

An aerial night view of a city street. The street is illuminated by streetlights and the headlights of cars. Pedestrians are walking on the sidewalks. Buildings with lit windows line the street. A large white bus is visible on the right side of the road. A digital sign on the left sidewalk displays the letter 'Q'.

June 2022

Digital Chassis

Qualcomm Automotive

Driving technology for the road ahead
Qualcomm Automotive Team

World's leading automakers build with our solutions

Trusted advisor to automakers



Source: Company data

Qualcomm Automotive Infotainment Platform is a product of Qualcomm Technologies, Inc. and/or its subsidiaries.

Design win pipeline reflects anticipated revenues associated with programs that have been awarded by automakers using Qualcomm solutions

#1

In telematics and Bluetooth for automotive

#1

In premium next-gen infotainment design wins for production vehicles starting 2020

24

Automakers have selected the Qualcomm® Snapdragon™ Automotive Infotainment Platform

\$16B

Design win pipeline for telematics, infotainment, and in-car connectivity





Snapdragon

cockpit platform



Qualcomm® Kryo™ CPU	Qualcomm® Adreno™ GPU	Qualcomm® Hexagon™ Tensor Accelerator
Qualcomm® Spectra™ Image Signal Processor (ISP)	Qualcomm® Adreno™ Video	Qualcomm® Hexagon™ HVX/Compute
Qualcomm® Secure Processing Unit (SPU)	Qualcomm® Adreno™ DPU	Connectivity

Custom low power architecture

Custom ARM CPU
Adreno GPU
Neural Signal Processor
Hexagon DSP
Audio DSP
Sensor DSP
Safety Island
Multimedia Codecs

Open Multi-OS Programmable Environment

- Car RTOS
- Driver HLOS
- Hypervisor

INTEGRITY

QNX



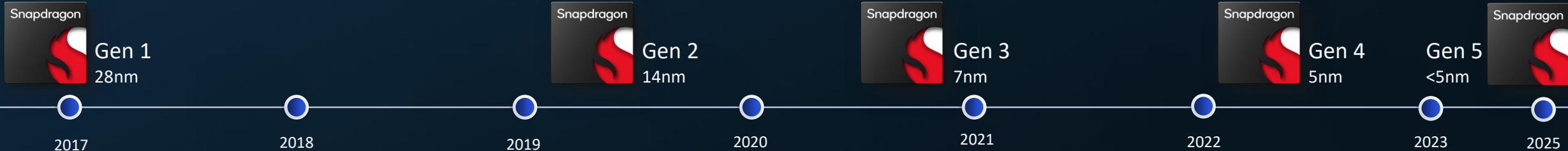
AliOS



INTEGRITY MULTIVISOR

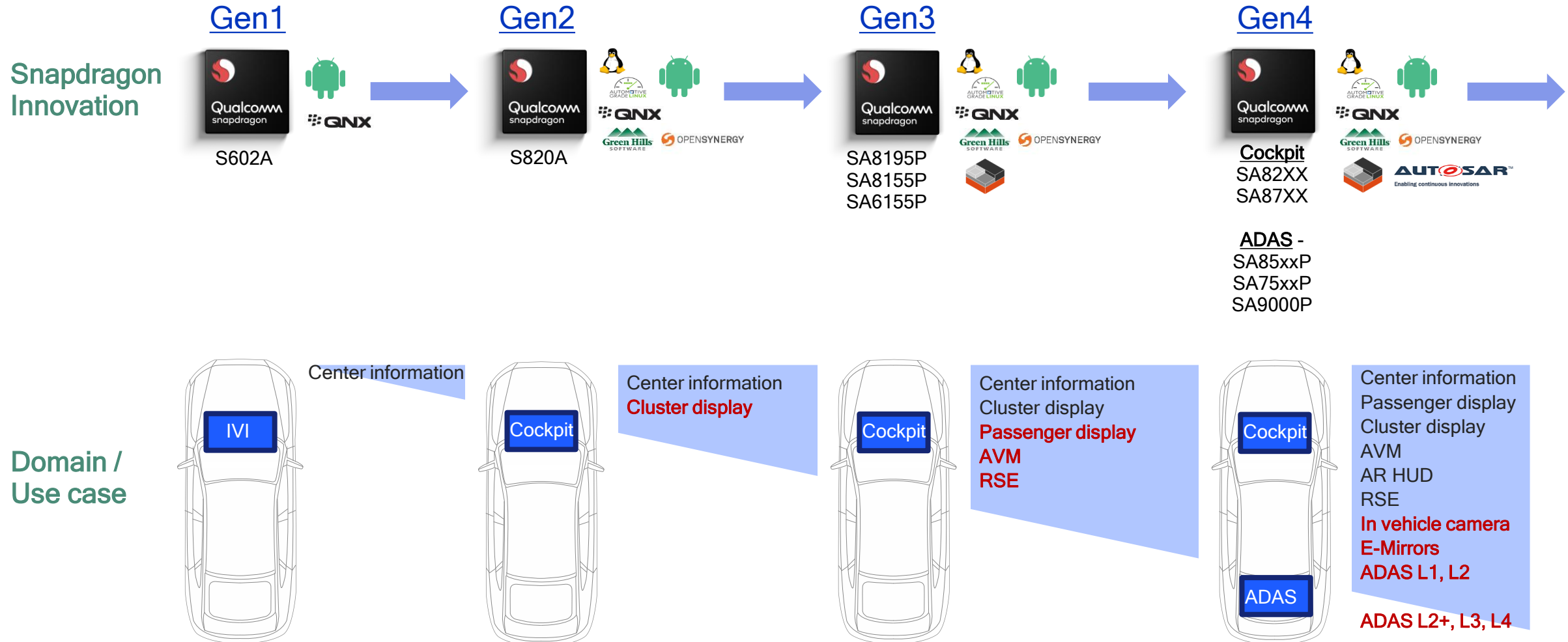


QNX



Qualcomm Snapdragon Compute Innovation

Qualcomm continues to innovate Snapdragon Solution to create Future Auto Compute with OEMs



Snapdragon Infotainment and Cockpit track record

>95% of Digital Cockpits are Snapdragon Powered

- Majority of the designs from entry to premium are based on cockpit architecture (Cluster & IVI integrated).
- Consolidation of ECUs, limited number of HW SKUs, fully scalable SW.

Qualcomm Automotive software



Region	Auto OEM	Direct OEM Engagement	Chipset	Type	HLOS	SoP
EU	Major OEM1		S602A	IVI	QNX	2016
			S820A	IVI	Android	2020
	Major OEM2		S820Am	IVI - Integrated Telematics	Linux	2020
			S820A	IVI	QNX	2020
	Major OEM3		S820A	Digital cluster	QNX	2019
	Major OEM4	Y	S820A	Digital Cockpit	GH + Linux	2020
		Y	SA8155/6155	Digital Cockpit	GH + Linux	2023
		Y	SA8295/SA8775/SA8225	Digital Cockpit/Fusion	QNX + Linux	2024/26
	Major OEM5		S820A	IVI	Linux	2020
			S820A	Digital Cockpit	QNX + Linux	2020
			SA8150/6150	Digital Cockpit	QNX + Linux	2023
	Major OEM6	Y	SA8155/6155	IVI	Android	2021
		Y	SA4150	Digital Cockpit	Android	2023
	Major OEM7		SA8195/8155	Digital Cockpit, IVI, RSE	Linux + Android	2022
	Major OEM8	Y	SA8155	Digital Cockpit	QNX + Android	2022/24
		Y	SA8255	Digital Cockpit	QNX + Android	2026
	Major OEM9		S820A	RSE	Android, Linux, OpSy	2020
		Y	SA8195	Digital Cockpit	Linux + Android	2021
		Y	SA8295	Digital Cockpit	Linux + Android	2022
	Major OEM10		SA6145	IVI	QNX + Android	2023
	Major OEM11	Y	S820A	RSE	Linux + Android	2019
		Y	SA8195/8155/6155	Digital Cockpit	QNX + Android	2022
	Major OEM13		S820A	IVI	Android	2019
			SA8155/6155	IVI	Android	2023
		Y	SA8155/6155	Digital Cockpit	QNX + Android	2023
		Y	SA8155	Digital Cockpit	QNX + Android	2021
		Y	S8295/8255	Digital Cockpit	QNX + Android	2024
Japan	Major OEM14		S602A	IVI	Android	2017
			S820A	IVI	Android	2020
			SA8155/6145	IVI	Android	2022
	Major OEM15	Y	SA6145	IVI	Android	2021
		Y	SA8155/6155	IVI	Linux	2024
Korea	Major OEM16		S820A	Digital cluster	QNX	2018
			S820A	DVRS	Linux	2019
			SA6145	Digital cockpit	Linux	2022
China	Major OEM17		S820A	IVI	Android	2020
			SA8155	Digital cockpit	QNX + Android	2021
	Major OEM18	Y	SA8155/6155	Digital Cockpit	QNX + Android	2021
			S820A	IVI	Android	2020
	Major OEM19		SA8155	Digital Cockpit	QNX + Android	2021
		Y	SA8295	Digital Cockpit	QNX+ Android	2023
	Major OEM20		SA6145	IVI	Android	2020
	EV-OEM	Y	SA8155	Digital Cockpit	QNX + Android	2021
		Y	SA8155	Digital Cockpit	QNX + Android	2021
	Major OEM21	Y	SA8295	Digital Cockpit	QNX + Android	2023

Gen1

Gen2

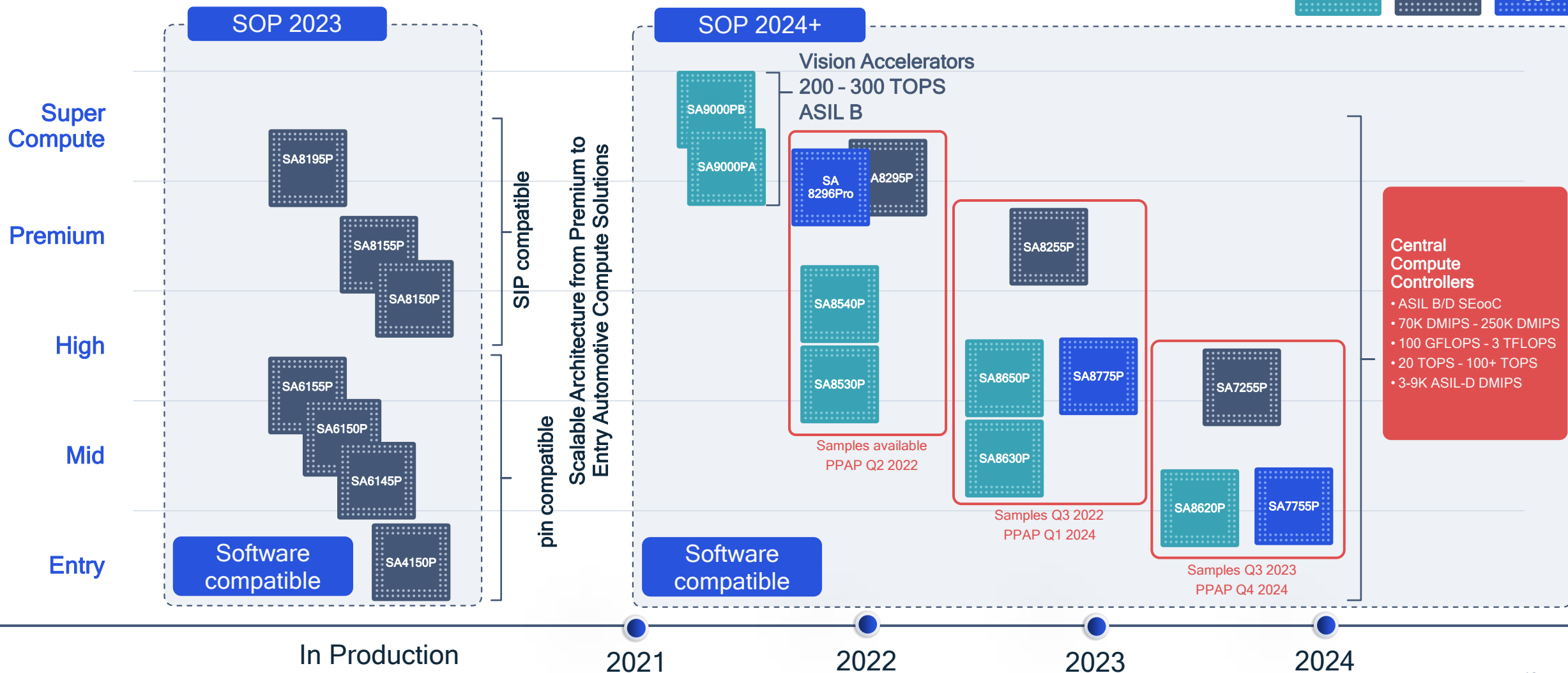
Gen3

Gen4

SoC lineup

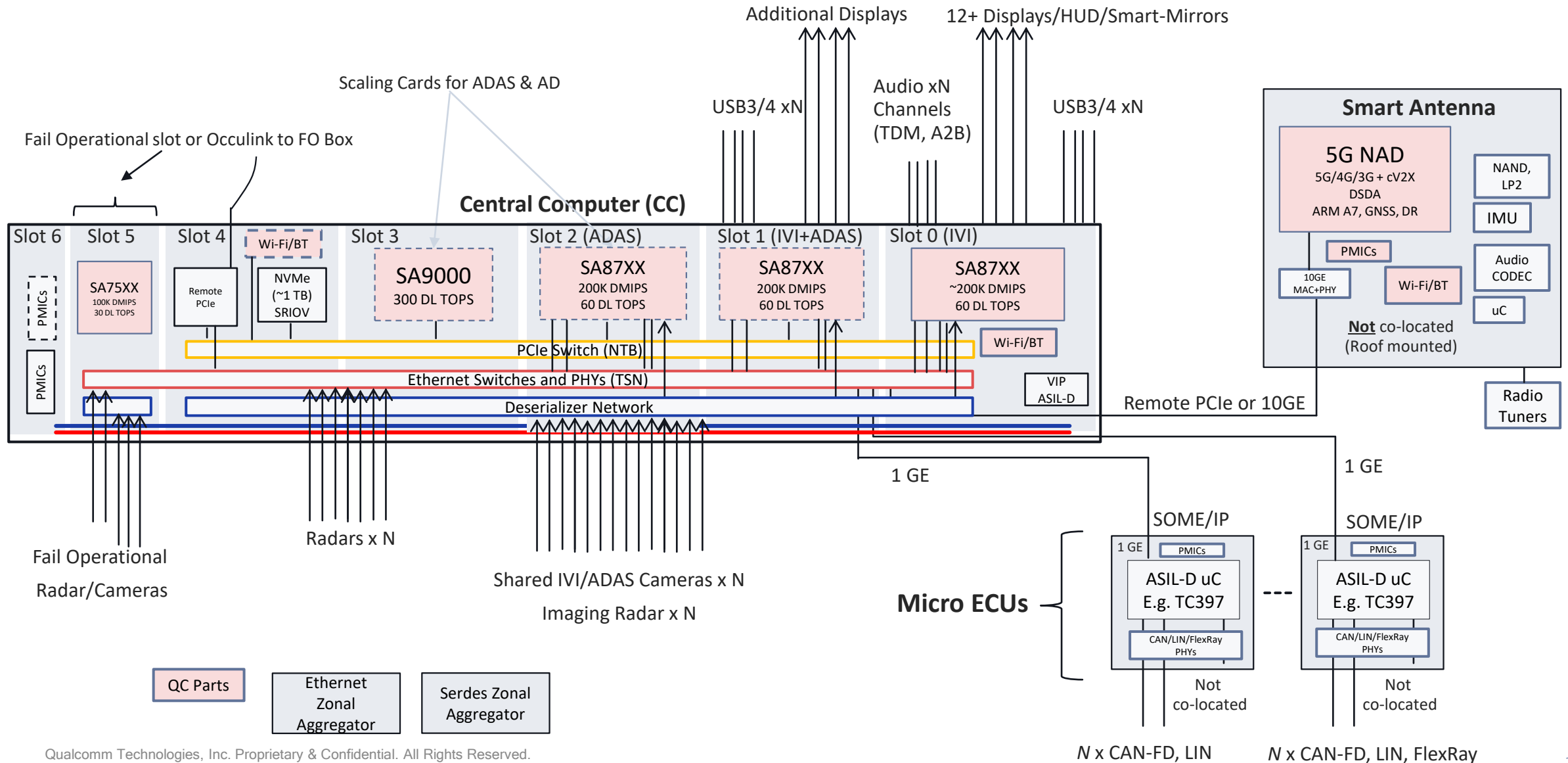
Qualcomm Automotive Cockpit Compute Roadmap

Multi-Generation Automotive Platforms—designed for Automotive Cockpit, ADAS, AD & Safety Integration



Homogenous Central Compute Platform

Multi-domain supported with Snapdragon Fusion, ADAS and Telematics SoCs



Qualcomm Automotive compute SKUs

* With external SERDES (Superframe over DSI, 2x/4x Superframe over DP MST)

** - DMIPS is not an estimate of true performance. Estimated only

*** - HMX- Hexagon Matrix eXtension

Chipsets	SA8295P - SiP only	SA8255P - SiP only	SA8195P	SA8155P	SA7255 - tbd	SA6155P
CPU	Octa Core Kryo Gen6	Octa Core Kryo Gen6	Octa Core Kryo Gen 4	Octa Core Kryo Gen 4	Six Core	Octa Core Kryo Gen 4
DMIPS**	230K	230K	110k	100k	90k	50k
GFLOPS (16b/32b)	~3.0 TFLOPS (32)/ 6.0 TFLOPS (16)	~1.2 TFLOPS (32)/ 2.4 TFLOPS (16)	2.1 TFLOPS (32)/ 4.2 TFLOPS (16)	1.0 TFLOPS (32)/ 2.0 TFLOPS (16)	350 GFLOPS (32)/ 700 GFLOPS (16)	110 GFLOPS (32)/ 220 GFLOPS (16)
Memory	8x16 LPDDR4x @ 2133 MHz	6x16 LPDDR5 @ 3200 MHz	8x16 LPDDR4x @ 2133 MHz	4x16 LPDDR4x @ 2133 MHz	2x16 LPDDR5/5x @ 3200 MHz	2x16 LPDDR4x @ 1555 MHz
Bandwidth (With UBWC)	>200 GB/s (incl. x3 gain)	>240 GB/s (incl. x3 gain)	204 GB/s (incl. x3 gain)	102 GB/s (incl. x3 gain)	75 GB/s (incl. x3 gain)	26 GB/s (incl. x2 gain)
Memory Footprint	Up to 32 GB with inline ECC	Up to 36 GB with inline ECC	Up to 32 GB	Up to 16 GB	Up to 16 GB with inline ECC	Up to 8 GB
Audio DSP (LPASS)	Q6 DSP @ 1.5 GHz	Q6 DSP @ 1.5 GHz	Q6 DSP @ 1.5 GHz	Q6 DSP @ 1.5 GHz	Q6 DSP @ 1.5 GHz	Q6 DSP @ 1.0 GHz
Compute DSP + HTA	Q6 DSP with 4xHVX + HMX*** ~30 TOPS for 8-bit FP	Q6 DSP with 4xHVX + HMX ~20 TOPS for 8-bit FP	Optional: Q6 DSP with 4x HVX @ 1.5 GHz + HTA @ 900 MHz	Optional: Q6 DSP with 4x HVX @1.5 GHz + HTA @ 900 MHz	Q6 DSP with 4xHVX + HMX ~5 TOPS for 8-bit FP	Optional: Q6 DSP with 2x HVX @ 1.1 GHz
# of Concurrent Displays*	Up to 28	Up to 32	Up to 12	Up to 8	Up to 10	Up to 6
Display Interfaces	2x DSI 6x DP, 2x eDP,	2x DSI 4x DP	2x DSI (both 4-lanes), 3x DP 1.4, 1x eDP 1.4	2x DSI (4-lanes), 1x DP1.4	1x DSI (4-lanes), 1x DP1.4 (4-MST)	1x DSI (4-lanes), 1x DP1.4 (2-MST)
Typ. Pixel/Resolution Supported	Typical 64 Mpix - 6x4k	Typical 48 Mpix - 5x4k	Typical 30 Mpix - 3x4k or 6x2880x1080	Typical 24 Mpix - 3x4K or 4x2880x1080	Typical 12 Mpix - 1x4K + 2x1920x1080	Typical 5 Mpix - 2x1080p + 1280x720
Typ. Video Decode/Encode	4k240/4k120	4k240/4k120	4k120/4k60	4k120/4k60	4k120/4k60	4k60/1080p60

(subject to change)

Qualcomm Automotive compute SKUs

Chipsets	SA8295P - SiP only	SA8255P - SiP only	SA8195P	SA8155P	SA7255 - tbd	SA6155P
Camera	Up to 16 cameras 4x CSI2 4-lane	Up to 16 cameras 4x CSI2 4-lane	Up to 16 cameras 4x 4-lane CSI-2 v1.3	Up to 14 cameras 4x 4-lane CSI-2 v1.3	Up to 12 cameras 3x CSI2 4-lane	Up to 10 cameras 3x 4-lane CSI-2 v1.3
Auto Peripherals	9x PCIe Ports - 1x4+2x2+1x1 (Gen3) 2x 1GbE w/ TSN (2 x RGMII) 1x QSPI	6x PCIe Ports - 1x2 + 1x4 (Gen4) 2x 2.5 GbE w/ TSN (2 x SGMII) 1x QSPI	1x 4-lane PCIe 3 (RC/EP) 2x 2-lane PCIe 3 (RC) 1x 1-lane PCIe 3 (RC) 1x GbE (RGMII/RMII), 1x QSPI	1x 2-lane PCIe 3 (RC/EP) 1x 1-lane PCIe 3 (RC) 1x GbE (RGMII/RMII), 1x QSPI	PCIe 1x1 (Gen4) 1x 2.5 GbE (1x SGMII) 1x QSPI	1x 1-lane PCIe 2.0 (RC/EP), 1x GbE (RGMII/RMII), 1x QSPI
USB Support	4 concurrent ports - 3 xUSB3 4xUSB 2.0	3 concurrent ports 2x USB 3.1 1x USB 3.0 3 USB2.0	2x USB3.1 Gen2 w/ DP, 2x USB3.1 Gen2	1x USB3.1 Gen2 w/ DP, 1x USB3.1 Gen2	1x USB3.1 Gen1, 1x USB2.0	1x USB3.1 Gen1, 1x USB2.0
Storage	2xUFS 3.1 G4 2lanes, 1x SDIO NVMe over PCIe	2xUFS 3.1 G4 2lanes, 1x 8-bit SDCC5, NVMe over PCIe	2x UFS2.1 Gear 3, 1x SD3.0, 1x NVMe over PCIe	1x 2-lane UFS3.0 Gear 4, 1x SD3.0, 1x NVMe over PCIe	1x UFS 2L Gear3, 1x 8-bit SDCC5	1x UFS2.1 Gear 3, 1x SD3.0, 1x eMMC 5.1
Audio Support	7xTDM/I2S + 3x High Speed I2S for Radio Front-end	7xTDM/I2S + 3x High Speed I2S for Radio Front-end	5x TDM/I2S (4x 2data lanes, 1x 4 data lanes), 2x SLIMBus, 3x High Speed I2S for Radio Front-end	5x TDM/I2S (4x 2data lanes, 1x 4 data lanes), 2x SLIMBus, 3x High Speed I2S for Radio Front-end	7xTDM/I2S + 3x High Speed I2S for Radio Front-end	5x TDM/I2S (4x 2data lanes, 1x 4 data lanes), 1x SLIMBus, 2x High Speed I2S for Radio Front-end
Other Peripherals	32x Serial Interfaces, up to 228 GPIOs	25x Serial Interfaces, up to 150 GPIOs	26x Serial Interfaces, up to 190 GPIOs	26x Serial Interfaces, up to 174 GPIOs	16x Serial interfaces, up to (tbc) GPIOs	14x Serial interfaces, up to 155 GPIOs
Power Management	4x PMM8295AU	PMM8250AU + 3x PMM8251AU	3x PMM8195AU	2x PMM8155AU	In scoping	1x PMM6155AU
Safety support	ASIL-B SAIL	ASIL-B SAIL w/ 4x CAN FD	ASIL-A, system level ASIL-B	ASIL-A, system level ASIL-B	ASIL-B SAIL w/ 4x CAN FD	system level ASIL-A & ASIL-B
Qualification	AEC-Q100 level 3	AEC-Q100 level 3	AEC-Q100 level 3	AEC-Q100 level 3	AEC-Q100 level 3	AEC-Q100 level 3

(subject to change)

Qualcomm Automotive Compute SKUs

Generation 4 samples & qualification schedule

Milestones	SA8295P (SIP module)	SA8255P (SIP module)	SA7255P	Comments
First Samples	available	Q3 2022*	Q3 2023*	Used for early HW testing & SW enablement
Final Samples	available	Feb 2023*	Q4 2023*	Final Package & Silicon
Auto Grade Production Samples	available ¹	Feb 2024*	Q4 2024*	PPAP Production Release

¹ - MSL re-qual early Q4'22

*- Under planning subject to change

SW Support

Qualcomm Automotive Software

Flexibility & Scalability

Qualcomm provides Board Support Packages (BSPs) for many software configurations:

‘To The Metal’ RTOS & HLOS BSP deliveries:

LA - Linux/Android

LV - Linux/AGL/Yocto

QX - QNX Neutrino kernel & software stacks

GH - Green Hills Software INTEGRITY RTOS

Hypervisor and multi-OS configurations:

HQX - QNX Hypervisor

HGH - Green Hills Software Multivisor

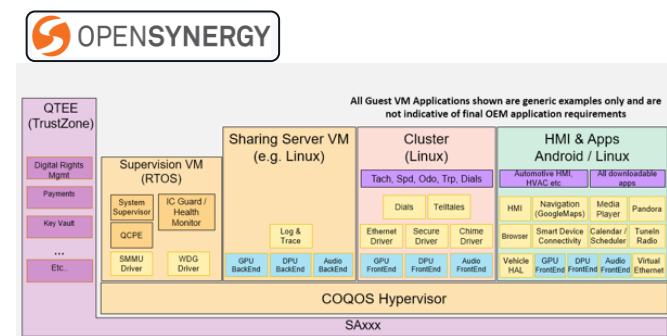
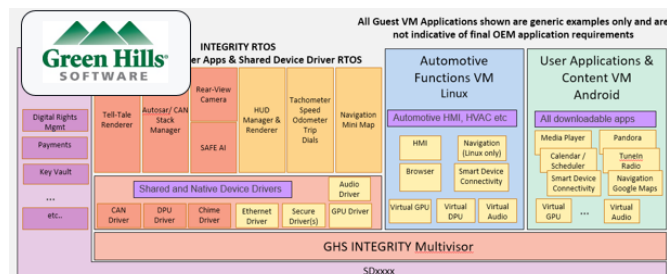
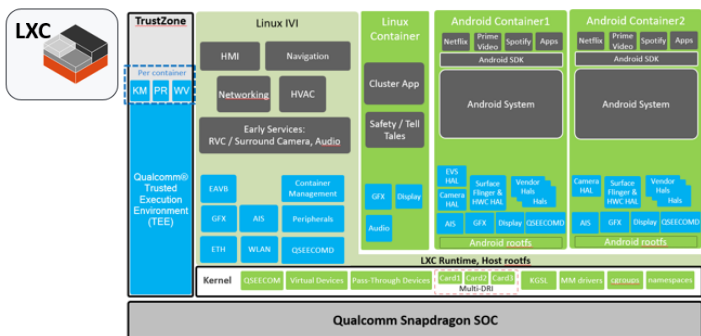
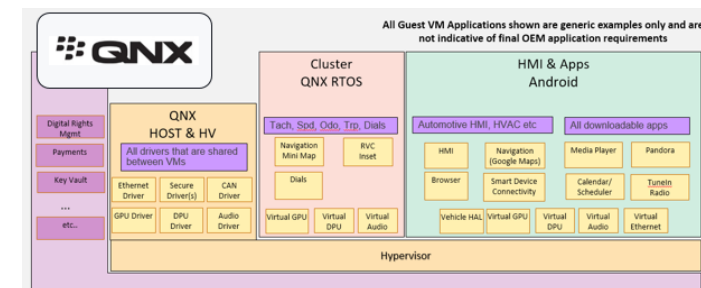
HOS - Open Synergy COQOS Hypervisor

LXC - Linux Containers (inc. Android)

Software Defined Vehicle - SOA & Microservices:

Qualcomm is working with partners on next gen SW configurations to support Cloud Native Edge applications

Virtual Platform Development: Qemu, Virtual SoC and RTL simulation options for development and testing without silicon. Working with OEMs to define different approaches depending on Model Fidelity, Performance, Cost, Flexibility.



Collaboration with OEMs, Tier1s and SW and HW partners

- Co-development with OEM & T1 ‘Software Factories’ – Agile development models, continuous Integration, Build & Test
- Developing Functional Safety Concepts with customers (FMEA/DIA/FTA ASIL and ISO26262)
- Pre-integrating and Optimizing state-of-the-art SW and HW solutions:
 - 3D UI Engines, Multi-Mic, Noise Reduction, Multi-Zonal Pre- and Post-processed Audio, Automotive Camera & Surrounds View Sensors
 - Fully immersive cabin display technologies
 - Digital Cockpit HV & ADAS Stack SW Pre-integration

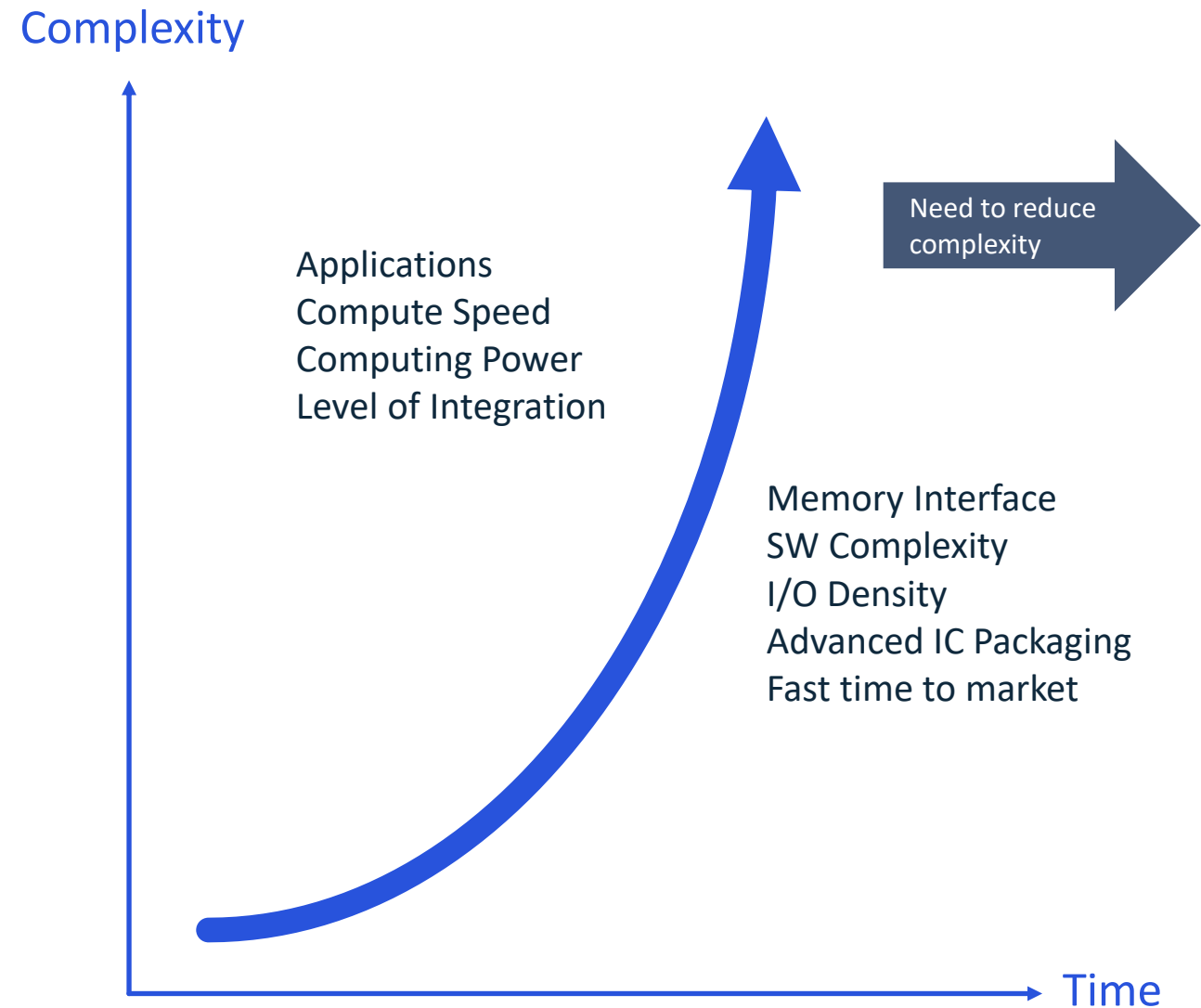
Qualcomm Automotive Modules

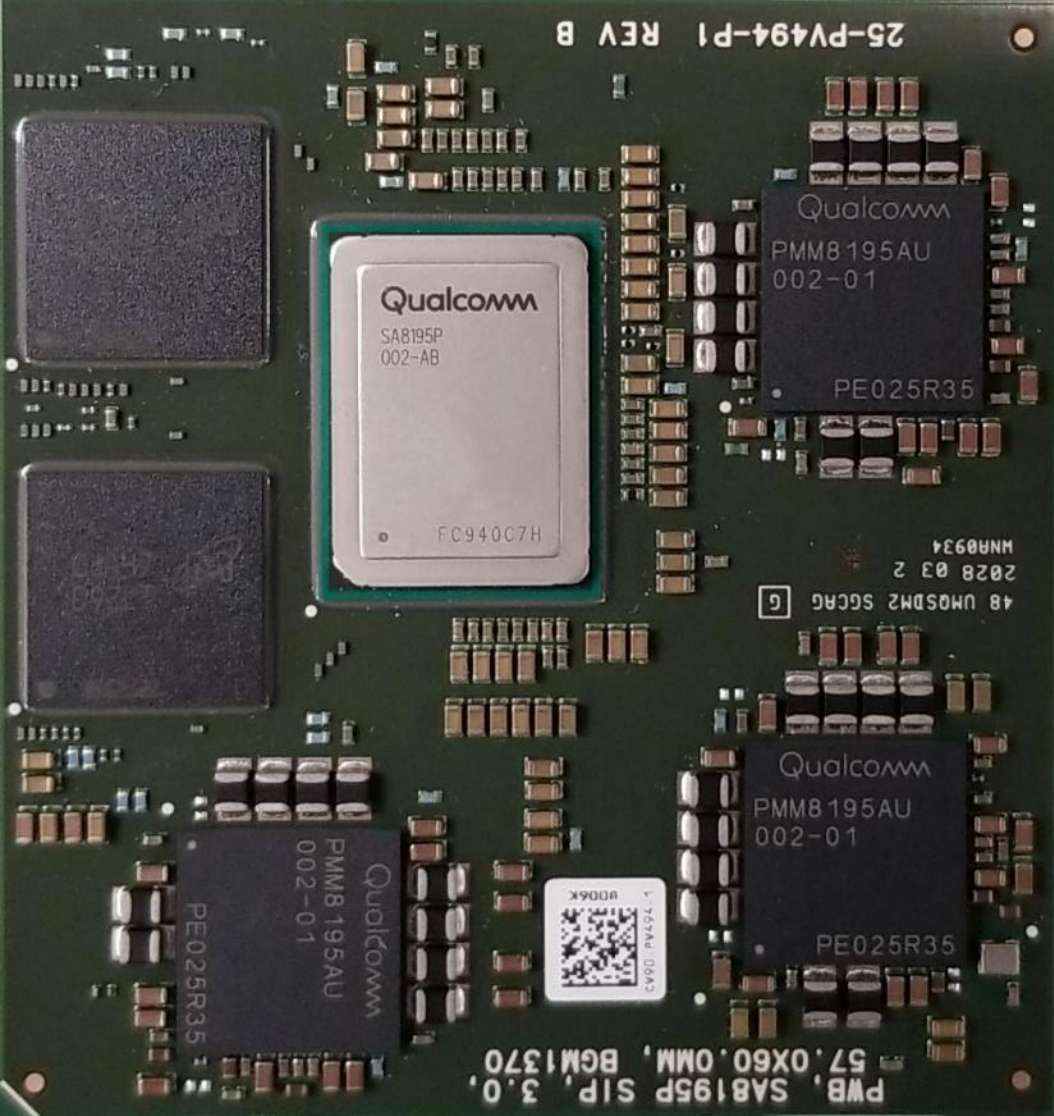
QAM8295P documentation: 80-PU692-700

Qualcomm Automotive Modules

Next level of integration for advanced cockpit and ADAS applications

- Designs Complexity increasing at an unprecedented rate and involves extensive modeling and simulation
- Optimum Design for Performance and Power require tight integration with and between silicon components
- Extensive testing on a single design and resolution of common issues seen across multiple customer designs
- High Speed I/O and memory interfaces make Signal Integrity & Product Validation more critical than ever
- Consistent Performance best done through optimized, reusable, modular sub-systems
- Leverage the buying power of Qualcomm for reduced cost





Qualcomm offers a full line up of modules to support Stellantis STLA Central HPC

- QAM8295 modules for premium performance cockpit/infotainment applications
- QAM8255 modules for high performance cockpit/infotainment/RSE applications
- QAM8650 modules for ADAS integration applications
- QAM8775 modules for next generation cockpit + ADAS fusion applications
- Available in multiple memory density and temp grade configurations

Qualcomm modules are pre-integrated and optimized solutions

- Benefits from > 5 years of advanced R&D and Qualification Testing
- Tight coupling of memory subsystems and PDN with compute subsystem
 - Full memory sku validation from Qualcomm
 - Leverages Qualcomm legacy of simultaneous optimization for small footprint and best in class power consumption
 - Reduced ECU baseboard complexity/cost compared to chip down designs
- Best in class Quality and Reliability
 - Extensive testing at both the SOC and module level
 - Modules tested to AEC-Q104 standards
 - Fully characterized design for signal integrity of high-speed lines
- Modules co-developed with chipset to shorten time to market & development cost

Qualcomm Automotive Modules

Next level of integration for advanced cockpit and ADAS applications

QAM8295P Module Product Features

Qualcomm Chipset included on Module:

- SA8295P Snapdragon Auto Compute SoC
- 4x PMM8295AU PMICs + 3rd Party PMIC (5x PMICs total)
 - Power regulation for Compute SoC & LPDDR4x DRAMs
 - Full system clocking for Compute SoC

Memory Support

- 2x 556-ball, 4x16-bit, 3rd party LPDDR4x DRAMs on module
 - 8 Channel x16-bit, 2133MHz, up to 32GB total system memory
- Support 2x external UFS devices
- Support external NVMe (non-bootable) via PCIe

Primary Power:

- Input: 3.3V
- Output: 0.9/1.2/1.8V voltage regulation for external use
 - Supplies for UFS for primary boot (UFS device not on module)

Package Type & Size

- Type: 1573 BGA Module
- Size: 65x65 mm²

Auto Qualification: AEC-Q104 Grade3

- Temp: Ta +85C, Tj 115C max
- AEC-Q100 Grade 3 for Qualcomm SoC + PMICs
- AEC-Q200 for Passive BOM

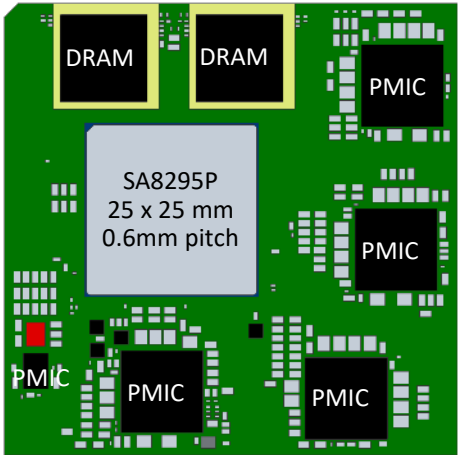
Full-Featured SA8295P Compute SoC performance:

- Kryo 695 Gen6 CPU Octa-Cores
- Adreno 695 GPU
- NSP subsystem with Quad-HVX & Dual-HMX DSPs
- Multi-Media:
 - Spectra 395 Camera ISP (Image Signal Processing)
 - Adreno 665 Gen5 VPU (Video Processing Unit)
 - Adreno 1195 DPU

External Connectivity / High-Speed Interface Support

- 9-Lane PCIe Gen3 – 2x 4-Lane or 4x 2-Lane, 1x 1-Lane
- 4x 4-lane CSI Camera ports (DPHY & CPHY support)
- 2x DSI/4x eDP/3x DP supporting up to 64MPixels
- 6x USB - 2x USB2 (HS), 4x USB3.1 Gen2 (HS+SS) (Type-C support)
- 2x RGMII to support Giga-bit Ethernet eAVB with TSN
- 2x 2-lane UFS3.1 Gear4 to support boot and mass storage
- 228x GPIOs
 - 32 GPIO-based QuP (Qualcomm Universal Peripheral) Serial Engines

Module	
Package Type	BGA Module
Package Size	65x65 mm
Mold Cap	NA
Module Thermal Lid	NA
Total Height	4.87 max
BGA Pitch	1.27 mm
BGA SRO	630 um
Mainboard Pad	630 um (NSMD)
BGA Alloy	SAC305
BGA Count	1573
Shielding	No
Underfilled Component	DRAM



Floor Plan (Preliminary)

Component Details	
APQ	SA8295P Qty: 1
	AEC-Q100 Grade: 3
LPDDR4X	Auto Grade Qty: 2
PMIC	PMM8295AU Qty: 4
	AEC-100 Grade: 3
Xtal	AEC-Q200 Qty 1 Grade: 2
Clock Buffer	AEC-Q100 Qty 3 Grade: 1
PMIC (3 rd party)	AEC-Q100 Qty: 1 Grade: 1
Passive BOM	AEC-Q200 Compliant 0201 up to 3225M form factor
Total Passives	422
Total BGA	7
Components Count	Top Side: 271 Top Side BGA Side: 163 (planned) Total: 434
Tallest Component	3225M Inductor

Assembly Materials	
Solder paste	SAC305
BGA UF	Non-reworkable



Dimensions: 65x65mm

Substrate	
Substrate Technology	HDI
Substrate Stackup	5-2-5
Layer Count	12 L
PCB Thickness	1.6 mm

SR	
L1	
PPG	
L2	
PPG	
L3	
PPG	
L4	
PPG	
L5	
PPG	
L6	
Core	
L7	
PPG	
L8	
PPG	
L9	
PPG	
L10	
PPG	
L11	
PPG	
L12	
SR	

QAM8295P Module Design Attributes



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