

**THERMAL MANAGEMENT OF CONVECTIVE COOLING FOR
ELECTRONIC PRINTED CIRCUIT BOARDS**

SURIYON CHOMDEE

**DOCTOR OF PHILOSOPHY
IN MECHANICAL ENGINEERING**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

**GRADUATE SCHOOL
CHIANG MAI UNIVERSITY**

OCTOBER 2005

ISBN 974-9889-19-3

**THERMAL MANAGEMENT OF CONVECTIVE COOLING FOR
ELECTRONIC PRINTED CIRCUIT BOARDS**

SURIYON CHOMDEE

**A THESIS SUBMITTED TO THE GRADUATE SCHOOL IN
PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY
IN MECHANICAL ENGINEERING**

ลิขสิทธิ์มหาวิทยาลัยเชียงใหม่
Copyright © by Chiang Mai University
All rights reserved

**GRADUATE SCHOOL
CHIANG MAI UNIVERSITY**

OCTOBER 2005

ISBN 974-9889-19-3

**THERMAL MANAGEMENT OF CONVECTIVE COOLING FOR
ELECTRONIC PRINTED CIRCUIT BOARDS**

SURIYON CHOMDEE

THIS THESIS HAS BEEN APPROVED
TO BE A PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY
IN MECHANICAL ENGINEERING

EXAMINING COMMITTEE

CHAIRPERSON

Prof.Dr. Tanongkiat Kiatsiriroat

MEMBER

Assoc.Prof. Thawan Sucharitakul

MEMBER

Asst. Prof. Dr. Wiwat Klongpanich

MEMBER

Asst. Prof. Dr. Nat Vorayos

MEMBER

Dr. Jirawan Tiansuwan

6 October 2005

@ Copyright by Chiang Mai University

ACKNOWLEDGEMENT

The author wishes to express his utmost gratitude to his adviser, Professor Tanongkiat Kiatsiriroat for his constructive guidance, suggestion, comments and discussions through every phase of the study. Grateful acknowledgements are made to the members of the Doctoral Program Committee, Assoc.Prof. Thawan Sucharitakul , Asst. Prof. Dr. Wiwat Klongpanich and Asst. Prof. Dr. Nat Vorayos for their valuable comments. The author is greatly indebted that Dr. Jirawan Tiansuwan kindly agreed to serve as the External Examiner.

The author is greatly indebted to Dr. Atipoang Nantaphan and Mr. Panich Jittayasotorn for the assistance during the experimental work.

Acknowledgement is due to the Thailand Research Fund for awarding the scholarship and research fund for his study at Chiang Mai University.

Finally, I would like to thank my father, my mother, my brother and my wife for all of the support, guidance, care and love throughout my life especially during my doctoral research work.

Suriyon Chomdee