# DC-TO DC RESONANT CONVERTER USING POWER MOSFET

This Project Report is presented in partial fulfillment for the award of the Bachelor of Electrical Engineering (Hons.)

### UNIVERSITI TEKNOLOGI MARA



RADZALEIGH BIN ABDULLAH FACULTY OF ELECTRICAL ENGINEERING UNIVERSITI TEKNOLOGI MARA 40450 SHAH ALAM, SELANGOR.

#### **ACKNOWLEDGEMENT**

Firstly, I would like to record my deepest appreciation to my project supervisor, Pn. Bibi Norasiqin Bt. Sheikh Rahimullah for the consistent consultation and invaluable advice throughout the preparation and completion of this project. Also, I would like to thank all the laboratory personnel for their involvement and assistance in making this project successful.

Secondly, I would like to express my sincere gratitude and heartfelt to my beloved parent, En. Abdullah B. Ismail and Pn. Radziah Bt. Mahmud for their guidance and love in nurturing me to be who I am today. Also, to my brothers and sisters through their caring, motivations and understanding, they have taught me to have the courage to believe in myself even more.

Last but not least, I would like to thank all my friends who had given their ideals, support and encouragement throughout the study. THANK YOU.

## **ABSTRACT**

This paper describes the design of a dc-to-dc (chopper) converter for resonant condition. This resonant converter is designed to be used in high frequency application. The parallel arrangement of resister, inductor and capacitor is used in the design to develop the resonant frequency. Simulation results show that the proposed design gives better efficient operation at higher switching rates.

# TABLE OF CONTENTS

C	HAPTER DESCRIPTION	PAGE
	DECLARATION	i
	ACKNOWLEDGEMENT	ii
	ABSTRACT	iii
	TABLE OF CONTENTS	iv
	FIGURES	vii
	LIST OF TABLES	ix
	LIST OF ABBREVIATIONS	<b>x</b>
1	CHAPTER 1: INTRODUCTION	
	1.1 Introduction.	1
	1.2 Scope of Work	1
	1.3 Scope of Thesis	2
2	CHAPTER 2: RESONANT POWER SUPPLIES	
	2.1 Introduction	3
	2.2 Types of Converter	4
3	CHAPTER 3: TANK CIRCUIT	
	3.1 Introduction	9
	3.2 Tank Circuit as Generator	9
4	CHAPTER 4: SWITCHING DEVICE	
	4.1 Introduction	13
	4.2 The Power MOSFET	13
	4.3 Advantages of Power MOSFET	16

	4.4 Types of MOSFETs	17
	4.5 The Enhancement MOSFET (E-MOSFET)	18
	4.6 Troubleshooting Enhancement-Type MOSFET	23
	4.7 N-Channel Enhancement MOSFET	24
5	CHAPTER 5: RESONANTCHARACTERISTIC	
	5.1 Introduction	26
	5.2 Parallel Resonant Circuit	26
	5.3 Parallel Resonant Characteristic	27
	5.4 Theoretical Calculation for Resonant Circuit	30
	5.5 Resonant Converter Operating Mode	33
6	CHAPTER 6: CIRCUIT DESIGN	
	6.1 Circuit Design	35
	6.2 Parallel-Loaded Resonant Converter	36
	6.3 Hardware Design	37
7	CHAPTER 7: RESULT	
	7.1 Introduction	38
	7.2 Circuit Simulation Result	38
	7.3 Hardware Experiment	43
8	CHAPTER 8: CONCLUSSION AND DISCUSSION	
	8.1 Discussion	46
	8.2 Inverter Circuit	47
9	CHAPTER 9: CONCLUSION	
	9.1 Conclusion	50
	9.2 Future Development	50