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Ing. Alexandru Falk

1. Lucrări științifice publicate în reviste indexate Web of Science-WoS (ISI)

1. **A. Falk**, L. Marsavina, O. Pop, "Analysis of Printed Circuit Boards strains using finite element analysis and digital image correlation", FRATTURA ED INTEGRITA STRUTTURALE, Vol. 51, pp.541-551, Ian. 2020 (WOS:000502844600041)
2. **A. Falk**, L. Marsavina, O. Pop, J. Dopeux "Assessment of Strains Produced by Thermal Expansion in Printed Circuit Boards", Materials, Vol. 15(11), art. 3916, Mai 2022 (WOS:000809023200001)

2. Lucrări științifice publicate în volumele unor manifestări științifice (Proceedings) indexate Web of Science-WoS (ISI) Proceedings

1. **A. Falk**, L. Marsavina, O. Pop, "Experimental determination of strain distribution on Printed Circuit Boards using Digital image correlation", 25th International Conference on Fracture and Structural Integrity, Vol. 18, pp. 214-222, 2019 (WOS:000504238000023)
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26 References
The paper investigates the use of digital image correlation (DIC) for strain measurement on Printed Board Circuits (PCBs). Digital Image Correlation (DIC) is a full-field contactless optical method for measuring displacements and strain in experimental testing, based on the correlation of the digital images taken during test. This method is used to measure strain of the surfaces of materials an... Show more
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Analysis of Printed Circuit Boards strains using finite element analysis and digital image correlation

By: Falk, A (Falk, Alexandru) [1]; Marsavina, L (Marsavina, Liviu) [1]; Pop, O (Pop, Octavian) [2]

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Abstract

This paper investigates the use of digital image correlation (DIC) and finite element analysis for strain measurement on Printed Board Circuits (PCBs).

Circuit boards (PCBs) are designed to mechanically support and electrically connect an electronic component assembly. Due to screw assemblies, the surface level differences on which the PCB is placed, the process of assembling the electronic components induces a certain state of stress and deformation in the PCB. The main components affected are microprocessors due to the way they are glued to PCBs with BGA- Ball grid arrays (BGA).

Digital Image Correlation (DIC) is a full-field contactless optical method for measuring displacements and strain in experimental testing, based on the correlation of images taken during test. The experimental setup is realized with Dantec Q-400 system used for image capture and Istra 4D software for image correlations and data analyses. The maximum level of the obtained strain is compared with the allowable limit.

Finite element analysis (FEA) is a numerical method of analysis for stresses and strain in structures of any given geometry.

Keywords

Author Keywords: Digital image correlation; Finite element analysis; PCB; Strain

Keywords Plus: BGA SOLDER JOINTS; MODEL

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By: Falk, A (Falk, Alexandru) [1]; Pop, O (Pop, Octavian) [2]; Dopeux, J (Dopeux, Jerome) [2]; Marsavina, L (Marsavina, Liviu) [1]

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The paper proposed an alternative optical metrology to classical methods (strain gauge measurements and numerical simulation) for strain determination on printed circuit board (PCBs) due to thermal loads. The digital image correlation (DIC) technique was employed to record the strain distribution in some particular areas of the PCB. A thermal load was applied using a heating chamber, and the measurements were performed at four different temperature steps (25 degrees C, 50 degrees C, 85 degrees C and 120 degrees C). An increase in the principal strains with temperature was observed. For validation, the principal strains on the PCB obtained with DIC were compared with the values from gauge strain measurements and numerical simulation. The conclusions highlighted that DIC represents a technique with potential for strain measurement caused by thermal deformation, with the advantages of full field measurement, less preparation of the surface and good accuracy.

Keywords**Author Keywords:** DIC; PCB; principal strain; thermal expansion; strain gauge rosette**Keywords Plus:** SOLDER JOINTS; MODEL**Author Information****Corresponding Address:** Marsavina, Liviu (corresponding author)

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E-mail Addresses: alexandru.falk@yahoo.com; ion-octavian.pop@unilim.fr; jerome.dopeux@unilim.fr; liviu.marsavina@upt.ro**Categories/Classification****Research Areas:** Chemistry; Materials Science; Metallurgy & Metallurgical Engineering; Physics**Funding**

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By: Falk, A (Falk, Alexandru) [1]; Marsavina, L (Marsavina, Liviu) [1]; Pop, O (Pop, Octavian) [2]

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Abstract

The paper investigates the use of digital image correlation (DIC) for strain measurement on Printed Board Circuits (PCBs). Digital Image Correlation (DIC) is a full-field contactless optical method for measuring displacements and strain in experimental testing, based on the correlation of the digital images taken during test. This method is used to measure strain of the surfaces of materials and structures subjected to various stresses (such as mechanical stresses or thermal stresses). So, this method is used according to the documentation for a variety of applications such as: large deformation measurements, crack analysis, stress strain curves (ct-c) for new materials, constructions - to evaluate certain displacements and cracks, measurement of strain caused by temperature variations. Circuit boards (PCBs) are designed to mechanically support and electrically connect an electronic component assembly. Due to screw assemblies, the surface level differences on which the PCB is placed, the process of assembling the electronic components induces a certain state of stress and deformation in the PCB. The main components affected are microprocessors due to the way they are glued to PCBs with BGA - Ball grid arrays (BGA). To determine the strain on PCBs, the actual measurement method uses strain gages. This method allows determining the strain only at certain points. The Digital Image Correlation method provides full field strain field. The experimental setup is realized with Dantec Q-400 system used for image capture and Istra 4D software for image correlations and data analyses. The maximum level of the obtained strain is compared with the allowable limit. (C) 2019 The Authors. Published by Elsevier B.V.

Keywords

Author Keywords: Digital image correlation; PCB; strain; gauge rosette

Keywords Plus: BGA SOLDER JOINTS

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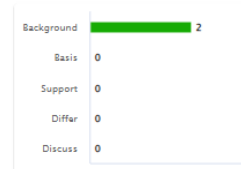
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