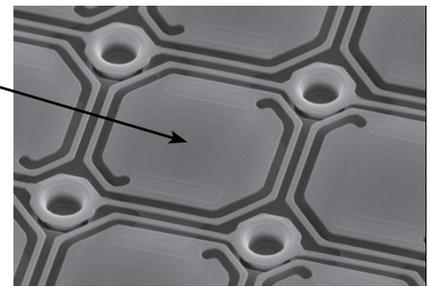
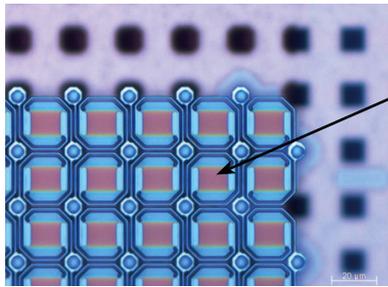


Each pixel is composed of a thin resistance in vanadium oxide (VOx) covered with an absorber in silicon oxide which absorbs the infrared ray. The temperature of the SiO<sub>2</sub> layer is proportional to the temperature of the IR radiation, and the value of the resistance VOx is proportional to the temperature of the absorber. A measurement of the resistance provides the temperature. For maximum operating frequency, the thermal mass must be minimized. This is achieved by suspending the VOx resistors and the absorber on a micro-bridge. The read-out electronic is manufactured on the silicon substrate before the micro-bridges; therefore, it is under the micro-bridges.

It is the production of these micro-bridges with very thin layers deposited on a sacrificial organic material that makes manufacturing microbolometers extremely complex and expensive. The deposition steps are very slow because of the low temperature used.



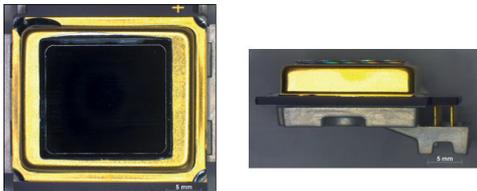
VOx

### Supply chain and cost structure

Initially manufactured internally on 150mm wafers, FLIR microbolometers have since 2006 been manufactured by ON Semiconductor on 200mm wafers. The transition to 200mm and the outsourcing of production to a large-capacity foundry has reduced manufacturing costs.

Today, the manufacturing cost is still high, due to a low yield and a low production volume: 100,000 units for Thermography in 2011 (source : Yole Développement)..

*Pictures of the micro-bridge with the VOx resistor - Optic and SEM views (Courtesy of System Plus Consulting)*



*Microbolometer ISC0601A package (Courtesy of System Plus Consulting)*

### Sylvain Hallereau, Project Manager, System Plus Consulting

Sylvain is in charge of costing analysis of Integrated Circuits, Power Semiconductors and Packaging. He has significant experience in the modeling of the manufacturing costs of electronics components. Sylvain has a master's degree in Microelectronics from the University of Nantes, France.

[www.systemplus.fr](http://www.systemplus.fr)

# Reverse Engineering & Costing Seminar

November **13**, 2012 – **Taipei Taiwan**

## Agenda:

- MEMS focus presentations led by Yole Développement and System Plus Consulting
- One to one meetings to answer specific questions dedicated to your own business challenges

## Contacts:

• **One to one meetings:**  
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• **Other requests:**  
Camille **Favre** (favre@yole.fr)

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