



**Artificial
Intelligence**



5G

Advanced substrates enabling differentiated technologies

Christophe Maleville, CTO- Soitec
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**Energy
Efficiency**



Semiconductor industry is in the era of engineered materials

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- Engineered substrates continue to take a larger share of semiconductor content in fast growing markets
- European collaboration from substrate to system is a must to enable a significant role in these strategic markets.
- Timing is critical to maintain WW competitiveness
- Value demonstration from R&D to pilot production will ensure sustainable European leadership in Electronics and Optoelectronics.

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Introduction to Soitec



Soitec – Who we are

DESIGNER & MANUFACTURER OF INNOVATIVE SEMICONDUCTOR MATERIALS



“

We design and deliver innovative substrates & solutions to enable our customers' products shaping everyday life”



1 | **Largest manufacturer of engineered substrates**
LEADER

2 | **Unique technologies**
SMART CUT™, SMART STACKING

4 | **High-growth markets**
SMARTPHONES, AUTOMOTIVE, CLOUD & INFRASTRUCTURE, IOT

6 | **Wafer fabs (150, 200 & 300 mm)**
FRANCE, BELGIUM, SINGAPORE, CHINA*

1,750 | **Employees Worldwide**
GLOBAL PRESENCE**

*Partnership with Shanghai Simgui Technology Co. Ltd. (Simgui)

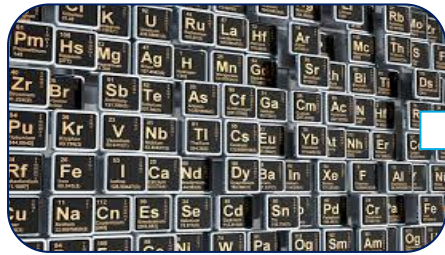
**December 2020

Soitec - Advanced substrates enabling differentiated technologies

Engineered substrates allow us to push boundaries



Using more MATERIALS



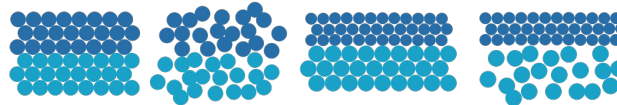
Applying unique PROCESSES

Crystal on
crystal

Amorphous
on
amorphous

Crystal on
crystal

Crystal on
amorphous



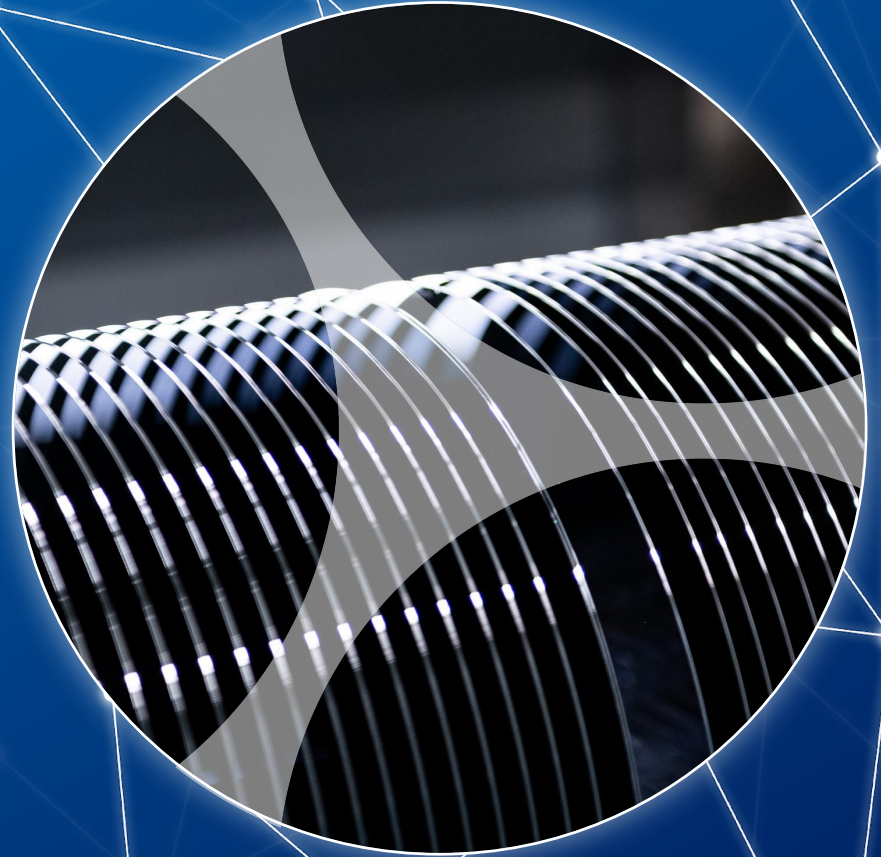
Smart Cut™

To enable new
APPLICATIONS



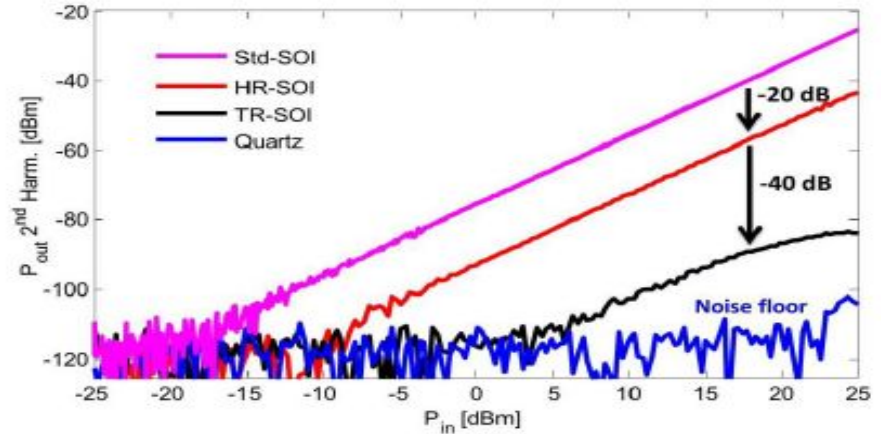
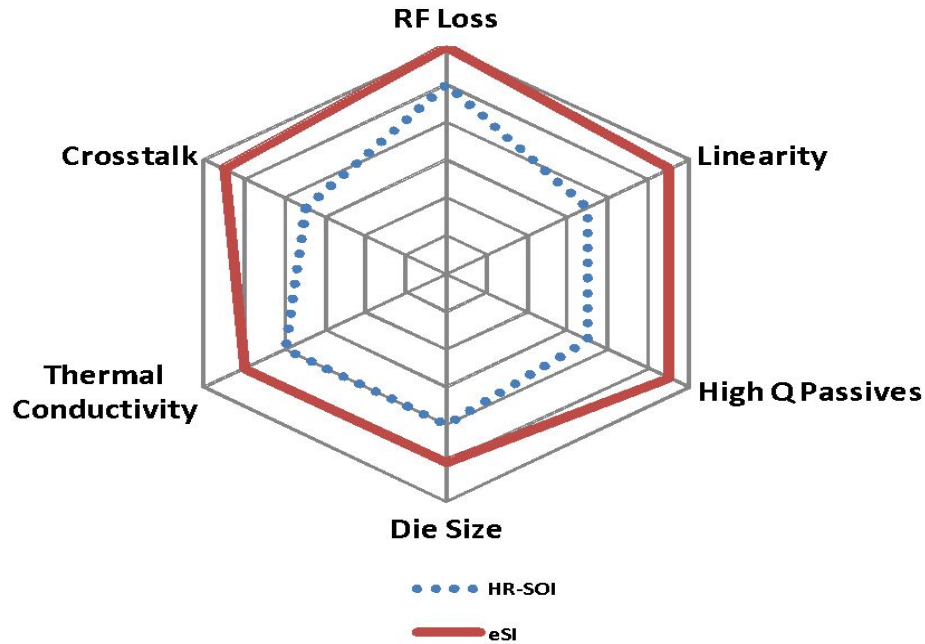
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**RFSOI: 1st
demonstration that
foundations are
making a difference**



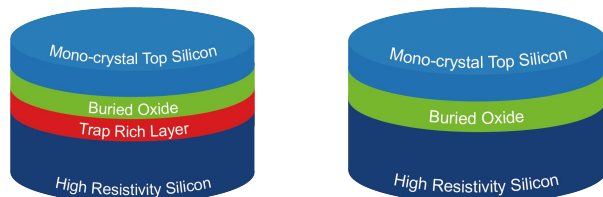
Substrate's direct impact on die performance

eSI vs. HR-SOI performance



RF-SOI: an industry standard for Front-End Module (FEM)

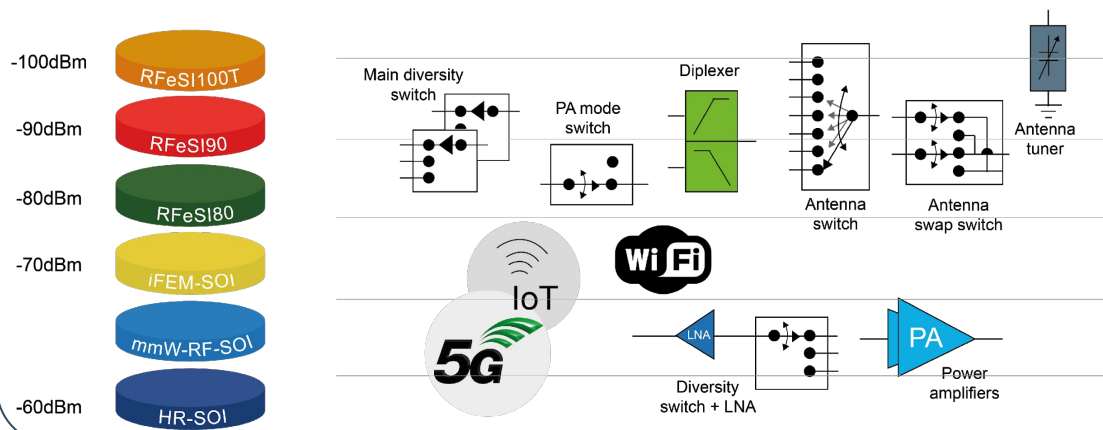
Product description



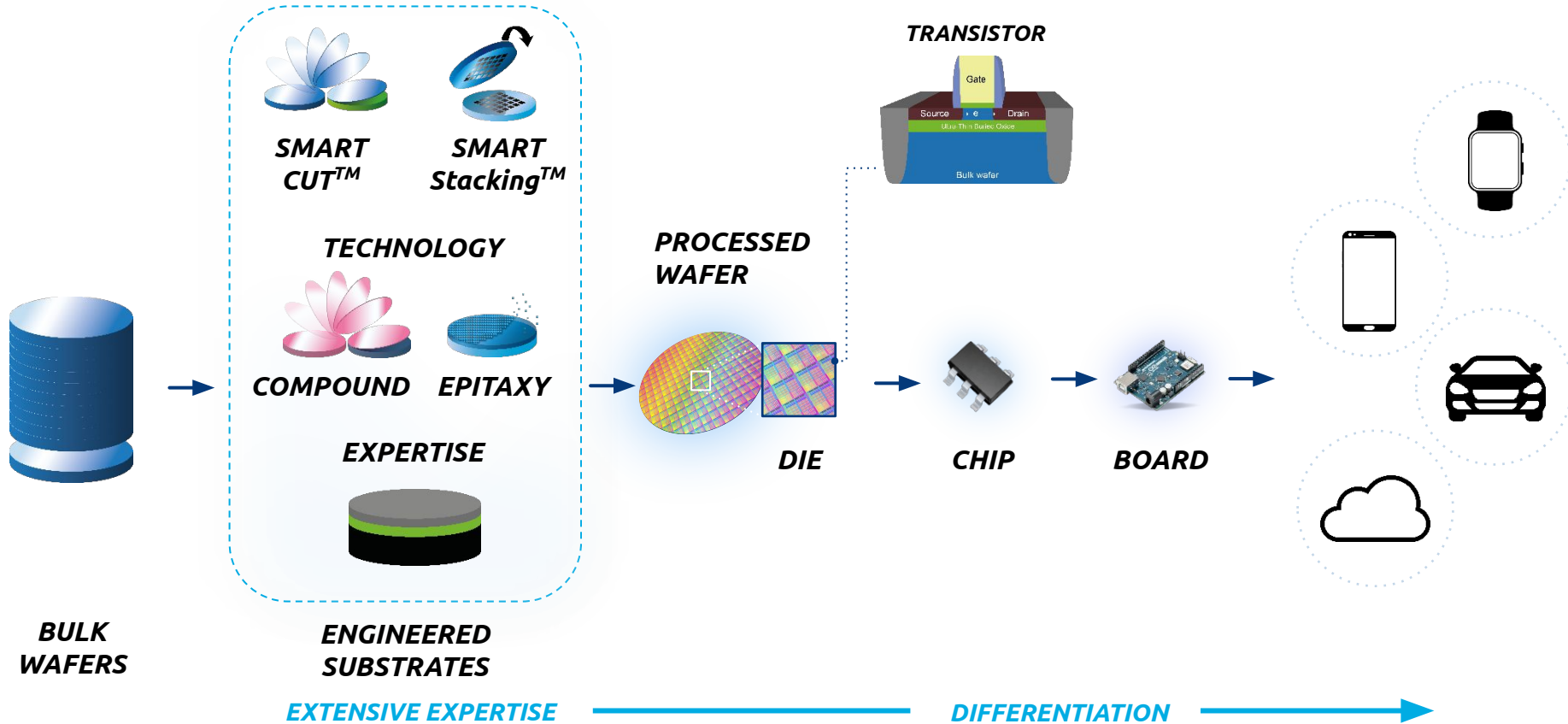
Value proposition

- RF-SOI is present in 100% of smartphones
- RF-SOI is a standard for RF FEM components (antenna tuners, switches, LNAs, PAs)
- RF-SOI is a unique platform for FEM integration
- RF-SOI provides inherent isolation and signal integrity for LTE and 5G
- Best in class performance per cost

A solid product roadmap to cover all RF FEM components



A Collaboration across the whole value chain for system benefit

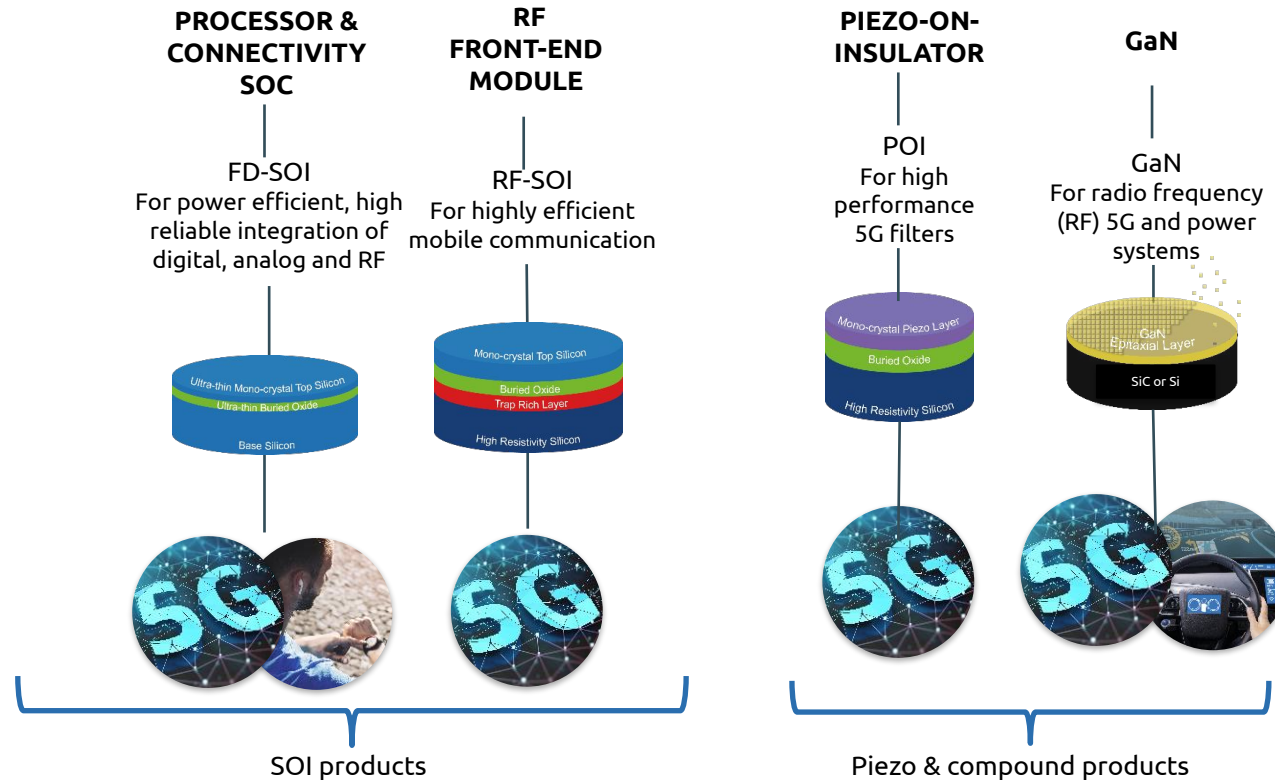


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5G



A broad product portfolio of engineered substrates to address 5G



A comprehensive 5G handset and base station offer for sub-6GHz and mmW



5G Sub-6Ghz FEM

	PA *Power Amplifier	LNA *Low Noise Amplifier	Switch	Tuner	Filter	ET *Envelope Tracker
RF-SOI		✓	✓	✓		
POI					✓	
FD-SOI						✓

5G mmW transceivers

	PA	LNA	Switch	Tuner	RF & IF Rx/Tx Mixer	Further integration
FD-SOI	✓	✓	✓	✓	✓	✓
RF-SOI	✓	✓	✓	✓	✓	
GaN	✓	✓	✓			



5G sub-6Ghz FEM

	PA	LNA	Switch	Filter	RF & IF Rx/Tx Mixer	Further integration
RF-SOI		✓	✓			
POI				✓		
FD-SOI					✓	✓
GaN	✓	✓				

5G mmW transceivers

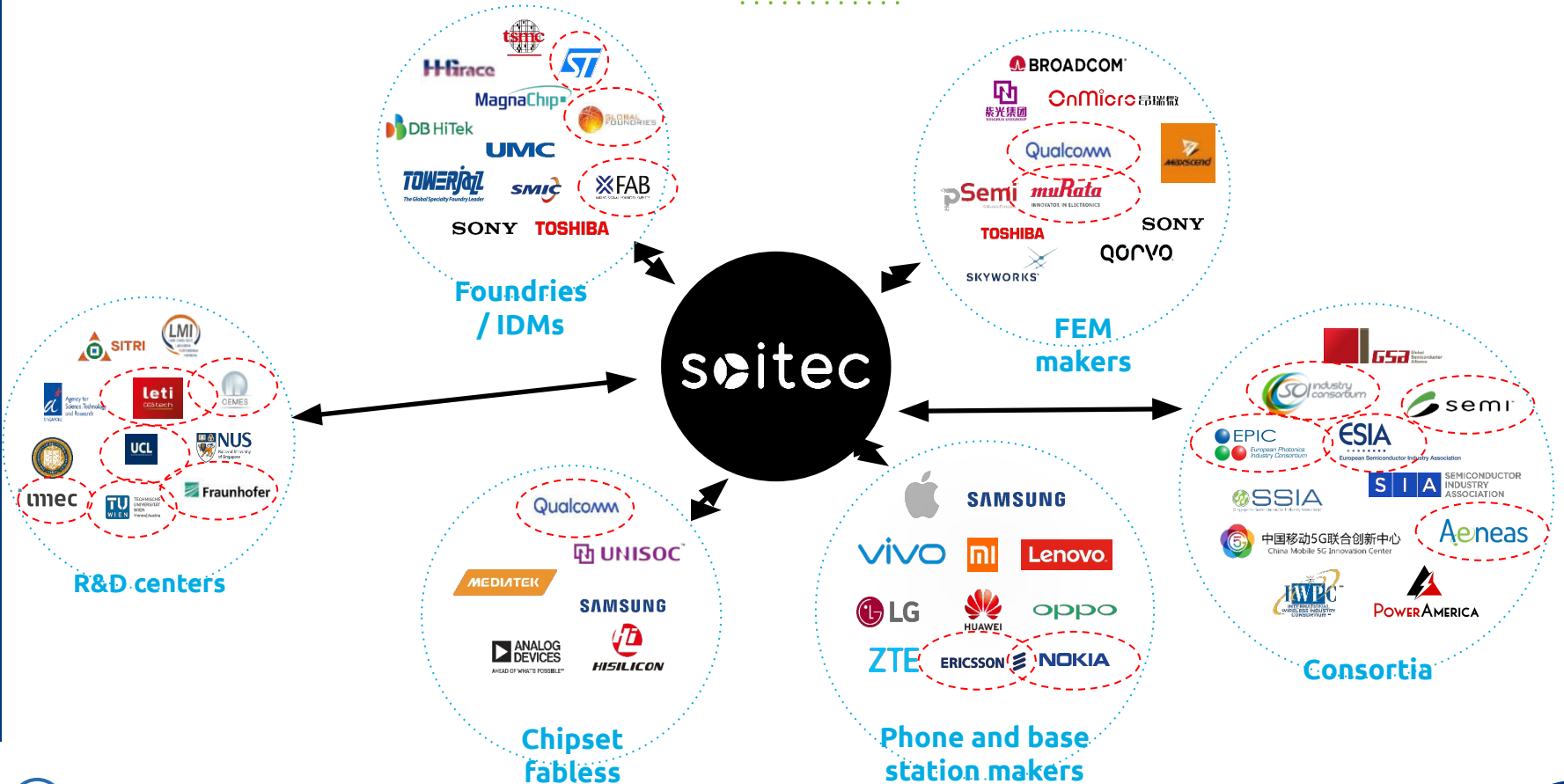
	PA	LNA	Switch	Tuner	RF & IF Rx/Tx Mixer	ADC/DAC
GaN * > 30dBm	✓	✓	✓	✓		
RF-SOI * > 23dBm	✓	✓	✓	✓		
FD-SOI * > 20dBm	✓	✓	✓	✓	✓	✓

✓ Suitable solution

(*) : No public data available for GaN



5G Differentiation requires wide collaboration - Europe has a play!



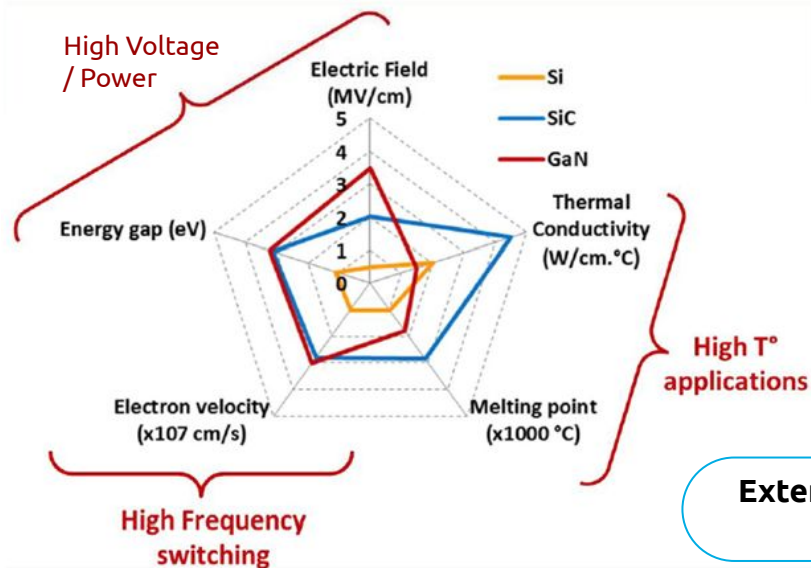
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Automotive: Power Devices



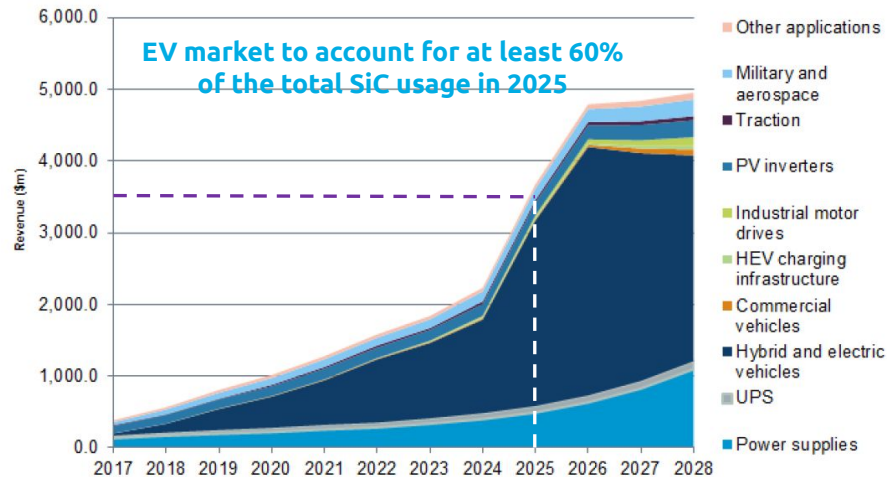
SiC: Key material to replace silicon in power application

Best in class material for high voltage, high temperature and high switching frequency operation



SiC power device forecast

THE SiC POWER SEMICONDUCTOR MARKET



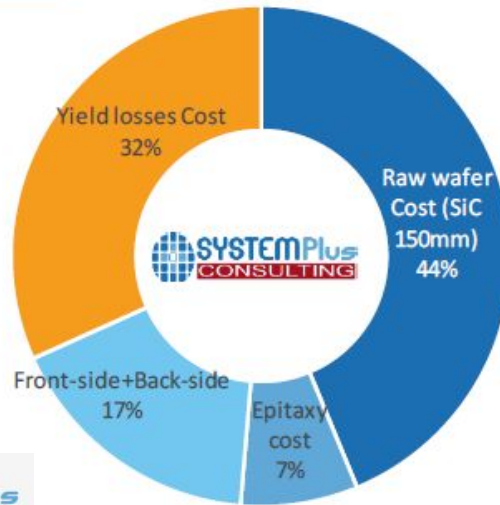
Extensive usage of large-area SiC MOSFET devices ⇒ need for high production yield and high performance devices

SiC power devices Rapidly-growing market, driven by automotive EV

Example of SiC MOSFET Wafer FE Cost Breakdown

SiC wafer price is the major cost-driver within SiC FE manufacturing cost

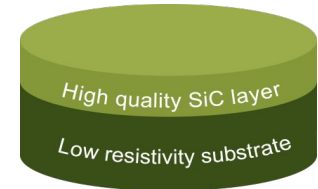
- Raw wafer Cost (SiC 150mm)
- Epitaxy cost
- Front-side+Back-side
- Yield losses Cost



Benefits of Smart Cut™ SiC substrate

System level

- Longer distance range
- Faster battery charging
- More reliable operation
- Smaller system footprint



Device and manufacturing level

- Target 40-70% less energy losses vs bulk SiC
- Target 15-30% higher manufacturing yield
- Target 5-10% smaller die size
- Simpler and cheaper manufacturing process

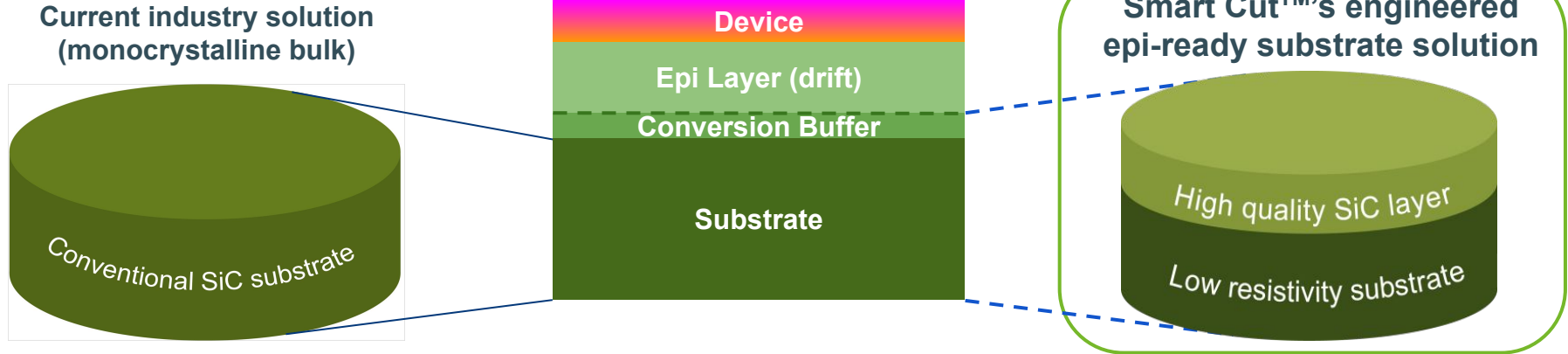
Supply chain

- Increased availability of ultra-prime substrates
- Independent, pure-play substrate supplier
- Fastest path to 200 mm transition

Smart Cut™ solution : SiC Engineered Substrate

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SiC Device structure



Ultra-prime top crystal + very-low resistivity base wafer

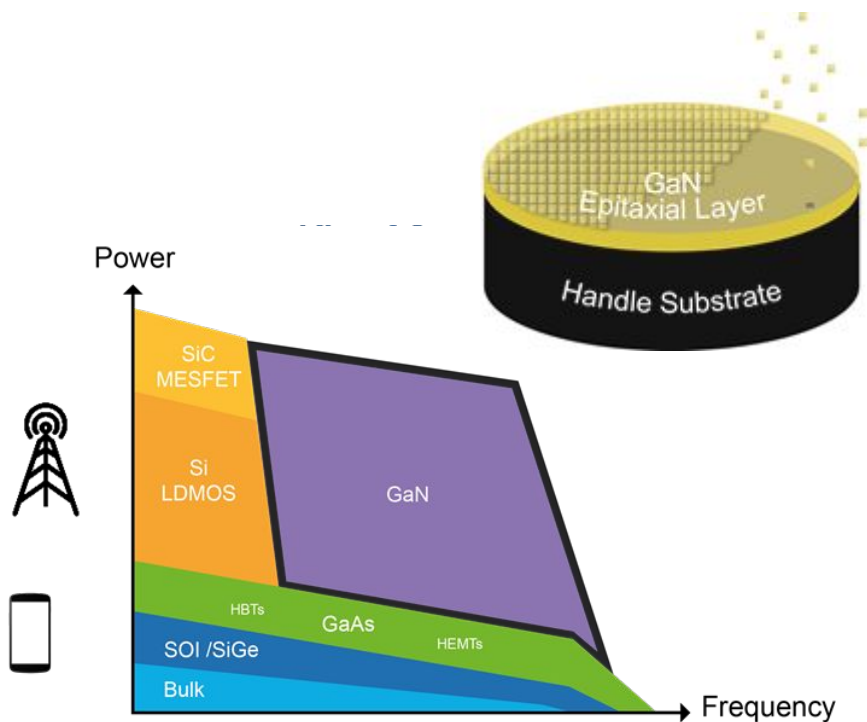
Collaboration Opportunities

Simpler process + Higher yield + Lower losses = lower \$ / device

SiC from Substrate to Car, a full chain in Europe



GaN epi wafers: leading technology for 5G - Opportunity for Power



Source: Figure adapted from Analog Device 2017.

Opportunities

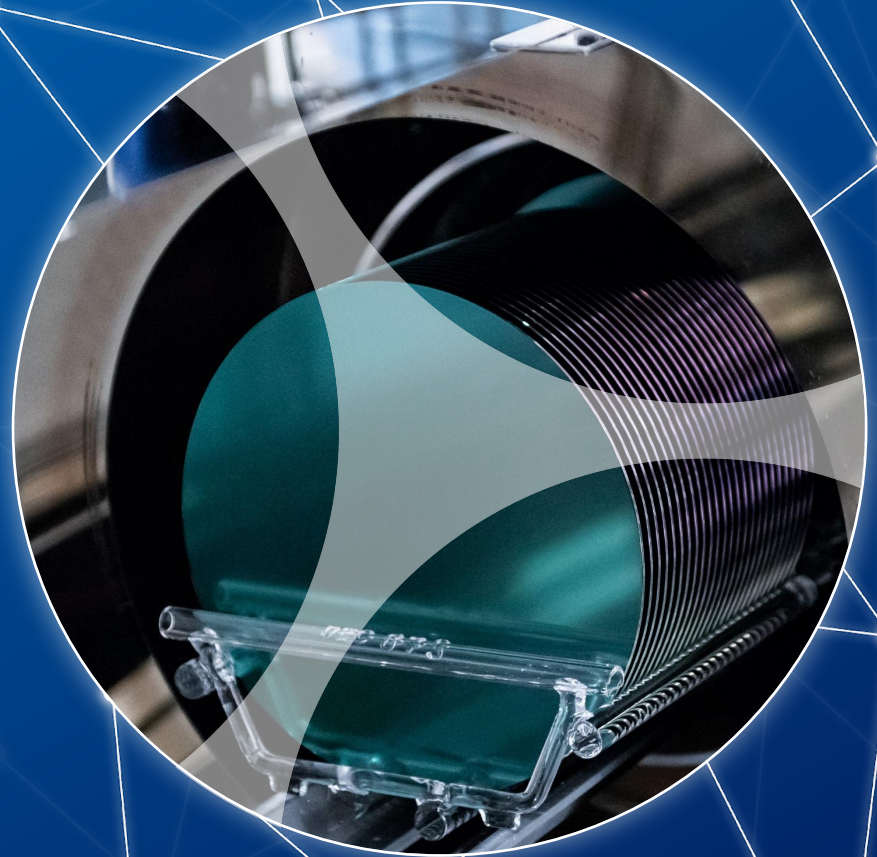
- GaN on Silicon opens opportunity for integration
 - Power regulation
 - GaN on SOI is a possible integration path, requires multi-players collaboration

Future opportunities on power automotive & sensors



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CONCLUSION



Semiconductor industry is in the era of engineered materials

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- Engineered substrates continue to take a larger share of semiconductor content in fast growing markets: smartphones, automobile, cloud & infrastructure, IoT
- European collaboration from substrate to system is a must to enable a significant role in these strategic markets.
 - 5G: Multiple opportunities with major integration challenges and opportunities.
 - Automotive (Power Electronics): Major SiC & GaN based system leadership opportunity.
 - IOT & Edge AI: Best PPAC solutions can be enabled
 - Vcsel: Large diameter, long wavelength are strategic advantages we can bring.
- Timing is critical to maintain WW competitiveness
- Value demonstration from R&D to pilot production will ensure sustainable European leadership in Electronics and Optoelectronics.