

**DESIGN A 12 V TO 24 V DC-DC SWITCHING BOOST  
CONVERTER**

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**SCHOOL OF ELECTRICAL SYSTEM ENGINEERING  
UNIVERSITI MALAYSIA PERLIS**

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# DESIGN A 12 V TO 24 V DC-DC SWITCHING BOOST CONVERTER

by

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Report submitted in partial fulfillment  
of the requirements for the degree  
of Bachelor of Engineering



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## APPROVAL AND DECLARATION SHEET

**This project report titled Design a 12 V to 24 V DC-DC Switching Boost Converter was prepared and submitted by Kee Cheng Rui (Matrix Number: 081070260) and has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the Bachelor of Engineering (Industrial Electronic Engineering) in Universiti Malaysia Perlis (UniMAP).**

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**May 2011**

# **REKABENTUK 12 V KEPADA 24 V DC- DC SWITCHING MODE PENUKAR KE HADAPAN**

## **ABSTRAK**

Pada masa kini, power supply switching yang berada dalam pasaran telah berkembang dengan cepat dan memainkan peranan yang penting. Jurutera sukar untuk mendapat voltan yang dikehendaki oleh hasil karya reka bentuk mereka. Tambahan pula voltan keluaran yang dihasilkan tidak selalu mempunyai kecekapan yang tinggi. Sebuah penukar ke hadapan atau penukar langkah-tinggi adalah sebuah penukar kuasa dengan voltan keluaran DC yang lebih besar daripada voltan masukan DC. Tujuan projek ini adalah untuk menghasilkan reka bentuk dan analisis meningkatkan voltan DC dari 12 Volt kepada 24 Volt dengan menggunakan MOSFET dan reka bentuk LM555 litar bersepadu khusus untuk tugas ini. Perisian komputer PSIM, MATHCAD atau perisian setara digunakan untuk simulasi litar ideal penukar ke hadapan. Manakala untuk litar penukar ke hadapan tidak ideal disimulasi oleh perisian MULTISIM untuk memastikan litar tersebut berfungsi. Selepas simulasi, litar prototaip penukar ke hadapan dibentuk, diuji, mendapatkan data-data dan dianalisa. Data yang diambil bagi litar prototaip selepas uji kaji mendapati voltan keluaran 21.95 V and mempunyai 70% kecekapan bagi beban 100  $\Omega$ , ini disebabkan oleh 46% duti kitaran.

## DESIGN A 12 V TO 24 V DC- DC SWITCHING MODE BOOST CONVERTER

### ABSTRACT

The switching power supply market is flourishing quickly in today's high-tech world. Design engineer are not supplied with the desired amount of voltage they need in order to make their design work. Adding an additional voltage supply to design is not always cost efficient. A boost converter or known as step-up converter is a power converter with an output DC voltage greater than its input DC voltage. This purpose of this project is to present the design and analysis boosting DC voltage from 12 V to 24 V by using a MOSFET and LM555 integrated circuit design specifically for this task. The PSIM, MATHCAD or equivalent software are used to simulate the ideal boost converter. While for non-idealities boost converter circuit was simulate by MULTISIM to make sure the circuit is function. Continued to the simulation, a hardware prototype of a boost converter was constructed, tested, and the result and analyzed. The hardware experiments shown the output voltage was 21.95 V and 70% efficiency for the 110  $\Omega$  load, due to 46% duty cycle.

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Appendix A Results simulation circuit from MATHCAD software

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## LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE

AC	Alternating current
BJT	Bipolar Junction Transistor
DC	Direct Current
ESR	Equivalent Series Resistor
IC	Integrated Circuit
IGBT	Integrated Gate Bipolar Transistor
MOSFET	Metal Oxide Semiconductor Field-Effect Transistor
PCB	Printed Circuit Board
PWM	Pulse Width Modulation
SMPS	Switched Mode Power Supply
$r_{ind}$	The series resistance inductor
rms	root-mean-square
D	Duty cycle
$\eta$	Efficiency
T1	Transistor 1

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