

[A review of piezoelectric fans for low energy cooling of power electronics](#)

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- **Is Part Of:** Applied energy, 2018, Vol.215, p.321-337
- **Publisher:** Elsevier Ltd
- **Language:** English
- **LCSH and PCI subjects:** Alternative air-mover ; Analysis ; Design optimisation techniques ; Electrical equipment and supplies ; Electrical machinery ; Low energy thermal management ; Mathematical optimization ; Numerical analysis ; Numerical simulation ; Piezoelectric fan ; Power electronics ; Validation
- **Description:** •The need for low energy thermal management solutions is introduced. •Piezoelectric fan design, operation and optimisation processes are analysed. •Existing limitations in the development process are outlined. •Methods to widen the field of piezoelectric fan applications are considered. Power consumption from electrical devices increases year upon year, and as a result thermal management of power electronics is becoming ever more relevant. This review summarises the advancements made in the piezoelectric fan optimisation since their invention in the late 1970s. Energy consumption is highly relevant, and is an underlying theme throughout. Emphasis is placed on the methods undertaken to optimise designs for many different applications, and critical analysis of these processes is included. Comparison of data taken from different studies highlights the well-established rules of piezoelectric fan design and, more importantly for future advancements, also identifies the aspects of design which are not fully understood. Numerical modelling has become an essential tool for piezoelectric fan design optimisation since 2010, and the large majority of publications since have included computational methods to some degree. The optimisation of a single piezoelectric fan for a hot spot cooling application is well understood and, whilst always fundamental to the research field, does not pose the greatest potential for development in real life applications, as a single piezoelectric fan cannot replace a cooling system of any great size. Rather, the development of multiple fan arrays, which could ultimately replace alternative power electronic thermal management systems, should be strongly considered in the coming years.
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- **Identifier:** ISSN: 0306-2619; EISSN: 1872-9118; DOI: 10.1016/j.apenergy.2018.02.014