

**DEVELOPMENT OF SINUSOIDAL PULSE WAVE
MODULATION (SPWM) INTEGRATED CIRCUIT TO
CONTROLLING THE SINGLE PULSE WAVE MATRIX
CONVERTER (SPMC)**

**Thesis submitted to the Faculty of Electrical Engineering,
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Degree of Bachelor of Engineering**



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ABSTRACT

This paper described about the research and the development of SPWM (Sinusoidal Pulse Wave Modulation) in form of integrated circuit (IC) which will be used to control SPMC (Single Pulse Matrix Converter) system. SPWM system gave a digital output by comparing two signals, sinusoidal wave signal and triangle wave signal, which will control the switches in SPMC system. This system has been synthesized using Xilinx Foundation Series 2.0 and targeted on XC4005XL. From the RTL schematic obtained from the synthesis tool, it transferred into schematic circuit using logical gate in Mentor Graphics system. The circuit that consisted is 8-bit counter, 8-bit multiplier and 8-bit comparator. After simulated and synthesized the schematic circuits, the schematic circuits were prepped into IC layout using Mentor Graphics Tools with 0.25 μm TSMC CMOS technology.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW OF SPMC

SPMC is an advanced converter which offers an “all silicon” solution for AC-AC converter, AC-DC converter, DC-AC converter, DC-DC converter by removing the need for reactive energy storage components used in conventional rectifier-inverter based system [1]. There was a lot of challenging to control the matrix converter with large energy storage components as loads, such as large DC capacitors or inductors, but by using carefully designed switching sequences, the conversion could be realized [3]. SPMC can be represented by four (4) Bi-directional switches that conduct current in both directions, blocking forward and reverse voltages, which can perform all the basic functions of converters supplying passive load [2]. SPWM switching algorithm with IGBTs are used as the SPMC power switching device [2] and this system has been successfully implemented on FPGA by [3]. Based on the successful implementation of SPWM on FPGA, the circuit of SPWM has been considered to be implemented on ASIC in order to increase in use of power electronics controllers in consumer electronics and portable electronics [4]. Below is the circuit of SPMC that used IGBT as switching components.