

## CASE STUDY

iW-RainboW-G35M

# ZU19EG System on Module Automotive LiDAR

Reliable solution for autonomous vehicles

## Introduction

Manufacturers and automakers are racing to design cars that drive themselves, reducing accidents and improving traffic flow. LiDAR is a key technology poised to power this revolution. LiDAR uses laser pulses to generate a 3D map of the surroundings of the vehicle in real-time. LiDAR systems begin by identifying the smallest object that needs to be detected and its reflectivity, with resolution as a key system characteristic. Creating real-time point clouds is one of the major challenges of a LiDAR system.

**A deep-tech company in the automotive vertical approached iWave with a requirement for a high-speed FPGA platform required for processing the input data from LiDAR Sensors powering the next generation of ADAS and autonomous driving systems.**

## Challenges

- Requirement of high-speed transceivers and a high number of DSP slices
- Ability to interface with a wide range of sensor modalities
- Scalable Deep Learning Processing Unit (DPU) for advanced AI perception with ultra-low latency processing
- Capability to implement pre- and post-processing algorithms on high-bandwidth sensor data
- Short lead times for the production of the processing platform
- High-speed interfaces like MIPI, JESD204B, LVDS, and GigE, as well as low bandwidth sensor standards such as CAN, SPI, and I2C

**With the above challenges and requirements in mind, iWave proposed the System on Module based on the [XILINX Zynq UltraScale+ MPSoC ZU19](#).**

## How ZU19 Adaptive SoC enables LiDAR Solutions

- The Image data can be transferred via GTH transceivers within Programmable Logic (PL), enabling high-speed connectivity and data transmission.
- Partitioning between software and associated hardware acceleration functions using the high bandwidth connectivity between the processing system and PL allows for parallel processing, reducing clock speed and power dissipation
- 1968 DSP Slices that offer advanced DSP capabilities produce rich point cloud images with depth, signal, and ambient data used for high resolution for object detection

With the [system on module](#) incorporating the above designs and considerations, customers can now focus on the core competencies and features of their product, helping them reduce time to market with reduced development cost. iWave Systems and other system-on-module manufacturers take responsibility for product longevity while maintaining the end of life for the modules' hundreds of components.

## ZU19 System on Module Features

- Quad Core Cortex-A53 MPCore @ 1.5GHz
- Dual Cortex-R5 MPCore @ 600MHz
- 1.1M programmable logic cells
- -1 Speed Grade Support
- 16 x High Speed transceivers @ 32.75Gbps
- 32 x High Speed transceivers @ 16.3Gbps
- 4 x PS transceivers @ 6Gbps
- 142 User Configurable IOs
- Peripherals: Ethernet, PCIe, USB3.0, SATA3.1, Display Port



The processing element can be configured to meet the processing and I/O needs of the sensor configuration, software framework, and system performance requirements. A LiDAR sensor can produce about a terabyte per second (TB/s), approximately 1012 bytes, which is converted to about 20Gb/s before processing. This is still a large amount of data that requires a lot of processing power. The Arm Cortex R5 real-time processing unit is used to implement safety-critical functionality for monitoring the LiDAR system in real-time.

The iWave [ZU19 System on Module](#) is a powerful and flexible platform that delivers advanced capabilities needed for lidar sensors: signal processing, point cloud pre-processing, and point cloud machine learning acceleration. The System on Module also helps speed up your product development cycle.

With our system on modules portfolio, iWave is driven by the mission to be a reliable technology partner in their product journey and ensure the best of products and extensive technical support. iWave System is a global leader in designing and manufacturing highly Scalable FPGA & SoC Systems on Modules and computing platforms.



iWave Systems Technologies is a product engineering organization offering an extensive portfolio of Telematics Solutions, System on Modules and avionic solutions. With over 21 years of embedded industry experience and designing solutions for automotive customers across the globe, iWave is driven with the aim to be a reliable global technology partner. Learn more about iWave at [www.iwavesystems.com](http://www.iwavesystems.com)