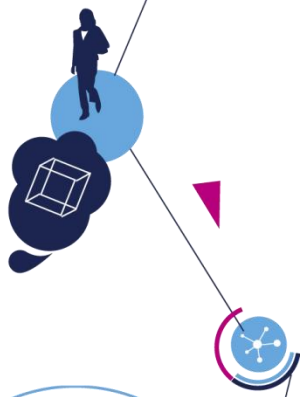

Manufacturing and Technology R&D

Jean-Marc Chery
Executive Vice President
Chief Manufacturing and Technology Officer

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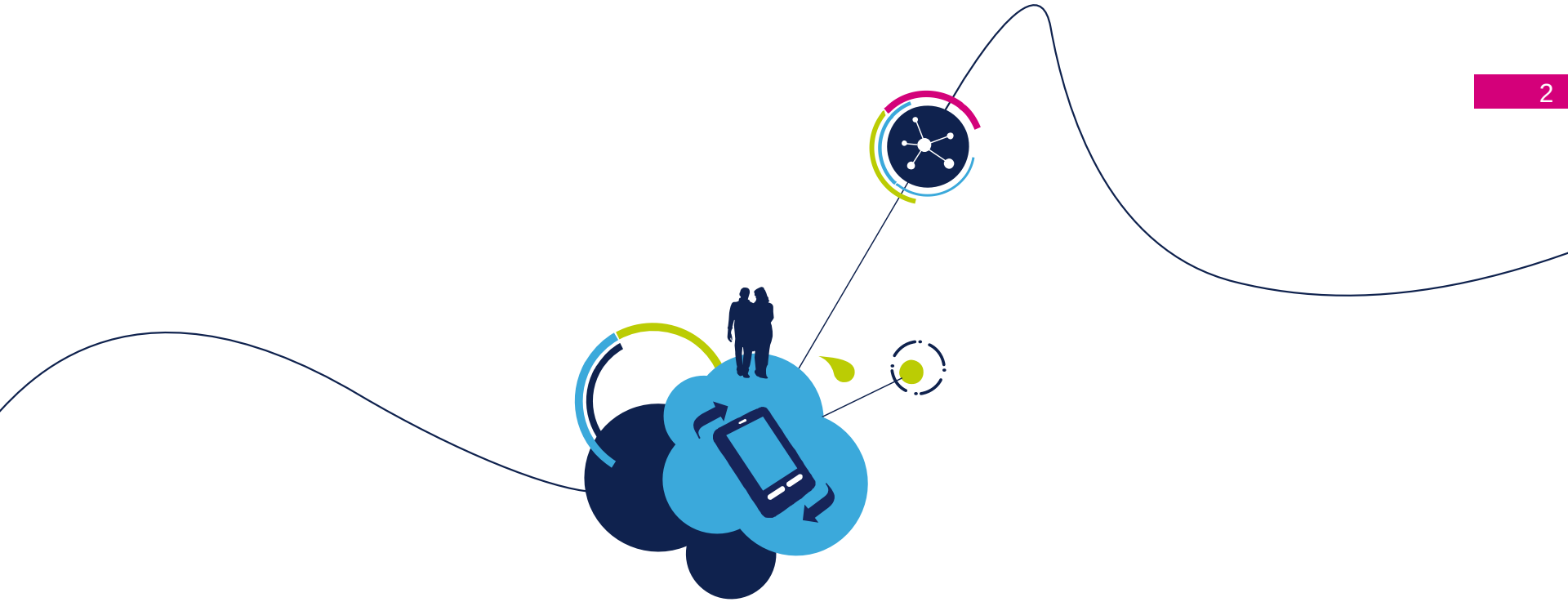

1. Introduction

Complete Products, IPs, & Technologies Portfolio

Power management | MEMS sensors | Analog | MCUs / ASICS | Automotive | Imaging | Smartphones and tablets | TV & digital set-top box

Power & Discrete | MEMS | BCD | eNVM | Analog Mixed Signal/RF | Advanced CMOS

Leadframe package leaded / leadless | MEMS | Leadframe package leaded / leadless | Laminated substrate package wired | Laminated substrate package flipchip | WLSP & 3D Integration

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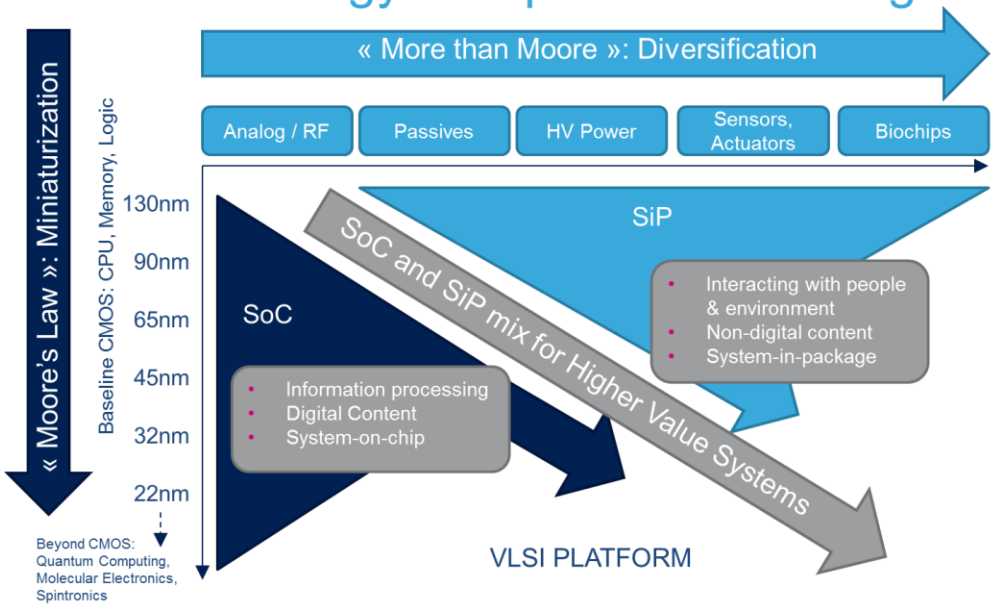
Technology R&D Model

Technology Competitive Advantage



CMOS Technology Alliances

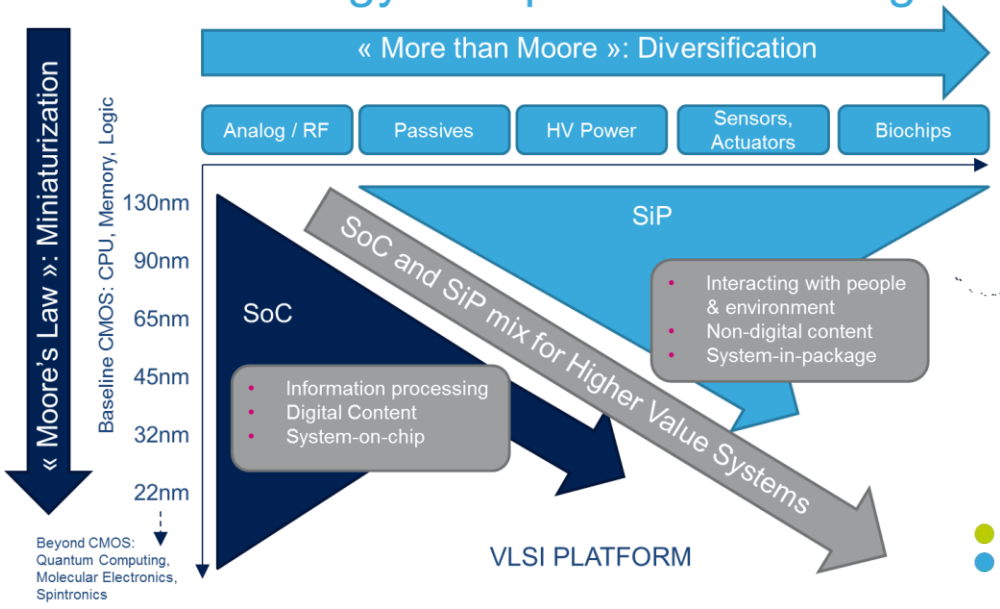
Pre T0 Alliance: Advanced R&D
- 14nn Finfet
- FDSOI

ISDA: Bulk/low-power (LP) technology
- 32/28nm
- 20nm

* Renesas is only part of the Pre T0 Alliance

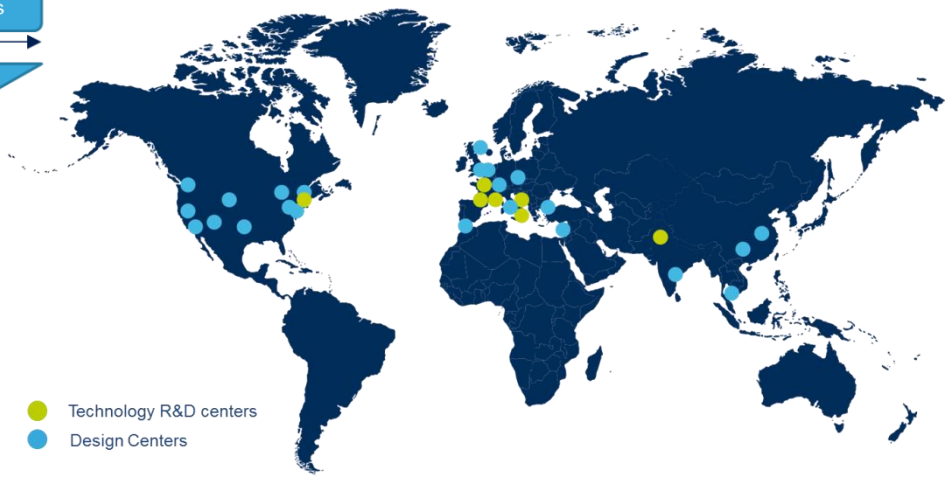
Technology R&D Model

Technology Competitive Advantage



An Unwavering Commitment to R&D

7 main technology R&D centers
39 design centers – **20,000** patents
12,000 people in technology, design, product and system R&D



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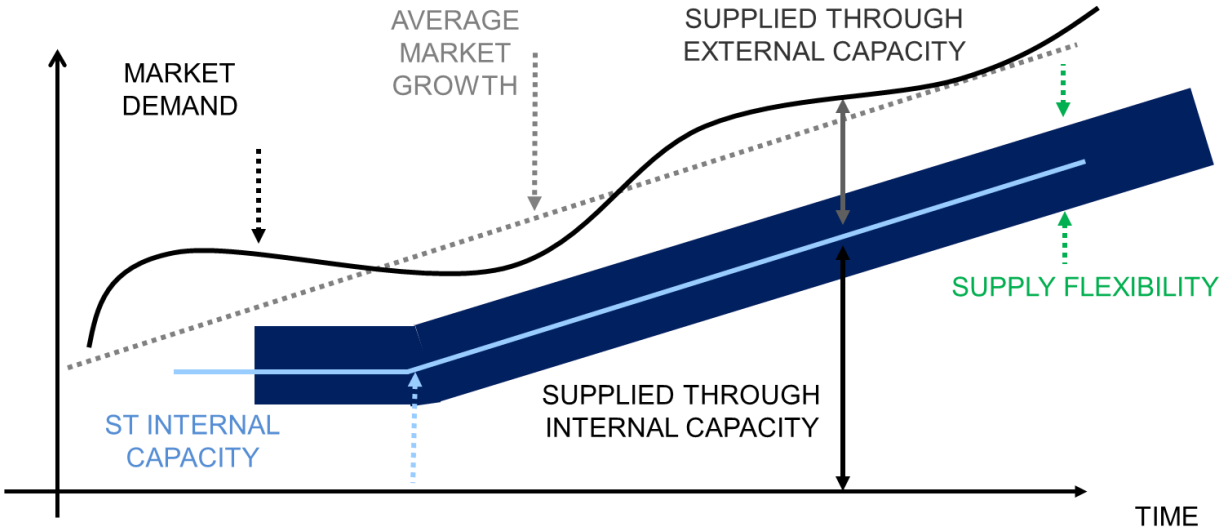
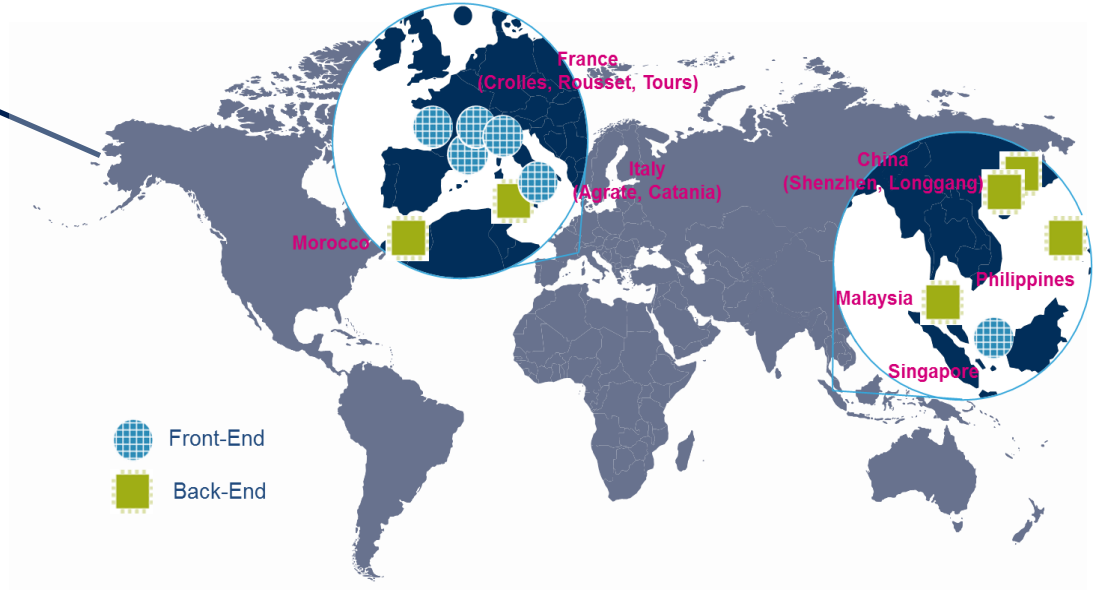
Manufacturing Model



Flexible and independent manufacturing



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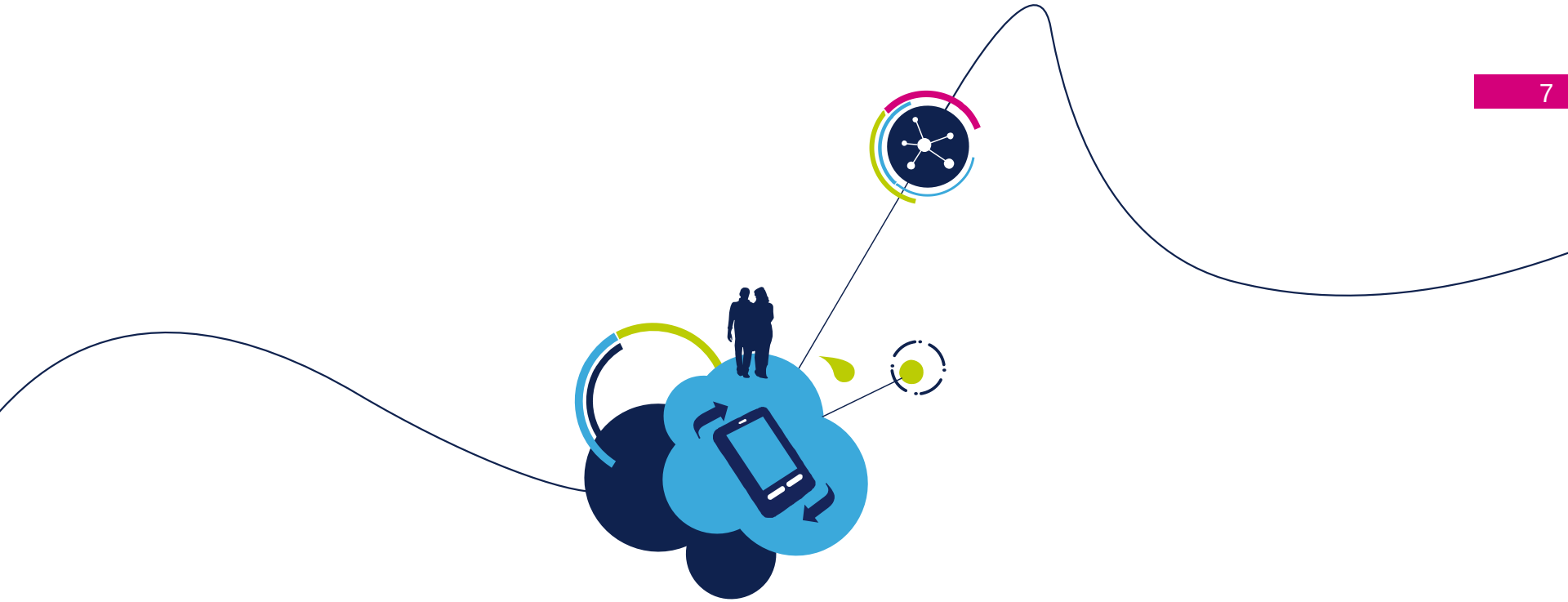
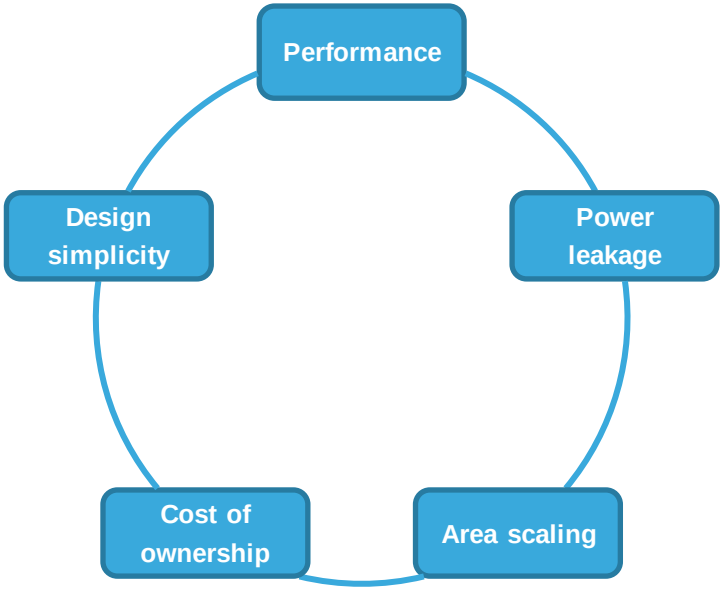


2. Technology R&D

Multimedia Convergence: The Ideal Technology

Multimedia convergence is about…

- Cloud (link between Network and Consumer equipment)
- Home servers and Gateways
- Connected Clients (OTT, Android, HTML5)
- Multi-screen, multi-application



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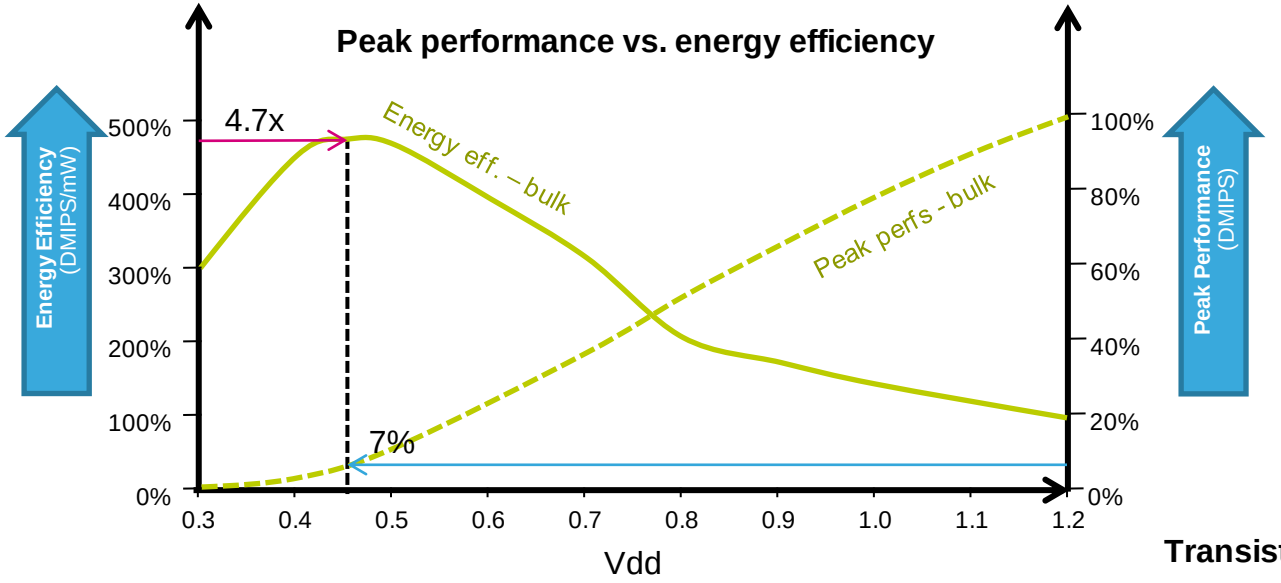
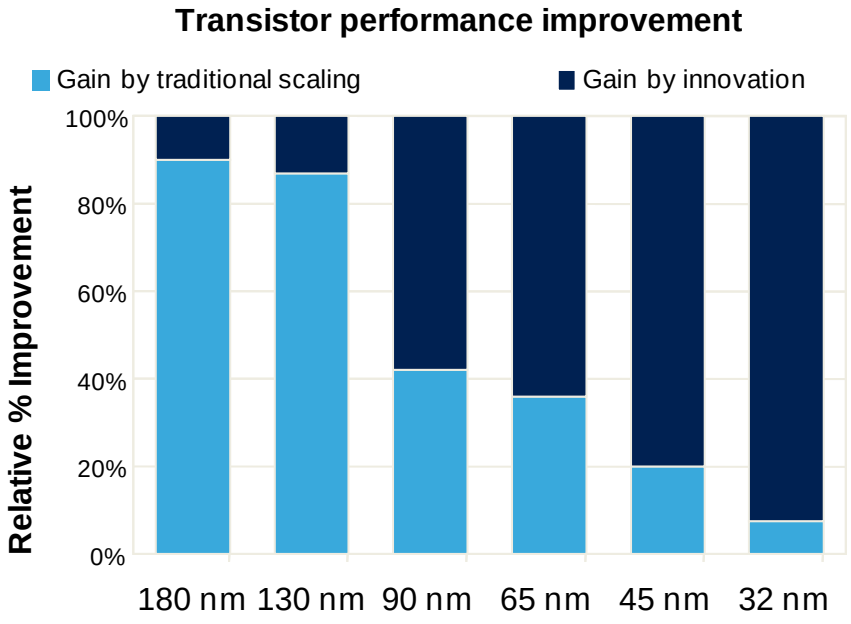
Multimedia Convergence: 28nm Bulk Weaknesses





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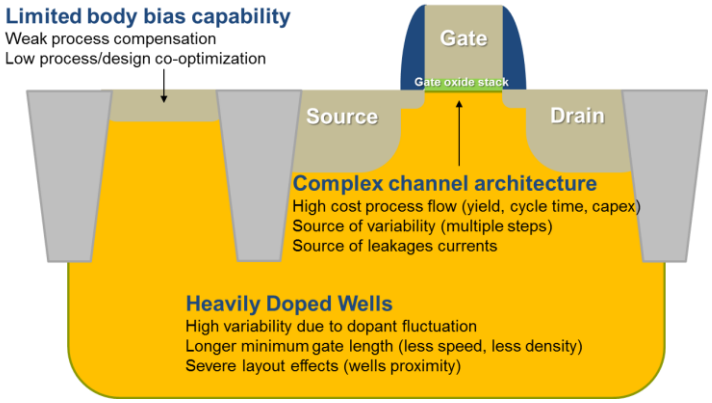
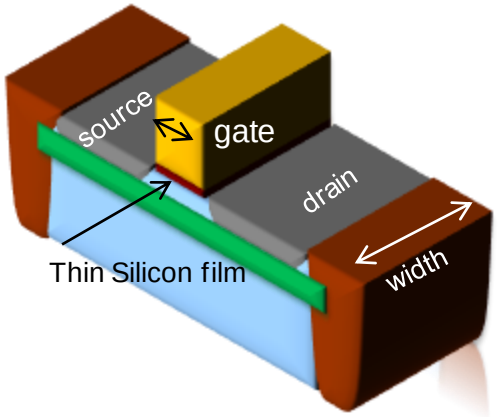
Multimedia Convergence: Fully Depleted Devices Enabling sub-20nm Technologies

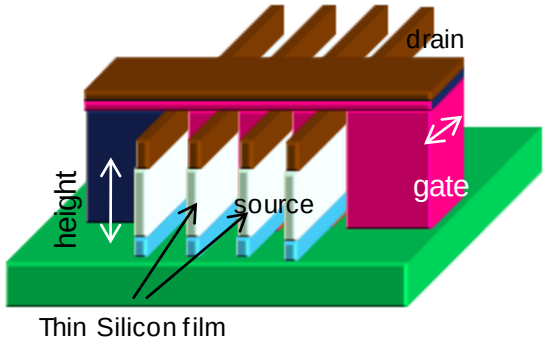
- Main candidates after bulk are fully depleted devices
  - For improved electrostatic control and device scalability



FDSOI = 2D



FinFET = 3D



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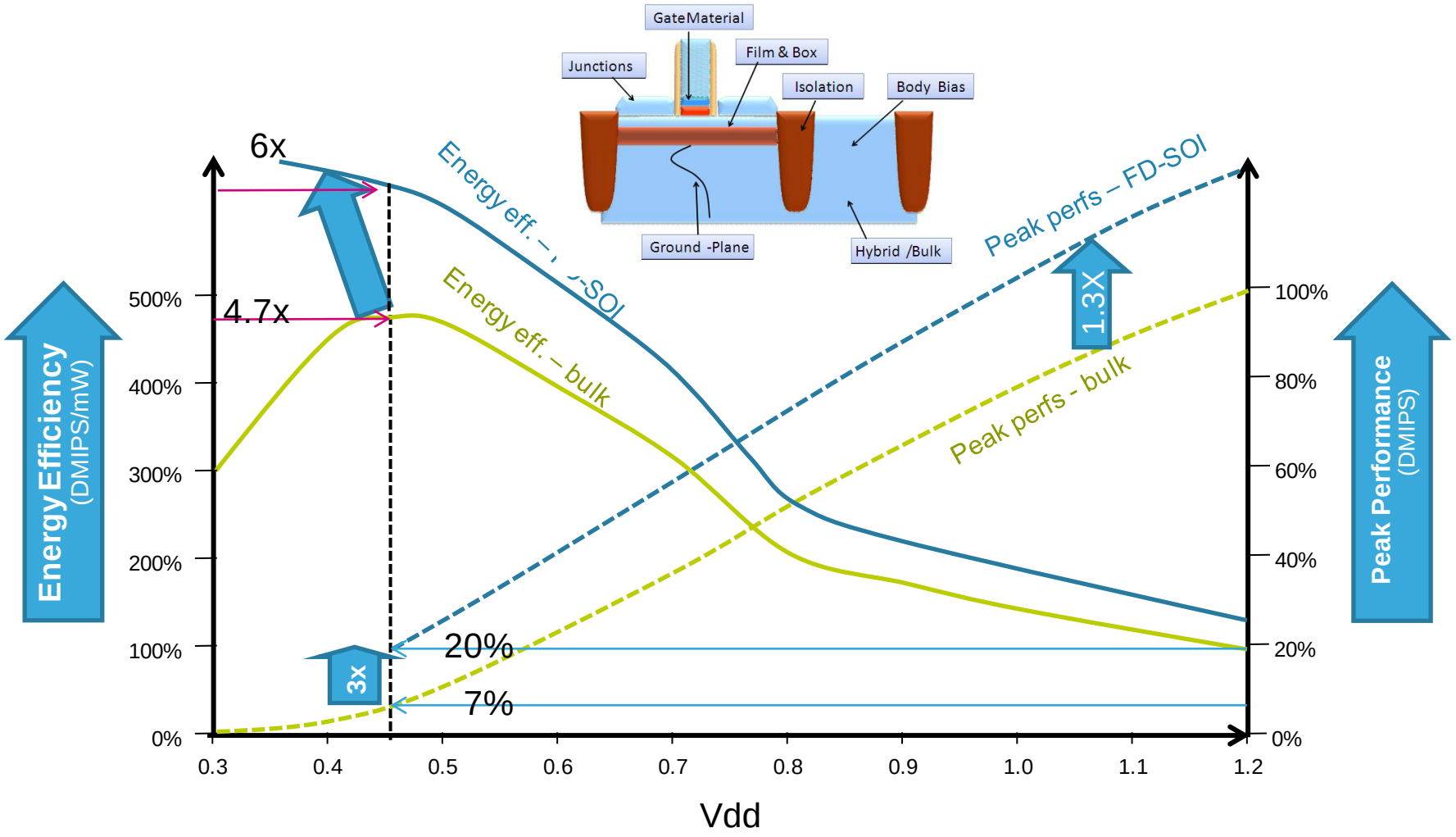
Multimedia Convergence: 28nm FDSOI Better Energy Efficiency



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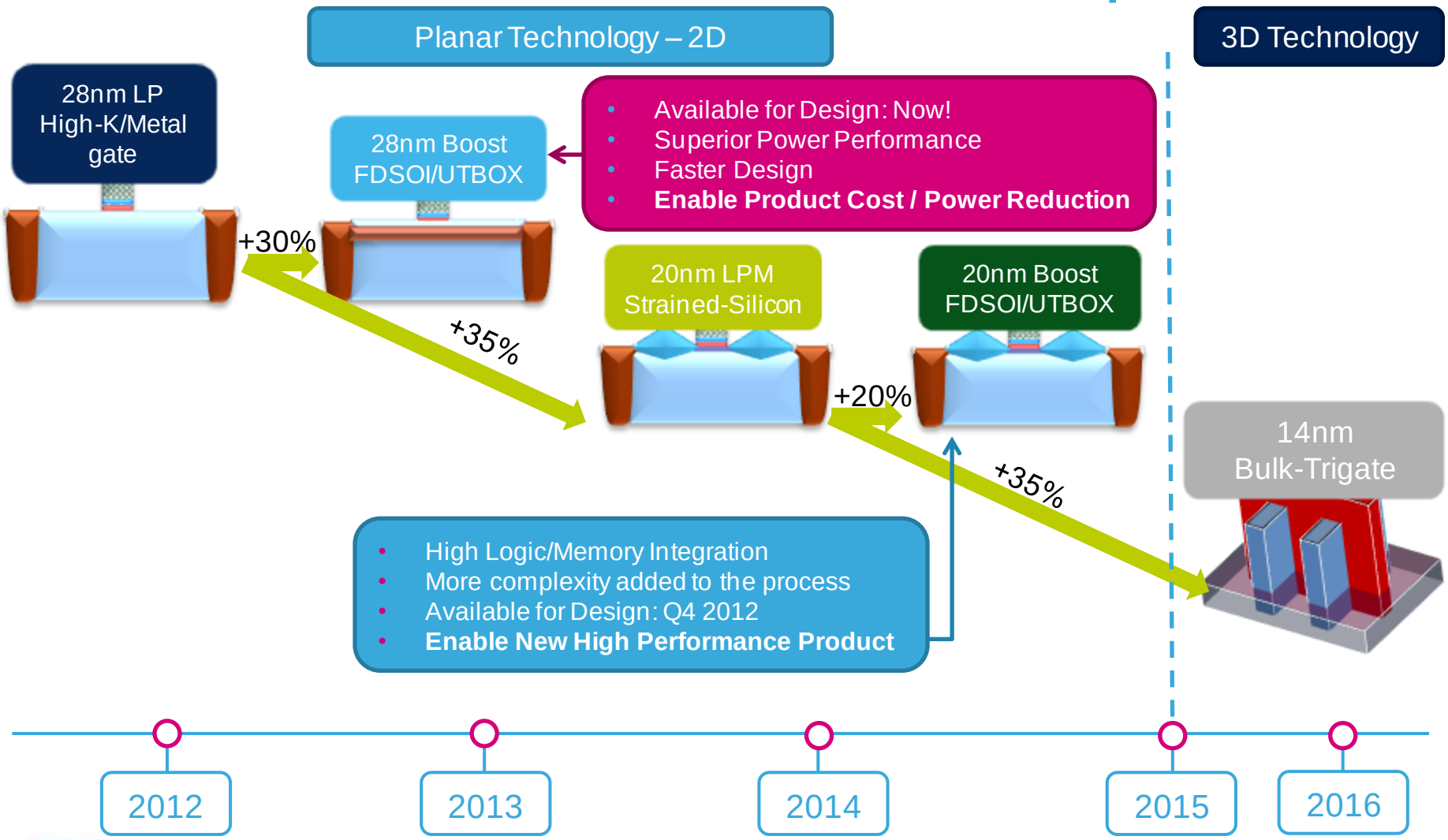
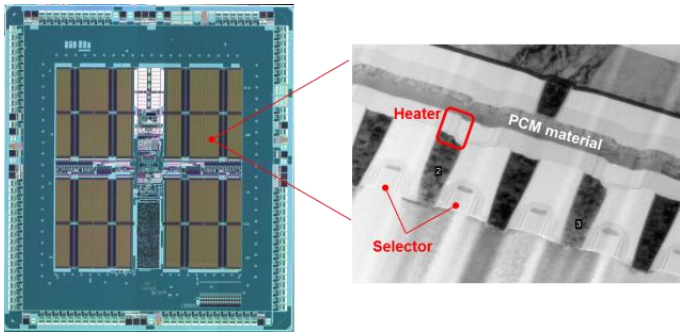
Multimedia Convergence: Value Proposition



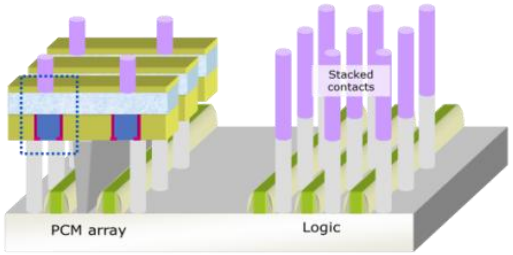
Other VLSI Key Differentiation Initiatives

- Embedded Flash PCM for future shrink nodes



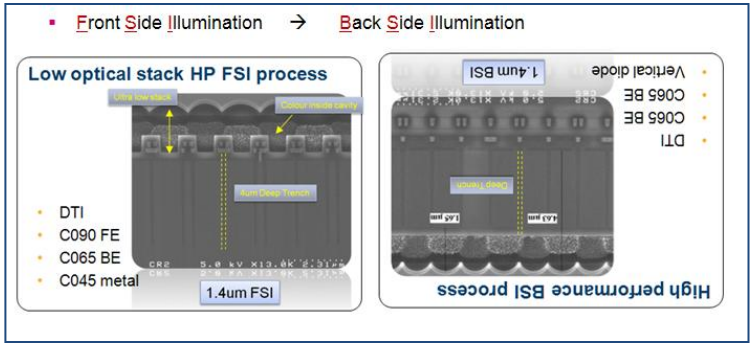
Memory Architecture

- Ultra Fast and Low Power Microcontrollers



A true 3D integration of Non Volatile Memory

- Imaging sensor with BSI on bulk



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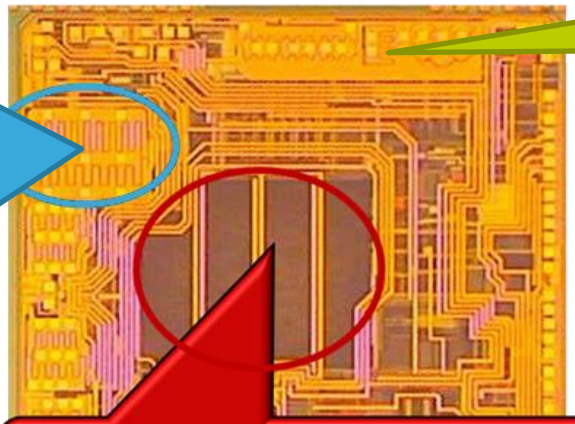
Smart Power: The Ideal Technology

POWER DEVICES

- Figures of merit:
  - Rsp = RonxA
  - Gate charge (Qg) – Fsw up to 5 Mhz
  - Safe operating area
- Trends:
  - Integration density saturating with LITHO scaling
  - Device architecture and drain engineering
  - Thick copper metallization for high current



- Thick Cu metallization & bonding over active areas

ISOLATION

- Junction isolation
- DTI (Deep Trench Isolation)
- SOI

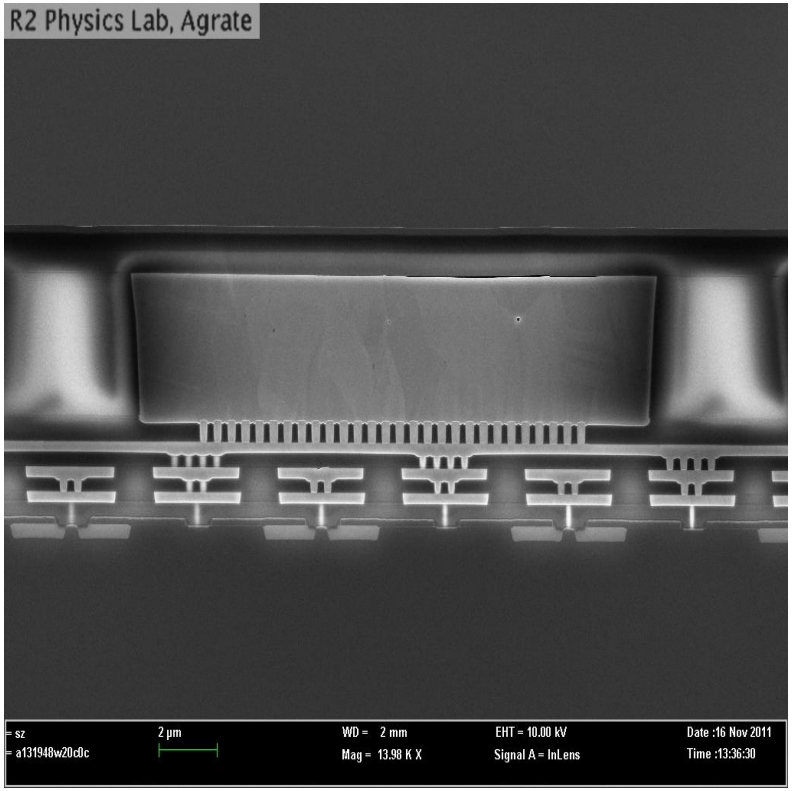
- LOGIC: from 100 K gates up to 500 K gates
- e-Memories

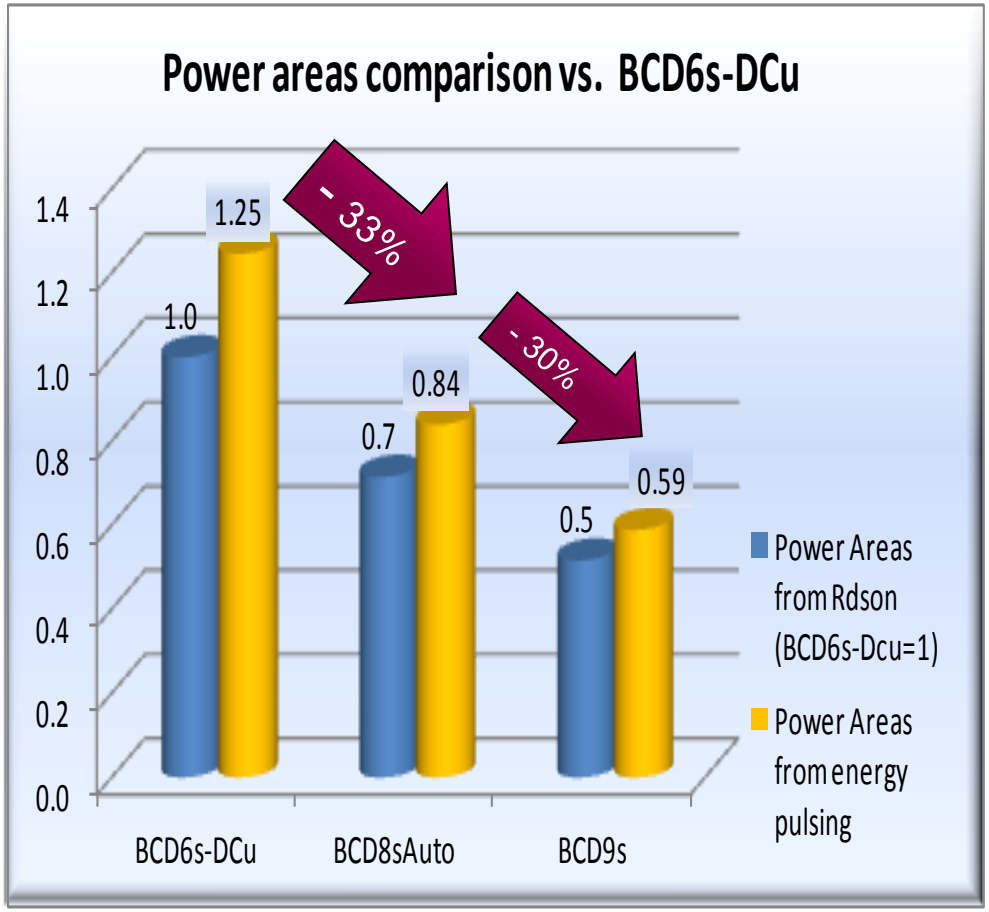
ST ROADMAP

- BCD8sP best in class for Power devices integration capabilities
- Customized solutions by application → Low Maks Count
- BCD9s (110 nm) ready for prototype in Q113 and BCD10 (90 nm) process architectures in definition phase

Smart Power: BCD9S

Full Copper Metallization





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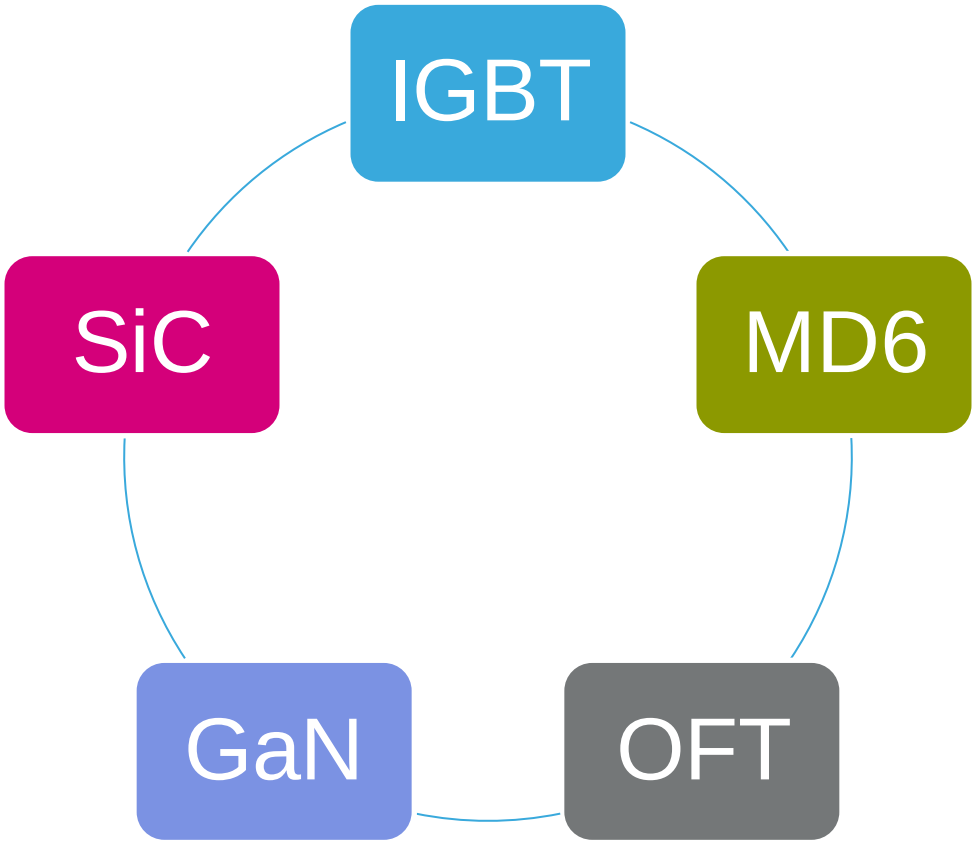
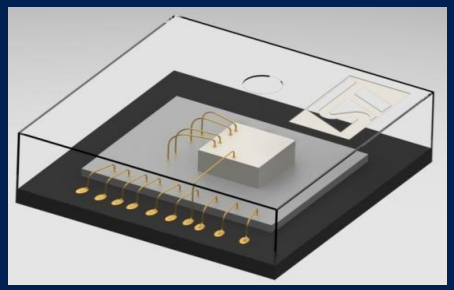
POWER: Top Priority Technology Platforms

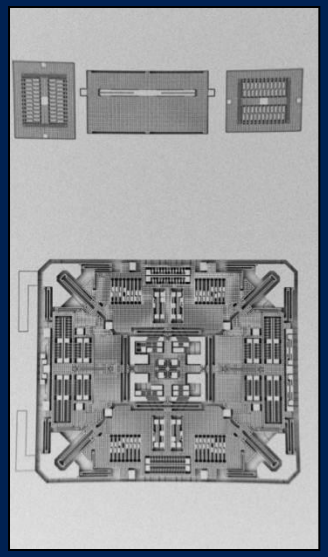


SENSE: Technology Coverage

SENSORS

- Accelerometers
- Gyroscopes
- Compasses
- iNEMO™
- Pressure
- MicroPhone

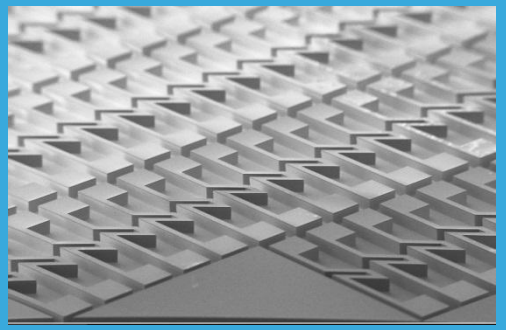




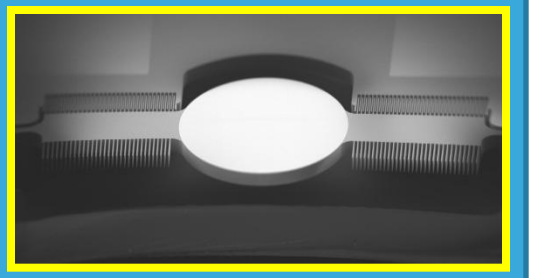
ACTUATORS

- Thermal

- Piezoelectric



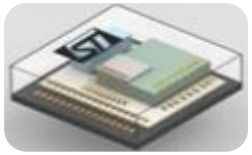
- Electrostatic

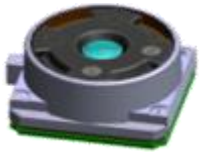


Packaging Technology R&D

Sense

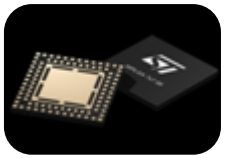
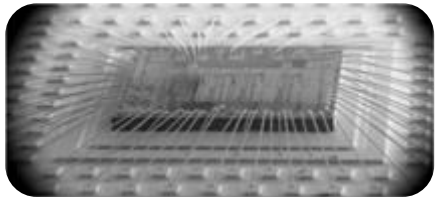
MEMS and microphones (LGAs), Optical modules and Imagers towards BSI





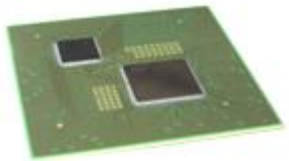
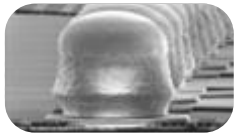
Power & BCD

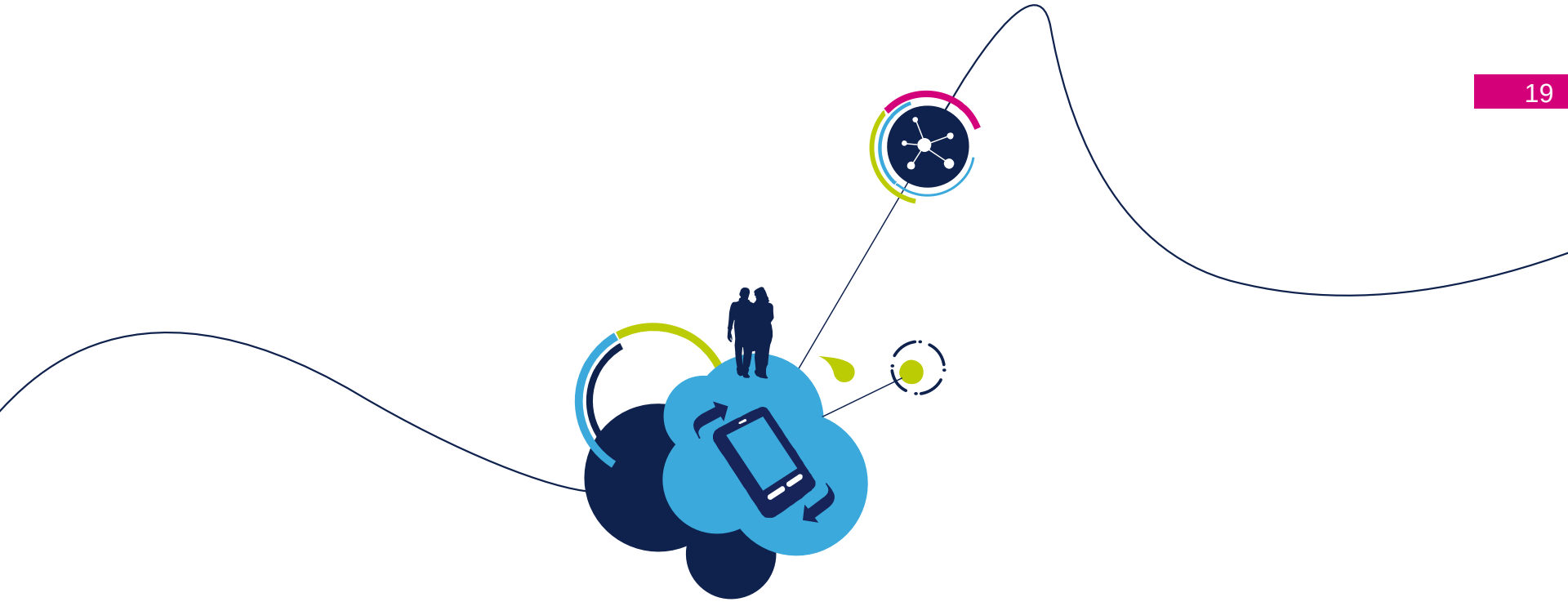
High dissipation, miniaturized packages (PSSO, QFNs)

Multimedia Convergence with advanced CMOS

Integration and miniaturization based on BGAs. Towards Flip Chip & WLP

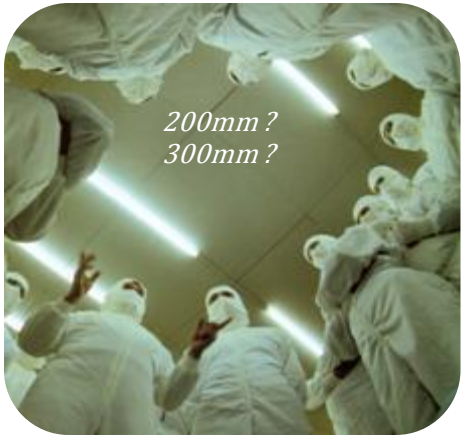


3. Manufacturing

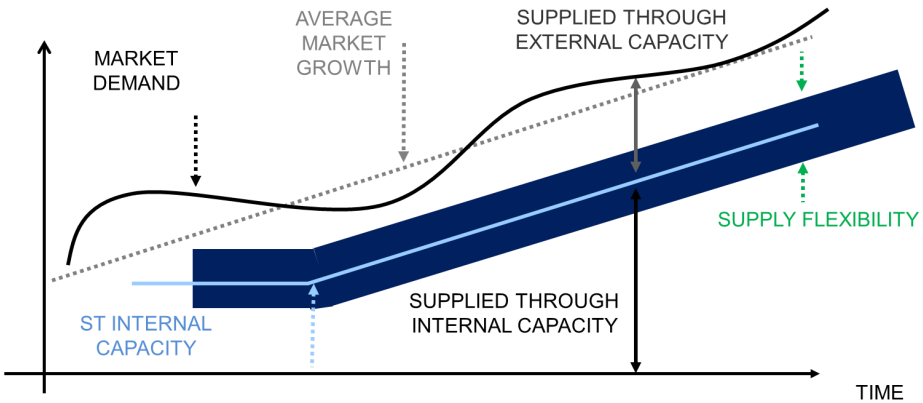
Front-End Manufacturing: Flexibility/Efficiency

Manufacturing flexibility across market cycle

- Minimize unused capacity in the downturns and lean investment to support upsides:
  - Model deployment by technology cluster better balancing internal vs. external with new major initiatives:
    - Start new generation of BCD (Smart Power) outsourcing
    - Start CMOS 28/20 nm FDSOI outsourcing
    - Start advanced CMOS Imaging Sensor with BSI
- Guarantee in-out flexible sourcing at product level
- Make fixed cost variable wherever possible



Front–End Manufacturing: Outsourcing Map



Technology / Source	First: Time to Market	Second	Alternative
CMOS 45LP	Crolles 300	Foundry*	No
CMOS 40LP	Crolles 300	Foundry*	Foundry**
CMOS 32LP	Foundry*	Crolles 300	No
CMOS 28LP	Foundry*	Crolles 300	Foundry**
CMOS 28 FDSOI	Crolles 300	Foundry*	No

Technology / Source	First : Time to Market	Second	Alternative
HCMOS9A	Crolles 200 / 300	Rousset 8	Foundry*
CMOS65 / 55RF	Crolles 300	Foundry*	No
CMOS Imaging Sensor	Crolles 300	Foundry*	No
CMOS55 eFlash	Crolles 300	Foundry*	No
CMOS M10 / F10 eFlash / eEEPROM	Rousset 8	Foundry*	No
BCD8	Agrate 8	Catania 8	Foundry*
Adv PMOS / VIP / MDMESH	Catania 8	Singapore 8	Foundry*
MEMS	Agrate 8	Catania 8	No

* One out of multi-foundry sources
** Another one of multi-foundry sources

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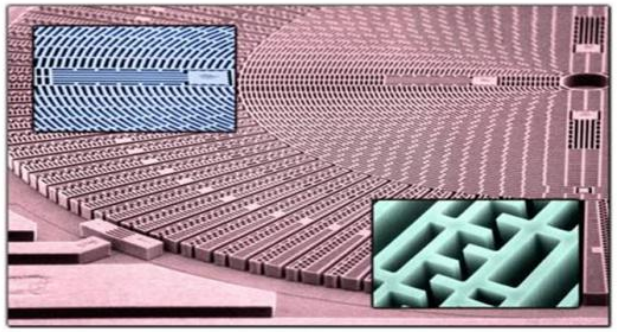
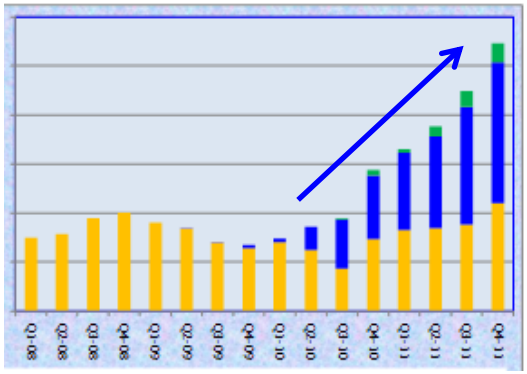
Front-End Manufacturing-Internal Fabs Value: Responsiveness, Differentiation, Efficiency

- Fast Time to Volume, to catch new business opportunities:
  - i.e. MEMS Gyroscope ramp-up within our 8” Fab





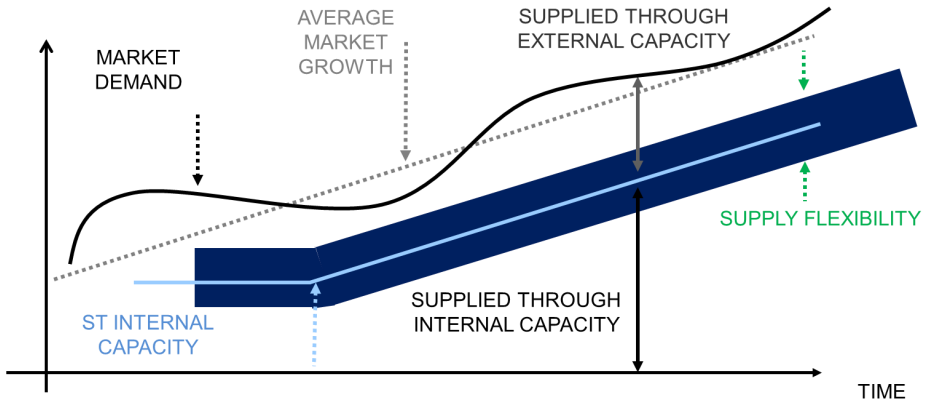
- Timely internal ramp-up of Crolles 12” ramp-up for Digital, Analog CMOS and Microcontroller (embedded Flash).

- Low cost & timely 8” conversion of the Singapore fab for discretes and mature BCD

Packaging & Test Manufacturing: Flexibility/Efficiency

- Re-profile and balance some internal capacity
- Outsource proprietary packages growing volumes
- Complete Dual Source qualifications Internal vs. OSAT (subcontractors)
- Accelerate gold to copper wire conversion toward World Wide leadership
- Speed-up conversion to high density lead-frames
- Packaging & Test Manufacturing Hub for economy of scale, to call for alliance is a possible option we are working on to accelerate

Packaging & Test Manufacturing: Outsourcing Map



Technology (Adv Logic) / Source	First: Time to Market	Second	Alternative
BGA - FC POP	OSAT*	Muar	Shenzhen
BGA - FC singulated	OSAT*	Malta	No
WLCSP	OSAT*	OSAT**	No

Technology (Others) / Source	First : Time to Market	Second	Alternative
BGA/ BGA-FC	Muar	Shenzhen	OSAT
MEMS	Malta	Calamba	No
Power Automotive	Muar	Shenzhen/ Bouskoura	Calamba
Power Discrete	Longgang	Shenzhen/ Bouskoura	OSAT**
QFN	Calamba	OSAT*	OSAT**
Imaging	Shenzhen	No	No
QFP small/Large	Muar/Malta	OSAT*	OSAT**
SOIC	Bouskoura	Shenzhen	OSAT*
Leadframe misc	OSAT*	OSAT**	No

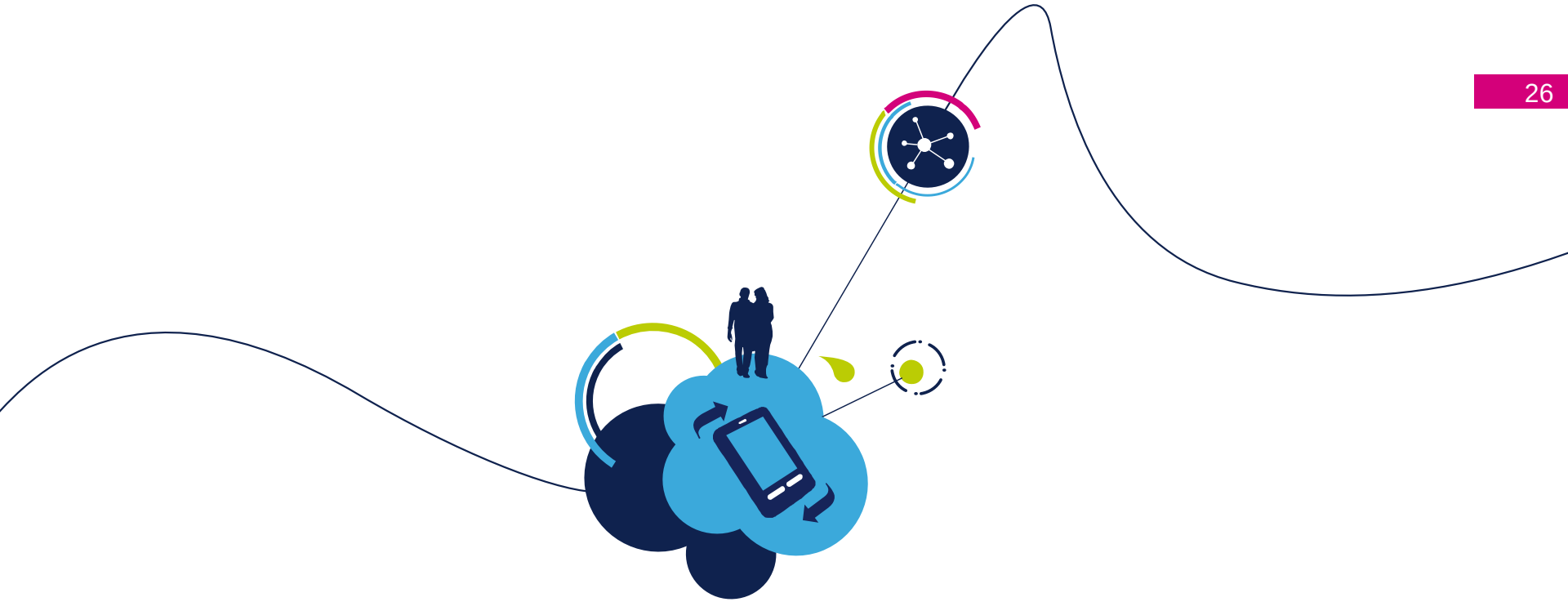
* One out of multi-OSAT sources
** Another one of multi-OSAT sources

Manufacturing and Technology R&D: 2012 Capital Spending

- Front-end manufacturing / R&D
  - 20 nm FDSOI capability
  - Crolles 300 mm 40 nm mix capacity increase
  - Imaging sensor BSI capability
  - Manufacturing and Engineering System
- Back-end manufacturing
  - Capacity increase and mix evolution at Asian plants
  - MEMS capacity increase
  - Manufacturing & Engineering System
  - Copper wire conversion
- Others
  - Testing, IT, quality & safety

Investments focused on:

- Strategic growth businesses and key product ramps
- Proprietary manufacturing



5. Conclusion