| | | | | | |
|---|---|---|---|---|---|
| | **Academic Year:** | **2022/2023** | **Term:** | **First term** | |
| | **Course Code:** | **Eective1** | **Course Title:** | **VLSI** | |

# Cairo University

# Faculty of Engineering

# Electronics and Communications Engineering Department – 4th Year

# VLSI PROJECT

| Name | Sec | BN |
|---|---|---|
| عبدالمنعم احمد عبدالمنعم سلام | 2 | 50 |
| منى منصور امين محمد | 4 | 30 |

# Table of Contents

# 1-Layout of the basic cells

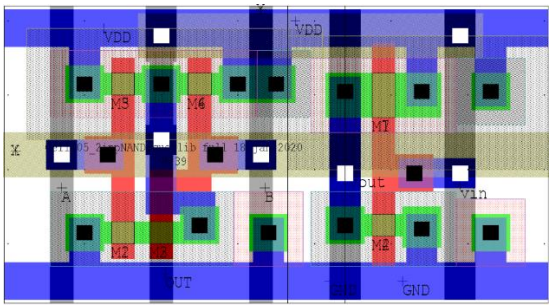



figure1-AND

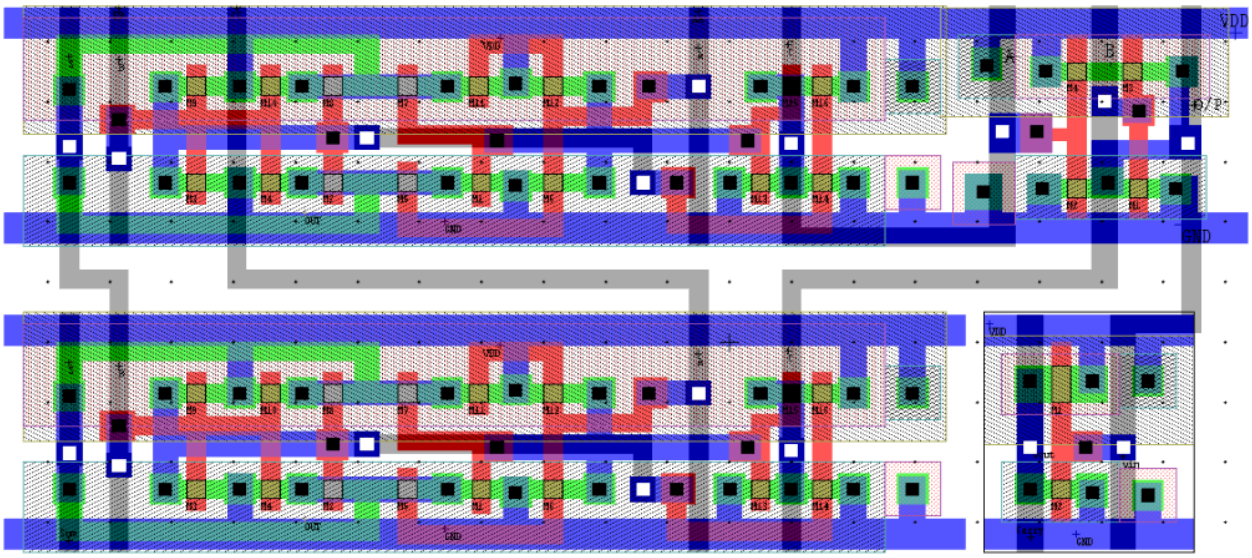



figure2-FA

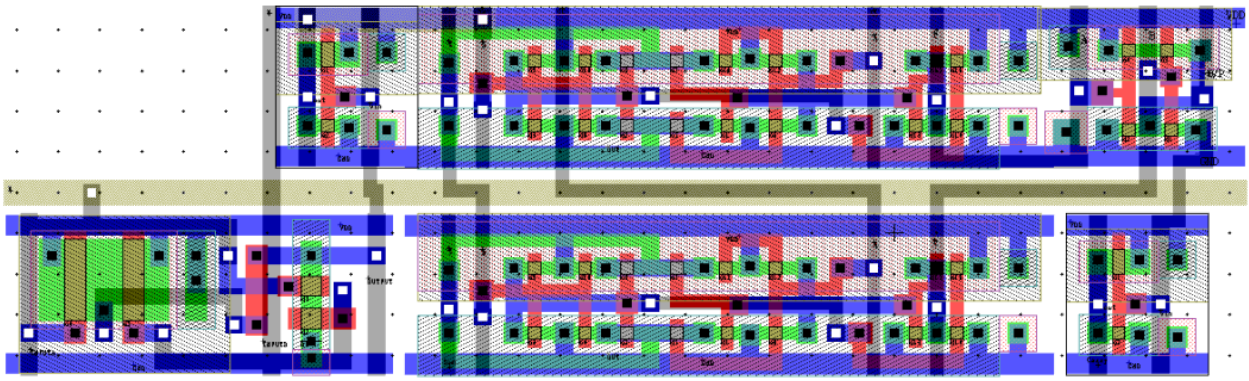



figure3-FA-AND

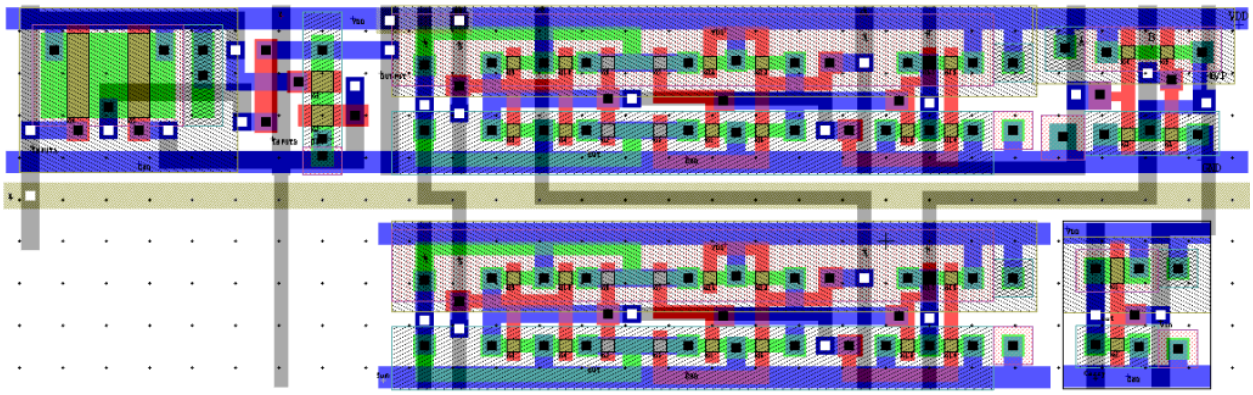


figure4-FA-NAND

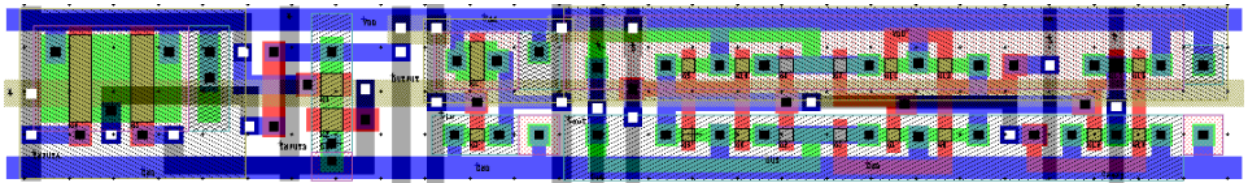


figure5-HA-AND

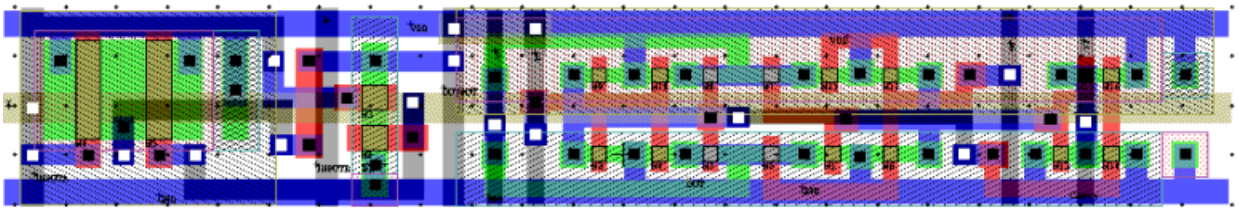
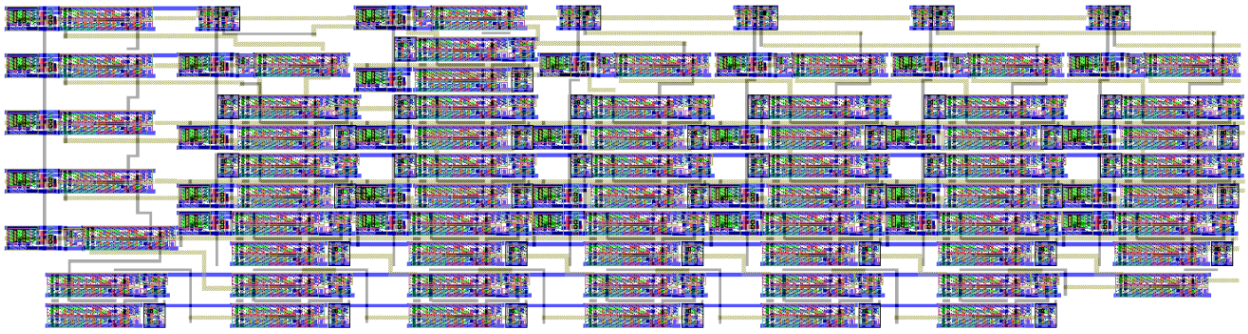


figure6-HA-NAND

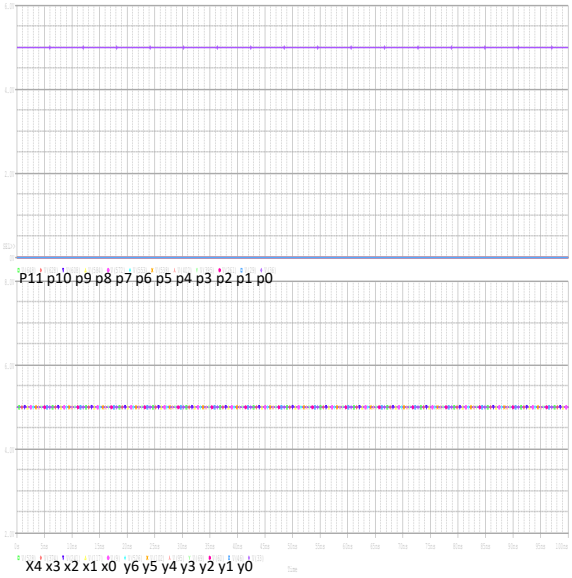
## 2-Layout of the multiplier core



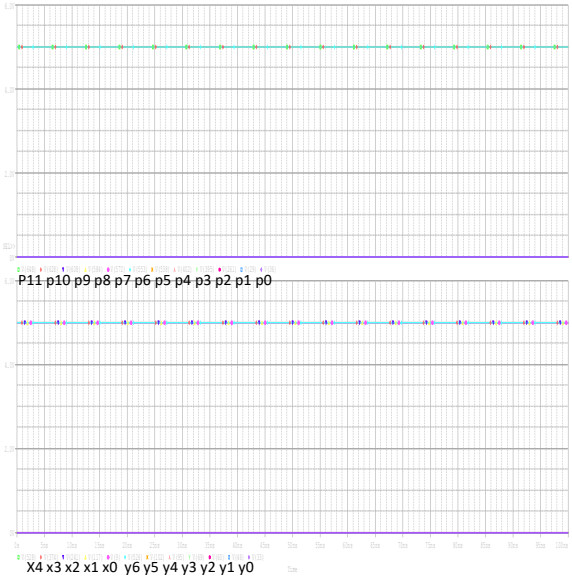
**Comment: DRC has been done for all Layouts above.**

# 3-Extract and simulation of the multiplier core

## 3.1 Case x=11111,y=1111111 then p=000000000001




## 3.2 Case x=01111,y=1000000 then p=110001000000

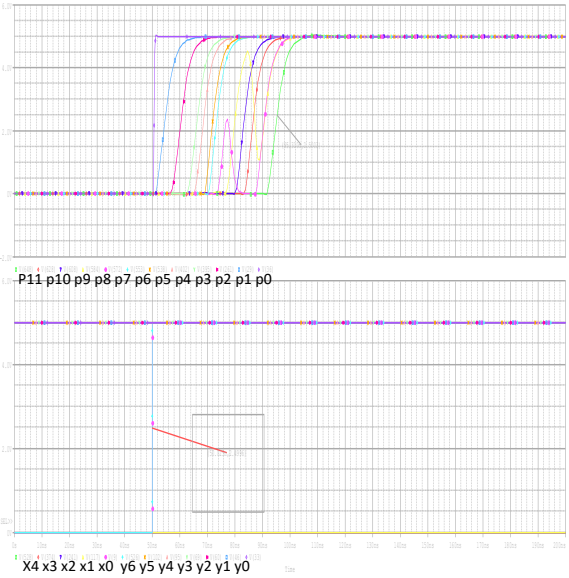



**Comment: More simulation cases are given in design_simulation.doc**

# 4-Performance estimation

## 4.1 Worst Case delay calculation

P11 is the critical path: 95.31n-50.025n =45.285ns




$tp_{LH}$=45.285ns and this is the worst case delay.

## 4.2 Max Frequency Calculation

$$f_{max} = \frac{1}{tp_{LH}} = \frac{1}{45.285n} = 22.082\ MHz$$

## 4.3 Dynamic Power at max Frequency Calculation

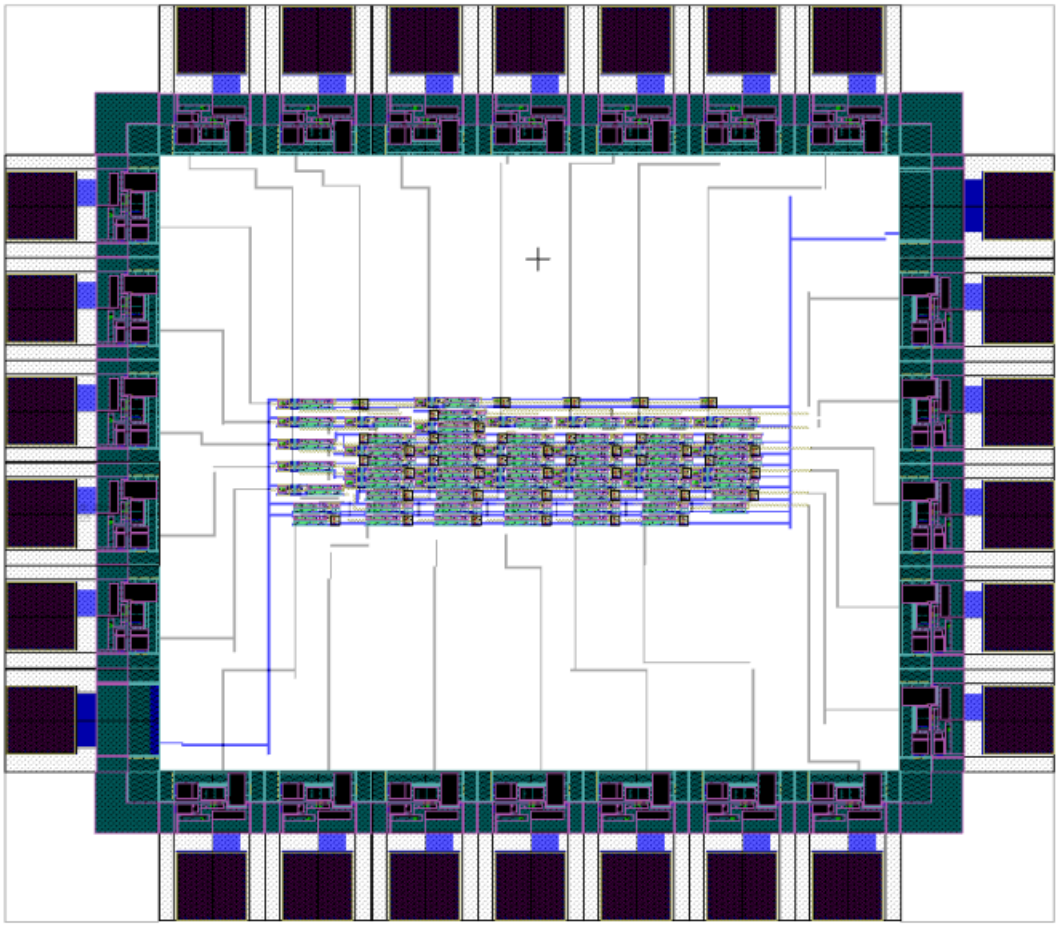
```
 1890:
 1891:      TOTAL POWER DISSIPATION   1.26E-08  WATTS
 1892:
```

The total power dissipated is 12.6 nwatt

## 4.4 Core area

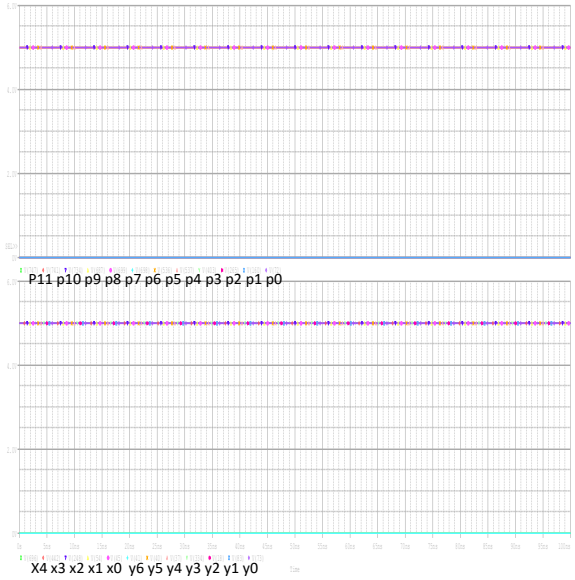
$core\ area = 1{,}058{,}414\ \lambda^2$

## 5-Layout of the multiplier core after pads

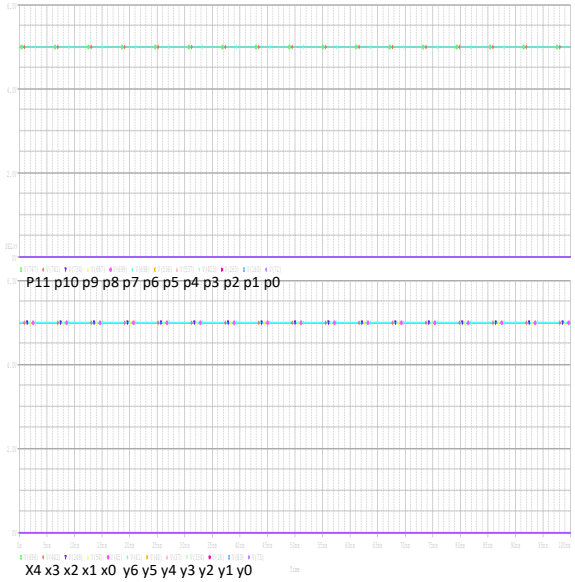


# 6-Extract and simulation of the multiplier core After pads

## 6.1 Case x=01111,y=0111111 then p=001110110001




## 6.2 Case x=01111,y=1000000 then p=110001000000

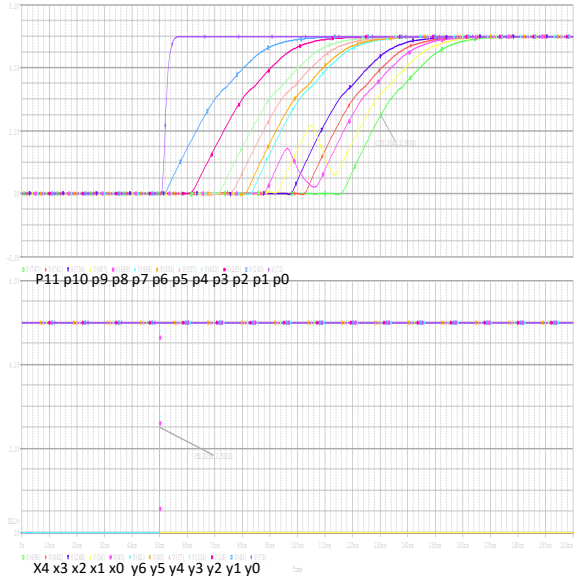



**Comment: More simulation cases are given in design_simulation.doc**

# 7-Performance estimation After pads

## 7.1 Worst Case delay calculation

P11 is the critical path:130.214n-50.025n =80.189ns




$tp_{LH}$=80.189ns and this is the worst case delay.

## 7.2 Max Frequency Calculation

$$f_{max} = \frac{1}{tp_{LH}} = \frac{1}{80.189n} = 12.4705\ MHz$$

## 7.3 Dynamic Power at max Frequency Calculation

```
25915:
25916:      TOTAL POWER DISSIPATION   7.74E-01  WATTS
```

The total power dissipated is 774 mwatt