Computer-On-Modules
Industrial Mainboards
Technology Partners

MSC is a premier partner of Intel® and AMD, and as a result has early access to design data for all new microprocessor generations. Based on latest silicon technology, MSC is developing cutting-edge solutions for COM Express, Qseven, SMARC 2.0 and ETX module products which we produce in our own factories. Under our lifecycle management we have full control of our embedded products’ long life support.

Next to x86 technologies, our Qseven, SMARC 2.0 and nanoRISC® modules also utilize ARM products from NXP™ and Texas Instruments. Our partnership with BIOS/UEFI vendor AMI has augmented our in-house software engineering capabilities and competencies in the BIOS/UEFI development including customization of the source code which is a key incentive for choosing our products.

We are cooperating with the leading industrial single-board manufacturers of the world and have selected their highest quality, long-term available boards to offer to our customers as part of our embedded products’ portfolio.
MSC Technologies at a Glance

The Embedded Boards Solutions unit within MSC Technologies is specializing in the design and production of highly integrated standard board-level products as well as customer-specific board solutions. The standard embedded COM products (Computer-On-Module) are available in a variety of variants and versions, but also can be easily customized to satisfy the requirements of volume OEM customers.

To complement our range of COM products, MSC is offering single-board computers (SBC) from some of the world’s leading computer board manufacturers. Before becoming part of our board-level offering, these boards had to pass a meticulous selection process for their design and production quality, high level of support and long-term availability.

Synergy at Work
MSC’s components and board-level products and custom developments are used in Industrial and Building Automation, Medical, POS/POI and Signage, Transportation/Logistics, Energy, Automotive and Mobile Devices as well as in Gaming applications.

But the computing board is only the beginning: MSC is offering a wide choice of TFT displays, touch solutions, DRAM and Flash memory modules and cards as well as wireless interface solutions. This way MSC represents a one-stop shopping partner offering our customers the full solution to their electronic requirements.

Vertical Market Solutions
MSC Technologies at a Glance

MSC is entering our customers’ development cycles where they want us to. We can provide just a COM module so that the target system can start with a proven, functional computing building block, or we can custom-design a complete sub-system based on the customer’s requirements.
MSC Technologies – The Solution Company
In the Embedded Boards Unit of MSC Technologies, we can provide a wide choice of solutions for the electronic needs of our customers. We will help our customers to find the solution to their requirements quickly, help them to bring it to their market first, and provide world-class support during and after the development phase. MSC has been in the electronic development industry for many decades, and has several design groups of experienced engineers doing hardware and software (BIOS, Firmware, Drivers) design. We are working at the forefront of technology and have a stack of proven modular building blocks for any new design at hand which will reduce development time and risk.

COM – Computer-On-Module
Our COM products are based on open standards and modular designs, and effectively simplify any system design and integration. COM products enable the system designer to focus on the end products. As a Founding Member of the SGeT.org consortium, MSC is actively driving new standards enabling further advances in COM technologies. MSC is committed to open specifications such as Qseven™ and is an executive member of the PCI Industrial Computer Manufacturer Group (PICMG), an organization promoting open industry standards like COM Express™. COM products are designed for reliability, 24/7 operation, quality, longevity and for industrial OEM applications.

Standard, Customized and Full-Custom Baseboard
Along with our families of Computer-On-Module products, we are offering a number of carefully designed Evaluation Boards and Application Boards which are meant to be used for laboratory tests as well as standard carrier boards for applications in which the design of a specialized carrier board is not foreseen. From a certain minimum production volume, MSC is offering to custom-populate these carrier boards or even perform a customization in the design thereby adapting the standard board to better suit the target application. For some cases a full-custom development of a COM carrier board may be required, and again MSC will consider such a design if certain production volume criteria are met or exceeded.

SBC – Industrial Single-Board-Computer
Clearly COM is the more flexible and elegant approach, but there are many applications where the solution has to be a single board, and therefore MSC is providing a wide selection of high-quality embedded SBCs in the most popular formats, as well as the accessories to put them at work most efficiently. From ATX format to Pico-ITX, we can provide a suitable solution offering the right computing performance, power consumption and cost to suit the applications’ requirements.

SMARC™ 2.0
The recent revision 2.0 of the SMARC module standard (Smart Mobility ARCHitecture) has every ingredient to become the best and most future-proof standard for small form-factor embedded modules. With 314 pins available on its inexpensive and robust MXM-3 connector, SMARC has ample space for proven and popular interfaces. In the new standard revision, PCIe now features 4 lanes instead of 3, USB now covers up to 2x USB 3.0 and up to 6x USB 2.0 interfaces, LVDS now supports two independent dual-channel connections which alternatively can be used for embedded DisplayPort (eDP) or for DSI, two Gigabit Ethernet ports are now supported, Audio has independent HDA and I2S ports and up to 4 UARTs are available. In addition to SPI, also eSPI is supported for attachment of peripheral devices on the baseboard or the application hardware. And still there are a lot of reserved pins left for future upgrades. Never again has it been so easy and natural to use ARM-based and x86-based computer modules on a modern and up-to-date module standard.
Internet of Things

Industry 4.0
A Subset of the Internet of Things
As the world becomes networked and things become intelligent, the production processes in the industrial environment will gain vastly from the growth of information sharing and active control cut-through. The Intelligent Factory, as depicted in the above drawing, is merely a part of the intelligent world and seamlessly blends into the networked world of the Internet of Things.

Scalability
Only Computer-On-Module solutions come with built-in scalability of performance, power and cost. COM boards will be plugged on a carrier board which adapts the I/O of the COM to the local environment. This board can remain the same even if the computer module gets swapped to a similar one with more/less computing performance and likewise more/less power consumption and related cost. In most cases, even the software of the system can remain the same giving the system designer the option to upgrade/downgrade the system in order to achieve different price/performance points.

Local Intelligence
The Internet of Things would be impossible without intelligent “things”, and that means computing devices inside the network nodes which are sensors, actors, information collectors or decision makers in control of larger machines. Depending on the task to perform, a large and powerful computer will be required or a small system consuming little power and generating little heat.

With our COM products used for either alternative, a wide choice of computing power classes exists which can reach up to high-performance multi-core engines and down to very small, power-nibbling microcomputer boards. Similarly, Single-Board Computers are available giving a wide choice of power and performance.
### COM-Module Selector

<table>
<thead>
<tr>
<th>Product Name</th>
<th>CPU Range</th>
<th>CPU Cores</th>
<th>max. Memory</th>
<th>Extension Bus Support</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>COM Express™ Family</strong></td>
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</tr>
<tr>
<td>C6B-SLH</td>
<td>Intel® Core™ i3, i5, i7, Intel® Celeron® (6th generation), 1.6 – 3.7GHz</td>
<td>2/4</td>
<td>32 GB DDR4 SO-DIMM</td>
<td>PCI Express™</td>
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<tr>
<td>C6B-8SB</td>
<td>Intel® Core™ i7 (5th generation), 2.6 – 3.4GHz</td>
<td>4</td>
<td>16 GB DDR3L SO-DIMM</td>
<td>PCI Express™</td>
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<td>C6B-8S</td>
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<td>16 GB DDR3L SO-DIMM</td>
<td>PCI Express™</td>
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<td>CXB-8S</td>
<td>Intel® Core™ i3, i5, i7, Intel® Celeron® (4th generation), 1.5 – 3.4GHz</td>
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<td>16 GB DDR3L SO-DIMM</td>
<td>PCI Express™, PCI</td>
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<td>C6B-7S</td>
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<td>PCI Express™</td>
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<td>CXB-6SI</td>
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<td>16 GB DDR3 SO-DIMM</td>
<td>PCI Express™, PCI</td>
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<td>C6C-SLU</td>
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<td>32 GB DDR4 SO-DIMM</td>
<td>PCI Express™</td>
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<tr>
<td>C6C-BW</td>
<td>Intel® Pentium® N3700, Celeron® N3xxx 2.08 - 2.4GHz</td>
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<td>8 GB DDR3L SO-DIMM</td>
<td>PCI Express™</td>
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<tr>
<td>C6C-BT</td>
<td>Intel® Atom™ E38xx, Celeron® N2920, J1900 1.33 - 2.42GHz</td>
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<td>8 GB DDR3L SO-DIMM</td>
<td>PCI Express™</td>
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<tr>
<td>CXC-BT</td>
<td>Intel® Atom™ E38xx, Celeron® N2920, J1900 1.33 - 2.42GHz</td>
<td>1/2/4</td>
<td>8 GB DDR3L SO-DIMM</td>
<td>PCI Express™, PCI</td>
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<td>C6C-GX</td>
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<td>C6C-A7</td>
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<td>PCI Express™</td>
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<tr>
<td>Q7-BW</td>
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<td>Q7-BT</td>
<td>Intel® Atom™ E38xx SOC E3845 1.91GHz, E3827 1.75GHz, E3826 1.46GHz, E3825 1.33GHz, E3815 1.46GHz</td>
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<tr>
<td>Q7-IMX6PLUS5</td>
<td>NXP™ LMX6 ARM Cortex®-A9 SOC IM 6QuadPlus, i.MX6Quad 0.8/1.2GHz, IM 6DualPlus, i.MX6Dual 0.8/1.2GHz, i.MX6DualLite, i.MX6Solo 0.8/1.0GHz</td>
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<td>PCI Express™</td>
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<td>4 GB DDR3 soldered</td>
<td>PCI Express™</td>
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<td>Q7-TCTC-FD</td>
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<td>2 GB DDR2 soldered</td>
<td>PCI Express™</td>
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<td><strong>SMARC™ 2.0 Family</strong></td>
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<td>SM2S-IMX6</td>
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<td>1/2/4</td>
<td>4 GB DDR3L soldered</td>
<td>PCI Express™</td>
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<td><strong>nanoRISC® Family</strong></td>
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<td>NXP™ LMX6 ARM Cortex®-A9 SOC IM 6QuadPlus, i.MX6Quad 0.8/1.2GHz, IM 6DualPlus, i.MX6Dual 0.8/1.2GHz, i.MX6DualLite, i.MX6Solo 0.8/1.0GHz</td>
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<td>PCI Express™, Processor Bus</td>
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<td>nanoRISC-AM335X</td>
<td>TI® ARM Cortex®-A8 AM335x AM3352 300MHz, AM3354 800MHz, AM3359 800MHz</td>
<td>1</td>
<td>512 MB DDR2 soldered</td>
<td>Processor Bus</td>
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<table>
<thead>
<tr>
<th>Specials</th>
<th>OS Support</th>
<th>Module Size (mm)</th>
<th>Typ. Power Dissipation (W)</th>
<th>Performance</th>
<th>Module Standard</th>
<th>Page</th>
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<tr>
<td>TPM 1.2, 4K resolution supported</td>
<td>Windows® 7, 8, 10, Linux</td>
<td>95 x 125</td>
<td>35/55</td>
<td>High</td>
<td>COM Express™ Type 6</td>
<td>9</td>
</tr>
<tr>
<td>TPM 1.2, 4K resolution supported</td>
<td>Windows® 7, 8, 10, Linux</td>
<td>95 x 125</td>
<td>55</td>
<td>High</td>
<td>COM Express™ Type 6</td>
<td>9</td>
</tr>
<tr>
<td>TPM 1.2, 4K resolution supported</td>
<td>Windows® 7, 8, 10, Linux</td>
<td>95 x 125</td>
<td>35/55</td>
<td>High</td>
<td>COM Express™ Type 6</td>
<td>10</td>
</tr>
<tr>
<td>TPM 1.2, 4K resolution supported</td>
<td>Windows® 7, 8, 10, Linux</td>
<td>95 x 125</td>
<td>35/55</td>
<td>High</td>
<td>COM Express™ Type 2</td>
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<tr>
<td>TPM 1.2</td>
<td>Windows® 7, 8, 10, XP, Linux</td>
<td>95 x 125</td>
<td>25/65</td>
<td>High</td>
<td>COM Express™ Type 6</td>
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<td>Windows® 7, 8, 10, Linux</td>
<td>95 x 95</td>
<td>17/19</td>
<td>High</td>
<td>COM Express™ Type 6</td>
<td>12</td>
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<tr>
<td>TPM 1.2, MicroSD socket</td>
<td>Windows® 7, 8, 10, Linux</td>
<td>95 x 95</td>
<td>7/9</td>
<td>Medium</td>
<td>COM Express™ Type 6</td>
<td>12</td>
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<tr>
<td>TPM 1.2 MicroSD socket</td>
<td>Windows® 7, 8, 10, Linux</td>
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<td>8/14</td>
<td>Medium</td>
<td>COM Express™ Type 6</td>
<td>13</td>
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<td>TPM 1.2, MicroSD socket</td>
<td>Windows® 7, 8, 10, Linux</td>
<td>95 x 95</td>
<td>8/14</td>
<td>Medium</td>
<td>COM Express™ Type 2</td>
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<td>TPM 1.2, MicroSD socket</td>
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<td>High</td>
<td>COM Express™ Type 6</td>
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<td>TPM 1.2, eMMC, ext. temp.</td>
<td>Windows® 7, 8, 10, Linux</td>
<td>55 x 84</td>
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<td>COM Express™ Type 10</td>
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<td>TPM 1.2, eMMC, USB 2.0 Client, ext. temp.</td>
<td>Windows® 7, 8, 10, Linux</td>
<td>55 x 84</td>
<td>8/14</td>
<td>Medium</td>
<td>COM Express™ Type 10</td>
<td>15</td>
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<tr>
<td>TPM 1.2 (opt.) SATA Flash, eMMC Flash</td>
<td>Windows® 7, 8, 10, Linux, Windows® EC7/2013</td>
<td>70 x 70</td>
<td>6/9</td>
<td>Medium</td>
<td>Qseven 2.0</td>
<td>20</td>
</tr>
<tr>
<td>TPM 1.2 (opt.) SATA Flash, eMMC Flash</td>
<td>Windows® 7, 8, 10, Linux, Windows® EC7/2013</td>
<td>70 x 70</td>
<td>6/12</td>
<td>Medium</td>
<td>Qseven 2.0</td>
<td>20</td>
</tr>
<tr>
<td>TPM 1.2 (opt.), eMMC Flash or NAND Flash, µSD Slot, ext. temp.</td>
<td>Linux, Windows® EC7/2013</td>
<td>70 x 70</td>
<td>4/7</td>
<td>Medium</td>
<td>Qseven 2.0</td>
<td>21</td>
</tr>
<tr>
<td>TPM 1.2 (opt.), eMMC Flash, ext. temp.</td>
<td>Linux, Windows® EC7/2013</td>
<td>70 x 70</td>
<td>4/7</td>
<td>Medium</td>
<td>Qseven 1.2 / 2.0</td>
<td>22</td>
</tr>
<tr>
<td>TPM 1.2, CAN, SATA, Flash, Ext. temp.</td>
<td>Windows® 7, XP, Linux</td>
<td>70 x 70</td>
<td>7</td>
<td>Entry / Medium</td>
<td>Qseven 1.2</td>
<td>21</td>
</tr>
<tr>
<td>TPM 1.2 (opt.), eMMC Flash, µSD Slot, ext. temp.</td>
<td>Linux, Windows® EC7/2013</td>
<td>82 x 52</td>
<td>4/7</td>
<td>Medium</td>
<td>SMARC 2.0</td>
<td>27</td>
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<tr>
<td>eMMC Flash or NANO Flash, µSD Slot, ext. temp.</td>
<td>Linux, Windows® EC7/2013</td>
<td>50 x 70</td>
<td>4/7</td>
<td>Medium</td>
<td>nanoRISC</td>
<td>29</td>
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<td>NAND Flash</td>
<td>Linux</td>
<td>50 x 70</td>
<td>2.5</td>
<td>Entry</td>
<td>nanoRISC</td>
<td>29</td>
</tr>
</tbody>
</table>
COM Express™

COM Express™ was defined by the PICMG® (PCI Industrial Computer Manufacturers Group) as an open specification without hidden hooks. Hence, this standard is supported by a large number of suppliers offering interchangeability of their COM Express™ products. The latest revisions introduced various changes in the COM Express standard. New module formats have been adopted and the support for USB 3.0, PCI Express™ Gen 2 and additional digital display interfaces has been included. Most of these changes require new pin-outs, like Type 6 and Type 10.

MSC has introduced products based on these new pin-outs while still offering new technologies on Type 2 products as well.
MSC C6B-SLH
Intel® Core™ - 6th Generation
Type 6

The MSC C6B-SLH module is based on Intel’s 6th generation Core processor family with a new processor architecture based on 14 nm process technology. The Intel® two-chip solution allows highest performance in graphics and computing on a COM Express module in basic form factor.

Highlights
- Intel® Core™ i7-6820EQ (quad-core, 2.8/3.5GHz)
- Intel® Core™ i7-6822EQ (quad-core, 2.0/2.8GHz)
- Intel® Core™ i5-6440EQ (quad-core, 2.7/3.4GHz)
- Intel® Core™ i5-6442EQ (quad-core, 1.9/2.7GHz)
- Intel® Core™ i3-6100E (dual-core, 2.7GHz)
- Intel® Core™ i3-6102E (dual-core, 1.9GHz)
- Intel® Celeron® G3900E (dual-core, 2.4GHz)
- Intel® Celeron® G3902E (dual-core, 1.6GHz)
- Intel® Xeon® E3-1505Mv5 (quad-core, 2.8/3.7GHz)
- Intel® Xeon® E3-1505Lv5 (quad-core, 2.0/2.8GHz)
- Intel® HD Graphics (530, P530)
- Intel® chipsets QM170, HM170 or CM236
- Up to 32GB DDR4 SDRAM, dual ch. (ECC opt.)
- Three DisplayPort/HDMI/DVI interfaces
- LVDS (24 Bit, dual channel) or eDP interface
- Triple independent display support (4K)
- DirectX 12, OpenGL 4.4, OpenCL 2.x
- Four SATA 6Gb/s; Trusted Platform Module
- Eight PCI Express™ x1 lanes; PEG x16
- Four USB 3.0/2.0 and four USB 2.0 interfaces

MSC C6B-8SB
Intel® Core™ - 5th Generation
Type 6

This module is based on Intel’s 5th generation Core™ processors produced in 14nm technology. It supports triple independent displays, DirectX 11.1, fast low-power DDR3L-1600 memory and USB 3.0 on a COM Express Type 6 module.

Highlights
- Intel® Core™ i7-5850EQ (quad-core, 2.8/3.5GHz)
- Intel® Core™ i7-5700EQ (quad-core, 2.6/3.4GHz)
- Intel® HD Graphics GT2 or GT3e
- Intel® 8-Series chipset
- Up to 16GB DDR3L-1600 SDRAM, dual channel
- Four SATA mass storage interfaces, up to 6Gb/s
- Three DisplayPort/HDMI/DVI interfaces
- Two Embedded DisplayPort interfaces
- LVDS (24 Bit, dual channel) and CRT interface
- Triple independent display support
- DirectX 11.1, OpenGL 3.2, OpenCL 1.2
- Resolution up to 4096 x 2304
- Seven PCI Express™ x1 lanes
- Four USB 3.0/2.0 and four USB 2.0 interfaces
- Trusted Platform Module
Based on Intel’s 4th generation Core™ processors this Type 6 COM Express module supports the latest digital display interfaces like DisplayPort, HDMI and DVI and controls up to three independent displays. USB 3.0 interfaces connect to the fastest peripheral devices available.

**Highlights**
- Intel® Core™ i7-4700EQ (quad-core, 2.4/3.4GHz)
- Intel® Core™ i5-4400E (dual-core, 2.7/3.3GHz)
- Intel® Core™ i5-4402E (dual-core, 1.6/2.7GHz)
- Intel® Core™ i3-4100E (dual-core, 2.4GHz)
- Intel® Core™ i3-4102E (dual-core, 1.6GHz)
- Intel® Celeron® 2000E (dual-core, 2.2GHz)
- Intel® Celeron® 2002E (dual-core, 1.5GHz)
- Intel® HD Graphics GT1/GT2
- Intel® 8-Series chipset
- Up to 16GB DDR3L-1600 SDRAM, dual-channel

Also based on Intel’s 4th generation Core™ processors this COM Express module with Type 2 pin-out has been designed as an upgrade product for existing system designs still using legacy interfaces like PCI bus and PATA.

**Highlights**
- Intel® Core™ i7-4700EQ (quad-core, 2.4/3.4GHz)
- Intel® Core™ i5-4400E (dual-core, 2.7/3.3GHz)
- Intel® Core™ i5-4402E (dual-core, 1.6/2.7GHz)
- Intel® Core™ i3-4100E (dual-core, 2.4GHz)
- Intel® Core™ i3-4102E (dual-core, 1.6GHz)
- Intel® Celeron® 2000E (dual-core, 2.2GHz)
- Intel® Celeron® 2002E (dual-core, 1.5GHz)
- Intel® HD Graphics GT1/GT2
- Intel® 8-Series chipset
- Up to 16GB DDR3L-1600 SDRAM, dual-channel
- Four SATA mass storage interfaces, up to 6Gb/s
- Three DisplayPort/HDMI/DVI interfaces
- Two Embedded DisplayPort interfaces
- LVDS (24 Bit, dual-channel) and CRT interface
- Triple independent display support
- DirectX 11.1, OpenGL 3.2, OpenCL 1.2
- Resolution up to 3800 x 2400
- Seven PCI Express™ x1 lanes
- Four USB 3.0 and four USB 2.0 interfaces
- Trusted Platform Module
MSC C6B-7S
Intel® Core™ - 3rd Generation
Type 6

Based on Intel's 3rd generation Core™ processors this Type 6 COM Express module supports the latest digital display interfaces, up to three independent displays and USB 3.0. Ultra-low power variants with only 17W CPU power dissipation allow passively cooled system designs.

Highlights
- Intel® Core™ i7-3612QE (quad-core, 2.1GHz)
- Intel® Core™ i7-3615QE (quad-core, 2.3GHz)
- Intel® Core™ i7-3555LE (quad-core, 2.5GHz)
- Intel® Core™ i7-3517UE (dual-core, 1.7GHz)
- Intel® Core™ i5-3610ME (dual-core, 2.7GHz)
- Intel® Core™ i3-3120ME (dual-core, 2.4GHz)
- Intel® Celeron® 1020E (dual-core, 2.2GHz)
- Intel® Celeron® 1047UE (dual-core, 1.4GHz)
- Intel® Celeron® 927UE (single-core, 1.5GHz)
- Up to 16GB DDR3-1600 SDRAM, dual channel
- Three DisplayPort/HDMI/DVI interfaces
- Two Embedded DisplayPort interfaces
- LVDS (24 Bit, dual channel) and CRT interface
- Triple independent display support
- DirectX 11, OpenGL 3.1, OpenCL 1.1
- Resolution up to 2560 x 1600
- Seven PCI Express x1 lanes, four SATA-300
- Four USB 3.0 and four USB 2.0 interfaces
- Trusted Platform Module

MSC CXB-6SI
Intel® Core™- 3rd Generation
Type 2

This COM Express module family with Type 2 pin-out is based on Intel’s 3rd generation Core™ processors and has been designed as an upgrade product for existing system designs still using legacy interfaces like PCI bus and PATA. Ultra-low power variants with only 17W CPU power dissipation allow passively cooled system designs.

Highlights
- Intel® Core™ i7-3612QE (quad-core, 2.1GHz)
- Intel® Core™ i7-3615QE (quad-core, 2.3GHz)
- Intel® Core™ i7-3555LE (quad-core, 2.5GHz)
- Intel® Core™ i7-3517UE (dual-core, 1.7GHz)
- Intel® Core™ i5-3610ME (dual-core, 2.7GHz)
- Intel® Core™ i3-3120ME (dual-core, 2.4GHz)
- Intel® Core™ i3-3217UE (dual-core, 1.6GHz)
- Intel® Celeron® 1020E (dual-core, 2.2GHz)
- Intel® Celeron® 1047UE (dual-core, 1.4GHz)
- Intel® Celeron® 927UE (single-core, 1.5GHz)
- Up to 16GB DDR3-1600 SDRAM, dual channel
- Four SATA-300, one PATA mass storage interfaces
- LVDS (24 Bit, dual channel) and CRT interface
- Triple independent display support
- DirectX 11, OpenGL 3.1, OpenCL 1.1
- Resolution up to 2560 x 1600
- PCI Bus, five PCI Express x1 lanes
- Eight USB 2.0 interfaces
- Trusted Platform Module
The MSC C6C-SLU module is based on Intel’s 6th generation Core processor family with a new processor architecture based on 14 nm process technology. The multi-chip-package includes processor, graphics and chipset on one carrier and allows extremely compact high-performance designs.

**Highlights**
- Intel® Core™ i7-6600U (dual-core, 2.6/3.4GHz, 15W)
- Intel® Core™ i5-6300U (dual-core, 2.4/3.0GHz, 15W)
- Intel® Core™ i3-6100U (dual-core, 2.3GHz, 15W)
- Intel® Celeron® 3955U (dual-core, 2.0GHz, 15W)
- Integrated Intel® Gen. 9 HD graphics
- Up to 32 GB DDR4 SDRAM, dual-channel
- Three SATA 6Gb/s mass storage interfaces
- MicroSD card socket
- DisplayPort/HDMI/DVI interface
- LVDS/embedded DisplayPort interface
- Three independent displays supported
- DirectX 11/12, OpenGL 4.3/4.4, OpenCL 2.x
- Resolution up to 4096 x 2304
- Four USB 3.0/2.0 and four USB 2.0 interfaces
- Eight PCI Express™ x1 lanes
- Trusted Platform Module

The MSC C6C-BW module is based on Intel’s next generation Atom processors in 14nm technology. These multi-core systems-on-chip provide outstanding computing and graphics power and are more power efficient compared to their predecessors. The new module brings triple independent display support, DirectX 11.1, fast DDR3L memory and USB 3.0 on a compact, power saving and cost-efficient module. Dual- and quad-core processors are supported by this design.

**Highlights**
- Intel® Pentium® N3700 quad-core 2.40GHz, 6W TDP
- Intel® Celeron® N3150 quad-core 2.08GHz, 6W TDP
- Intel® Celeron® N3050 dual-core 2.16GHz, 6W TDP
- Intel® Celeron® N3000 dual-core 2.08GHz, 4W TDP
- Integrated Intel® Gen. 8 HD graphics
- Up to 8GB DDR3L SDRAM, dual-channel
- Two SATA 6Gb/s mass storage interfaces
- MicroSD card socket
- DisplayPort/HDMI/DVI interface
- LVDS/embedded DisplayPort interface
- Three independent displays supported
- DirectX 11.1, OpenGL 4.2, OpenCL 1.2
- Four USB 3.0 and four USB 2.0 interfaces
- Up to five PCI Express™ x1 lanes
- Trusted Platform Module (option)
COM Express™

MSC C6C-BT
Intel® Atom™ / Celeron® SOC
Type 6

Based on Intel’s multi-core system-on-chip (SOC) Atom generation this COM Express Type 6 module brings display interfaces like DisplayPort, HDMI 1.4a and DVI, supports dual independent displays, USB 3.0 and fast DDR3L memory on a compact, power saving and cost-efficient module.

**Highlights**
- Intel® Atom™ E3845 quad-core 1.91GHz, 10W TDP
- Intel® Atom™ E3827 dual-core 1.75GHz, 8W TDP
- Intel® Atom™ E3826 dual-core 1.46GHz, 7W TDP
- Intel® Atom™ E3825 dual-core 1.33GHz, 6W TDP
- Intel® Atom™ E3815 single-core 1.46GHz, 5W TDP
- Intel® Celeron® N2920 quad-core 1.86/2.00GHz, 7.5W TDP
- Intel® Celeron® J1900 quad-core 2.00/2.42GHz, 10W TDP
- Integrated Intel® Gen. 7 HD graphics
- Up to 8GB DDR3L SDRAM, dual-channel
- Two SATA 3Gb/s mass storage interfaces
- MicroSD card socket
- DisplayPort/HDMI/DVI interface
- LVDS/Embedded DisplayPort interface
- VGA interface
- Two independent displays supported
- DirectX 11.1, OpenGL 3.2, OpenCL 1.1
- One USB 3.0 and up to seven USB 2.0 interface
- Trusted Platform Module (option)

Also based on Intel’s multi-core system-on-chip (SOC) Atom generation this compact COM Express module with Type 2 pin-out has been designed as an upgrade product for existing system designs still using legacy interfaces like PCI bus and PATA.

**Highlights**
- Intel® Atom™ E3845 quad-core 1.91GHz, 10W TDP
- Intel® Atom™ E3827 dual-core 1.75GHz, 8W TDP
- Intel® Atom™ E3826 dual-core 1.46GHz, 7W TDP
- Intel® Atom™ E3825 dual-core 1.33GHz, 6W TDP
- Intel® Atom™ E3815 single-core 1.46GHz, 5W TDP
- Intel® Celeron® N2930 quad-core 1.83/2.16GHz, 7.5W TDP
- Intel® Celeron® J1900 quad-core 2.00/2.42GHz, 10W TDP
- Integrated Intel® Gen. 7 HD graphics
- Up to 8GB DDR3L SDRAM, dual-channel
- One (two) SATA 3Gb/s mass storage interface
- One (zero) PATA/IDE mass storage interface
- MicroSD card socket
- LVDS 24bit, dual-channel
- VGA interface
- Two independent displays supported
- DirectX 11.1, OpenGL 3.2, OpenCL 1.1
- Eight USB 2.0 interfaces
- Trusted Platform Module (option)
MSC C6C-GX
AMD Embedded G-Series SOC
Type 6

This compact COM Express Type 6 module is based on AMD’s Embedded G-Series SOC platform, a high-performance, low-power System-on-Chip solution with outstanding HD graphics and multimedia capabilities. The power saving and cost-efficient module offers dual independent display support, DirectX 11.1, fast DDR3 memory and USB 3.0.

**Highlights**
- AMD GX-420CA quad-core 2.0GHz, 25W TDP, Radeon HD 8400E
- AMD GX-415GA quad-core 1.5GHz, 15W TDP, Radeon HD 8330E
- AMD GX-217GA dual-core 1.65GHz, 15W TDP, Radeon HD 8280E
- AMD GX-210HA dual-core 1.0GHz, 9W TDP, Radeon HD 8310E
- Integrated AMD HD 8000E graphics
- Up to 16GB DDR3 SDRAM, dual-channel
- Two SATA 3Gb/s mass storage interfaces
- MicroSD card socket
- DisplayPort/HDMI/DVI interface
- LVDS/Embedded DisplayPort interface
- VGA interface
- Two independent displays supported
- DirectX 11.1, OpenGL 4.2, OpenCL 1.2
- Two USB 3.0 and six USB 2.0 interfaces

MSC C6C-A7
AMD Embedded R-Series
Type 6

Based on AMD’s Embedded R-Series platform this compact COM Express Type 6 module offers unprecedented integrated graphics and multi-display capabilities. It brings quad independent display support, DirectX 11 and USB 3.0. Turbo overclocking and accelerated video encoding / decoding support graphics- and video-centric applications.

**Highlights**
- AMD R-460L quad-core 2.0/2.8GHz, 25W TDP, Radeon HD 7620G
- AMD R-252F dual-core 1.7/2.3GHz, 17W TDP, Radeon HD 7400G
- AMD R-452L quad-core 1.6/2.4GHz, 19W TDP, Radeon HD 7600G
- AMD R-260H dual-core 2.1/2.6GHz, 17W TDP, Radeon HD 7500G
- Integrated AMD HD 7000G graphics
- Up to 16GB DDR3-1333 SDRAM, dual-channel
- Four SATA-300 mass storage interfaces
- MicroSD card socket, bootable
- Three DisplayPort/HDMI/DVI interfaces
- LVDS/Embedded DisplayPort interface
- VGA interface
- Four independent displays supported
- DirectX 11, OpenGL 4.2, OpenCL 1.1
- Resolution up to 4000 x 2000 @ 30 Hz
- Six PCI Express x1 lanes
- Four USB 3.0 and four USB 2.0 interfaces
Based on Intel’s multi-core system-on-chip (SOC) Atom generation this COM Express Type 10 module brings dual independent display support, DirectX 11.1 and fast DDR3L memory on a very compact, power saving and cost-efficient COM Express Mini module. The rugged design with soldered memory, optional ECC support and extended temperature range opens new application areas.

**Highlights**

- Intel® Atom™ E3845 quad-core 1.91GHz, 10W TDP
- Intel® Atom™ E3827 dual-core 1.75GHz, 8W TDP
- Intel® Atom™ E3826 dual-core 1.46GHz, 7W TDP
- Intel® Atom™ E3825 dual-core 1.33GHz, 6W TDP
- Intel® Atom™ E3815 single-core 1.46GHz, 5W TDP
- Intel® Celeron® N2930 quad-core 1.83/2.16GHz, 7.5W TDP
- Intel® Celeron® J1900 quad-core 2.00/2.42GHz, 10W TDP
- Integrated Intel® Gen. 7 HD graphics
- Up to 8GB DDR3L SDRAM
- Two SATA 3Gb/s mass storage interfaces
- eMMC SSD (optional)
- DisplayPort/HDMI/DVI interface
- LVDS/Embedded DisplayPort interface
- Two independent displays supported
- DirectX 11.1, OpenGL 3.2, OpenCL 1.1
- One USB 3.0 and up to seven USB 2.0 interfaces
- Trusted Platform Module (option)
- Extended temperature variants

This COM Express Type 10 module is based on Intel’s Atom SOC, like the C10M-BT. The outstanding new feature of the MSC C10M-BTC is a USB 2.0 client interface. It also offers dual independent display support, DirectX 11.1 and fast DDR3L memory on a very compact, power saving and cost-efficient COM Express Mini module.

**Highlights**

- Intel® Atom™ E3845 quad-core 1.91GHz, 10W TDP
- Intel® Atom™ E3827 dual-core 1.75GHz, 8W TDP
- Intel® Atom™ E3826 dual-core 1.46GHz, 7W TDP
- Intel® Atom™ E3825 dual-core 1.33GHz, 6W TDP
- Intel® Atom™ E3815 single-core 1.46GHz, 5W TDP
- Intel® Celeron® N2930 quad-core 1.83/2.16GHz, 7.5W TDP
- Intel® Celeron® J1900 quad-core 2.00/2.42GHz, 10W TDP
- Integrated Intel® Gen. 7 HD graphics
- Up to 8GB DDR3L SDRAM
- Two SATA 3Gb/s interfaces; eMMC (optional)
- DisplayPort/HDMI interface
- LVDS/Embedded DisplayPort interface
- Two independent displays supported
- DirectX 11.1, OpenGL 3.2, OpenCL 1.1
- One USB 3.0 and four USB 2.0 interfaces
- One USB 2.0 client interface
- Trusted Platform Module (option)
- Extended temperature variants
This evaluation board in the popular Mini-ITX format provides the interface infrastructure for COM Express Type 6 modules and offers various PC type connectors for external access.

**Highlights**
- Socket for COM Express™ Type 6 modules
- PCI Express x16 slot (useable as PEG or x4)
- PCI Express Mini Card slot
- Four SATA connectors
- Four USB 3.0 interfaces
- Up to four USB 2.0 ports
- Three DisplayPort connectors
- LVDS and eDP connectors
- GbE interface
- SD Card slot
- HD audio codec
- Super I/O
- Various additional COM Express™ specific interfaces
- Power supply via ATX-style power connector or 12V-only power jack
- Wide power input range

This versatile carrier board was designed for evaluation, prototyping and software development. It provides the interface infrastructure for COM Express Type 6 modules and offers various PC type connectors for external access.

**Highlights**
- Socket for COM Express Type 6 modules in Basic or Compact form factor
- One PCI Express x4 slot
- Four PCI Express x1 slots
- One PCI Express x16 PEG slot
- Four SATA connectors
- Four USB 3.0, four USB 2.0 interfaces
- Two DisplayPort/HDMI connectors
- VGA/DVI connector
- LVDS interface
- Embedded DisplayPort connector
- HD audio codec; six audio jacks and SPDIF
- LAN interface
- mSATA and Mini PCI Express sockets
- Various additional COM Express specific interfaces
- ATX-style power connector
- POST code LED display
- ATX form factor
MSC C6-SK
Starterkits for COM Express
Type 6

The COM Express Starterkit for Type 6 modules is available for the whole range of Type 6 modules. The kit contains all necessary products to quickly enable the user to run and evaluate COM Express Type 6 modules. The kit does not include a COM Express module in order to give the user greater flexibility as to which particular module variant and CPU core and speed is desired.

Highlights
• COM Express™ Type 6 baseboard
• 2x 4GB DDR3L SO-DIMM memory modules
• Heatsink for safe operation of module
• Type 6 module socket
• PCI Express Mini Card slot
• Up to four SATA connectors
• Up to four USB 3.0 interfaces
• Up to four USB 2.0 ports
• Up to three DisplayPort connectors
• LVDS and eDP connectors
• GbE Interface, SD Card slot
• HD audio codec, Super I/O
• Baseboard size 170 x 170 mm
• Getting Started Manual
• Download link for drivers and BSPs
• Optional display kits with cables
Depending on the computing performance, processor technology and system environment, COM Express modules require different cooling measures. MSC has developed various solutions that help the system designer to quickly solve the heat dissipation problems and ensure optimal environmental conditions for the module.

**Heatspreaders**
Standardized thermal interfaces for easy integration in customers’ cooling concepts and full interchangeability.

**Passive cooling**
Optimized heatsinks for best cooling performance even in industrial environments.

**Active cooling**
Heatsinks combined with a dedicated speed controlled fan. Off-the-shelf solutions for demanding ambient conditions.
The latest embedded Computer-On-Module standard for entry level performance and low power applications with a very attractive price performance ratio. Qseven is an open standard of the SGeT Standardization Group. Taking advantage of the ongoing development in processor technology towards smaller and more power efficient CPUs, Qseven has in recent years become the most widely adopted new standard for small form factor modules.

Qseven™

The Qseven™ specification has been extended to include module architectures based on the ARM processor which is renowned for its excellent performance to power ratio. Providing different processor architectures and a wide range of modules for commercial and extended temperature together with matching baseboards, the MSC Qseven family leads the way to feature rich and small, low power modular systems.
The MSC Q7-BW module is based on Intel’s next generation Atom processors in 14nm technology. These multi-core systems-on-chip provide outstanding computing and graphics power and are more power efficient compared to their predecessors. The new module brings triple independent display support, DirectX 11.1, fast DDR3L memory and USB 3.0 on a compact, power saving and cost-efficient module. Dual- and quad-core processors are supported by this design.

**Highlights**

- Intel® Pentium® N3710 quad-core 2.56GHz, 6W TDP
- Intel® Celeron® N3160 quad-core 2.24GHz, 6W TDP
- Intel® Celeron® N3060 dual-core 2.48GHz, 6W TDP
- Intel® Celeron® N3010 dual-core 2.24GHz, 4W TDP
- Integrated Intel® Gen. 8 HD Graphics
- Up to 8GB DDR3L SDRAM (dual-channel)
- Up to 64GB SATA Flash Disk (optional)
- Up to 64GB eMMC Flash (optional)
- HDMI/DVI interface up to 3840x2160
- DisplayPort 1.1a up to 3840x2160
- Dual-Channel LVDS 24 or 18 bit up to 3840x2160
- DirectX 11.1, OpenGL 4.2, OpenCL 1.2
- Triple Independent Display support
- 3x PCIe x1, GbE, SATA-II, UART, LPC, SPI, I2C, SMBus
- USB 3.0, opt. USB 3.0 Device
- Up to 7x USB 2.0, opt. USB 2.0 Device

The MSC Q7-BT module is based on the Qseven Rev. 2.0 standard and uses Intel’s multi-core System-On-Chip (SOC) Atom E3800 generation based on Intel’s 22nm processor technology. The quad-core, dual-core or single-core Atom processor provides outstanding computing and graphics power and is accompanied by a comprehensive set of peripherals.

**Highlights**

- Intel® Atom™ E3845 quad-core 1.91GHz, 10W TDP
- Intel® Atom™ E3827 dual-core 1.75GHz, 8W TDP
- Intel® Atom™ E3826 dual-core 1.64GHz, 7W TDP
- Intel® Atom™ E3825 dual-core 1.33GHz, 6W TDP
- Intel® Atom™ E3815 single-core 1.46GHz, 5W TDP
- Up to 8GB DDR3L SDRAM (opt. ECC)
- Up to 64GB SATA Flash Disk (optional)
- Up to 32GB eMMC Flash (optional)
- 2x SATA interfaces (1 used for opt. Flash Disk)
- Integrated Intel® Gen. 7 HD Graphics
- HDMI up to 1920x1200
- DisplayPort 1.1a up to 2560x1600
- Dual-Channel LVDS 24 or 18 bit up to 1920x1200
- 3x PCIe Express x1 Gen. 2.0 ports, GbE LAN
- USB 3.0 Host, optional USB 3.0 Device
- Up to 6x USB 2.0 Host, optional USB 2.0 Device
- UART, LPC, I2S Audio, SPI, I2C, SMBus, SDIO, TPM
The MSC Q7-IMX6PLUS module provides the NXP™ i.MX6 ARM Cortex-A9 CPU (quad, dual, dual-lite or single core) as well as the new i.MX 6QuadPlus and 6DualPlus Processors with up to 1.2 GHz, up to 4GB DDR3 DRAM and up to 64GB eMMC Flash memory as well as an extensive set of interface controllers.

**Highlights**

- NXP™ i.MX6 ARM® Cortex™-A9 quad-, dual-, dual-lite or single-core CPU
- Supports i.MX 6QuadPlus, i.MX 6DualPlus
- “Triple-Play” Graphics and Video Subsystem
- Up to 4GB DDR3L SDRAM
- Up to 64GB eMMC or 4GB NAND Flash
- Gigabit Ethernet
- PCI Express x1 port
- HDMI/DVI up to 1920 x 1200 @30Hz
- Dual-Channel LVDS 18/24 bit up to 1920 x 1200
- Triple independent display support
- SATA-II (3Gbps, quad-/dual-core only)
- USB Host / Device+ up to 4x USB 2.0
- MMC / SD / SDIO Interface
- CAN Interface, I2S Audio
- MIPI CSI-2 Camera Interface

The MSC Q7-IMX6 module is based on NXP™’s i.MX6 CPU offering quad-core, dual-core and single-core ARM® Cortex™-A9 performance at very low power consumption. The MSC Q7-IMX6 CPU Module incorporates the NXP™ quad-core, dual-core or single-core processor with up to 1.2 GHz, up to 4GB DDR3 DRAM and up to 32GB eMMC Flash memory as well as an extensive set of interface controllers.

**Highlights**

- NXP™ i.MX6 ARM® Cortex™-A9 quad-, dual-, dual-lite or single-core CPU
- “Triple-Play” Graphics and Video Subsystem
- Up to 4 GB DDR3 SDRAM
- Up to 32 GB eMMC Flash
- Gigabit Ethernet
- PCI Express x1 port
- HDMI/DVI up to 1920 x 1200 @30Hz
- Dual-Channel LVDS 18/24 bit up to 1920 x 1200
- Triple independent display support
- SATA-II (3Gbps, quad-/dual-core only)
- Up to 8 USB2.0 ports, I2S Audio
- OS support: Linux, Windows EC7/2013 (Android on request)
The MSC Q7-TCTC-FD module is based on the Intel's E6x0 Atom™ CPU and the EG20T Platform Controller Hub. The module provides up to 2GB DDR2 DRAM and optionally up to 8GB on-board SATA Flash Disk.

**Highlights**

- Intel® Atom™ E6xx (up to 1.6GHz) with integrated Graphics EG20T PCH
- Up to 2GB DDR2 SDRAM, soldered
- Optional 4 / 8 GB on board Flash SSD, bootable
- Gigabit Ethernet interface
- LVDS (18 / 24 Bit) up to 1280 x 768 @ 60Hz
- SDVO up to 1920 x 1080

The Qseven Rev. 1.2 Reference Platform MSC Q7-MB-RP2 offers a large variety of interfaces commonly used in industrial applications such as Gigabit LAN, USB 2.0, 1x RS232, CAN and LVDS/ADD2 for display attachment. In addition PCI Express is supported with four PCIe x1 slots. This platform for rapid prototyping helps to evaluate and test Qseven modules.

**Highlights**

- Four PCI Express x1 slots
- One ADD2 slot for SDVO / DP / HDMI
- Mini PCI Express, ExpressCard socket
- MMC / SD Card socket
- Two SATA onboard connectors
- Two Super I / O (Winbond/SMSC)

- COM1 / COM2, LPT, fan control and HW monitor
- CAN transceiver
- HD audio codec, AC97 connector
- Up to eight USB interfaces
- LVDS display via Jili30
The Qseven™ Rev. 2.0 Embedded Platform MSC Q7-MB-EP6 offers a variety of embedded interfaces such as dual Gigabit LAN, USB 3.0, USB 2.0, RS232/485 and CAN as well as HDMI, DisplayPort and LVDS display interfaces. In addition a mini PCI Express™, an mSATA and an SD Card socket are supported. Module slot on bottom side.

**Highlights**
- HDMI and DisplayPort connectors for direct output of TMDS signals from Qseven module
- Dual Gigabit Ethernet
- Mini PCI Express card slot
- MMC/SD card and mSATA card sockets
- 1x SATA connector
- RS-232 on DB9 connector
- RS-485 and RS-232 on pin header
- LPC / GPIO on pin header
- USB 3.0 host connector
- 2x USB 2.0 host connector
- 1x USB 2.0 on pin header
- 1x microUSB 2.0 OTG connector
- LVDS / eDP via Jili30 connector
- Backlight interface 3.3/5/12VDC
- SPI / I2C / SMBus, CAN bus, I2S audio
- Wide input range from 10-28VDC

The Qseven™ Rev. 1.2 Embedded Platform MSC Q7-MB-EP4 offers many interfaces often used in embedded applications such as dual Gigabit LAN, USB 2.0, RS232, CAN and LVDS as well as DVI/HDMI. In addition a mini PCI Express™ and an mSATA slot as well as an SD Card socket are supported. Module slot on bottom side.

**Highlights**
- One DVI port up to 1920 x 1080 for Qseven modules with SDVO
- Dual Gigabit Ethernet
- Mini PCI Express slot
- MMC/SD Card socket
- Two SATA onboard connectors
- One RS-232 onboard pin header
- One CAN interface
- Six USB 2.0 interfaces, four external
- Touch screen controller on board
- LVDS display connection via Jili30
- Backlight interface 3.3/5/12VDC
- Size 148 x 102 mm
- Wide input range from 10-28VDC
Qseven™

Cooling Solutions

For all its Qseven modules, MSC is offering tailored cooling solutions which perfectly fit the geometry of the COM product.

MSC is providing a heatspreader for each Qseven module, and a single-piece heatsink for the higher-performance modules.

A heatspreader offers a blank surface allowing to mount a cooling device or to contact the metal housing of a system, while the underside provides contact areas for the heat generating parts of the module’s geometry.

A heatsink is shaped like the heatspreader, but shows cooling fins on the upper side so as to maximize the surface used to dissipate heat into the surrounding air.

The enclosure MSC Q7-MB-EP-02 BOS-001 was designed for use with the Qseven platform boards MSC Q7-MB-EP2/4. The enclosure provides suitable cut-outs for the baseboards’ connectors plus two optional cut-outs for D-Sub9 connectors for serial lines available on the baseboards.

**Highlights**
- Compact dimensions: 175 x 117 x 60 mm (L x W x H)
- Material 1.5 mm sheet metal, RAL7032
- Optional DIN Rail Adaptor
- Front plate with cut-outs for EP2/4 interface connectors:
  - DVI, 4x USB, 2x Ethernet
  - 2x optional D-Sub9 for serial lines or CAN
- Cooling slots on two sides improve air flow inside the housing
The Qseven Starterkit for Qseven 2.0 modules with the Intel® Atom™ E3800 or N3000 is based on the 3.5” Qseven carrier board MSC Q7-MB-EP6 and contains all necessary products to quickly enable the user to run and evaluate Qseven modules built to the Rev. 2.0 specification. The kit does not contain a Qseven module in order to give the user greater flexibility as to which particular module version and CPU core and speed variant is desired.

**Highlights**

- 3.5” Qseven carrier board with socket for Qseven Rev. 2.0 modules MSC Q7-BT or Q7-BW (not included)
- Heatsink suitable for all module variants of the Q7-BT and Q7-BW families
- 12V power supply and cable kit included for immediate operation of the Starter Kit
- Resource CD with drivers, manuals etc.
- HDMI and DisplayPort graphics output
- LVDS graphics output on standard 30-pin connector; backlight connector includes dimming output
- 2x Ethernet (10/100/1000 LAN) connectors
- SATA, USB 3.0, 3x USB 2.0, USB 2.0 OTG, 3x UARTs
- Mini PCI Express and mSATA Card slots
- SD Card socket

The Qseven Starterkits for Qseven 1.2 modules are available in versions for the NXP™ i.MX6, AMD Embedded G-Series and the Intel® Atom™ E6x0. The kits are based on the 3.5” Qseven carrier boards MSC Q7-MB-EPx and contain all necessary products to quickly enable the user to run and evaluate Qseven modules. The kits do not contain a Qseven module allowing the user to select the most suitable one from MSC’s wide offerings.

**Highlights**

- 3.5” Qseven carrier board with socket for Qseven Rev. 1.2 modules (not included)
- Heatsink suitable for the chosen module family
- 12V power supply and cable kit included for immediate operation of the Starter Kit
- Resource CD with drivers, manuals etc.
- HDMI/DisplayPort or DVI graphics output
- LVDS graphics output on standard 30-pin connector; backlight connector includes dimming output
- 2x Gigabit Ethernet connectors
- SATA, 4x USB 2.0, USB 2.0 OTG
- HD audio or I2S audio
- Mini-PCI-Express and mSATA Card slots
- SD Card socket
The recent revision 2.0 of the SMARC module standard (Smart Mobility ARCHitecture) has every ingredient to become the best and most future-proof standard for small form-factor embedded modules. With 314 pins available on its inexpensive and robust MXM3 connector, SMARC has ample space for proven and popular interfaces. In the new standard revision, PCIe now features 4 lanes instead of 3, USB now covers up to 2x USB 3.0 and up to 6x USB 2.0 interfaces, LVDS now supports two independent dual-channel connections which alternatively can be used for embedded DisplayPort (eDP) or for DSI, two Gigabit Ethernet ports are now supported, Audio has independent HDA and I2S ports and up to 4 UARTs are available. In addition to SPI, also eSPI is supported for attachment of peripheral devices on the baseboard or the application hardware. And still there are a lot of reserved pins left for future upgrades. Never again has it been so easy and natural to use ARM-based and x86-based computer modules on a modern and up-to-date module standard.
The MSC SM2S-IMX6 module is fully compliant with the new SMARC™ 2.0 standard and is based on NXP’s i.MX6 CPUs offering quad-, dual- and single-core ARM Cortex-A9 compute performance at very low power consumption and excellent graphics performance combined with a high degree of functional integration.

**Highlights**
- NXP i.MX6 ARM® Cortex™-A9 quad-, dual-, dual-lite or single-core CPU
- Supports i.MX 6QuadPlus, i.MX 6DualPlus
- MPEG-4 Video En-/Decoding 1080p,
- HDMI graphics 1920x1080x30fps,
- dual-channel LVDS 1920x1080x30fps
- Up to 4GB DDR3L DRAM
- Up to 64GB eMMC Flash memory
- 10/100/1000 GbE LAN interface
- 1x PCI Express x1
- 1x SATA-II (3Gbps, quad-/dual-core only)
- 1x USB Device/Host + up to 5x USB 2.0 Host
- 1x MMC / SD / SDIO interface
- 2x CAN interface
- I2S Audio interface
- MIPI CSI-2 camera interface

The SMARC™ 2.0 Embedded Platform MSC SM2-MB-EP1 offers many embedded interfaces such as dual Gigabit LAN, USB 3.0, USB 2.0, SATA, UART/RS232 and CAN as well as DVI/HDMI, embedded DisplayPort and LVDS display interfaces. In addition a PCI Express™ socket and an SD Card socket are supported.

**Highlights**
- Socket for SMARC™ 2.0 modules
- PCI Express x4 slot
- SD Card slot
- Mini-PCI-Express Card slot
- Two USB 3.0 interfaces
- USB 2.0 OTG, three USB 2.0 Host
- DVI/HDMI and DisplayPort connectors
- LVDS and eDP connectors
- SATA connector
- Two GbE interfaces
- Two CAN interfaces
- I2S audio and HD audio codec
- Two UART interfaces
- Various additional SMARC™ specific interfaces
- Power supply via ATX-style power connector
- Power jack for 12-24V input voltage
The nanoRISC module standard has been created for applications requiring a small form factor and lowest power consumption.

The nanoRISC modules simplify the design of embedded systems by providing a processor core with an extensive set of interfaces on a small form factor board. Boot loader and adaptations for popular Operating Systems will be provided by MSC so that design times will be shortened dramatically.

nanoRISC® modules can be used as a processing “supercomponent”, while users only need to add application-specific periphery. The 230-pin MXM connector used as interface to the baseboard is inexpensive but robust and proven. A variety of easy-to-use interfaces are available. All popular embedded interfaces are included, and additional interfaces can be provided by adding suitable controllers on the baseboard and connecting them to the processor bus available on the MXM connector.
The MSC NANORISC-AM335X module is based on the Texas Instruments ® Cortex™-A8 processor AM335x family which ranges from 300 to 800MHz. On the module it is combined with up to 512MB DDR3 SDRAM, up to 512MB SLC NAND Flash, optionally up to 64GB eMMC Flash and 10/100 Ethernet LAN.

**Highlights**
- Texas Instruments Cortex™-A8 CPU AM335x clocked up to 800MHz
- Up to 512MB DDR3 SDRAM soldered
- Up to 512MB SLC NAND Flash soldered
- Up to 64GB eMMC Flash soldered
- 10/100 Base-T Ethernet Interface
- Optional 2nd 10/100 LAN or GbE
- USB 2.0 HS Host, USB 2.0 HS OTG
- RGB 16/18/24 bit up to 1366 x 768

The MSC NANORISC-IMX6 module is based on the NXP™ Cortex™-A9 processor i.MX6x which is available as quad-core, dual-core and single-core CPU. On the module it is combined with up to 4GB DDR3 SDRAM, up to 4GB SLC NAND Flash, optionally up to 64GB eMMC Flash and Gigabit Ethernet LAN.

**Highlights**
- NXP™ i.MX6 Cortex™-A9, 1/2/4 core(s) CPU clocked up to 1.2GHz
- Up to 4GBYTE DDR3 SDRAM soldered
- Up to 4GBYTE SLC NAND Flash soldered
- Up to 64GByte eMMC Flash
- Gigabit Ethernet interface
- USB 2.0 Host
- USB 2.0 OTG Host/Client High Speed
- Graphics Interfaces: HDMI/DVI, LVDS, RGB up to 1920 x 1080, dual independent display support
- Video decoder and scaler
- CAN 2.0B, 3x UART, 2x SPI, 2x PC
- IPS audio interface
- SD V3.0 / SDIO V2.0 / MMC V4.3
- Parallel bus interface
- Camera interface ITU656 / CSI
The Evaluation Platform MSC NANORISC MB2 offers dual LAN, USB, UARTs, audio and graphics RGB 18/24 Bit and extension connectors for graphics, SATA, PCIe, CAN (CPU I/O), Local Bus, I²C and SPI. In addition touch controllers for projected capacitive touches and for resistive touches are provided. An SD Card socket is supported.

**Highlights**

- Socket for nanoRISC compatible modules
- LCD panel interfaces with RGB TTL output
- Backlight power 8..20VDC
- Graphics extension connector for optional graphics modules (LVDS, HDMI)
- 2x 10/100 Base-T Ethernet interface or GbE
- 2x USB Host, USB OTG Host/Client port
- Touch Screen support (capacitive + resistive)
- ITU656 video input interface on ext. connector
- 2x COM ports on 9pin Sub-D connector
- I2S audio codec with standard audio connectors
- SD Card socket
- PCIe, SATA, CAN, Local Bus, SPI, I2S on extension pad field
- Battery charger support (Lithium cell)
- 8..20V power supply input

The MSC NANORISC-SK is a complete, ready-to-run Starterkit for MSC’s range of nanoRISC processor modules. It consists of the nanoRISC Embedded Platform board MB2, a 7-inch WVGA display with capacitive touch and a suitable power supply.

**Highlights**

- Evaluation and Development Kit for all nanoRISC® modules
- Includes 7” LCD panel 800 x 480 pixels with all required interface cables
- Power supply included
- Integrated Debug Adapter on-board
- SD Card with pre-installed Linux or Android Operating System to be ordered with CPU module of choice
- nanoRISC CPU module not contained - please order separately
- Complete range of usable interfaces
- GbE or 2x 10/100 Base-T (dep. on module)
- 1 or 2 USB Host Port (dep. on module)
- USB OTG Port (dep. on module)
- CAN Bus, 2x COM Ports on 9-pin Sub-D
- I2S or AC97 audio codec with standard audio connectors
Design and Production

Expertise

Module Design
Industrial applications require module designs to be a balance between performance, price, size, reliability and power dissipation. These factors are incorporated into our design guidelines ensuring that our designers select components appropriately for longevity, low power consumption and multiple sourcing to ensure the best availability. By adopting COM technology in the form of COM Express™, Qseven™, SMARC™ 2.0 or nanoRISC® in your system design minimizes your efforts and engineering competencies required for high speed design and provide you a clearly defined upgrade path.

Custom Development
While modules require a carrier board to operate, complete custom designs may be the right solution for high volume projects. These may include single board requirements or special application demands using FPGA or DSP support. MSC offers such custom product development including the production and logistics according to your needs. This also includes mechanical design, certification support and regulatory requirements like ISO 13485.

Custom Adaptation
The intermediate step, before a full custom design, is the adaptation of existing standard products to your requirement by tuning the firmware, special assembly or integration of memory, heatsink or display kits. This approach combines standard products with some customization for a fast time to market and minimized engineering efforts. MSC offers a broad spectrum of expertise and distribution products which can be combined with our modules and carrier boards.

Firmware Expertise
With today's highly integrated CPUs the hardware designs from different module vendors tend to be similar. The BIOS/UEFI or microcontroller firmware not only ensures interoperability, but also makes the modules configurable for special requirements. MSC's large BIOS/UEFI engineering team has throughout the years adopted a variety of BIOS/UEFI from various vendors for our modules and accumulated significant experience and know-how to be able to support any custom specific BIOS/UEFI. We ensure direct support, maximum expertise and rapid reaction to customer demand. All new designs are based on the latest UEFI implementations, and as a standard API they follow the common EAPI definition for COM Express and Qseven.

Product Support
MSC uses a tracking system for all product support issues related to our module technologies, ensuring quick and professional support. This helps customers to register their issues and the communication is maintained until the reported issues are resolved. Our support group also offers services such as compliance measurements on customers carrier boards as well as schematic and PCB layout design review consultancies for volume OEMs. With a private login to our support portal, customers are able to download restricted design support documents, BIOS updates or special drivers.

Please use www.msc-technologies.eu to get your personal user account.
Design and Production
Expertise / Support

Operating systems
for embedded modules and boards
In addition to our BIOS competence, we are also focusing on operating system support for our customers. Starterkits and board support packages for different board and operating system platforms are available. Customized driver support for dedicated applications can be offered on request. Major operating system support is available for Microsoft Windows® 8, Windows® 7, Windows® XP (embedded), Windows® Embedded Compact 7, Linux and Android, depending on the architecture of the individual module. QNX® and VxWorks are supported on project request. For more details see the table on pages 6/7 and our product pages on www.msc-technologies.eu

On our website www.msc-technologies.eu you will find detailed information on MSC’s embedded products. This includes data sheets, user’s manuals, mechanical data and other design support documentation. On the software side, BIOS updates, drivers for multiple operating systems and BSPs for typical embedded operating systems such as Windows® 10 IoT, WES7, WEC7, and WEC2013 are available for download. In addition, application notes, videos, whitepapers and FAQs provide deeper technical insight on specific topics. Part of the information provided is only available for registered customers. If you are a customer using MSC products then you can register using the link in the top line of the website to gain access to this private portal.

Product Support
The MSC Embedded Solutions group has a dedicated support team that works in close cooperation with the module hardware and software developers. This rapid access to design resources allows us to help our customers to achieve fast time to market. All technical issues from our customers are tracked in an internal system, thus ensuring timely response and enabling the support group to make use of a large technical knowledge database.

Other Support services
Our support group also offers services such as compliance measurements for customer carrier boards as well as schematic and PCB layout design review consultancy for volume OEMs. If you cannot find the information you need or if you have additional questions please use the email or telephone contact address below:

Email: support@msc-technologies.eu
Phone: +49 (0)8165 906-200

MSC Web-based Support Center
Customers can contact our support group by phone or email, but we also provide an extensive website for delivering as much information as possible to help customers design-in with our products.
BIOS and Secure Boot
Built-in Security

Secure booting
- MSC’s enhanced security features
In many of our COM products we have implemented the most advanced BIOS technologies such as UEFI architecture plus MSC Secure Boot enhancements. Using encryption algorithms, digitally signed storage devices and a Trusted Platform Module (TPM) these products provide full TCG (Trusted Computing Group) compliance and additional security against attacks, protection from software theft or misuse.

BIOS customization
Our BIOS solutions have been adapted to our customers’ special industrial requirements, such as flat panel display support, booting from various devices, extensive power and thermal management or initialization of customer specific devices.

New technologies
MSC continuously improves its BIOS solutions with new functions and technologies, such as UEFI, Intel® Virtualization Technology, VT-d Virtualized I/O Support, Intel® Advanced Management Technology and Intel® Trusted Execution Technology. Continuous improvement of security functions is also one of the most challenging tasks to meet the growing demand for safer embedded systems. MSC is maintaining user friendly interfaces, such as EPI (Extended Panel interface) and EAPI (Embedded Application Programming Interface) to allow low-level control of non-volatile memory, I2C bus, backlight, watchdog timer etc.
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