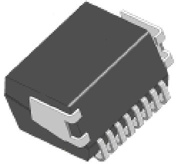
What a Package !!!

25th October 2023

sencio

functional packaging center

More than 35 years experience in innovative assembly



1987	Foundation of eurasem as an OSAT
1996	TS16949 certification
1997	Creation of first plastic encapsulation of front airbag MEMS-sensor
2001	Acquistion by Elmos Semiconductor AG
2011	Sencio independent OSAT
2014	Introduction of *n*Capsulate – technology
2015	Move to technology campus in Nijmegen
2016	Innovation award medical sensor application
2018	Cost effective 4th generation Plastic Ultrasonic Level Sensor
2021	High pressure sensor package for transmission

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Mission

Our mission is to be world class competence center offering development and manufacturing of semiconductor assembly solutions with added functionality.

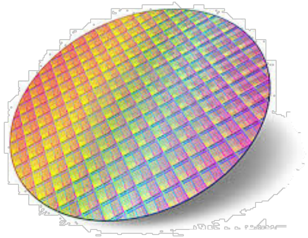
- Focus on (MEM’s) sensor systems
- Development from idea to mass production
- Meeting quality demand of Automotive industry

Facts & Figures

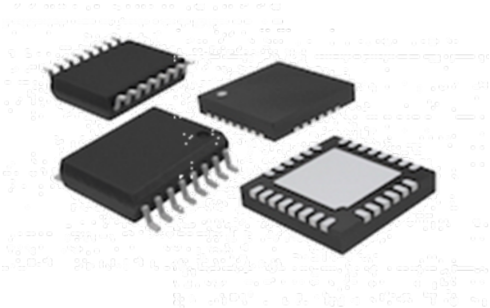
Made
in
EU

- Specialized OSAT in Europe
- 600 sqm clean room (class 10.000)
- IATF16949 & ISO14001 certified
- Over 600 million assemblies supplied to the Automotive Industry
- Development and production in Nijmegen (NL)
- Number of employees 50
- Far East assembly location Cabuyao (Philippines)

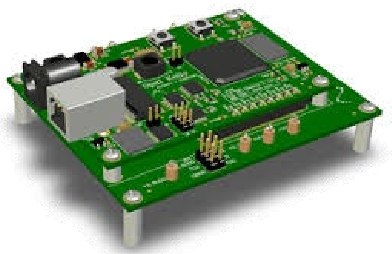
Packaging trends



1st - level assembly



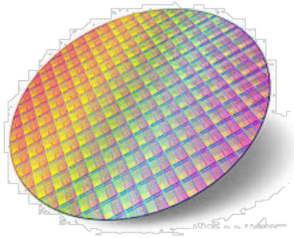
2nd - level assembly



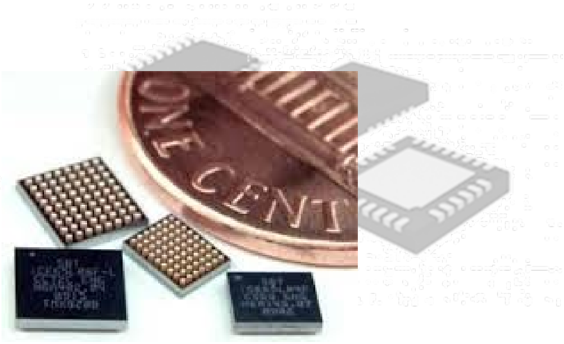
3rd - level assembly

Traditional assembly levels

Packaging trends

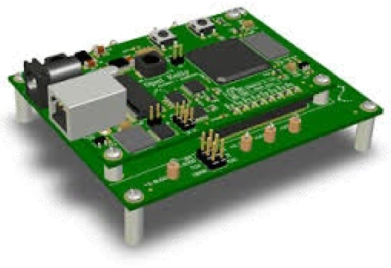


1st - level assembly



0- level assembly

2nd - level assembly



3rd - level assembly

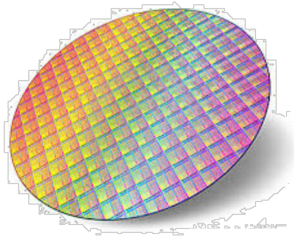
Foundries and OSAT's introduce wafer scale packaging

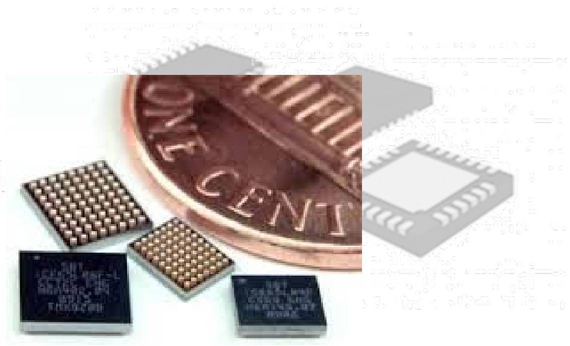
Packaging trends

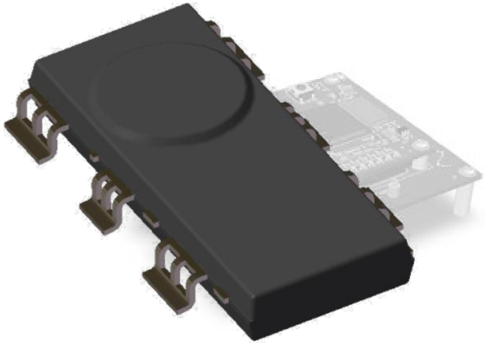
1st - level assembly

2nd - level assembly

3rd - level assembly







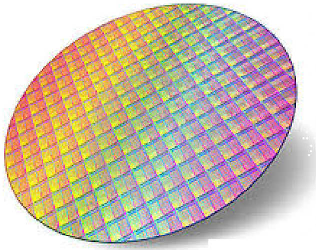
0- level assembly

1- level system assembly

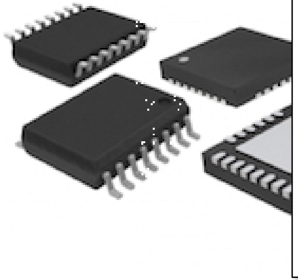
Focus on functional system assembly solutions

Market Value Chain

Component supplier

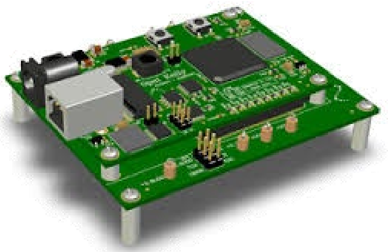


Wafer fab / foundry



Assembly & Test / OSAT

System supplier 1st / 2nd Tier



PCB assembly

Module assembly

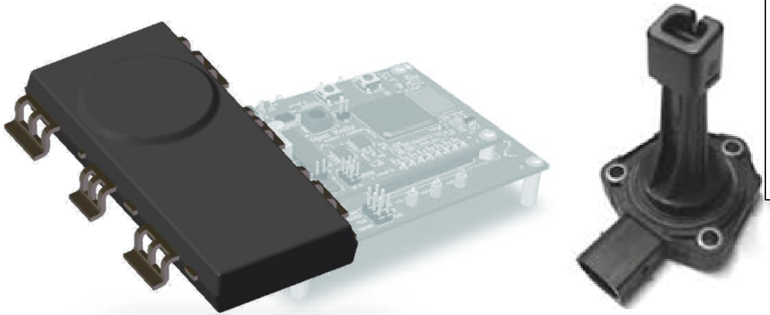
OEM

Traditionally: Assembly service is offered to component supplier

Market Value Chain

OEM

System supplier 1st / 2nd Tier



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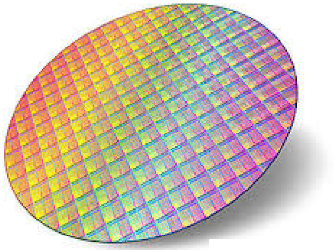
Module assembly

Component supplier



Wafer fab / foundry

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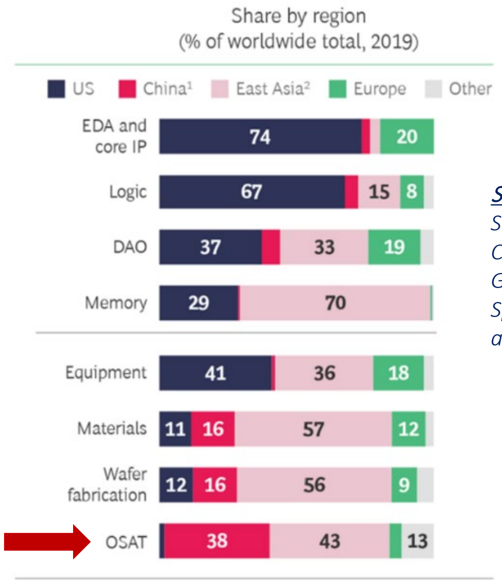
System assembly service offered to 1st /2nd Tier

Worldwide OSAT Landscape

Outsourced Semiconductor Assembly and Test



Source: "The Global Semiconductor Supply Chain based on Geographic Specialization", BCG analysis, 2019

Europe: < 3%

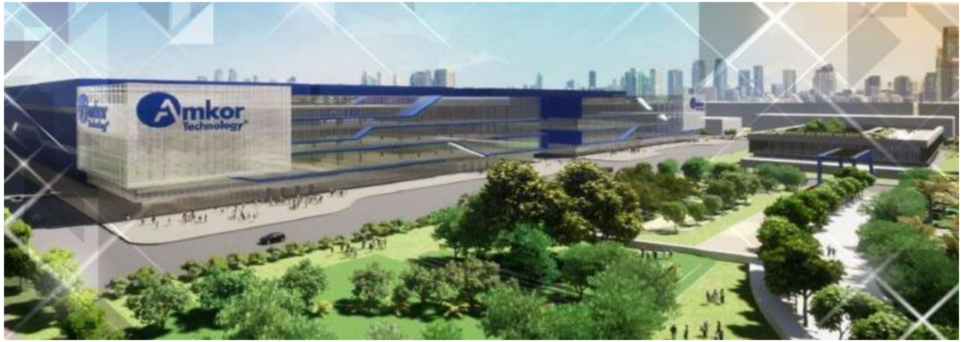
DAO = Discrete, Analog, and Other (including optoelectronics and sensors);
EDA – electronic design automation);
1) Mainland China, 2) East Asia including South Korea, Japan, and Taiwan.

No European OSAT in the Top 50+

Source: "Top OSAT Ranking by 2021 Revenue [$M] – Intel and TSMC added", Advanced Packaging Quarterly Market Monitor Q1 2022, YOLE Développement

Large OSAT Investments for Capacity Extension

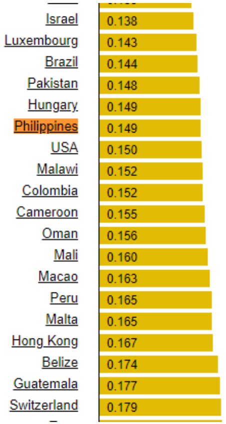
Did you hear similar news from the US or Europe?

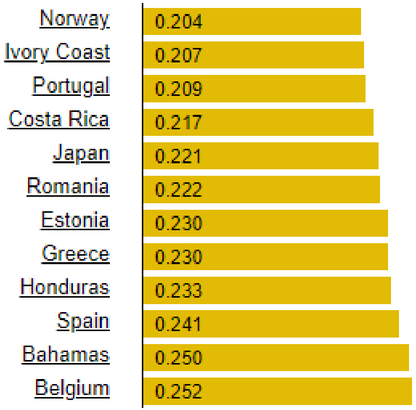


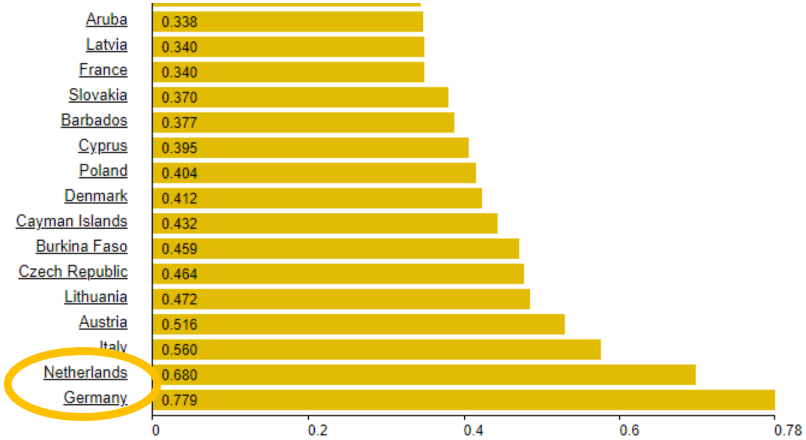
- **NOV/10, 2022: "ASE Breaks Ground on New Chip Assembly and Testing Facility in Penang, Malaysia (ASEM)"**
  - will be completed in 2025
  - will create 2,700 additional job
  - will comprise 2 buildings (Plants 4 and 5) with a built-up area of 982,000 square feet
  - ASEM will invest **$300 million over a period of 5 years** to expand its production floor space (w/ plant 4 and 5 total of 2 million square feet), procure advanced equipment, and train and develop engineering talent
- **NOV/21, 2021: "Amkor Technology, Inc. is growing once again: New factory in Bac Ninh, Vietnam (ATV)"**
  - will invest a total of $1.6 billion to develop a manufacturing, testing and assembling plant
  - will disburse **$520 million during the first five years**
  - 23-hectare plot, groundbreaking March/April 2022
  - project is due for completion in 2035

Energy prices September 2022 ($/kWh)

- https://www.globalpetrolprices.com/electricity_prices/

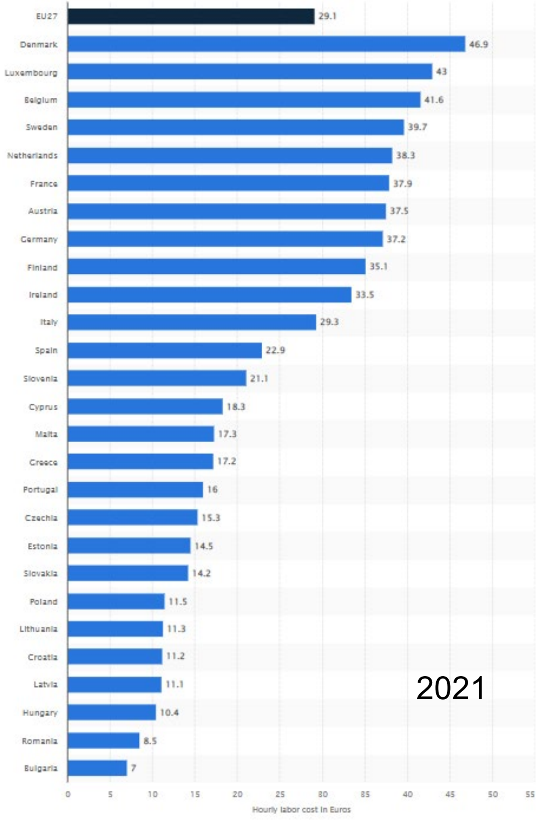






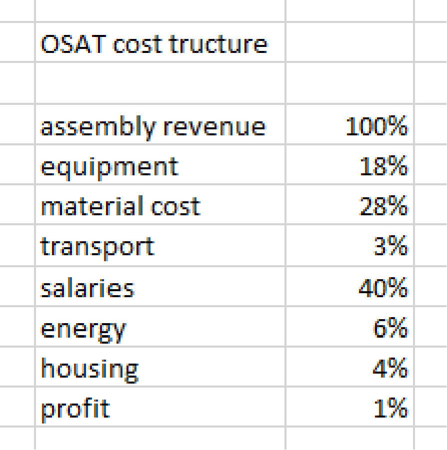
Salaries (hourly rates)

- The Netherlands: 38.3 €
- Germany: 37.2 €
- Romania: 8.5 €
- Thailand: 4.5 €
- The Philippines: 2.5 €

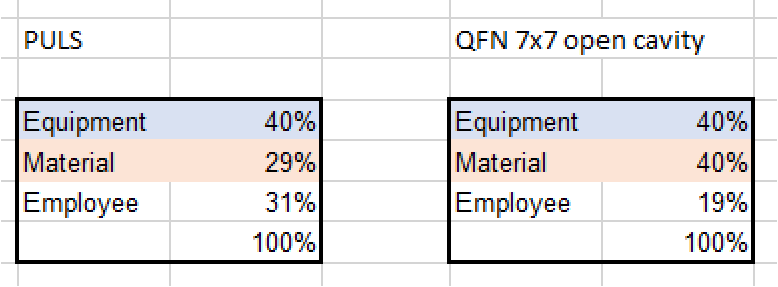


2021

OSAT / Product Cost structure



OSAT cost tructure	
assembly revenue	100%
equipment	18%
material cost	28%
transport	3%
salaries	40%
energy	6%
housing	4%
profit	1%



PULS	
Equipment	40%
Material	29%
Employee	31%
	100%

QFN 7x7 open cavity	
Equipment	40%
Material	40%
Employee	19%
	100%

Why are we in NL / EU different ?

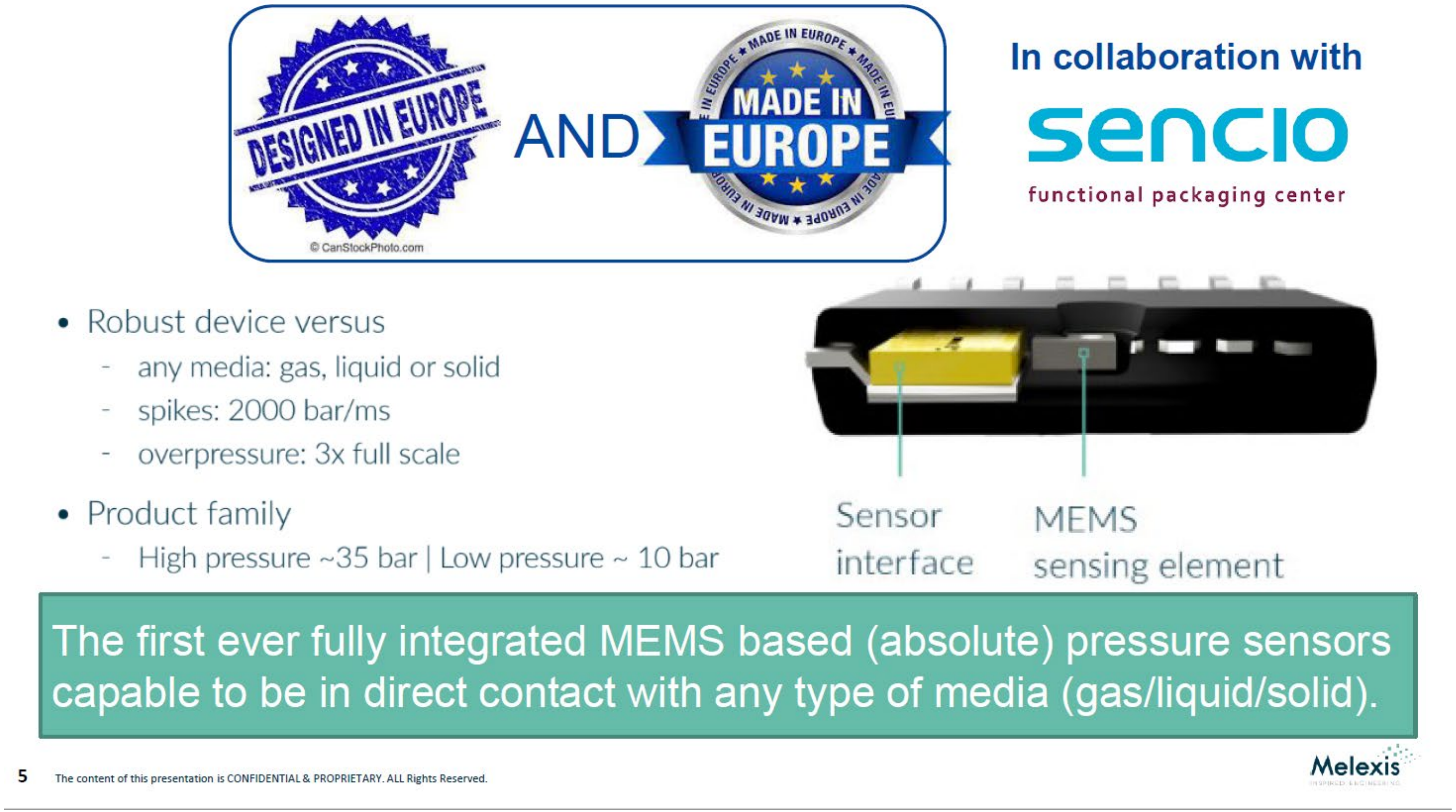
Made in EU

Innovation

• Customer and service oriented	
• Complexity / creativity	=> Niche markets
• Non-commodity	=> Niche markets
• Customized	=> Niche markets
• Small / medium volume	=> Niche markets
• Edge of existing technologies	=> Niche markets

Sencio’s added value

- Beyond expectation creative encapsulation solutions for sensor systems
- Development from idea to mass production
- Geography based supply security
- Proven technology track record
- Design for cost effective system manufacturing



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- Robust device versus
  - any media: gas, liquid or solid
  - spikes: 2000 bar/ms
  - overpressure: 3x full scale
- Product family
  - High pressure ~35 bar | Low pressure ~ 10 bar

Sensor interface

MEMS sensing element

The first ever fully integrated MEMS based (absolute) pressure sensors capable to be in direct contact with any type of media (gas/liquid/solid).

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Melexis

Key benefits

- Minaturized solution
- All-in-one solution: MEMS, sensor interface, packaging and calibration
- Robust device versus
  - any media: gas, liquid or solid
  - spikes: 2000 bar/ms
  - overpressure: 3x full scale
- Product family
  - High pressure ~35 bar | Low pressure ~ 10 bar
  - Outputs: SENT, UART or LIN
- Accurate pressure (1~2%) and temperature (1~4°C)

Applications

- Standalone sensors on LIN: refrigeration lines...
- Integrated in components on SENT/UART: Valves, pumps, e-compressors...

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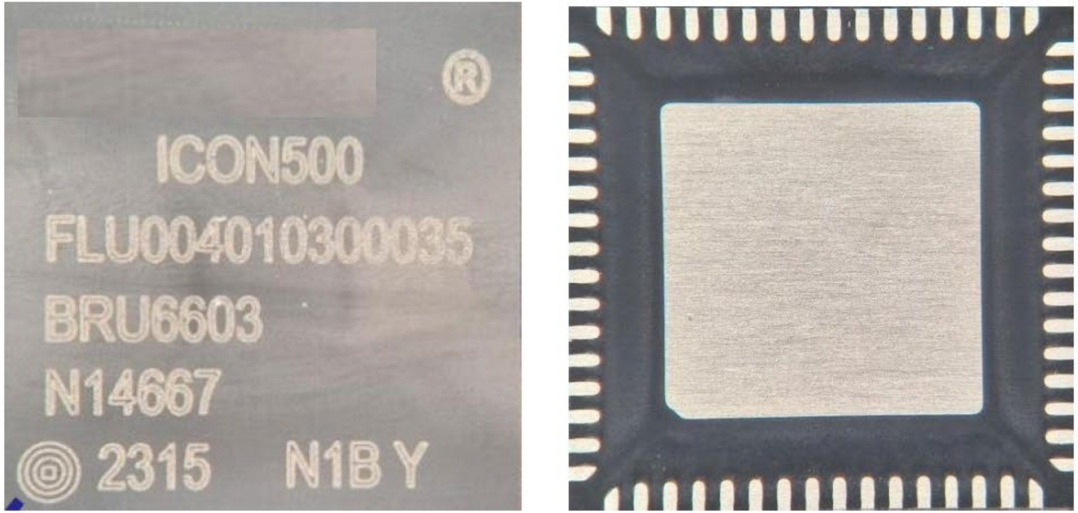
Melexis INSPIRED ENGINEERING

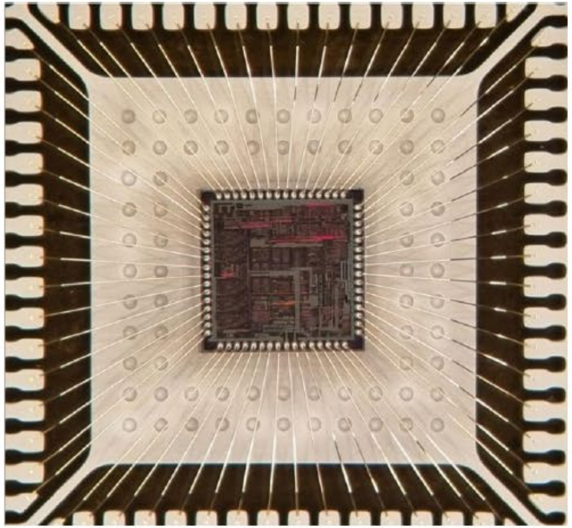
QFN64 9x9mm

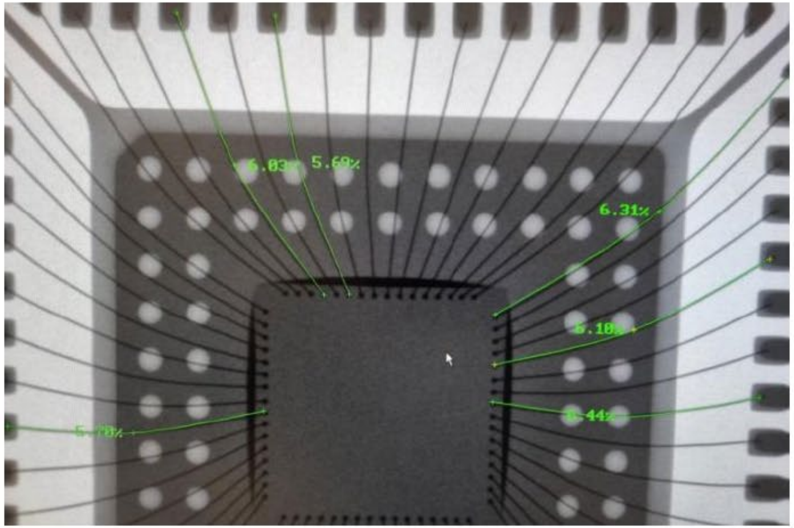
Package outline



QFN64 9x9mm

Wirebonding and wiresweep





Made in EU

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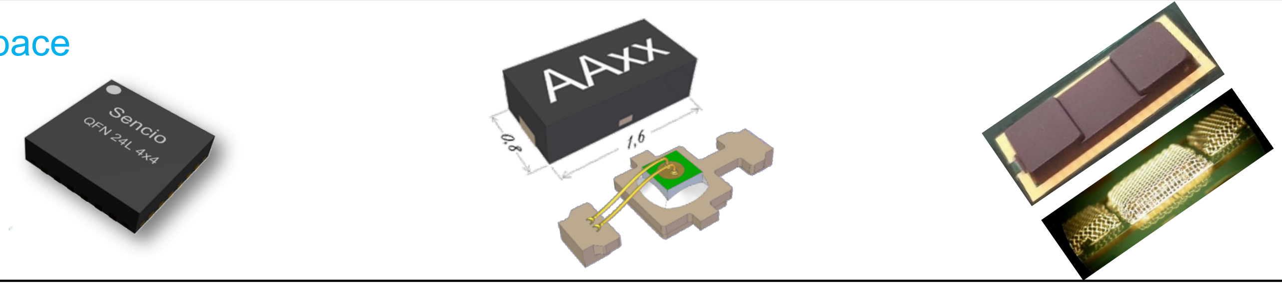
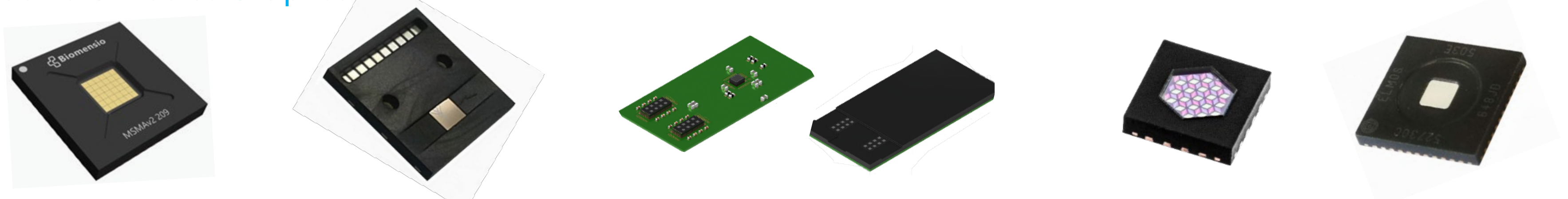
Automotive

RF / Radar / Space

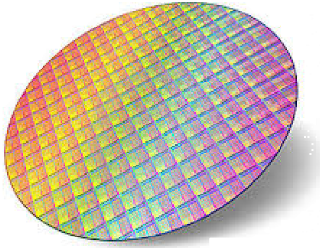


Industrial / Medical / Optical

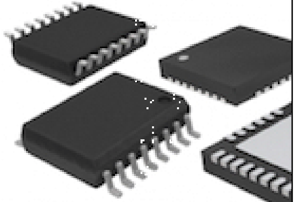


Market Value Chain NL/EU

Component supplier



Wafer fab / foundry



Assembly & Test / OSAT

System supplier 1st / 2nd Tier

PCB assembly

Module assembly

Melexis
INSPIRED ENGINEERING

bruco
INTEGRATED CIRCUITS

sencio
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SALLAND
Engineering

PacTech
member of nagase group

Melexis
INSPIRED ENGINEERING

eurofins
MASER

Made
in
EU

The Art of Packaging

Made in EU

- Unique OSAT in Europe !!!
- One-Stop-Packaging solution provider
- Filling the gap between semiconductor and application