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ARCES-ST Joint Lab: A Success Story

Pier Luigi Rolandi

Smart Power Technology R&D STMicroelectronics

Bologna, February 17th 2023

STMicroelectronics: creators and makers of technology

One of the world's largest semiconductor companies

Over **50,000** employees of which **9,000+** in R&D

$16.1 billion revenues in 2022

Over **80** sales & marketing offices serving over **200,000** customers across the globe

14 main manufacturing sites

Signatory of the United Nations Global Compact (UNGC)
Member of the Responsible Business Alliance (RBA)

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As of December 31, 2022

Global presence

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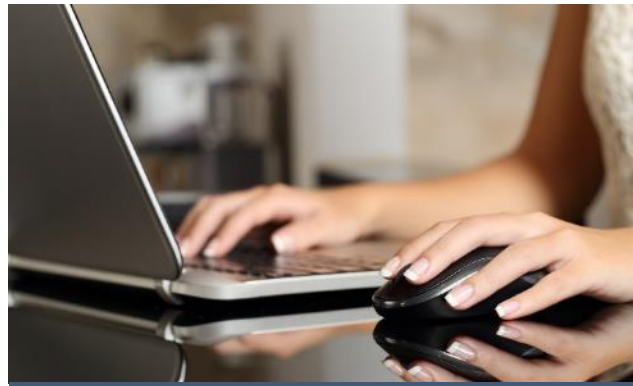
We address four end markets

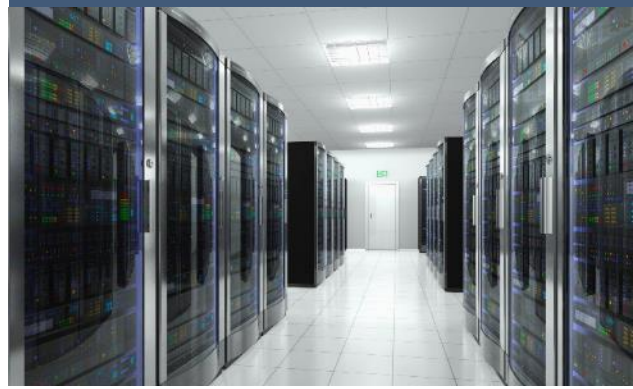
Automotive

Industrial

Personal electronics



Communications equipment, computers & peripherals



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We are drivers of your innovation

Advanced R&D centers around the world for close collaboration with operations, customers, and partners

9,000+ people working in R&D and product design

~12% of revenues invested in R&D in 2022

~200 active R&D partnerships

~**19,500** active and pending patents

~600 new filings in 2022

Open innovation with startups in **15** Proof of Concept centers

50 startups engaged in our programs

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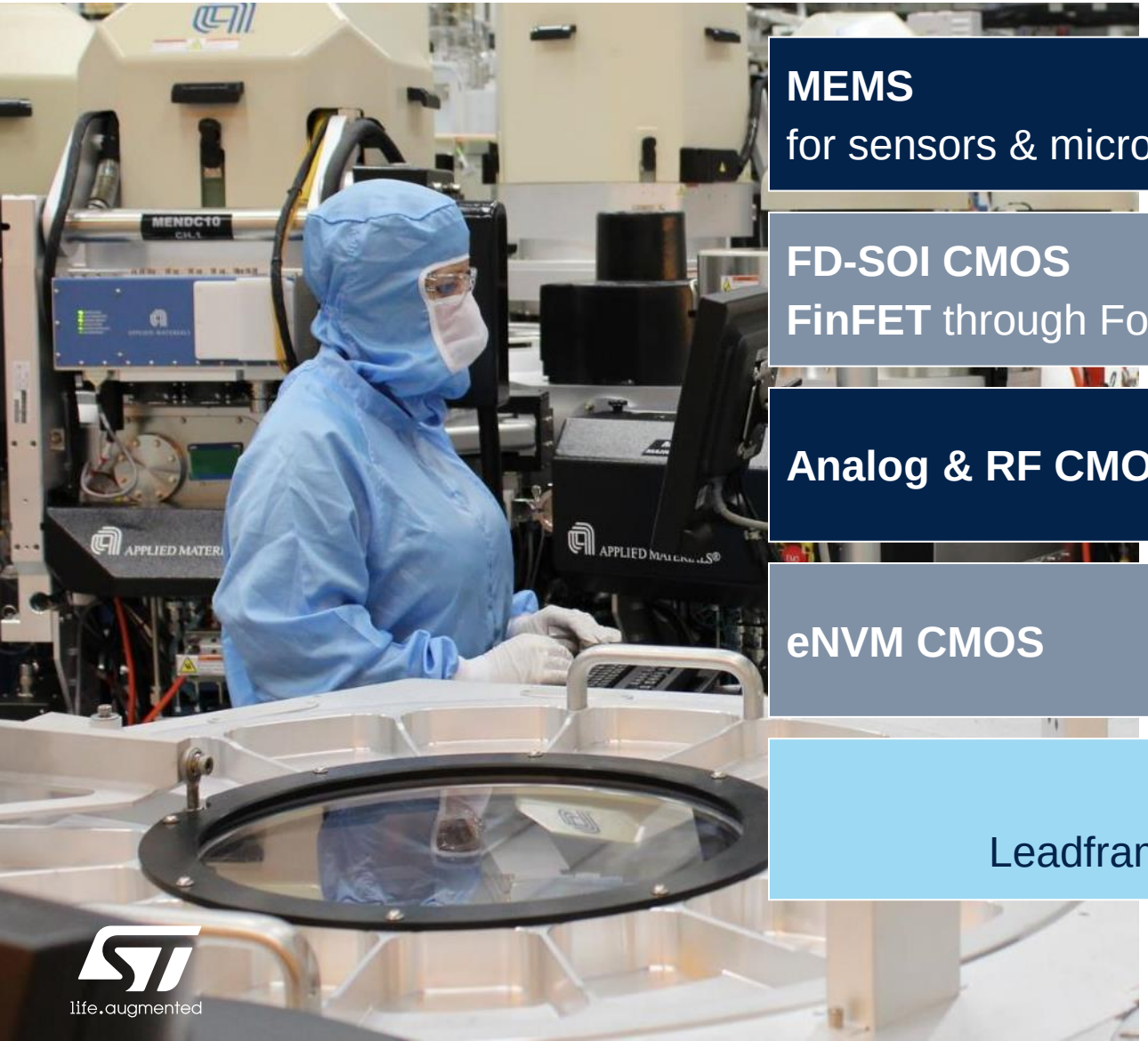
Differentiated technologies are our foundation



MEMS
for sensors & micro-actuators

Smart Power: BCD
(Bipolar - CMOS - Power DMOS)

FD-SOI CMOS
FinFET through Foundry

Discrete, Power MOSFET, IGBT
Silicon Carbide, Gallium Nitride

Analog & RF CMOS

Vertical Intelligent Power

eNVM CMOS

Optical sensing solutions

Packaging technologies
Leadframe – Laminate – Sensor module – wafer level

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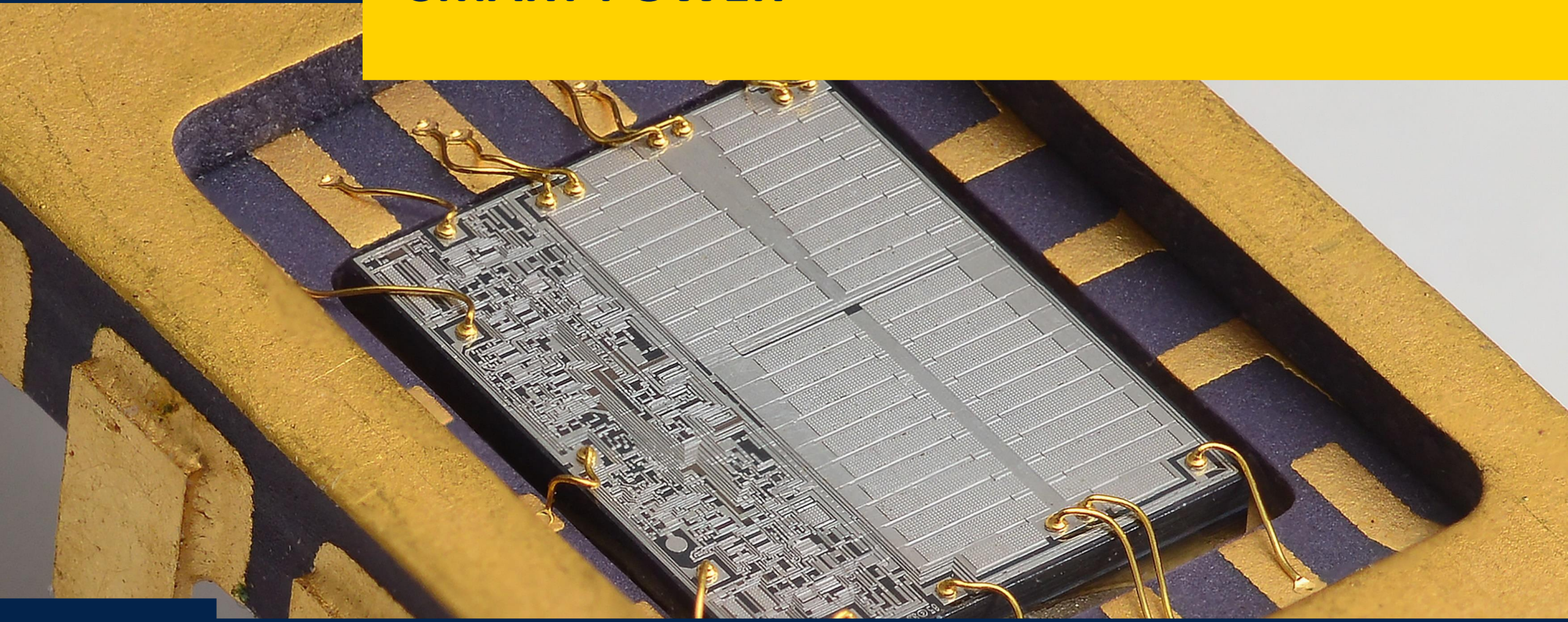
SMART POWER



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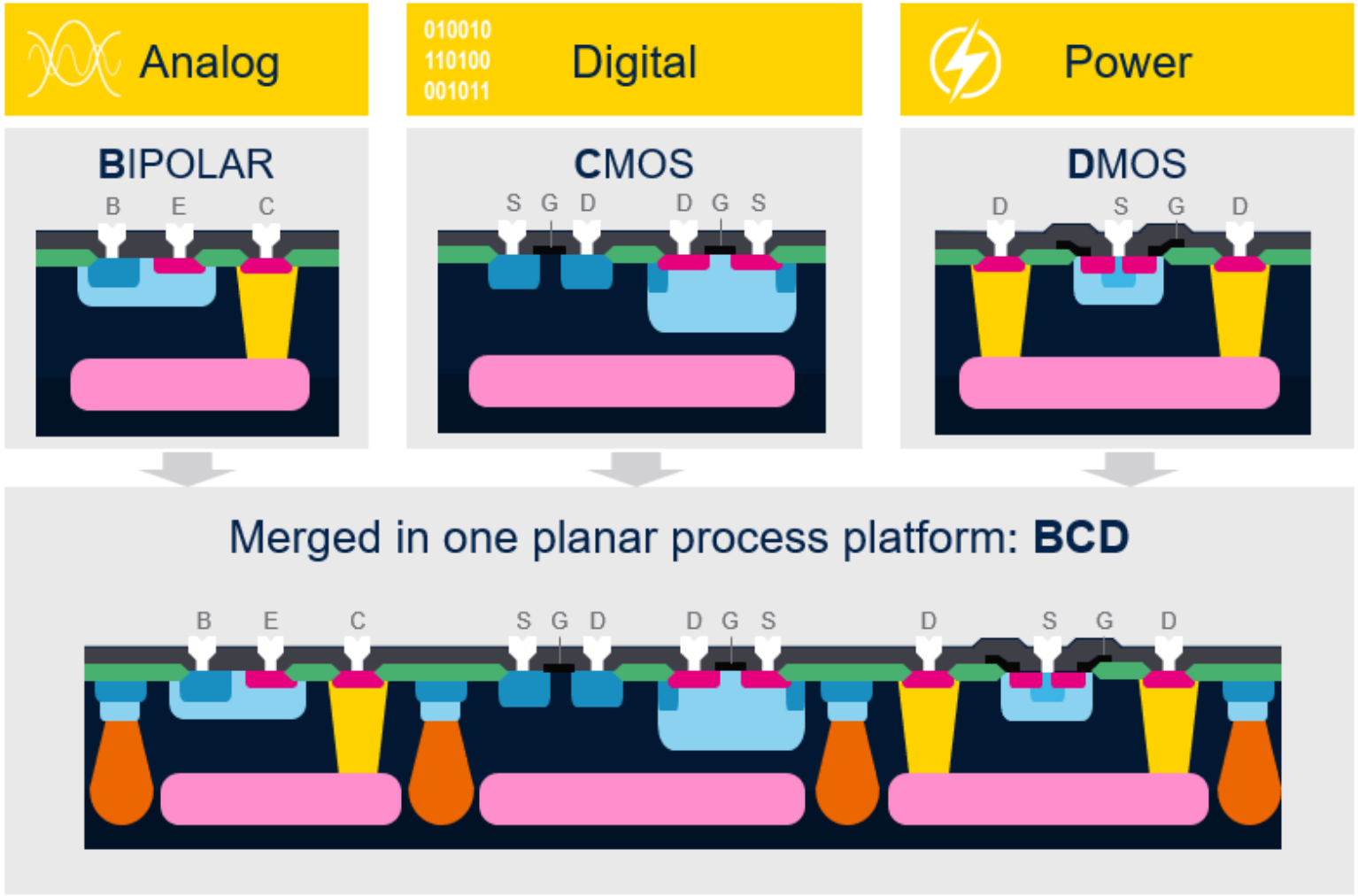
BCD : BIPOLAR CMOS power DMOS



more than

40 billion

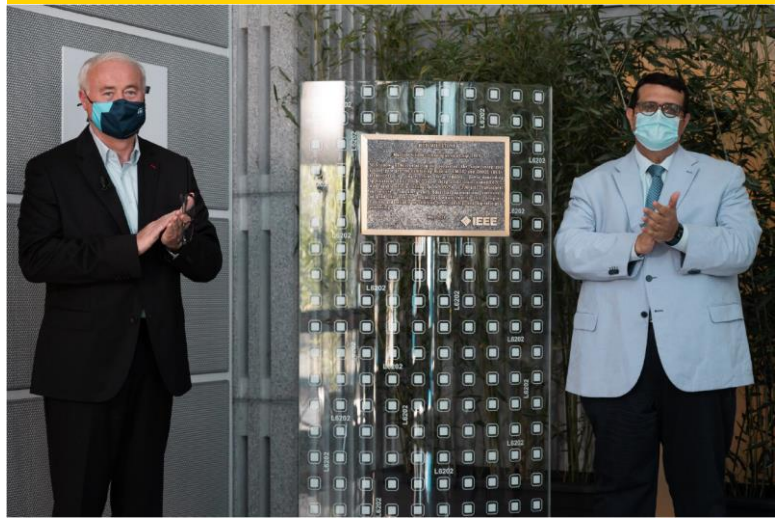
BCD devices

sold to date

SMART POWER

CORNAREDO

AGRATE



IEEE MILESTONE

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Strategic manufacturing programs

300 mm capacity expansion

Crolles

Agrate

Doubling 300 mm footprint by 2025

Wide bandgap capacity expansion

Catania – Silicon Carbide

Tours – Gallium Nitride

Expanding production capacity

Internal vertical integration & external parterships

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Joint Lab

First Joint Lab Agreement 18 May 1998

UNIVERSITÀ DEGLI STUDI DI BOLOGNA

SGS-THOMSON MICROELECTRONICS

PRESS RELEASE COMMUNIQUE DE PRESSE COMUNICATO STAMPA PRESSEINFORMATION

L' UNIVERSITA' DI BOLOGNA E SGS-THOMSON MICROELECTRONICS SIGLANO ACCORDO DI COLLABORAZIONE PER LA RICERCA

Laboratorio congiunto per la progettazione di sistemi microelettronici
Ricerca e formazione gli obiettivi dell'accordo

Bologna, 14 maggio 1998 - L'Università di Bologna e la SGS-THOMSON Microelectronics - tra i principali gruppi mondiali nel campo della microelettronica - hanno firmato un accordo di collaborazione per costituire un laboratorio congiunto per la progettazione di sistemi

2002 Joint Lab ARCES-ST opening in this site
(with P. Pistorio – Rettore Calzolari)

Joint Lab Regular meeting 5th October 2016
(with C. Papa – Rettore Ubertini)

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Joint Lab

A Successful Collaboration

- Strong iteration between industrial and academic researchers
- Access to advanced ST technologies and Design Platforms
- Excellence in teaching and education for talent development
- Multi-disciplinary expertise in different research area
- Foster sustainable innovation and technology

Results

- Continuous funding along more than 20 years: in 2022: 5 PhD grants, 9 AdR grants (**+ 80%**) , 4 industrial internships
- Joint Participation in European Projects: 6 are currently active
- Know-how and technology transfer
- Several Scientific publications
- Intellectual Property: more than 60 patents (6 patents filed in 2022)
- Several PhD and graduates hired in ST during the years (4 hired in 2022)

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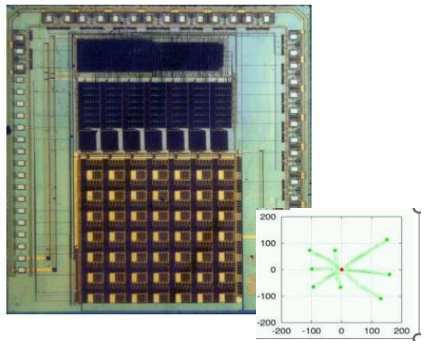
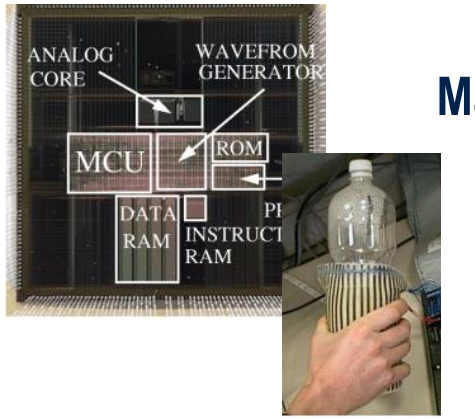
20 years of joint projects

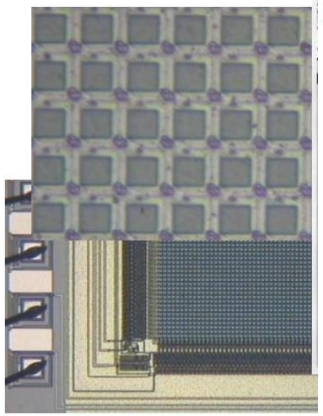
CMOS touch-pointer capacitive sensor
1998

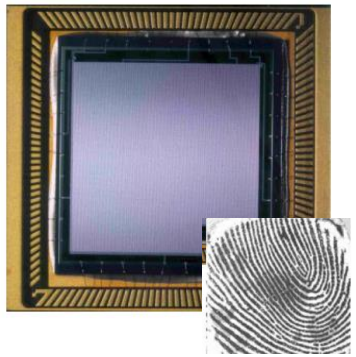


Textile capacitive pressure sensor
2002



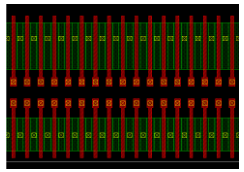
CMOS Camera
1995



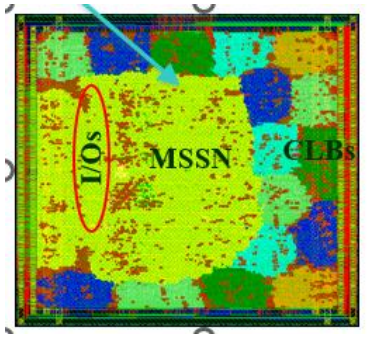


Fingerprint capacitive sensor
1996

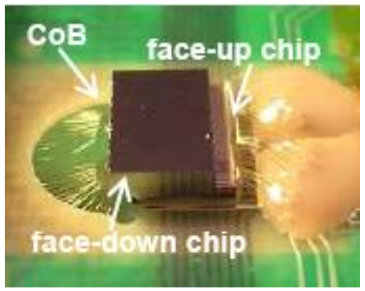
Mask Programmable ECO
2008



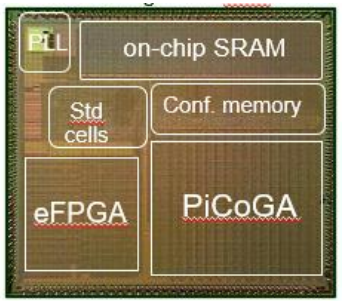
Embedded FPGA
2015

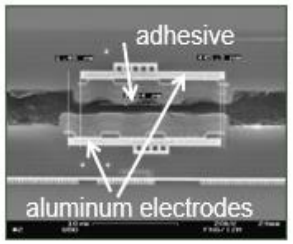


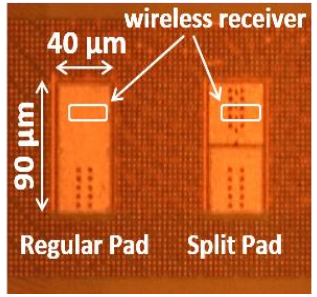
3D Capacitive coupling
chip to chip communication
2008-2013



Reconfigurable Computing
2001-2005







Wireless Probing
2013

1990 2000 2010 2015

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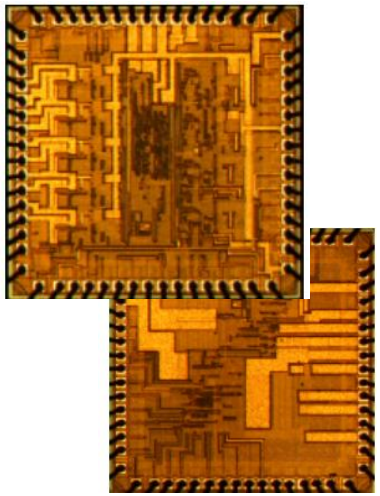
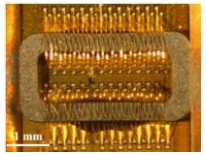
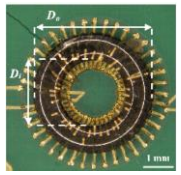
20 years of joint projects

Nano power conversion Energy Harvesting

2013-2016







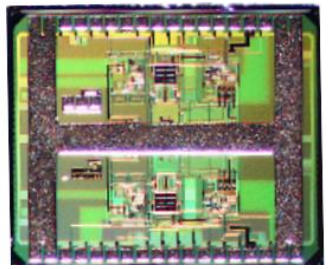
2015

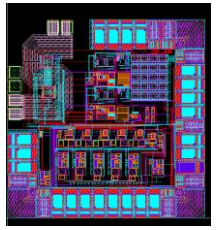
Energy Autonomous wireless IoT sensor node

2016

Hall current Sensor

2018-2023

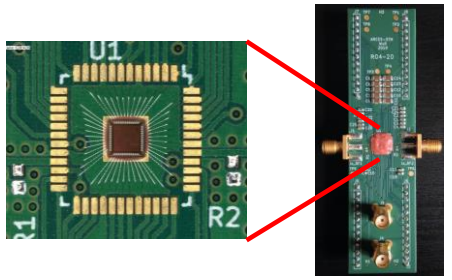


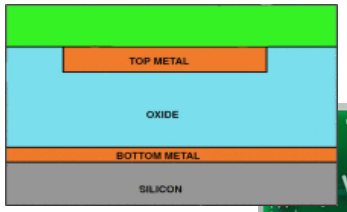


2020

Wake up radio

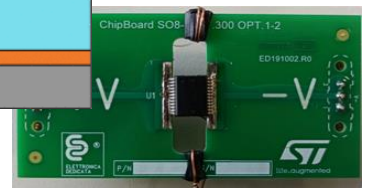
2019-2023





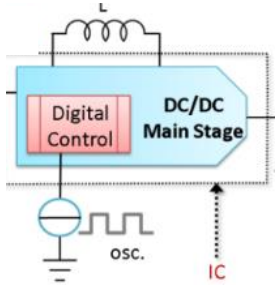
Galvanic Isolation

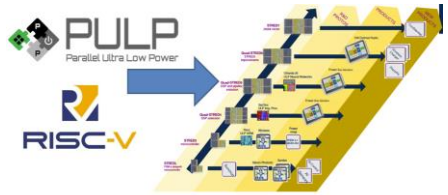
2021-2023



DC/DC power converter

2023



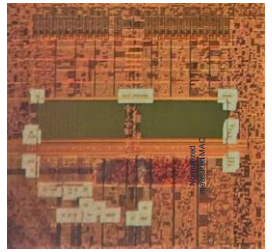


RISC-V Vector Processor

2022-2023

Analog In-memory Computing based on PCM

2021-2023



2023

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Summary

Win - Win long term and still growing partnerships

Very good and consolidated working relationships

- Trust and synergies between University researchers and industrial researchers

Strategical for fostering our R&D and innovation roadmap

- New ideas in multi disciplinary area
- New technology/IP’s/products
- Possibility to have very advanced and sometimes also “risky” R&D

Very important to sustain our growth strategy

- Talent development and acquisition

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