

芯片中陶瓷电路板的散热模拟研究

冯欣¹, 曾勇², 陈继民^{1,*}

¹北京工业大学,北京市朝阳区平乐园 100 号,100124

²北京工业大学,北京市朝阳区平乐园 100 号,100124

^{1,*}北京工业大学,北京市朝阳区平乐园 100 号,100124

*Email: jimmin@bjut.edu.cn

摘要:

本文介绍了芯片中陶瓷电路板的散热模拟研究。首先对我国芯片的自给率进行数据分析,我国目前芯片的自给率仍然较低,核心芯片缺乏,高端技术长期被国外厂商控制。随着近年来国家加强对科技芯片的扶持和重视,预计到 2025 年,我国芯片的自给率将达到 70%。紧接着对电子技术在各应用领域的逐步加深,线路板高度集成化已然成为必然趋势进行阐述。而高度的集成化封装模块又要求具有良好的散热承载系统,因此多采用金属和陶瓷等具备良好散热性能的材料来制备线路基板,在本文中研究的是陶瓷材料。接着做了两大组对照实验,第一个实验是研究了以相同的环境温度作为热源,对所用陶瓷的打印方式、材料、配比、结构的不同做了相应的散热模拟研究,在不同条件下最终散热效果的影响。其中打印方式为熔融沉积式打印和数字光处理打印;结构是在热分析的基础上,选用体心立方结构、面心立方结构、极小曲面作为模拟的结构。第二个实验是在模拟系统中,改变风速和散热片数量,探究不同条件下对散热效果的影响。最后对陶瓷电路板的创新应用进行了总结与展望,陶瓷电路板作为科技发展的重要元件,也将不断的推动半导体芯片的发展,因此散热系统具有很好的研究意义。

关键词: 陶瓷; 芯片; 3D 打印; 数值模拟; 散热

参考文献

- [1] Zeng Yong, Sun Lijun, Yao Hai hua, Chen Jimin. Fabrication of alumina ceramics with functional gradient structures by digital light processing 3D printing technology[J]. *Ceramics International*,**2022,48(8)**.
- [2] Qi Guo an, Zeng Yong, Chen Jimin. Preparation of porous SnO₂-based ceramics with lattice structure by DLP[J]. *Ceramics International*,**2022,48(10)**.
- [3] Sun Lijun, Dong Peng, Zeng Yong, Chen Jimin. Fabrication of hollow lattice alumina ceramic with good mechanical properties by Digital Light Processing 3D printing technology[J]. *Ceramics International*,**2021,47(18)**.
- [4] 曾勇,张子佳,孙立君,姚海华,陈继民.3D 打印氧化铝陶瓷的气氛脱脂热处理工艺研究[J].*无机材料学报*,**2022,37(03)**:333-337.
- [5] 陆月星,李洪淼. 飞机座舱散热的数值模拟研究[C]//.第十一届全国流体力学学术会议论文摘要集.**2020**:957.

*第一作者联系方式: 冯欣、18863049250、fengxin110866@163.com

Simulation of heat dissipation of Ceramic Circuit Board on chip

Abstract:

This paper introduces the simulation of the heat dissipation of the Ceramic Circuit Board in the chip. First of all, the self-sufficiency rate of our chip data analysis, our current chip self-sufficiency rate is still low, the lack of core chips, high-end technology has long been controlled by foreign manufacturers. In recent years, the state has strengthened the support and attention to the science and technology chip, it is expected that by 2025, our chip self-sufficiency rate will reach 70% .Then, with the deepening of electronic technology in various application fields, the high integration of PCB has become an inevitable trend. High Integrated packaging module requires a good heat dissipation load-bearing system, so the use of metal and ceramic materials with good heat dissipation properties to prepare the circuit board, in this paper is the study of ceramic materials. The first experiment is to simulate the heat dissipation of the ceramics with the same ambient temperature as the heat source and the different printing methods, materials, ratios and structures of the ceramics, effects of different conditions on the final heat dissipation. On the basis of thermal analysis, body-centered cubic structure, face-centered cubic structure and minimal curved surface are selected as the simulated structures. The second experiment is to investigate the effects of varying the wind speed and the number of heat sinks on the heat dissipation in a simulated system. Finally, the application of Ceramic Circuit Board is summarized and prospected. As an important component in the development of science and technology, Ceramic Circuit Board will promote the development of semiconductor chip. Therefore, the cooling system has a good research significance.

Keywords: ceramics; chip; 3D printing; numerical simulation; heat dissipation.