



GLOBALFOUNDRIES®



# Automotive Solutions

## Including AutoPro™ Service Package

### Highlights

- Strong track record in automotive
  - + Zero excursion, zero defect policy
  - + AEC-Q100 qualification, IATF 16949 certification, ISO26262 compliance
  - + 3rd Party and Customer Audit Compliant
  - + Supplying automotive customers for more than 10 years
- Broad range of automotive customers modular platforms
  - + Highest level of integration
  - + Includes Flash NVM, RF and BCD
  - + Automotive Grade technology and IP
- Technology Leadership with Automotive-aligned roadmap
  - + 22FDX® FD-SOI with eMRAM
  - + 14LPP/12LP and 7LP FinFET
  - + 180/130/55/40/28nm processes
- Market leader in 40nm mmWave automotive radar and NVM development
- Advanced packaging and test solutions in 2.5D, 3D, FOWLP and Silicon Photonics

**Enabling  
Connected  
Intelligence**

### Solutions for the car of tomorrow—Today!

The recent acceleration of electronic automotive systems and consumption of semiconductor content has been revolutionary. This growth is largely driven by new technologies that enhance the driving experience such as navigation, remote roadside assistance, and advanced systems that combine data from multiple sensors with high-performance processors that make control decisions. The automotive market draws on GLOBALFOUNDRIES' core strengths, gained from a decade of working with the leading automotive suppliers. GF offers the industry's broadest set of solutions for a full range of driving system applications and is working with partners to implement mainstream and leading-edge process technology products such as multi-core MCUs, radar, cellular and WiFi communications, embedded memory, sensors, power and battery management, and other automotive solutions with proven quality flows.

### AutoPro™—Accelerating innovation and productivity of the transportation industry

GF AutoPro™ Service Package is designed to meet the rigorous quality and reliability requirements of the automotive industry. The package delivers an experience and level of quality and reliability that is uniformly applied across all GF automotive technologies and is built upon three core pillars:

- Quality Systems Readiness
- Technology Platform Readiness
- Operational Readiness



#### Key Sub-segment Requirements

	ADAS	Infotainment (IVI)	Body Electronics, Powertrain, etc.	mmWave Radar
Compute (CPU, GPU, DSP)	●	●	●	●
Connectivity (Cellular/WiFi)	●	●	●	●
Analog	●	●	●	●
Sensor Fusion	●	●	●	●
Power Management	●	●	●	●
In-Vehicle Networking	●	●	●	●
Security	●	●	●	●
<b>GF Products</b>	28SLP, 22FDX, 14LPP/12LP, 7LP	22FDX, 14LPP/12LP	130 BCDLite®, 130 BCD, 55LPX, 40LP, 22FDX	40LP, 22FDX, 7SW, 45RFSOI

# Automotive Solutions

## GF Capabilities for Automotive

Key Requirement	130 BCD/ 180 BCDLite®	55LPX	40LP	28SLP	22FDX	14LPP/12LP	7LP
<b>AEC Q-100 Automotive Grade</b>							
Grade 2 (-40°C to +105°C Ta)	●	●	●	●	●	●	○
Grade 1 (-40°C to +125°C Ta)	●	●	●		○	○	○
Grade 0 (-40°C to +150°C Ta)	○	○	●				
<b>Memory</b>							
eFuse	●	●	●	●	●	●	○
eFlash	●	●	○				
eMRAM					○	Under Assessment	
<b>mmWave Radar Integration</b>							
Packaging			●		○		
<b>2D (FC BGA)</b>							
WLP (Fan-in, Fan-out)	●	●	●	●	●	●	○
2.5D	●	●	●	●	●	●	○
3D						●	○
<b>Integration: NVM, RF, Analog</b>							
Core Voltage (Vdd)	1.8V/5V/6V (180 BCDLite) 1.2V/1.5V/5V (130 BCD)	0.9V, 1.2V	0.9V, 1.1V, 1.2V, 9V, 12V	0.8V, 1.0V, 1.1V	0.65V, 0.8V	0.8V	0.75V
I/O Voltage	5V, 6V (180 BCDLite) 5V (130 BCD)	1.8V, 2.5V, 3.3V	1.5V, 1.8V, 2.5V, 3.3V	1.5V, 1.8V, 2.5V, 3.3V	1.2V, 1.5V, 1.8V, 2.5V, 3.3V	1.2V, 1.5V, 1.8V	1.2V, 1.5V, 1.8V

Contact GF for latest availability by Automotive Grade. The table represents suitability of GF process nodes for each key requirement. ● Available ○ In Development

## Embedded Memory for Automotive

GF's technology platforms from 130nm to 22nm offer a wide variety of embedded memory solutions such as embedded magnetoresistive RAM (eMRAM) and embedded Flash (eFlash). These memory solutions address the automotive market from Grade 2 to Grade 0.

## CMOS mmWave Radar

GF's 40nm and 22FDX® CMOS mmWave solutions enable system-on-chip integration of memory, DSP, analog and RF for optimized ADAS solution cost and complexity and are ideal for short-range side/rear and mid-range forward-looking radar. 22FDX fully depleted SOI has RF performance comparable to SiGe for long-range radar with the integration advantages of advanced CMOS, along with the lowest power consumption achieved with the unique back-gate bias capability of CMOS. 22FDX is the ideal solution for highly integrated next-generation ADAS radar SoCs leveraging the novel architectures enabled by FD-SOI.

## SiGe BiCMOS

GF's SiGe BiCMOS solutions offer world-class performance for Automotive ADAS radar RFICs due to the superior VCO phase noise and higher PA output power and efficiency that can be achieved with the SiGe HBT, and are optimal for long-range forward looking 77GHz ADAS radar.

## RF SOI

GF's 45RFSOI partially-depleted SOI technology is built with an RF-centric thick metal back end on a high-resistivity trap-rich substrate which enables low loss and world class harmonic performance. It is the ideal solution for low latency, next generation V2V and V2X applications. The technology offers great RF performance along with the integration advantages of advanced CMOS.

Key RF/mmWave Application	SiGe PA				SiGe HP				RFSOI	RFCMOS	
	5PAe	1KW5PAe	5PAx	1K5PAx	7SW	8WL	8HP	8XP	45RFSOI	40LP	22FDX
<b>Automotive Radar</b>											
24GHz - Short Range						●				●	●
77-86GHz - Mid Range							●			●	●
77-86GHz - Long Range								●			●
Side/Rear Radar					●				●	●	●
Vehicle-2-Vehicle (V2V)	●	●	●	●	●		●	●	●		●
Vehicle-2-Road / Infrastructure (V2X)	●	●	●	●			●	●	●		●
Gesture Sensing							●	●	●		●
<b>System Partitioning</b>											
Front End Modules	●	●	●	●	●	●	●	●	●		●
Transceivers	●	●	●	●	●	●	●	●		●	●
Digital SoC											●

Contact GF for latest Automotive Grade availability. The table represents suitability of GF process node for each technology function.

## Power Solutions

GF's 130nm BCD process enables customers to provide a monolithic solution for multiple modules inside electric, hybrid and Internal combustion vehicles:

- Automotive Grade 1 and Grade 0 qualified process
- 80V device, with a roadmap to 100V device (for 48V hybrid specification)
- NVM (eFlash) solution for real-time information on age and health of battery
- Applicable sub-segments: battery management, battery monitoring, head-end PMICs

# Automotive Solutions

## IP Libraries for Automotive

Features	Description	130 BCD	55LPx	40LP	28SLP	22FDX®	14LPP/12LP	7LP
Foundation IP	Standard Cell	⊕ 7T/9T	⊕ 8T/9T/12T	⊕ 9T/12T	⊕ 7T/9T/12T	● 8T/12T	⊕ 7.5T/9T/10.5T	○ 6T/7.5T/9T
	Standard Cell ULP		⊕ 8T/9T/12T	⊕	⊕ 8T	● 7.5T		
	SRAM / TCAM Compiler	⊕ SRAM	⊕ SRAM	⊕ SRAM	⊕ SRAM	● SRAM	⊕	○
	ROM Compiler	⊕	⊕	⊕	⊕	●	⊕	○
	Register File: 1P	⊕	⊕	⊕	⊕	●	⊕	○
	Register File: 2P	⊕	⊕	⊕	⊕	●	⊕	○
	GPIO	⊕	⊕	⊕	⊕	●	⊕	○
	ESD	⊕	⊕	⊕	⊕	●	⊕	○
Non Volatile Memory	Electrical Fuse	⊕	⊕	⊕	⊕	○	⊕	○
	eMRAM					○		
	eFlash	⊕	⊕	○				
Analog	Temp Sensor			⊕		●	⊕	○
	Process Monitor					●	⊕	○
	PLL		●	⊕	⊕	●	⊕	○
	Video DAC			⊕		●	⊕	<i>In Planning</i>
	Audio ADC/DAC				⊕	●		<i>In Planning</i>
Interface IP	DDR3/4		⊕ DDR3/2	⊕ DDR3/2	⊕ DDR3/2	○	⊕	○ DDR4
	LPDDR2/3/4		⊕ LPDDR2	⊕ LPDDR2	⊕ LPDDR3/2	●	⊕	○ LPDDR4
	PCIe G1.1/2/3/4		⊕ Gen1/2	⊕ Gen1/2	⊕	●	⊕	○
	MIPI D-PHY/M-PHY		● D-PHY	⊕	⊕	● D-PHY	⊕	○
	SATA I/II/III		⊕ I/II	⊕ I/II	⊕	●	⊕	○
	SerDes (6G-56G)			⊕ Up to 6G	⊕ Up to 6G	● Up to 12.5G	● Up to 56G	○ >56G
	USB2/3.x		⊕ PHY	⊕	⊕	●	⊕	○
	HDMI 2.0/DP		⊕ HDMI 1.4	⊕ HDMI	⊕	● HDMI 2.0	⊕	○
	V-by-One PHY					○	⊕	
RF IP	mmWave			⊕		○		
Power Management	LDO, DC-DC, RTC					●	<i>In Planning</i>	

Contact GF for latest IP availability across AEC-Q100 temp grades

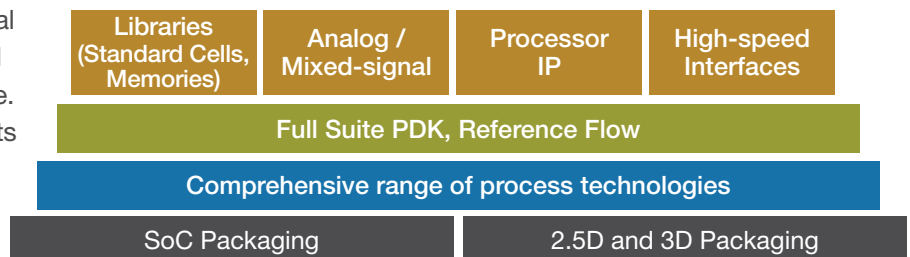
⊕ Silicon Validated

● Design Kit Available

○ In Development

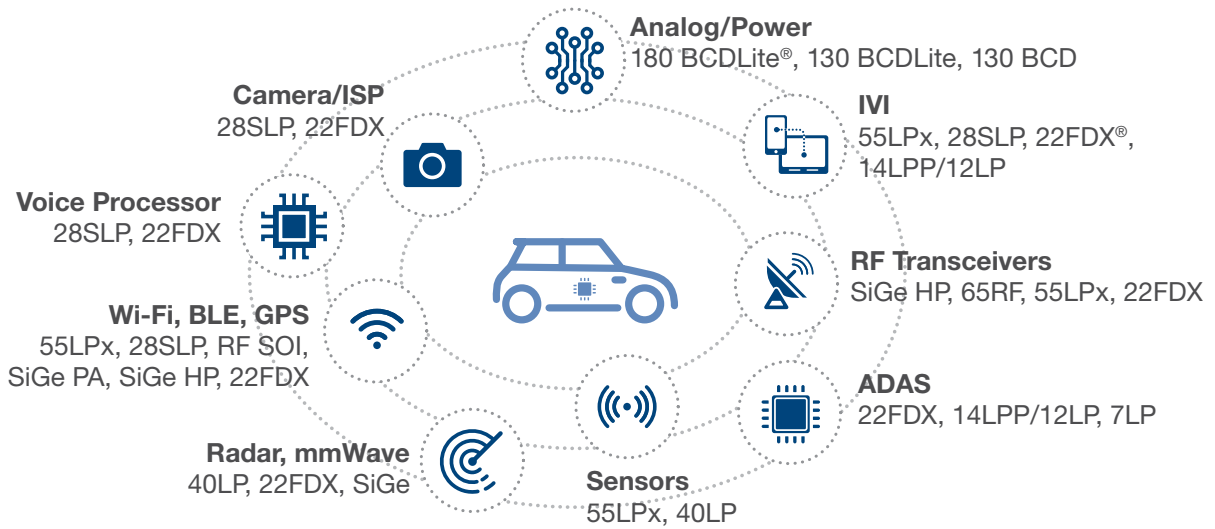
## GLOBALSOLUTIONS® Design and Manufacturing Ecosystem

GLOBALSOLUTIONS is the sum of our internal resources and ecosystem partners, combined to efficiently enable the fastest time-to-volume. This ecosystem includes partners in all aspects of design enablement and turnkey services, OPC and mask operations, and advanced capabilities in assembly solutions.



# Automotive Solutions

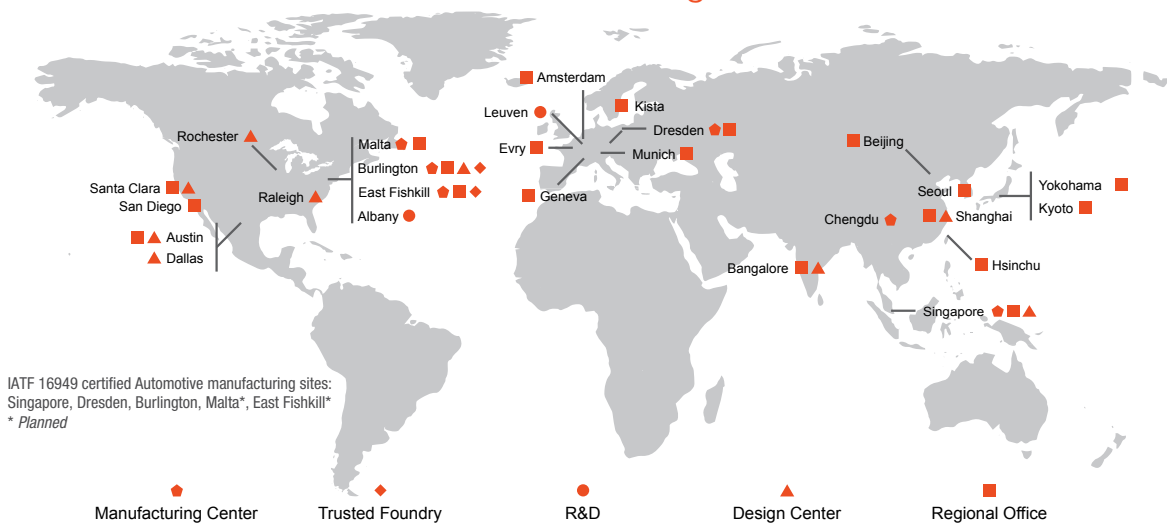
## GF Products – Automotive Applications and Solutions



## Product Roadmap for the Automotive SoC Market

Leading Edge	14LPP/12LP Highest performance & power efficient		7LP Highest density & performance
	28SLP Performance/power/cost optimized	22FDX® Cost-effective performance for Auto MCUs, mmWave radar and ADAS	12FDX™ Full-node scaling, ultra-low power & performance on demand
Mainstream			
Mature	130/180nm	55LPx	40LP
	Mixed-technology solutions based on proven processes		

## Global Presence for Semiconductor Manufacturing



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