GLOBALFOUNDRIES®

45RFSOI

Advanced 45 nm RF SOI Technology

Highlights

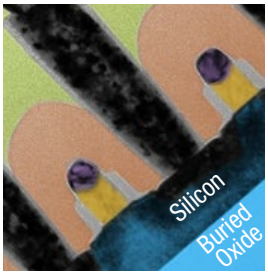
- Leverages a silicon-proven, server-class 45 nm partially depleted (PD) SOI technology
- Optimized for 5G/next-generation RF and mmWave applications
- Comprehensive design enablement:
  - + Full RF PDK
  - + RF-centric devices and features
  - + mmWave modeling and enablement
  - + RF-friendly metal stacks with thick top Cu levels for transmission line design
  - + Comprehensive digital standard-cell library, I/Os and reference flows
  - + RFwave™ ecosystem

Future-ready RF offering for mmWave and 5G applications

The GLOBALFOUNDRIES (GF) 45 nm RF SOI foundry technology, 45RFSOI, is targeted for high performance, next-generation communications, including:

- Integrated millimeter wave (mmWave) front-end modules (FEMs) and beamformers for 5G base stations and smartphones
- Phased array front ends for internet broadband satellite ground and space applications
- Fixed wireless broadband (infrastructure, customer-premises equipment) and other high-performance wireless/wired applications

45RFSOI takes advantage of a 45 nm, partially-depleted SOI server-class technology base extensively evaluated for use in mmWave applications and in high volume production at multiple GF fabs since 2008. RF-centric enablement, device and technology additions to this baseline technology, including thick copper and dielectric back-end-of-line (BEOL) features, enable 45RFSOI to handle the demanding performance requirements of 5G solutions.



45 nm PD-SOI Transistor

Strain engineering boosts NFET and PFET mobility

Reduced perimeter and junction parasitics enable faster FETs

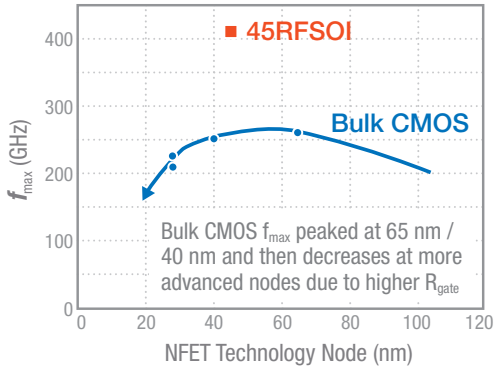
Buried oxide provides good electrical isolation between CMOS transistors and enables FET stacking

High resistivity substrate makes lower insertion loss transmission lines and higher Q passives possible, critical to achieving higher performance in power amps, switches, low noise amplifiers and phase shifters

The RF-centric enhancements available in 45RFSOI build on the inherent advantages of its SOI technology base and combine to help you optimize RF performance by enabling:

- A high f_t/f_{max} (290/410 GHz) to meet 5G mmWave operating frequencies
- Device stacking for high voltage handling and high output power
- High linearity and improved noise isolation and harmonics suppression

Advanced 45 nm RF SOI vs. bulk CMOS performance*



SOI NFET has lower parasitics than bulk CMOS, enabling higher performance.

45RFSOI achieves ~40% higher f_{max} than bulk CMOS.

*GF 45RFSOI technology f_{max} compared to GF 28 nm, 40 nm and 65 nm bulk CMOS technologies.

Enabling differentiation across applications

By using 45RFSOI, chip designers can leverage the collective benefits of RF-centric features, device stacking, an optimized BEOL and a high-resistivity substrate to develop differentiated products—across a range of applications.

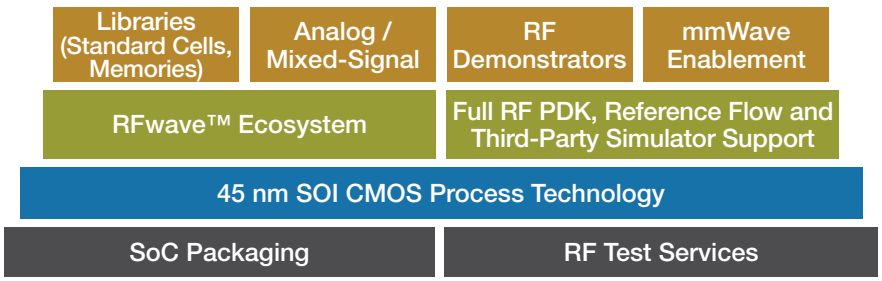
Application	45RFSOI benefit
PAs	High f_{max} and stacking capability for higher output power, power gain and higher efficiency power amplifiers (PAs)
LNAs	Low BEOL loss and low NF due to excellent f_t, and NF_{min} for reduced noise in low noise amplifiers (LNAs)
Tx Rx switches	Optimized BEOL, high-resistivity substrate, device stacking and low R_{on} for lower insertion loss and higher linearity switches at mmWave frequency range

Process design kits are available now. Frequent MPW runs are available and enable fast prototyping so you can evaluate results in hardware early.

45RFSOI at a glance

Standard features	Optional features
• High resistivity substrate • Three BEOL stack options • RF interconnect transmission lines • Primitive and hierarchical ESD elements	• Electrically programmable fuse (eFuse) • SRAM • Wire bond or solder bump terminals
FETs	
• Thin gate oxide 0.9/1.0 V floating body regular V_t (RVT) FETs	• Multiple voltage threshold options (thin gate oxide FETs only):High V_t (HVT), super-high V_t (SVT), ultra-high V_t (UVT) • Analog FETs: Floating body and body contacted • Thick gate oxide 1.5/1.8 V FETs: Floating body and body contacted
Resistors	
• N+ silicide resistor	• P+ poly silicon • P+ high resistivity poly silicon
Capacitors	
• Vertical natural capacitor	• Thick oxide decoupling capacitors • High-Q MIM capacitor • High-density MIM capacitor
Inductors	
• BEOL inductors: Spiral and symmetrical	
Varactors and diodes	
• Thin oxide varactor	• Thick oxide forward bias annular diode

45RFSOI Comprehensive Design Enablement



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