

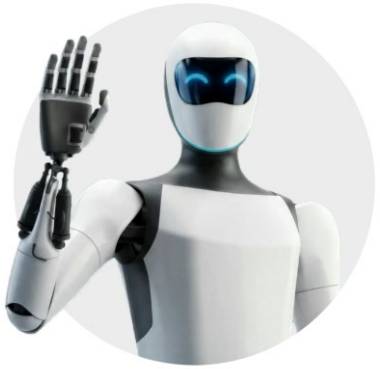
The future of physical AI is built on chips

We empower humanoids
to sense, move, act and connect.
Safe and secure.

Public

The next era of AI is emerging

From thinking to moving machines



Physical AI

Agentic AI

Generative AI

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100 million robots by 2030

Projected global robot shipments are set to nearly triple between 2025 and 2030



Humanoid robots



Drones



Cobots



Industrial robots



Mobile robots



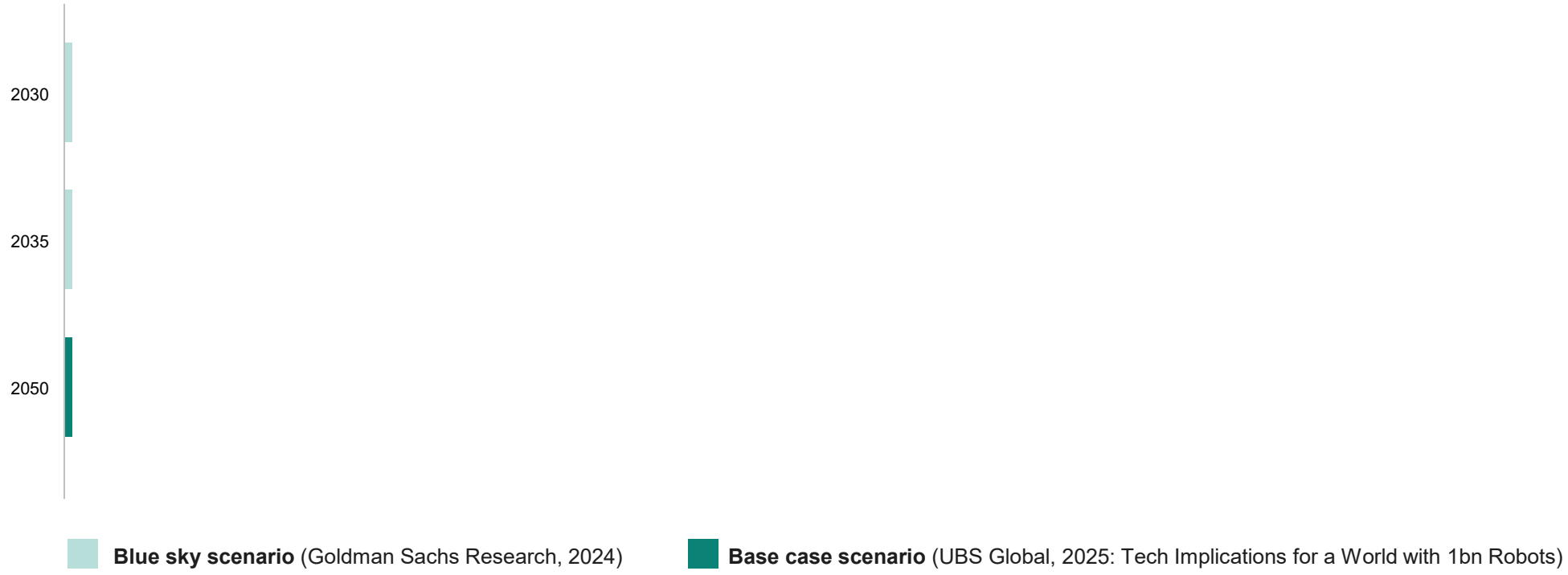
Domestic robots

Source: ABI research (2025), Goldman Sachs (2025)

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300 million humanoids by 2050

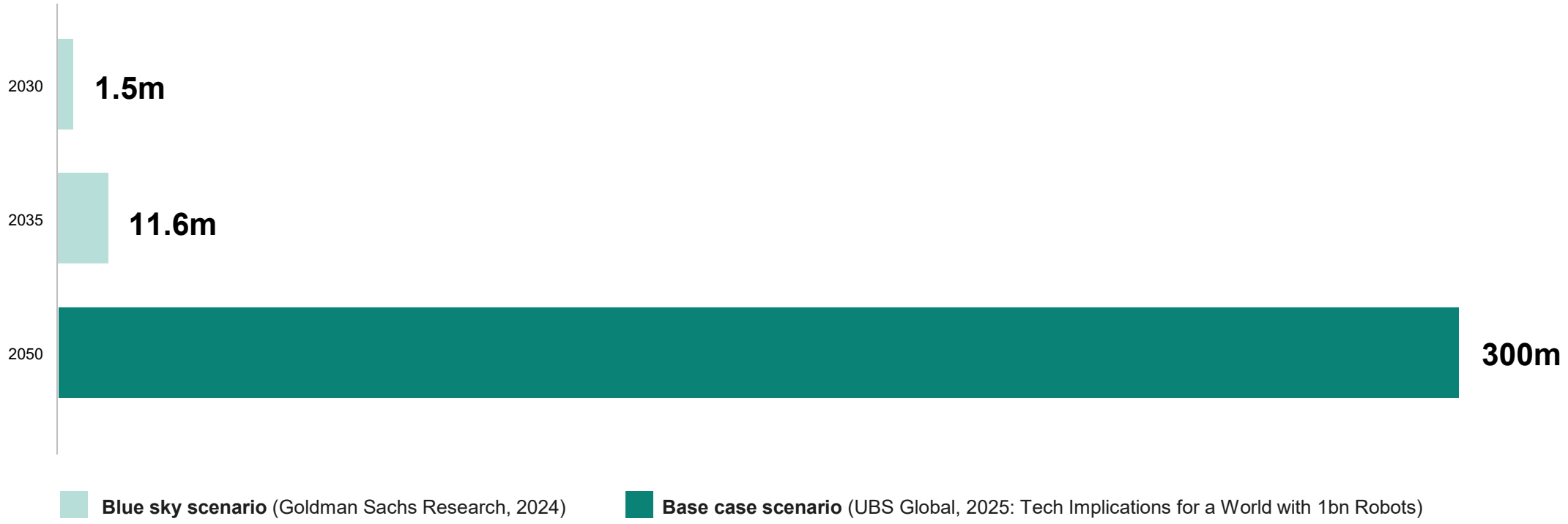
Forecast for global humanoid robot shipments (industrial and consumer, in millions)



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300 million humanoids by 2050

Forecast for global humanoid robot shipments (industrial and consumer, in millions)



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Semiconductors define the system

Explicit programming

Fixed motion sequences defined in domain-specific languages

Example:
Pick and place routines

Visual perception

Robots perceive their environment in real time using camera and sensor data

Example:
Intelligent cobots

Dexterous manipulation

Vision-Language-Action models are closing the gap in fine motor skills

Example:
Folding a t-shirt

Workflow planning

Robots understand intent and autonomously plan multi-step workflows

Example:
Autonomous assembly

Reasoning

Reason actions in advance through situational awareness and chain-of-thought

Example:
Cleaning, robot-to-robot coordination

Semiconductors are system defining
Hardware driven

Semiconductors are system enabling
Software driven

Source: BCG “Unlocking the Value Potential of AI”, June 2025 | Infineon

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MECHANICAL COMPLEXITIES

Less material, smarter solutions

A typical humanoid (170 cm, 70 kg) consists of estimated [1]

20% to 30% aluminum alloy

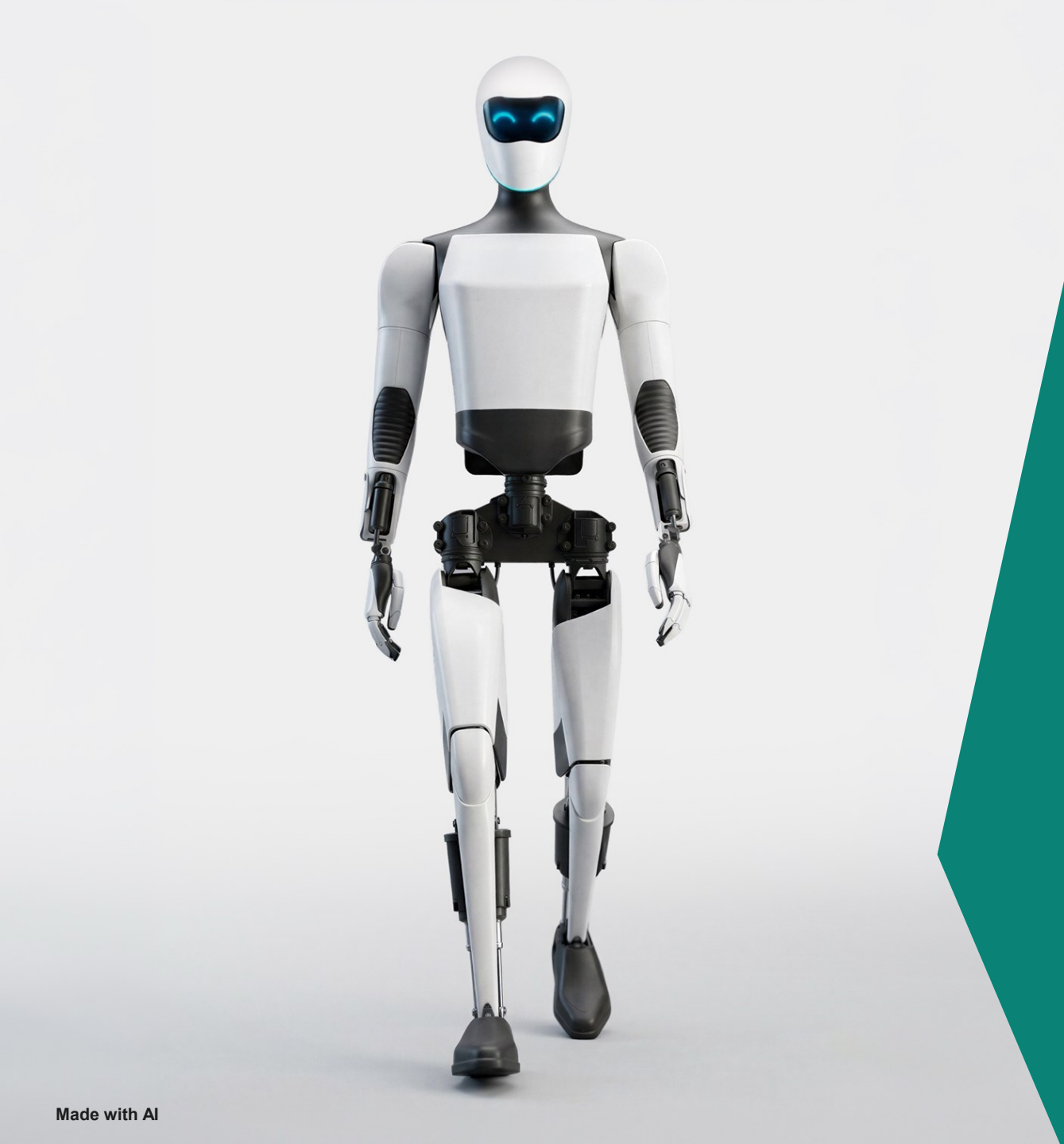
4 kg high-performance rare earth magnets

5-10 kg copper

2-3 kWh Li-ion battery



Source: [1]UBS report June 2025, Is the world ready for 1bn robots?



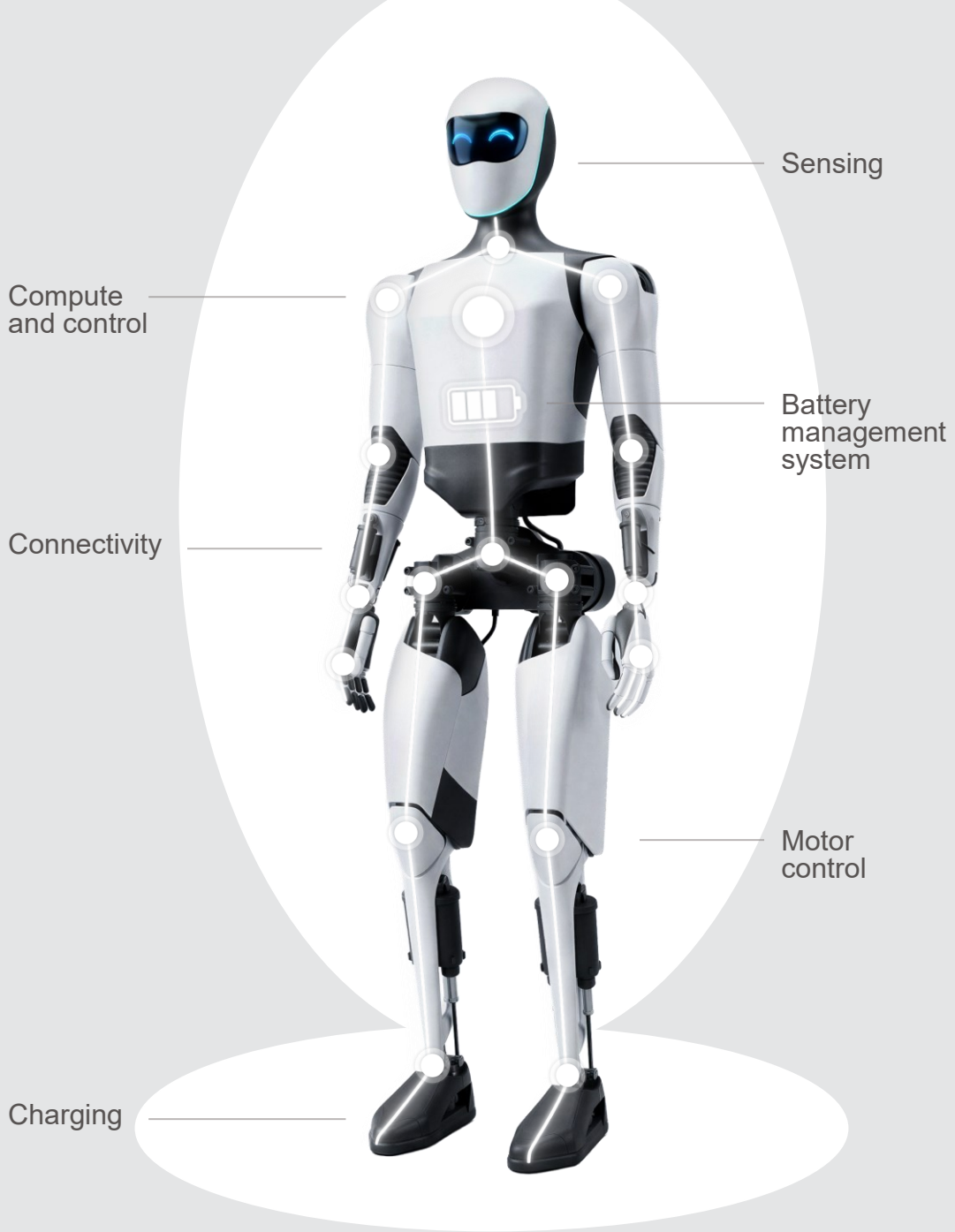
Made with AI

PHYSICAL AI

Humanoid architecture

Enabling the key functional blocks in a humanoid robot

Infineon provides the entire electronics stack for all types of intelligent robotic systems





Made with AI

Tackling the complexities of physical AI

Empowering perception, thinking, and movement

- Dexterity
- Connectivity
- Functional safety
- Security
- Power management
- Environmental perception
- Stable and balanced movement

DEEP DIVE

Motor control





Made with AI

Motor control from head to toe

Infineon offers a comprehensive GaN and Si portfolio for 70+ joints
Compact motor control systems, enabling all relevant power classes from 25 W – 10 kW

GaN Si

High power density

up to 3.3 kW per in^3

High dynamics

Switching frequencies with up to 500 kHz

High dexterity

Fully integrated motor control 4x4 mm

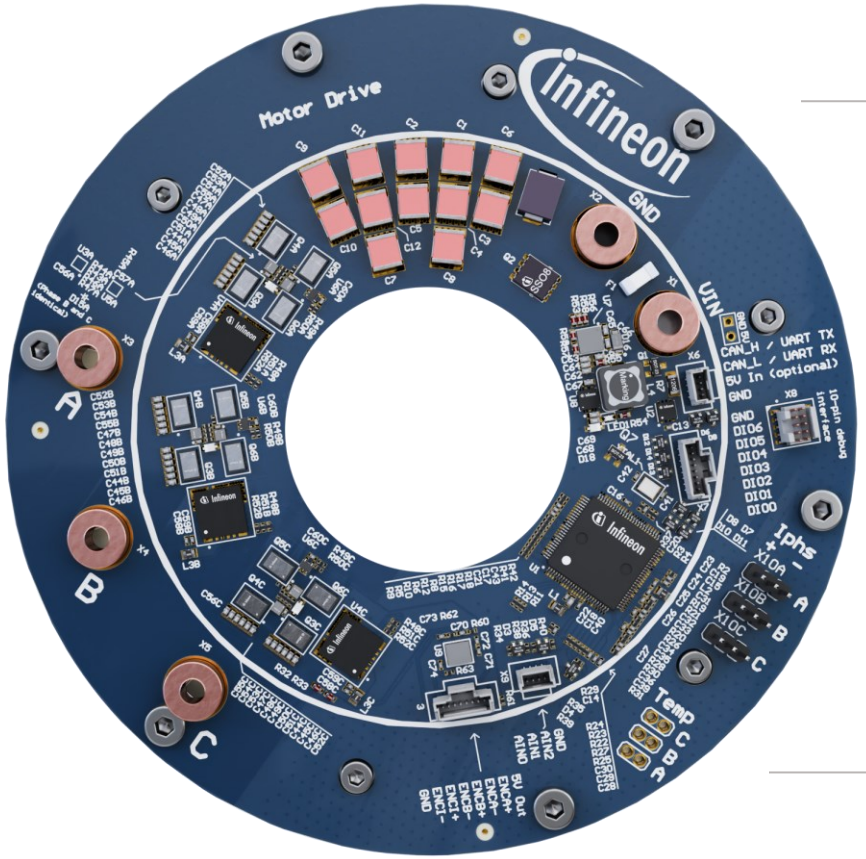
HIP MOTOR CONTROL

Infineon powers hip actuators for every step



Made with AI

Scalable, discrete system solutions



Microcontroller

AURIX™ or PSOC™



Gate drivers

EiceDRIVER™



Power switches

OptiMOS™ or CoolGaN™



Current and position sensor

XENSIV™



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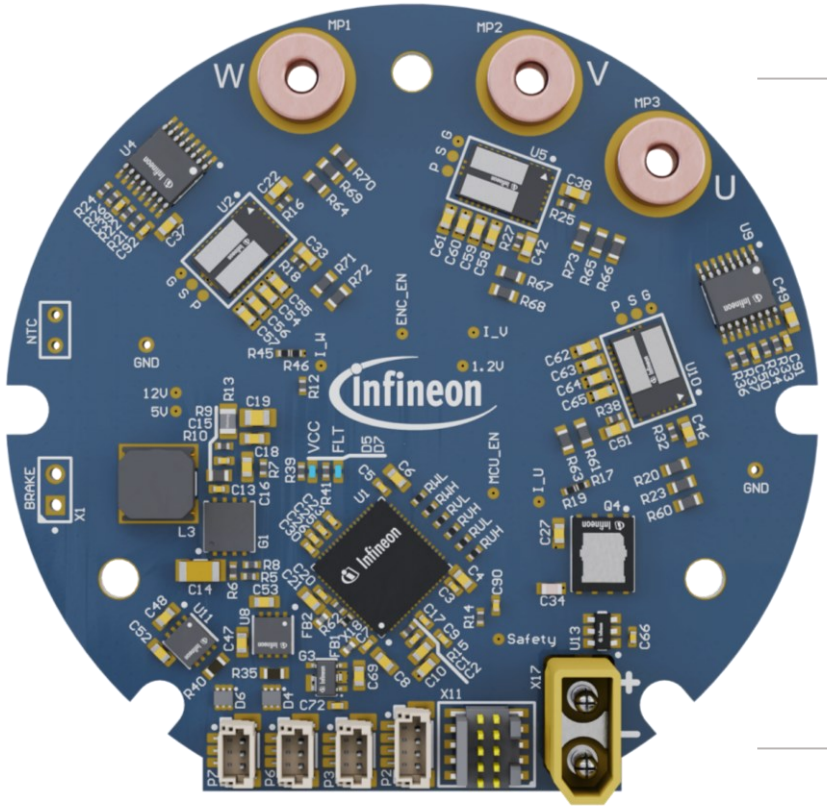
ELBOW MOTOR CONTROL

Look inside the reach



Made with AI

Integrated system solutions for every movement



Microcontroller

AURIX™ or PSOC™



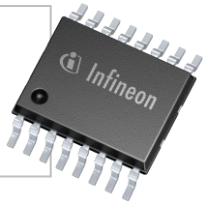
Integrated power stages

CoolGaN™ Drive



Current sensors

XENSIV™



Position sensor

XENSIV™



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FINGER MOTOR CONTROL

Anatomy of dexterity by Infineon



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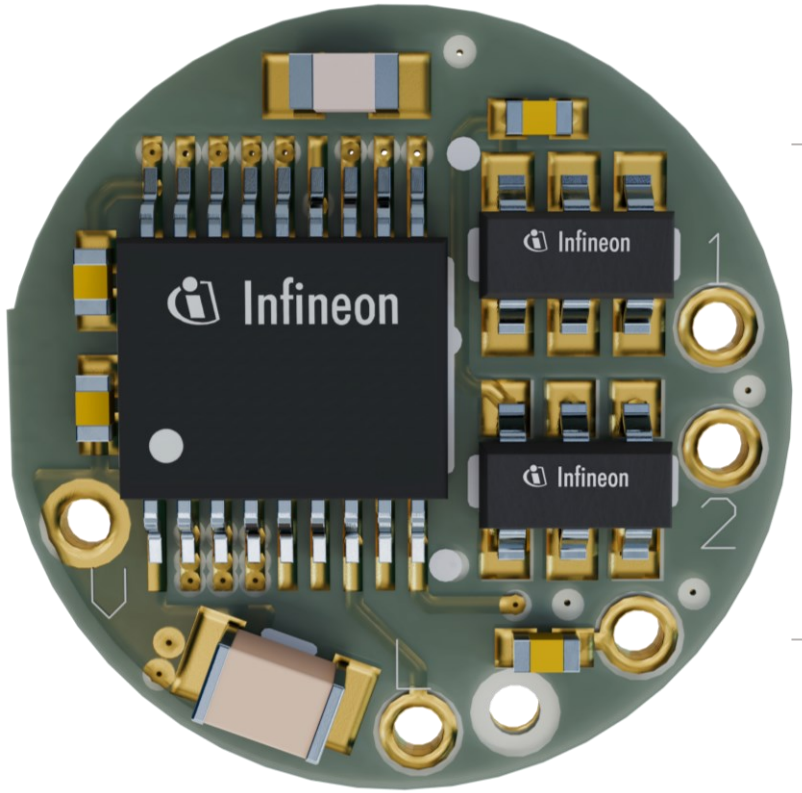
FINGER MOTOR CONTROL

Anatomy of dexterity by Infineon



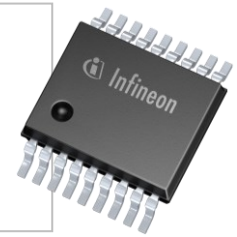
Made with AI

Integrated system solutions for dexterous hands



Fully integrated motor control

MOTIX™



Current sensor

XENSIV™

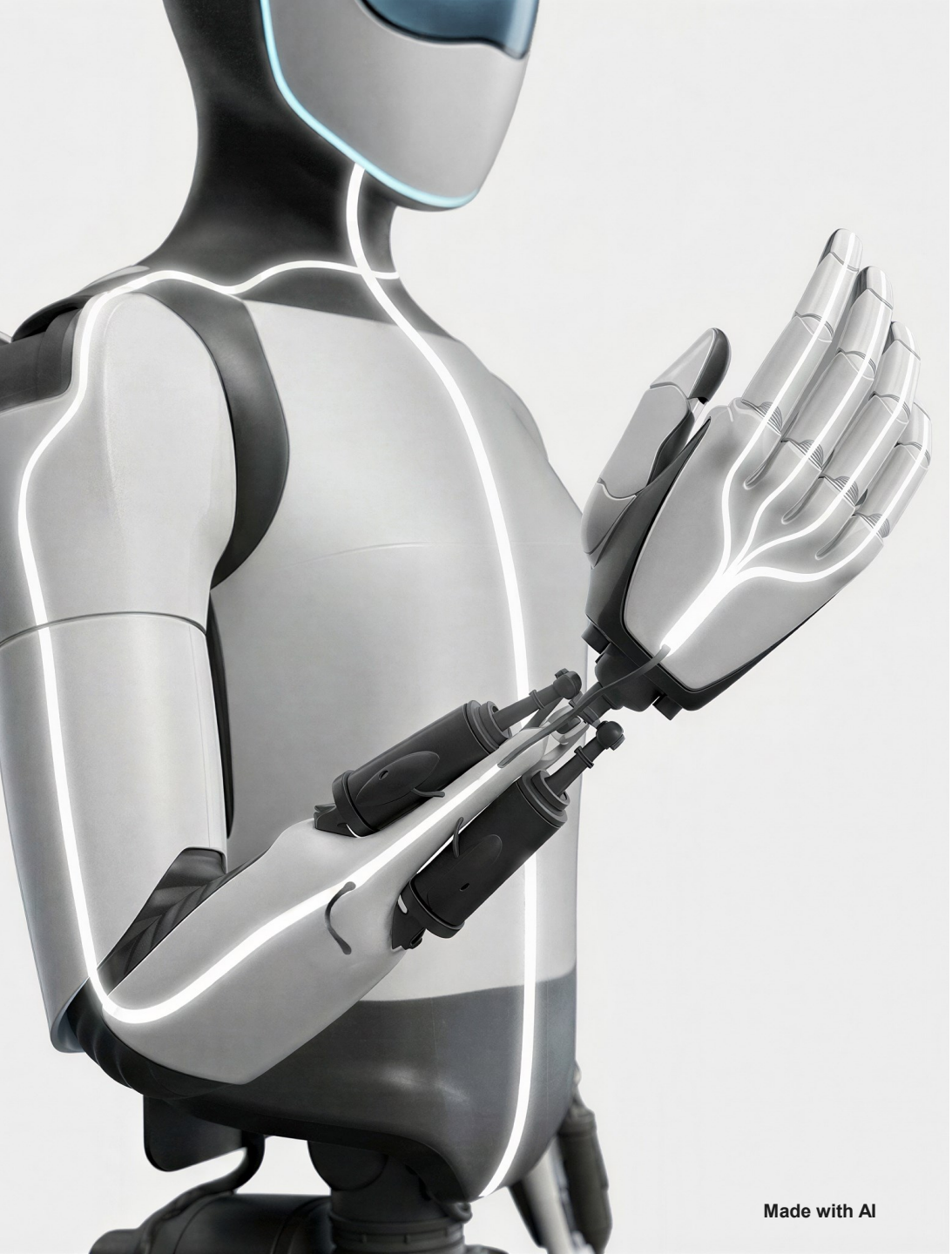


Position sensor

XENSIV™



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CONNECTIVITY

In-robot Ethernet connectivity

Wired, high volume data communication
for real-time operation

Higher and scalable bandwidth
with multi-gigabit data communication

Lower latency
with TSN for microsecond determinism

Software-defined architecture
with Ethernet standard

Communication backbone
for functional safety and security

SECURITY

Security for in robotics

Platform security and authentication

Software and firmware integrity, protection of AI models and confidential data, authentication for critical components

Secured interactions

Secured connectivity and commissioning

Security for tomorrow

Post-quantum cryptography and EU Cyber Resilience Act compliant





INFINEON EMPOWERS ROBOTS

Scaling physical AI with digital enablement

The $1.7T humanoid robot market by 2050 requires a comprehensive ecosystem

- System solutions including software
- Digital twins
- Virtualization
- Ecosystem and partnerships play

Made with AI

Infineon’s global ecosystem Empowering robotics innovation

The future of physical AI is built on chips



We empower humanoids to sense, move, act and connect. Safe and secure.

Made with AI


Infineon