16 TO 4 BIT ENCODER

A project report submitted in partial fulfilment requirement for the course

on

VLSI DESIGN

By

Group-8

V.KEDHARESHWAR	2005A42026
T. SWATHI	2005A42027
G. KAMAL HEMANTH	2105A42L01
P. MEGHANA	2005A43005
D.RAKSHITH	2005A43006

Under the Guidance of

Dr. J. AJAYAN

Associate Professor

Department of Electronics and Communication Engineering

CERTIFICATE

This is to certify that the course project entitled **"16 TO 4 BIT ENCODER "** is the bonafide work carried out by **Kedhareshwar(2005A42026), T.Swathi(2005A42027), G.Kamal hemanth(2105A42L01), P.Meghana(2005A43005), D.Rakshith(2005A43006)** in the partial fulfilment of the requirement for the award of course **VLSI DESIGN** during the academic year 2023-2024 under our guidance and Supervision.

DR. J. AJAYAN
Associate Professor

Department of ECE

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABSTRACT

The combinational circuit that changes the binary information into N output lines is known as Encoders. The binary information is passed in the form of 2^N input lines. The output lines define the N-bit code for the binary information.

The project aims to design a circuit using MOSFETs that can convert hexadecimal numbers to binary numbers. The circuit will use logic gates implemented with MOSFETs to convert each digit of the hexadecimal number to its binary equivalent. The project will provide a practical application of MOSFETs and logic gates in digital circuits and contribute to the understanding of binary and hexadecimal number systems.

1. INTRODUCTION

The 16-to-4-line encoder is also known as Hexadecimal to Binary Encoder. In a 16-to-4-line encoder, there is a total of four outputs, i.e., O0, O1, O2 and O3 and sixteen inputs, i.e., 0, 1,2,3,4,5,6,7,8,9, A, B, C, D, E and F.

The encoder circuit uses logic gates, which are implemented using MOSFETs, to convert each digit of the hexadecimal number to its binary equivalent. This project demonstrates the application of MOSFETs and logic gates in digital circuits and provides a practical tool for converting hexadecimal numbers to binary numbers. It also contributes to the understanding of the relationship between the hexadecimal and binary number systems, which is essential in computer science and engineering.

It takes 16 inputs and activates one of the four outputs. The circuit is designed with OR logic gates and its functionality can be verified using truth tables or logic simulations. This type of encoder is used to convert a decimal number into the binary number, controlling multiplexers, and enabling specific functions based on the input data. 16 to 4 encoder is a fundamental building block in digital system design and is widely used in various applications.

2. CIRCUIT IMPLEMENTATION

2.1 BLOCK DIAGRAM

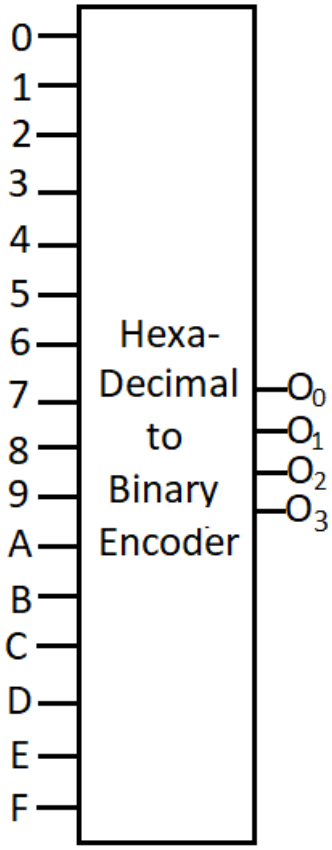

Fig 1: Block Diagram

2.2TRUTH TABLE

						Inputs										Outputs			
F	E	D	C	B	A	9	8	7	6	5	4	3	2	1	0	O_3	O_2	O_1	O_0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	0
0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1
0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0
0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	1
0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	1	0
0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	1	1
0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	0
0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	1
0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	1	0
0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0
0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1

Table 1: Truth Table

2.3 DESIGN

$O3 = \Sigma (8, 9, A, B, C, D, E, F)$

$O2 = \Sigma (4, 5, 6, 7, C, D, E, F)$

$O1 = \Sigma (2, 3, 6, 7, A, B, E, F)$

$O0 = \Sigma (1, 3, 5, 7, 9, B, D, F)$

2.4 CIRCUIT DIAGRAM

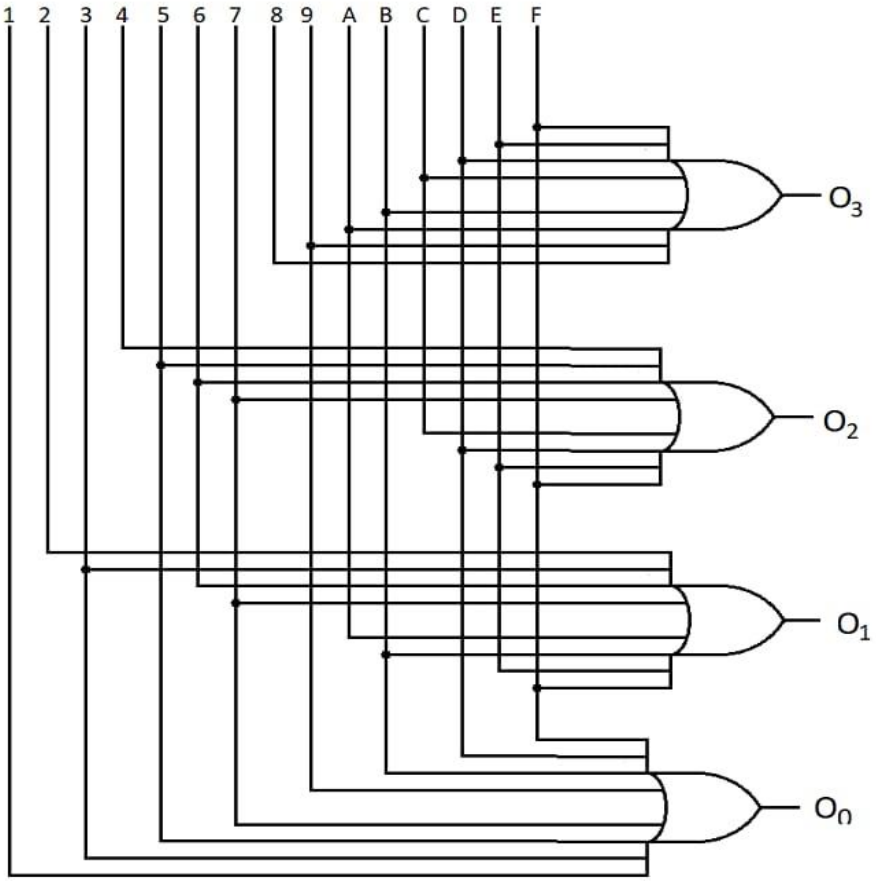

Fig 2: Circuit diagram

Subcircuit:

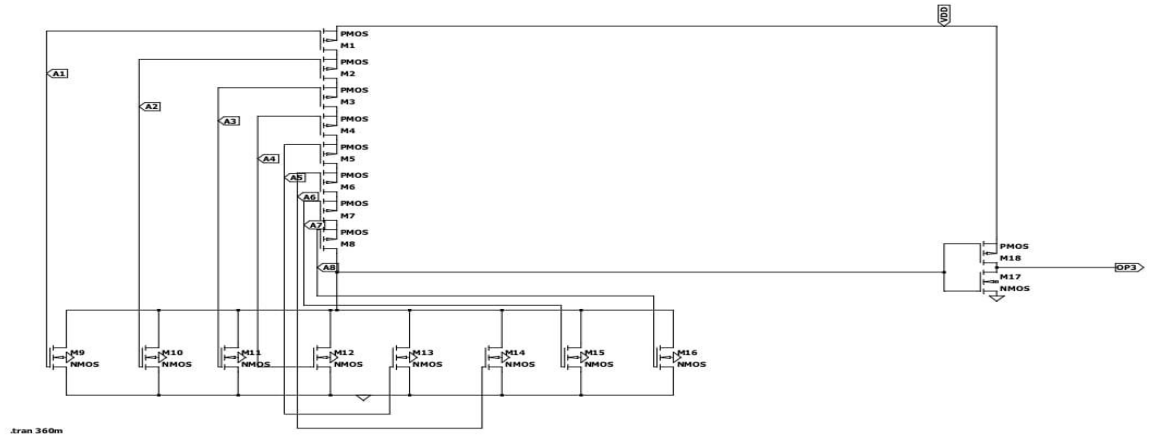

Fig 3: Subcircuit

System:

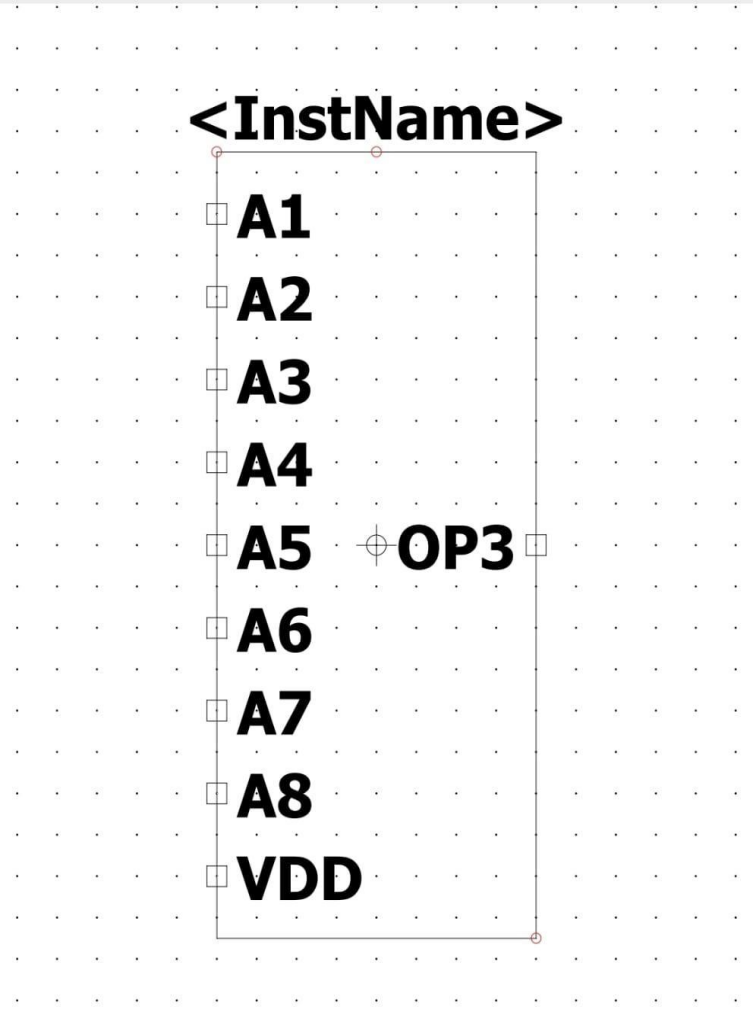

Fig 4: System

Circuit:

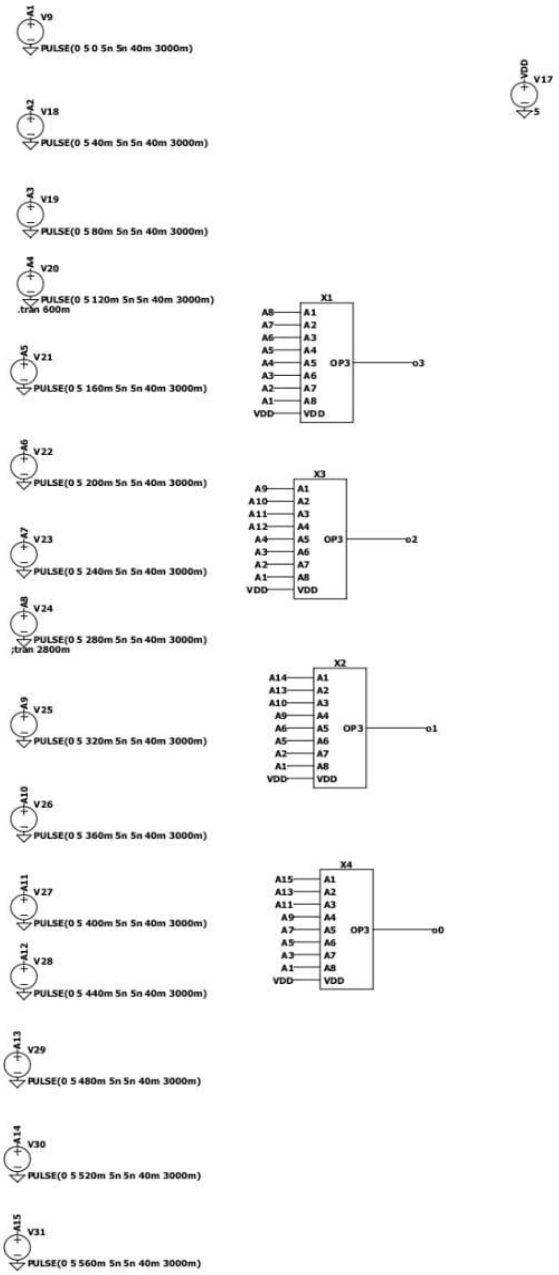

Fig 5: Circuit

3. SOFTWARE TOOLS

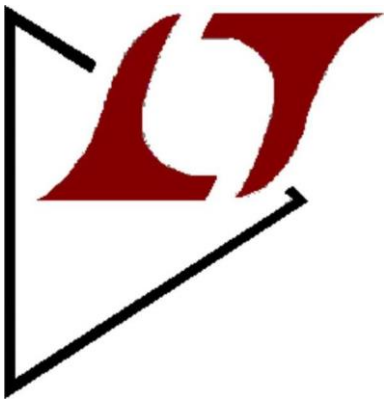

Fig 6: LTSPICE

LT spice is a free and open-source SPICE simulation software developed by Linear Technology (now part of Analog Devices) that allows users to analyse and simulate analog and digital circuits. It provides a powerful graphical user interface (GUI) that enables users to quickly create and modify circuit schematics, define circuit parameters, and simulate circuit performance under different operating conditions.

4. RESULTS & DISCUSSION

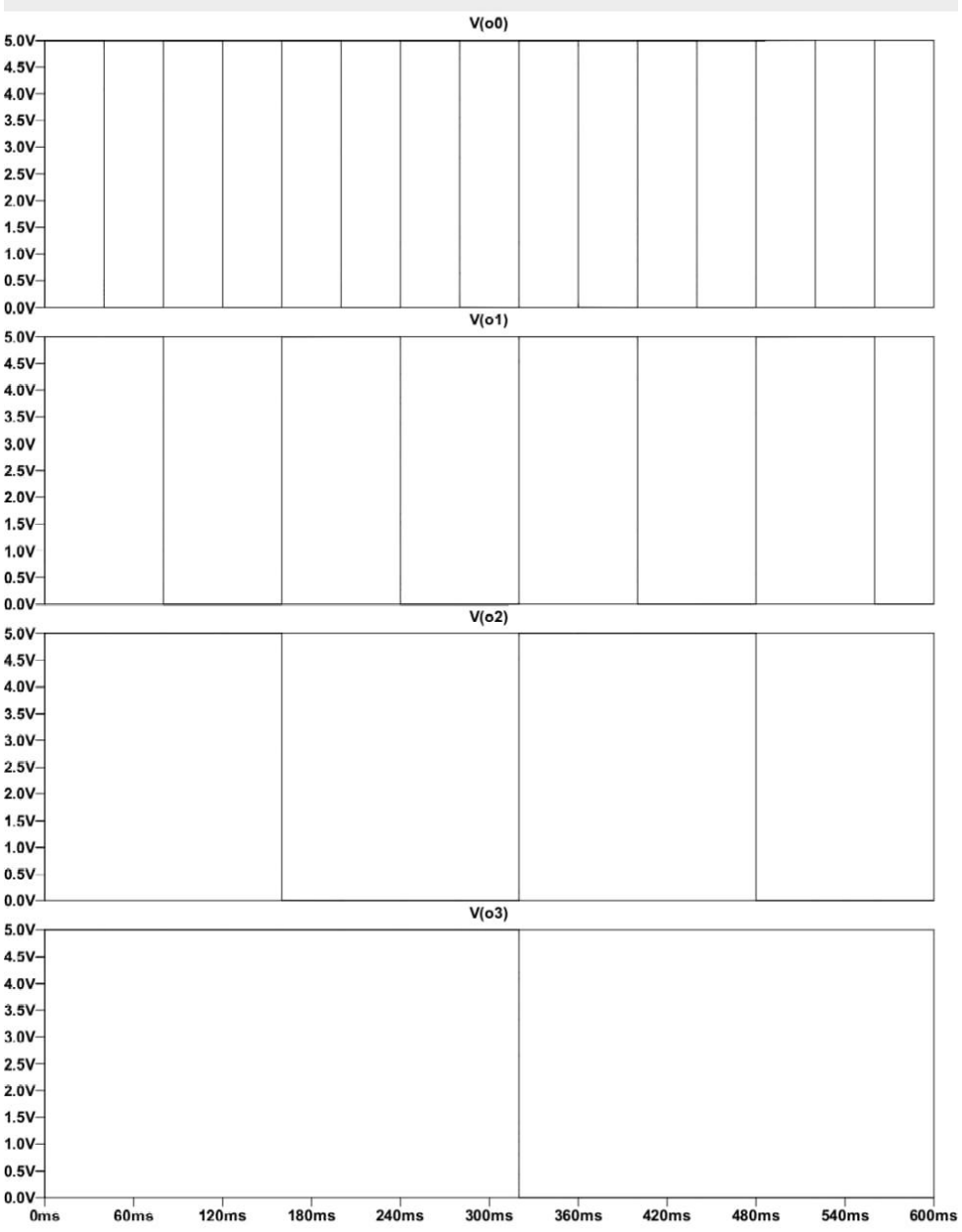

Fig 7: Output

5. CONCLUSION

The encoder works by enabling one of four output lines based on the hexadecimal value of the input signal. 16 to 4 encoder using logic gates and verified its functionality by testing various input combinations and observing the corresponding output signals. Also analysed the truth table for the encoder and compared it to the simulated and experimental results to ensure that they matched.

By understanding how the 16 to 4 encoder works and how to design and test it, we gain valuable insights into the operation of digital circuits and their practical applications.

6. REFERENCES

1.https://www.tutorialspoint.com/digital_circuits/digital_circuits_encoders.htm#:~:text=An%20Encoder%20is%20a%20combinational,lines%20with%20'n'%20bits.

2.https://www.electronics-tutorials.ws/combination/comb_4.html.

3.https://electronics-fun.com/digital-encoder-and-its-application/.