Synopsys and Arbe

Arbe Achieves First-Pass Silicon Success for High-Resolution Imaging Radar SoC using DesignWare Foundation, ARC Processor, Security & Interface IP

"*Synopsys was the only vendor ready to provide a portfolio of ISO 26262 qualified, ready-to-implement IP.*"

~Avi Bauer, Vice President of Hardware Engineering at Arbe

arbe

Business

Arbe has repositioned radar, the most dependable of sensing technologies, from a supportive role to the backbone of a vehicle's sensor suite, delivering unprecedented road safety through 4D ultra high-resolution imaging. From standard maneuvering to high-risk engagement, Arbe services real-world driving needs, differentiating threats from false alarms in real-time, no matter their speed, elevation, proximity, size or the surrounding weather conditions to provide 'every-scenario' road safety. Founded in 2015 by an elite team of semiconductor engineers, radar specialists, and data scientists, Arbe's patent pending chipset solution empowers automakers and Tier 1 companies with a sensing solution 100 times more detailed than any other radar on the market, suited for every level of vehicle autonomy or class.

Challenges

- Develop Imaging Radar chipset with innovative features for today's automotive level 2 market and future autonomous vehicle demands
- Reduce cost of new high-resolution sensor SoC
- Acquire fully qualified IP on GlobalFoundries 22FDX that accelerates time-to-market while meeting AEC-Q100 and ISO 26262 requirements
- Implement efficient security solution for system boot up and networking communication

Synopsys DesignWare IP Solution

- ASIL B Ready General Purpose IO and LVDS IO*
- ASIL D Compliant ARC® EM22FS Processor**
- ASIL D Ready ARC EV62 Embedded Vision Processor*
- ASIL D Ready ARC MetaWare® EV Development Toolkit for Safety***
- ASIL B Ready Ethernet QoS Controller IP*
- Foundation IP: Logic Library, High-Density, High-Speed & Low-Power Embedded Memory, and Process Monitor and Temperature Sensor IP
- Security IP: True Random Number Generator, Security Protocol Accelerator, and Public Key Accelerator

* Developed and assessed specifically for ISO 26262 random hardware faults with ASIL systematic in progress

** Compliant for both ASIL B random hardware faults and ASIL D systematic

*** Certified as ASIL D Compliant according to ISO 26262-8 2018 as suitable for the development of safety related software up to ASIL D

> *"Synopsys was instrumental in helping us meet our stringent ESD targets with their general-purpose IO and LVDS libraries. They took the initiative to sign off the IO libraries with an increased CDM level of 500V by working closely with us to assess our design requirements."*

~Avi Bauer, Vice President of Hardware Engineering at Arbe

Benefits

- Achieved first-silicon success and beat the competition to market for 4D ultra high-resolution Imaging Radar
- Met performance and stringent ESD requirements
- Acquired ASIL Ready IP to accelerate ISO 26262 qualification
- Easily integrated security IP with pre-verified security/processor IP solution
- Received excellent support from a knowledgeable and responsive local technical support team

Overview

Arbe's patented imaging radar is a next-generation sensor specifically designed for advanced driver assistance systems (ADAS) and autonomous vehicles. The high-resolution imaging radar can sense the environment at a wide 100-degree field of view in high-resolution at the highest reliability in various weather and environment conditions, including fog, heavy rain, pitch darkness, and air pollution. It is able to create a detailed image of the road at a range of more than 300 meters (1,000 feet) and capture the size, location, and velocity data of objects surrounding the vehicle to enable safer driving and support levels 2-5 autonomous operation. Arbe collaborated with Synopsys to acquire high-quality automotive IP for the GLOBALFOUNDRIES 22FDX process, accelerating their time-to-market while meeting their safety and security requirements.
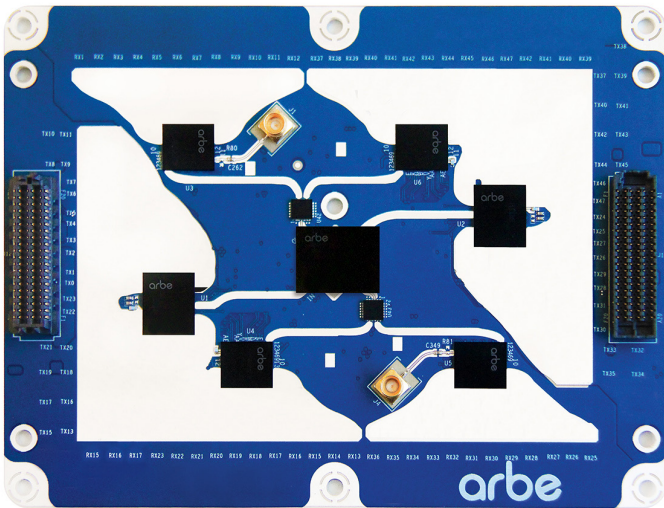
Arbe's Phoenix 4D Imaging Radar Chipset Solution

High-Quality DesignWare IP Solutions

Arbe selected a portfolio of automotive-ready DesignWare IP for their Phoenix chipset. Arbe selected the ARC EM22FS Processor because of its integrated self-checking safety monitor, error correcting code (ECC), and programmable watchdog timer. The EV62 Embedded Vision Processor provides a highly efficient 512-bit wide SIMD vector DSP with functional safety capabilities without sacrificing power, area, and performance. Both processors feature lockstep capabilities that enable rapid detection of system failures and runtime faults. The ARC MetaWare EV Development Toolkit for Safety enables software developers to generate highly efficient, ISO 26262-compliant code for their automotive applications. "The ARC EM Functional Safety Processor, EV62 Processor, and MetaWare toolkit offer performance and safety features that were easily integrated into the complex operations necessary for our 4D imaging radar SoC," said Avi Bauer, Vice President of Hardware Engineering at Arbe.

> *"Meeting industry security requirements can be challenging, but the Synopsys Security IP was very easy to integrate, allowing us to meet the necessary security standards and performance within the silicon area budget."*

~Avi Bauer, Vice President of Hardware Engineering at Arbe

For its real-time networking needs, Arbe selected Synopsys' configurable Ethernet QoS Controller IP with safety package, which supports Time Sensitive Networking (TSN) to reliably manage the data stream between connected devices. In addition, the 1.8V and 3.3V general purpose IOs and 2Gbps LVDS IOs met Arbe's ESD requirements for 500V CDM. "The general purpose IOs offered higher performance and increased drive strengths compared to the competitors we considered," said Bauer.

In addition to safety, security is paramount in connected vehicles, including for booting up the system and establishing secure networking connections. "Meeting industry security requirements can be challenging, but the Synopsys Security IP was very easy to integrate, allowing us to meet the necessary security standards and performance within the silicon area budget," said Bauer.

Expert and Responsive Technical Support

Arbe utilized Synopsys' responsive, worldwide support team to meet the requirements for their complex, high-performance AI SoC. "When we reached out, Synopsys' technical support and R&D teams were very proactive and responsive," said Bauer. "Our products integrate a lot of Synopsys IP, and the option to communicate directly with engineering teams helped accelerate our time-to-market."

"We have started development on our next SoC for ADAS and autonomous vehicles. Due to Synopsys' continued success in developing and delivering ISO 26262 IP, we plan to use DesignWare IP in that project as well," said Bauer.

"*At the end of the day, our collaboration with Synopsys a long-term relationship, not just a business deal. Integrating Synopsys IP is win-win-win, of course for Arbe and Synopsys, but also for our customers who can count on high-quality IP that meets ISO 26262 functional safety.*"

~Avi Bauer, Vice President of Hardware Engineering at Arbe