DESIGN A WIDEBAND LOW-NOISE AMPLIFIER FOR WIRELESS COMMUNICATION USING 0.35-µm CMOS TECHNOLOGY

By

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By the name of Allah, The Most Merciful. All praises due to Him, Lord of all worlds.

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APPROVAL AND DECLARATION SHEET

This project report titled Design A Wideband Low Noise Amplifier for Wireless Communication Using 0.35-um CMOS Technology was prepared and submitted by Mohd. Hafiz Bin Abu(Matrix Number: 031030257) and has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the Bachelor of Engineering (Electronic Engineering) in Universiti Malaysia Perlis (UniMAP).

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MEREKABENTUK PENGUAT RENDAH HINGAR JALUR LEBAR UNTUK KEGUNAAN WAYARLES MENGGUNAKAN TEKNOLOGI CMOS 0.35-um.

ABSTRAK

Penguat rendah hingar merupakan salah satu komponen yang terdapat pada bahagian hadapan sistem penerima isyarat tanpa wayar. Diletakkan berhampiran dengan antena, bahagian ini bertindak meminimumkan isyarat yang mengandungi hingar di samping menguatkan isyarat yang datang dari bahagian sebelumnya. Ia biasanya digunakan untuk menguatkan isyarat yang lemah yang kebiasaannya wujud pada radio dan kabel penerima. Di dalam menjalankan projek ini, sebahagian pengkhususan nilai menggunakan aspek dari sistem *Digital Enhanced Cordless Telecommunication (DECT)*. Semasa merekabentuk penguat, ciri-ciri penguat rendah hingar telah dipelajari dan dikaji. Oleh yang demikian, teras pada penguat menggunakan struktur *simple common-source transconductance* pada fasa pertama dan pada fasa kedua menggunakan *simple common source* dengan eleman aktif pirau. Kelebihan menggunakan suap balik ini adalah penguat akan mengurangkan kewujudan hingar di samping mengurangkan ketidak selanjaran gangguan dengan menyeimbangkan antara keluaran dan masukan. Rekabentuk penguat kurang hingar ini dijalankan menggunakan perisian 'Mentor Graphic' dengan menggunakan teknologi 0.35-um tsmc (*Taiwan Semiconductor Manufacturing Company*) untuk proses rekabentuk dan simulasi. Pada penghujung proses, rekabentuk susunan penguat rendah hingar dihasilkan dan bersedia untuk distrukturkan di dalam bilik bersih.

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ABSTRACT

Low Noise Amplifier (LNA) is one of the receiver front end component. Place near antenna, this part used to minimize the noise figure of the amplifier while providing enough gain with sufficient linearity to overcome the noise of subsequent stage. It is commonly used to amplify signal that are to weak for direct processing for example in radio and cable receiver. For this project, some specification to design Low Noise Amplifier are picked from Digital Enhanced Cordless Telecommunication (DECT) specification. During designing the amplifier, the characteristic of the low- noise amplifier has been study. Thus, the core amplifier of the low noise amplifier consist of simple common source transconductance structure for the first stage and the second stage used common source amplifier with active shunt- shunt feedback. The advantage by using the feedback structure is the amplifier reduce effect of noise that occur and reduce non-linear distortion as the output proportional with the input. The design of the Low Noise Amplifier used Mentor Graphic software by using 0.35tsmc (Taiwan Semiconductor Manufacturing Company) for design and simulation process. At the end of the process, layout of the Low Noise Amplifier has been produce and ready to be fabricated at clean room.

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LIST OF ABBREVIATION

IC	Integrated Circuit
VLSI	Very Large Scale Integration
μ	Mobility of charge
L	Effective channel length
$\left(\frac{W}{L}\right)$	Aspect ratio
V_{TH}	Voltage threshold
C_{ox}	Total capacitance per unit length
g_m	Transconductance
ψ_o	Junction built in potentional
V_{db}	Reverse voltage across the junction
NF	Noise Factor