



GLOBALFOUNDRIES®



SiGe 9HP

90nm SiGe BiCMOS Technology

Highlights

- Performance-optimized 90nm SiGe BiCMOS technology:
 - + 50% higher integration and more than 40% higher f_T than SiGe 8HP
- Optimized for demanding data communications / telecom optical modules and mmWave RF applications:
 - + PAM4 based 50G / 200G / 400G Ethernet optical modules
 - + Hybrid silicon photonics support for trans-impedance amplifiers, drivers, control and clock and data recovery
 - + 64 GBaud coherent optical modules
 - + Next-generation fiber channel and InfiniBand modules
 - + mmWave E-band, W-band and D-band applications (up to 170GHz)
 - + Satellite communications, aerospace and defense and enhanced security solutions
 - + 5G wireless infrastructure
 - + Test equipment and instrumentation

Optimized for Performance and Integration in Demanding Optical and RF Applications

GLOBALFOUNDRIES 90nm high-performance silicon germanium (SiGe) technology, SiGe 9HP, is the latest extension to its performance-optimized SiGe BiCMOS portfolio.

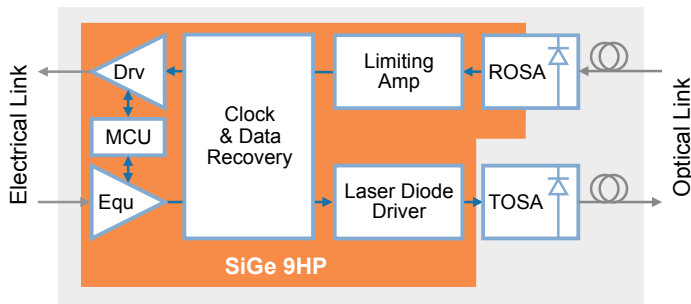
With an industry leading f_T/f_{MAX} of 310/370GHz, SiGe 9HP is designed to deliver premier RF performance at higher breakdown and operating voltages than RF CMOS alternatives. Additionally, because of its BiCMOS technology base, SiGe 9HP enables:

- 50% more integration density than its 130nm SiGe 8HP/8XP predecessors
- Higher performance mmWave applications that demand high output power, high linearity, low phase noise and a low noise figure
- High drive capability, sensitivity and gain
- Excellent thermal stability
- Simplified impedance matching with full mmWave RF passives

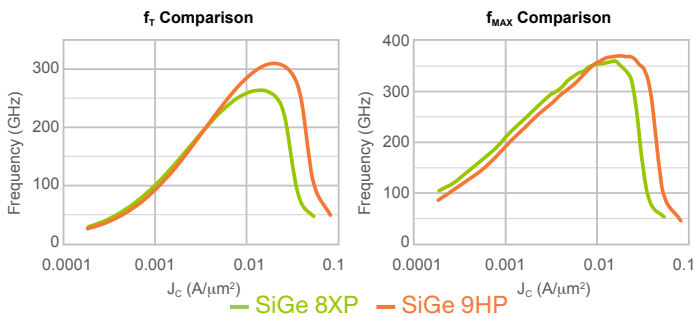
Built on a cost-effective mature silicon base, SiGe 9HP offers designers exceptional high-frequency NPN performance, a broad array of mmWave-ready active and passive devices and the ability to integrate multiple functions on a single chip. Options for up to 10 levels of metal can help designers boost RF performance further. The additional levels of metal also facilitate chip wiring that improves analog performance and enables even higher levels of digital integration.

This combination of value, performance, optimized devices and integration enables differentiated 64 GBaud coherent telecom modules and 50G/200G/400G Ethernet data center PAM4 optical modules. The benefit mix also makes 9HP an excellent fit for 5G and other mmWave wireless infrastructure applications.

Example Active Optical Cable / Optical Fiber Module Block Diagram



SiGe 8XP vs. SiGe 9HP f_T and f_{MAX} Comparison



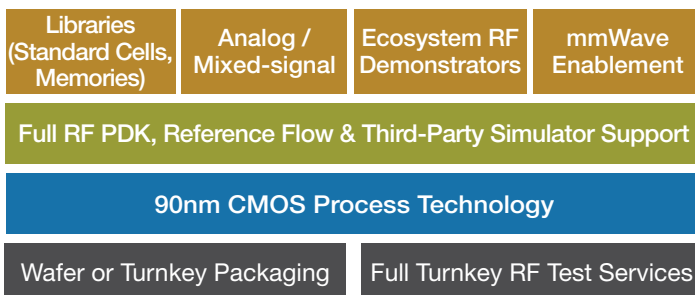
Comprehensive Enablement

GF experts pioneered the development of SiGe and have decades of experience with SiGe technologies.

Comprehensive SiGe 9HP process design kits (PDKs) tap into this expertise, providing accurate model-to-hardware correlation and RF-specific tool support designed to help you achieve first-time-right results in hardware and accelerate time to market. Frequent multi-project wafer (MPW) runs enable fast prototyping.

SiGe 9HP is qualified and PDKs are available now.

SiGe 9HP Design Enablement



SiGe 9HP Features

SiGe 9HP at a Glance

Technology Node	90nm
CMOS supply (V)	1.2, 1.8, 2.5, 3.3

Metallization (enhanced Cu / thick Al):

Base: 7 levels of metal

Option: Up to 10 levels of metal

HBTs:

High performance (f_T/f_{MAX}) 310/370GHz

Medium breakdown BV_{ceo} 2.4V (150GHz f_T)

mmWave Diodes:

Schottky barrier

PIN

Transmission Lines:

RF wire

Coupled wires

Coplanar waveguide

Microwave/mmWave passive elements:

Unique structures, including bends, tees, stubs

FETs:

Reg V_t , high V_t

Triple well

Resistors:

p+ poly

Precision p+ poly

High resistance poly

Silicided poly ballast resistor

Low-resistance sub collector

Metal

n+ diffusion

Capacitors:

MIM

VN cap

Varactors:

MOS

Hyper-abrupt

Inductors:

Single spiral, series / parallel spirals

Symmetrical

Memory:

eFuse (OTP)

SRAM

Interconnect: Wire bond and lead-free C4 available

Refer to the latest PDK release for the current feature set.



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