



GLOBALFOUNDRIES®



SiGe Power Amplifier Technologies

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

Highlights

- Family of silicon power amplifier technologies 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 device, 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

The GLOBALFOUNDRIES family of silicon germanium (SiGe) BiCMOS power amplifier technologies, 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 been shipped to customers.

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

The SiGe PA family includes four offerings, enabling you to choose the technology that delivers the right mix of performance, integration and affordability for your 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 you to implement PAs, RF switches and low noise amplifiers (LNAs) on a single chip.

GF SiGe 5PAx and 1K5PAx technologies 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 $R_{on} \cdot C_{off}$, for RF switches with less insertion loss
- Lower LNA noise figure

Comprehensive Enablement

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

SiGe PA Technologies at a Glance

Feature	5PAe	1KW5PAe	5PAx	1K5PAx
CMOS supply (V)	3.3, 5.0			
TSV	Second generation 100 μ m 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/ μ m ²)	✓	✓	✓	✓
Single nitride MIM (1.35 fF/ μ m ²)	✓	✓	✓	✓
Dual MIM (2.7 fF/ μ m ²)	✓	✓	✓	✓
High-density single nitride MIM (2.7 fF/ μ m ²)	✓	✓		
High-density dual nitride MIM (5.4 fF/ μ m ²)	✓	✓		
High-voltage MIM (0.6 fF/ μ m 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 μ m thick Al)	✓		✓ (Enhanced)	✓ (Enhanced)
Dual metal (4 μ m thick Al / 3 μ m thick Cu)	✓	✓	✓ (Enhanced)	✓ (Enhanced)
Interconnect (wire bond, Cu pillar and lead-free C4 available)				
	✓	✓	✓	✓



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