

SC-IQ-IUC-180F310

Current-to-Voltage Converter

The path from the real world to the digital word

The **SC-IQ-IUC-180F310** is a current-to-voltage converter designed as silicon **IP module**. This chip converts current captured from the sensor system to fully differential output voltage, ready to be amplified. Highly linear current to voltage conversion is achieved by using Transimpedance Amplifier (TIA) architecture with 8 current ranges and specially designed built-in offset cancellation. The output signals are ready for further analogue signal processing and analogue-to-digital conversion.

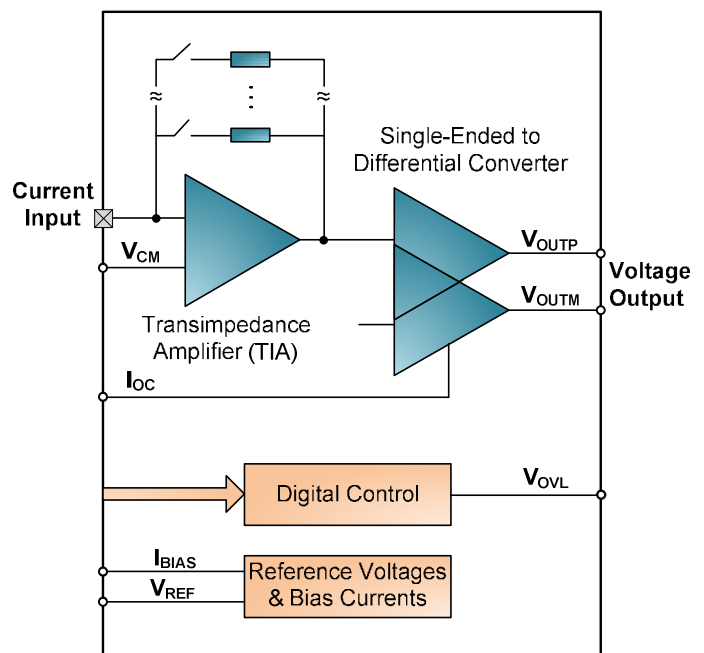
It is ideally suited for a broad range of devices with sensor systems where the generic information about the phenomenon to be measured - light or other physical or chemical or electrochemical appearance - passes the first electrical conversion to the current. The IP implementation enables easy further System on Chip (SoC) integration of follow up functions.

Key Features

- Detection and measurement of **low input current** from **hundreds of pA to 1 mA [absolute value]**
- Continuous current-to-voltage conversion
- Highly linear transfer characteristic:
<0.7 LSB for 12-bit resolution (resistive load >9 kΩ)
- Fast response time: ~ 25 μs
- Unique offset cancelling solution
- Voltage at input pin regulated for all operating modes
- Eight programmable current ranges
- Current ranges are fully monitored through comparator's output overload detection
- Fully differential output with output range of 1.3 Vp-p
- Single supply voltage: 1.6 V to 1.8 V
- Low power dissipation: ~ 1.7 mW
- Operating temperature range: -40°C to 125°C
- Small and compact area: ~ 0.75 mm²

Technology

- Silicon validated IP module:
TSMC 180nm 1P6M mixed signal



Functional block diagram SC-IQ-IUC-180F310

Advantages on the Chip Level

Features which make the difference, worthy to be highlighted:

- Detection and measurement of small **input current difference (ΔI)** on the level of **hundreds of pA** with additional signal processing
- Direct interface to the sensor system without external components
- Single-ended current input with fully differential (FD) voltage output for further signal processing
- Low power design ideally suited for battery-powered operation
- Built-in guard rings for noise isolation
- Carefully done layout, following circuit design, with special emphasis on matching
- Fully functional temperature range: from -40°C to 125°C, under investigation up to 180°C

Customization Offer

The customization is open to the potential customers on demand. The key emphasis is to meet the system developers' needs in a way to allow quick customization and/or optimization either for the specific sensor system or the application.

Flexible re-configurations of the built-in functions are feasible because of the modular design and our original circuit solutions (some features could be changed).

Some additional redesign or new circuits built-in options are as follows:

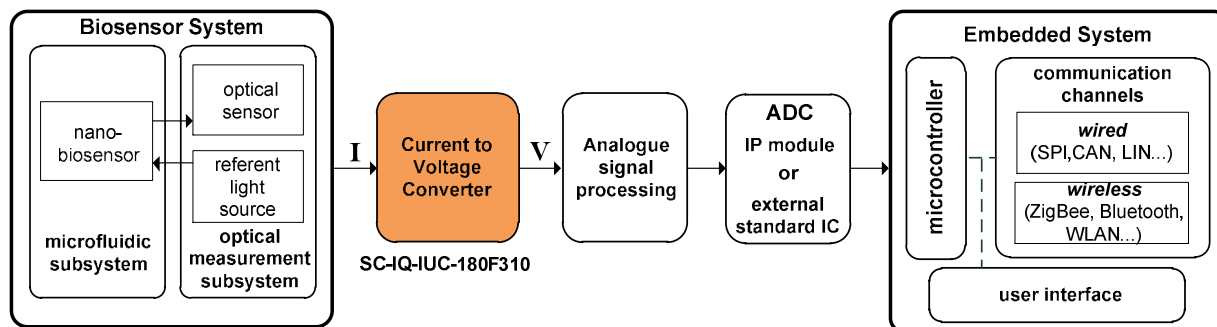
- Customisable current ranges on demand, for instance:
 - high current detection up to **10 mA** (for the industrial applications)
- Ability to upgrade into multi-channel input, etc.

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Application Areas

- **Industrial & Consumer:** bio industry - medical, environmental, agriculture, aquaculture, food, ecology (soil, air, water pollution monitoring) / photonics / energy & process control (smart meters & grids) / instrumentation / automotive & security/military equipment & aircrafts/smart phones, gadgets, PCs & notebooks with built-in sensors
- **R&D and scientific projects**, especially in the life science



Application example: *Modern medical diagnostic device based on the achievements in bio-, micro- & nano-technology with the optical sensor as a phenomenon detector*

Benefits on the System Level

- Detection and measurement of low input current in the range of hundreds of pA, well suited for biosensors, photosensors, LED and PIN diodes
- Top performance is the imperative in the systems built with nanobiosensors, MEMS/MOEMS biosensors and microfluidic systems ("lab-on-a-chip")

Support on the System Level

Our key goal is that this analogue IP module implementation meets the system level performance of competing dedicated ICs, optimized both in price and performance. With strong technical HW and SW expertise Systemcom Ltd. can provide customers with the following all-around additional technical support (on-demand):

- Additional chip measurements and characterisation
- Service in the evaluation board (PCB) design to be used for device testing, production, after-sales, R&D
- Development of the specific test environment (both SW and HW)
- System level consulting on the customer's specific application requirements
- Development of the embedded system including respective microcontroller software
- Support during SoC design
- Participation in the modelling on the system level based on the models like VHDL and MATLAB

Deliverables

- GDSII layout database
- Assembly guidelines and integration support
- Datasheet
- Behavioural VHDL model for SoC simulations
- Layout footprint
- Application notes

On demand:

- LVS/SPICE netlist
- MATLAB model for effective system design

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

SC-IC-AFE-180F209 does not contain the block: *Digital Control & Interface* which is usually the part of overall SoC solution.

This block is incorporated in **SC-I-AFE-180F210**.

Systemcom AFE Family

Contact Data

For further technical and sales communication please contact us at: afe@systemcom.hr

Sale Business Models

- License fee
- Royalties
- Customization / Consulting / Training

About Systemcom Ltd.

Systemcom Ltd, founded in 1993, is a SME design house and reliable semiconductor design partner. We provide best quality IC design services (analogue, digital and mixed signal) and high performance products (IP modules). With long-term expertise in HW and SW development we are dedicated to support customers in achieving shortest time cycle from product concept to revenue shipment. Systemcom strong references are, among others: in analogue and mixed signal design: Robert Bosch GmbH; in digital design: Intel (Itanium), HP and Compaq (Alpha microprocessor).