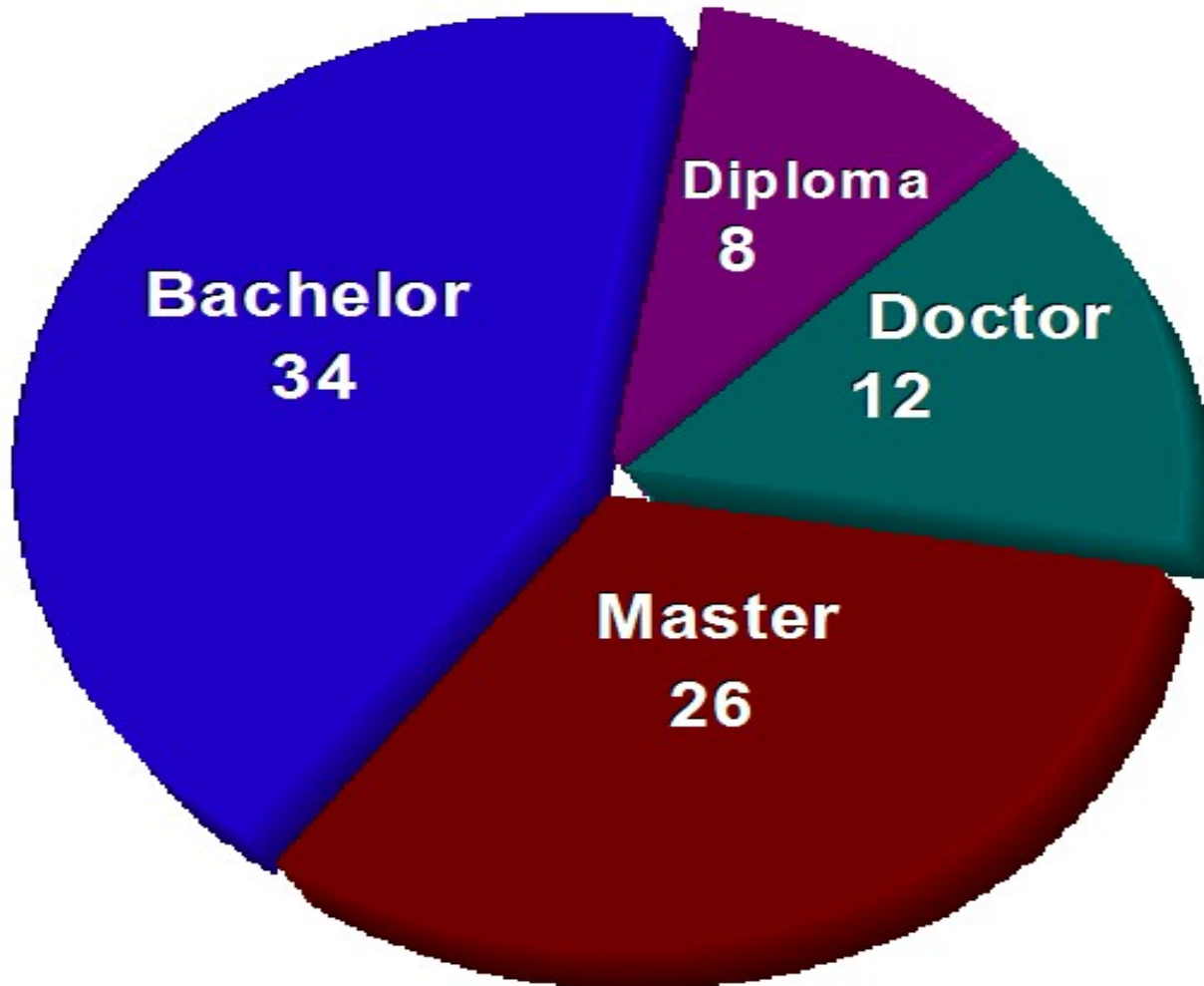
Our main office and facility is located in Chachoengsao province, approximately 70km east of Bangkok.

- 1,000 sq. m. (10,764 sq. ft.) of class 100 and 10,000 cleanroom space with additional support area.
- 6" Wafer production line
- 500 wafer starts per month capacity
- 80 employees and growing



Manpower

Over 70% directly involve in R&D



Total 80

TMEC process line

CMOS process line is the heart of TMEC work.



Cleaning Process



Furnace



Photolithography



Implanter



Dry Etching



Metrology



Sputtering



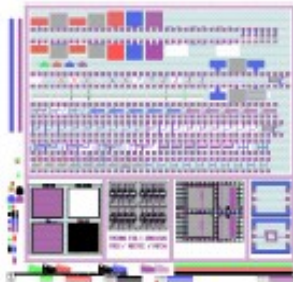
Plasma CVD



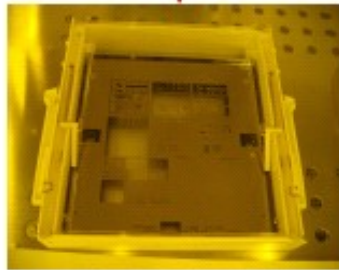
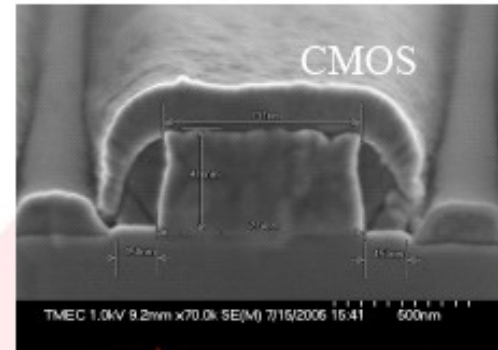
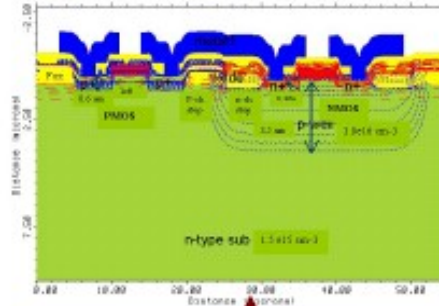
Standard
340 steps

TMEC core technology

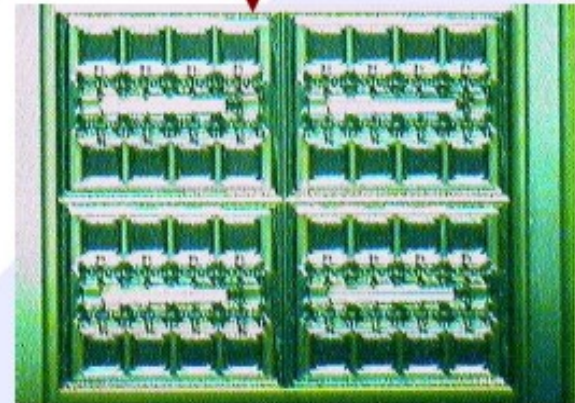
Layout design



Process simulation



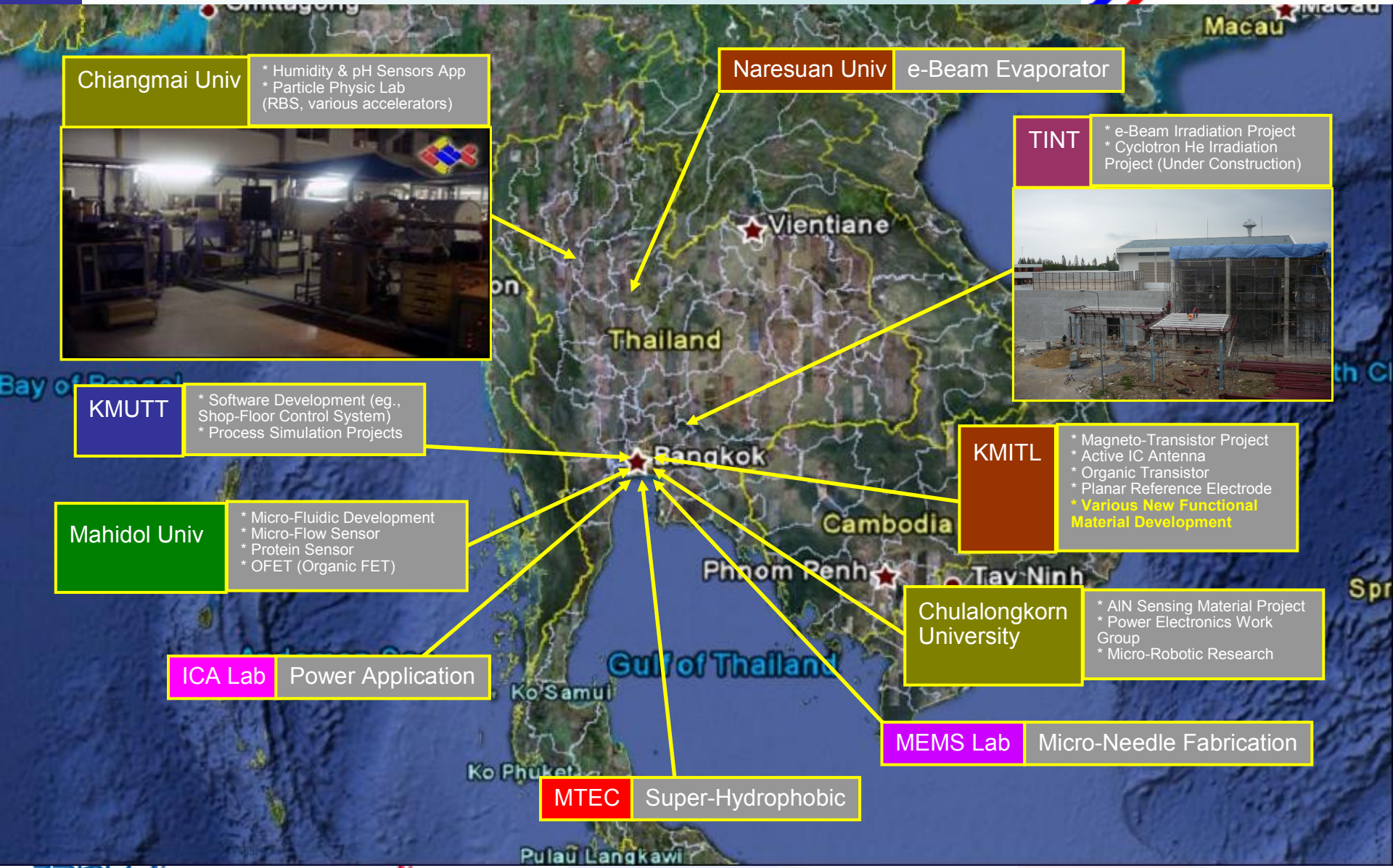
Mask fabrication



Wafer fabrication

Integrating Ideas into Reality

Public sector



Private sector



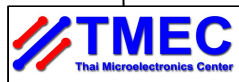
Organization



Ministry of Science and Technology



National Science and Technology Development Agency



- NECTEC: National Electronics and Computer Technology Center**
- BIOTEC: National Center for Genetic Engineering and Biotechnology**
- MTEC: National Metal and Materials Technology Center**
- NANOTECH: National Nanotechnology Center**
- TMC: Technology Management Center**

- 1. Research and development service**
- 2. Small volume production**
- 3. Solution provider**
- 4. Failure analysis services**

Mass Market

Red Ocean

Blue Ocean

Niche market

Innovation & Fabrication

Problem solving

Innovation

TMEC

TMECnology



2010

2011

2012

2013

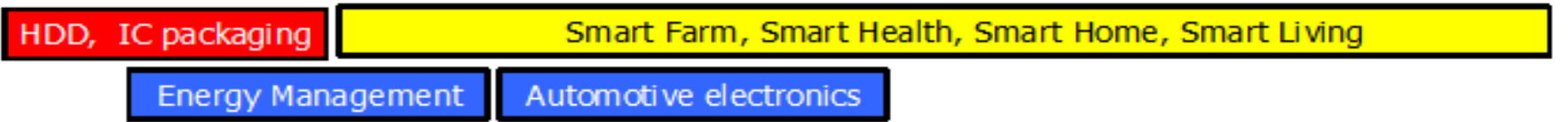
2014

2015

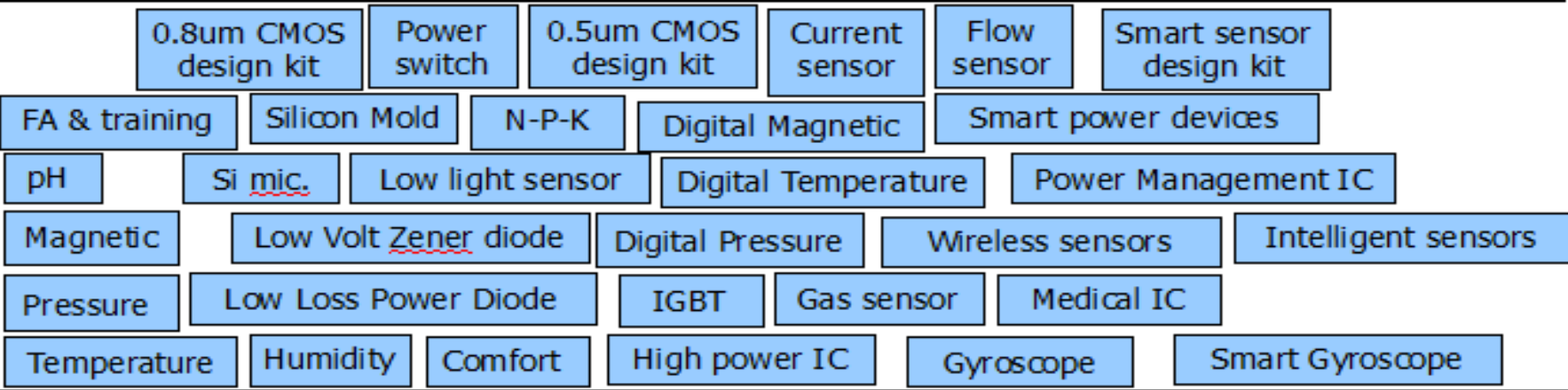
Market Driver



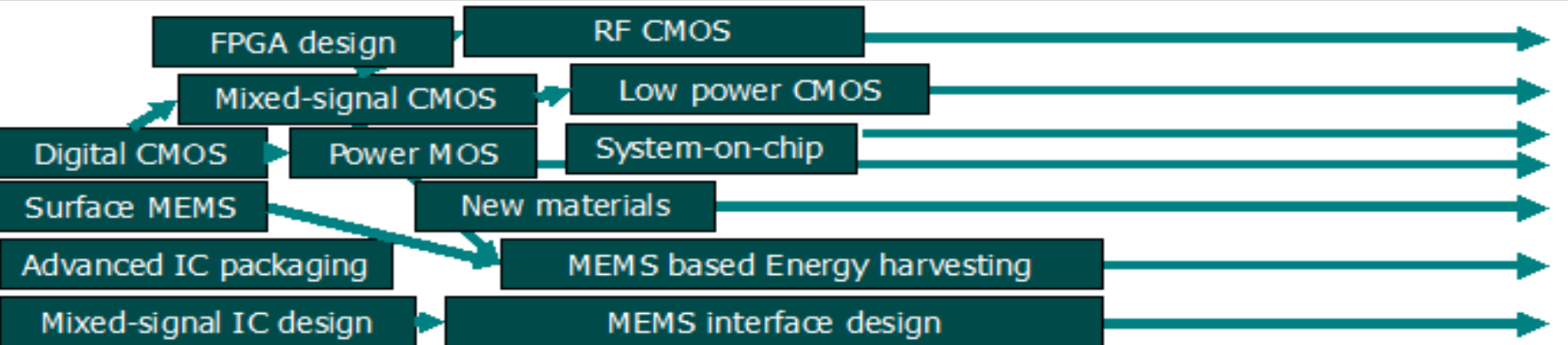
Market



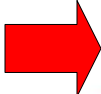
Products



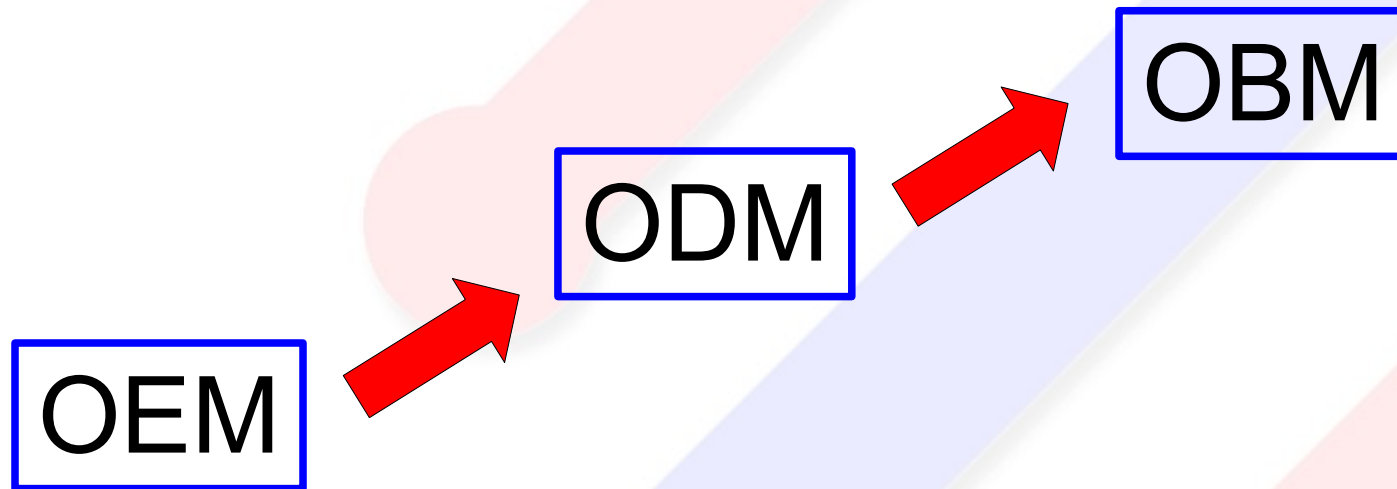
Technology



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TMEC is ideal partner for integrating ideas into reality





<http://tmec.nectec.or.th>