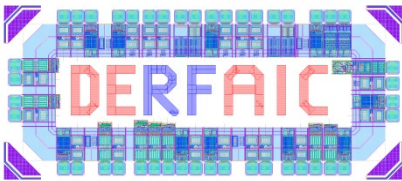
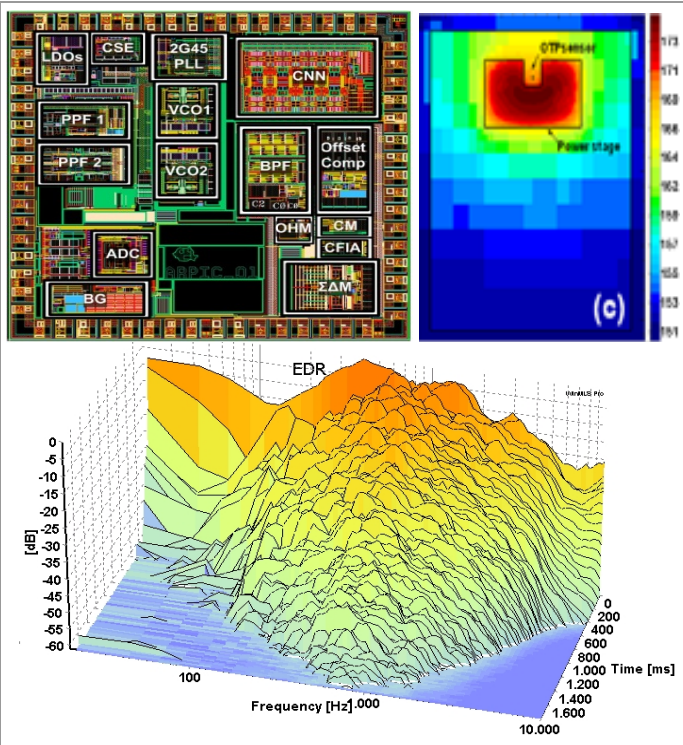


# DIGITALLY ENHANCED ANALOG AND RF INTEGRATED CIRCUITS

## Contact details

Name	Digitally Enhanced Analog and RF Integrated Circuits
Acronym	DERFAIC
Logo	
Site	<a href="http://www.icdesign.utcluj.ro/">http://www.icdesign.utcluj.ro/</a>
Address	26-28 G. Baritiu St, Rooms 26, B2, B3, S3.1, S3.2, Cluj-Napoca
Faculty	Faculty of Electronics, Telecommunications and Information Technology
Department	Basis of Electronics Department
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Director	Prof. Dr. Marina Topa
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## Areas of expertise

### Design of RF, Analog and Mixed-Signal Integrated Circuits

- High performance Power Management circuitry, including Energy harvesting and conversion
- Reconfigurable and programmable analog circuits; Analog Front-Ends for sensors
- Digitally-intensive frequency synthesizers and Low-power radio transceivers

### Circuit and Signal Theory and Applications

- Systematic and optimized design of analog and digital circuits; Feedback theory & stability
- System modelling and analysis; Electro-thermo-mechanical analysis of power integrated circuits

### Electronic circuits and systems for acoustics

- Optimized synthesis of acoustic equalizers; Analysis and improvement of the acoustic behaviour of enclosures

### Methodologies for optimized design and testing of electronic circuits and systems

- Multivariate performance analysis for application verification. Yield analysis.
- Automated pre- and post-silicon verification methods

### Algorithms and techniques for compensating effects of non-idealities inherent to analog circuits & systems

- Compensation of IQ mismatch in integrated radio receivers; Reduction and compensation of DC offsets
- Digital control of DC-DC Converters

## Team

Prof. Dr. Marina Topa, Assoc.Prof. Dr. Marius Neag, Assoc.Prof. Dr. Botond-Sandor Kirej, Lect. Dr. Ioana Sărăcuț, Lect. Dr. Erwin Szopos, Lecturer Dr. Raul Onet, Assist. Prof. Dr. Călin Fărcaș, Dr. Ingrid Kovacs, 10+ PhD and Master students

## Representative projects

**HELP - Home Electronic Laboratory Platform**; Erasmus+ ; Grant No. 2020-1-IE02-KA226-HE-000786, 2021-2023

**PartEnerIC - Parteneriate pentru transfer de cunoștințe și tehnologie în vederea dezvoltării de circuite integrate specializate pentru creșterea eficienței energetice a noilor generații de vehicule**, POC2014, Ctr.19 (2016-2022)

**iDev4.0 - Integrated development 4.0 (Dezvoltare integrată 4.0)**, Program ECSEL Call H2020-ECSEL-2017-1-IA-TWO STAGE, contract nr. 783163-iDev40, POC 72/1/2, Componenta 1: RO-ECSEL - Crearea de sinergii cu acțiunile de CDI ale programului cadru ORIZONT 2020 al Uniunii Europene și alte programe CDI internaționale (2020-2021)

**NAPOSIP – “New Approaches to Analyzing and Designing High Frequency Synthesizers Performance for Modern Communication Systems”**, PNIII 43 BG/2016 (2016-2018), <https://naposip.utcluj.ro/node/1>

**“Design of functional blocks for high-performance power management integrated circuits”**, R&D Consultancy for Romanian industrial partner, 2023-2024

**“High-performance integrated LDO regulators”**, R&D Consultancy for Romanian industrial partner, 2021-2022

**“Analog Front-End for Automotive Sensors”**, R&D Consultancy for foreign industrial partner, 2015-2017

**“Optimized power-management circuits for automotive applications”**, R&D Consultancy, RO partner, 2014-2017

**“Analog Front-End for Automotive Sensors”**, R&D Consultancy for foreign industrial partner, 2015-2017

**“New Methodologies for multivariate performance analysis”**, R&D Consultancy for RO industrial partner, 2014-2016

## Significant results

**Representative publications in the last 5 years:**

1. R. Onet, M. Neag, A. Fazakas, P. Miresan, G. Petrasuc, I. Sularea, A. Battigelli, M. Murray, M. Hill – “A Blended On-Campus and At-Home Approach to Laboratories on Electronic Circuits”, *Romanian Journal of Information Science and Technology*, Volume 26, Number 2, 2023, 167–180
2. C. Răducan, M. Neag, "Slew-Rate Booster and Frequency Compensation Circuit for Automotive LDOs", *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 69, no. 1, pp. 465-477, Jan. 2022
3. C. Răducan, M. Neag and A. -G. Băjenaru, "Automotive Switched-Capacitor DC-DC Converter With High BW Power Mirror and Dual Supply Driver," in *IEEE Trans. Circuits and Systems I*, vol. 69, no.1, pp. 452-464, Jan. 2022,
4. A.-T. Grăjdeanu, C. Răducan, C.-S. Pleșa, M. Neag, L. Vârzaru & M. Țopa, "Fast LDO Handles a Wide Range of Load Currents and Load Capacitors, up to 100 mA and over 1 $\mu$ F", *IEEE Access*, vol. 10, pp. 9124-9141, Jan.2022
5. C.-S. Pleșa, C. Răducan, A.-T. Grăjdeanu, O. Serpedin, M. Neag, "An Area-Efficient Automotive LDO with Scalable Maximum Load Current Exhibits Excellent Response to Line and Load Transients", *AEU - International Journal of Electronics and Communications*, Volume 149, May 2022, 154136, ISSN 1434-8411,
6. C. Răducan, M. Neag, A.-T. Grăjdeanu, M. Țopa, A. Negoită, – “A High-Precision Low-Temperature Drift LDO Regulator Tailored for Time-Domain Temperature Sensors”, *Sensors*, vol 22, issue 4:1518, February 2022,
7. P. Coste, I. Kovács, M. Neag, A. -T. Grăjdeanu, V. -A. Ionescu and M. D. Țopa, "Type-II Compensation for Automotive Buck Converters Implemented by Fully Integrated Capacitor Multiplier," in *IEEE Access*, vol. 10, 2022,
8. V. Belega, C.-S. Pleșa, R. Onet, M. Neag, "Methods for Assessing the Stability of Conditionally Stable Circuits by Using Small-signal Simulations", *ROMJIST*, Volume 25, No 2, 2022, pages 205-223
9. I. Sularea, C. Răducan, M. Neag, - “High Power Supply Rejection Capacitor-less Low Dropout Regulators Based on High Slew Rate Symmetrical Operational Transconductance Amplifiers”, *ROMJIST*, Vol. 25, No 2, 2022, pp 179-204
10. P. Miresan, M. Neag, M. Topa, I. Kovacs, L. Vârzaru, “Multipurpose Drivers for MEMS Devices Based on a Single ASIC Implemented in a Low-Cost HV CMOS Process Without Triple Well”, *Journal of Sensors*, vol. 2021
11. G. Petrasuc, P. Miresan, M. Neag, C. Chira, “A Novel Full-Wave Current Sensor for Automotive Synchronous Buck Converters”- *ROMJIST*, Volume 24, Number 2, June 2021, pages 161-181
12. Marius Neag, István Kovács, Raul Onet, Iulian Câmpanu, “Design options for high-speed OA-based fully differential buffers able to drive large loads”, *Microelectronics Journal*, Volume 114, (2021), 105115,
13. Paul Coste, Paul Mărtari, Marius Neag, Marina Topa, Vlad Ionescu, "Programmable Capacitor Multiplier Based on Gm-cell with Two Outputs – Topology, Circuit Implementations and Applications" - *Romanian Journal of Information Science and Technology*, Volume 24, Number 1, March 2021, pages 4–27
14. Fărcaș, C.A., Szopos, E., Sărăcuț, I., Neag, M., Topa, M.D. - Experiments on Multiple-point Room Equalization Applied to Medium-sized Enclosed Spaces. *Acoustical Physics*, vol 67, issue 5, pp. 537–552 (2021).
15. Paul Miresan , Raul Onet, Marius Neag, Marina Topa, Cosmin Chira – “Design options for implementing in standard CMOS drivers for MEMS body biasing”, *Microelectronics Journal*, vol. 97 (2020) 104705
16. C. Răducan, A.-T. Grăjdeanu, C.-S. Plesa, M. Neag, A. Negoită, M. Țopa – “LDO with Improved Common Gate Class-AB OTA Handles any Load Capacitors and Provides Fast Response to Load Transients”, *IEEE Trans. on Circuits and Systems I - Regular Papers*, vol 67, issue 11, November 2020, pp. 3740-3752
17. N. Braic, C. Răducan, M. Neag, M. Țopa, V. Ionescu, " Ascertaining the root-cause of discrepancies between simulations and measurements for a SC DC-DC converter", *ROMJIST*, Vol. 23, No 4, 2020, pages 333 - 353
18. C.-S. Plesa, B. Dimitriu, M.s Neag – Design Options for Thermal Shutdown Circuitry with Hysteresis Width Independent on the Activation Temperature, *Advances in Electrical and Computer Engineering*, Vol. 19, No 1, 2019,
19. C.-S. Plesa, M. Neag, C. Boianeanu - “Design of Over-Temperature Protection for Switched-Capacitor DC-DC Converter Based on Electro-Thermal Simulations”, *ROMJIST*, Volume 22, Number 2, 2019, pages 144–157
20. B.S.Kirei, V.I.M. Chereja, S.Hintea, M.D.Țopa, “PAELib: A VHDL Library for Area and Power Dissipation Estimation of CMOS Logic Circuits”, *Advances in Electrical and Computer Engineering*, Volume 19, Number 1, pp. 9-16, 2019

**Patents:**

D. Petreus, M. Neag, B. Morley – Improved MPPT control for PWM-based DC-DC converters with average current control, Republic of Ireland, 2010, IES20100461 (A2), WO2012010613 (A1)

M. Neag, M. McCullagh, G. Marow, M. McLaughlin, I. Kovács - Frequency Comparator and Early-Late Detector, US patent 2015, US20160191035

Cristian Răducan, Alina-Teodora Cirlescu, Marius Neag - “Voltage regulator and method of voltage regulation, German patent 2021, DE102020115851B3

**Product realized for industrial beneficiaries:**

1. Low-power, high-performance Low dropout voltage regulators, DC-SC converters with and without inductors
2. High-Voltage LDO for automotive applications: IC designed for Infineon Technologies Romania, in mass production
3. Analog Front-End for automotive sensors – integrated in 0.18 $\mu$ m CMOS technology, for Melexis Technologies NV,
4. Frequency synthesizer integrated within an UWB transceiver produced in 90nm technology

**The offer addressed to the economic environment**

Research & development	Low-Power, High-Performance RF, Analog and Mixed-signal Integrated Circuits and Systems Design of electronic systems and circuits using advanced modelling and optimization methods Adaptive filters for processing of non-stationary signals by non-linear systems, acoustics Electronic systems and circuits for harvesting power from un-conventional energy sources
Consulting	Analysis and design of analog, RF and mixed-signal integrated circuits Analysis and design of digital systems, including FPGA and/or ASIC implementation Design of electro-acoustic systems – echo cancellation, reverberation, signal separation, equalization
Training	Systematic & Optimized Design of RF, Analog and Mixed-Signal Integrated Circuits

Last update on February 2024