

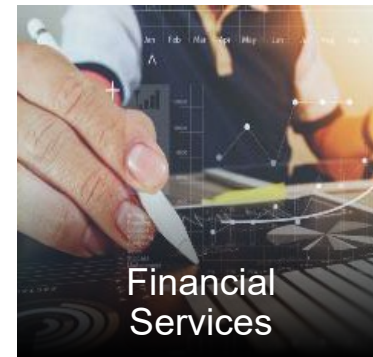
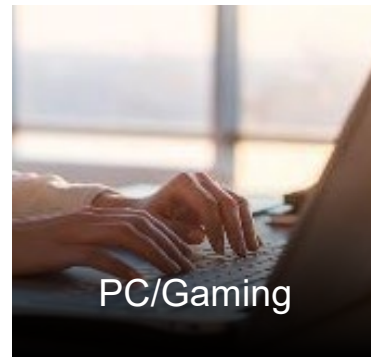
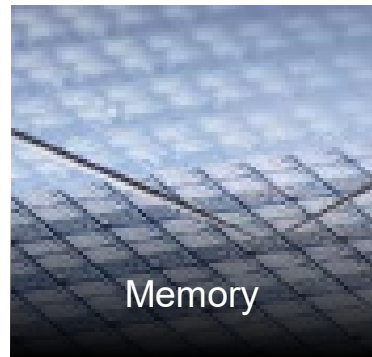
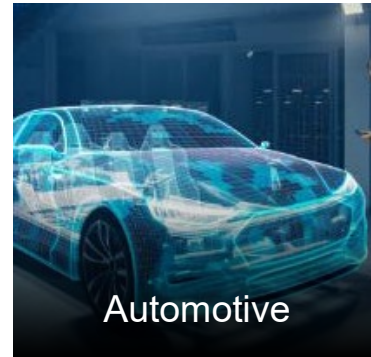
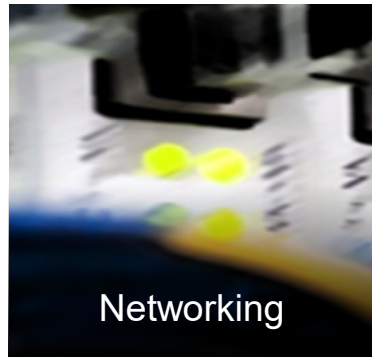


# Semiconductor IP Trends

## GSA International Semiconductor Conference

Dr Yankin Tanurhan, SVP of Engineering, Solutions Group  
March 14, 2024

# Change Occurring in Many Markets



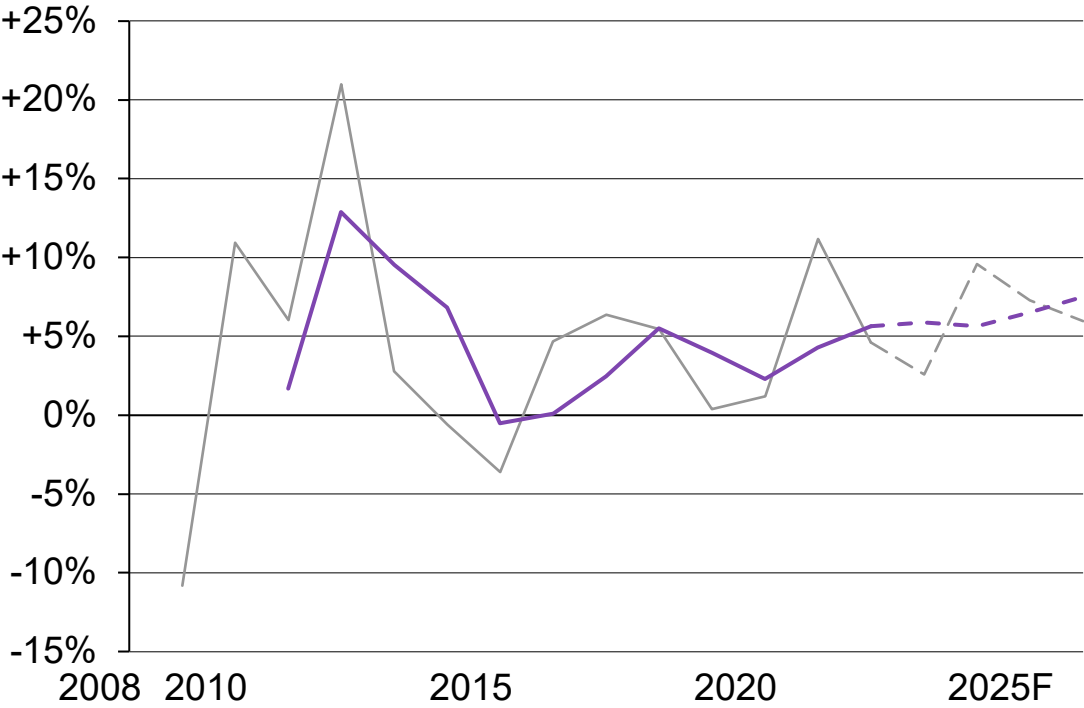
Demand for Smart Everything  
seems limitless

Innovation is fueled  
by semiconductor and  
software advances

Driven by fusion of  
big data, massive compute,  
and machine learning

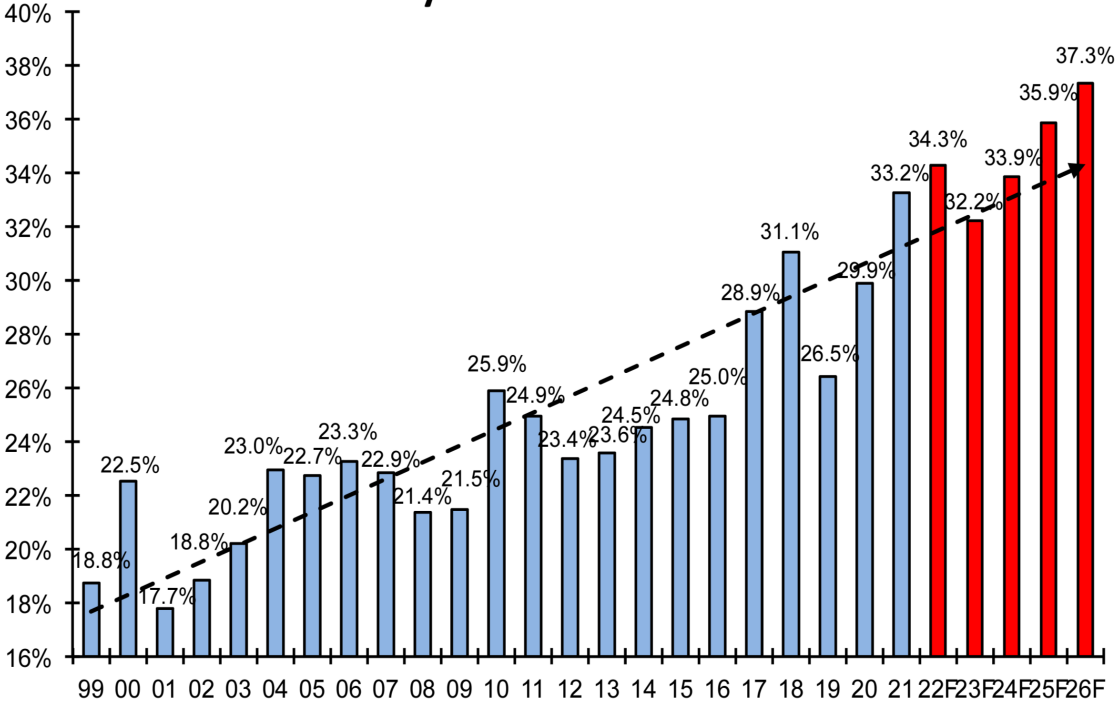
# Rising Semiconductor Content In Electronic Systems Compounding Growth

YoY % growth in electronics ex-factory production revenue



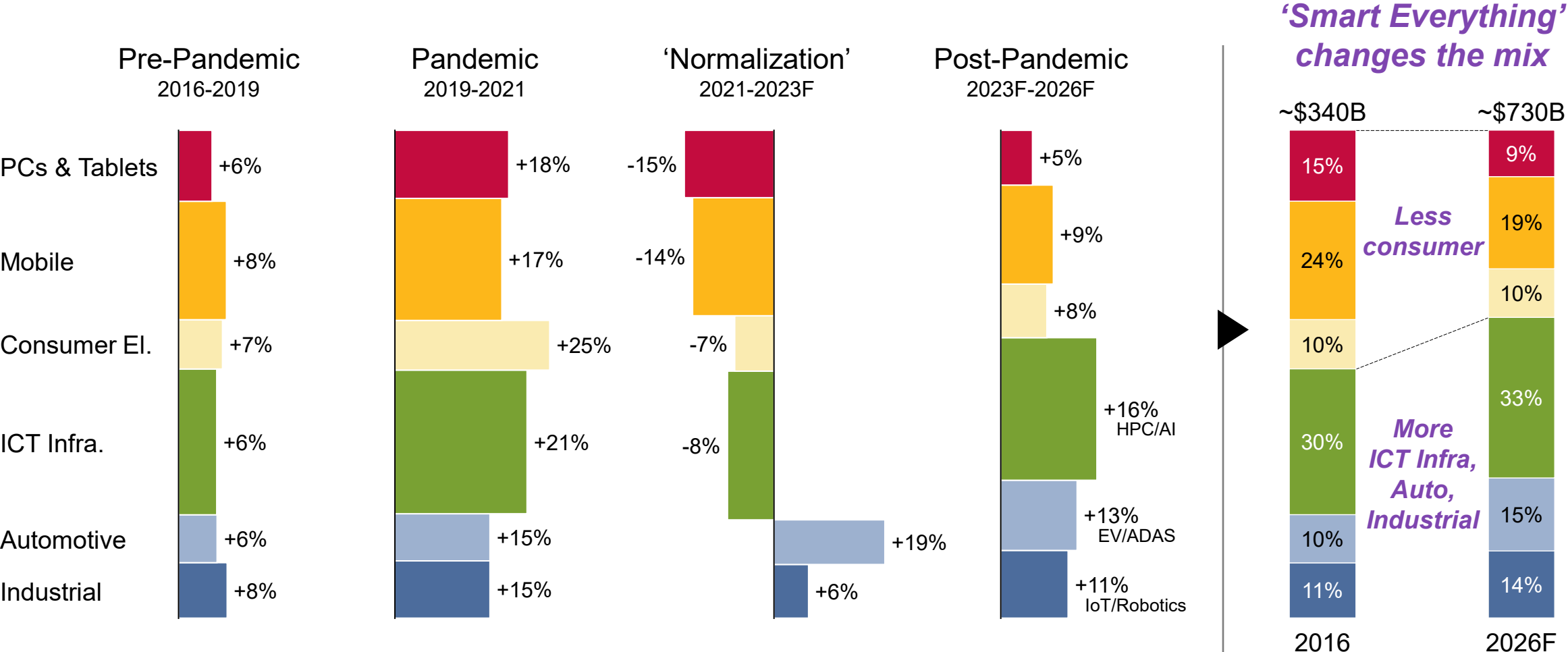
— Total Electronics — 3Y Rolling

% Semiconductor content in electronic systems



# Drivers of Semiconductor Demand Growth Are Shifting

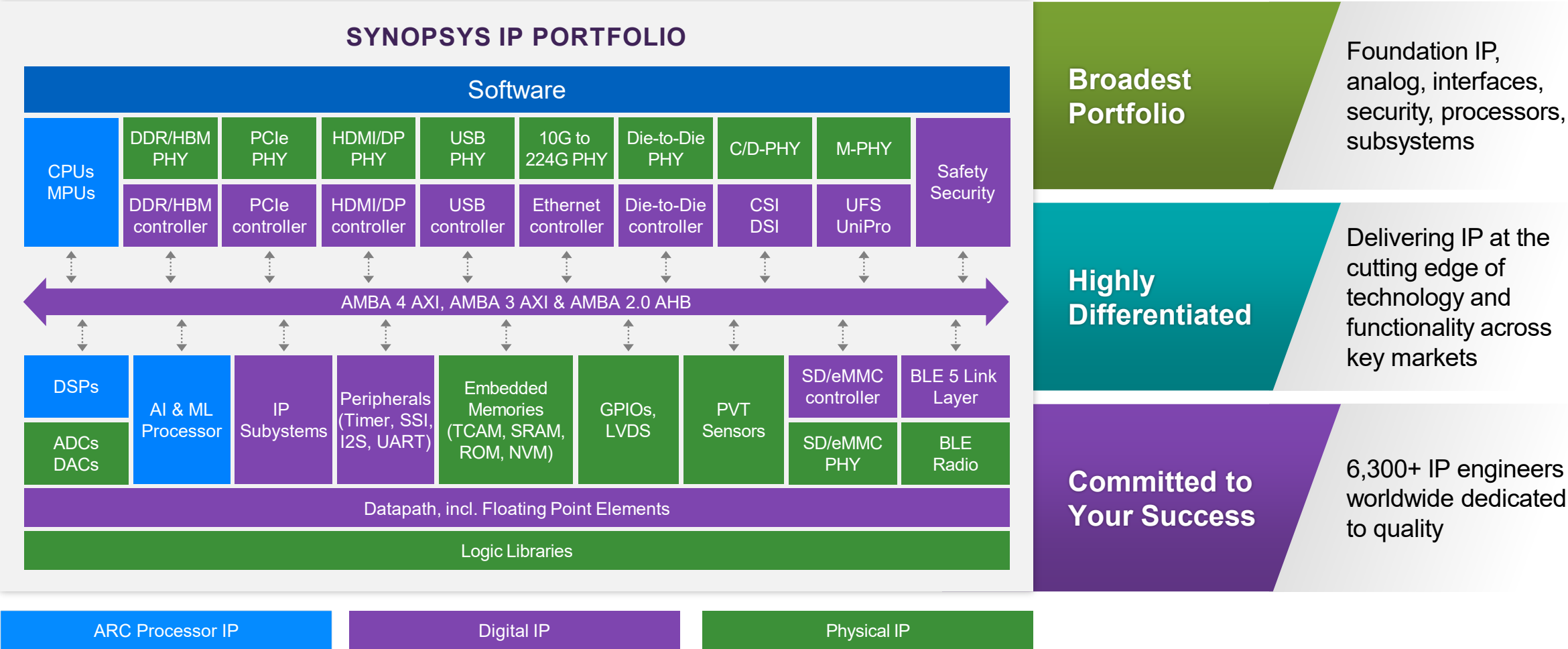
## Growth in Total Global Semiconductor Sales by End Application Market<sup>1</sup>



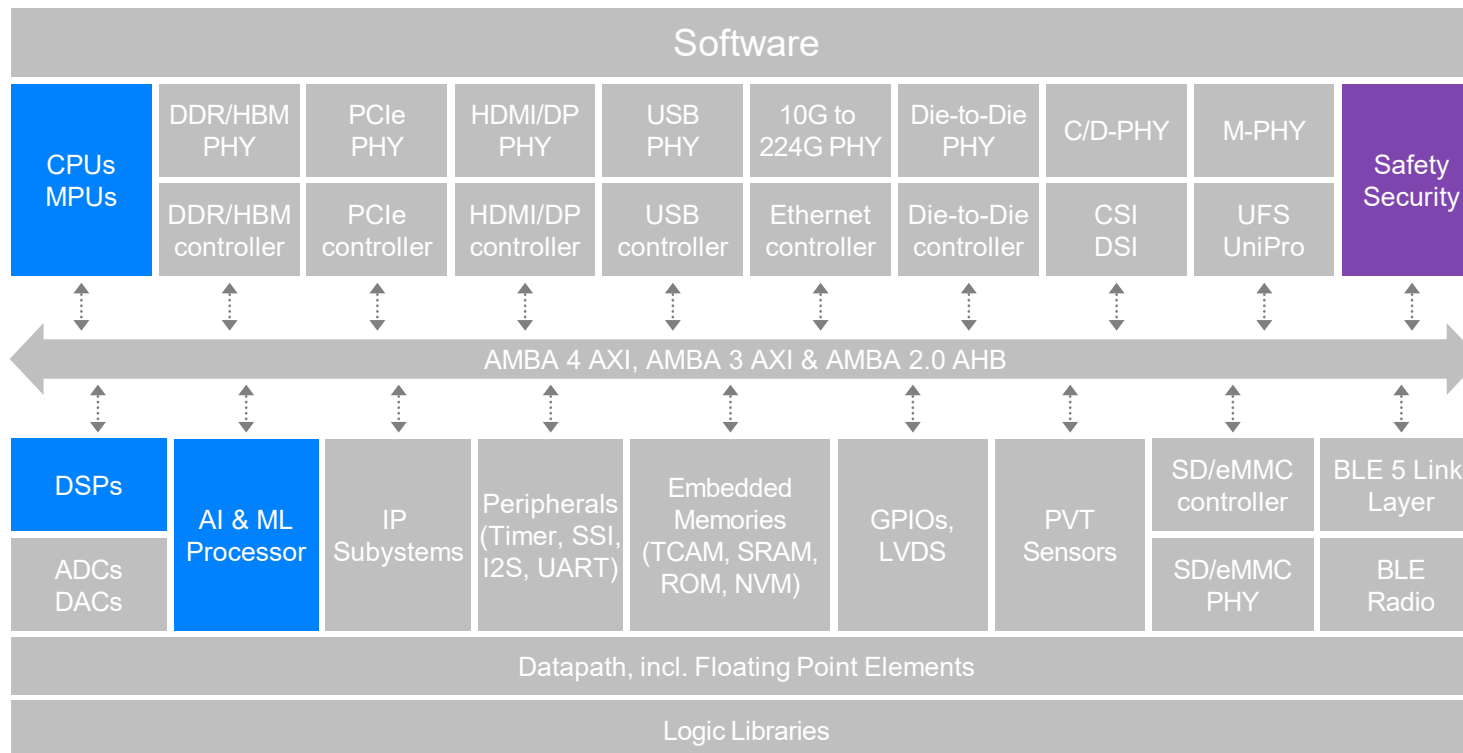
<sup>1</sup>Bar height = CAGR in period; bar width = % of total semi sales in first year of period

sources: Gartner (3/23)

# Silicon IP Is an Enabler for Semiconductor Innovation



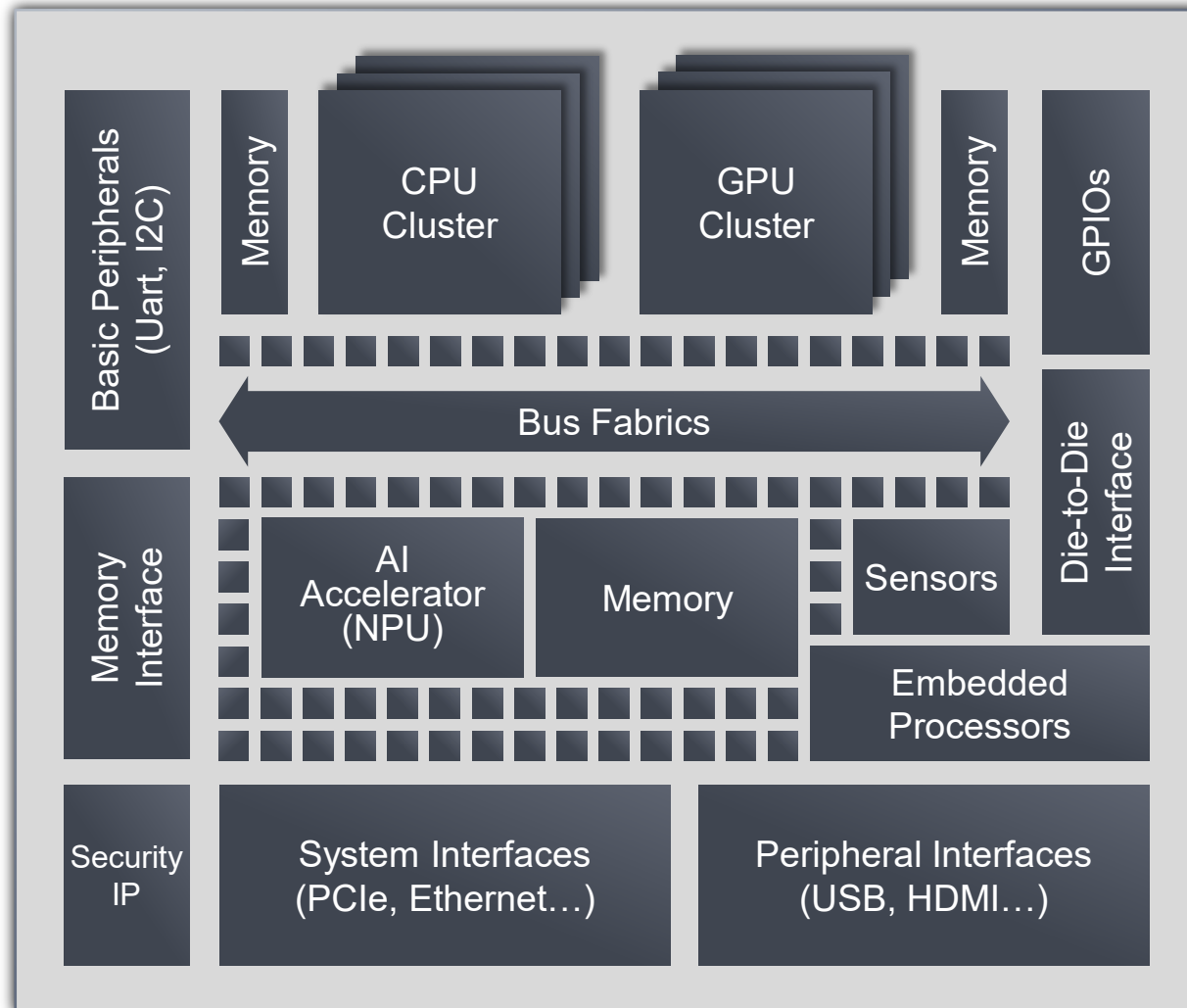
# Two Key Silicon IP Trends



1. Heterogenous Processing

2. Device Security

# Modern SoCs Process Variety of Workloads



- SoCs can contain dozens of processor IP blocks
  - e.g., CPUs, controllers, DSPs, NPUs, GPUs, ISPs, ...
- Processing requirements go well beyond main CPU
  - Sensor data (camera, Radar, Lidar), audio, I/O control, image processing, security algorithms, displays, embedded control, ...
- Specialized processors enable optimized PPA
  - “Performance efficiency” is key to control energy & cost

# Synopsys Processor IP Portfolio

CPU, DSP & AI Solutions Deliver Unrivalled PPA Efficiency



## Embedded MPU

- Optimized for ultra low power IoT
- 3-stage pipeline w/ high efficiency DSP
- Power as low as 3uW/MHz
- Area as small as 0.01mm<sup>2</sup> (28HPM)



## Security CPU

- Security processors for IoT and mobile
- Protection against HW, SW, side channel attacks
- SecureShield to create Trusted Execution Environments



## High Speed CPU

- Highest performing CPUs, CPU+DSP
- 32- & 64-bit ISAs
- High-speed 10-stage pipeline
- SMP Linux support
- Single- and multi-core configs



## DSP

- High throughput vector DSP
- SIMD/VLIW design for massive parallel processing
- Multiple vector FP units for high precision results



## NPU

- Scalable neural processor units
- Up to 250 TOPS (440 w/ sparsity)
- Supports latest AI applications
- High productivity, standards-based tool suite

## Functional Safety (FS) Processors

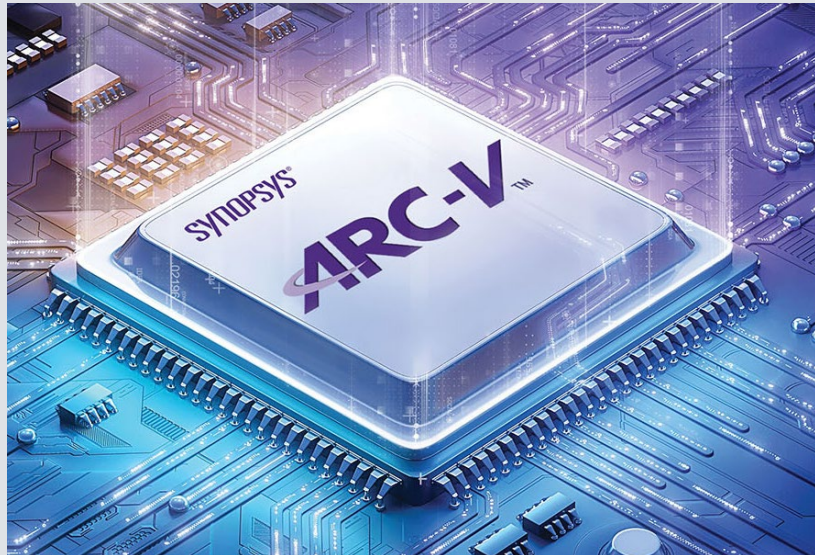


- Integrated hardware safety features for all ARC processor families
- Accelerates ISO 26262 certification for safety-critical automotive SoCs



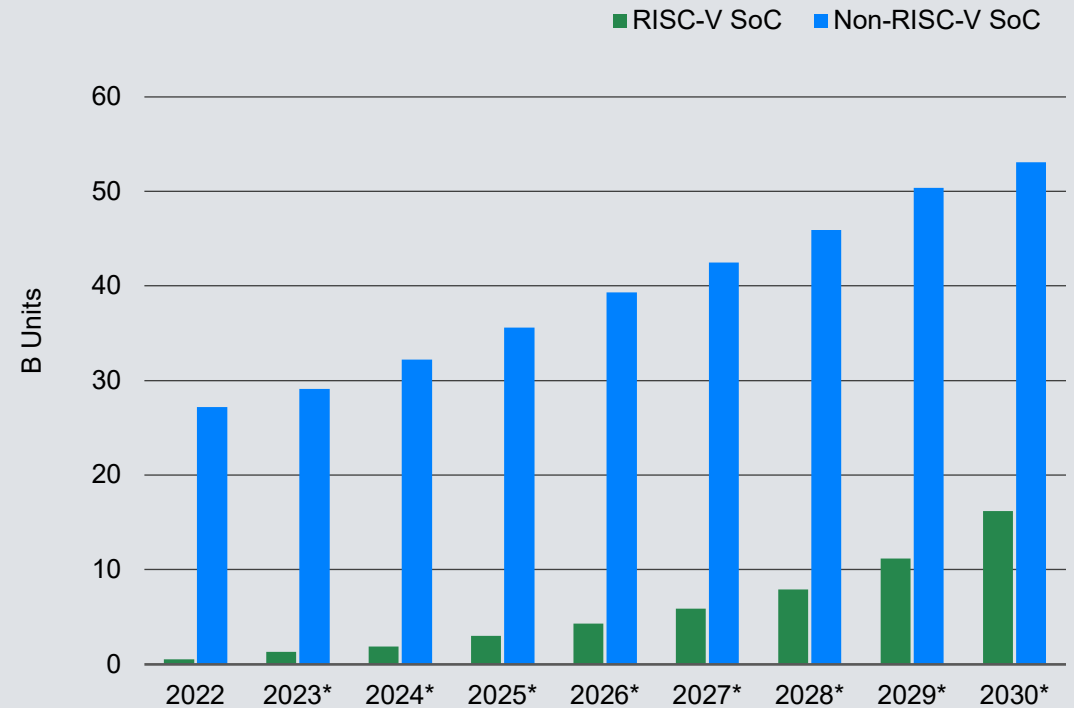
# Growing Adoption of Open Standard RISC-V Architecture

## ARC-V Extends Synopsys Processor IP Portfolio to RISC-V Ecosystem



**Builds on 25+ year track record of implementing extensible processors with leading PPA efficiency**

**>40% CAGR Forecasted for SoCs with RISC-V Processors**



Source: The SHD Group

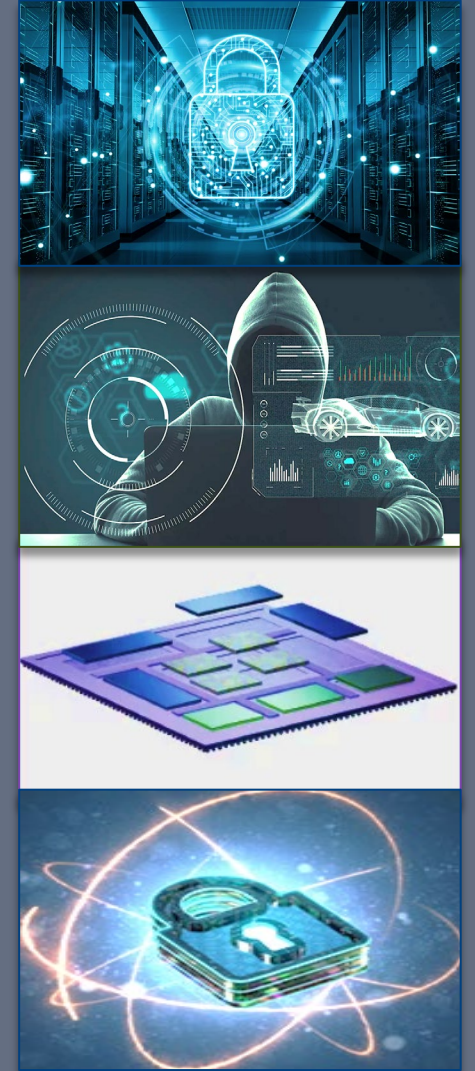
\*Forecasted

# Security IP Adoption Drivers

**120 ZB**  
of Data  
(2023)

**\$8T**  
Cybercrime  
cost (2023)

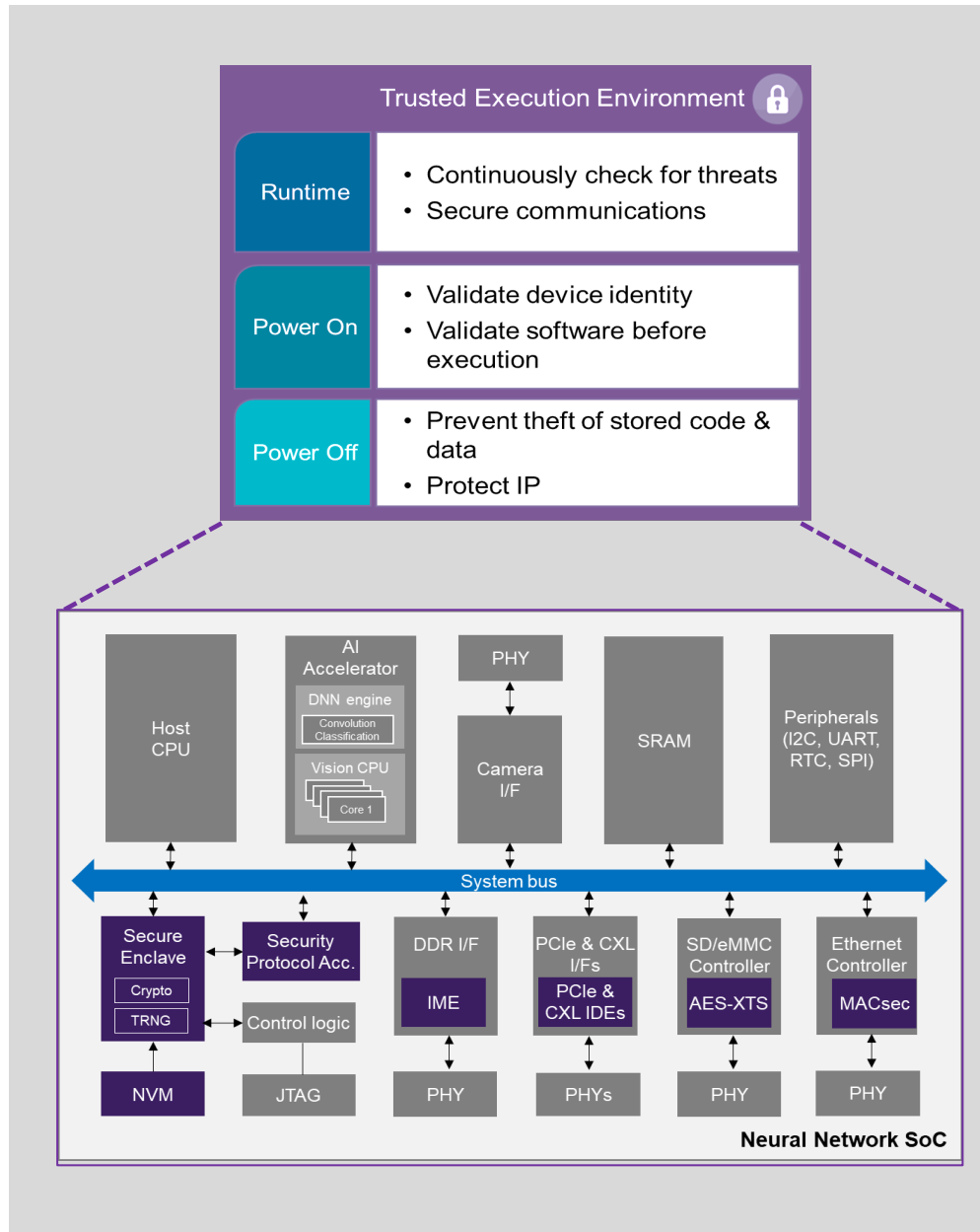
- More data contains private & sensitive information
- More laws, regulations, increased liability – UN R155, US CyberTrust Mark, EU Cyber Resilience Act, ...
- Technology evolution: Cloud computing, Multi-Die Systems, AI, Quantum Computing, ...
- Standards evolution: PCIe, CXL, ISO/SAE 21434, UCIe, Post Quantum Cryptography (PQC), ...



# Security at the Source

## Protect All Phases of SoC Operation

- Securing SoCs requires comprehensive approach
  - Overall SoC protection functions (secure boot, attestation, key management, secure updates, secure debug & JTAG access...)
  - Secure data-in-motion & data-at-rest
  - Encryption and authentication for secure communication, inputs from peripherals, AI model updates
  - Confidential compute: secure isolation of compute workloads that share resources
  - End product security certification to demonstrate assurance/trust /conformance



# Synopsys Security IP Solutions

Broad Portfolio of Certified & Standards HW & SW Compliant Solutions

Cryptography IP	Security Protocol Accelerators	Interface Security	Trusted Execution Environments
<ul style="list-style-type: none"><li>• Crypto Cores:<ul style="list-style-type: none"><li>– AES, RSA, ECC, TRNG...</li><li>– Agile PQC PKA</li></ul></li><li>• Crypto SW Library</li><li>• Secure Boot SDK</li></ul>	<ul style="list-style-type: none"><li>• IPsec, TLS/DTLS, WiFi, LTE/LTE Advanced/LTE-M</li><li>• Accelerate ciphers, hashes &amp; MAC algorithms</li></ul>	<ul style="list-style-type: none"><li>• HDCP 2.3 Content Protection for HDMI, DisplayPort, USB Type-C</li><li>• PCIe &amp; CXL Integrity &amp; Data Encryption</li><li>• DDR/LPDDR Inline Memory Encryption</li><li>• Ethernet MACsec</li></ul>	<ul style="list-style-type: none"><li>• tRoot Hardware Secure Modules with Root of Trust<ul style="list-style-type: none"><li>– Secure Element</li><li>– iSIM/eSIM</li><li>– Automotive HSM</li></ul></li><li>• ARC Processors with SecureShield™</li></ul>

Secure authentication, data encryption, key management, platform security & content protection

Thank You