



UNIVERSITI TEKNOLOGI MARA

**FPGA ON-BOARD MEMORY STUDIES AND
PERFORMANCE ANALYSIS**

MUHAMAD AIMAN BIN MUHAMAD AZNAN

Thesis submitted in fulfilment of the requirements
for the degree of
Bachelor of Engineering (Hons.) Electronics Engineering

Faculty of Electrical Engineering

JULY 2018

ACKNOWLEDGEMENT

First of all, thanks for His mercy and guidance in giving me full strength to complete this “FPGA On-Board Memory Studied and Performance Analysis” project just in time. Even facing with difficulties in completing this task, I still managed to complete it.

A lot of thanks to my supervisor of this final year project, Mrs Siti Lailatul Binti Mohd Hassan for all of his support and guidance in helping me finish my final year project. She had given me appropriate example and knowledge in order to help me understand more about this project even this project really tested my abilities mentally and physically.

Then, I would like thanks to my parents, for supporting me mentally and physically not just during finishing this final year project but also during my whole studies in UiTM Shah Alam.

In addition, grateful acknowledgment to all of my friends who never give up in giving their support to me in all aspect of life. They tried their best to give their support for me either by giving me a lot of encouragement for keep up with this final year project in order to fully complete.

ABSTRACT

This paper present Field Programmable Gates Array (FPGA) on-board memory studies and performance analysis by designing a controller of memory using Verilog code. Inside this type of FPGA board, there are three types of on-chips memory available that is SRAM, SDRAM and FLASH memory. The memories have its own capability and function. The purpose of this study is to determine the performance for each types of memory in term of its area and power. This study is expected to help students in the future to fully understand on board memory. This study achieved by design controller using Verilog code on FPGA board and test the output through seven segment displays. Quartus tools as a software to compile Verilog code. Then, Timing Analyzer and Power Tools used to obtain the area and power consumption. From the analysis, SDRAM has maximum area with 89 logics then follow by SRAM with 88 logic and last is flash with 83 logics. For power consumption, SDRAM is lower follow with flash then SRAM is higher power consumption. All the memory successfully obtained its performance as expected.

TABLE OF CONTENTS

TITLE	i
APPROVAL	ii
DECLARATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
TABLE OF CONTENTS	vi
LIST OF FIGURES	ix
LIST OF TABLES	xi
LIST OF ABBREVIATIONS	xii

CHAPTER	DESCRIPTION	PAGE
1.0	INTRODUCTION	
	1.1 Project Overview	1
	1.2 Problem Statement	3
	1.3 Research Objectives	3
	1.4 Scope of Work	3
	1.5 Significant of Work	4
	1.6 Thesis Organization	4
2.0	LITERATURE REVIEW	
	2.1 ANALYSIS FROM PREVIOUS WORK	5
	2.1.1 SRAM	5
	2.1.2 SDRAM	8

CHAPTER 1

INTRODUCTION

1.1 PROJECT OVERVIEW

Memory is an important component inside the computer itself. It has information capability to store data either temporary or permanently and widely used in processor architecture. Although previous studies stated the performance is not enough to optimize the memory performance due to the long memory access potential[1]. For information, memory is divided into two types on memory that is volatile memory and non-volatile memory. Random Access Memory RAM is known as one of the volatile memory. Volatile memory is a type loses its content when the computer or hardware device loses power. While non-volatile memory will save its content even the device loses power[2]. Non-volatile memory is expected to enrich the next generation computer system[3].

Why memory is important to the computer or hardware? This is because the speed is different when compared to all device in computer or hardware. RAM have two types that is SRAM and SDRAM. While SDRAM have many level, the latest one is Dual Data Rate (DDR) 4 ram. Because the DDR is a very low cost then is widely used to custom own computer where they are usually used to run the functions of storage[4].

This project is to studies and analyse memories performance on the FPGA board. The performance such as area and power be obtained by designing controller using Verilog code. Result was collected through Quartus software. Inside Quartus itself, it has