BLUMIND

AI for Everyone, Everywhere

Application Brief

All-analog AI for Smart Tires

Next generation *Smart Tires* embrace ultra-low power all-analog AI to support accelerometer sensor input for advanced road and tire condition classification while extending battery life.

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Always on AI for Smart Tire Applications

Tire Pressure Monitoring Systems (TPMS) have been required on new vehicles in the US since 2007. Now a global standard, 10's of millions of units are shipped each year. Sine introduction the basic feature of TPMS has been to detect pressure deviations from ideal to enable a dashboard warning light. Now next generation *smart tires* are looking to add significant additional functionally to the TPMS system, buy adding accelerometers to tires. With the additional sensor data comes the need for ultra-low power *in-tire* signal processing.

The use of accelerometers allows for road surface conditions (dry, ice, wet, snow, sand) to be determined along with tire wear, and vehicle load dynamics. Analog AI technology embedded in each tire is the only solution able to accurately process the local sensor data volume at low enough power to provide classification to the engine control unit (ECU) and support the years of battery life required in smart tire applications. Smart tires enable more efficient and safer vehicles, particularly for solutions using heavier EV based powertrains.

Lowest Power with Programmability

Blumind all-analog approach to smart tire AI, achieves the highest total system value for clients. System level power, size, and cost are minimized to achieve the most efficient solution. Our all-analog approach to AI reduces system power, up to 100x, while allowing for simpler lower cost analog sensor inputs. Further, our unique architecture enables in-field updates to neural network parameters critical as new algorithms develop in this fast-moving market area.

Blumind offers high integration ASSP devices and Chiplet/IP solutions.

Blumind AMPL™ Technology

Blumind's AMPL technology is unique. The Blumind all-analog approach delivers the lowest power solution while the inherently parallel architecture delivers ultra-low latency for real time applications, all in a tiny footprint.

No high-speed clocks, ADCs, DACs, or specialty memory are used. AMPL technology is built in standard CMOS with a roadmap to advanced process node.

By exploiting advanced CMOS device physics Blumind creates single transistor neurons that are small and power efficient.

The AMPL architecture was built from the ground up to address the analog compute challenges of variations in process, temperature, voltage, and long-term drift and our results are impressive.

Standard PyTorch and TensorFlow software tools are used to create the parameters for the powerful AMPL neural network.