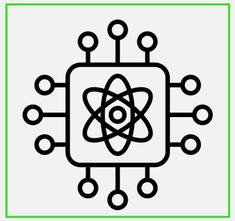
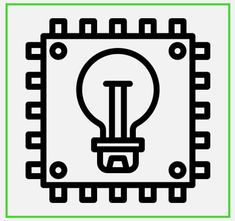
Łukasiewicz
Institute of
Microelectronics
and Photonics

Semiconductors and electronics ecosystem in Poland

Semiconductors-related technologies
Competences to be developed

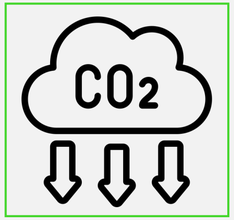


Quantum Computing:
Machine learning,
Energy flow distribution
Efficient circuit designs for chips

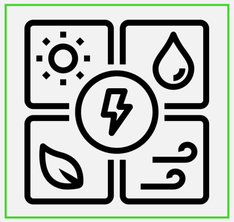


Photonic Integrated Circuits
Autonous driving,
Quantum computing,
High resolution sensing

Cybersecurity
Ransomeware, Vulnerability in the Cloud,
Data Breaches, Cyber-Physical Attacks,
IoT Attacks, Smart Medical Devices



CO2 Reduction:
Zero-Carbon Technologies
Photosynthesized Hydrogen.
Sustainable aviation fuel engine.



Clean Energy:
6G or 7G Systems,
Hydrogen Fuel Cells
Power Modules

Sustainable Manufacturing
Green energy storage solutions
Battery technologies
Innovations in agriculture

Semiconductors becoming the Critical Technology to National Competitiveness

Major Research & Development and science centers working on semiconductor materials and devices developement (including IC and PIC design):

Łukasiewicz Research Network:

- Łukasiewicz-Institute of Microelectronics and Photonics (IMiF) (Warsaw)
- Łukasiewicz-PORT (Wroclaw)
- Łukasiewicz-Tele and Radio Research Institute (Warsaw)

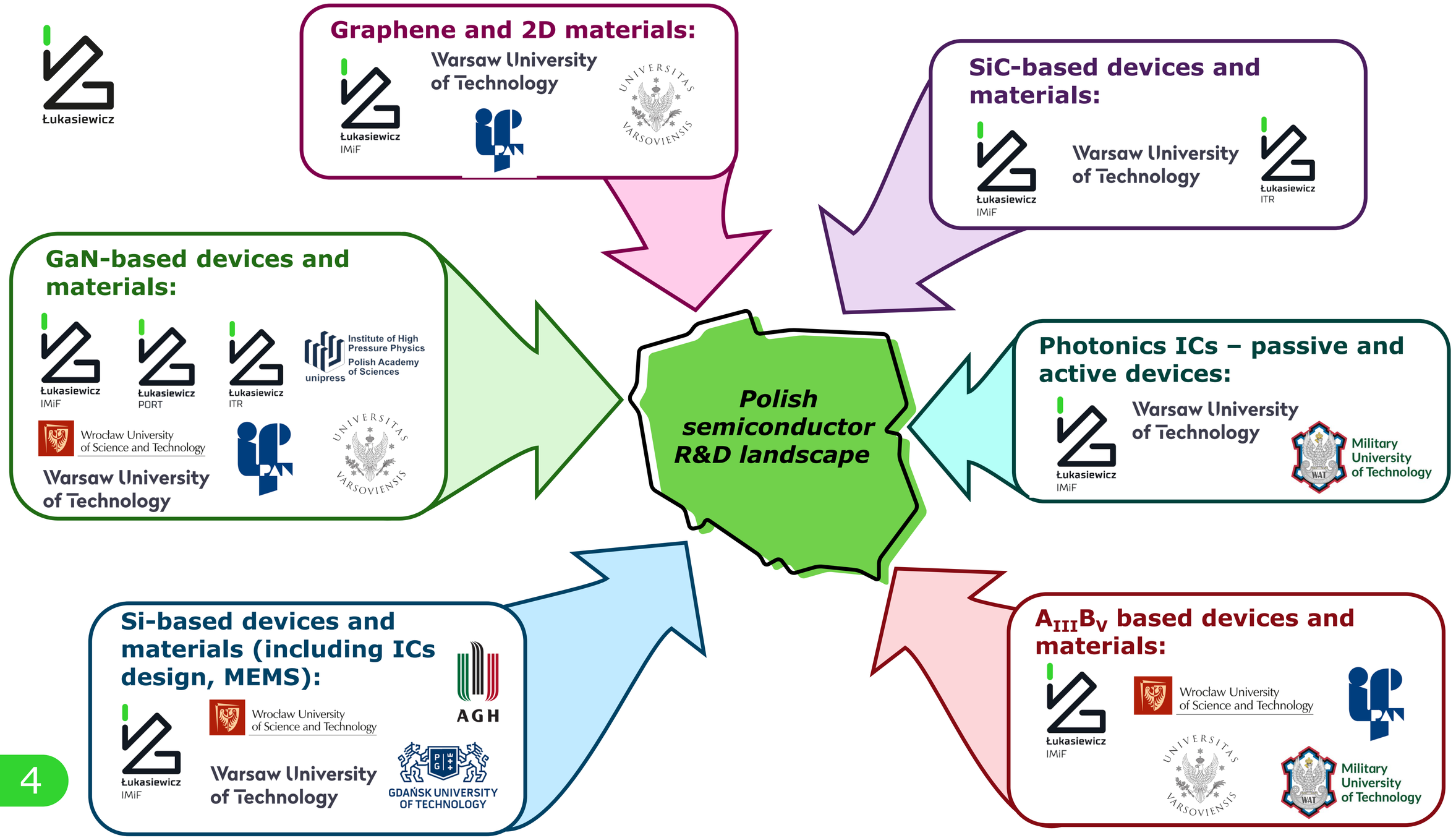
Universities:

- Warsaw University of Technology and Center for Advanced Materials and Technologies CEZAMAT WUT
- Wroclaw University of Science and Technology
- AGH University of Krakow
- Gdańsk University of Technology
- University of Warsaw
- Military University of Technology (Warsaw)

Polish Academy of Sciences:

- Institute of High Pressure Physics (Warsaw)
- Institute of Physics (Warsaw)

and many others involved in application of semiconductor devices (including several Łukasiewicz Institutes)


Graphene and 2D materials:
Łukasiewicz IMiF
Warsaw University of Technology
SiC-based devices and materials:
Łukasiewicz IMiF
Warsaw University of Technology
Łukasiewicz ITR
GaN-based devices and materials:
Łukasiewicz IMiF
Łukasiewicz PORT
Łukasiewicz ITR
Institute of High Pressure Physics Polish Academy of Sciences
unipress
Wrocław University of Science and Technology
Warsaw University of Technology
Polish semiconductor R&D landscape
Photonics ICs – passive and active devices:
Łukasiewicz IMiF
Warsaw University of Technology
Military University of Technology
Si-based devices and materials (including ICs design, MEMS):
Łukasiewicz IMiF
Wrocław University of Science and Technology
AGH
Warsaw University of Technology
GDAŃSK UNIVERSITY OF TECHNOLOGY
AIIIBV based devices and materials:
Łukasiewicz IMiF
Wrocław University of Science and Technology
Military University of Technology

Łukasiewicz in the SMT ecosystem

Institute of High Pressure Physics
Polish Academy of Sciences
unipress

ITRI
Industrial Technology Research Institute

imec

cnrs

SAULE TECHNOLOGIES

intel

Infineon

VIGO PHOTONICS

TRUMPF
TRUMPF Hüttinger

PPTF
Polska Platforma Technologiczna Fotoniki

NARLabs
國家實驗研究院
National Applied Research Laboratories

Fraunhofer

UMC

Current SMT Capability in Poland:

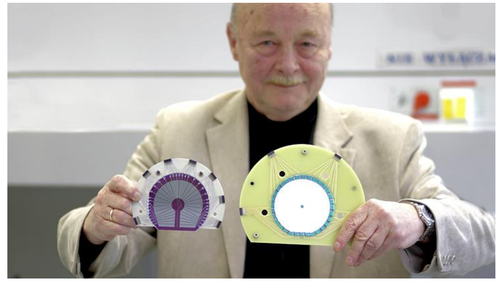
Commercial production:

- Vigo Photonics – worldwide leader in uncooled infrared detectors and modules (HgCdTE, InAs, InAsSb), A^{III}-B^{V} epitaxial wafers (InGaAs, VCSEL, QCL)
- Intel (anounced) - Assembly and Test Facility (planned to build in 2027), $4.6 bilion USD investment

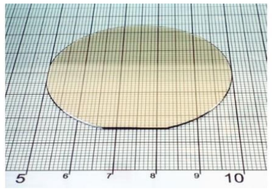
https://www.intel.com/content/www/us/en/newsroom/news/intel-plans-assembly-test-facility-poland.html

Small-scale or R&D production and technology developement:

- Łukasiewicz – IMIF - Si ICs, MEMS, photodetectors; GaN devices; A^{III}-B^{V} QCL, and photodetectors; IC design; materials: A^{III}-B^{V} epitaxial wafers, SiC epitaxial wafers and bulk crystals, Graphene, GaN epitaxial wafers
- Unipress PAS - GaN blue lasers and LEDs, GaN material (epitaxial wafers and 2” bulk crystals)
- Saule Technologies - Inkjet-Printed Perovskite Solar Cells
- Polish Platform of PICs (under developement) – VIGO, WUT and Łukasiewicz-IMiF



Łukasiewicz-IMiF alpha-particle detectors used in the experiments leading to discovery of new 112, 114 nad 117 elements

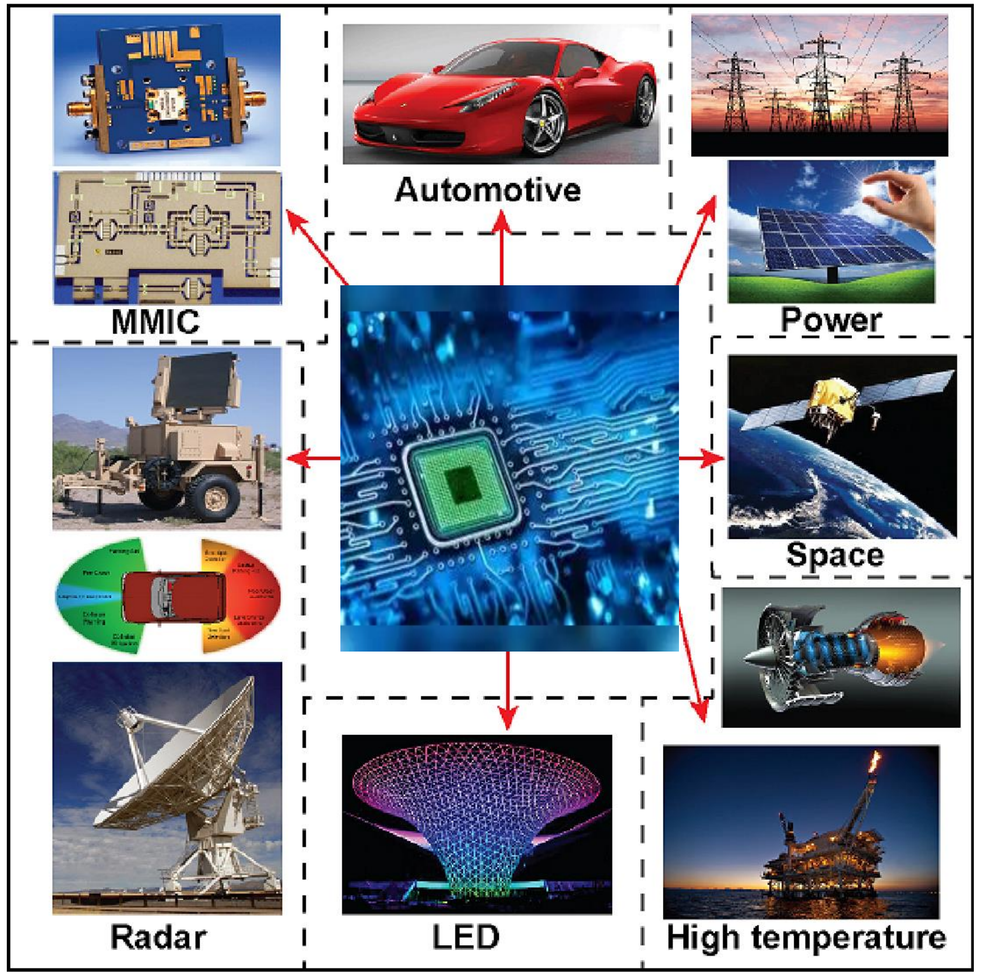


2” inch GaN bulk wafers developed at Unipress PAS

Commercial ICs Design:

Semiconductor Industry Customers in Poland

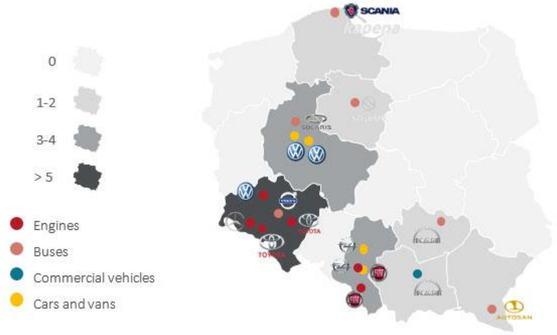
- **Electronics manufacturers** (power supplies, inverters and converters)
- **Car manufacturers and suppliers** (car chargers, LIDARs, steering electronics)
- **Aerospace and defense** (radar systems, electronic warfare, communications systems)
- **Telecommunication** (base stations, radar and satellite communication systems)
- **Renewable Energy** (solar energy inverters and wind turbine converters)
- **Industrial automation** (motor drives, robotics)
- **Consumer electronics** (chargers, adapters and power banks)
- **Radio frequency** (spectrum analyzers, signal generators and network analyzers)
- **Broadcasting** (television and radio transmitters)
- **Industrial and scientific applications** (plasma generators, scientific research equipment and high-frequency heating systems)



Semiconductor Industry Customers in Poland

Automotive and electromobility industry

- Polish Automotive Sector (OEM plants)



- The largest first- and second-tier subcontractors in Poland

- LG Energy Solutions – the largest EV battery factory in the world is being built near Wrocław

- Izera - Polish manufacturer of electric cars

Industrial Electronics Systems

- International and domestic companies: Medcom, Trumpf Huttinger, Mitsubishi, ABB, Hitachi, ASTAT, Amtek, Arrow Electronics, Dacpol, Fideltronik, MEDCOM

ABB ASTAT Fideltronik HITACHI Inspire the Next

TRUMPF TRUMPF Hüttinger

High power lasers and power electronics for semiconductor industry: EUV sources for ASML, power supplies for crystal growth (Czochralski, Flat-zone, PVD), power supplies for coating technologies PVD, PECVD, ALD

Areospace, space and defence sector

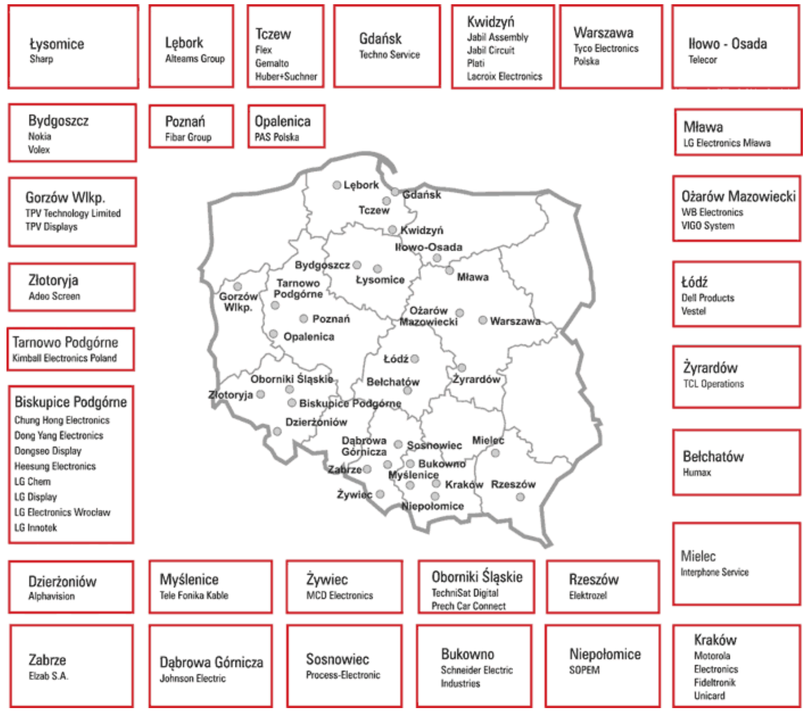
(UAV, radars, missles, detectors)

PGZ WB ELECTRONICS WB GROUP TELESYSTEM PITRADWAR THORIUM SPACE TECHNOLOGY

- Manta – polish Unmanned Aerial Vehicle from WB Electronics

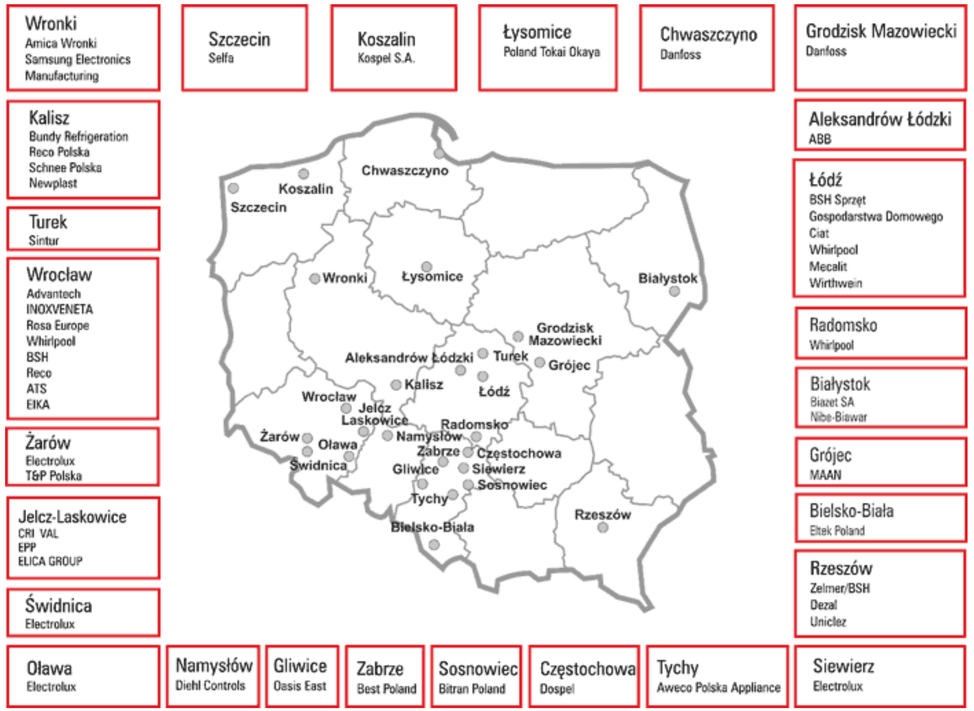
Semiconductor Industry Customers in Poland

Electronic industry



- **Dell** - production of desktops and servers
- **Kimball Electronics** - production of electronic components for telecommunications and the automotive industry
- **LG Display Poland** - production of liquid crytal displays
- **LG Electronics** - production of television sets and consumer devices
- **Nokia** - production of telecommunications equipment and other consumer devices
- **Sharp** - production of television sets
- **TCL Operations Polska -** production of electronics
- **TPV Technology** - production of computer monitors

White Goods industry



Global companies representing the household appliances sector have located their factories in Poland

- **BSH Bosch und Siemens Hausgeräte GmbH**
- **Electrolux**
- **Whirlpool**
- **LG**
- **Samsung Electronics**
- **Elica**

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Head of Commercialization

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