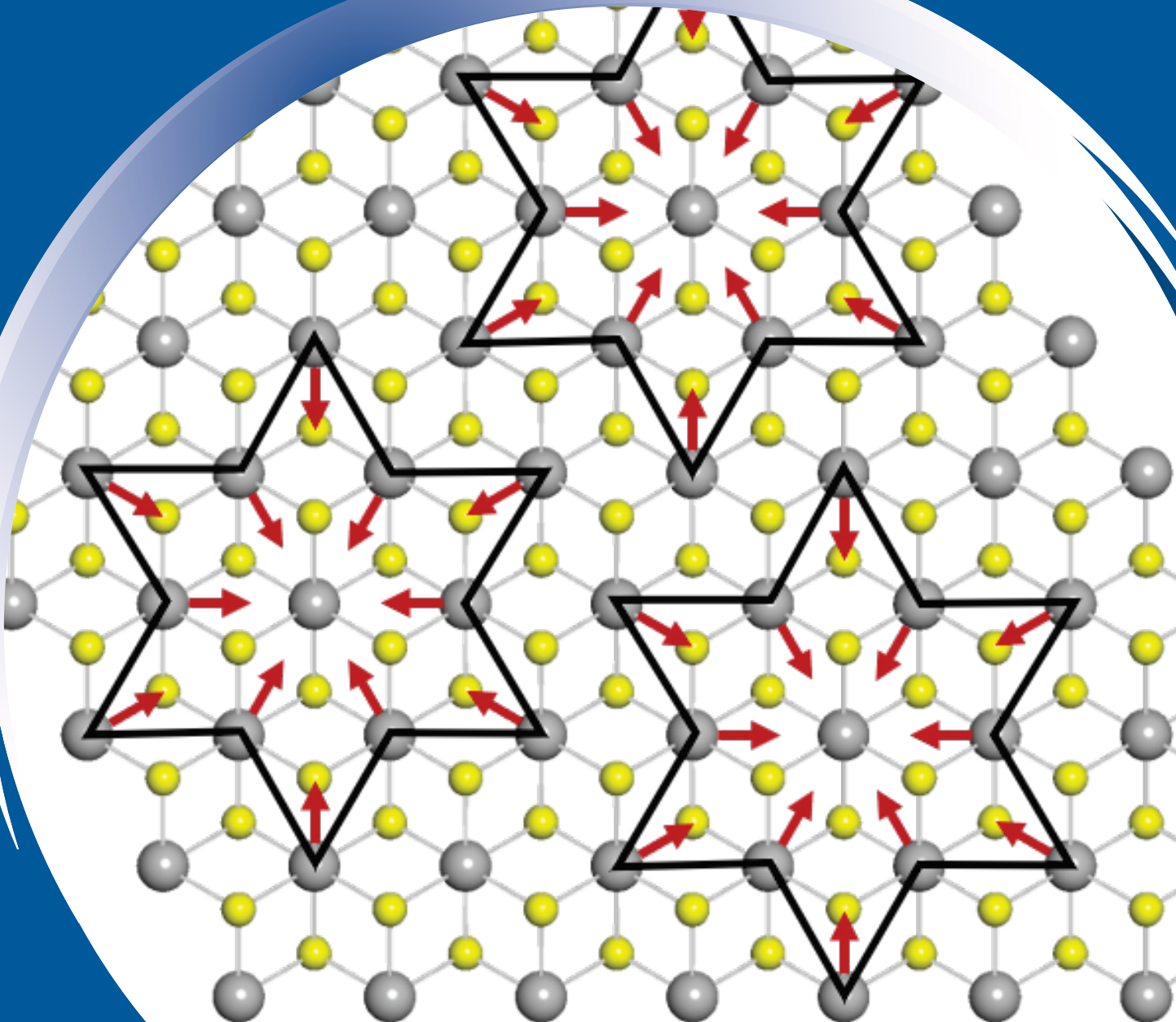


ISSN 0352-9045

# *Informacije* MIDEM

*Journal of Microelectronics,  
Electronic Components and Materials*  
**Vol. 51, No. 3(2021), September 2021**

*Revija za mikroelektroniko,  
elektronske sestavne dele in materiale*  
**letnik 51, številka 3(2021), September 2021**



# Informacije MIDEM 3-2021

Journal of Microelectronics, Electronic Components and Materials

VOLUME 51, NO. 3(179), LJUBLJANA, SEPTEMBER 2021 | LETNIK 51, NO. 3(179), LJUBLJANA, SEPTEMBER 2021

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 Donlagić, 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*

Ö. Kasar, M. A. Gözel, M. Geçin: 3D Printed Microwave Clamp Probe Design to Detect Water Level in PVC Pipes	151	Ö. Kasar, M. A. Gözel, M. Geçin: 3D natisnjena zasnova mikrovalovne sonde za zaznavanje nivoja vode v PVC ceveh
A. Mraz, I. Vaskivskyi, R. Venturini, D. Svetin, Y. Chernolevska, D. Mihailović: Charge Configuration Memory (CCM) Device – A Novel Approach to Memory	157	A. Mraz, I. Vaskivskyi, R. Venturini, D. Svetin, Y. Chernolevska, D. Mihailović: Spominska naprava na podlagi konfiguracije naboja (CCM) – nov pristop do spomina
X. Xu, G. Bao, M. Ma, Y. Wang: Multi-Objective Optimization Phase-Shift Control Strategy for Dual-Active-Bridge Isolated Bidirectional DC-DC Converter	169	X. Xu, G. Bao, M. Ma, Y. Wang: Strategija upravljanja faznega premika z več ciljn- imi optimizacijami za dvoaktivni izolirani mostič dvosmernega DC-DC pretvornika
M. Nohtanipour, M. H. Maghami, M. Radmehr A Placement and Routing Method for Layout Generation of CMOS Operational Amplifiers Using Multi-Objective Evolutionary Algorithm Based on Decomposition	181	M. Nohtanipour, M. H. Maghami, M. Radmehr Metoda umeščanja in usmerjanja za generiranje postavitve operacijskih ojačevalnikov CMOS z uporabo večciljnega evolucijskega algoritma na osnovi dekompozicije
M. Nohtanipour, M. H. Maghami, M. Radmehr: Analog Circuits Sizing Using Multi-Objective Evolutionary Algorithm Based on Decomposition	193	M. Nohtanipour, M. H. Maghami, M. Radmehr: Določanje velikosti analognih vezij z uporabo večciljnega algoritma na osnovi dekompozicije
Front page: Formation of a polaron, A. Mraz et al.		Naslovnica: Formacija polarona, A. Mraz et al.

# *Boards of MIDEM Society |* *Organi društva MIDEM*

## *MIDEM Executive Board | Izvršilni odbor MIDEM*

### **President of the MIDEM Society | Predsednik društva MIDEM**

Prof. Dr. Barbara Malič, Jožef Stefan Institute, Ljubljana, Slovenia

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

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

Dr. Iztok Šorli, Mikroiks d.o.o., Ljubljana, Slovenia

### **Secretary | Tajnik**

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

### **MIDEM Executive Board Members | Člani izvršilnega odbora MIDEM**

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

Izr. Prof. 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, Poljska

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

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

Mag. Mitja Koprivšek, ETI Elektroelementi, Izlake, Slovenia

Doc. Dr. Gregor Primc, Jožef Stefan Institute, Ljubljana, Slovenia

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

Doc. Dr. Hana Uršič Nemevšek, Jožef Stefan Institute, Ljubljana, Slovenia

Dr. Danilo Vrtačnik, UL, Faculty of Electrical Engineering, Ljubljana, 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, retired

## *Court of honour | Častno razsodišče*

Darko Belavič, Jožef Stefan Institute, Ljubljana, Slovenia

Dr. Miloš Komac, retired

Dr. Hana Uršič Nemevšek, Jožef Stefan Institute, Ljubljana, Slovenia

**Informacije MIDEM**

*Journal of Microelectronics, Electronic Components and Materials*

ISSN 0352-9045

*Publisher / Založnik:*

*MIDEM Society / Društvo MIDEM*

*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)**