# THE HIGH SPEED SWITCHING PHASE CHANGE MEMORY (PCM) USING GERMANIUM TELLURIDE (GeTe)

The thesis is presented in fulfillment for the requirement of Bachelor of Engineering (Hons.) in Electronic Engineering (Electronic) UNIVERSITI TEKNOLOGI MARA (UiTM)

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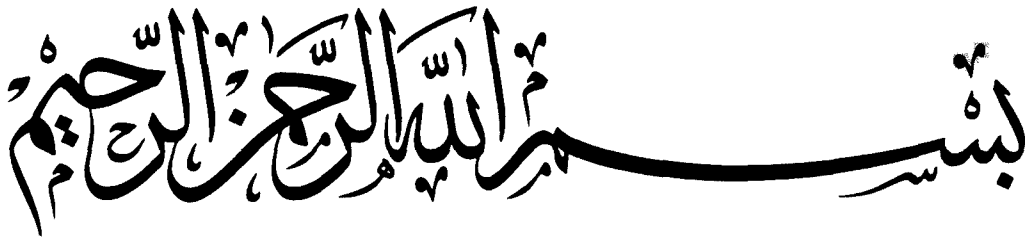

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# ABSTRACT

This project will be present the Phase Change Memory (PCM) by using the GeTe material. Nowadays, there a lot of demand of memory devices with high speed, high performance and low production cost are the major issues in the semiconductor industry all around the world. PCM is considered to be one of the promising candidates for the next generation memory device. PCM technology is based on the remarkable difference between the resistivity of phase change materials in the amorphous and crystalline phase and fast switching of between this two phase. It can store and erase memory through switching phases between amorphous phase to crystalline phase and from crystalline phase to amorphous phase. The data is stored in the SET condition which is SET is a process to change phase form from amorphous to crystalline. The data will be erased in the RESET condition which is RESET is a process to change from crystalline to amorphous. The objective of this project is to achieve the highest speed of PCM by using the GeTe material. The transition from the amorphous to the crystalline phase is induced by heating the material and switching back the crystalline to the amorphous by melting and quenching the material. GeTe is the best phase change material to help PCM to switch phases from an amorphous phase to crystalline phase or vice versa at high speed, in order to fulfill the demand of a high speed memory.

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# CHAPTER 1

# INTRODUCTION

## 1.1 PROJECT BACKGROUND

Recently, non-volatile memory is used widely for data storage such as flash memory, FERAM and MRAM. However, this type of memory has its own disadvantages such as low speed processing to write and erase data, low scalability and less interesting for low-power consumption. Due to this problem, PCM has become the next promising technology for data storage because it has fast generation speed, high scalability, low power operation and fabrication costs. PCM can store memory because it uses the chalcogenide alloys (phase-change material) for its memory layer. The active material which is commonly used for PCM is the Ge2Sb2Te5 (GST). However, Ge2Sb2Te5 (GST) has some drawbacks such as low crystallization temperature and low crystalline resistance.