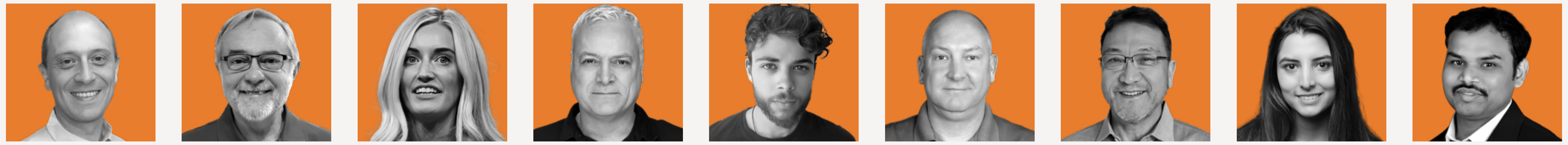
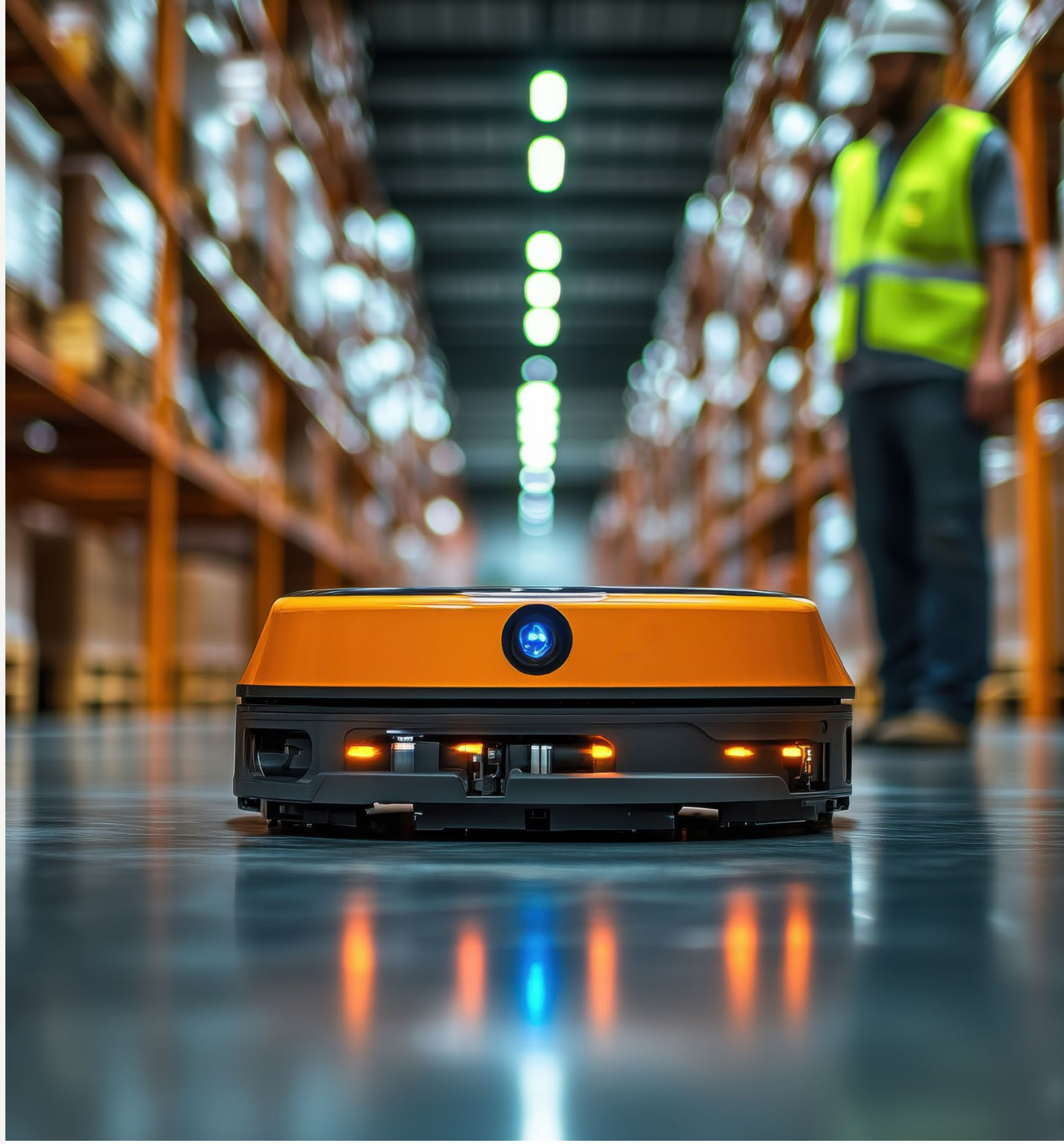
Engineering the Future: The Sensors and Systems Powering Modern Mobile Robots





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Meet Our Experts

Autonomous Mobile Robots (AMRs) are at the forefront of a robotics revolution—evolving from fixed, repetitive-task machines into mobile, intelligent systems that navigate the physical world with real-time awareness. We interviewed nine experts on the impact of AMRs, the transformative potential of physical AI, and how engineers can develop solutions that are efficient, high-performing, and scalable.

We hope you enjoy their insights!

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Introduction

Robotics is experiencing a revolution in scale, capability, and context. What began as fixed, industrial machines programmed for repetitive tasks has now evolved into mobile, intelligent systems capable of navigating the physical world with real-time awareness.

Autonomous Mobile Robots (AMRs) are at the forefront of this change. These systems move beyond predefined motion paths and structured environments to bring automation to warehouses, hospitals, farms, retail spaces, and other settings where traditional robots could not operate effectively.

In many ways, the adoption of AMRs has been driven by practical needs, including labor shortages, rising demand for 24/7 operation, and the need for automation in less predictable environments. At the same time, AI has been made possible by directly interacting with and understanding the physical world and technological advances in perception and mobility.

AMRs today integrate a diverse array of sensing technologies, including cameras, time-of-flight, and other depth sensors. Each helps the robot interpret complex surroundings and make split-second decisions. These perception systems are increasingly combined with edge computing and machine learning to let AMRs localize and adapt in real time.

In this eBook, we'll explore the impact of AMRs, the powerful impact of physical AI, and how onsemi helps engineers develop AMR and physical AI solutions that are efficient, performant, and scalable.

Foreword

By **Palani Subbiah**, VP, Global Applications Engineering, onsemi

As a semiconductor applications engineering leader with an academic background in AI, I am excited to introduce this thought-provoking eBook. My semiconductor solutions experience plus academic background in machine vision and AI, including a thesis on skin cancer detection, has fueled my passion for physical AI and robotics. As VP of Applications Engineering at onsemi, my team integrates diverse technologies into Autonomous Mobile Robots (AMRs), showcasing onsemi's products like world-class imagers, sensors, and advanced power solutions. This holistic approach builds comprehensive robotic platforms, highlighting AMRs' potential in various industries.

onsemi collaborates with processor and GPU vendors to create a state-of-the-art robotics demonstration platform, including sensor drivers and a hardware abstraction layer for seamless integration. Our team has developed the third generation of our robot demo, demonstrating the practical benefits of our integrated solutions. This eBook explores the transformative impact of AMRs, driven by innovations and collaborative efforts within our company and ecosystem partners. I hope you find this eBook as inspiring and informative as I have.

onsemi is driving disruptive innovations to help build a better future. With a focus on automotive and industrial end-markets, the company is accelerating change in megatrends such as vehicle electrification and safety, sustainable energy grids, industrial automation, and 5G and cloud infrastructure. onsemi offers a highly differentiated and innovative product portfolio, delivering intelligent power and sensing technologies that solve the world's most complex challenges and leads the way to creating a safer, cleaner and smarter world. onsemi is recognized as a Fortune 500® company and included in the Nasdaq-100 Index® and S&P 500® index. Learn more about onsemi at www.onsemi.com.

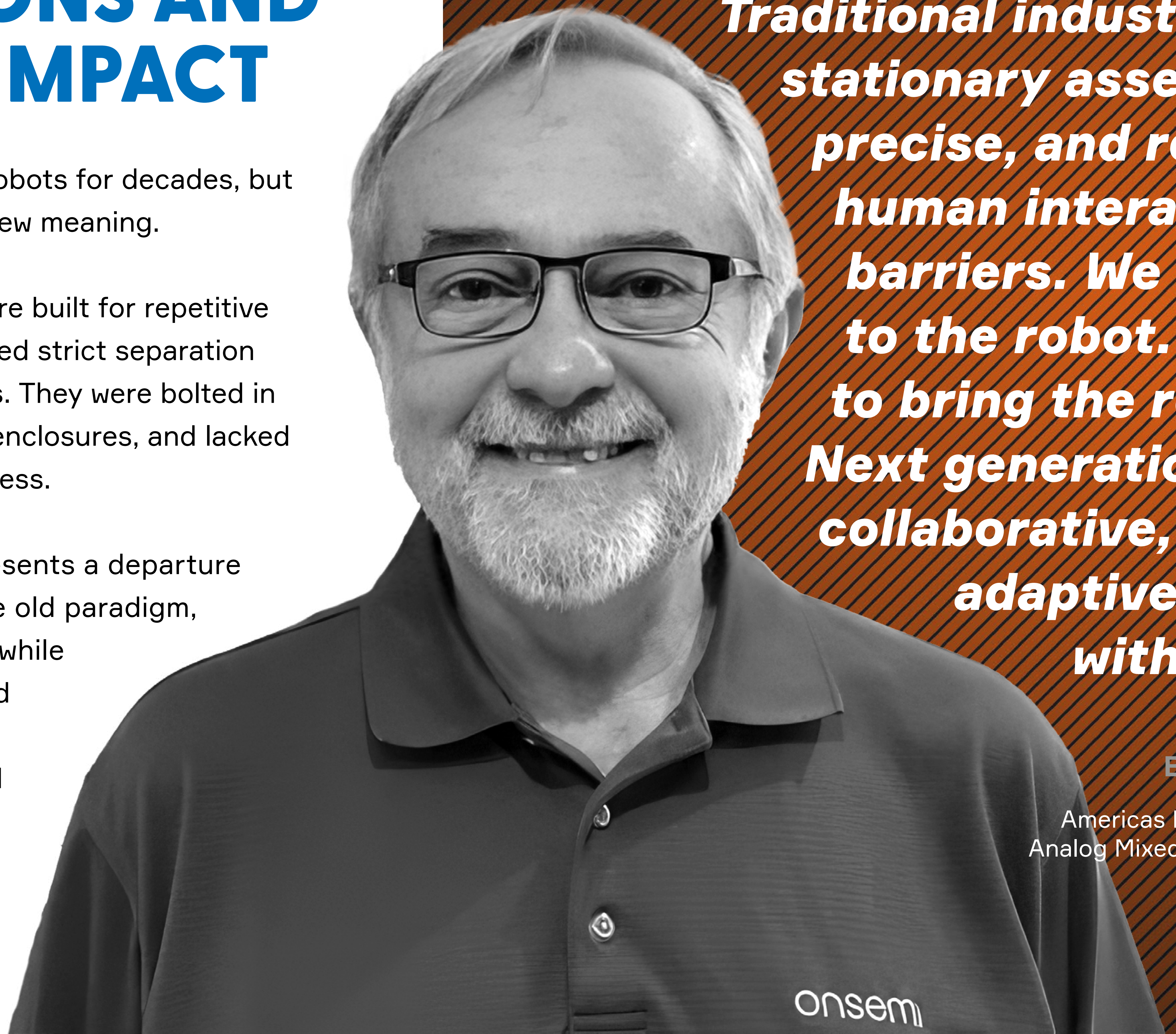
Chapter 1

AMR APPLICATIONS AND INDUSTRY IMPACT

Many industries have utilized robots for decades, but today, robotics is taking on a new meaning.

Traditional industrial robots were built for repetitive precision and speed but required strict separation from people due to safety risks. They were bolted in place, operated within fenced enclosures, and lacked dynamic environmental awareness.

The emergence of AMRs represents a departure from this model. Instead of the old paradigm, AMRs are built to move freely while sensing their surroundings and making decisions in real time. The shift from a fixed, isolated

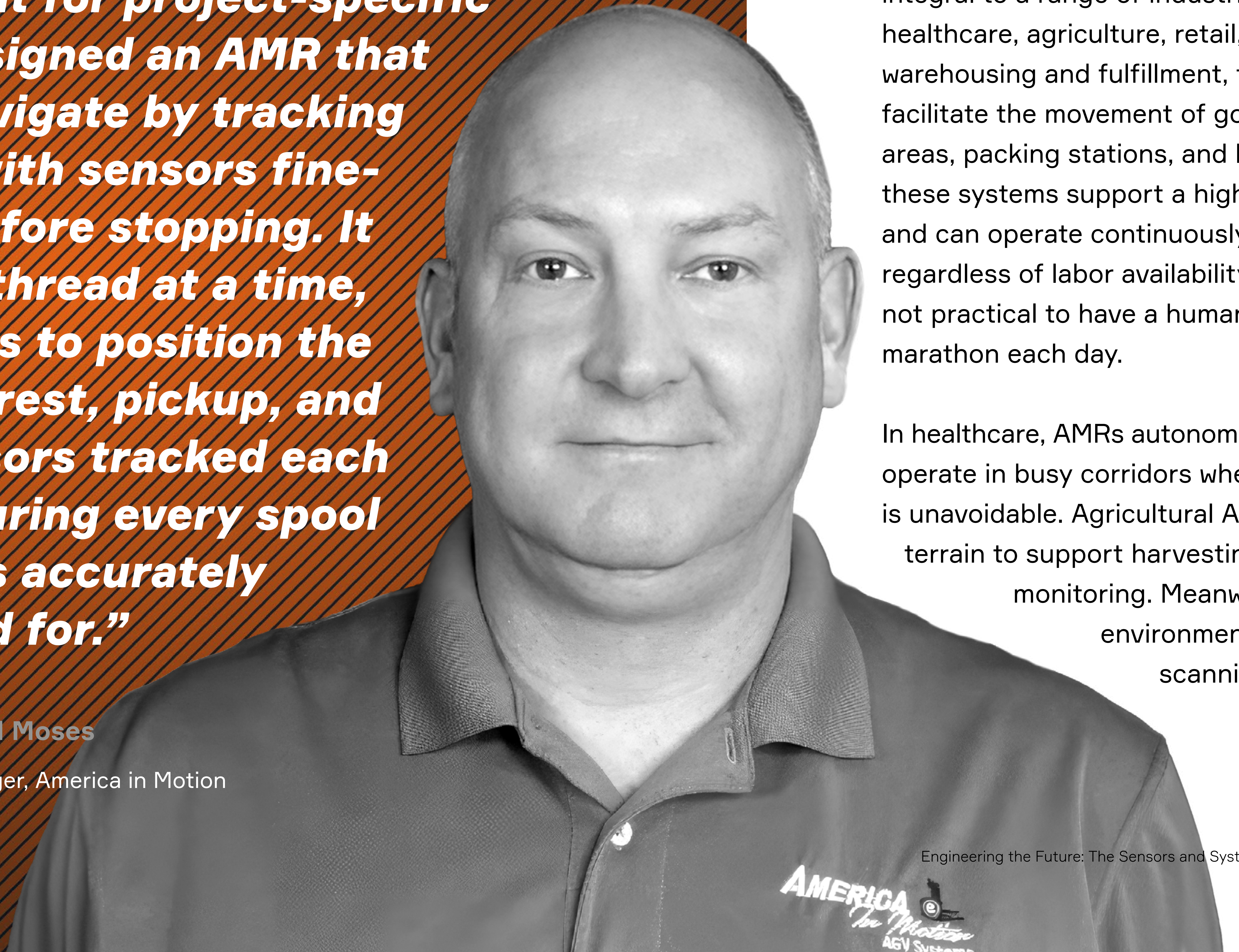


"Traditional industrial robots were built for stationary assembly line tasks—fast, precise, and repetitive, with little to no human interaction and heavy safety barriers. We brought the physical work to the robot. The future of robotics is to bring the robot to the physical work. Next generation robots will be mobile, collaborative, safer, smarter, and more adaptive, working in harmony with humans."

Bob Card

Americas Marketing Manager,
Analog Mixed Signal Group, onsemi

> ***AMRs are great for project-specific applications. We designed an AMR that used LiDAR to navigate by tracking reflective targets, with sensors fine-tuning its position before stopping. It picked up 30 spools of thread at a time, using inductive sensors to position the pickup arms during rest, pickup, and drop-off. Additional sensors tracked each spool after pickup, ensuring every spool and empty spot was accurately accounted for.”***
>
> **David Moses**
>
> Engineering Manager, America in Motion



automation paradigm to mobile systems unlocks a new host of use cases.

Unlike historical robots, modern AMRs are not confined to the factory floor. Today’s AMRs are integral to a range of industries, including logistics, healthcare, agriculture, retail, and security. In warehousing and fulfillment, for example, AMRs facilitate the movement of goods between storage areas, packing stations, and loading docks. Here, these systems support a high degree of flexibility and can operate continuously to meet rising demand regardless of labor availability. And at scale, it’s just not practical to have a human product picker walk a marathon each day.

In healthcare, AMRs autonomously move supplies and operate in busy corridors where human interaction is unavoidable. Agricultural AMRs navigate uneven terrain to support harvesting, spraying, and monitoring. Meanwhile, AMRs in retail environments conduct inventory scanning and restocking.

Ultimately, these use cases are enabled by the convergence of AI and advanced sensing and control. Specifically, AMRs rely on position and torque sensors, image sensors, ultrasonic sensors, and intelligent motor control to operate safely around people and objects. Torque sensing, for example, helps guarantee safety by detecting resistance or collisions, and also enables training through guided manipulation. This kind of physical feedback allows an AMR to learn tasks through demonstration and adapt to user input without reprogramming.

Naturally, human-robot collaboration is now a design focus. For AMRs to function in spaces designed for people, they must sense and respond to the physical world in ways that mimic human awareness. This requirement is now driving the development of humanoid AMRs equipped with legs, arms, and dexterous manipulators to perform tasks in the human-made world. Such platforms will rely on multi-modal sensor fusion and real-time AI to navigate complex layouts and interact with tools or objects designed for human hands.

onsemi supports emerging AMR use cases by

- Enabling safe and responsive human-robot interaction through integrated position and inductive sensing
- Providing scalable component platforms suited for AMRs operating outside traditional industrial boundaries
- Supporting modular robot architectures adaptable to varied tasks across logistics, healthcare, and agriculture

"AMRs can automate intralogistics workflows by transferring components and raw materials between cells, lines, or departments along fixed routes. They can also handle on-demand deliveries from storage based on production requests and move Work-In-Progress (WIP) parts between production cells and lines."

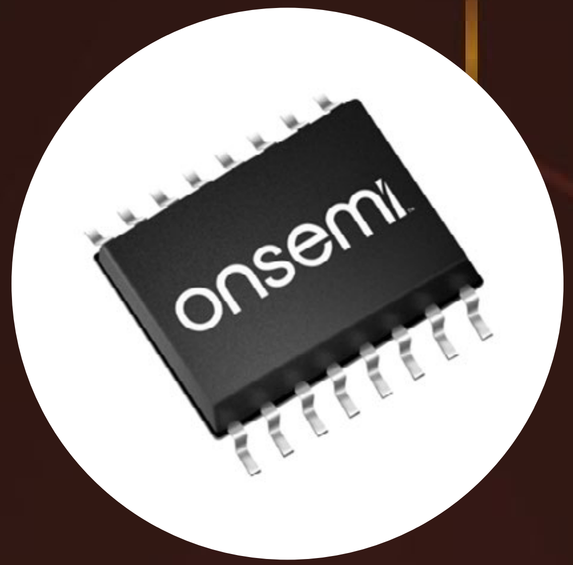
Manoj Kumar S

Sr. Robotics System Engineer, Universal Robots

“onsemi inductive torque and position sensors offer the reliability, robustness, and accuracy required by the most demanding AMR and robotic systems. Detecting any obstacle, and more importantly any human, in the path of such powerful machines is critical to their wide adoption by the industry and their acceptance by the public.”

Jacques Bertin

Product Definer, High Performance Sensing, onsemi



NCV75215 Ultrasonic Parking Distance Measurement Application-Specific Standard Product (ASSP)

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NCS32100 Inductive Position Sensor

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Key Points

- AMRs are a shift from fixed, fenced-off robots to mobile systems that navigate and make decisions autonomously in dynamic, human-centric environments.
- Industries such as logistics, healthcare, agriculture, and retail now rely on AMRs to automate tasks.
- onsemi supports emerging AMR deployments with integrated torque and position sensors, scalable platforms, and modular components designed for diverse, real-world environments.

ADVANCED SENSING AND AI-DRIVEN PERCEPTION

The effectiveness of AMRs in unstructured environments depends on their ability to continuously perceive, interpret, and respond to complex inputs. These systems must detect and classify objects, extract spatial geometry, track motion, respond to dynamic changes in their surroundings, and execute navigational decisions with low latency. As such, robust perception demands a layered architecture of sensing technologies that each address different needs.

Rolling shutter image sensors provide high-resolution and high dynamic range (HDR) visual data and are widely used for object recognition and semantic segmentation. However, their sequential exposure mechanism introduces geometric distortion during rapid motion. In high-speed or variable lighting conditions, global shutter sensors offer clear advantages. These sensors expose all pixels simultaneously to eliminate motion artifacts and enable accurate shape detection under fast motion or flickering artificial light.

For depth perception, AMRs typically integrate one or more of four methods—stereo vision, indirect time-of-flight (iTOF), direct time-of-flight (dTOF, as used in LiDAR), and ultrasonic sensing:

"With sensor fusion, adaptive safety zones, predictive AI, and emergency routines, AMRs can navigate efficiently while maintaining a high standard of human safety."

José Carlos García Moreno

Autonomous Navigation Engineer, PAL Robotics

> **_“One of the most impactful AMR applications I’ve worked with is goods-to-person (GTP) picking. Technologies like Simultaneous Localization and Mapping (SLAM), sensor fusion, and multi-modal perception have been key to enabling the level of autonomy GTP requires.”_**

Victoria Quinde

System Engineering Manager, Dematic

- Stereo vision uses dual cameras to estimate disparity and infer depth, but can suffer in textureless or low-contrast scenes.
- iTOF sensors emit modulated light and calculate distance from the phase shift of the returned signal. It’s particularly useful in applications that need compact integration, low latency, and low power.
- Direct TOF systems measure photon return time for higher range accuracy but require more power and cost.
- Ultrasonic sensors, which measure the time of flight of high-frequency sound waves, are unaffected by visual occlusion or transparency. This makes them effective in detecting soft obstacles, glass surfaces, and fluid boundaries.

However, environmental variability introduces substantial complexity into AMR perception. Lighting conditions, surface reflectivity, and structural occlusions can degrade the performance of any single sensor modality.

Sensor fusion addresses this challenge by combining raw and pre-processed data from complementary sensors into a unified perception model. This approach effectively improves reliability and robustness in edge cases while also enhancing spatial resolution and obstacle classification. Multi-modal perception via real-time sensor fusion unlocks features like SLAM, dynamic obstacle avoidance, and context-aware path planning.

onsemi offers sensing solutions for AMRs, including

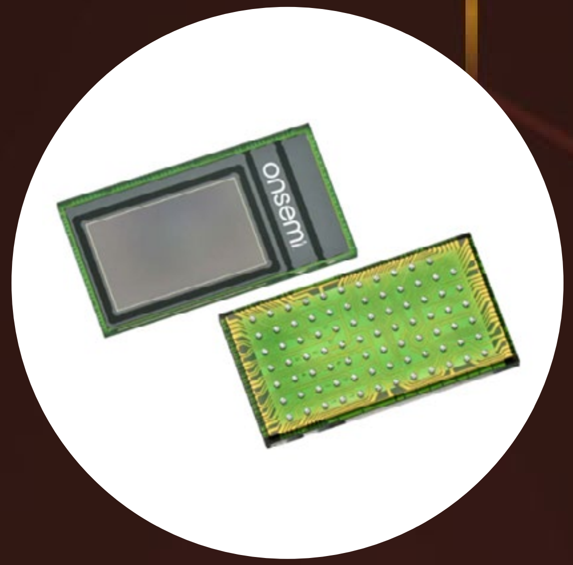
- Hyperlux LP/LH (Rolling Shutter), Hyperlux SG (Global Shutter) image sensors optimized for object detection and barcode scanning

- Hyperlux SG, small optical format Global Shutter image sensors, ideal for applications such as code scanning. When utilized as stereo cameras, they can be employed for 3D sensing, offering an alternative solution for SLAM
- Hyperlux LP, ultra low-power Rolling Shutter image sensors, along with Hyperlux LH, Rolling Shutter image sensors supporting up to 120 dB High Dynamic Range, are designed for object identification in collision avoidance
- Hyperlux ID, indirect time-of-flight (iToF) sensors that provide real-time depth data with embedded processing capabilities. It is suitable for short distances ranging from 10 to 50 cm, as well as long distances up to 30 meters, making it ideal for simultaneous localization and mapping (SLAM)
- Ultrasonic sensors capable of detecting transparent surfaces, reflective materials, and fine-grained motion such as human breathing
- Torque and position sensors that enable safe physical interaction and guided manipulation for human-collaborative tasks

"One sensor alone cannot meet the requirements for accurate AI training and processing—sensor fusion is becoming increasingly essential."

Daniel Noguchi

Sr. Product Marketing Manager, ICSD, ISG, onsemi



AR0235 Digital Image Sensors

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AF013x Hyperlux™ ID 1.2MP Indirect Time of Flight (iTOF) Sensors

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Key Points

- **AMRs must continuously interpret complex environments using layered perception systems.**
- **Different sensing modalities each offer tradeoffs in accuracy, range, power, and reliability depending on application constraints.**
- **Sensor fusion improves robustness by combining outputs from complementary sensors.**
- **onsemi offers AMR-ready sensing solutions, including Hyperlux image sensors, iTOF modules, and ultrasonic sensors.**

Chapter 3

INTELLIGENT POWER AND ENERGY EFFICIENCY

As the name suggests, AMRs are mobile devices. To this end, AMRs are powered by batteries and rely on energy-efficient power architectures to support sustained operation with minimal downtime. Because these systems operate untethered, energy availability is constrained by battery capacity, and every subsystem must be optimized to extend runtime without compromising performance. Intelligent power management is therefore central to AMR design.

The foundation of energy efficiency begins with how power is drawn from and distributed across the system. AMRs typically operate on multi-cell lithium-ion battery packs. For smaller AMRs, this can be in the 10-cell range, with nominal voltages of 36- 40V, while larger Mobile Robots operate from 60V or 80V.

As the battery discharges, onboard power systems must accommodate a wide input range while maintaining tight regulation for critical subsystems. This includes stepping down voltage levels to support 20V motor drivers, 5V control electronics, 3.3V sensors, and 1.8V processors. High-efficiency DC-DC converters minimize losses during this voltage conversion process and help maintain thermal stability in compact enclosures.

“

Designers must ensure motor control is extremely efficient by using low-loss switches—with low RDS(on), low gate charge, and high switching efficiency—to minimize wasted power, thereby maximizing Li-ion battery life.”

Bob Card

Americas Marketing Manager, Analog Mixed Signal Group, onsemi

"We built our autonomous disinfection robot to protect frontline workers during COVID and minimize downtime in critical areas like operating rooms and isolation units. Energy-efficient architectures and edge computing enabled safe, uninterrupted operation, helping hospitals bring vital spaces back online faster and more efficiently."

Niamh Donnelly

Co-Founder, Akara Robotics

Motor control is the dominant energy consumer in most AMR designs. Efficient actuation requires a combination of low-resistance power switches and smart gate drive strategies to reduce conduction and switching losses. Additionally, advanced MOSFETs with low RDS(on) and optimized thermal characteristics are essential for minimizing power dissipation during mobility and manipulation. For systems with many actuated joints, the cumulative efficiency of each motor stage significantly extends overall uptime.

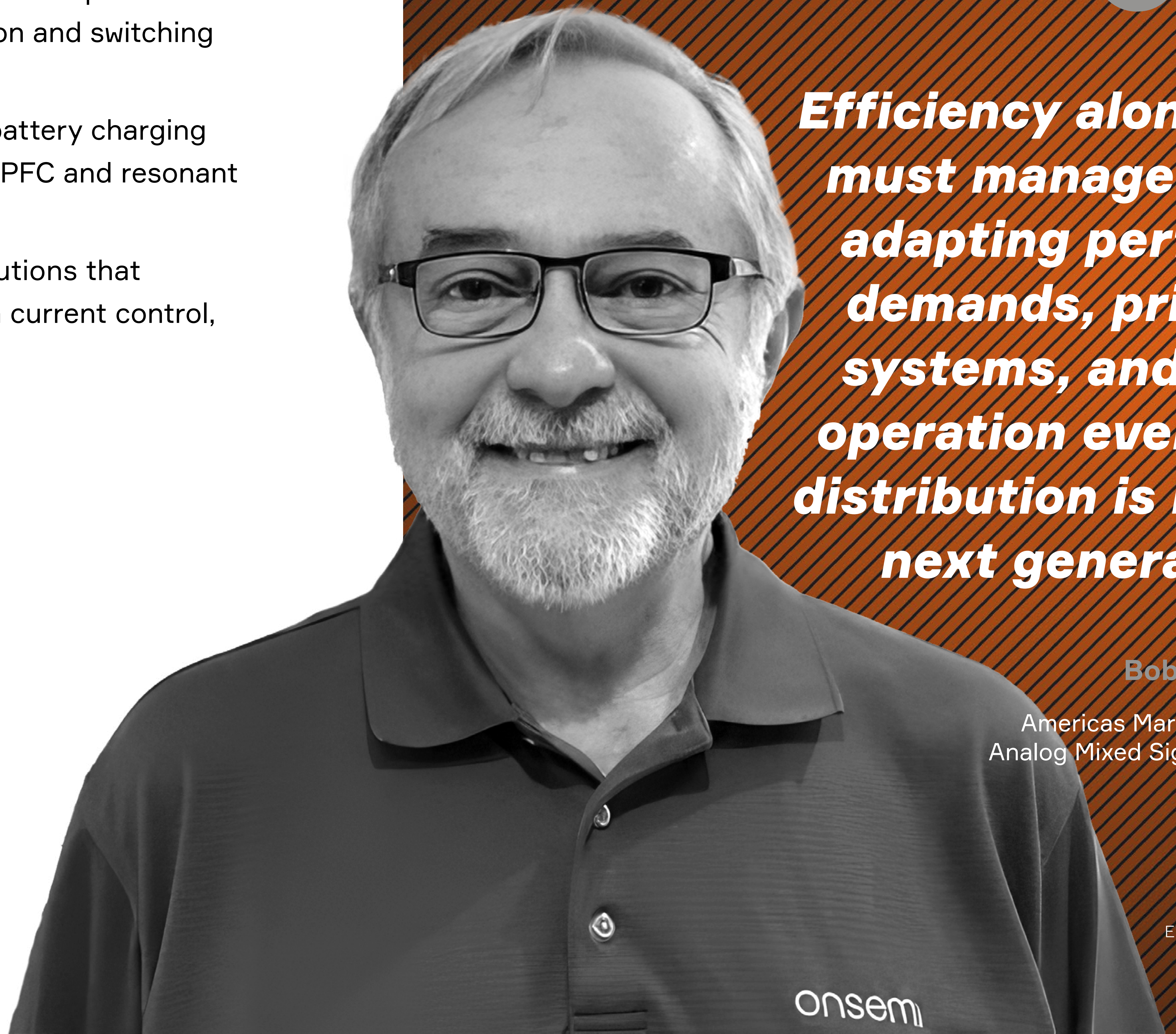
Battery charging introduces additional complexity, as systems now demand 1-3 kW charging capability with minimal energy loss and fast cycle times. To improve charging efficiency, totem-pole power factor correction (PFC) architectures eliminate input diode bridges. Resonant converters such as LLC topologies enable soft-switching across varying load conditions. These architectures are often paired with wide-bandgap semiconductors like silicon carbide (SiC) MOSFETs. SiC supports faster switching and higher thermal tolerance compared to silicon-based alternatives.

Power management must also support safe and reliable operation under fault conditions. To this end, electronic fuses (eFuses) provide programmable overcurrent protection, inrush control, and thermal shutdown for improved fault isolation compared to mechanical fuses. Their resettable nature also supports fault recovery and reduced maintenance, which can be valuable for AMRs deployed in remote or autonomous scenarios.

All things considered, efficiency alone is not sufficient. Rather, AMRs must also manage power intelligently, including scaling performance based on task load, shedding non-essential subsystems when battery levels drop, and enabling limp-home behavior during failure states. Collectively, intelligent power distribution, protection, and actuation systems can unlock a new class of mobile robots.

onsemi helps engineers develop efficient AMR systems by

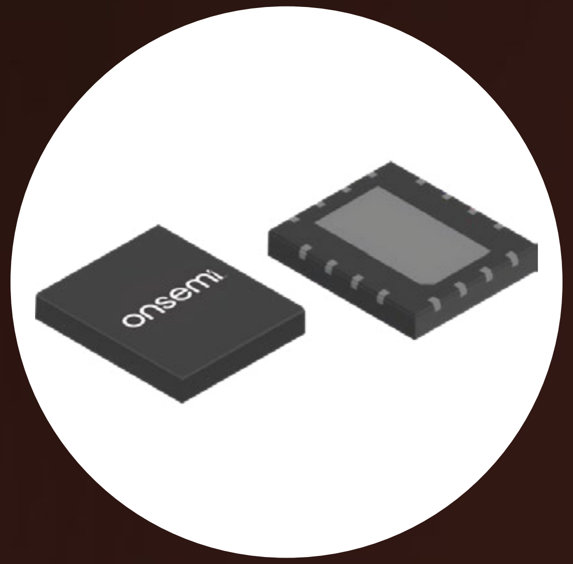
- Offering high-efficiency DC-DC converters that support wide input voltage ranges
- Providing low RDS(on) MOSFETs and optimized gate drivers to reduce conduction and switching losses in motor control stages
- Enabling fast, energy-efficient battery charging through support for totem-pole PFC and resonant converter topologies
- Delivering integrated eFuse solutions that enhance fault protection, inrush current control, and system reliability



"Efficiency alone isn't enough—AMRs must manage power intelligently, adapting performance to task demands, prioritizing critical systems, and ensuring safe operation even in failure. Smart power distribution is key to unlocking the next generation of mobile robotics."

Bob Card

Americas Marketing Manager,
Analog Mixed Signal Group, onsemi



NIS3071/NIV3071
4-Channel eFuses

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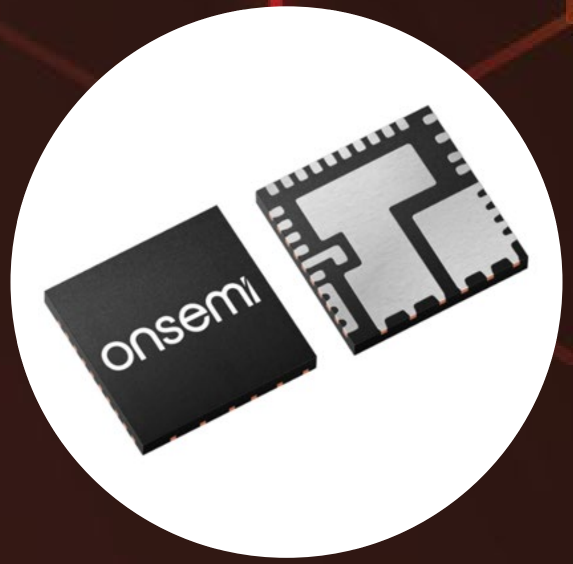

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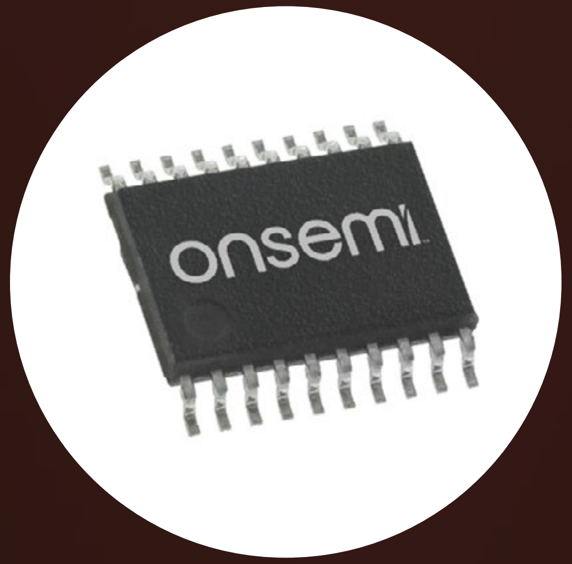

NCP1681 Totem-Pole Power Factor Controller

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Key Points

- **AMRs depend on energy-efficient power architectures to extend battery runtime, reduce heat buildup, and sustain operation across varied voltage and subsystem demands.**
- **Intelligent power management is essential to support mobile autonomy with minimal downtime or manual intervention.**
- **onsemi supports efficient AMR platforms with wide-input DC-DC converters, low RDS(on) MOSFETs, SiC-based fast charging architectures, and programmable eFuses for fault protection.**

CONNECTIVITY

As mobile robots become more autonomous and collaborative, their ability to reliably communicate data becomes critical. From low-latency control loops to high-bandwidth data exchange, AMRs require a mix of wired and wireless communication interfaces optimized for speed and reliability.

Internally, AMRs integrate multiple subsystems, including perception, motor control, safety logic, and battery management. Each of these subsystems requires deterministic communication. Traditionally, Controller Area Network (CAN) has been the protocol of choice in this domain due to its noise immunity and suitability for time-sensitive control messages.

However, CAN's limited bandwidth constrains its use in today's data-heavy tasks such as fused sensor telemetry.

To address this shortcoming, designers are adopting Ethernet-based solutions, including 10BASE-T1S. 10BASE-T1S has the benefits of offering multi-drop capability over a single twisted pair and also allowing multiple devices to share a common bus with higher bandwidth and less wiring complexity. The result is denser and lighter AMR platforms.

Meanwhile, the move toward sensor fusion and edge AI only amplifies connectivity demands. Advanced AMRs incorporate a slew of sensors, all of which generate streams of data that must be

> ***"Reliable communication is the backbone of AMR operations in dynamic environments. Wired connections provide stability and low latency for internal systems, while wireless networks enable real-time localization, fleet coordination, and cloud-based intelligence."***

José Carlos García Moreno

Autonomous Navigation Engineer, PAL Robotics

"AMR operations rely on wired and wireless networks to enable real-time data exchange between the robot and its control system. We used a real-time communication framework to provide the messaging infrastructure and support seamless application-to-application communication."

Manoj Kumar S

Sr. Robotics System Engineer, Universal Robots

synchronized and processed close to the edge. Transmitting this sensor data with low jitter and minimal latency requires both high-throughput interfaces and robust time synchronization. Ethernet with Time-Sensitive Networking (TSN) support enables precise temporal coordination, which facilitates features such as multi-sensor SLAM and fleet-level coordination.

Network reliability is also paramount. For example, AMRs operating in industrial environments will experience electromagnetic interference, network congestion, and physical obstructions that could compromise connectivity. To solve this, redundant network topologies and adaptive routing protocols can maintain service continuity even in degraded conditions.

Finally, edge computing enhances AMR connectivity by localizing data processing and reducing the need for constant backhaul. Processing sensor data at the edge reduces latency, minimizes bandwidth use, and improves privacy for sensitive environments like hospitals or industrial R&D labs. AMRs equipped with embedded compute can make autonomous decisions locally while selectively transmitting high-value data to centralized systems for analytics, fleet optimization, or remote diagnostics.

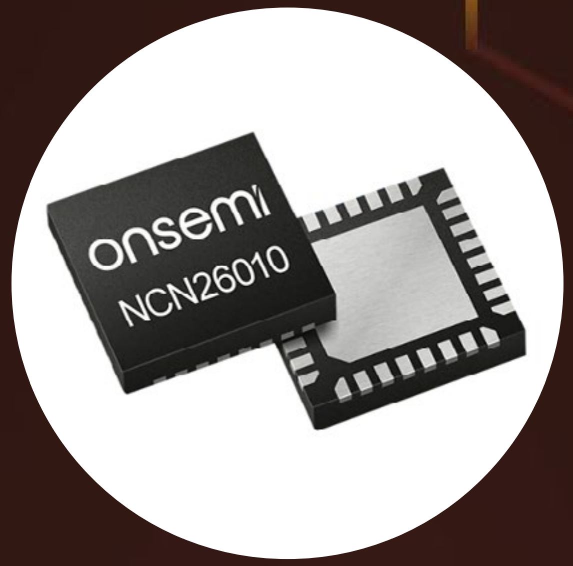
onsemi supports reliable and low-latency AMR communication with

- Automotive-grade CAN transceivers designed for high EMC performance
- 10BASE-T1S Ethernet PHYs that enable high-speed, multi-drop networking over a single twisted pair
- Interface components compatible with TSN-based Ethernet

"With so many sensors generating massive amounts of data, and real-time coordination needed between the perception and planning engines, low-latency communication is absolutely crucial."

Theo Kersjes

Global Applications Engineering,
Business Development & Solutions,
onsemi



NCN26010 Industrial Ethernet Transceiver

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NCN26000 Ethernet 10BASE-T1S Transceivers

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Key Points

- **As AMRs become more autonomous, they require low-latency and high-bandwidth connectivity to synchronize sensor data and support real-time decision-making.**
- **Evolving from CAN to 10BASE-T1S Ethernet enables higher data throughput, simpler wiring, and denser sensor integration for advanced perception and control.**
- **onsemi supports AMR connectivity with high-EMC CAN transceivers, TSN-compatible Ethernet interfaces, and 10BASE-T1S PHYs.**

THE FUTURE OF AMRS AND PHYSICAL AI

Looking to the future, it's clear that the concept of Physical AI will shape the next evolution of AMRs.

Physical AI refers to using AI to directly interact with and understand the physical world, encompassing everything from sensing and understanding the environment to manipulating objects and making decisions based on real-time data. These robots will not be confined to predefined tasks or static environments. Instead, they will learn from context, adjust to unstructured surroundings, and generalize their capabilities across a wide range of use cases. Importantly, such a shift is underpinned by a transition from rule-based autonomy to behavior-driven intelligence. This is powered by foundation models and real-time environmental feedback.

On a high level, physical AI combines perception, planning, and actuation into a unified feedback loop. This convergence allows robots to understand both spatial and semantic elements of their environment. For example, a robot that recognizes a table and drives around it must also understand that an object falling off the table has not disappeared, but is rather lying on the ground. Any object that is out of the perception of the robot is still somewhere

“

The real significance of embodied AI and foundation models is their potential to eliminate the constant trade-offs between flexibility and reliability in AMR deployments. Instead of over-engineering for edge cases or limiting functionality, we can now train models that adapt and scale with the operation.”

Victoria Quinde

System Engineering Manager, Dematic

“Embodied AI is key because it enables robots not just to perceive the world, but to understand and physically interact with it, moving beyond domain-specific learning to generalize across tasks.”

Theo Kersjes

Global Applications Engineering,
Business Development & Solutions, onsemi

in the world according to the rules of physics and must therefore be taken into account for navigation.

Whereas traditional systems might rely on manually defined behaviors, physical AI leverages massive datasets and simulation to pretrain models that can transfer across domains with minimal tuning. The result is a robotic platform capable of rapid task adaptation in dynamic environments.

Meanwhile, the rise of human-like robots is a response to the constraints of existing infrastructure. Buildings, tools, and workflows are designed for human dimensions and dexterity. Mobile robots that walk, climb stairs, or manipulate objects with human-level precision will be better suited to operating in the real world. These platforms will depend on a tightly integrated stack of real-time sensing, proprioceptive feedback, and AI-driven motion planning.

Beyond isolated tasks, it’s also expected that future AMRs will serve as collaborative agents that augment human labor and extend the reach of automation. With scalable hardware and adaptive intelligence, physical AMRs are expected to become the most flexible and context-aware robotic systems yet deployed.

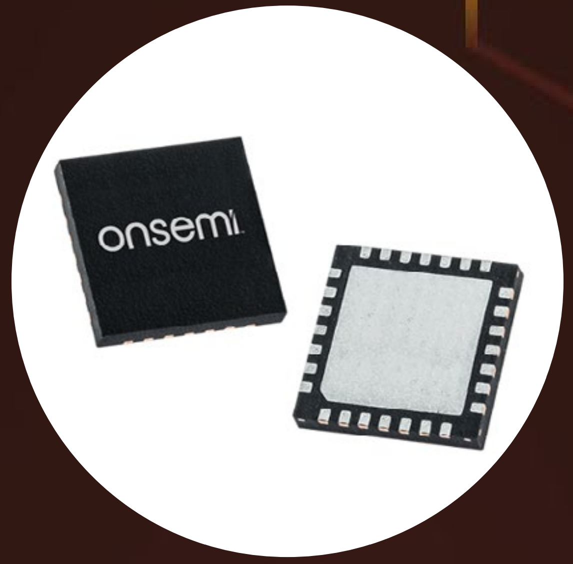
onsemi supports the future of AMRs and physical AI through

- Integrated sensor platforms that support real-time perception, localization, and adaptive decision-making in mobile systems
- Compact, low-power sensing solutions that scale across form factors from wheeled robots to humanoid platforms
- Intelligent power products that optimally use and manage the battery power in mobile platforms

> *"Hospital robotics must operate in complex, dynamic clinical environments where real-time responsiveness is critical for safe navigation and effective performance. Since many hospitals have unreliable wireless connectivity, robots rely heavily on edge computing to maintain autonomy without depending on cloud or remote infrastructure."*

Niamh Donnelly

Co-Founder, Akara Robotics



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Key Points

- **Physical AI enables AMRs to perceive and reason in dynamic environments by combining sensing, motion, and planning in a unified, real-time feedback loop.**
- **Future AMRs will adapt to unstructured settings and safely collaborate with humans by leveraging foundation models and context-aware intelligence.**
- **onsemi supports this evolution with real-time sensor platforms, efficient power solutions, and compact sensing technologies.**

Learn More About Our Experts

Jacques Bertin

**Product Definer,
High Performance Sensing,
onsemi**

in

Jacques Bertin has over 25 years of experience in position sensor architecture and design, with a strong focus on inductive sensors for high-reliability automotive applications and high-accuracy industrial systems. He began his career in Europe with Alcatel Microelectronics before relocating to the U.S. in 2002 to join AMIS and later onsemi. Jacques is the holder of 17 U.S. patents and continues to drive innovation in sensor technology.

Bob Card

**Americas Marketing Manager,
Analog Mixed Signal Group,
onsemi**

in

Bob Card brings over 30 years of experience in the semiconductor industry, with a strong track record of innovation across a broad range of applications. His expertise spans robotics, BLDC motors, Li-ion battery management and charging, USB-C/PD, 10BASE-T1S, gate drivers, inductive position sensors, wireless and wired communications, authentication, SMPS, DC-DC converters, and PoE. Bob holds 12 U.S. patents and has contributed to the field through numerous publications and blogs.

Niamh Donnelly

**Co-Founder,
Akara Robotics**

in

Niamh Donnelly is the co-founder of Akara Robotics, a pioneering company using AI and robotics to revolutionize healthcare. Her work earned a spot on TIME's Best Inventions list and recognition as a Top Rising Innovator by the European Commission. With a background in AI and engineering, Niamh brings deep technical expertise and visionary leadership to the forefront of robotic innovation in healthcare and beyond.

Learn More About Our Experts

Theo Kersjes

Global Applications Engineering, Business Development & Solutions, onsemi

With over twenty-five years´ international experience in product management, marketing, and applications in the semiconductor industry, Theo is creating cross-solution technology demonstrators for industrial and automotive applications. He created the onsemi Autonomous Mobile Robot technology demonstrator, integrating various onsemi product development platforms, including motor control, sensors, LED lighting, and power. Theo's technical interest is in how sensors and power integrate with physical AI and adaptive robotic workflows to enable robots to perceive their environment, make decisions, and perform tasks autonomously.

José Carlos García Moreno

Autonomous Navigation Engineer, PAL Robotics

José Carlos García Moreno is a senior robotics engineer specializing in autonomous navigation, AI, and machine learning. Based in Barcelona, he works at PAL Robotics, focusing on cutting-edge solutions in mobile robotics, autonomous vehicles, and medical robotics. With an MSc in AI research, he has led R&D projects in robotics and self-driving technologies. Passionate about innovation, José Carlos continuously strives for advancements in AI-driven automation and intelligent systems.

David Moses

Engineering Manager, America in Motion

David Moses is an experienced mechanical engineer currently leading the design of automated guided vehicles (AGVs) as an engineering manager at America In Motion. He brings over a decade of expertise in SolidWorks, particularly for sheet metal design, weldments, and simulation work. David specializes in CAD, Kaizen, project management, and lean manufacturing and has held multiple engineering roles focused on automation and innovation across North Carolina's top tech companies.

Learn More About Our Experts

Daniel Noguchi

Sr. Product Marketing Manager, ICSD, ISG, onsemi

Daniel Noguchi is the Senior Product Marketing Manager of onsemi's Industrial and Commercial Sensing Division (ICSD) and Intelligent Sensing Group (ISG). With a career spanning imaging and semiconductor industries, he has held roles at Aptina, BAE Systems, and onsemi's Automotive Solutions Division, focusing on vision and global shutter sensors. Daniel previously managed NAND flash marketing at Micron and holds a master's in economics from San Francisco State University.

Victoria Quinde

System Engineering Manager, Dematic

Victoria Quinde is a system engineering manager at Dematic with a background in solutions design, mechanical engineering, and systems integration. She earned her bachelor's degree in mechanical engineering, along with a minor in economics and aerospace engineering from Michigan Technological University. With nearly seven years of experience in automation and integration roles, Victoria brings strong project leadership, multilingual communication skills, and a passion for innovation to her work in supply chain and material handling solutions.

Manoj Kumar S

Sr. Robotics System Engineer, Universal Robots

Manoj Kumar S is a senior robotics systems engineer at Universal Robots, bringing over 15 years of experience in engineering software development. Over his career, Manoj has played a key role in developing cutting-edge robotic solutions for the oil and gas, medical, and manufacturing industries. With expertise in real-time systems, robotic path planning, and data distribution systems, Manoj combines technical excellence with innovation.