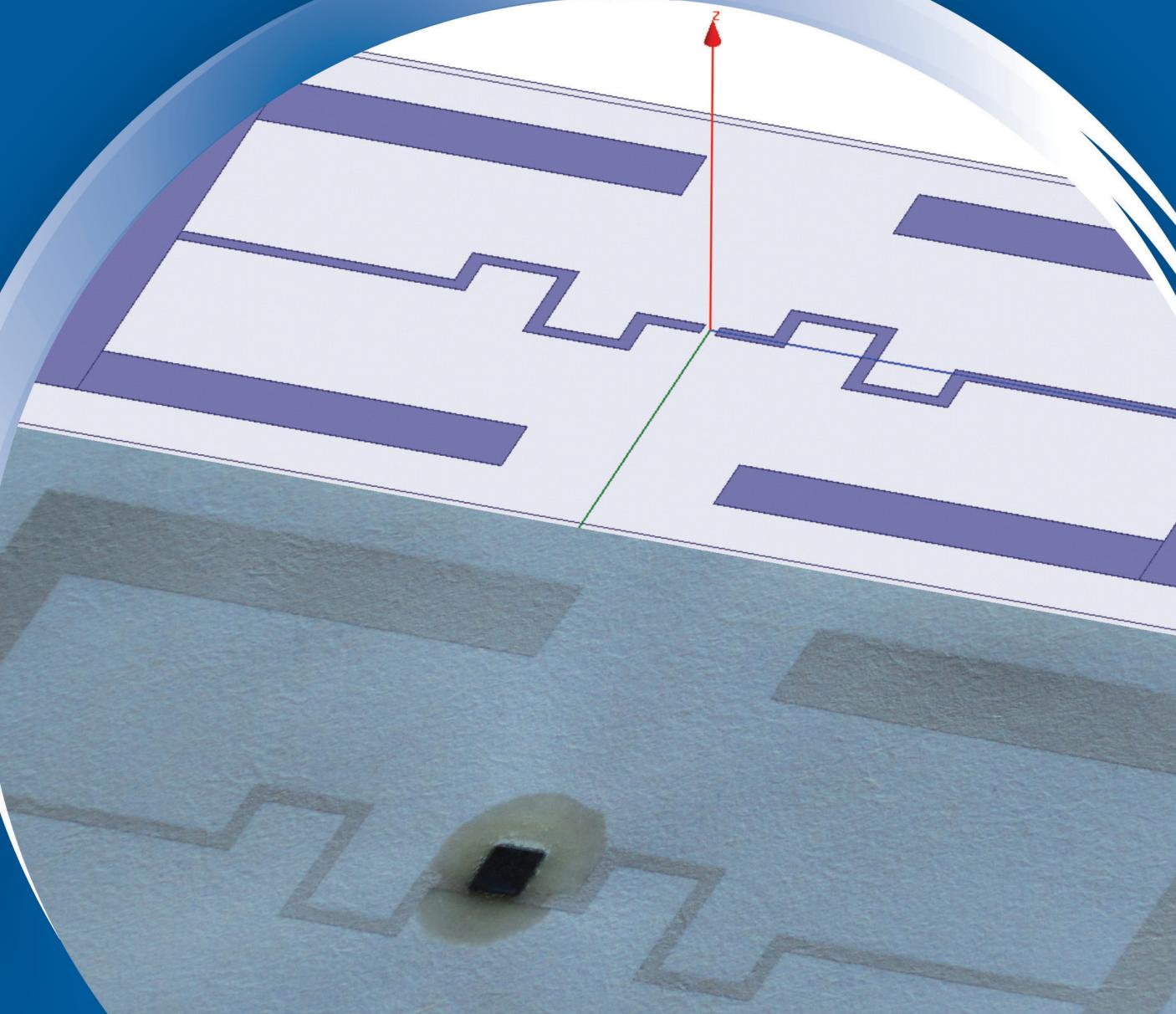


ISSN 0352-9045

Informacije MIDEM

*Journal of Microelectronics,
Electronic Components and Materials
Vol. 43, No. 1 (2013), March 2013*

*Revija za mikroelektroniko,
elektronske sestavne dele in materiale
letnik 43, številka 1 (2013), Marec 2013*



Informacije MDEM 1-2013

Journal of Microelectronics, Electronic Components and Materials

VOLUME 43, NO. 1(145), LJUBLJANA, MARCH 2013 | LETNIK 43, NO. 1(145), LJUBLJANA, MAREC 2013

Published quarterly (March, June, September, December) by Society for Microelectronics, Electronic Components and Materials - MDEM.
 Copyright © 2012. All rights reserved. | Revija izhaja trimesečno (marec, junij, september, december). Izdaja Strokovno društvo za mikroelektroniko, elektronske sestavne dele in materiale – Društvo MDEM. Copyright © 2012. Vse pravice pridržane.

Editor in Chief | Glavni in odgovorni urednik

Marko Topič, University of Ljubljana (UL), Faculty of Electrical Engineering, Slovenia

Editor of Electronic Edition | Urednik elektronske izdaje

Kristijan Brecl, UL, Faculty of Electrical Engineering, Slovenia

Associate Editors | Odgovorni področni uredniki

Vanja Ambrožič, UL, Faculty of Electrical Engineering, Slovenia

Slavko Amon, UL, Faculty of Electrical Engineering, Slovenia

Danjela Kuščer Hrovatin, Jožef Stefan Institute, Slovenia

Matjaž Vidmar, UL, Faculty of Electrical Engineering, Slovenia

Andrej Žemva, UL, Faculty of Electrical Engineering, Slovenia

Editorial Board | Uredniški odbor

Mohamed Akil, ESIEE PARIS, France

Giuseppe Buja, University of Padova, Italy

Gian-Franco Dalla Betta, University of Trento, Italy

Martyn Fice, University College London, United Kingdom

Ciprian Iliescu, Institute of Bioengineering and Nanotechnology, A*STAR, Singapore

Malgorzata Jakubowska, Warsaw University of Technology, Poland

Marc Lethiecq, University of Tours, France

Teresa Orlowska-Kowalska, Wrocław University of Technology, Poland

Luca Palmieri, University of Padova, Italy

International Advisory Board | Časopisni svet

Janez Trontelj, UL, Faculty of Electrical Engineering, Slovenia - Chairman

Cor Claeys, IMEC, Leuven, Belgium

Denis Đonlagic, University of Maribor, Faculty of Elec. Eng. and Computer Science, Slovenia

Zvonko Fazarinc, CIS, Stanford University, Stanford, USA

Leszek J. Golonka, Technical University Wrocław, Wrocław, Poland

Jean-Marie Haussonne, EIC-LUSAC, Octeville, France

Barbara Malič, Jožef Stefan Institute, Slovenia

Miran Mozetič, Jožef Stefan Institute, Slovenia

Stane Pejovnik, UL, Faculty of Chemistry and Chemical Technology, Slovenia

Giorgio Pignatelli, University of Perugia, Italy

Giovanni Soncini, University of Trento, Trento, Italy

Iztok Šorli, MIKROIKS d.o.o., Ljubljana, Slovenia

Hong Wang, Xi'an Jiaotong University, China

Headquarters | Naslov uredništva

Uredništvo Informacije MDEM

MDEM pri MIKROIKS

Stegne 11, 1521 Ljubljana, Slovenia

T. +386 (0)1 513 37 68

F. + 386 (0)1 513 37 71

E. info@midem-drustvo.si

www.midem-drustvo.si

Annual subscription rate is 100 EUR, separate issue is 25 EUR. MDEM members and Society sponsors receive current issues for free. Scientific Council for Technical Sciences of Slovenian Research Agency has recognized Informacije MDEM as scientific Journal for micro-electronics, electronic components and materials. Publishing of the Journal is cofinanced by Slovenian Book Agency and by Society sponsors. Scientific and professional papers published in the journal are indexed and abstracted in COBISS and INSPEC databases. The Journal is indexed by ISI® for Sci Search®, Research Alert® and Material Science Citation Index™. | Letna naročnina je 100 EUR, cena posamezne številke pa 25 EUR. Člani in sponzorji MDEM prejemajo posamezne številke brezplačno. Znanstveni svet za tehnične vede je podal pozitivno mnenje o reviji kot znanstveno-strokovni reviji za mikroelektroniko, elektronske sestavne dele in materiale. Izdajo revije sofinancirajo JAKRS in sponzorji društva. Znanstveno-strokovne prispevke objavljene v Informacijah MDEM zajemamo v podatkovne baze COBISS in INSPEC. Prispevke iz revije zajema ISI® v naslednje svoje produkte: Sci Search®, Research Alert® in Materials Science Citation Index™.

Po mnenju Ministrstva za informiranje št.23/300-92 se šteje glasilo Informacije MDEM med proizvode informativnega značaja.

Content | Vsebina

Original scientific papers

	<i>Izvirni članki</i>
Editorial	2 Uvodnik
I. Sabotin, G. Tristo, G. Bissacco, J. Valentinčič: Optimization of Grooved Micromixer for Microengineering Technologies	3 I. Sabotin, G. Tristo, G. Bissacco, J. Valentinčič: Optimizacija mikromešalnika z utori za izdelavo z mikroinženirskimi tehnologijami
U. Pešović, J. Mohorko, S. Randić, Ž. Čučej: Hidden Node Avoidance Mechanism for IEEE 802.15.4 Wireless Sensor Networkss	14 U. Pešović, J. Mohorko, S. Randić, Ž. Čučej: Mehanizem izogibanja problema skritega vozlišča v IEEE 802.15.4 brezžičnih senzorskih omrežjih
B. Sviličić, E. Mastropaoletti, R. Cheung: Two-Port Piezoelectric Silicon Carbide MEMS Cantilever Resonator	22 B. Sviličić, E. Mastropaoletti, R. Cheung: Dvovhodni piezoelektrični MEMS rezonator na ročico iz silicijevega karbida
V. Đ. Vukić, P. V. Osmokrović: Impact of the Excess Base Current and the Emitter Injection Efficiency on Radiation Tolerance of a Vertical PNP Power Transistor in a Voltage Regulator	27 V. Đ. Vukić, P. V. Osmokrović: Vpliv presežnega baznega toka in izkoristek injekcije emitorja na tolerance radiacije vertikalnega PNP močnostnega tranzistorja v napetostnem regulatorju
I. A. Khan, M. T. Beg: Design and Analysis of Low Power Master Slave Flip-Flops	41 I. A. Khan, M. T. Beg: Načrtovanje in analiza master-slave flip-flop vezij nizkih moči
U. Kavčič, L. Pavlovič, M. Pivar, M. Đokić, B. Batagelj, T. Muck: Printed Electronics on Recycled Paper and Cardboards	50 U. Kavčič, L. Pavlovič, M. Pivar, M. Đokić, B. Batagelj, T. Muck: Tiskana elektronika na recikliranem papirju in kartonu
D. Danković, I. Manić, A. Prijić, V. Davidović, S. Djorić-Veljković, S. Golubović, Z. Prijić, N. Stojadinović: Effects of Static and Pulsed Negative Bias Temperature Stressing on Lifetime in P-Channel Power VDMOSFETs	58 D. Danković, I. Manić, A. Prijić, V. Davidović, S. Djorić-Veljković, S. Golubović, Z. Prijić, N. Stojadinović: Vpliv statičnega in pulznega negativnega temperaturnega stresa na življenske čase v kanalu p močnostnih VDMOSFET-ov

Professional papers

	<i>Strokovni članki</i>
A. B. Yıldız, E. Kelebekler: A Simplified Approach to Analyze of Active Circuits Containing Operational Amplifiers	67 A. B. Yıldız, E. Kelebekler: Poenostavljen pristop analize aktivnega vezja z operacijskim ojačevalnikom
A. T. Mobashsher: Investigation of a Compact Dual-band Handheld RFID Reader Antenna	74 A. T. Mobashsher: Raziskava kompaktne dvopasovne ročne DFID bralne antene
Announcement and Call for Papers: 49 th International Conference on Microelectronics, Devices and Materials With the Workshop on Digital Electronic Systems	81 Napoved in vabilo k udeležbi: 49. Mednarodna konferenca o mikroelektroniki, napravah in materialih z delavnico o digitalnih elektronskih sistemih
Front page: RFID tag with printed antenna (U. Kavčič et. al.)	Naslovnica: RFID etiketa s tiskano anteno (U. Kavčič et. al.)

Editorial | Uvodnik

Dear Reader,

This issue belongs to the second volume of our renewed journal, so it is time to review facts from the previous volume and reveal some statistics. The previous volume (vol. 42) brought some changes and reflects the renewal of the Editorial Board and the journal design. We have internationalized the EB with distinguished researchers across Europe and beyond to cover five areas of research and development:

- **Technologies and Materials** (Associate Editor: Asst. Prof. Dr. Danjela Kuščer Hrovatin)
- **Sensors and Actuators** (Associate Editor: Prof. Dr. Slavko Amon)
- **Electronics** (Associate Editor: Prof. Dr. Andrej Žemva)
- **Power Engineering** (Associate Editor: Prof. Dr. Vanja Ambrožič)
- **Communications** (Associate Editor: Prof. Dr. Matjaž Vidmar)

related to Microelectronics, Electronic Devices and Materials. The renewed Editorial Board counts 16 members (above are named five Associate Editors) with devotion to increase high quality standards for all types of papers being published in our journal (order of appearance in each quarterly issue):

- review scientific paper (*pregledni znanstveni članek*)
- original scientific paper (*izvirni znanstveni članek*)
- professional paper (*strokovni članek*)

Since we publish papers only quarterly we see no purpose to publish letter papers or short communication papers.

All submitted manuscripts undergo peer-review process with up to two reviewers and from manuscripts submitted in 2012 has brought the following statistics of submitted manuscripts:

- accepted 47 % (most of them after minor or major revision)
- rejected 26 % (most of them after revised version)
- under review 16 %
- out-of-scope: 7 % (before undergoing peer-review)
- withdrawn: 4 %.

The whole EB strived to shorten the review process and we cordially thank all reviewers, past, present and future, for their dedicated work in 2012. We have not calculated the time between submission and decision of submitted manuscripts yet, but the time spread is big and mainly depends on the willingness of potential reviewers to accept a manuscript for peer-review. In these modern times when nobody has time it is hard to find reviewers, but a broad international network of experts that members of editorial board have makes our peer-review process objective and time efficient. I sincerely thank all members of editorial board for numerous e-mails in search for reviewers.

In the volume 42 with its four issues we have publish 34 original scientific papers and one professional paper.

We still ask for and encourage you to submit review papers solicited to the above areas to be published. Some short news and announcements may appear at the end of each issue as it used to be in the previous volumes.

Marko Topič
Editor-in-Chief

P.S.

All papers published in Informacije MIDEM (since 1986) can be access electronically at
<http://midem-drustvo.si/journal/home.aspx>

Boards of MIDEM Society | Organi društva MIDEM

MIDEM Executive Board | Izvršilni odbor MIDEM

President of the MIDEM Society | Predsednik društva MIDEM

Prof. Dr. Marko Topič, University of Ljubljana, Faculty of Electrical Engineering, Slovenia

Vice-presidents | Podpredsedniki

Prof. Dr. Barbara Malič, Jožef Stefan Institute, Ljubljana, Slovenia
Dr. Iztok Šorli, MIKROIKS, d. o. o., Ljubljana, Slovenija

Secretary | Tajnik

Olga Zakrajšek, UL, Faculty of Electrical Engineering, Ljubljana, Slovenia

MIDEM Executive Board Members | Člani izvršilnega odbora MIDEM

Prof. Dr. Slavko Amon, UL, Faculty of Electrical Engineering, Ljubljana, Slovenia
Darko Belavič, In.Medica, d.o.o., Šentjernej, Slovenia
Prof. Dr. Bruno Cvikl, UM, Faculty of Civil Engineering, Maribor, Slovenia
Prof. DDr. Denis Đonlagić, UM, Faculty of Electrical Engineering and Computer Science, Maribor, Slovenia
Prof. Dr. Leszek J. Golenka, Technical University Wroclaw, Poland
Leopold Knež, Iskra TELA d.d., Ljubljana, Slovenia
Dr. Miloš Komac, UL, Faculty of Chemistry and Chemical Technology, Ljubljana, Slovenia
Prof. Dr. Miran Mozetič, Jožef Stefan Institute, Ljubljana, Slovenia
Jožef Perne, Zavod TC SEMTO, Ljubljana, Slovenia
Prof. Dr. Giorgio Pignateli, University of Perugia, Italia
Prof. Dr. Janez Trontelj, UL, Faculty of Electrical Engineering, Ljubljana, Slovenia

Supervisory Board | Nadzorni odbor

Prof. Dr. Franc Smole, UL, Faculty of Electrical Engineering, Ljubljana, Slovenia
Mag. Andrej Pirih, Iskra-Zaščite, d. o. o. , Ljubljana, Slovenia
Dr. Slavko Bernik, Jožef Stefan Institute, Ljubljana, Slovenia

Court of honour | Častno razsodišče

Emer. Prof. Dr. Jože Furlan, UL, Faculty of Electrical Engineering, Slovenia
Prof. Dr. Radko Osredkar, UL, Faculty of Computer and Information Science, Slovenia
Franc Jan, Kranj, Slovenia

Informacije MDEM

Journal of Microelectronics, Electronic Components and Materials

ISSN 0352-9045

Publisher / Založnik:

MDEM Society / Društvo MDEM

Society for Microelectronics, Electronic Components and Materials, Ljubljana, Slovenia

Strokovno društvo za mikroelektroniko, elektronske sestavne dele in materiale, Ljubljana, Slovenija

www.midem-drustvo.si