PLA Layout Generation using MPLA

MPLA is a PLA layout generation tool. It accepts a multiple input, multiple output truth table like format called *PLA format* and generates a *Pseudo-NMOS PLA. Please refer to the MPLA and PLA(5) man pages for details.* In this tutorial we will demonstrate the use of *MPLA* to generate a PLA for a 3-bit binary to gray code converter.

- **Create an input truth table:** Create an input truth table file as follows: First, declare the number of inputs (**.i**), number of outputs (**.o**), input and output labels (**.ilb** and **.olb**) and the number of product terms (**.p**) for which at least one of the outputs is a "1" (e.g., in the table below there is no entry for input combination "000" since all the outputs are "0"). Next, list the actual product terms followed by the **`.end'** statement. The gray code converter input file, **gray.tt** is given below.

```
## 3-bit BINARY to GRAY CODE CONVERTER
.i 3
.o 3
.ilb   b2 b1 b0
.olb  g2 g1 g0
.p 7
001 001
010 011
011 010
100 110
101 111
110 101
111 100
.end
```

- **Minimize the input truth table:** Use the logic minimization *Espresso* to minimize the input truth table and generate the PLA personality matrix that can be supplied as input to *MPLA.   Please refer to the Espresso man page for details.*

```
espresso gray.tt  >  gray.mtt
```

The minimized output file (**gray.mtt**) generated by *Espresso* is shown below.

```
## 3-bit BINARY to GRAY CODE CONVERTER
.i 3
.o 3
.ilb   b2 b1 b0
.olb  g2 g1 g0
.p 5
01- 010
-10 001
-01 001
10- 010
1-- 100
.e
```

- **Generate a PLA layout:** Use *MPLA* to generate a PLA layout using the **gray.mtt** file as follows:

```
mpla -s SCS3cis -o gray  gray.mtt
```

In the above command line, **SCS3cis** is the style for the output layout. You can increase the number of ground lines with well plugs by using the **- G** option in *MPLA.* The *Espresso* and *MPLA* commands given above can be combined together using the Unix pipe as follows:

```
espresso gray.tt | mpla -s SCS3cis -o gray
```

The above *MPLA* commands will generate the *Magic* layout **gray.mag.** The gray code converter PLA layout is shown in <u>Fig 1</u>.
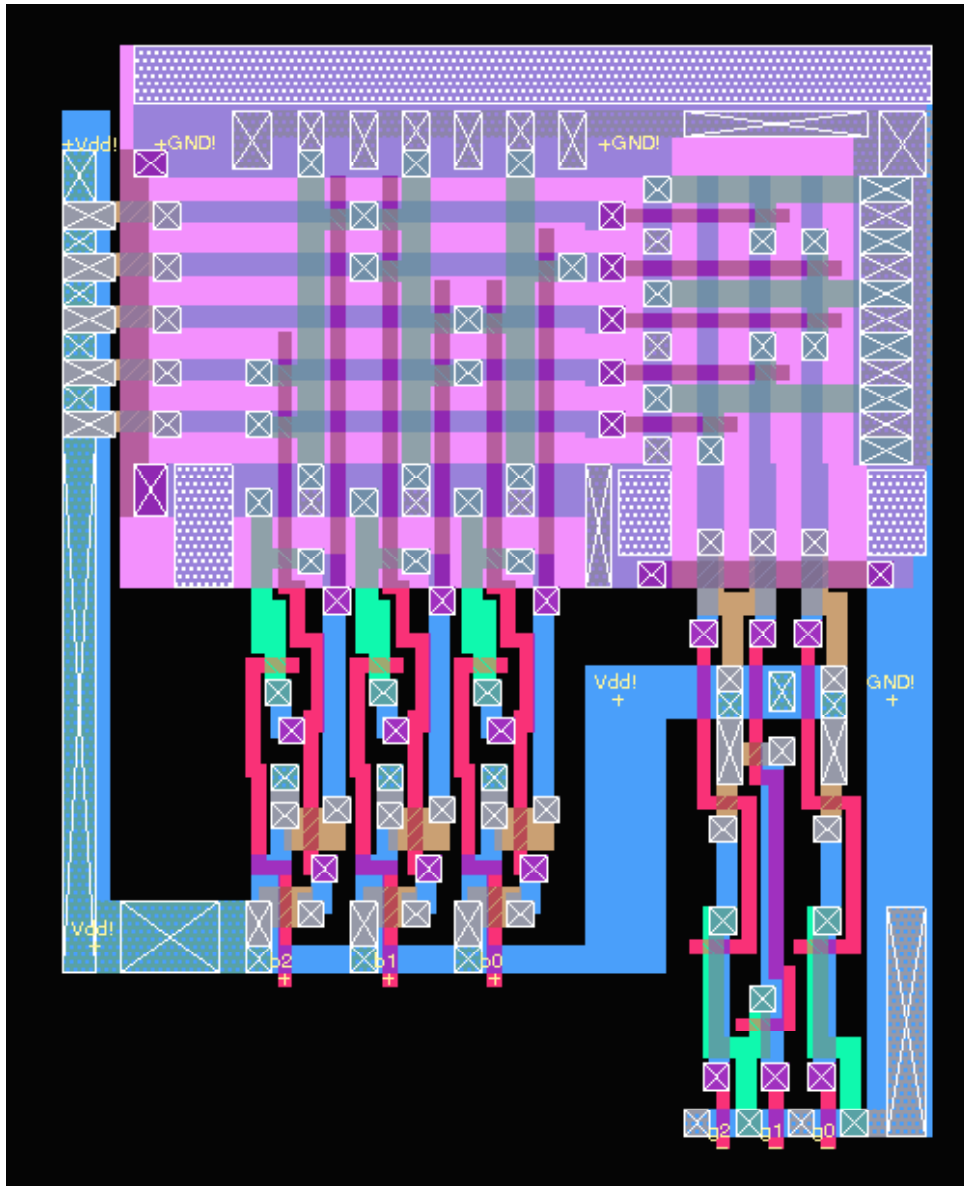

<u>Figure 1: 3-bit Binary-to-Gray Code Converter PLA layout generated using MPLA</u>

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