Computer on Modules based on differentiated processors

AI-supported edge applications in focus

F&S Elektronik Systeme primarily offers Computer-on-Modules (CoMs) based on i.MX93 and i.MX95 CPUs. But what is the actual difference between an i.MX93 and an i.MX95 module - and what about the CoMs that are equipped with them?

»In terms of performance, the i.MX93 CPU is equipped with dual-arm Cortex-A55 cores and a Cortex-M33 core,« explains Andreas Kopietz, Sales Director at F&S Elektronik Systeme. »For edge AI applications, it offers an integrated Ethos U65 NPU (Neural Processing Unit), which was developed by ARM.«

Especially with regard to the EU's Cyber Resilience Act, the CPU has many functions for encryption, which are summarised under the generic term 'EdgeLock Secure Enclave'. »What is particularly interesting is that the CPU supports 24-bit RGB display interfaces in addition to MIPI DSI and LVDS. It is suitable for energy-efficient edge

A CoM from F&S based on the OSM standard.
(Image: F&S Elektronik Systeme)

computing applications where machine learning and advanced security functions are required, for example in industrial automation and the IoT environment.«

In contrast, the i.MX95 CPU has up to six Arm Cortex A55 cores integrated and very high-performance Arm Mali-based 3D graphics and an NPU developed by NXP. For high-speed data processing, 2x Gen 3.0 PCI Express and 10 Gbit Ethernet + 2x 1 Gbit Ethernet with TSN interfaces are integrated. The area of application for the CPU is challenging applications in the fields of industry, network technology and HMI that require high computing power and advanced graphics features.

For AI applications, the NPUs in the i.MX93 and i.MX95 differ significantly in terms of performance, according to Andreas Kopietz: »The i.MX93 is energy-efficient and tailored to edge AI with low power consumption, while the i.MX95 with its more powerful NPU, CPU and GPU is suitable for very processing intensive tasks such as machine vision.«

NPU cores are particularly suitable for models based on neural networks: »We have carried out extensive tests with SSD-MobileNet, CenterNet-MobileNet and ResNet, for example,« says Andreas Kopietz. »These models are based on the principle of Convolutional Neural Networks (CNN)

and are applied specifically in image and video analysis. Here the NPU supports the TensorFlowLite framework. Other frameworks such as ONNX (Open Neural Network Exchange) are also supported.« For example, particularly in edge AI applications, the original resolution of the image information is reduced from 4K or full HD to 640x640 or 320x320 before processing.

»In our tests, we have demonstrated that there are major differences between the various CNN models and the resolution used in terms of the computing time required and the accuracy of the results. The faster the NPU used, the higher the resolution that can be selected or a model such as ResNet, which requires a large amount of computing power, can be used. The objective is always to optimise both the performance time and the result of the inference.« The i.MX95 CPU delivers significantly higher performance in this context. Nevertheless, the i.MX93 is also very suitable and consumes significantly less energy. Ultimately, both the i.MX93 and i.MX95 CPUs, as well as the CoMs based on them, are suitable for AI-supported edge applications. »The i.MX93 is ideal for energy-efficient and cost-sensitive solutions such as industrial controllers, smart home devices and IoT applications,« explains Andreas Kopietz. »It achieves basic graphics

Andreas Kopietz, F&S:
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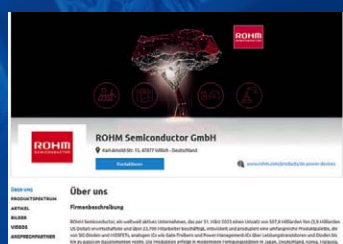different in terms of performance.«

performance for straightforward user interfaces. The more powerful i.MX95 is better suited to processing-intensive tasks such as computer vision, autonomous systems and industrial image processing, for example in medical technology. Thanks to its powerful GPU, it also supports demanding graphic applications and 3D visualisation.« (ak)

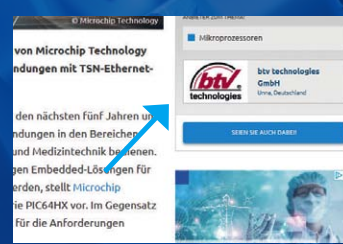**F&S Elektronik Systeme**
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