AMD
EMBEDDED
SOLUTIONS

PARTNER:
SINTRONES
NEW TAIPEI CITY, TAIWAN

INDUSTRY:
IN-VEHICLE COMPUTING

AMD TECHNOLOGY AT A GLANCE:

- AMD EMBEDDED R-SERIES SOCS
- AMD RYZEN™ EMBEDDED V1000 SOCS

CASE STUDY

In-Vehicle Computing
SINTRONES

SINTRONES Integrates High-performance Compute, Graphics and AI Capabilities in Fanless In-vehicle Computers Powered by AMD Embedded SOCs

CHALLENGE:
In-vehicle computers introduce significant design constraints and require a careful balance of processing performance and power efficiency harnessed in compact, fanless system enclosures to protect against harsh environments. As compute and graphics demands scale ever higher to accommodate advanced AI capabilities, these design challenges grow increasingly complex.

SOLUTION:
AMD Embedded R-Series SOCs and AMD Ryzen™ Embedded SOCs provide SINTRONES with a range of high-performance processing solutions to accommodate its aggressive design goals across a growing portfolio of thermally-adept, in-vehicle computers.

RESULTS:
SINTRONES' VBOX-3210 and ABOX-5100 computers blend sophisticated compute and graphics processing capabilities with 4K, multi-display configurability, enabling advanced features and functionality for a new generation of intelligent vehicles.

VBOX-3210 AND ABOX-5100 IN-VEHICLE COMPUTERS LEVERAGE AMD EMBEDDED SOCS TO MAXIMIZE PROCESSING, I/O AND MULTI-DISPLAY AGILITY IN HARSH ENVIRONMENTS

Since its inception in 2009, SINTRONES (www.sintrones.com) has earned considerable industry acclaim for its versatile, ruggedized industrial PC (IPC) system designs targeting in-vehicle and transportation computing applications. Leveraging a patented technology portfolio encompassing sophisticated system cooling, power management and battery backup solutions, among other advanced technologies, SINTRONES is distinguished in the market for its unique ability to innovate high-performance, power efficient IPCs optimized to endure harsh environmental conditions including extreme temperatures, shock and vibration.

Among its many achievements, SINTRONES is perhaps most renown for its ability to integrate high-performance processing capabilities in fanless, ventless system enclosures. Carefully balancing demanding processing and thermal dissipation requirements, its IPCs are sealed against the ingress of dust, debris and other particulates that might otherwise compromise an on-board fan. With no moving parts and associated device failure risks, fanless SINTRONES IPCs deliver highly-reliable performance in environments that might otherwise sap the longevity and maintenance of conventional fan-cooled system designs.

These daunting processing and cooling challenges have been further compounded in the new era of artificial intelligence (AI) and deep learning-based applications, for which extreme computing horsepower is a crucial requirement. As SINTRONES has extended its product portfolio to support compute-intensive AI functionality, its attention to processing performance and thermal design issues has only magnified.

In parallel, the need for expanded I/O connectivity and multi-display IPC configurability has imposed additional system demands, tasking SINTRONES' designers to assess processing platforms that support multi-device connectivity from a single chip, rather than accept the design complexities and form factor penalties associated with system architectures leveraging discrete, heterogeneous chipsets.

These exacting engineering challenges were top of mind for SINTRONES' expert design team when developing its VBOX-3210 and ABOX-5100 fanless in-vehicle computer systems. Tasked with optimizing these systems for space- and power-constrained mobile environments, SINTRONES would need to achieve an optimal balance of system performance, functionality, size and power consumption – all at a competitive cost.

SINTRONES VBOX-3210 FEATURING AMD EMBEDDED R-SERIES SOCS

Among SINTRONES' product portfolio for midrange performance requirements, the VBOX-3210 fanless in-vehicle computer is distinguished as a particularly compelling option for fleet vehicles spanning buses, taxis, municipal trucks, police and emergency vehicles, and beyond. The ultra-compact VBOX-3210 is optimized for applications including public transportation surveillance, digital signage, and infotainment applications, bringing together multi-camera versatility and high-resolution, multi-display graphics capabilities in a seamlessly integrated system.

To power the VBOX-3210, Sintrones' design team selected AMD Embedded R-Series SOCs, leveraging up to four CPU cores, up to 8 GPU compute units, and an I/O controller – all on a single die – maximizing processing and graphics performance in a small footprint that conserves valuable board real estate. AMD Embedded R-Series SOCs deliver excellent processing performance for CPU workloads as well as GPU-accelerated, parallel processing workloads for algorithm-intensive smart camera functionality.

The smart camera capabilities enabled by the VBOX-3210 are expandable to support multi-camera configurations leveraging up to four PoE 802.3 and one GbE connection (total of five LAN ethernet connections). This allows for flexible camera deployments, with the processing performance to handle a wide range of functions, from passenger counting to mobile license plate recognition and driver/passenger facial recognition.

The AMD Embedded R-Series SOC enables stunning video and graphics performance for VBOX-3210s servicing in-vehicle digital signage and infotainment applications, providing true 4K encode and decode and integrated support for DirectX® 12, Unified Video Decode (UVD) 6 (4K H.2654 and H.264 decode) and Video Coding Engine (VCE) 3.1 (4K H.264 encode). Up to three independent displays are supported, all of which are capable of 4K resolution at 60Hz, with options to use the Embedded DisplayPort (eDP) 1.4, DisplayPort (DP) 1.2, Digital Video Interface (DVI) or HDMI™ 1.4/2.0 interfaces.

AMD Embedded R-Series SOCs also feature a configurable thermal design power (cTDP) capability that enables a programmable TDP range from 12W to 35W, giving SINTRONES' designers the added flexibility to tune power consumption and thermal profiles to meet their demanding system requirements for fanless in-vehicle operation, minimizing heatsink architecture complexities and associated design penalties.

SINTRONES ABOX-5100 FEATURING AMD RYZEN EMBEDDED V1000 SOCS

Building on the advanced features offered with the VBOX-3210, the SINTRONES design team endeavored to apply their engineering expertise to a new class of in-vehicle computers optimized to support next-generation AI capabilities, retaining the fanless cooling architecture of earlier SINTRONES product offerings while significantly boosting the compute and graphics processing capabilities.

The new ABOX-5100 is ideally suited for deployment in autonomous vehicles, smart patrol vehicles, intelligent transportation, agriculture vehicles, and automated guiding vehicles (AGVs) for factory floor and warehouse environments. Leveraging GPU-accelerated deep learning

to cultivate vehicle- and fleet-level intelligent inference capabilities for improved navigation and automation, ABOX-5100-equipped vehicles are optimized for the accelerating evolution toward smart cities, factories and farms.

As with the VBOX-3210, the ABOX-5100 computer design imposed strict constraints on power consumption, thermal management and system size – constraints compounded by the dramatic boost in processing performance needed to achieve intelligent awareness in dynamic and/or harsh operating environments. For applications with digital signage and infotainment functionality requirements, the underlying processing platform would need to strike an optimal balance of compute and graphics performance, complemented with robust multimedia support and multi-display configurability.

Amid these formidable design challenges, SINTRONES' engineering team selected the AMD Ryzen™ Embedded V1000 SOC to underpin the ABOX-5100, bringing together the breakthrough performance of the pioneering AMD "Zen" CPU and AMD "Vega" GPU architectures in a seamlessly-integrated, single-chip SOC that's fully optimized for next-generation AI-based, in-vehicle computing, among other applications. Delivering superior graphics and multimedia processing, and compute performance up to 3.6 TFLOPS with thermal design power (TDP) as low as 12W, AMD Ryzen™ Embedded V1000 SOCs equipped SINTRONES' ABOX-5100 engineering team to achieve new levels of processing efficiency and design versatility for the next era of intelligent vehicles.

The AMD Ryzen™ Embedded V1000 SOC simplifies the design, form factor and thermal management challenges inherent to discrete CPU and GPU configurations, providing an ultra-high-performance complement to the AMD Embedded R-Series. Utilizing a 14nm FinFET process, the AMD Ryzen™ Embedded V1000 enables scalability to higher performance at comparable TDPs as legacy SOC offerings, or sustained performance levels with significantly reduced thermal budgets. Up to 4 CPU cores/8 threads and 11 GPU compute units can be harnessed to achieve breakthrough processing throughput for the demanding compute and graphics workloads targeted for the ABOX-5100.

In addition, a single, small-footprint AMD Ryzen™ Embedded V1000 SOC can power up to four independent displays in brilliant 4K resolution, delivering stunningly rich and immersive visual experiences for ABOX-5100 systems servicing in-vehicle digital signage and infotainment applications. Leveraging DisplayPort/eDP and/or HDMI™, and support for High Dynamic Range (HDR) displays, SINTRONES' engineering team was enabled to easily and elegantly scale graphics and compute performance for a wide range of in-vehicle use cases, with a clear pathway to advanced AI functionality leveraging the combined CPU and GPU processing engines.

ABOUT SINTRONES

SINTRONES is a world-renowned and ISO 9001 certified provider of in-vehicle and industrial computing system products. The company is dedicated to providing customers with high-quality, certified computer system products that meet international traffic transportation standard certifications, including EN50155, E-Mark, IEC60945, IACS E10, DNV and MIL-810. For more information, visit **www.sintrones.com**

ABOUT AMD

For more than 45 years, AMD has driven innovation in high-performance computing, graphics and visualization technologies – the building blocks for gaming, immersive platforms and the datacenter. Hundreds of millions of consumers, leading Fortune 500 businesses and cutting-edge scientific research facilities around the world rely on AMD technology daily to improve how they live, work and play. AMD employees around the world are focused on building great products that push the boundaries of what is possible. For more information about AMD, visit **www.AMD.com**

AMD EMBEDDED SOLUTIONS

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