CASE STUDY

iW-RainboW-G40M

i.MX 8M Plus OSM LGA Module Drones

How drones are changing military operations

Introduction

Drones or UAVs are pilotless aircraft whose basic function is to gather information on an environment and relay it back to its controller. Military applications continue to be the primary use of drones today, as the vast majority of drones manufactured are for military purposes. They are used as decoys for targets, in research and development, and even in supervision. They come with an onboard computer, multiple sensors, GPS positioning, accelerometers, and high-definition cameras.

The flight controller board is what monitors and controls the drone's movement. The flight controller's primary function is to receive and process input signals received by the sensors and process them to execute appropriate commands given by the user. The Electronic Speed Controllers (ESCs) receive these commands and convert them into signals that a motor can understand to adjust the rotational speeds of the motors, thereby stabilizing the craft.

A leading provider of specialized products and services for the defense and security industry required an industrial-grade, powerful computing platform that could withstand high vibrations while remaining compact in size. It was also essential that the platform has interfaces optimized for image processing to support different sensor modalities, camera connectivity, and onboard AI intelligence to convey reliable data to the command team on the ground.

Challenges

- Industrial grade module that can operate at extreme temperatures
- High-performance processors with neural processing units to support real-time operations
- Interfaces optimized for image processing - MIPI, USB, GigE
- Communication protocols - CAN, I2C, UART, SPI
- Withstand high vibrations
- Compact-sized board to reduce overall weight for a better flight
- Should consume low power

Solution Highlights

- PCB solderable module for robust design
- i.MX 8M Plus Dual/QuadLite/Quad CPU
- NPU with up to 2.3TOP/s Neural Processing Unit
- 4 lane MIPI CSI, 4 lane MIPI DSI, 4 lane LVDS, HDMI 2.0
- Interfaces – RGMII, PCIe 3.0, CAN, I2C, SPI, USB 3.0, USB 2.0, UART
- Industrial grade module operating at -40°C to +85°C
- Form factor: OSM Size-L (45mm x 45mm)

The i.MX 8M Plus OSM System on Module supports a powerful Arm Cortex-A53 processor with a neural processing unit (NPU) operating up to 2.3 TOPS, Cortex-M7 real-time control, dual image signal processors (ISP) to support advanced image processing techniques for real-time interpretation of images, and camera inputs to build advanced vision systems.

Compliance with different interface standards is a significant challenge in drone sensor interfacing and processing. Addressing this, the SoM incorporates dual CAN and Gigabit Ethernet to provide time-sensitive networking and robust control networks. MIPI CSI, MIPI DSI, LVDS, and HDMI 2.0 interface connectors in the SoM support advanced vision systems. Additionally, the SoM supports CAN, USB, I2C, UART, and SPI to connect external devices like sensors to the flight controller.

H.264/H.265 video encode/decode and 2D/3D graphics accelerator is used for performing graphics processing in real-time while high-speed data transmission is enabled via RGMII and PCIe connectors. Hence, with the support for all industry-leading interfaces available on a single platform, the customer can focus on their core competencies and features of the product.

Since the SoM is directly soldered onto the carrier board, it adds an extra level of ruggedness to the products making them resistant to shock and vibrations. Compact OSM SoMs enable the design of lighter and more compact drones.

The i.MX 8M Plus development kit and software board support packages provided by iWave, helped the team to jumpstart the project by offloading several complexities involved in the design cycle. The development kit further enhances the time-to-market advantage compared to ASIC-based design.

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