

## Accepted Manuscript

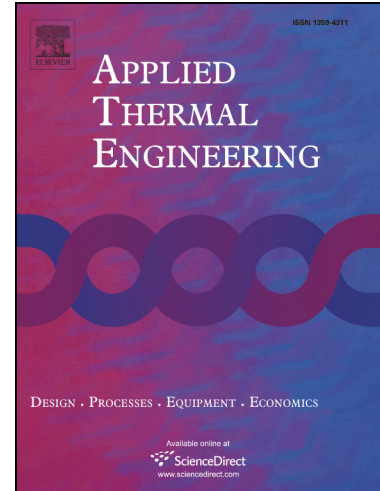
Comparisons between Heat Pipe, Thermoelectric System, and Vapour Compression Refrigeration System for Electronics Cooling

Kun Liang, Zhaohua Li, Ming Chen, Hanying Jiang

PII: S1359-4311(18)32843-6  
DOI: <https://doi.org/10.1016/j.applthermaleng.2018.09.120>  
Reference: ATE 12729

To appear in: *Applied Thermal Engineering*

Received Date: 7 May 2018  
Revised Date: 1 August 2018  
Accepted Date: 27 September 2018



Please cite this article as: K. Liang, Z. Li, M. Chen, H. Jiang, Comparisons between Heat Pipe, Thermoelectric System, and Vapour Compression Refrigeration System for Electronics Cooling, *Applied Thermal Engineering* (2018), doi: <https://doi.org/10.1016/j.applthermaleng.2018.09.120>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

## Comparisons between Heat Pipe, Thermoelectric System, and Vapour Compression Refrigeration System for Electronics Cooling

Kun Liang<sup>\*</sup>, Zhaohua Li, Ming Chen, Hanying Jiang

*Department of Engineering and Design, University of Sussex, Brighton BN1 9QT, UK*

\* Corresponding author. Tel: +44 1273 678573. Email address: kun.liang@sussex.ac.uk

### Abstract

Passive systems such as air for electronics cooling have now effectively reached their limits. This paper evaluated three comparable systems for electronics cooling, including heat pipe (HP, passive system), thermoelectric (TE) and vapour compression refrigeration (VCR) systems (active systems). Mathematical model has been built for the heat pipe and the thermoelectric system respectively. Measurements have been conducted to validate the model and to compare the performance among a HP, a single stage TE system and a two-stage TE system, a combination of the HP and the TE system, and a VCR system using an oil-free linear compressor. Close agreements between the modelling and measurements have been achieved in terms of electric power input and cooling capacity at various temperatures. The HP improved the cooling capacity and the coefficient of performance (COP) of the TE system by 53% and 42% respectively at a cold end temperature of 10 °C. Heat pipe is more attractive for cooling large devices at higher temperatures. Two-stage TE system can be used for cooling devices at lower temperatures. VCR system is capable of dissipating much higher heat flux (200 W/cm<sup>2</sup>) at lower temperature than all other technologies.

*Keywords:* thermoelectric, heat pipe, vapour compression refrigeration, two-stage, COP, cooling capacity

Download English Version:

<https://daneshyari.com/en/article/11020820>

Download Persian Version:

<https://daneshyari.com/article/11020820>

[Daneshyari.com](https://daneshyari.com)