

22FDX®

22nm FD-SOI Technology

Highlights

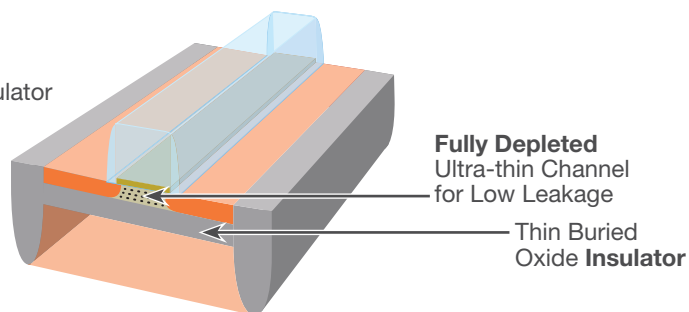
- 22nm FD-SOI technology
 - + Manufactured in state-of-the-art fab in Dresden, Germany
 - + Includes ultra-low-power with 0.4V operation
 - + Transistor back-gate biasing for enhanced performance, *and* lower power and reduced area
 - + World-class Fmax; Unique FET stacking for high-Pout/high-PAE mmWave PA and switches; Lowest power mmWave LNA
 - + Bulk-like self-heating effect
 - + Superior radiation immunity with >30x/1000x lower SCU/MCU SER
 - + Integrated RF and mmWave SoC for 5G architectural innovation and reduced system cost
- Low power embedded applications
 - + Automotive (ADAS, IVI)
 - + IoT, Wearables
 - + Networking and WiFi
 - + 5G: <6GHz and mmWave handset solutions, backhaul, base stations
 - + LEO satellite communications
 - + mmWave radar
- Comprehensive design ecosystem
 - + Leverages bulk digital design flows and existing EDA tools
 - + Fully enabled with foundation IP and application-specific complex IP
- Complete services and support
 - + Design starter kit, MPWs, prototyping
 - + Advanced packaging and test solutions, including 2.5D/3D products

GLOBALFOUNDRIES 22FDX® 22nm FD-SOI (Fully-Depleted Silicon-On-Insulator) process technology platform delivers cost effective performance for connected and low power embedded applications.

22nm FD-SOI transistor technology delivers FinFET-like performance and energy-efficiency, including up to 70% lower power vs. 28nm. The simultaneous high Ft /high Fmax, high self gain and high current efficiency of 22FDX enables efficient, ultra low power analog/RF/mmWave designs.

FD-SOI

- Fully-Depleted Silicon-On-Insulator
- Planar process similar to bulk



Target Applications and Platform Solutions

5G, LTE and 802.11ac/ax/ad	IoT / Wearables	Mid/low-tier Apps Processor	Automotive mmWave Radar, MCU, ADAS
Enables new RF architectures <ul style="list-style-type: none"> • 35-50% die shrink • 40-50% lower power for RF Tx/Rx (vs. 28nm) 	Low power operation down to 0.4V <ul style="list-style-type: none"> • 1pA/cell standby • 80% lower total power (vs. 40nm) 	Full-node scaling benefits in PPAC vs. 28nm <ul style="list-style-type: none"> • <60% power @ iso-perf. • ~1.3X perf. @ iso-power • ~70% area 	High Pout for long-range radar @77GHz in single-chip auto radar system for low latency, lower power, and lower cost
Integrated mmWave PA with high PSAT via FET stacking	High performance (RF) LDMOS for integrated PA and switch & power management	Adaptive body bias enables additional PPAC gains by compensating for PVT variability and aging	GLOBALFOUNDRIES AutoPro™ Service Package
Highest ft/fmax for 5G/mmWave	Fully integrated & versatile eMRAM for storage & compute	Roadmap to 12nm FD-SOI for next-gen designs	Automotive G2/G1 including eMRAM

Technology Overview

- Four core device Vt's (FBB, RBB & eLVT)
- Two I/O Vt's @ 1.2V/1.5V/1.8V
- Full set of active and passive devices
- LDMOS (3.3V/5.0V/6.5V)
- Low power: 0.4V to 0.8V Vnom
- Reference flow for back-gate biasing
- RF BEOL /w ultra thick metal stacks
- Standard temperature range: -40°C to 125°C

IP Overview

The 22FDX Platform IP portfolio includes a wide range of silicon-proven high performance, power-optimized solutions for a broad set of applications.

Foundation IP					
Standard Cell	Low Power/Performance/Dense/Low Leakage Libraries				
Memory	HP/HD/ULL/TP/DP, SRAM, Register File, ROM				
GPIO	1.2-1.8V/3.3V, ESD				
Body Bias	Body Bias Generator, Dynamic Body-bias Controller				
Interface IP					
DDR3/4	LPDDR3/4	USB2/3.x	PCIe	SATA	
SERDES	MIPI D-PHY/M-PHY	HDMI 2.0	LVDS	XAUI	
Wireless Connectivity IP			Non-volatile Memory IP		
BLE	WiFi	NB-IoT	Cat-M1	OTP	eFuse
Analog IP				Core IP	
PLL	ADC/DAC	Video DAC	Audio CODEC	LS	RISC-V
RTC	Temp Sensor	Process Monitor	POR/BOR	Regulator	

Contact GF for IP availability.

Application-optimized Solutions

- Analog, RF/mmWave**
 - Integrated RF and analog with high ft/fMAX
 - WiFi & BT combo, LTE transceivers
 - Low power 5G and mmWave technologies
- Ultra Low Leakage**
 - Ultra-low static leakage (~1pA/μm)
 - ULL SRAM with <1pA/cell leakage
 - IoT, Wearables, Smartcard applications
- Ultra Low Power**
 - Flexible power options as low as 0.4V
 - Consumer, mobile, Auto IVI applications
- eMRAM**
 - Fully integrated, versatile memory for storage and compute for IoT and MCU (in development)
- Automotive**
 - Grade 1 for under-the-hood automotive/ industrial (in development); Grade 2

Architected for Effective Back-gate Biasing

Technology back-gate biasing feature enables dynamic tradeoffs between power, performance and leakage and provides the greatest design flexibility.

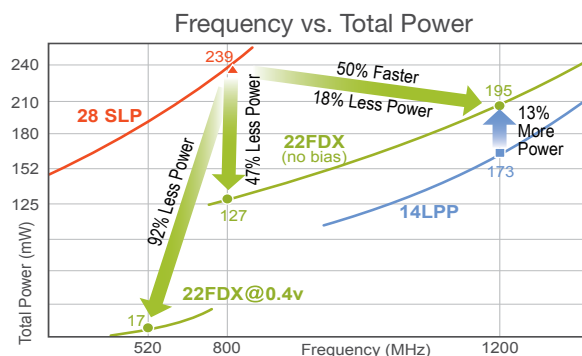
Forward Body Bias (FBB)

- 50% lower power at same frequency (vs 28nm)
- Up to 40% faster performance at same power (vs 28nm)

Reverse Body Bias (RBB)

- Reduces leakage to 1pA/micron in standby mode

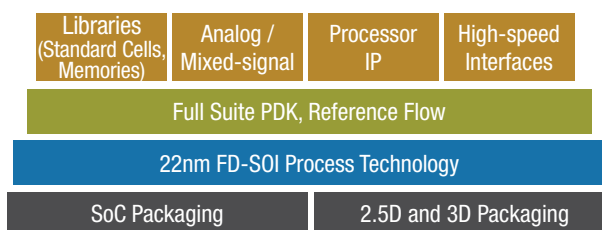
High Performance and Low Power



Design and Manufacturing Ecosystem with FDXcelerator™ Partner Program

GLOBALSOLUTIONS is the sum of our internal resources and ecosystem partners, combined to efficiently enable the fastest time-to-volume.

The FDXcelerator Partner Program facilitates FDX™ SoC design, reduces time to market and minimizes development costs.



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