

PORTFOLIO / OFFER IN MICRO-NANOELECTRONICS

Systemcom microelectronic goods and services are protected by the trademark: MAR-WIN®

1. Know-how Transfer: Analogue and Mixed Signal Integrated Circuits (IC) Design

Knowledge Base:

- Design methodology for analogue & mixed signal integrated circuits
 - includes RTL digital design and synthesis
 - includes prototyping in FPGA
 - experience in silicon CMOS technologies: analogue & mixed signal - TSMC and TI; digital - Intel and IBM (SOI)
- Lab testing & measurement methodology
- Modelling training (HDL behavioural, MATLAB, Mathematica)
- Deliverables:
 - methodology: design, lab testing, verification, characterisation
 - library: basic circuits and modules OLIB® in TSMC 180 nm technology
 - software: proprietary electronic design automation (EDA) tool chain SILBA-TC®

Know-how transfer by: documentation, dissemination of analogue design practice and flows, training, consulting

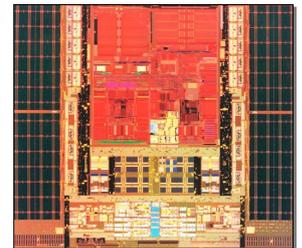
2. Services

Integrated Circuits Design

- **Analogue and Mixed Signal ICs:** feasibility study, specification, architecture, chip-level system partitioning and modelling (MATLAB), system / block / circuit design levels (schematics), HDL behavioural modelling, physical design (layout), prototype, functional verification & assertion of system performance, documentation
- **Digital ICs:** specification, architecture, HDL (RTL) description, synthesis, verification, prototype, functional verification & assertion of system performance, documentation
- **Implementation: IP modules, SoC, ASIC, FPGA**
- **Lab testing and measurement:** measurement system development (microcontroller based embedded system), PCB design, chip measurement & characterisation, data collection & analysis
- **Consultancy and training service**

More than ten years experience in IC design service

Compaq / HP:
Alpha microprocessor



Key Performances: ✨ established industry know-how ✨ in situ work at partner's premises and/or remote work through VPN ✨ seamless integration with an organization's core technology ✨ effective project management, excellent communication skills, good English ✨ experience in working with "industry standard" EDA tools as Cadence, Synopsys, Mentor Graphics, Xilinx, as well as with partners' tools ✨ fruitful collaboration with academic community ✨ established intellectual property protection ✨

Embedded Systems Solutions

New solutions featuring also hardware and software co-design (microcontroller and/or FPGA):

- Development of embedded systems based on microcontroller implemented either as standard microcontroller component or as soft microcontroller core in FPGA together with supporting digital logic
- PCB implementation and hardware/software integration
- Development and porting of GNU based tool chain for target microcontroller
- Development of Integrated Development Environment (IDE) for target microcontroller based on Eclipse framework

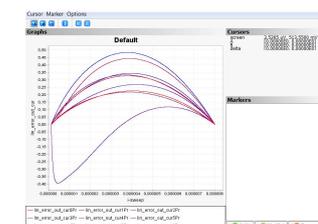
Software Development & Production

New software products development and/or improving existing software solutions featuring:

- Strong working knowledge in programming and script languages: C/C++, Java, Visual Basic, Tcl, Perl, Python, Bash, Tsch, Swing...
- Familiarity with various operating system like Linux, Microsoft Windows, Solaris, Tru 64 Unix, OpenVMS
- Complex graphical solutions
- Experience in comprehensive software engineering projects
- Knowledge of algorithms and data structures
- Good software debugging skills
- Strong background in electronics, semiconductors and computer engineering

Example:

Data visualisation done in the proprietary EDA tool SILBA-TC®



Some Advantages in Doing Business in Croatia

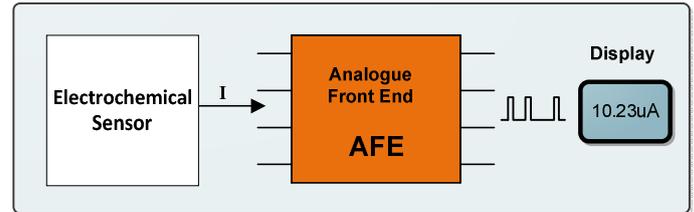
✨ good education, comprehensive knowledge, experience and skills of Croatian engineers and managers ✨ universities and high schools known by high quality education in mathematics, physics, ICT, English ✨ long-standing tradition in microelectronics from ~1960 ✨ strong ICT sector ✨ recognized and supported on State level: intellectual property protection, legal regulations, international standards ✨ member of the EU with advantageous overall business costs ✨ good geographic position on the Adriatic sea, in the middle of Europe, with nice climate ✨

3. Products: Integrated Circuits - Sensor Interface AFE Family

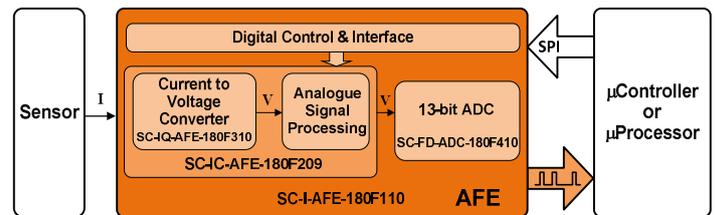
Systemcom Analogue Front End (AFE) family, consisting of ASICs and/or IP (Intellectual Property) modules, is designed as a sensor signal interface for sensors with current at the output. This current is the input to the signal-processing electronic system. Therefore, AFE provides a complete signal path between sensor system and microcontroller or microprocessor, generating digital word proportional to the input current. It is optimized for low current input, low power & high resolution applications. This modular family consists of 5 compatible and consequential IP modules, listed also at [Design&Reuse Catalogue](#):

Application example

Electrochemical sensor built in the electronic device



Electronic device set-up with AFE structure shown



- **SC-I-AFE-180F110**
Current Input Analogue Front-End with 13-bit ADC
- **SC-IQ-IUC-180F310**
Current-to-Voltage Converter
- **SC-IC-AFE-180F209**
Current Input Analogue Front End - Core
- **SC-I-AFE-180F210**
Current Input Analogue Front End with SPI Interface
- **SC-FD-ADC-180F410**
Fully Differential 13-bit ADC

Key Features for SC-I-AFE-180F110:

- Detection and measurement of **low input current [absolute value]** from **hundreds of picoA to 1 mA**
- Detection and measurement of small **input current difference ΔI (hundreds of picoA)**
- Excellent linearity and fast current to voltage conversion achieved by using Transimpedance Amplifier (TIA) architecture
- Active mode (6 mW) and sleep mode operation with low power consumption, ideally suited for battery-powered devices
- Temperature range: from -40°C to 125°C
- Prototype is silicon proven in TSMC 180 nm mixed signal CMOS
- Easy System on Chip (SoC) integration of follow up functions
- Customization and technology migration available on-demand

This AFE solution is easily customizable if incorporating sensors with charge (Q) or voltage output like rotation meter, humidity meter, gyroscope, accelerometer, pressure (+ altitude), temperature, etc.

The great new space for detecting subtle bio, physical and chemical phenomena has been opened by using amazing sensors developed either in MEMS or in nanotechnology. It usually requires so called SIP (System in Package) solution with two chips mounted in the same package: MEMS or nano-sensor + AFE. Furthermore, those AFE IP modules could be used as a core for various embedded or intelligent sensor systems that integrate all three functions in one chip: sensor + AFE + DSP (or microcontroller).

Systemcom offers the ideal AFE solution when incorporating light, chemical or radiation sensors / biosensors that usually have current output. Vertical market segments with the examples representing attractive applications (not only ones) are as follows:

- **Medical and biomedical:** minimally invasive diagnostics by imagers and image processors with low light sensitivity; non-invasive optical glucose meter; optical blood oxymeter; heart rate monitor; blood analysis devices including gases; chromatography; x-ray detection; CT scanners; pyrometers; telemedicine (e.g. tests done at home by battery powered devices)...
- **Environmental:** soil, air, water pollution monitoring in agriculture, aquaculture, ecology; CO₂ sensors based on the infrared technology; moisture sensors with the optical detection based on the light dispersion; smoke detectors based on the photoelectric detectors...
- **Automotive:** car body electronics; driver safety systems; light angle sensor (for air-conditioning setup); rain sensor used for the automated windshield wipers; tire pressure control; exhaust gases control; built-in medical instruments (blood pressure, alcohol detection, etc.); gadgets...
- **Industrial:** quality monitoring and control in overall industry, e.g. food industry; the industrial and residential safety by the emission detection using various sensors like oxygen, carbon dioxide, carbon monoxide, alcohol, ammonia, hydrogen sulphide, sulphur dioxide; position detectors - measurement of distance, relative position and angle; energy saving & control equipment like smart meters and smart grids (electricity, water, heat, gas); solar panels management...
- **Communications, computing, consumer and cutting-edge mobile devices** like smartphones and tablets. They already have built in accelerometer, gyroscope, digital compass, pressure + altitude, temperature sensors. The trend is to incorporate much more sensors for improving the everyday life (ambient light, UV light for sun light strength, proximity based on the reflection of the object, radiation, smoke-alarm, air quality, humidity, specific gases, glucose, alcohol detector, etc.). Silicon Nose is a tiny silicon chip that can be embedded in mobile devices to detect and then map the location and extent of gas leaks and toxins in the air - very interesting for the protection of the general population. Other applications are: data-acquisition systems, surveillance, battery-powered / portable devices, etc.

About Systemcom Ltd. Founded in 1993, Systemcom Ltd. is a privately owned fabless design house located in Zagreb, Croatia. It supplies IC design service, IP modules and ASICs for worldwide customer base, not only for sensor applications, but also for other high performance analogue, mixed signal and digital ICs. The expertise in microelectronics and software development has been achieved in the long-standing collaboration with **Bosch, Intel, Compaq/HP** (recognitions available on demand). It is recognized as one of the best Croatian companies, dedicated to support customers in achieving required quality and the shortest time cycle from the product concept to launching.

ICT office

Maksimirska 120, 10000 Zagreb, Croatia
phone: +385-1-2339-591, 2339-592, 2335-880
fax: +385-1-2339-590

email: info@systemcom.hr
<http://www.systemcom.hr>

Headquarters

Kruciceva 4, 10000 Zagreb, Croatia
phone / fax: +385-1-4819-020

July 2013.