

22FDX®

22nm FD-SOI Technology

Highlights

- 22nm FD-SOI technology
 - + Manufactured in state-of-the-art fab in Dresden, Germany
 - + Ultra-low-power extension with 0.4V operation
 - + Transistor back-gate biasing for energy-efficient trade-off between performance and power
 - + Integrated RF for reduced system cost and low RF power back-gate feature to further reduce RF power up to ~50%
 - + World-class Fmax, self gain; very low noise figure at mmWave; FET stacking for single chip integration of high Pout, high PAE PA and switches
- Low power embedded applications
 - + 5G: <6GHz and mmWave handset solutions, backhaul, base stations
 - + LEO satellite communications
 - + mmWave radar
 - + Narrow-band IoT, Wearables
 - + Mobile Applications Processors
 - + Networking and WiFi
 - + Automotive (ADAS, IVI)
- 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

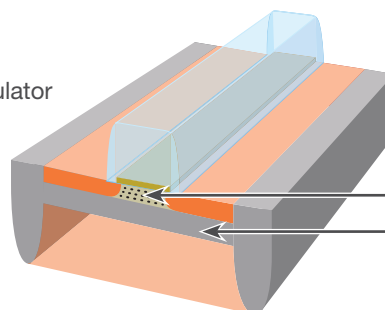
Enabling *Connected Intelligence*

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 at the cost of 28nm planar technologies, including up to 70% lower power vs. 28nm. The simultaneous high Ft, high self gain and high current efficiency of 22FDX enables efficient, ultra low power RF/analog designs.

FD-SOI

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



Fully Depleted Channel for Low Leakage

Ultra-thin Buried Oxide Insulator

Target Applications and Platform Solutions

5G, LTE and 802.11ac/ax/ad	IoT / MCU	Low/mid-tier Apps Processor
Enables new RF architectures w/ 35-50% die shrink (vs. 28nm) for LTE, WiFi and other wireless applications <6GHz	Lower dynamic & leakage power (vs. 40nm) - 80% lower total power - 1pA/cell standby	70% lower power than 28nm
Integrated mmWave PA with high PSAT via SOI-stacking	High performance (RF) LDMOS for integrated PA and switch (WiFi, BLE4&5.0) & power management	40-50% lower power than 28nm for RF Tx/Rx
Highest ft/fmax for 5G / mmWave	Versatile eNVM in FD-SOI	Roadmap to 12nm FD-SOI for next gen designs

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 7.5T (ULP), 8T (ULL), 12T	Low power & low leakage library
ROM and SRAM compiler	GPIO (1.2-1.8V, 3.3V), ESD, BB Gen

Memory	
High density memories	NVM: Electrical Fuse / OTP
Low leakage SRAM	ROM

RF and Analog IP		
Process monitor & Temp sensor	GP and fractional PLL	
Audio/Video DAC/ADC	High-performance Audio DAC / ADC	
BLE	WiFi	LTE M2M
LDO library	Real-time clock (RTC)	DC-DC

RF and Analog IP		
DDR3/4	LPDDR3/4	USB2/3.x
PCIe G1/2/3/4	SATA I/II/III	MIPI D-PHY/M-PHY
12.5G SerDes	DP / HDMI 2.x	

Contact GF for IP availability.

Application-optimized Platform Extensions

- RF Analog**
 - 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**
 - Efficient non-volatile memory and low-power cache replacement for IoT (in development)
- Automotive**
 - Grade 1 for under-the-hood automotive / industrial (in planning); 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.

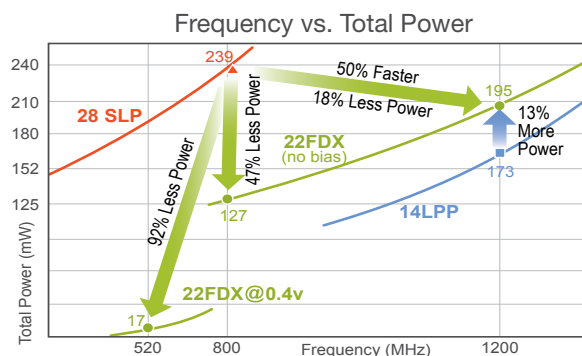
Forward Body Bias (FBB)

- 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

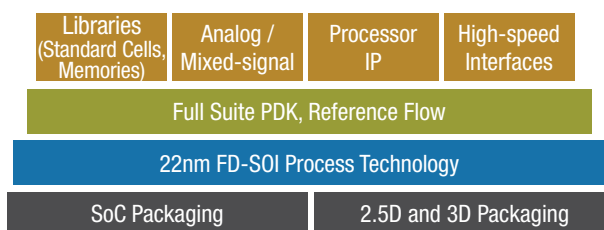
High Performance and Low Power



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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