



**UNIVERSITI PUTRA MALAYSIA**

***DEVELOPMENT OF AUTOMATED NEIGHBORHOOD PATTERN  
SENSITIVE FAULTS SYNDROME GENERATOR FOR  
STATIC RANDOM ACCESS MEMORY***

**JULIE ROSLITA BINTI RUSLI**

**FK 2011 114**

**DEVELOPMENT OF AUTOMATED NEIGHBORHOOD PATTERN  
SENSITIVE FAULTS SYNDROME GENERATOR FOR  
STATIC RANDOM ACCESS MEMORY**

By

**JULIE ROSLITA BINTI RUSLI**

**Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia,  
in Fulfillment of the Requirements for the Degree of Master of Science**

**AUGUST 2011**

## DEDICATION

**This Thesis is dedicated**

**To**

***My Beloved Husband***

*Ahmad Rifaie thanks for your immeasurable support*

***My Inspiration***

*Late Rusli and Erita Usman*

*and*

***My Princess***

*Nur Afiqah and Nur Aisyah*

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirement for the degree of Master of Science

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**Faculty : Engineering**

Testing is one of the main key in advanced semiconductor memory technologies. In the past, memory testing only focuses on fault detection. With the increasing complexity of memory devices, fault diagnosis is becoming very important to locate and identify type of fault. One of the memory faults is Neighborhood Pattern Sensitive Faults (NPSF). NPSF is one of the faults that are hard to test due to higher number of cells to be tested at one time. Moreover, most of the memory test algorithm does not have the capability to detect and diagnose NPSF. Therefore, the purpose of this thesis is to develop NPSF detection and diagnose software for Static Random Access Memories (SRAM).

The development of this Automated NPSF Syndrome Generator (ANPSFSG) is to improve the process of analyzing NPSF detection and to generate the fault syndrome for NPSF diagnosis. This automated generator will facilitate NPSF analysis as manual fault analysis is no longer practical due to increasing memory size. The algorithms used in this generator are based on March algorithm. Three types of March algorithms which are March 17N, March 12N and MarchPS 23N are selected to validate the tool in term of their compatibility for NPSF detection and diagnosis. Suitable data background is identified and a test procedure is developed for each algorithm. All test procedures are integrated into comprehensive database which is developed using Microsoft Access software.

The ANPSFSG is able to list detected diagnosed faults as well as to calculate and display fault diagnostic resolution. A user-friendly Graphical User Interface (GUI) is developed using Microsoft Visual Basic software to load and display the algorithm under test and display the result. The results produced by the tools are then validated with other research finding. This tool can be used to ease the process of developing a new March test algorithm for NPSF.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

**PEMBANGUNAN PENJANA SINDROM KESALAHAN POLA  
PERSEKITARAN SENSITIF SECARA AUTOMATIK UNTUK  
MEMORI AKSES RAWAK STATIK**

Oleh

**JULIE ROSLITA BINTI RUSLI**

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Ujian merupakan salah satu kunci utama di dalam kemajuan teknologi memori semikonduktor. Pada masa lampau, ujian memori hanya tertumpu kepada pengesanan kesalahan. Dengan meningkatnya kerumitan peranti memori, diagnosis kesalahan menjadi sangat penting untuk mengesan dan mengenalpasti jenis kesalahan. Satu daripada kesalahan memori ialah kesalahan pola persekitaran sensitif (NPSF). NPSF merupakan satu daripada kesalahan-kesalahan yang sukar untuk diuji kerana jumlah sel yang tinggi untuk diuji pada satu masa. Lagi pula, kebanyakan daripada algoritma ujian memori tidak mempunyai keupayaan untuk mengesan dan mendiagnosis NPSF. Oleh itu, tesis ini ialah bertujuan untuk membangunkan

perisian untuk mengesan dan mendiagnosis kesalahan NPSF untuk memori akses rawak static (SRAM).

Pembangunan penjana sindrom NPSF automatic (ANPSFSG) ialah untuk memperbaiki proses menganalisa pengesanan kesalahan NPSF dan untuk menghasilkan sindrom kesalahan untuk mendiagnosis NPSF. Penjana automatic ini akan membantu analisis NPSF kerana analisis kesalahan secara manual tidak lagi sesuai kerana meningkat saiz memori. Algoritma yang digunakan didalam penjana ini adalah berasaskan algoritma March. Tiga jenis algoritma March iaitu March 17N, March 12N dan MarchPS 23N adalah dipilih kerana kesesuaian kesemuanya untuk diagnosis NPSF. Latar belakang data yang bersesuaian telah dikenal pasti dan tatacara ujian telah dibangunkan untuk setiap algoritma. Kesemua tatacara-tatacara ujian disepadukan untuk menjadi pengkalan data yang lebih menyeluruh yang dibangunkan menggunakan perisian Microsoft Access.

ANPSFSG mampu untuk menyenaraikan kesalahan-kesalahan diagnosa yang dikesan serta mengira dan memaparkan resolusi diagnostik. Grafik antara muka pengguna (GUI) yang mesra pengguna dibangunkan menggunakan perisian Microsoft Visual Basic untuk memasukkan algoritma yang diuji dan memaparkan keputusannya. Keputusan penjana ini telah disahkan dengan hasil penemuan kajian yang lain. Penjana ini juga boleh digunakan untuk memudahkan proses untuk membina March algoritma untuk NPSF.

## ACKNOWLEDGEMENTS

In the name of Allah, the Most Beneficent, the Most Merciful. All praise due to Allah for His help and guidance until I'm able to finish the journey.

First of all, I would like to express my appreciation to my supervisor Assoc. Prof. Dr Roslina for her extraordinary support, advice, guidance and encouragement throughout my research.

My gratitude also goes to my great member of my committee Dr Wan Zuha for his encouragement in exploring this area with remarkable support, guidance and advice.

I also would like to extend my thanks to member of my committee Assoc.Prof. Dr Abd Rahman for his support.

Great appreciation is expressed to my friend Masnita who is always there when I needed help especially during my research completion and also to Azura for her support.

Appreciation also goes to the Faculty of Engineering for providing the facilities and the components needed to undertake this project and UniKL-BMI for supporting my study. Finally, I would like to thank my family for their unconditional support and bless until I reach to this point. May Allah help us in performing ibadah only to HIM.



I certify that an Examination Committee has met on **23 August 2011** to conduct the final examination of **Julie Roslita binti Rusli** on her degree thesis entitled **“Development of Automated Neighborhood Pattern Sensitive Faults (NPSF) Syndromes Generator for Static Random Access Memory (SRAM)”** in accordance with Universiti Pertanian Malaysia (Higher Degree) Act 1980 and Universiti Pertanian Malaysia (Higher Degree) Regulations 1981. The committee recommends that the student be awarded the Master of Science.

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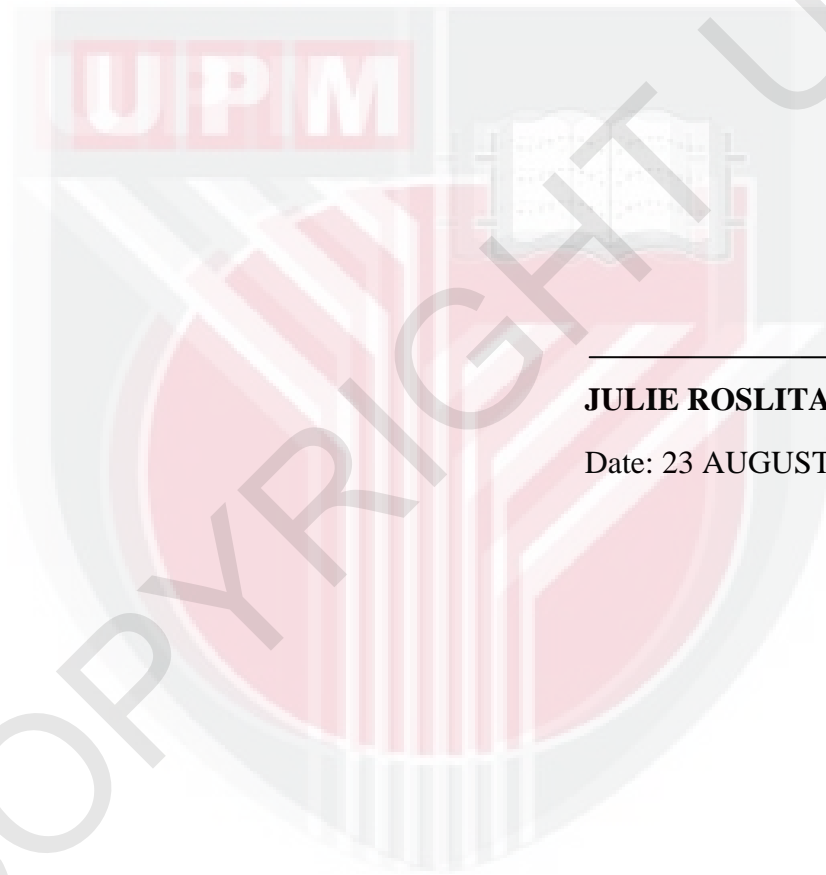
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## DECLARATION

I declare that the thesis is my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously, and is not concurrently, submitted for any other degree at Universiti Putra Malaysia or at any other institution.



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**JULIE ROSLITA RUSLI**

Date: 23 AUGUST 2011



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