**Qseven™ module with digital media processor for demanding imaging applications:** Ability to simultaneously process up to three high-definition video streams

The MSC Q7-TI8168 compact Qseven™ module from MSC Vertriebs GmbH integrates a digital media processor from Texas Instruments (TI) with ARM® RISC MPU and digital signal processor (DSP). The DSP is specially designed for computationally intensive image processing tasks. This embedded platform is therefore ideally suited for demanding image analysis and image processing applications for, among other things, identification of biometric data such as iris scanning and facial recognition.

Standardized Computer-On-Modules (COMs) offer users up-to-date, application-ready processor technologies and have thus firmly established themselves in the embedded world. On the one hand, Intel® has occupied the low power area of x86 with its Intel® Atom™ processor family and on the other hand, addresses the high-end market for power hungry applications with its 3rd Generation Intel® Core™ processor family with quad-core and dual-core. Today, extremely powerful modules are implemented in the established COM Express™ form factor. However, further improved graphics, video and computing performance is not everything. With the revision from Type 2 pin-out to Type 6 pin-out in the latest COM Express™ specification, up to three Digital Display Interfaces (DDI) and USB 3.0 are now supported. The power dissipation of such modules is, however, simply too high for passively cooled systems.

The Qseven™ standard, which defines modules in a compact form factor of 70 mm x 70 mm, bridges the gap from x86- to ARM®-based modules. In addition to support for various x86 processors, with the Qseven™ Specification Revision 1.2 support was added for power-efficient ARM®/RISC architectures. Thus, the basis for a series of particularly compact embedded modules with a number of different types of processors for a wide range of applications has been established. Additional fields of application are opened up through the integration of a digital signal processor (DSP). DSPs can manage the demanding data and image analysis tasks in real-time and thus significantly reduce the load on the integrated ARM® processor. The use of DSPs is especially worthwhile in applications such as imaging, demanding visualization and media in, for example, industrial automation, medical and measurement technologies as well as in the fields of transportation and safety engineering.

One of the most promising applications for Computer-On-Module (COM) with high computing power and demanding digital signal processing are biometric identification methods, which have experienced an enormous boom in the last few years. The rapid measurement of biological characteristics and their analysis with reasonable effort in high quality are only possible as a result of technological progress in image processing and analysis technologies. The basis of biometric methods for computer-assisted identification of human beings is based on biological features such as fingerprint, handprint, hand/finger geometry, face, eye (iris and retina) as well as behavior-specific features such as voice, typical body movements, signature or the rhythm of keyboard strokes.

A biometric identification system integrates a sensor component, for example a video camera, which captures a biometric sample. By means of complex algorithms, any superfluous information provided by the sensor which does not contribute to biometric identification is filtered out. After establishing a biometric reference template, where biometric features have been stored for the purpose of a comparison, the submitted biometric sample is compared with the template. The system now determines whether the score, which designates the degree of similarity between the submitted biometric sample and the previously stored reference template, is sufficiently high for verification of identity.

Biometric features are difficult to falsify or copy, because they are tied to biological characteristics of a person. With the correct comparison to reference data, these biometric features enable a reliable verification whether he or she is the person in question. Fingerprinting techniques are
Identification systems for the identification of human beings are considered to be cost-effective and relatively reliable whereas hand geometry techniques provide only limited reliability due to too many similarities across different individuals. Techniques for analysis of eye features and face identification techniques are rated as very reliable, but also associated with comparatively high costs. By means of multiple biometrics, which uses verification of several different biological features, the greatest possible reliability can be achieved.

Identification systems for the identification of human beings for surveillance and access control systems that ensure only authorized users are allowed to gain access to specific buildings, premises and automated teller machines (ATMs) as well as specific areas of information technology are an important field for the use of biometric systems. Biometric techniques are also used in document issuance systems and automatic signature verification in electronic legal transactions.

In order to meet the demanding needs of image capture and image processing systems, MSC Vertriebs GmbH now offers its MSC Q7-TI8168 Qseven™ module in an even more powerful version with the DM8168 DaVinci™ Digital Media Processor from Texas Instruments (TI). The DM8168 integrates an ARM® Cortex™-A8 RISC MPU (up to 1.2 GHz), a TI C674x VLIW floating-point DSP core with up to 8000 MIPS/6000 MFLOPS as well as video and graphics accelerators (Figure 1).

The DM8168 DaVinci™ Digital Media Processor has the ability to simultaneously process up to three high-definition video streams with 1080p at 60 frames per second (fps). The ARM® NEON™ media processing engine, integrated in the DM8168, supports video imaging, speech, audio codes and frameworks. The DSP manages the computationally intensive image processing in real-time, thus reducing the load on the ARM® processor. TI offers comprehensive support for a large number of tasks such as digital filtering, complex mathematical calculations, image processing and image analysis. The DM8168 is therefore ideally suited for use in multiple-channel high-definition video surveillance systems, videoconferencing systems, media hubs and media servers.

In addition to MPU and DSP, the DM8168 DaVinci™ Digital Media Processor includes 32 KB instruction cache, 32 KB data cache, 256 KB L2 cache, 64 KB RAM and 48 KB boot ROM. The MSC Q7-TI8168 Qseven™ module integrates 1 GB DDR3-1600 SDRAM and 2 GB NAND Flash soldered on board.

The MSC Q7-TI8168 embedded platform provides a HDMI/DVI interface with a resolution of up to 1920 x 1080 pixels and single channel LVDS 24 bit with up to 1280 x 720 pixels. In addition to a PCI Express™ x1 port, the platform provides a Gigabit Ethernet interface, six USB 2.0 connections (5x host and 1x client/host), UART, SPI, HD AC97 audio and a camera interface. User data can be stored via two SATA II channels. Connection of a memory card is possible via the SD/SDIO interface.

Furthermore, the MSC Q7-TI8168 ARM®-based Qseven™ module will soon be available in the extended temperature range from -40°C to +85°C.

Since the MSC Q7-TI8168 module already integrates extensive standard PC functionality, only the application-specific functions are implemented on a specially designed baseboard. By separating the standard PC functions and the application-specific functions, the development complexity and design risk of embedded systems can be substantially reduced and, furthermore, design times can be significantly optimized.

The MSC Q7-TI8168 compact Qseven™ module is easily mounted on the baseboard via a proven MXM connection. Direct connection of the heat spreader to the metal housing ensures an optimal passive cooling. A baseboard developed by the customer or a Qseven™ baseboard from MSC Vertriebs GmbH can be used. As a rule, this therefore saves the customer complex in-house design effort. The high-performance standard embedded platform can also be put directly into production.

MSC Vertriebs GmbH offers the MSC Q7-MB-EP4 baseboard (Figure 2) for fast development of...
embedded systems that integrate the MSC Q7-TI8168 ARM®-based Qseven™ module. The
baseboard measures 148 mm x 102 mm and provides a wide variety of important interfaces such
as dual Gigabit Ethernet, five USB 2.0 ports (four external), RS-232 (pin header), AC97 audio and
SATA. CAN signals are available via a special pin header. Additionally, an ARM® RS-232 debug
port for Linux software development is provided. Industrial displays can be connected via the
Digital Visual Interface (DVI) connector and the Low-Voltage Differential Signaling (LVDS) interface
directly via JILI30 connector. Furthermore the platform integrates a controller for the connection of
a resistive touchscreen and supports the connection of a backlight.

The mSATA slot provides an easy way to add a SATA-based Flash memory card. The baseboard
can be individually configured by customers via the integrated MMC/SD card slot. In order to
further extend the functions on the baseboard, for example for the support of wireless local area
network (WLAN), a mini PCI Express™ slot is provided.

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((Photos + Photo Captions))

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Figure 1. The MSC Q7-TI8168 Qseven™ platform integrates the DM8168 DaVinci™ Digital Media Processor with ARM® Cortex™-A8 RISC MPU and TI C674x DSP
Source: MSC Vertriebs GmbH

Figure 2. The MSC Q7-MB-EP4 baseboard ensures fast development of high-performance embedded systems based on the MSC Q7-TI8168 compact Qseven™ module
Source: MSC Vertriebs GmbH