

2024 47th International Spring Seminar on Electronics Technology (ISSE 2024)

**Prague, Czech Republic
15-19 May 2024**



IEEE Catalog Number: CFP24509-POD
ISBN: 979-8-3503-8548-9

**Copyright © 2024 by the Institute of Electrical and Electronics Engineers, Inc.
All Rights Reserved**

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

***** *This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.***

IEEE Catalog Number:	CFP24509-POD
ISBN (Print-On-Demand):	979-8-3503-8548-9
ISBN (Online):	979-8-3503-8547-2
ISSN:	2161-2528

Additional Copies of This Publication Are Available From:

Curran Associates, Inc
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: (845) 758-0400
Fax: (845) 758-2633
E-mail: curran@proceedings.com
Web: www.proceedings.com

TABLE OF CONTENTS

Design of Navigation System with Wireless Connectivity.....	1
<i>Rosen Miletiev, Rumen Yordanov, Emil Iontchev</i>	
Variations in Open Circuit Voltage of Cycle-Aged Lithium-Ion Batteries Due to Silicon-Enhanced Anodes.....	5
<i>Michele Galasso, Simon Schwunk, Václav Knap</i>	
Silver Sintering Application in Packaging Al Metallized Chip onto Au Metallized Substrates	10
<i>Marcin Mysliwiec, Krystian Pavlov, Ryszard Kisiel</i>	
A TeraRanger One Based LiDAR.....	14
<i>Péna Madalina, Gombos Andreea, Emilian Ceuca</i>	
FCCSP Warpage Scope Evaluation for 5G Product with Advanced Wafer Node	18
<i>Tzu-Chi Zeng, Vito Lin, Teny Shih, Yu-Po Wang</i>	
Propagation Delay Analysis by Employing Various PCB Manufacturing Process.....	22
<i>Jae-Ho Choi, Dong-Yoon Seo, Se-Woong Choi, Ye-Jin Cho, Do-Hyung Kim, Jeong-Hyeon Cho, Ji-Won Kim, Won-Seop Lee, In-Sung Kim</i>	
Stretchable Strain Sensor Using Interdigitated Capacitor on Fabric	27
<i>Miroslav Katanic, Dragica Pantelic, Nikola Šormaz, Nataša Šarcevic, Vladimir Citakovic, Milica Kisic, Mirjana Damjanovic</i>	
Electronic Nose Based on AI-Capable Sensor Module for Beverages Identification.....	31
<i>Barbara Molnár, Attila Géczy</i>	
Electrochemical Migration: What Happens if a Drink is Spilled on a Computer?	36
<i>Petr Veselý, Jaroslav Šenkýř, Markéta Klimtová, Karel Dušek</i>	
Adhesion Measurements of Polyimide to Silicon Nitride for Semiconductor Component Applications.....	41
<i>Moritz Hartleb, Peter Imrich, Johannes Zechner, Thomas Walter, Golta Khatibi</i>	
Modelling of Battery Management System Based on Switching Capacitors	46
<i>Dimitar Arnaudov, Krasimir Kishkin, George Angelov</i>	
Active Balancing Using the DC2100B-C and DC2100B-D Module	51
<i>Mirela Olteanu, Dorin Petreus, Ana-Maria Petri</i>	
Influence of Number of Turns on Common-Mode Choke's Characteristics	57
<i>Mirjana Damjanovic, Milica Kisic, Miodrag Milutinov, Milan Bodic, Stanko Aleksic</i>	
Influences on the Mechanical Strength of Inkjet-Printed, Ag-Nanoparticle-Based Interconnects of Fine-Pitch Components	62
<i>Christian Voigt, Johannes Dornheim, Alexander Muth, Matthias Petersen, Nils Thielen, Jörg Franke</i>	
State-Of-Charge Estimation Based on Open-Circuit Voltage Model Considering Hysteresis.....	68
<i>Václav Knap, Anna Pražanová, Jan Kasper, Tomáš Finsterle, Pavel Hrzina</i>	

An Expired Solder Paste Vs Fresh Solder Paste: Reliability and Sustainability in Electronics Manufacturing	72
<i>David Busek, Jonas Uricar, Dominik Pilnaj</i>	
Design and Implementation of an Electronic Encryption System Based on Programmable Cellular Automata Algorithm	76
<i>Petre Anghelescu</i>	
Thick-Film Thermoelectric Structures Based on $\text{Ca}_3\text{Co}_4\text{O}_9$ Thermopiles	80
<i>Szymon Wójcik, Miroslaw Gierczak, Nana Brguljan, Slavko Bernik, Andrzej Dziedzic</i>	
Design of a Flat Coil Electrothermal Vaporization Device for Inductively Coupled Plasma Optical Emission Spectrometry.....	85
<i>S. Cadar, D. Petreus, T. Patarau, E. Szilagyi</i>	
Thick-Film CuNi-Ag and CuNi-Cu Thermocouples and Thermoelectric Microgenerators	91
<i>Szymon Wójcik, Miroslaw Gierczak, Kathrin Reinhardt, Stefan Körner, Andrzej Dziedzic</i>	
Simulation of Electrochemical Heating in Li-Ion Batteries	96
<i>Dominika Dusíková, Jan Zemen</i>	
Modeling the Optical Response of a Periodic Nanoparticle Arrangement with the Finite Element Method	101
<i>Rebeka Kovács, Attila Bonyár</i>	
Thermal Coupling of NTC Chip Thermistors.....	106
<i>Milan Z. Bodic, Stanko O. Aleksic, Vladimir M. Rajs, Mirjana S. Damnjanovic, Milica G. Kisić</i>	
3-Axis Accelerometer IMU in Various Degrees of Freedom Multi-Switch Button Array	110
<i>Slavomir Kardos, Igor Vehec</i>	
Design of a Dual-Band Wilkinson Power Divider Using Compact Lowpass Filter with Wide Suppression Band	115
<i>Saeedeh Lotfi, Golshan Mohamadpour, Salman Karimi, Tomas Blecha</i>	
Training Cost Analysis on a Large Computer Vision Defect Detection Model for Ceramics	119
<i>Andrei Alexandru Tulbure, Ioan Szabo, Dermina-Petronela Danciu, Adrian Alexandru Tulbure, Eva Henrietta Dulf</i>	
Assessing the Impact of Creep and Random Vibration on BGA Solder Interconnects Through Finite Element Analysis (FEA).....	125
<i>Joshua Depiver, Sabuj Mallik, Emeka H. Amalu</i>	
Design of a Compact Lowpass Filter with an Ultra-Wide Stopband Using Triangular Resonators	131
<i>Saeedeh Lotfi, Saeed Roshani, Sobhan Roshani, Martin Janda, Tomas Blecha</i>	
Analysis of Composite BiSn Solder Paste Doped by Titanium Dioxide Nanoparticles	135
<i>Iva Králová, Vasyl Babets, Jonáš Uricár, Yew Hoong Wong, Mohd Faizul Mohd Sabri</i>	
Analyzing the Impact of Surface Treatment on Solder Joint Voids	140
<i>Pavel Rous, František Steiner</i>	
Investigation of Sn Grain Growth in Solder Joints by Numerical Simulations	145
<i>István Bozsóki, Attila Géczy, Balázs Illés</i>	

Nitrogen Dioxide Sensor Based on Organic Electrochemical Transistor	149
<i>Josef Slauf, Jan Reboun</i>	
Design of a Quadrature Hybrid Coupler with Triple Tapered Resonators.....	153
<i>Saeedeh Lotfi, Golshan Mohamadpour, Salman Karimi, Tomas Blecha</i>	
Detection of Nucleotides Using Gold Nanoprisms Immobilized on Glass.....	157
<i>Nóra Tarpataki, Alexandra Borók, Attila Bonyár</i>	
Electrical Properties' Stability of Flexible Carbon-Based Conductive Layers	161
<i>Peter Lukacs, Tomas Lenger, Igor Vehec, Samuel Janoscik</i>	
Sustainability in Electronics - Testing Sensors with Polycarbonate Housing (PC) Vs Poly Lactic Acid Housing (PLA).....	166
<i>Ioan Szabo, Andrei Tulbure, Cristian Farcas, Adrian Tulbure</i>	
Investigation of In-Situ Polymerization in a Doped Methacrylate Resin	170
<i>Alexandra Borók, Melinda Szalóki, Attila Bonyár</i>	
Study of Thermal Loading of Ceramic Capacitors During Reflow Soldering.....	175
<i>Adam Yuile, Erik Wiss, David Barth, Steffen Wiese</i>	
TCAD Model of GAA Nanowire Transistor with Silicon Oxide/Nitride/Oxide Dielectric.....	180
<i>Rostislav Rusev, Ivelina Ruskova, George Angelov, Dimitar Nikolov, Elitsa Gieva, Rossen Radonov, Dorian Minkov</i>	
Printed Piezoelectric Harvester for Integration in a Wearable Energy Storage Device	184
<i>Mariya Aleksandrova, Ivaylo Pandiev</i>	
Board Level Underfill – Moisture Related Voids	188
<i>Zbynek Plachý, Tamás Hurtony, Attila Géczy, Karel Dušek</i>	
Textile-Based Flexible Coaxial Cable	194
<i>Jan Handrejch, Tomáš Blecha</i>	
Effect of Manufacturing Technology on Polymer Thick-Film Resistors in 3D Printed Structures	199
<i>Igor Vehec, Peter Lukacs, Tomas Lenger, Slavomir Kardos, Lukas Garnek</i>	
The Use of Scatter Plot Charts for the Study of Changes in the Electrical Parameters of Conductive Adhesive Joints.....	204
<i>Pavel Mach, Ivana Pelikánová</i>	
Unlocking Insights: A Systematic Survey of Material Composition in Lithium-Ion Battery Cells for Recycling Solutions.....	208
<i>Jan Koci, Anna Pražanová, Zbynek Plachý, Vaclav Knap</i>	
Increasing Productivity in Vapour Phase Soldering Using Vertical Stacking of Boards	214
<i>Gergo Havellant, Balázs Illés, Attila Géczy</i>	
Effects of Thermal Cycling and PCB Substrate Type on Reliability of Solder Joints	220
<i>Denis Froš, Markéta Klimtová, Iva Králová</i>	
Biodegradable Comb Sensor Based on 3D Printed Conductive Polylactic Acid.....	227
<i>Peter Lukacs, Tomas Lenger, Igor Vehec, Mark Krajesza</i>	

Influence of Reflow Temperature Profile on the Intermetallic Layers Thickness at Different Surface Finishes.....	231
<i>Karel Dušek, Petr Veselý, David Bušek, Denis Froš, Iva Králová, Markéta Klimtová, Dominik Pilnaj, Jonáš Uricár, Zbyněk Plachý, Kristina Sorokina, Jan Hintermüller, Ali Dayoub, Bálint Medgyes, Oliver Krammer, Attila Geczy, Balázs Illes</i>	
Portable Device for In-Situ Cyclic Voltammetry Measurements.....	235
<i>Mitar Simic</i>	
The Use of Bending Experiments for the Efficient Characterization of the Mechanical Functionality of Component Interconnections.....	240
<i>Erik Wiss, Shiva Goud Anthati, Vlad Serea, Steffen Wiese</i>	
Noise Measurement System Based on Cross-Correlation Method.....	244
<i>Cristina Davidas, Ovidiu Aurel Pop, Liviu Viman, Elena Mirela Stetco, Traian Petrisor</i>	
Optimal Resource Scheduling for a Greenhouse Powered by an Islanded Microgrid.....	249
<i>Nicoleta Stroia, Daniel Moga, Dorin Petreus, Nicolae Alexandru Sarbu, Eniko Lazar, Alexandru Lordin</i>	
Additively Printed Heating Structure for Radome De-Icing Application.....	254
<i>Kok Siong Siah, Umang Bharatkumar Ramaiya, Felix Häußler, Max Dörfler, Daniel Utsch, Christian Voigt, Jörg Franke, Hüseyin Erdogan</i>	
Sustainability Challenges: The Circular Economy Dilemma in Lithium-Ion Battery Cell Electrochemical Discharging Processes	260
<i>Anna Pražanová, Zbyněk Plachý, Jonáš Uricár, Dominik Pilnaj, Jan Koci, Vaclav Knap</i>	
Distributed System Using Synthetic Data of Lithium-Ion Battery Digital Twin for Battery Diagnosis.....	264
<i>Eliza Maria Olariu, Adelina Ioana Ilies, Horia Hedesiu, Gabriel Chindris</i>	
Effect of Post-Annealing on Electrical Parameters of Joints Formed from Conductive Adhesive.....	269
<i>Pavel Mach, Ivana Pelikánová, Jaroslav Rohlena</i>	
Experimental Study of a Novel Printed Circuit Board Interconnection Technology.....	273
<i>Karamat Adavi, Sebastian Quednau, Xaver Müller, Daniel Ernst, Karsten Meier, Hanno Platz</i>	
Lithium-Ion Cell and Battery Testing by Spectral Analysis	278
<i>Krasimir Kishkin, Dimitar Arnaudov, Venelin Todorov</i>	
Reliability Meta-Modelling of Power Components.....	284
<i>Stoyan Stoyanov, Tim Tilford, Yaochun Shen, Yihua Hu</i>	
Realization of Cost-Effective Supercapacitors Utilizing Substitutable Materials	291
<i>Irina Madalina Burcea, Rodica Cristina Negriu, Bogdan Mihailescu, Paul Svasta, Madalin Vasile Moise, Ciprian Ionescu</i>	
Effect of Electro(less) Plating on Mechanical and Geometric Properties of Polymer-Metal Structures Based on 3D Printed Models.....	295
<i>Radek Tucek, Lukáš Vojtech</i>	
Differential Thermal Voltammetry for State-Of-Health (SOH) Estimation of Li-Ion Batteries	300
<i>Miroslav Mikolasek, Martin Kemeny, Martin Brazda, Boris Bajla, Erik Baga, Jakub Gavenda, Lukas Gardian, Aron Stranovsky, Matej Novak</i>	

Effect of TiO ₂ Nanoparticles Addition on the Electrochemical Migration of Lead-Free Sn-Bi Alloys	304
<i>Ali Dayoub, Ali Gharaibeh, Patrik Tamási, Petr Veselý, Markéta Klimtová, Iva Králová, Karel Dušek, Bálint Medgyes</i>	
Stretchability of Printed Conductive Structures for Thermoformable Structural Electronics	310
<i>Adam Urban, Silvan Pretl, Martin Janda</i>	
Evaluating the Performance of Measurements Systems Using Data Processing Methods Based on Kalman Filter.....	316
<i>Flutur Alexandru Florin, Pop Septimiu Sever, Bande Vlad</i>	
Effect of New Types of PCB Surface Finishes on Fractographic Morphology of Solder Joints	320
<i>Daniel Dziviv, Alena Pietrikova, Peter Hornak</i>	
Towards Sustainable Electronics: Unveiling the Nexus of Circular Economy, Global Policies and Industry Impacts	324
<i>Andrea Benešová, Martin Hirman, František Steiner, Jiri Tupa</i>	
Thermal Diffusivity Determination of a Semiconductor Device.....	330
<i>Corina Ruxandra Mitulescu, Bogdan Mihailescu, Mihai Brânzei, Paul Svasta</i>	
Soil Degradation of Sustainable PLA/Flax Substrates and Printed Circuit Board Assemblies	334
<i>Csaba Farkas, András Csiszár, László Gál, Réka Czaun, Attila Géczy</i>	
Evaluation of Semipermeable Membranes for Encapsulating Gas Sensors in Human Intestinal Environments.....	340
<i>Felix Stadermann, Victoria Constance Köst, Krzysztof Nieweglowski, Karsten Meier, Karlheinz Bock</i>	
Analysis of Electronic Modules for Construction Machines and Development of a Reliability Test Method	344
<i>Max Häusler, Karsten Meier, Karlheinz Bock</i>	
Modeling and Simulation of a Two-Stage Grid-Connected MPPT Inverter.....	349
<i>D. Petreus, T. Patara, P. D. Teodosescu, Z. Mathe</i>	
Multifunctional Inkjet-Printed Silver Structures for Wearable Biosensors	355
<i>Rade Tomov, Mariya Aleksandrova, Georgi Nikolov, Valentin Mateev, Ivo Iliev</i>	
Occurrence of Voids in Soldered Joints for Electrical Engineering.....	359
<i>Tomáš Chvosta, Karel Dušek, Tomáš Gurcik</i>	
3D Printing Conductive Pastes Based on Polystyrene/Graphite Composite	364
<i>Jonáš Uricár, Petr Veselý, Dominik Pilnaj, Josef Sedláček, Jirí Brožek</i>	
Laser Powder Bed Fusion of Titanium Alloyed Copper Powder for Power Electronic Substrates	368
<i>Christoph Hecht, Mario Sprenger, Jörg Franke</i>	
Iron Nanoparticle-Doped Flux: Wetting Characteristics of Flux and SAC305 Solder and Effects on Flux Viscosity	374
<i>Irina Wodak, Golta Khatibi, Andriy Yakymovych, Oliver Krammer, Attila Géczy</i>	
Hydrogen in Automotive: LCA Study	379
<i>Michael Fridrich, Anna Pražanová, Vaclav Knap, Jan Weinzettel</i>	

Development of Computationally Efficient Numerical Models for Assessing the Reliability of Electronic Components Under Vibration Loads.....	384
<i>Chengzhe Lyu, Karsten Meier, Karlheinz Bock</i>	
Development of Sensor Emulators for Testing the Safety Mechanisms of Sensor Interfaces in Automotive Electronics	390
<i>Nicolae Ioan Gross, Paul Svasta</i>	
Stability of OhmegaPly Resistors with Different Shapes	396
<i>Tomas Lenger, Alena Pietrikova, Peter Lukacs, Igor Vehec, Martin Jarkovsky</i>	
NTC Thermistor Ferrite Composite for Temperature Sensing with Reduced Humidity Influence	400
<i>Maria Vesna Nikolic, Zorka Z. Vasiljevic, Milena P. Dojcinovic</i>	
Development an Ultra-Low Power "Coin" Size Sensor	404
<i>Stoyan G. Bogdanov, Nina R. Bogdanova, Elitsa E. Gieva</i>	
3D Printed Circuit Boards from Recycled Plastics: Interconnection Properties.....	408
<i>Jakub Zdráhal, Markéta Klimtová, Iva Králová</i>	
The Effect of Oxide Reduction Using Formic Acid Vapours on the Thickness of the Conductive Layer.....	414
<i>David Michal, Jan Reboun</i>	
Electrochemical Migration: Evaluating the Effect of Fe ₂ O ₃ Nanoparticle Incorporation on the Reliability of SAC Alloys.....	418
<i>Ali Gharaibeh, Dániel Rigler, Bálint Medgyes</i>	
Towards Additively Manufactured Alumina Substrates for Printed Electronics Applications	424
<i>Martin Janda, David Kalas, Karel Sima, Jan Reboun</i>	
Modelling the Effect of Laser-Trimming on the Electrical Properties of Thick-Film Resistors.....	429
<i>Oliver Krammer, Patrik Kovács</i>	
How Different Cleaning Procedures Affect Reliability of Conductive Joints on E-Textiles?	433
<i>Martin Hirman, Jiri Navratil, Tomas Blecha, Petra Komarkova, Renata Nemcokova, Viera Glombikova, Frantisek Steiner</i>	
Moisture Resistance Enhancing of E-Textiles	438
<i>Martin Hirman, Jiri Navratil, Tomas Blecha, Frantisek Steiner</i>	
Intra-Day Optimal Dispatching of an Islanded Microgrid Under Solar Power Uncertainty.....	443
<i>Nicolae Alexandru Sârbu, Dorin Petreus</i>	
Electrochemical Migration Resistance of Gold Surface Finishes.....	448
<i>Markéta Klimtová, Petr Veselý, Iva Králová, Yew Hoong Wong, Mohd Faizul Mohd Sabri, Karel Dušek</i>	
Knowledge Mining Using Generative AI for Causal Discovery in Electronics Production.....	453
<i>Sven Meier, Florian Töper, Jonas Gebele, Ben Rachinger, Steffen Klarmann, Jörg Franke</i>	
Low Temperature Adhesive Die Bonding for Sensitive MEMS Dies	463
<i>Nithin Anujan Beena, Lukas Lorenz, Thomas Ludewig, Kai Swiecinski, Volker Bock</i>	
Highly Elastic Textile Conductive Ribbons as Frequency Resonators for Wearable Strain Monitoring.....	472
<i>Michaela Radouchova, Tomas Blecha</i>	

Author Index