Innovative development and deployment of Intuitive Human Machine Interface for embedded applications
## MSC @ Glance

**MSC is operating in two business areas**

<table>
<thead>
<tr>
<th>Distribution</th>
<th>Technical Department</th>
<th>Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description</strong></td>
<td><strong>Boards</strong></td>
<td><strong>Systems</strong></td>
</tr>
<tr>
<td>• Distribution of electronic components</td>
<td>• Customised Engineering and Design-In of PCBA´s</td>
<td>• Engineering &amp; production of components, systems and devices for OEM customers</td>
</tr>
<tr>
<td>• Service Support around Europe including Design-In, Supply Chain Management and many more</td>
<td>– Medical technology</td>
<td>• Complete manufacture Komplette Fertigung „from concept to finished system“</td>
</tr>
<tr>
<td><strong>Impact</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>• MSC-GE ranks 4th among the Distributors in Germany</td>
<td>• Assembly of boards</td>
<td>• Historically with focus on medical technology, Displays and Industrial-PC´s</td>
</tr>
<tr>
<td></td>
<td>• USP by combination with our distribution department</td>
<td>• Aktive Diversifizierungsstrategie</td>
</tr>
<tr>
<td></td>
<td>• USP with integrated custom-designed circuits</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Synergistic effect associated with distribution side</td>
<td></td>
</tr>
</tbody>
</table>

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ca. 64 %

ca. 36 %
Agenda

• Smart Monitor for Intuitive HMI

• MSC nanoRISC module for deeply Embedded Applications.
CYBERSCREEN: The Smart Monitor for Intuitive HMI
CYBERSCREEN – Main Board Block Diagram
Implementation
scalable up/down

Markets:
• Vending Machine, Dashboard, GPS Navigation, Medical
• Surveillance, Generic Remote Terminal
• Automotive, PLC, Heating System, etc...

Scalable/Migrable Lattice products:
✓ XO2-7000
✓ ECP3-17
✓ ECP2-12
IQ-Engine Capabilities & GUI Elements

Capabilities:
✓ Highly optimized graphics engine running on the Lattice Mico32 CPU and/or external CPU such as ARM
✓ Utilizes the IQ-GraphBlit FPGA-based 2D Graphics accelerator to render high quality 2D graphics

GUI elements:
Renders touch screen user interfaces composed out of standard elements:
- Labels and images
- Push-buttons and Toggle-buttons
- Sliders, scrollbars and knobs
- Indicators
- Numeric, text and message fields
- Dynamic graphics
- Bar-graphs
- Gauges
- Trends
- Import external objects
IQ-Engine: Graphical Tool to design GUI

IQ-Editor – WYSIWYG GUI Editor
  Allows touch screen HMI interfaces to be designed in a graphical environment
  Standard graphics themes
  Fully custom graphics

GUI elements can be bound to the Tag database or assigned UI actions
  Visualization of Tag data
  Modification of Tag data

Video mixing settings can be controlled directly from the GUI
Display Ecosystem – Versatile & Scalable

The IQ-Display ecosystem consists of:

- FPGA components
  - IQ-DispLite display controller IP core
  - IQ-GraphBlit graphic accelerator IP core
- Optional:
  - IQ-MEM memory controller
  - IQ-LinkSPI SPI bridge
- Firmware components
  - IQ-Engine embedded graphics engine
- Software components
  - IQ-Editor WYSIWYG HMI project editor
Embedded Computer Technology

- Computer-On-Modules
  - COM Express™
  - ETX/ET(e)
  - Nanorisk
  - Qseven
  - EXM32
  - BIOS
- Customer specific developments
- System Integration
New COM family from MSC – The main targets:

- CPU range from ARM9 up to ARM Cortex-A9 multi core ..... and more
- Performance up to medium „x86 level“
- Deeply-embedded interface (easy system integration)
- Low power / passive cooling (mostly no heat sink required)
- Low cost / small form factor
Target markets:

- POI Terminals
- POS / Cash Register Terminals
- Any kind of low and medium HMI
- Medical Equipment
- Industrial Equipment (non ruggedized)
- Low to medium Digital Signage
- Home Automation (Domotics)
- V2oIP (Video and Voice over IP)
- Video Surveillance
- Taxi Meters w/ Navigation and Multimedia
- Mobile Devices
- Small panel PC
- Embedded PC
Backside view Display with electronics

- CPU Module (Scalable Family)
- Fixation Plate
- Display Connector
- Display Back Side
- Carrier-board (Customer or MSC)
System I/O of the Module

nanoRISC®

<table>
<thead>
<tr>
<th>System I/O</th>
<th>MIN</th>
<th>MAX</th>
</tr>
</thead>
<tbody>
<tr>
<td>LAN 10/100/1000</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>MMC / SD</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>SPI</td>
<td>1</td>
<td>2</td>
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<tr>
<td>I2C</td>
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<td>2</td>
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<tr>
<td>UART</td>
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<td>3</td>
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<tr>
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</tr>
<tr>
<td>USB Host</td>
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</tr>
<tr>
<td>USB Client or OTG</td>
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<td>1</td>
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<tr>
<td>Display 18/24 TTL (AO)</td>
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</tr>
<tr>
<td>HDMI (AO)</td>
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<tr>
<td>Audio, digital</td>
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<tr>
<td>TV Out</td>
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<td>1</td>
</tr>
<tr>
<td>Touch</td>
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</tr>
<tr>
<td>Camera</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>PCIe x 1, (FFU)</td>
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<td>1</td>
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<tr>
<td>SATA, (FFU)</td>
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<tr>
<td>Local Bus</td>
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<td>1</td>
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<tr>
<td>CF Card</td>
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<td>PWM</td>
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<tr>
<td>Timer</td>
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<tr>
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<td>Battery Management</td>
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Note:

(FFU) = For Future Use

(AO) = Assembly Option
<table>
<thead>
<tr>
<th>System IO</th>
<th>MIN</th>
<th>MAX</th>
<th>Note</th>
<th>S5PV210 Cortex A8</th>
<th>S5PC100 Cortex A8</th>
<th>AM335x Cortex A8</th>
<th>S3C2416 ARM 9</th>
<th>plan of record Cortex A9</th>
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<td>MAC / PHY on board, Transformer on carrier</td>
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<tr>
<td>I2C</td>
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<tr>
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<td>Tx / Rx / RTSn / CTSn</td>
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<td>2(3)</td>
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<td>2(3)</td>
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<td>1(2.0)</td>
<td>1(1.1)</td>
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<td>1(OTG, 2.0)</td>
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<td>1280x720</td>
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<td>1366x768</td>
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<td>1(i2S or AC97 or PCM)</td>
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<tr>
<td>Local Bus</td>
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<tr>
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<td>shared with Local Bus</td>
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<td>*) max. not specified because of multi functions pins</td>
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<tr>
<td>Timer</td>
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<td>2</td>
<td>*) max. not specified because of multi functions pins</td>
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<tr>
<td>CAN, (AO)</td>
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<td>1(Full)</td>
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<td></td>
<td>1</td>
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<td>1</td>
<td>1</td>
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</tr>
</tbody>
</table>

Note:
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(AO) = Assembly Option
System I/O Evaluation Board MB2

nanoRISC®

Evaluation Board MB2

MSC
Low Cost
RISC Module

- 2 x USB (2 Host, 1 OTG / Client)
- 2 x UART
- 2 x I2C
- 2 x SPI
- Display (TTL, TFT 18/24Bit) (MIPI alternative)
- Touch (4 wire IF)
- Camera IF
- 1 x MMC / SD Card
- HDMI / DVI
- Backlight control
- Audio (AC97)
- 1 x CAN
- LAN
- Local Bus
- CPU Specific GPIOs / SPI
- Battery
- Gold Capacitor
- 2 x Type A, 1 x Type B, 1 x OTG
- 2 x DSUB 9
- Graphics connector 50 pin
- Graphics connector 50 pin
- Graphics connector 50pin & 40 pin
- FFC, 4 pin
- IDC Connector, 1 x 20 pin
- MMC/SD Connector
- HDMI Connector
- IDC Connector, 20 pin
- Audio Connector
- IDC Connector, 10 pin
- RJ 45
- IDC Connector 50pin
- IDC Connector 20 pin
- Power Supply
- Power Connectors

USB Power
RS232 PHY
USB Power
RS232 PHY
Form Factor

All measurements are in mm

Layout to match the connector type MXM230
Form Factor

Module PCB

Carrier PCB

Depending of socket used
- 1.20 ± 0.1
- max. 6.00, typ. 3.01 ± 0.1 (depending on module)
- max. 2.50 ± 0.1

Optional: Heatspreader

Note:
1. Component height on module top max. 5.50 mm
2. Component height on module bottom max. 2.50 mm
3. Tolerance if not noted 0.20 mm
4. Depending on the used connector the total height varies between 12.2 and 9.9 mm (without heatspreader)

Standard use

If heat sink is required
NANORISC-AM335x

- Texas Instruments® AM335x Cortex™-A8
  - from 300MHz up to 800MHz
- Up to 512MByte DDR3 SDRAM soldered
- Up to 512MByte SLC NAND Flash soldered
- Up to 64Gbyte eMMC Flash
- 10/100 Base-T Ethernet Interface
  - Optional 2nd 10/100 or GbE LAN
- USB 2.0 High Speed (Host + OTG)
- Versatile Graphics Interface
  - RGB 16/18/24 bit up to 1366 x 768
- CAN 2.0B, 3x UART, 2x SPI, 2x I²C
- I²S Audio Interface
- SD V2.0 / SDIO V1.0 / MMC V4.2
• ARM® Cortex-A8™ 32-bit RISC CPU at 300MHz, 500MHz, 600MHz or 800MHz
  – NEON™ SIMD Coprocessor
  – 32KB/32KB of L1 Instruction/Data Cache with Single>Error Detection (parity)
  – 256KB of L2 Cache with Error Correcting Code (ECC)
• SGX530 Graphics Accelerator Engine (option)
• LCD Controller supporting up to 1366 x 768 resolution (HD)
• Real-Time Clock (RTC)
• USB 2.0 High-Speed Host and OTG Ports with integrated PHY
• 10/100 Base-T Ethernet
  – Optional GbE or 2nd 10/100 LAN Interface; optional RT-Ethernet
• Serial Interfaces including:
  – Controller Area Network Port (CAN)
  – 2x UARTs, 2x I2C Ports, 2x SPI Interfaces
• Audio Interfaces: I2S, SPDIF, McASP
• MMC / SD Interface and 1x CF Card Port
  – microSD Card Socket soldered on Module
• Watchdog Timer
• Battery Charger supporting 1x Lithium Cell
• LED Backlight Interface incl. Current Source for LED Backlight
Software Support Model

nanoRISC®

Software

LINUX
(Android - future)

WinCE

Customer

Application

Application

MSC

Operating System

Drivers

Drivers

MSC

Bootloader

UBOOT

EBOOT

WinCE BSP and Support is in preparation at a partner company.
Why should I use nanoRISC Modules?

- Huge CPU scalability from ARM9 (400MHz) to Cortex A8 (300MHz…1GHz)
- ARM CPUs offer a lot of interfaces without additional cost for the baseboard
- Low cost module designed for high quantities
- Low power, usually no cooling requirements
- Provided interface ideal for embedded solutions
- Full Linux and WinCE support