



# SCALDIO RECONFIGURABLE RADIO TRANSCEIVER IP

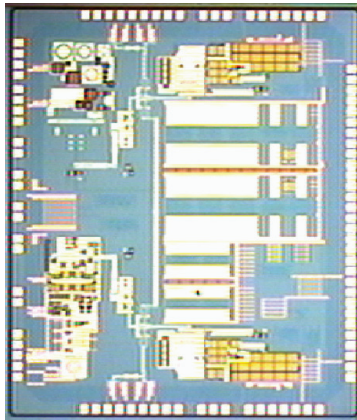
The Scaldio technology is suitable for mobile handsets and all kind of battery-powered wireless connectivity devices, as well as for base-stations for small cells, and can be programmed to meet the requirements for many standards and dedicated needs.

## NEXT-GENERATION WIRELESS ACCESS ASKS FOR RECONFIGURABLE RADIOS

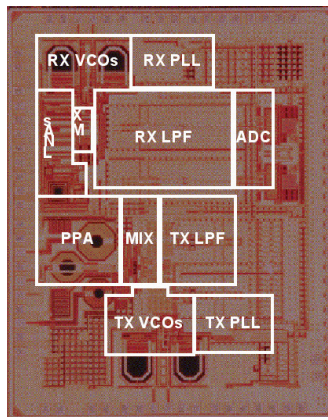
The trend in wireless communication where terminals give their users ubiquitous access to a multitude of services drives the development of reconfigurable radios in deep-submicron CMOS. This is enhanced with the advent of 3GPP-LTE, a standard that is inherently so flexible that a reconfigurable radio is its most economical implementation. The single-chip reconfigurable transceiver 'Scaldio' technology provides an answer to this need.

## TECHNOLOGY DESCRIPTION

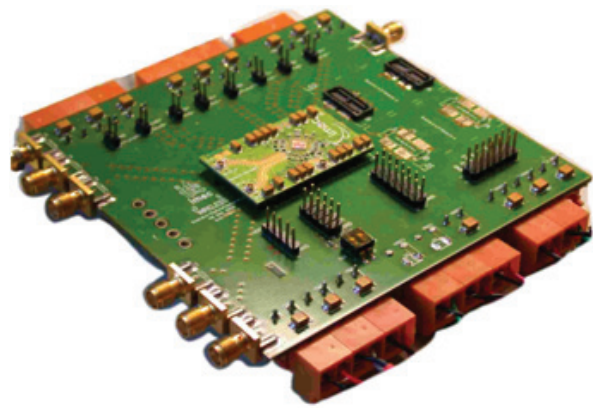
- ▶ Imec's reconfigurable radio front-end, named SCALDIO (scalable radio), is programmable to operate with all current and future cellular, wireless local area network (WLAN), wireless personal area network (WPAN), broadcast and positioning standards in the frequency range between 174MHz and 6GHz.
- ▶ The unique architecture of the flexible RF front-end achieves a power consumption, performance and CMOS chip area competitive with current state-of-the-art single-mode radio front-ends. The average power consumption can be reduced even further by using the flexibility to exploit real-time power/performance trade-offs when allowed by the environmental conditions. E.g., by reducing the filtering level when there is less/no interference.
- ▶ Imec has 2 generations of SCALDIO radio transceivers with proven silicon performance: SCALDIO-1 and SCALDIO-2. SCALDIO-2 has been realized in a digital system-on-chip (SoC) 40nm CMOS technology. It fits the cost requirements for integration into next-generation mass volume devices. SCALDIO-1 has been realized in a 130nm CMOS technology thereby offering cost advantages for niche applications.



01  
SCALDIO-1



02  
SCALDIO-2



03  
SCALDIO-1 Evaluation Board

### SCALDIO-1 SPECIFICATIONS

- ▶ RF tuning range: 100 MHz – 6GHz
- ▶ Signal bandwidths supported: 700kHz – 40MHz
- ▶ 130nm CMOS, no analog or RF technology options.
  - 1.2V supply
  - 3x3.8mm<sup>2</sup>
  - 50-100mA, depending on configuration

### SCALDIO-2 SPECIFICATIONS

- ▶ RF tuning range: 100 MHz – 6GHz
- ▶ Signal bandwidths supported: 200kHz – 40MHz
- ▶ Digital 40nm CMOS, no analog or RF technology options
  - 1.1V supply
  - 5mm<sup>2</sup>
  - 30-100mA, depending on configuration
- ▶ Performance optimized for cellular (GSM, UMTS, WCDMA, 3GPP-LTE,...) and broadcasting standards (DVB-H,...)
- ▶ Compatible with SAW-less 3GPP-LTE

### MORE INFORMATION

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### SCALDIO-2: A 5 mm<sup>2</sup> 40nm CMOS 0.1 – 6GHZ RECONFIGURABLE RADIO TRANSCEIVER

SCALDIO-2 consists of a single-chip reconfigurable receiver, transmitter and 2 frequency synthesizers in 40nm digital CMOS technology.

The flexible receiver, including analog-to-digital converter, is fully software configurable across all channels in the frequency bands between 100MHz and 6GHz. Its properties (such as the RF carrier frequency, channel bandwidth, noise figure, linearity, filter characteristic) can be adapted to the requirements of the standards that are used. It combines high sensitivity for cellular standards, low phase noise, and high linearity for the inter-modulation test in DVB-H mode. The flexible transmitter reaches very low out-of-band noise, making it compatible with SAW-less 3GPP-LTE operation. This enables to reduce the bill of materials and board space of mobile devices. The transceiver is further characterized by a very low power consumption and an extremely small chip area of only 5mm<sup>2</sup>. All these targets are achieved by optimizing both the overall transceiver architecture and the individual building blocks to exploit the speed capabilities of the scaled digital technology while minimizing the total area occupied by passive devices. Therefore, it is competitive with state-of-the-art single-mode radios in mobile devices – handsets, smart phones, PDAs, PC cards, USB dongles, etc. Moreover, its high performance, ultra-low power and low cost features make the transceiver suited for next generations of mass volume mobile devices.

In the next phase of the project, the focus will be on improving the multi-mode power efficiency of the transmitter and radically increasing the linearity of the receiver beyond current state-of-the-art. Such an extremely linear receiver reduces the dependability on external (bulky, non-flexible, expensive) filters and enables a reconfigurable antenna interface. As a result, the bill of materials and cost of these reconfigurable radio transceivers can be significantly reduced.

### SCALDIO TECHNOLOGY AVAILABLE FOR LICENSING, IMEC'S MULTI-PARTNER R&D PROGRAM DESIGNS THE NEXT GENERATION.

The SCALDIO-1 and 2 technology is available for licensing. The technology can be evaluated at imec, where we offer customer-dedicated workshops including hands-on session and support for evaluating and testing the reconfigurable radio transceiver prototype.

In its green radio R&D program, imec partners up with industrial players to design the next generation, targeting increased integration and improved power efficiency for cognitive reconfigurable radios.

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