



SiGe Power Amplifier Platforms

SiGe 5PAe, 1KW5PAe, 5PAx and 1K5PAx

Highlights

- Family of silicon power amplifier platforms optimized for affordability, integration and performance in mobile and fixed RF applications
- High resistivity substrate offerings enable integration of multiple RF functions on single chip
- Production-proven TSVs
- Wide range of passive and active devices
- Ongoing platform, feature and technology roadmap enhancements
- Design with confidence using a technology family already deployed in more than four billion chips

Keep Pace with Mobility Advances

GlobalFoundries® (GF®) family of silicon germanium (SiGe) BiCMOS power amplifier platforms, SiGe PA, is optimized for Wi-Fi and cellular solutions in next-generation Wi-Fi access points, base stations/small cells and smartphones, tablets and other RF-enabled devices. More than four billion SiGe PA chips have shipped to customers.

Because they are built on a silicon base, GF SiGe PA platforms offer integration advantages over gallium-arsenide alternatives for smaller modules at similar performances. All SiGe PA offerings feature production-proven through-silicon vias (TSVs) so customers can leverage low-cost packages.

The SiGe PA family includes four offerings, allowing customers to choose the right mix of performance, integration and affordability for their RF solution.

50 ohm-cm P-substrate offerings

SiGe 5PAe and 5PAx: Balance value with performance for standalone Wi-Fi and cellular PA applications.

High-resistivity substrate offerings

SiGe 1KW5PAe and 1K5PAx: Optimized for performance and integration, enabling customers to implement PAs, RF switches and low noise amplifiers (LNAs) on a single chip.

GF SiGe 5PAx and 1K5PAx platforms deliver faster data throughput and use less power than their earlier counterparts—5PAe and 1KW5PAe, respectively—through multiple performance benefits:

- Higher PA gain and linearity
- Lower $R_{on} * C_{off}$, for RF switches with less insertion loss
- Lower LNA noise figure

Comprehensive Enablement

GF leverages extensive technology insight and expertise for design enablement customers can rely on. SiGe PA PDKs include RF-specific tool support and accurate model-to-hardware correlation to help customers achieve predictable results for faster time-to-market, while cost-effective MPW runs enable fast prototyping so customers can see results in hardware early.

GF SiGe PA Platforms at a Glance

Feature	5PAe	1KW5PAe	5PAx	1K5PAx
CMOS supply (V)	3.3, 5.0			
TSV	Second generation 100 μm TSV			
eFuse	✓	✓	✓	✓
Multi-emitter power cells:				
High-performance NPN	$f_{max} = 100$ GHz		$f_{max} = 110$ GHz	
High-breakdown NPN	$BV_{ceo} = 8.3$ V		$BV_{ceo} = 7.6$ V	
High-efficiency LNA NPN		✓	✓	✓
High-efficiency PA NPN		✓	✓	✓
FETs:				
Thin oxide NFET, PFET (3.3 V)	✓	✓	✓	✓
Thick oxide NFET, PFET (5.0 V)	✓	✓	✓	✓
Thin and thick oxide-isolated NFET (3.3 V and 5.0 V)	✓	✓	✓	✓
Tight pitch switch FET		✓	✓	✓
Waffle FET	✓	✓		
Resistors:				
PC P+ poly resistor (220 ohm/sq.)	✓	✓	✓	✓
PE poly resistor (3 Kohm/sq.)	✓	✓	✓	✓
Silicided poly resistor (2.8 ohm/sq.)	✓	✓	✓	✓
L1 TaN resistor (60 ohm/sq.)	✓	✓		
Diffusion	✓	✓	✓	✓
Capacitors:				
Thick oxide MOS (1.2 fF/μm ²)	✓	✓	✓	✓
Single nitride MIM (1.35 fF/μm ²)	✓	✓	✓	✓
Dual MIM (2.7 fF/μm ²)	✓	✓	✓	✓
High-density single nitride MIM (2.7 fF/μm ²)	✓	✓		
High-density dual nitride MIM (5.4 fF/μm ²)	✓	✓		
High-voltage MIM (0.6 fF/μm ²)	✓	✓		
Q1 MIM	✓	✓		
Varactors and diodes:				
CB varactor	✓	✓		
NMOS varactor (thin and thick oxide)	✓	✓	✓	✓
Hyper-abrupt varactor	✓	✓		
PIN diode	✓	✓		
Schottky barrier diode	✓	✓	✓	✓
Inductors:				
Analog metal (4 μm thick Al)	✓		✓ (Enhanced)	✓ (Enhanced)
Dual metal (4 μm thick Al / 3 μm thick Cu)	✓	✓	✓ (Enhanced)	✓ (Enhanced)
Interconnect				
(wire bond, Cu pillar and lead-free C4 available)	✓	✓	✓	✓