nanoveu
(ASX: NVU)

&

CEMASS

Unleashing the Power of **Ultra-Low Power Semiconductor system on chip** (**SoC**) for Next-Gen 3D Content

October 2024

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Transaction Summary

nanoveu x EMASS

Structure

NVU to acquire 100% of **Embedded A.I. Systems Pte. Ltd** ("EMASS") including:

- Proprietary System on a Chip business
- IP portfolio

Consideration

Total Consideration of $5m in Shares plus Performance Rights:

- 172,413,793 Shares (priced at 2.9c)
- 83,333,333 Performance Rights subject to key commercialisation milestones.[1]

1. For full details, please refer to the ASX release dated 15 October 2024

Acquisition Rationale | *Artificial Edge Computing for 3D Imaging*

EMASS *Founded in 2020*

Founded by a Stanford-trained researcher and engineer whose groundbreaking research led to $75M of DARPA funding, EMASS was incubated at Nanyang Technological University, Singapore to design and develop high-performance, ultra-low power **SemiConductor System-on-Chip (SoC)** solutions.

Portable devices using **EMASS's cutting-edge SoC** technology can perform complex computations without relying on cloud processing (at "edge"). The reduced latency ensures smoother, **instantaneous** user experiences, especially in low-power and bandwidth-constrained environments.

Nanoveu will integrate **EMASS SoC** capability into the **EyeFly3D™** platform to support computationally intensive, real-time conversions of 2D content. EMASS SoC technology can bring glasses-free, 3D experiences to a dramatically increased number of devices and use-cases.

Direct sales of **EMASS RISC-V-based SoCs** also represent a potential market opportunity, extending **Nanoveu's** AI applications and offerings beyond vision.

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EyeFly 3D™

EMASS Competitive Advantages

20x

Efficiency

EMASS SoCs deliver **20x** the energy efficiency compared to competitors, making them the leading solution for power-sensitive applications.

$$$

COST ADVANTAGES

By processing AI tasks on-device, **EMASS SoCs** reduce the need for cloud infrastructure, minimising operational costs and enabling smoother and more efficient processing.

SCALABILITY

The RISC-V architecture is modular and open, allowing **EMASS SoCs** to be tailored for a wide variety of applications, from smart home devices to medical technology, without increasing power consumption.

INNOVATION PIPELINE

EMASS's rapid prototyping capabilities meet the growing demand for edge AI solutions, positioning it as a frontrunner in the development of next-gen SoC technologies.

EMASS Overview

System-on-Chip (SoC) Technology:

What is an SoC?:

A System-on-Chip (SoC) is a technology-intensive **semiconductor that integrates an entire computational system onto one chip**. Combining multiple functions such as graphics, wireless communication, and data processing into a single, compact form. Reducing size, cost and power consumption

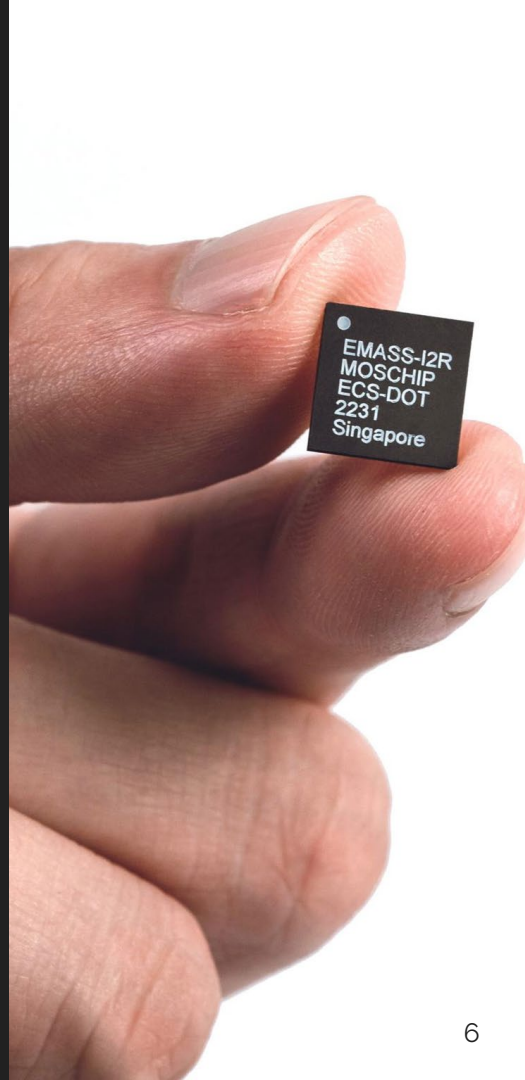
Powering Portable Technology:

SoCs enable small, "non-smart" devices to **deliver a range of complex computational functions**, including live data analysis, Edge-AI image processing, gaming and multi-program communications, with very little power consumption.

Benefits RISC-V Architecture:

The RISC-V instruction architecture of **EMASS is vastly advantageous to Intel's x86 and ARMv8 architecture.**

RISC-V architecture is Open-Source allowing full customization, granting EMASS customers flexibility to scale across numerous softwares and IoT devices.



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EMASS Brings BIG computation to SMALL chips

Problem: *As AI applications grow in complexity, greater performance and memory is required from our devices. Current devices have high power demands and struggle to deliver the full suite of emerging AI applications.*

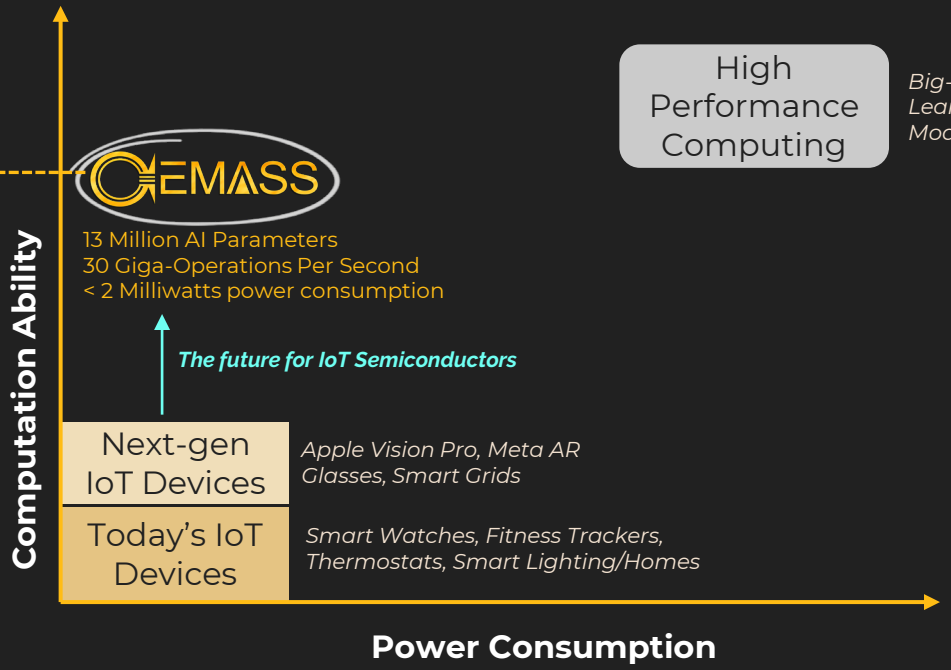
Solution: *EMASS proprietary tech solves this problem by providing portable devices with vastly improved AI capabilities alongside best-in-class power consumption. EMASS tech extends the market possibilities of portable AI-backed devices.*

EMASS USE CASES

High Artificial Intelligence capability, low power requirements

IoTs Embedded with A.I

- Cloud-Free security devices
- 5G enabled IoT
- Live biometric & kineomatic monitoring with predictive diagnostics
- Realtime immersive AR/VR conversion from videos.
- Realtime integrated medical imaging models
- Natural language models embedded to home devices
- Crop yield prediction



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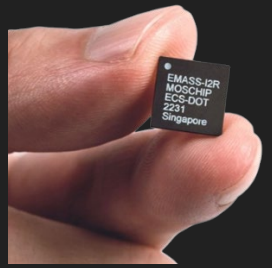
EMASS x EyeFly3D | *Glasses-free 3D on more devices*

Enhanced 3D Experiences:

EMASS integrated into portable devices and wearables extends Nanoveu's EyeFly3D™ platform by enabling real-time data and image processing and on-device 3D conversions without relying on a cloud system. **EMASS SoC** can help deliver richer 3D visuals across a greater range devices and use cases.

Faster Performance:

By eliminating the need for cloud processing, **EMASS SoCs** accelerate 2D to 3D conversions, allowing EyeFly3D to render 3D content instantly and seamlessly on any screen, without the delays or pre-programming, typically associated with cloud-based solutions.



Lower Power Consumption:

EMASS's ultra-low power SoCs enable EyeFly3D to run on portable, power-sensitive devices to deliver seamless, high-quality 3D experiences on any screen, especially where power consumption is critical.

EMASS x EyeFly 3D | *Glasses-free 3D on more devices*

2D Content

2D to 3D Conversion

Glasses-Free 3D Experiences

2D content

Today

Future

Smartphone

+

NVU's proprietary AI Apps

Leverage powerful computation of a smartphone to perform 2D to 3D conversions

On Power-Hungry Smartphones

Low-power, portable devices

EMASS

Leverage powerful, embedded system-on-chip (SoC) computation to perform 2D to 3D conversions on portable, low-powered devices

On A Massive Range of Low Power Portable Devices

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EMASS Expands Market Opportunities for nanoveu

EMASS's SoC Technology Unlocks New Target Industries Beyond EyeFly3D

Medical Imaging

- Improve reach and portability of next-generation medical imaging devices
- Improve diagnostic models by processing live biometric sensor feeds from more sources
- Combine multiple radiological images, in real-time, to create coherent 3D images for smart-glasses and next-generation visual displays

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Autonomous Driving Systems

- Improve safety by leveraging 5G connectivity and live traffic and pedestrian data into Smart Dash-Cams.
- Improve coordination amongst vehicles in autonomous driving ecosystems
- Project live traffic, safety and pedestrian data onto windshield, in 3D

IoT Devices

Nanoveu has ability to license cutting-edge EMASS technology to existing IoT device makers to bring Artificial Intelligence computation to a greater number of small devices without increasing power consumption:

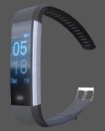
- Smart Watches
- Medical Implantable devices
- Smart Glasses and Lenses
- Biometric Monitors
- Drones
- Smart Agriculture

EMASS Expands Market Opportunities for nanoveu

EMASS has been tried and tested to deliver cutting-edge semi-conductor performance with industry leading power efficiencies

Ability to undertake 13 Million AI Parameters and perform 30,000,000,000 operations per second while consuming < 2Milli-Watts.

Smart Watches



Drones

Medical Devices

Glasses & Lens

EMASS SoC INTEGRATION

Allows each connected device to be embedded with AI capabilities without requiring excessive power or hardware upgrades

- Processing live biometric data (Non-invasive oxygen, hydration, blood glucose analysis)
- Predictive diagnosis and early disease detection

- Self-navigating drones via Artificial Intelligence
- Multi-spectral and hyper-spectral crop & livestock monitoring
- Predictive harvesting

- 2D scans to instant 3D models
- Integrated medical imaging reconstruction
- Point-of-care monitoring and diagnostics for pacemakers and cochlear implants

- 2D images to augmented 3D
- Virtual augmented reality videocalls
- Immersive Artificial Intelligent assistants

EMASS Leading SoC *Outperforms* Peers

EMASS's edge AI capabilities and power efficiency **outperforms peers** in the semiconductor and SoC market, particularly in applications requiring high performance and low energy consumption.

EMASS consistently achieves over **10 trillion AI operations per second per watt**, far exceeding industry standards where typical performance falls below 2 trillion operations, while also outperforming competitors in benchmarks for power consumption and execution speeds for AI tasks.

EMASS | Cutting Edge, Low-Power Chip

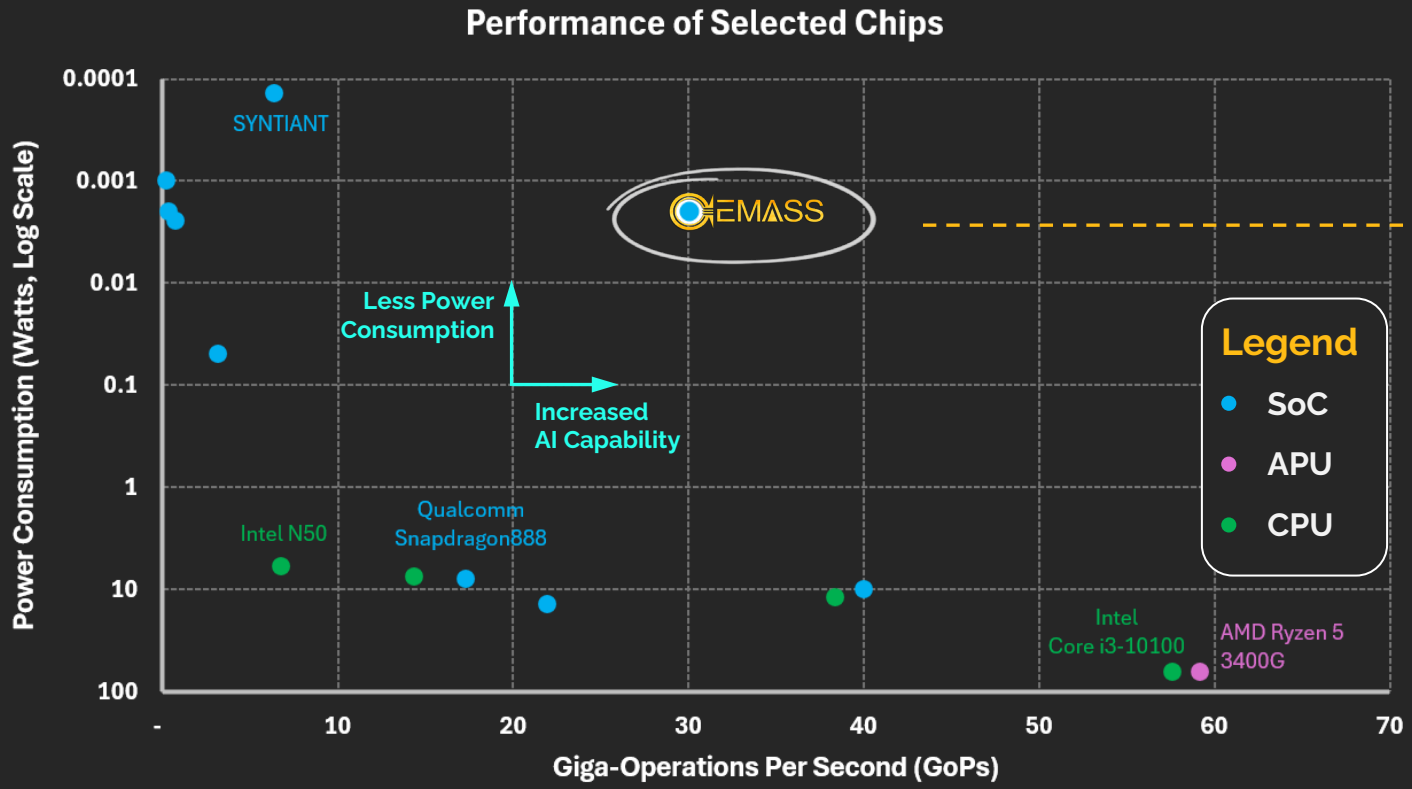
Ideal for integrating AI capabilities into battery-powered IoT devices

Selected Chip Performances

GoPs ≈ Clock Speed (GHz) × Instructions Per Cycle (IPC) × Number of Cores

Company	Chip	Chip Type	Target Industry	Max Peformance (GoPs)	Power Consumption (TPD)
INTEL	Core i3-10100	CPU	Computing	~58 GoPs	65 Watts
AMD	Ryzen 5 3400G	APU	Computing	~59 GoPs	65 Watts
INTEL	Processor N50	CPU	IoT, Chromebook	~40 GoPs	75 Watts
ARM	Cortex-A53	CPU	Smartphone, Tablets, Wearables, IoT	~14 GoPs	7.5 Watts
QUALCOMM	Snapdragon 888	SoC	Artificial Intelligence, Wearables, Smartphone	~17 GoPs	8 Watts
BROADCOM	BCM2712	CPU	Robotics, industrial automation, edge computing	~38 GoPs	12 Watts
MEDIATEK	Helio P60	SoC	Artificial Intelligence Processing, Smartphones	~40 GoPs	10 Watts
MARVELL	Octeon TX2	SoC	5G Networks & Data Centres	~20 GoPs	30 Watts
NANOVEU	**EMASS**	**SoC**	**IoT, Wearables, Drones Artificial Intelligence**	**30 GoPs**	**0.1 – 10 MilliWatts**

EMASS | Cutting Edge Performance, Low Power Consumption



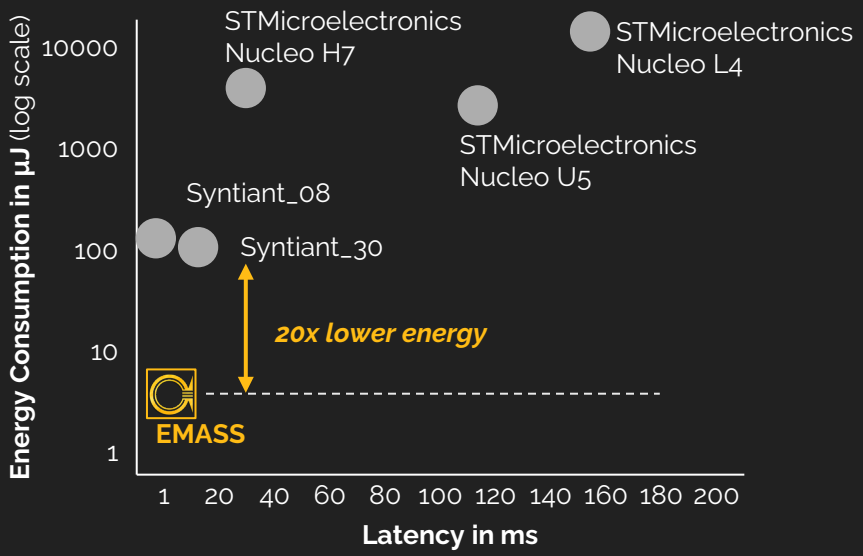
EMASS full semi-conductor System on Chip provides complete AI operational capability with leading power efficiency.

EMASS is positioned as the ideal SoC to integrate into any battery-sensitive IoT device without compensating performance, draining power or requiring hardware modifications. Leading the way for developing the next generation of IoT Devices

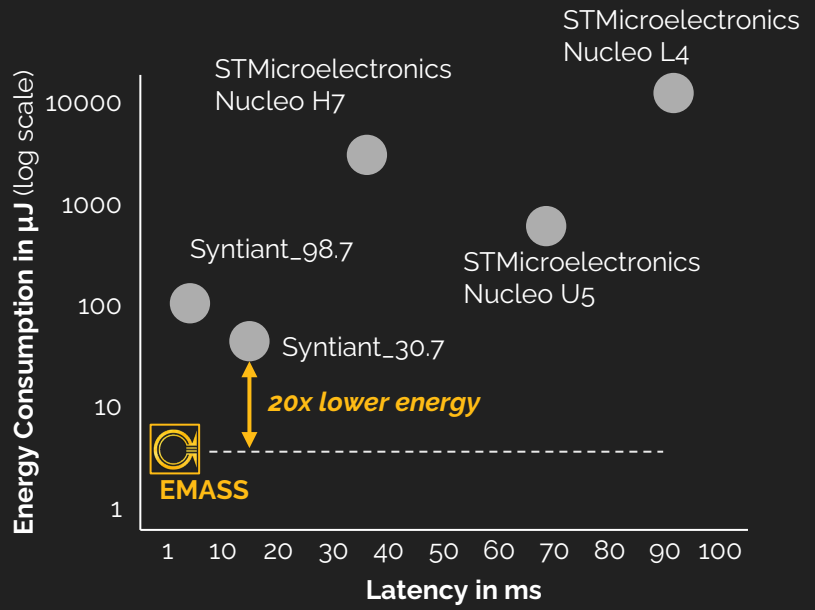
EMASS | AI Task Benchmarking and Chips

EMASS SOC has greater AI performance compared to today's leading chips

Image Classification



Visual Wake Words



EMASS | World Leading Founder

EMASS was founded with the world's leading Chip manufacturers

FOUNDER: Professor Mohamed Sabry Aly

- Associate Professor at **Nanyang Technological University**, Singapore
- Ph.D. in Electrical and Computer Engineering from **EPFL**
- Postdoctoral Research Fellow at **Stanford University** (2014-2017)
- Research focus: system design and optimization for **AI computing systems**
- Senior IEEE Member and collaborator with **Stanford University and TSMC**
- Recipient of the **Nanyang Education Award (**2023)

Stanford University

EPFL ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Mentor Graphics

NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

EMASS | Global Development Partners

EMASS has been developed with the world's leading Chip manufacturers and partners

Nanyang Technological University Singapore

Briggin – Success Starts Here

NTUitive Pte Ltd

Agency for Science, Technology and Research Singapore

Investment Partners, Grants, IP & Development

EMASS

Fabless Design (I.P)

EMASS

Performance Testing

tsmc

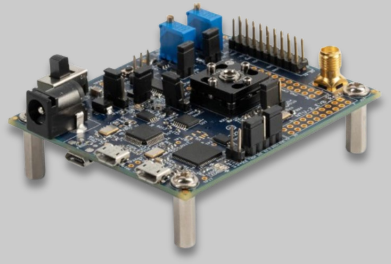
Taiwan Semiconductor Manufacturing Company (Market Cap: $1.2T)

MOSCHIP

Moschip Technologies (Market Cap: $763M)

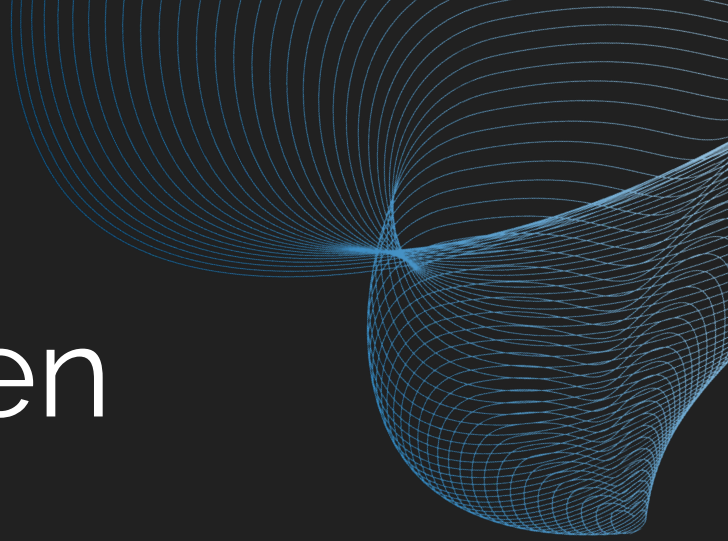
IC Fabrication
PCB Fabrication
Packaging

EMASS



State of the Art EMASS Chip

Market for next-gen SoCs represents a massive opportunity



Market Trends for SoCs

The System-on-Chip market is projected to reach **USD 205.97 billion** by 2029.[1]

EMASS's edge AI SoC capabilities will provide **Nanoveu** with the opportunity to participate in the growing portable and power-sensitive technology markets.

Investment Impact: This acquisition positions Nanoveu to capitalise on the growing demand for AI-powered, 3D content applications in high growth industries ranging from wearables to advanced medical devices.

[1] *https://finance.yahoo.com/news/system-chip-soc-market-worth-141500285.html*

The Vital Importance of SoCs

Edge AI and Machine Learning Use Cases:
SoCs enable real-time AI processing directly on devices, reducing reliance on cloud-based systems and improving overall performance for applications such as autonomous vehicles and smart devices.

Power Efficiency and Sustainability:
SoCs balance high performance with ultra-low power consumption, making them essential for energy-efficient, portable devices and supporting the growing demand for greener technology solutions.

5G and IoT Expansion:
SoCs are key to enabling seamless connectivity for IoT devices in the 5G era, supporting high-speed data transfers and driving innovations in smart cities, connected homes, and industrial automation.

Autonomous Systems and Robotics:
SoCs provide the computational power required for real-time decision-making in autonomous systems, including self-driving cars, drones, and industrial robots, where fast and efficient processing is critical.

Healthcare and Wearable Tech:
SoCs power AI-driven, real-time health monitoring in wearable devices, enabling advancements in telehealth, fitness trackers, and remote patient monitoring systems, all while maintaining low energy consumption.

Augmented Reality (AR) and Virtual Reality (VR):
SoCs allow for efficient 3D content processing, making immersive AR and VR experiences possible with low latency and high-quality graphics, revolutionizing gaming, education, and training applications.

RISC-V Architecture:
SoCs based on RISC-V architecture allows for customisable, open-source designs, reducing dependency on proprietary chip architectures

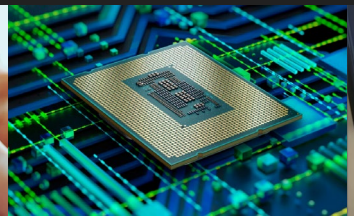
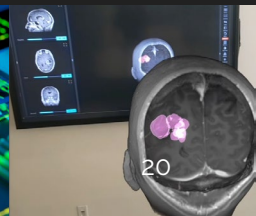
Advanced Security and Encryption:
SoCs integrate robust hardware-level security and encryption features, providing enhanced data protection and cybersecurity solutions, especially in industries like finance, healthcare, and defense.

Supply Chain Resilience and Chip Shortage:
With the global chip shortage, SoCs are central to supply chain strategies, as companies invest in domestic chip manufacturing to ensure reliable production and reduce dependency on external suppliers.

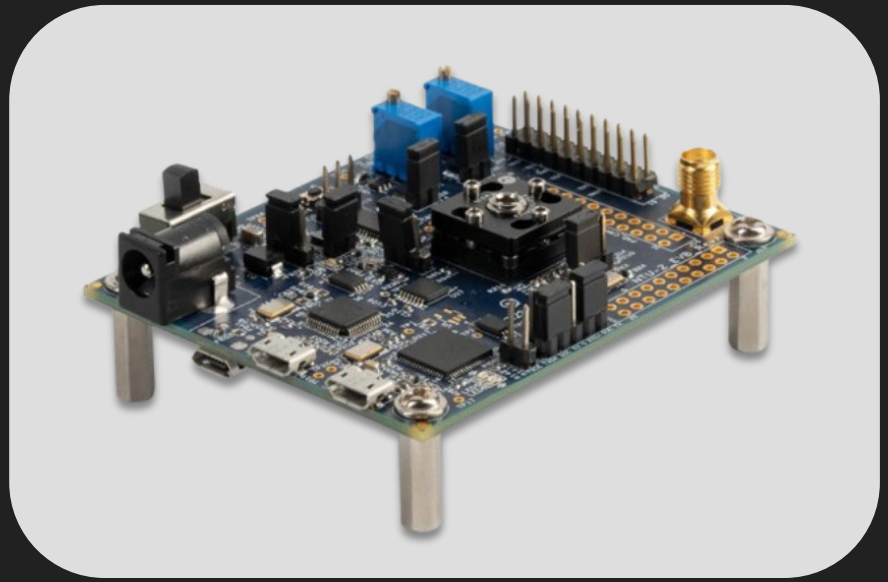
Automotive and Smart Transportation:
SoCs play a crucial role in electric vehicles and smart transportation systems, powering advanced driver assistance systems (ADAS), infotainment, and vehicle-to-everything (V2X) connectivity for safer, smarter mobility.





EMASS Stats | Ultra-Low Power Edge AI RISC-V



***ZOOMED IN:** Integrated EMASS Semi-Conductor System on a Chip with full Artificial Intelligence capacity and Accelerator module*

Targeting highest computational efficiency at ultra low power

EMASS UNPARALLED NUMBERS AT A GLANCE

AI Capacity

- ***30 Giga-Operations Per second @ 50 MHz, 2mW***
- *That is the ability for EMASS to perform 30 billion operations, in one second, using 2-Milliwatts.*

Power Efficiency

- **Upto *12 TOPs/W***
- *That is 12 Trillion Operations Per second consuming 1watt*

On-chip dense memory

- **4MBytes**

Hardware support for compressed AI models

- ***< 2-bits***

Physical size

- *22nm technology* with ***7mm² die area***

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EMASS | Deep and Growing IP Portfolio

Exclusively Licensed Patents and Technology Disclosures:

No	Title
1	Rate-distortion Optimized Coding for Deep Neural Network Compression
2	Edge SoC with AI acceleration
3	Porting of EMBED OS 5.12.4 to ECS-DOT's SoC and RISCV CPU
4	Porting of the NVDLA ARM Linux Driver for EMBED-OS of ECS-DOT RISCV CPU
5	Hardware design methodologies for efficient Tunstall Decoder
6	Register-Transfer-Level Implementation Of Decoders For Decoding A Codeword of A Tunstall Code
7	ShapoolNMS: Towards Scalable Hardware Acceleration Of Non-Maximum Suppression For Object Detection

Future EMASS IP filing strategy underway with Nanoveu

- Advanced algorithm transformation for max compression
- Improved dataflow mapping and power gating techniques
- Customised firmware for application mapping
- EMASS advanced deep learning compiler

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