GLOBALFOUNDRIES®

45RFSOI

Advanced 45nm RF SOI Technology

Highlights

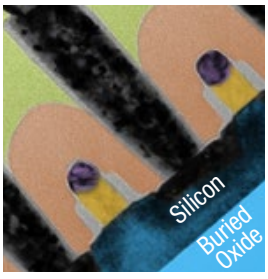
- Leverages a 45nm partially depleted SOI technology:
  - + Enhanced with high-performance RF features
  - + Built on a mature, server-class silicon technology in production at multiple GF fabs since 2008
- Optimized for next-generation RF and mmWave applications:
  - + 5G integrated front ends and beam formers
  - + Broadband satcom phased array terminals
  - + Radar and high-performance wired and wireless 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
- Complete services and supply chain support:
  - + Regularly scheduled MPWs
  - + Packaging and RF test services

Future-ready RF Offering for mmWave and 5G Applications

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

- Integrated millimeter wave (mmWave) front-end modules (FEMs) and beam formers for 5G base stations and smartphones
- Phased array front ends for internet broadband satellite ground and space applications
- Radar and high-performance wired and wireless applications

45RFSOI takes advantage of a 45nm, 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.



Partially Depleted 45nm SOI Transistor

Strain engineering boosts NFET and PFET mobility

Reduced perimeter and junction parasitics enable faster FETs

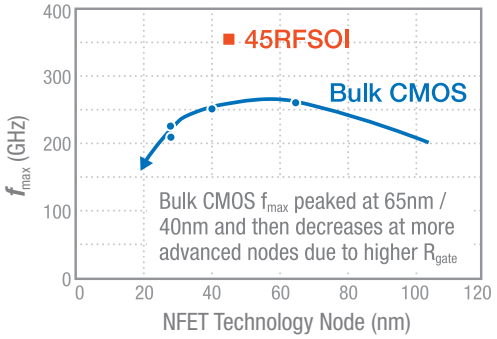
Buried oxide provides good electrical isolation between CMOS transistors and enables FET stacking

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} (305/380GHz) 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 45nm 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 28nm, 40nm and 65nm 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 5G base station, backhaul, satellite and smart-phone FEM applications.

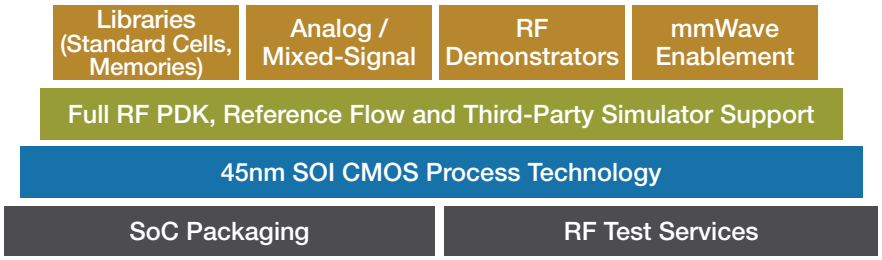
Application	45RFSOI Benefit
Power amplifiers (PAs)	High f_{max} and stacking capability for higher output power, power gain and higher efficiency PAs
Low noise amplifiers (LNAs)	Low BEOL loss and low NF due to excellent f_t, NF_{min} for lower noise LNA
Tx Rx switch	Optimized BEOL, high-resistivity substrate,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

Evaluation process design kits are available now. Frequent MPW runs through The MOSIS Service of the USC Information Sciences Institute 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 • Four BEOL stack options • RF interconnect transmission lines • Electrically programmable fuse • Primitive and hierarchical ESD elements	• SRAMs • Wire bond or solder bump terminals
FETs	
• Thin gate oxide 0.9V/1.0V 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 1.5V/1.8V 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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