The FDSOI history and its future

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Our “digital” world in 2020

4 BILLION
Connected People

$4 TRILLION
Revenue Opportunity

25+ TRILLION
Apps

25+ BILLION
Embedded and Intelligent Systems

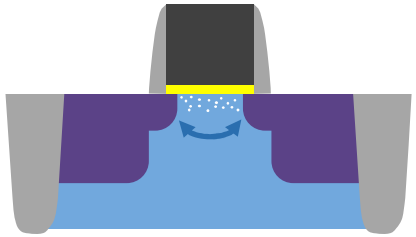
50 TRILLION
GBs of Data

Power Efficient Technologies are mandatory

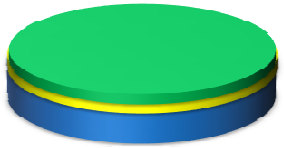
Source: IDC

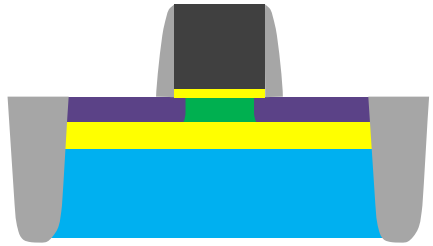
Choosing the right material is essential !

Raw Material



Engineered Material





Needs of fully-depleted transistors

FD-SOI: more than 20 years success history

Flexibility, scalability and innovation: the success story of Silicon-on-Insulator (SOI) technology through key collaborations and achievements

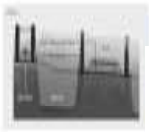
1991
Smart Cut invention

1999
Smart Cut Fab

1992
SOITEC creation

2002
300mm Fab

2008 - 2012
R&D acceleration



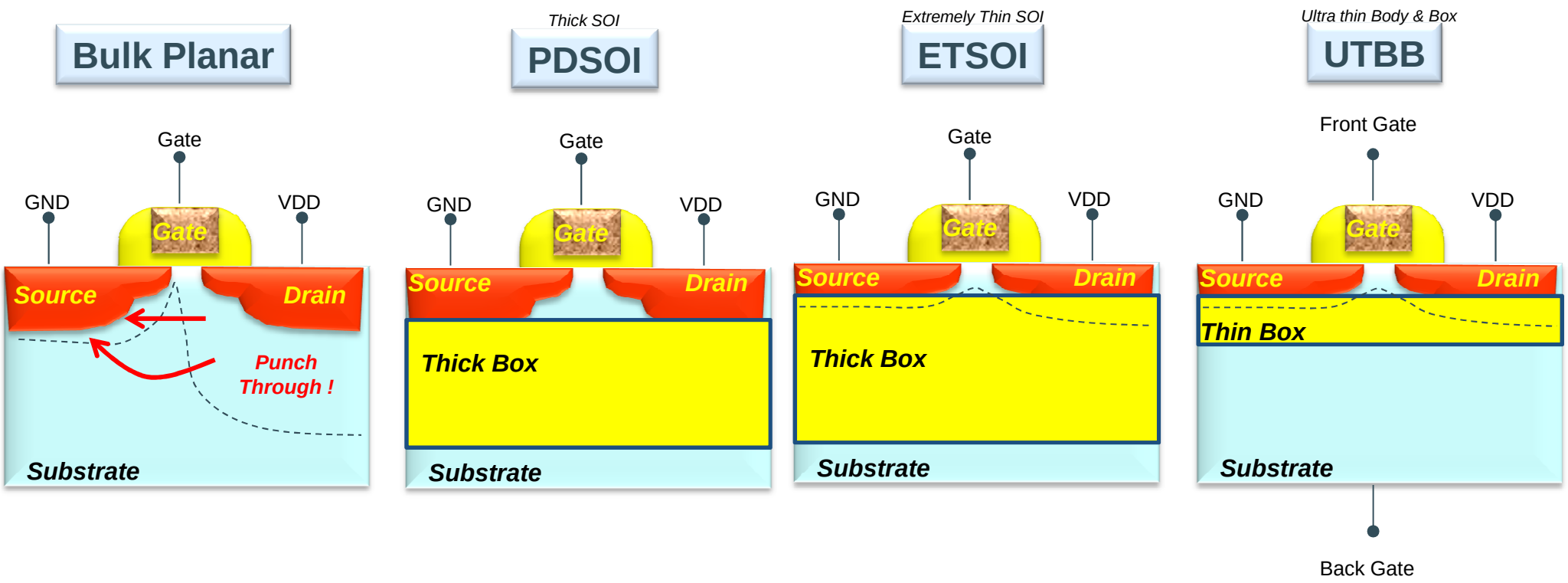
2009 - FD-SOI: the easiest path for transistor
UTBB

2013 - 2014 - Making it happen
3GHz+ AP

2015 - Announcing multi-foundries adoption
Multi-foundries adoption

2017 - Ramping-up - Preparing the future
FDSOI prod @ GF, SEC, ST

The electrical history of FDSOI



Electrostatic issues ☹ High Sub-VT slope ☹ High DIBL	Electrostatic issues ☹ High Sub-VT slope ☹ High DIBL	Electrostatic Recovery ☺Low Sub-VT slope ☺ Low DIBL	Electrostatic Recovery ☺Low Sub-VT slope ☺ Low DIBL
☹Low Body Biasing Efficiency	☹ History effect	Low Body Biasing Efficiency	☺ High Body Biasing Efficiency

Soitec ensures FD-SOI wafer supply

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300mm SOI

Soitec Bernin II, France
HVM

650 K wafers/y. capacity
of which FD-SOI capacity will be increased from 100 K wafers/y. to 400 K wafers/y.

Total potential 300mm capacity =
Up to 1.5 M wafers/y.

Pasir Ris, Singapore
Ready HVM

+ 800 K wafers/y. capacity (FD-SOI pilot line launch – Sept. 17)

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FD-SOI focus stronger than ever

GLOBAL FOUNDRIES

GF Chengdu fab announcement & fast construction

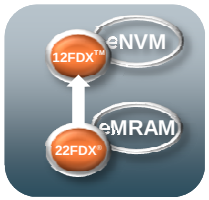
Increasing number of products

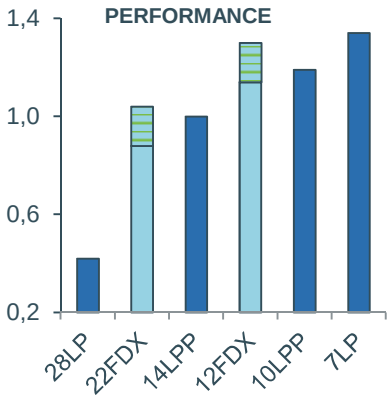
15

Tape-Outs

15 product tape-outs by end 2018

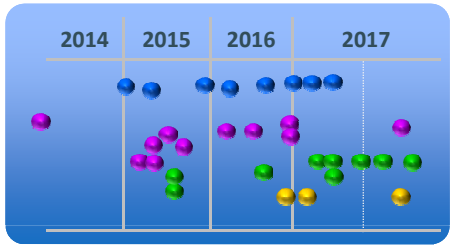
12nm node announced with 7nm FF perf





SAMSUNG

Increasing number of products



FD-SOI at the heart of Samsung foundry strategy

The winning combination

SAMSUNG

SFB

FD-SOI
RF
MRAM

The best foundry team

18nm announcement

	18FDS
Performance	1.2X
Power	0.60X
Logic Area	0.70X
Mask set (10MTL)	+5Layer

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FD-SOI Multiple Foundry Offering

In development

- FDX 12nm — GLOBALFOUNDRIES
- FDS 18nm — RFeMRAM — SAMSUNG

In production

- FDX 22nm — RFeMRAM — GLOBALFOUNDRIES
- FDS 28nm — RFeMRAM — life.augmented + SAMSUNG
- SOTB 65nm — RENESAS

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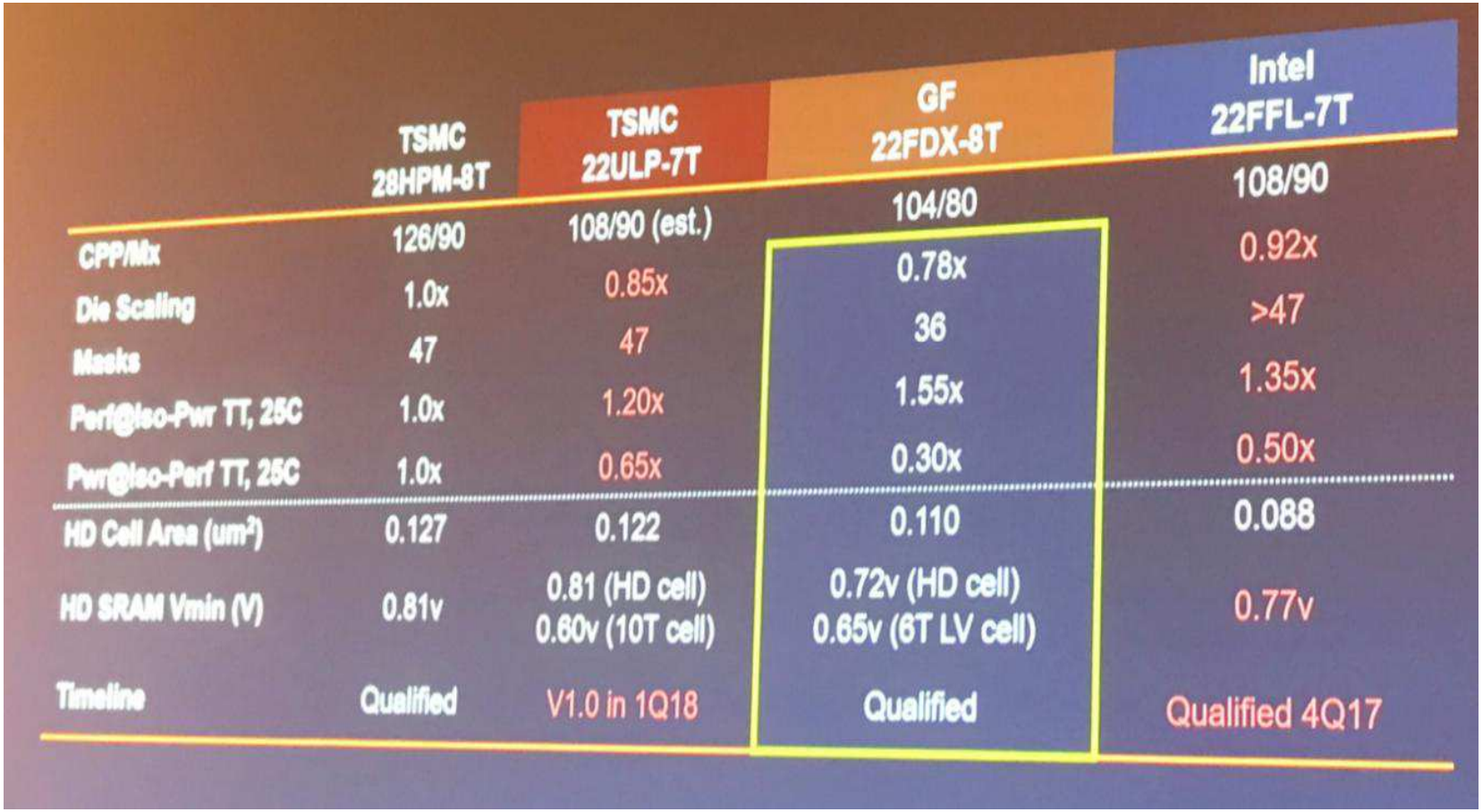
22nm benchmark



	TSMC 28HPM-8T	TSMC 22ULP-7T	GF 22FDX-8T	Intel 22FFL-7T
CPP/Mx	126/90	108/90 (est.)	104/80	108/90
Die Scaling	1.0x	0.85x	0.78x	0.92x
Masks	47	47	36	>47
Perf@iso-Pwr TT, 25C	1.0x	1.20x	1.55x	1.35x
Pwr@iso-Perf TT, 25C	1.0x	0.65x	0.30x	0.50x
HD Cell Area (um^2)	0.127	0.122	0.110	0.088
HD SRAM Vmin (V)	0.81v	0.81 (HD cell) 0.60v (10T cell)	0.72v (HD cell) 0.65v (6T LV cell)	0.77v
Timeline	Qualified	V1.0 in 1Q18	Qualified	Qualified 4Q17

Is Body Bias really a Game Changer?


YES!

Body Bias as key differentiator for FDSOI

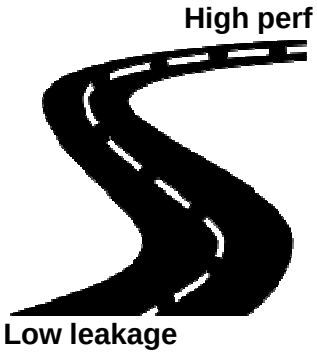
Energy management

Take the control of your circuit

Leakage reduction

Performance Boosting

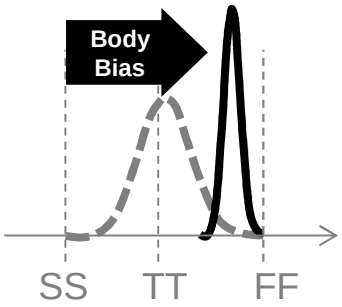
Do it dynamically!



- Dynamically switch between high perf & low leakage

Compensation

Take the control of your process

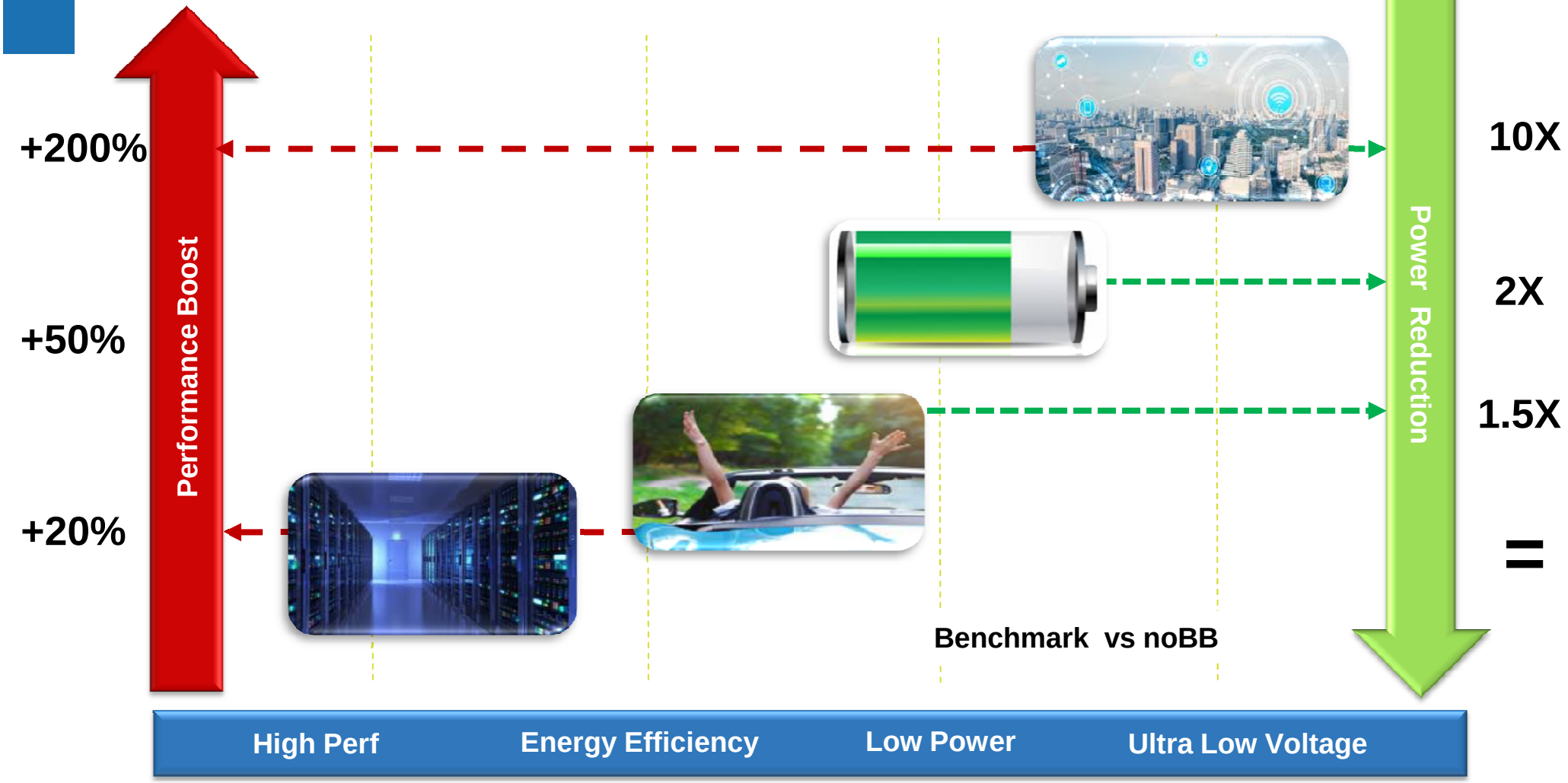


- Offset process variation

Operate safe at the edge

FOREVER YOUNG

Body Bias gain per market segment



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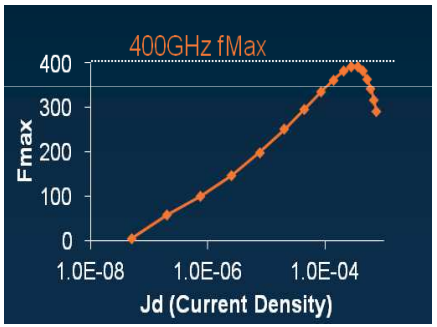
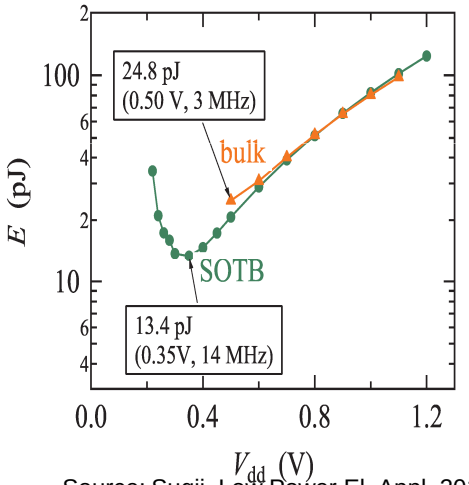
FD-SOI key features summary

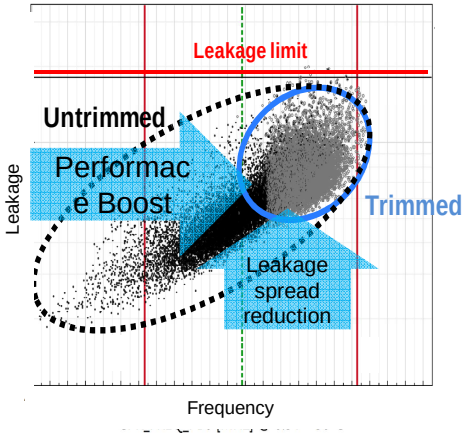
mmWave RF-CMOS	Ultra Low Voltage	Process compensation through body bias	Immunity to radiations



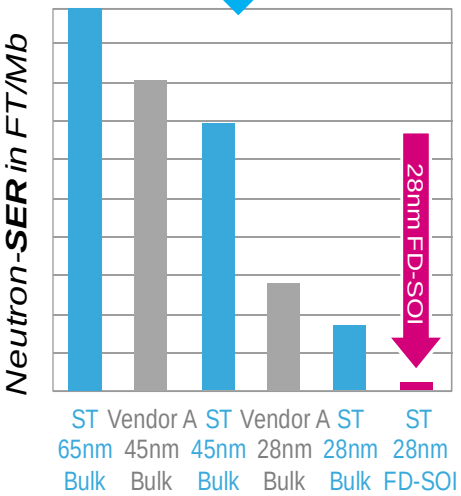
Source: GF, GTC2017



Source: Sugii ,Low Power El. Appl. 2014



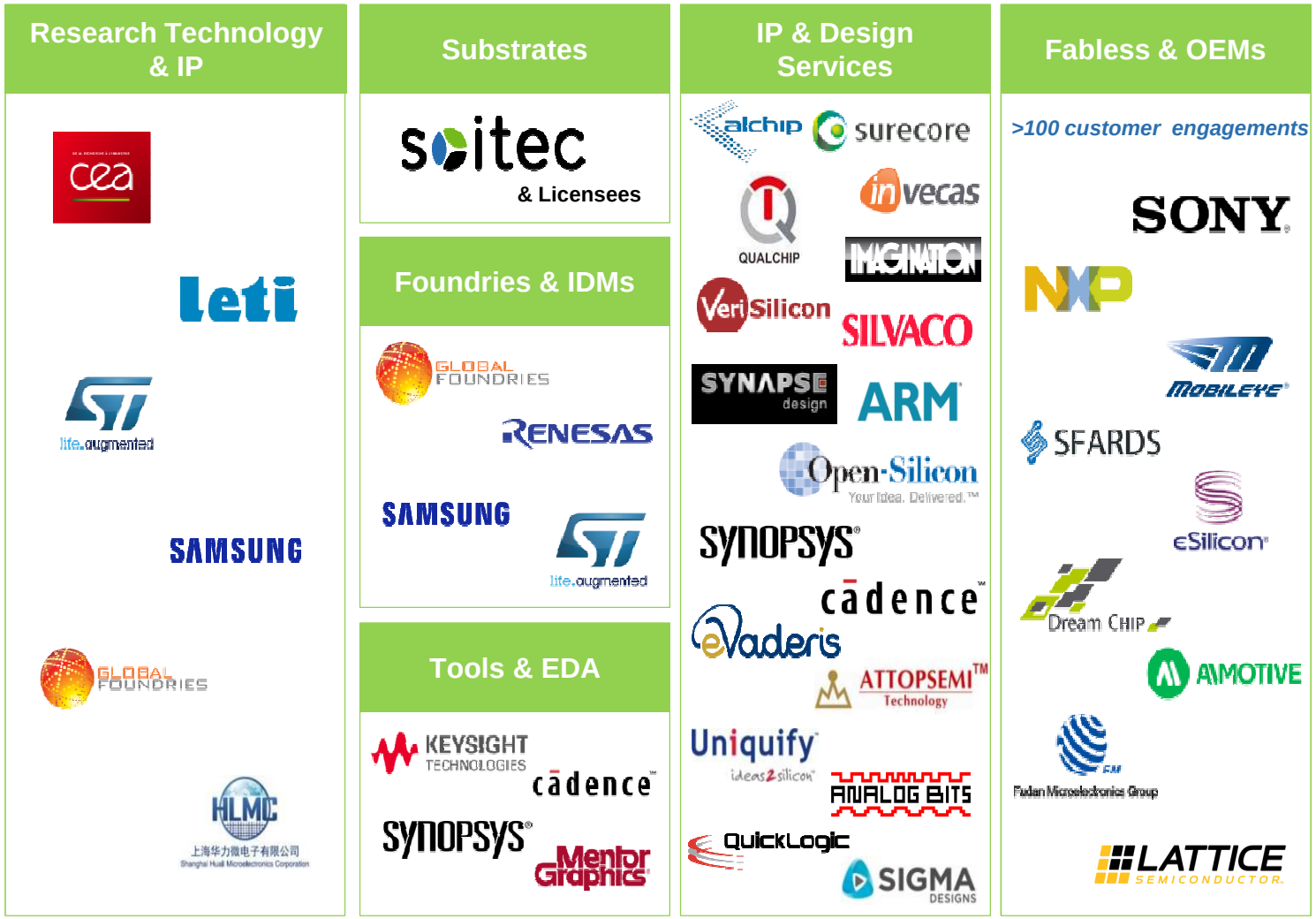
Source: P. Flatresse, ST, ICICDT17



Source: ST, Shanghai FDSOI forum, 2015

Best CMOS mmWave with similar performance to SiGe radios	Operation at minimum energy point (<0.4V)	4X less process spread +15% frequency boost	20x Soft Error Rate improvement vs. bulk

FD-SOI ecosystem is getting stronger



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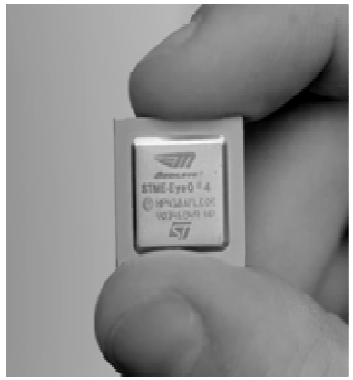
FD-SOI for Automotive

Best power efficiency allowing simpler integration and enhanced reliability

FD-SOI - Reference technology for
ADAS level 3 applications



EyeQ4

MOBILEYE

Next generation **e-Cockpit** solution with
full management of **car infotainment**

NXP

i.MX 8 series
Advanced Graphics & Performance
ARM® v8-A

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FD-SOI for Internet of Things

A game changer technology for better battery life

FD-SOI cuts standard GPS
power
consumption by 5 to 10 times

huami

AMAZFIT

CASIO

PRO TREK

i.MX reference platform by
NXP

amazon alexa

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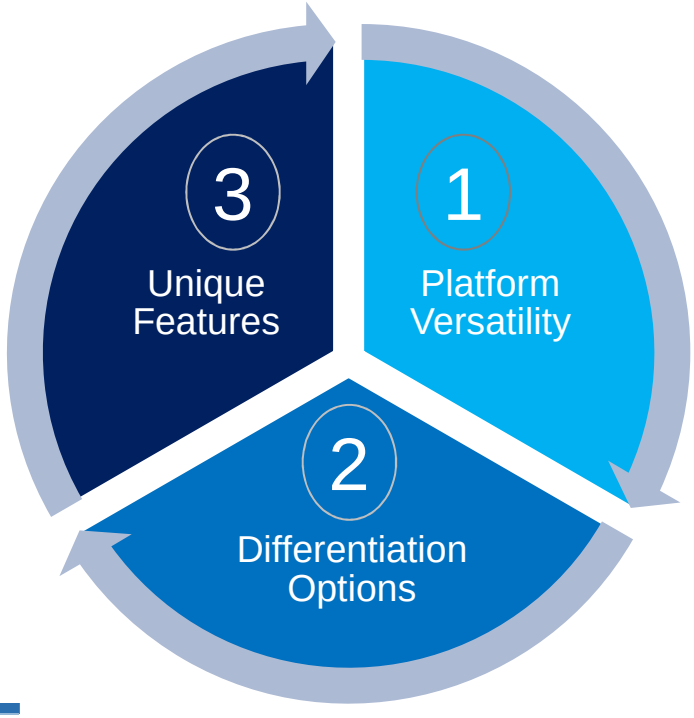
FD-SOI : 3 steps adoption

Unique Features :

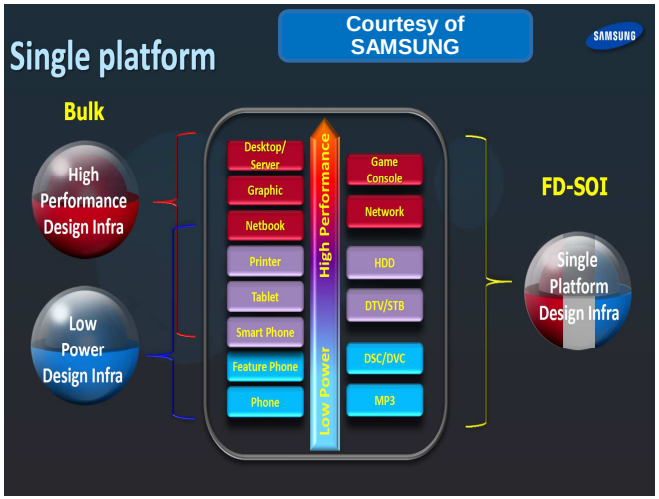
Body Bias Compensation

mmWave CMOS

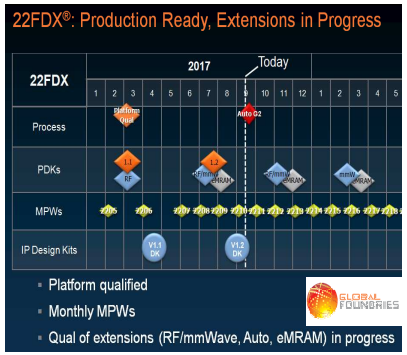
Radiation immunity

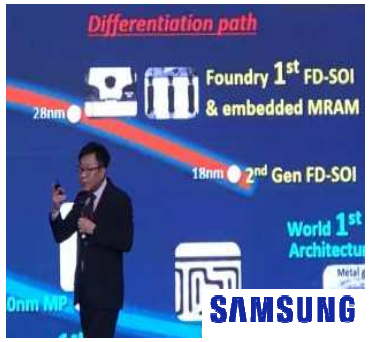


Platform Versatility: Energy Efficiency + Performance on Demand



Differentiation Options: RF, MRAM, ULP





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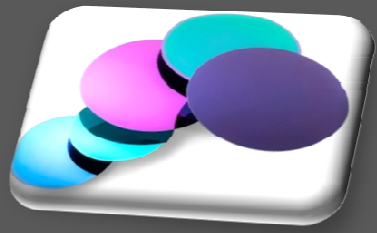
Take-Aways



FDSOI is at the heart of every day life !

Power efficient & flexible technology with easy Analog/RF integration

Power, Performance not forgetting cost

Engineered substrate brings clear value to device

This is just the beginning…