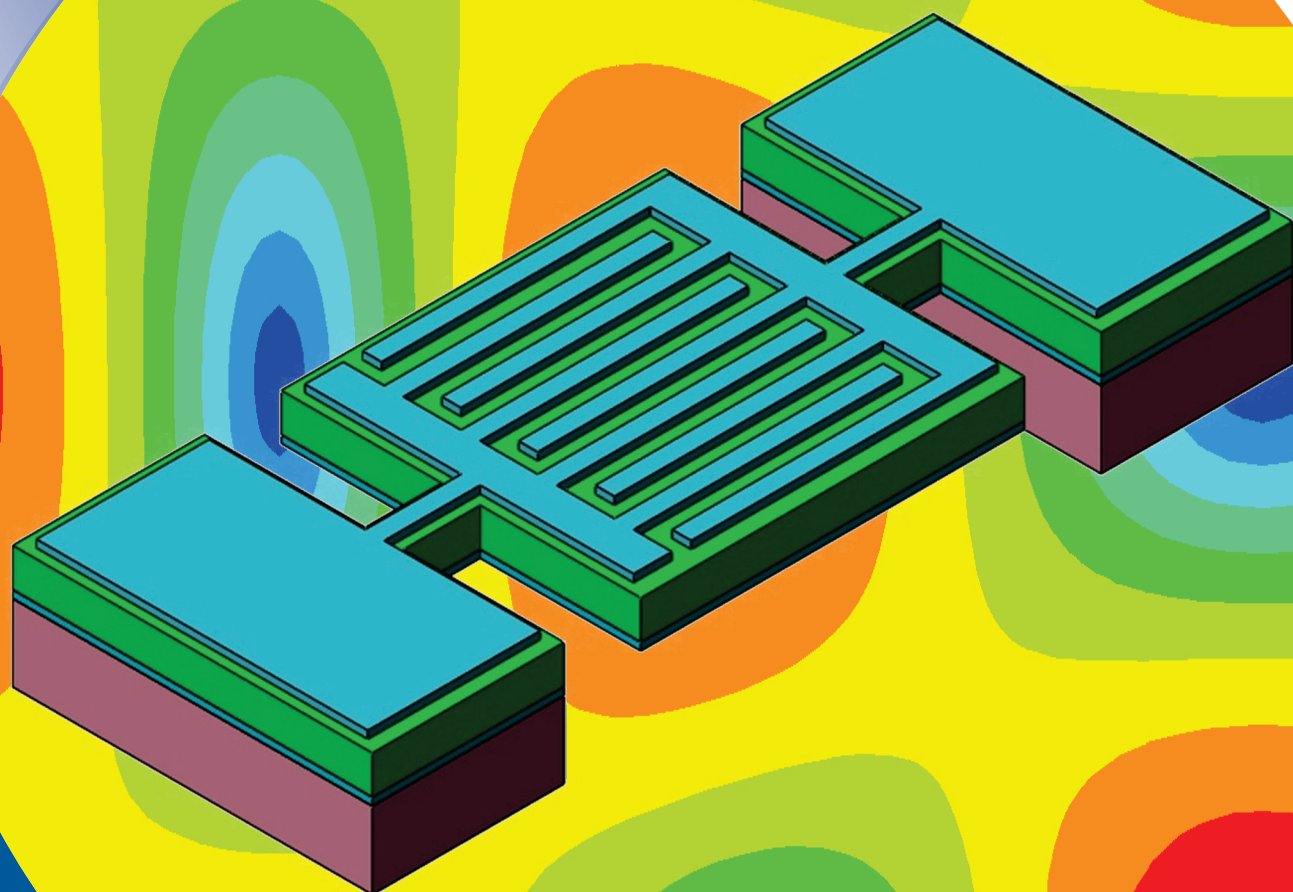


ISSN 0352-9045

# *Informacije* MIDEM

*Journal of Microelectronics,  
Electronic Components and Materials*  
**Vol. 50, No. 3(2020), September 2020**

*Revija za mikroelektroniko,  
elektronske sestavne dele in materiale*  
**letnik 50, številka 3(2020), September 2020**



# Informacije MIDEM 3-2020

Journal of Microelectronics, Electronic Components and Materials

VOLUME 50, NO. 3(175), LJUBLJANA, SEPTEMBER 2020 | LETNIK 50, NO. 3(175), LJUBLJANA, SEPTEMBER 2020

Published quarterly (March, June, September, December) by Society for Microelectronics, Electronic Components and Materials - MIDEM. Copyright © 2020. All rights reserved. | Revija izhaja trimesečno (marec, junij, september, december). Izdaja Strokovno društvo za mikroelektroniko, elektronske sestavne dele in materiale – Društvo MIDEM. Copyright © 2020. 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

Arpad Bürmen, UL, Faculty of Electrical Engineering, Slovenia

Danjela Kuščer Hrovatin, Jožef Stefan Institute, Slovenia

Matija Pirc, UL, Faculty of Electrical Engineering, Slovenia

Franc Smole, UL, Faculty of Electrical Engineering, Slovenia

Matjaž Vidmar, 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

Marc Lethiecq, University of Tours, France

Teresa Orłowska-Kowalska, Wrocław University of Technology, Poland

Luca Palmieri, University of Padova, Italy

Goran Stojanović, University of Novi Sad, Serbia

## International Advisory Board | Časopisni svet

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

Cor Claeys, IMEC, Leuven, Belgium

Denis Donlagič, 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 MIDEM

MIDEM 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 160 EUR, separate issue is 40 EUR. MIDEM members and Society sponsors receive current issues for free. Scientific Council for Technical Sciences of Slovenian Research Agency has recognized Informacije MIDEM as scientific Journal for microelectronics, electronic components and materials. Publishing of the Journal is cofinanced by Slovenian Research 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 160 EUR, cena posamezne številke pa 40 EUR. Člani in sponzorji MIDEM prejema 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 ARRS in sponzorji društva. Znanstveno-strokovne prispevke objavljene v Informacijah MIDEM 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™.

## Content | Vsebina

### *Original scientific papers*

### *Izvirni znanstveni članki*

<p>S. P. Philip, S. Palaniswami, H. Sivakumar: A Computationally Efficient 11 Band Non-Uniform Filter Bank for Hearing Aids Targeting Moderately Sloping Sensorineural Hearing Loss</p>	153	<p>S. P. Philip, S. Palaniswami, H. Sivakumar: Računsko učinkovit 11 pasoven neenoten filter za slušno pomoč pri zmerni senzorno-nevralni izgubi sluha</p>
<p>Z. Zhao, T. Yu, P. Si, K. Zhang, W. Lü: Superior Performance of a Negative-capacitance Double-gate Junctionless Field-effect Transistor with Additional Source-drain Doping</p>	169	<p>Z. Zhao, T. Yu, P. Si, K. Zhang, W. Lü: Odlična učinkovitost dvovratnega brezspojnega poljskega tranzistorja z negativno kapacitivnostjo z dodatnim dopiranjem izvor-ponor</p>
<p>P. S. Marinushkin, A. A. Levitsky, F. G. Zograf, V. A. Bakhtina: On the Finite-Element Analysis of Resonance MEMS Structures based on Acoustic Lamb Waves</p>	179	<p>P. S. Marinushkin, A. A. Levitsky, F. G. Zograf, V. A. Bakhtina: Analiza končnih elementov resonance MEMS struktur za akustične Lamb valove</p>
<p>M. I. A. Albrni, F. Mohammad, N. Herencsar, J. Sampe, S. H. Md Ali: Novel Electronically Tunable Biquadratic Mixed-Mode Universal Filter Capable of Operating in MISO and SIMO Configurations</p>	189	<p>M. I. A. Albrni, F. Mohammad, N. Herencsar, J. Sampe, S. H. Md Ali: Nov elektronsko nastavljiv bikvadratičen univerzalen filter v mešanem načinu delovanja sposoben delovanja v MISO in SIMO konfiguraciji</p>
<p>N. Mitrović, D. Danković, B. Ranđelović, Z. Prijić, N. Stojadinović: Modeling of Static Negative Bias Temperature Stressing in p-channel VDMOSFETs using Least Square Method</p>	205	<p>N. Mitrović, D. Danković, B. Ranđelović, Z. Prijić, N. Stojadinović: Modeliranje statičnega stresa temperature zaradi negativne napetosti v p-kanalnem VDMOSFETu z metodo najmanjših kvadratov</p>
<p>I. R. Chandran, S. Ramasamy, C. Nallaperumal: A High Voltage Gain Multiport Zeta-Zeta Converter for Renewable Energy Systems</p>	215	<p>I. R. Chandran, S. Ramasamy, C. Nallaperumal: Več vhodni zeta-zeta pretvornik z visokim napetostnim ojačenjem za sisteme obnovljivih virov</p>
<p>Front page: MEMS resonator and Lamb waves (P.S. Marinushkin et al.)</p>		<p>Naslovnica: MEMS resonator in Lambovi valovi (P.S. Marinushkin et al.)</p>



# *Boards of MIDE M Society | Organi društva MIDE M*

## *MIDE M Executive Board | Izvršilni odbor MIDE M*

### **President of the MIDE M Society | Predsednik društva MIDE M**

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

### **Vice-presidents | Podpredsednika**

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, Slovenija

### **MIDE M Executive Board Members | Člani izvršilnega odbora MIDE M**

Darko Belavič, HIPOT-RR d.o.o., Otočec, Slovenia

Dr. Slavko Bernik, Jožef Stefan Institute, Ljubljana, Slovenia

Dr. Miha Čekada, Jožef Stefan Institute, Ljubljana, Slovenia

Prof. DDr. Denis Donlagič, UM, Faculty of Electrical Engineering and Computer Science, Maribor, Slovenia

Prof. Dr. Leszek J. Golonka, Technical University Wroclaw, Poland

Dr. Vera Gradišnik, Tehnički fakultet Sveučilišta u Rijeci, Rijeka, Croatia

Leopold Knez, Iskra TELA d.d., Ljubljana, Slovenia

mag. Mitja Koprivšek, ETI Elektroelementi, Izlake, Slovenia

Prof. Dr. Miran Mozetič, Jožef Stefan Institute, Ljubljana, Slovenia

Prof. Dr. Janez Trontelj, UL, Faculty of Electrical Engineering, Ljubljana, Slovenia

Dr. Danilo Vrtačnik, UL, Faculty of Electrical Engineering, Slovenia

## *Supervisory Board | Nadzorni odbor*

Prof. Dr. Franc Smole, UL, Faculty of Electrical Engineering, Ljubljana, Slovenia

Prof. Dr. Drago Strle, UL, Faculty of Electrical Engineering, Ljubljana, Slovenia

Igor Pompe, Ljubljana, Slovenia

## *Court of honour | Častno razsodišče*

Darko Belavič, Slovenia

Dr. Marko Hrovat, Slovenia

Dr. Miloš Komac, Slovenia

**Informacije MIDE**

*Journal of Microelectronics, Electronic Components and Materials*

ISSN 0352-9045

*Publisher / Založnik:*

*MIDEM Society / Društvo MIDE*

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

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

**[www.midem-drustvo.si](http://www.midem-drustvo.si)**