COMPUTATIONAL FLUID DYNAMIC ANALYSIS ON MINICHANNEL ELECTRONIC COOLING DEVICE

IZZUDDIN ALI BIN SIDEK ALI

(2006688878)

A thesis submitted in partial fulfillment of the requirements for the award of Bachelor Engineering (Hons) (Mechanical)

Faculty of Mechanical Engineering

Universiti Teknologi MARA (UiTM)

MAY 2010

" I declared that this thesis is the result of my own work except the ideas and summaries which I have clarified their sources. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any degree "

Signed : .....

Date : 14/5/10

Izzuddin Ali Bin Sidek Ali

UiTM No. : 2006688878

ACKNOWLEDGEMENT

Firstly, I would like to be very thankful to the Almighty for His benevolence and generosity in giving me strength and courage to complete my thesis successfully in order to fulfill the requirement for Bachelor of Engineering (Hons.) in Mechanical Engineering.

I would like to express my sincere gratitude and appreciation to my supervisor, Mr. Baljit Singh a/l Bhathal Singh, for their continuous support, generous guidance, help, patience and encouragement in the duration of the thesis preparation until its completion.

In addition, I would like to express my thanks to my parents, Sidek Ali bin Jobad Ali and Hamidah binti Husin, and family who has gave me support and encouragement to complete my thesis.

ABSTRACT

Miniaturization process of electronic components occurs at very rapid rate and has resulted in increasing power generated with decreasing of the surface area. Today technologies of electronic component have generated very high heat fluxes resulting in large temperature rises. For the electronic component to functioning effectively, a good heat exchanger is required. Heat flux that produced by electronic component cooled by air has almost reach its limit about 100 W/cm^2. Minichannel heat pipe is an effective and efficient alternative method to be used for high heat flux removal. Minichannel heat pipe is small device of very high thermal conductance and that are used to remove high heat flux from other device. In this project, the effect of the serpentine element, channel pattern, channel dimension and channel inlet velocity on the heat transfer rate are presented. Computational fluid dynamic (CFD) method is used for the analysis of the minichannel heat pipe. CFD module/software used for the project is STAR CCM. Assumptions that are made are the flow is three dimensional, incompressible, laminar flow and steady state condition. The rate of heat transfer for all the model was analyzed using the CFD software. The results show that reduce in channel hydraulic diameter, using rectangular cross-sectional area flow passage and increase inlet velocity will result in higher heat transfer of the minichannel.

TABLE OF CONTENTS