Technology Highlights

Take a Closer Look
SOC stands for ‘System-on-Chip’ which is our core business area. Computers, communication network devices, and embedded systems are becoming more multi-functional nowadays, demanding larger and more complex SoC circuits. With the cutting-edge technology and our 40 years of experience, we provide sophisticated solutions to enhance the value of our worldwide customers’ products.

I/O, Input and Output is a fundamental element constituting semiconductors, with Imaging and Optical networks as our core technologies. We have expertise in all aspects of the video imaging field - from ‘Input’ technology of video capturing and authoring to ‘Output’ technology of graphics and display, including video encoding technology in between.

Next, forward-thinking, looking to the future. We offer not only solutions for today’s new technologies but also strive to reach new opportunities globally and revolutionize the experiences of our customers. As a leading innovation company we constantly aim to improve the performance of our products and services and innovate the way people live.
## Technology Highlights

### Content

<table>
<thead>
<tr>
<th>Page</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>04</td>
<td>Automotive Display Solutions</td>
</tr>
<tr>
<td>06</td>
<td>In-Vehicle Graphics Computing</td>
</tr>
<tr>
<td>08</td>
<td>SEERIS® Graphics Engine IP</td>
</tr>
<tr>
<td>10</td>
<td>3D Audio HMI</td>
</tr>
<tr>
<td>12</td>
<td>Milbeaut® Image Processors</td>
</tr>
<tr>
<td>14</td>
<td>ASIC Solutions</td>
</tr>
<tr>
<td>16</td>
<td>Automotive ASICs</td>
</tr>
<tr>
<td>18</td>
<td>ASIC for Industry 4.0</td>
</tr>
<tr>
<td>20</td>
<td>Solutions for Optical Network and Wireless Transmission</td>
</tr>
<tr>
<td>22</td>
<td>Codec ICs for Professional AV Equipment</td>
</tr>
<tr>
<td>24</td>
<td>Encoding/Transcoding Solutions</td>
</tr>
<tr>
<td>26</td>
<td>About Socionext Europe</td>
</tr>
<tr>
<td>28</td>
<td>Locations</td>
</tr>
</tbody>
</table>
Automotive Display Solutions

Remote Graphic Display Controllers

Socionext introduces the next generation of Display Controllers for remote display applications in the car. Integrating high speed serial video links up to 12 Gbps, safety features such as window-based signature units and up to two timing controllers for panel connectivity, the SC1701 family offers unparalleled flexibility and cost saving for any in-vehicle display application.

Video compression and encryption methods allow future-proof designs beyond 4K resolution and at the same time protect high value content.

As business models evolve and HMI designs face the challenges of autonomous driving experiences, Socionext is here to lead the display application technology.
5 km/h

CHECK YOUR SURROUNDINGS
In-Vehicle Graphics Computing

SoCs for Visual and 3D Graphics Applications

Socionext offers specialized solutions for surround view and display graphics applications. Wherever there is a need to compute camera data and present it on a display in order to assist the driver, we offer a complete solution based on a specialized SoC and Software package.

Surround or rear view paired with demanding cluster applications can be effectively realised with the SC1810 series SoC utilising the integrated Vision and Graphics processing units. OpenVX and OpenGL interfaces provide flexibility for developing custom applications.

Key Features
- ARM Core Architecture
- Visual and 3D Graphics Acceleration
- Camera and Display Connectivity
- HW Accelerated Video Decoding
- Extensive SW Libraries

Application Areas
- Instrument Cluster
- Parking Assistance
- Surround View
SEERIS® Graphics Engine IP

Scalable Building Block Concept

The SEERIS® 2D Graphics IP is a building block concept combining a collection of graphics processing units with focus on 2D operations, display control and video capture which can be combined on a system level to a more complex graphic subsystem. Implemented as a high-quality, synthesizable Soft IP, it allows an easy adaption to existing semiconductor technologies.

With its generic, flexible and silicon-proven concept it is made for a wide range of System-on-Chips and is capable of working with different types, sizes and resolutions. In total over 10 different variants, such as application processors, GPUs, MCUs, Codecs and GDCs, are used for in-house and several external customer projects. Although it was initially developed for automotive applications with additional features to support safety critical use cases, it is used and suitable for many other applications. Therefore the SEERIS® 2D Graphics Engine IP is continuously updated with new technologies and features.
2D Blit and Raster Graphics

Display Control

Capture Control

Memory

CPU

System

3D GPU

2D GPU

Connectivity

System-on-Chip

IoT & Graphics Solution Business Unit
3D Audio HMI

More Intuitive User Experience & Warning Alerts for Drivers

Socionext’s 3D acoustic surround technology delivers state-of-the-art UI (User Interface) to aid driver safety with sound localization control for in-vehicle applications, such as driver assistance and infotainment systems, to help vehicle operators receive intuitive directions and alerts for unexpected occurrences.

ADAS
When other objects approach from the blind area, drivers are able to intuitively perceive its direction with ‘Close-to-Ear’ effect sound. This is also applicable to car navigation systems.

Driver Monitoring System
When a driver unconsciously starts to feel drowsy or tired, the ‘Close-to-Ear’ effect sound can alert the driver to wake up.

Key Features
- ‘Close-to-Ear’ effect generated by the software helps drivers to feel as if there are speakers just around the ears.
- Off-line processing using ‘3D Authoring Tool’ means no dedicated speaker or DSP is required. This allows its use in a wide range of vehicles at lower cost.
- Robust sound localization technology is available to control any form of in-vehicle speaker configurations or conditions such as asymmetric speaker layout or acoustic reflections.

Application Areas
- ADAS
- Driver Monitoring System
‘Close-to-Ear’ 3D Sound Effects
Since its introduction in 2000, Socionext’s Milbeaut® series has been adopted in a wide variety of digital imaging systems, ranging from single-lens reflex, compact and smart phone cameras.

We support customers who need the highest image quality under all conditions, even when utilizing low-power consumption systems for extended operations. Our camera solutions centered on Milbeaut® are at the forefront of market trends, producing products such as high-quality digital cameras, 4K security cameras for 24-hour surveillance and action video cameras.

**Key Features**
- Imaging Pipeline Performance >1Gpixel/sec
- Various Sensor Inputs and Interfaces Supported
- Quadcore ARM Cortex Processor Core
- Support for 4K and Beyond
- Multiple Streaming e.g. 4K@60fps + 1080p@30fps
- 3DNR (Temporal NR with Ghost Removal)
- Geometric Distortion Correction (De-warping)
- Local Tone Mapping/High Dynamic Range
- Face/Object Detection and Tracking
- Video Image Stabilization/Time Lapse
- HEVC and H.264 Codec up to 4K@60fps (Encode/Decode)

**Application Areas**
- Digital Cameras (DSC and SLR)
- Surveillance Cameras
- Action Cameras
- Drone Cameras
- Sensing Cameras
- Mobile Cameras
The 'SC2000 Smart-Kit' is a camera reference design-kit which enables rapid development of mobile cameras (e.g. drone cameras, action cameras, wearable cameras) and Digital Still Cameras (DSCs) with advanced features and high image quality. The 'SC2000 Smart-Kit' SDK will enable easy code development for above applications.

The kit includes the Smart-Kit Board stack (70mm x 70mm, contains IMX477 sensor board, main ISP board, debug and I/F board), reference schematic diagram, Gerber files, BOM list and documentation. Build environment, Linux Firmware source code and binary ISP control block are also included as well as basic IQ tuning tools.
ASIC Solutions

Providing Custom SoC Solutions that Bring New Value to Next-Generation Products

With over 40 years of experience, Socionext is one of the world’s leading ASIC (Application Specific Integrated Circuit) suppliers. We enable our customers’ visions to become reality.

As a fabless ASIC vendor, we are engaged with the world’s leading foundries and can use our extensive experience to select the optimal semiconductor process for your application.

ASIC development with Socionext is a full-service experience. We offer flexible engagement models from traditional ASIC to full turnkey designs as well as a range of services that help bring your product to market quicker and with minimal risk.

Reference | Track Record

- Leading Supplier of Advanced ASIC Solutions with over 40 Years History
- Over 500 ASIC Designs Completed; over 4B Units Shipped
- Full ‘One-stop’ ASIC Solutions
- Flexible Business Models from Traditional ASIC to Full Turnkey Design
- High Performance/Low-Power Design Methodology
- Access to Advanced Process Technologies from Various Foundries to Ensure Optimized Solutions
- Extensive Analog and Digital IP Catalog
- Custom Analog and RF Design Capabilities
- Full ARM Core Line-up; Extensive Expertise in CPU Subsystem Design
Wide Variety of IP available for your ASIC Projects
Automotive ASICs

High-Performance, Efficient ASICs Enable Advanced Automotive Systems

With the move to autonomous driving, demands on automotive electronics systems are increasing dramatically. The corresponding requirements for system quality, reliability and safety creates completely new design challenges.

For many of the new applications in areas such as sensor technology and machine learning, customized ASIC solutions are often the only way to meet the required system cost and performance.

As an established supplier to the automotive market, Socionext has the expertise to support all aspects of your ASIC project from functional safety design support, Automotive-compliant implementation and test to documentation and manufacturing.

Reference | Track Record
- Optimised Design and Test Strategy
- Functional Safety (ISO26262)
- AEC-Q100 Qualification
- PPAP Documentation
- Production Process Control
- Failure Analysis/8D Reporting

Achievements
Socionext’s Automotive Custom SoCs are used in a Wide Variety of Products in the Following Application Areas:
- LiDAR
- V2X (Vehicle-to-everything) System
- HMI (Human Machine Interface)
- Camera (Viewing/Sensing)
- Car Navigation Systems
- OFDM (Orthogonal Frequency Division Multiplexing)
- CarTV
ASIC for Industry 4.0

Leveraging Extensive Expertise in SoC Development for Factory Automation Applications

Industrial applications such as Factory Automation place tough constraints on ASIC design. In particular, the demanding operating environment and extremely long lifetimes required by the end systems have a major impact on device reliability expectations.

Equipment downtime due to unexpected device failures can be extremely costly.

To address these issues, Socionext has developed a number of design features to be incorporated in its ASIC design process to monitor the chip status and predict premature failures. This allows any devices affected to be exchanged during planned maintenance intervals.

These features include clock monitoring, IC lifetime prediction and SRAM soft error correction.

Functional Safety is also a key issue for next generation Industry 4.0 systems. Socionext’s expertise and design flow ensures that these demands are met.

Reference | Track Record
- Functional Safety IP and Subsystem Design
- IC Lifetime/Wear-out Prediction Based on Individual IC Characteristics
- Clock Monitoring
- SRAM Soft Error Repair
- Dedicated IP for Industrial Ethernet-based Communications
Solutions for Optical Network and Wireless Transmission

Highest Performance and Low Power for the Growing Network Capacity Demand

The proliferation of smart devices, the expansion of cloud computing, the increase in internet distribution of UHD videos as well as the upcoming 5G mobile infrastructure and related services continue to drive the world-wide network capacity demand and require state-of-the-art network component solutions.

Scaling the network throughput at reasonable costs and utilizing existing optical cable infrastructure requires differentiated CMOS-based optical transceivers. These convert the data between the optical and electrical domain with exceptional energy efficiency.

Socionext has a long track record in this field offering a comprehensive set of technologies, highly reliable mixed-signal IPs, ASIC services and products designed for high performance and low power to address your future needs of high capacity data transfer in optical network component design.

Reference | Track Record
Our Customers are World Leading Telecom and Datacom Systems and Modules Vendors.

- **2009** World’s First 56 GSa/s, 8b ADC Enabling First CMOS 100G Coherent Devices
- **2011** World’s First 65 GSa/s 8b DAC Enabling First 100G/200G CMOS Coherent Devices
- **2012** Demonstration of Quadruple Data Rate (>100 Gbit/s) over CEI-28G-VSR Electrical Channel
- **2013** World’s First 92 GSa/s 8b ADC & DAC Enabling First 100G/200G/400G Coherent Devices
- **2014** Low-power 8b 38 GSa/s ADC Enabling World’s First Digital CFP 100G Coherent Optical Module
- **2015** Socionext ADC/DAC IP Enabling Record-breaking Transmission Field of 38.4 Tbit/s over 762 km
- **2017** Launched 128 GSa/s 8b ADC/DAC in 16nm CMOS Technology Enabling Devices with >1 Tbit/s per Wavelength
Socionext provides all the necessary analog IP blocks, digital cells, memory blocks and standard interfaces to help system developers implement their digital coherent DSP designs as ASIC SoCs. IP hard-macros include power optimized high-speed ADCs, DACs and SerDes to support systems using a variety of different modulation formats.

**Transceiver Key Features**
- Line rate: 64 Gbaud
- SerDes line data rate: 56 Gbit/s
- On-Chip PLLs: Common reference clock design for SerDes and Converter possible
- Digital coherent DSP with high performance FEC

**Support Protocols**
- 16 QAM
- Higher order modulation possible with optimized DSP IP

**Standard Interfaces**
- 8x56G SerDes (VSR)
- 4ch ADC (2 I/Q pairs)
- 4ch DAC (2 I/Q pairs)
- 1ch PCIe Gen2 CPU control interface
- I2C 1ch
- GPIO 16ch
- SPI Master

**Application Example:**

**Custom DSP Logic**
- 8x56G
- 16-bit optical IF

**Converter**
- Line side
- 16-QAM
- 2 I/Q pairs each

**Application Example:**

**400 Gbit/s Coherent Transceiver SoC**
- 16-QAM
- Higher order modulation possible with optimized DSP IP

For Your Applications
- Coherent Optical Transceivers (Optical Transport Networks, Data Center Interconnect) with Data-Rates of 100-800 Gbit/s and Above
- Wireless Communications (Satellite, 5G) for Direct Radio-Frequency Conversion without Analog Down-/Up-Converters
- Test and Measurement to Digitize, Analyze, and Generate (Arbitrary Waveform Generator) Wide Bandwidth Signals
Codec ICs for Professional AV Equipment

M30 – 4K/60p HEVC Compatible Multi-Format Codec IC

The MB86M30 supports encoding, decoding and transcoding of video and audio in HEVC/H.265, which compresses 4K video data at half the cost of conventional formats without image quality degradation. The IC is also compatible with conventional formats such as AVC/H.264 and MPEG2, and is capable of handling all codec functions with a single chip. Its power efficiency and high density processing capability makes the MB86M30 the optimum codec device for digital broadcasting equipment. The IC also helps to reduce power consumption and minimize the size of data centers for video transmission over the Internet.

The MB86M30 is capable of processing real-time encoding and decoding of 4K/60p video. It also features very low-latency encoding, as low as 10ms, of 4K/60p video in HEVC/H.265. Furthermore, the MB80M30 is compatible with HDR (High Dynamic Range) video, which has recently been gaining more attention in the industry.

Key Features
- 4K/60p HEVC, AVC and MPEG Real-time Encoder and Decoder
- 4:2:0 / 4:2:2 and 8bit / 10bit Support
- 10ms ULL (Ultra Low Latency) Encoding
- Multi-channel Processing
- HDR (High Dynamic Range) / HLG (Hybrid Log Gamma) – via SEI Insertion
- Power Consumption: 6.3W incl. 4x DDR in Package

Application Areas
- Broadcast Contribution/Distribution
- Live Events/Streaming
- Transcoding in Data Center
- Avionics
- Medical
Socionext delivered the world’s first 4K/60p HEVC real-time video encoder, the MB86M31 and the HEVC / H.264 / MPEG multi-format codec MB86M30, for high-end video transmission equipment. Built with the engineering expertise gained from these new products, Socionext has successfully implemented a high-image quality HEVC codec functionality into a small 25mm x 25mm package. The SC2M50 supports 4K/60p video which has excellent color reproducibility, making it suitable to cover a wide range of needs for professional video equipment, including portable devices.

**Key Features**
- 4K/60p, 4:2:2, 10bit HEVC Codec
- Low Latency (<150ms Glass-to-glass)
- Power Consumption: 3.5W

**Applications**
- Web Casting and Live Streaming
- Portable Codec Solution
- Video Distribution
- 4K Recorder

**HEVC / H.265 Product Lineup**
- Professional Video Market
- High-end Mid-range to entry, ProAV

- **M31 firmware option**
  - MB86M31: HEVC 4K/60p 4:2:2 10bit ENCODER
  - M30 firmware option
  - MB86M30: HEVC, H.264, MPEG 4K/60p 4:2:2 10bit CODEC

- **M30 firmware option**
  - SC2M50: HEVC 4K/60p 4:2:2 10bit CODEC

**AVC / H.264 Product Lineup**
- Professional Video Market
- Mid-entry & Mobile

- **M2x**: H.264, MPEG2 1080/30p TRANSCODER
Technology Highlights

Encoding/Transcoding Solutions

M820L - High Density Transcoder Accelerator

M820L is a PCIe Card to accelerate Encoding and Transcoding processes that can be attached to server systems without changing existing users’ server configuration.

The M820 Series combines the industry’s highest performance processing power using dedicated Codec hardware and flexible software processing via high-efficiency CPU. FFmpeg can be used to operate the encoding process which simplifies the integration of the Accelerator into existing video workflows.

Key Features
- High Channel Density Encode / Transcode Accelerator
- Broadcast Level AVC/HEVC Compression up to 4:2:2, 10bit, 4K/60p
- 24W Low Power Consumption
- HEVC and H.264 Codec up to 4K/60p [Encode/Decode]

Application Areas
- Transcoding Acceleration in OTT and IP Streaming Workflows
- Live and Offline Transcoding System of Social Networking Service
- Encoding of Video Archive and in Video Production Workflows
Other Solution Product Highlights

X500E - UHD Encoder Box for Live IP Streaming
- X500E is a next generation low latency (<50ms) encoder supporting broadcast level quality HEVC / H.265 compression for live IP streaming.
- Based on the Company’s highly reliable codec SoC, X500E meets and exceeds the rigorous demands for UHD/HEVC elevated processing power, using reduced bandwidth transport capacity.

8K Streaming Box and 8K Media Player
- 8K Streaming Box enables real-time video streaming through a network with 8K resolution which makes an impressive experience for public viewing, live streaming and other applications. In combination with the 8K Media Player Socionext is able to offer an end-to-end solution for 8K/60p which is easy to use.
Socionext Europe

Socionext Europe plays a major role in the company’s worldwide activities from our Headquarters in Langen, near Frankfurt (Germany) and offices in Neuried/Munich (Germany), Braunschweig (Germany) and Maidenhead (UK).

In Europe, our focus is on Imaging, Networking and Computing technology for a wide range of applications.

Core Technologies

First for quality, expertise and unequalled service. Socionext provides innovative System-on-Chip solutions solving industry issues surrounding emerging technologies, including IoT, cloud computing, big data, rich content and sustainability.

Performance at the Highest Level

| World’s first single-chip decoder for 8k resolution HEVC Video | Ultra high performance ADC/DAC technology – market leader in Optical Long-Haul Networking |
| Leading-edge expertise in 2D/3D graphics including sophisticated authoring tool environment and 360° Wrap-Around View solution | Unique image processing expertise ensuring best-in-class image quality |
| #2 worldwide supplier of customized SoC (ASICs) – 40 years’ experience | First single-chip H.265 real-time video encoder |
| Worldwide development and support infrastructure |

Leading Global Player

Approx. 250 employees in Europe
2,800 worldwide

One of the top ranked fabless logic ASSP/ASIC suppliers in the world
**Imaging**

Our Design Center in Neuried makes a major contribution to Socionext’s global graphics solutions business. Here we develop Graphics Display Controllers for Automotive and Industrial Markets and utilizing our technical competence in hard and software product development, are established as a leader in embedded graphics solutions.

**Networking**

Socionext’s worldwide Network SoC Business Unit has its Headquarters in Europe (Langen office). Not only do we offer worldwide engineering and applications support for the Optical Networking market but we also offer advanced R&D capabilities which are essential to ensure we realize the next generation of optical network solutions.

**Computing**

Custom SoC solutions are a key part of Socionext Europe’s competencies. Our expertise in R&D, design, development and support ensures we can supply SoC solutions to meet the demands of our customers for both today and future realizations.
Locations

Socionext Inc.

Global Headquarters
Shin-Yokohama
Nomura Shin-Yokohama Bldg.,
2-10-23 Shin-Yokohama,
Kohoku-ku, Yokohama,
Kanagawa, 222-0033, Japan
Tel: +81-45-568-1000

socionext.com

Socionext Europe GmbH

European Headquarters
Pittlerstrasse 47
63225 Langen
Germany
Tel: +49-6103-3745-0

European Headquarters
Pittlerstrasse 47
63225 Langen
Germany
Tel: +49-6103-3745-0

Graphics Competence Center
Forstenrieder Strasse 10
82061 Neuried/Munich
Germany
Tel: +49-89-218938-400

Network Solution BU
Theodor-Heuss-Strasse 2
38122 Braunschweig
Germany
Tel: +49-531-21368-0

eu.socionext.com