Chapter 6
Electronic Cooling

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ABSTRACT

Through the ongoing downsizing and fast growth of heat flow of electronic components, cooling concerns are confronting severe tasks. This chapter examines the recent advancements and modernization in the cooling of electronics. The most popular electronic cooling technologies, which are classed as direct and indirect cooling, are examined and described in depth. The best prevalent methods of indirect cooling by employing heat pipes, microchannels, PCM are discussed. The efficiency of cooling strategies for various levels of electronic cooling requirements, as well as approaches to increase heat transfer capabilities, are also discussed in depth. Meanwhile, by considering the intrinsic thermal characteristics, optimization approaches, and pertinent uses, the advantages and disadvantages of various thermal management systems are examined. Furthermore, the present issues of electronic cooling and thermal management technologies are discussed as well as the prospects for future advancements.

INTRODUCTION

Electronic equipment has penetrated almost all facets of new life, from toys and

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Figure 1. Major Applications of Integrated Circuits

appliances to powerful processors. The worthiness of an electronic system is a key aspect in the total reliability of the system. Guarnieri M (2016) specified in his article that, integrated circuits (IC) have progressed significantly later in 1949 Werner Jacobi published the first conception of IC. An IC is a tiny chip constructed of the semiconductor material silicon that may hold lots of microelements viz., capacitors, transistors and resistors. It is often created using the several-nanometer method. As seen in Figure 1, integrated circuits are now employed in practically all electronic equipment, and modern life is closely entwined with numerous electronic items. These apps have greatly increased the efficiency and quality of labor, production, and living for modern people.

Ho-Ming Tong et al. (2013) depicted the failure reasons of electronic equipment in percentages as shown in Figure 2. Temperature, vibration, humidity, and dust are the most common reasons for electronic component failure. The greatest risk of failure is owing to heat production, which causes component temperatures to rise (Upto 55%). Electronic components rely on the flow of electricity to accomplish

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