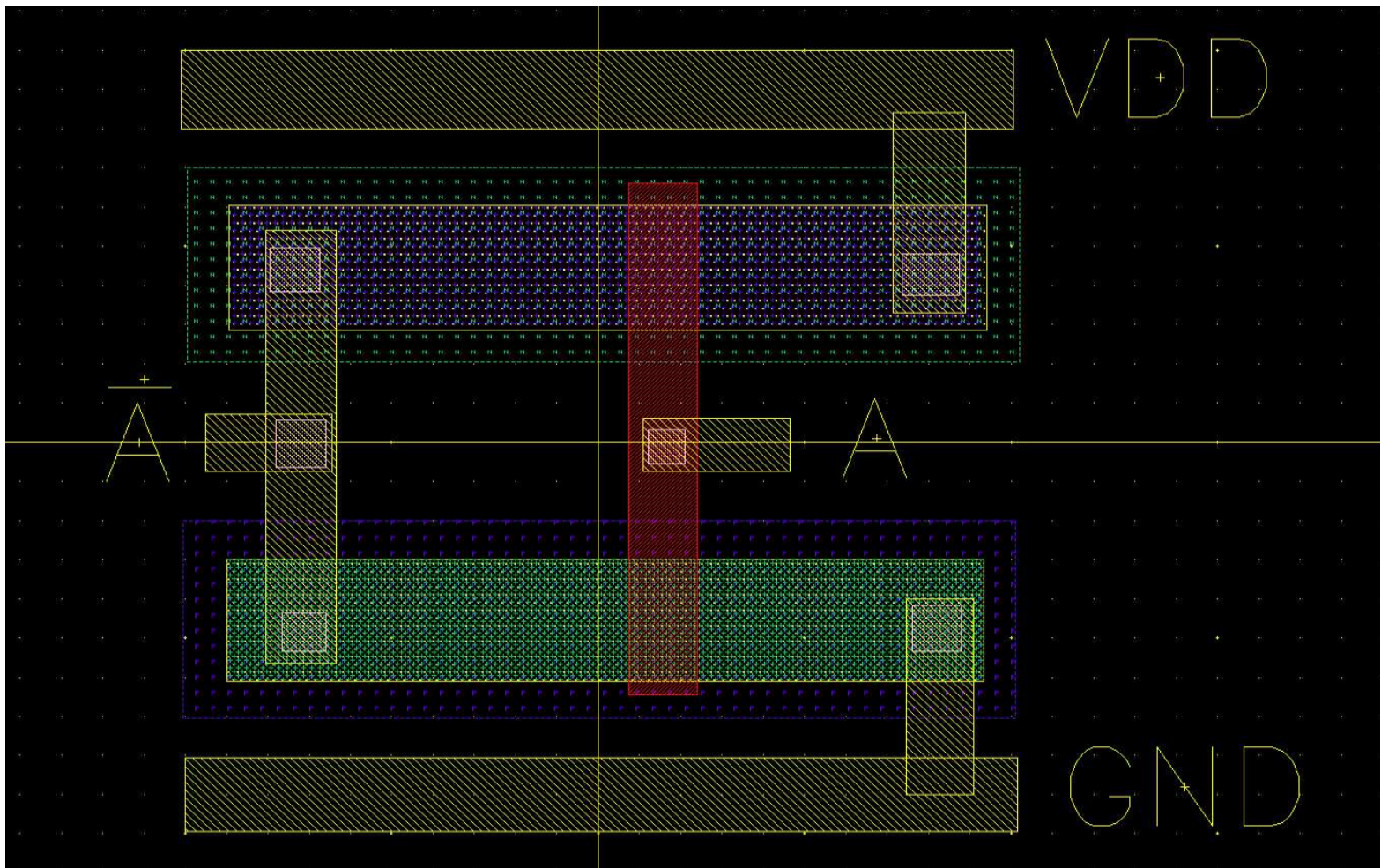


SPICE Simulation

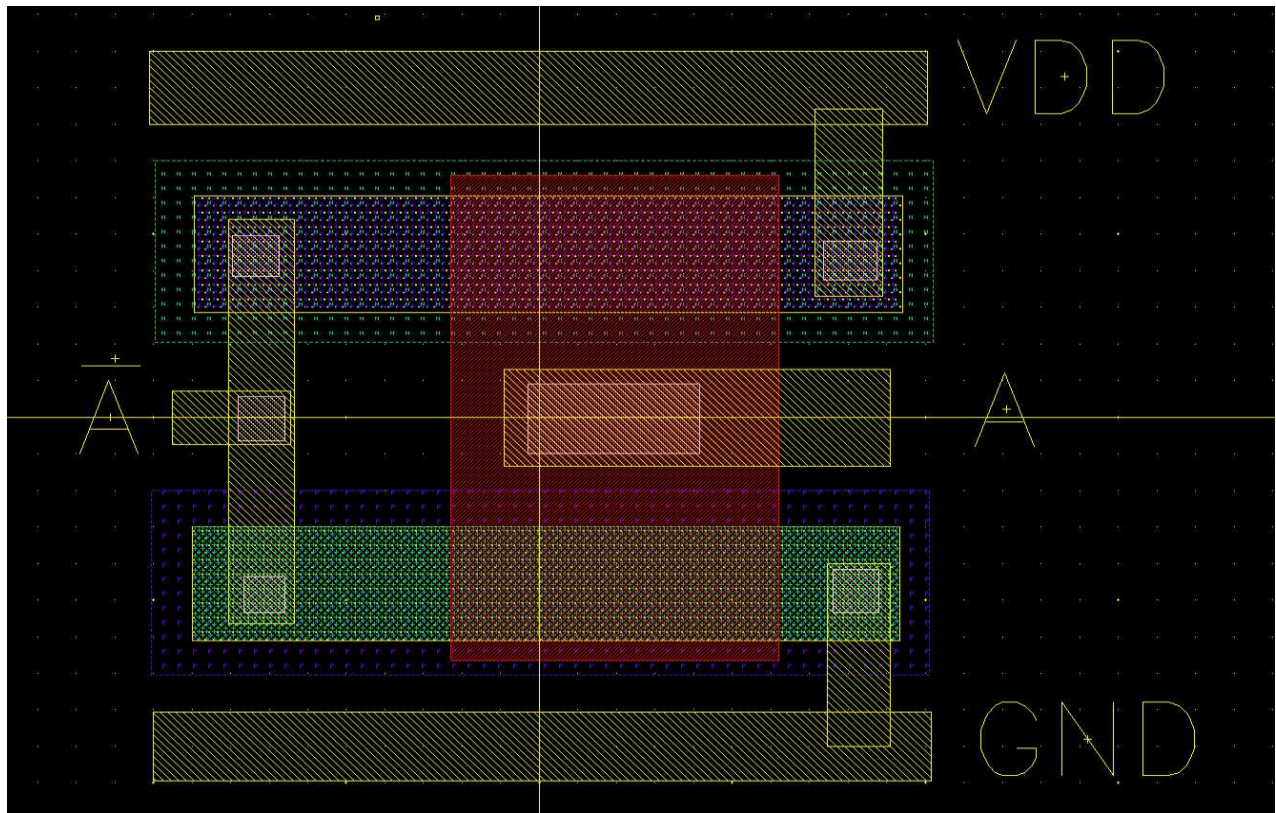
I was unable to perform the SPICE simulation to find the ideal PMOS width. The rest is assuming both width are 90nm.

Virtuoso Gates

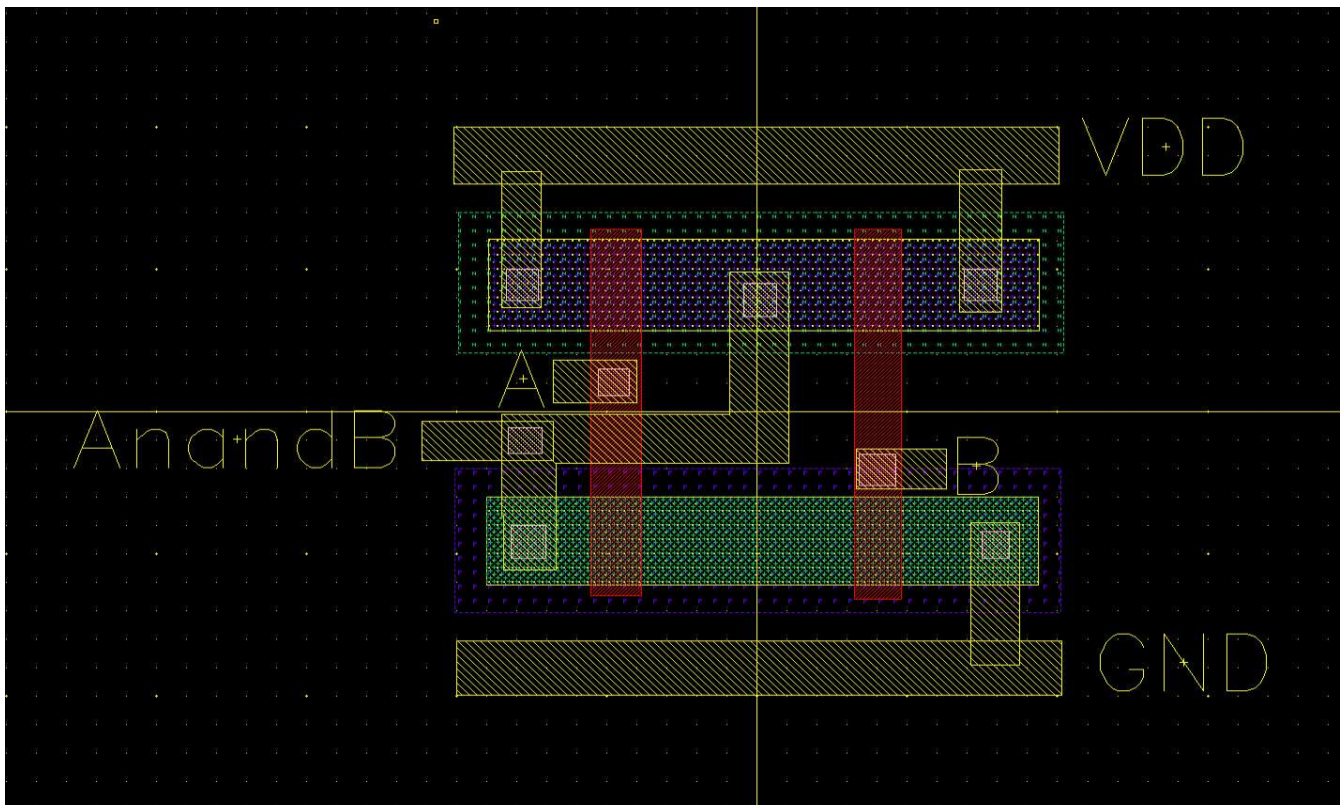
Inv



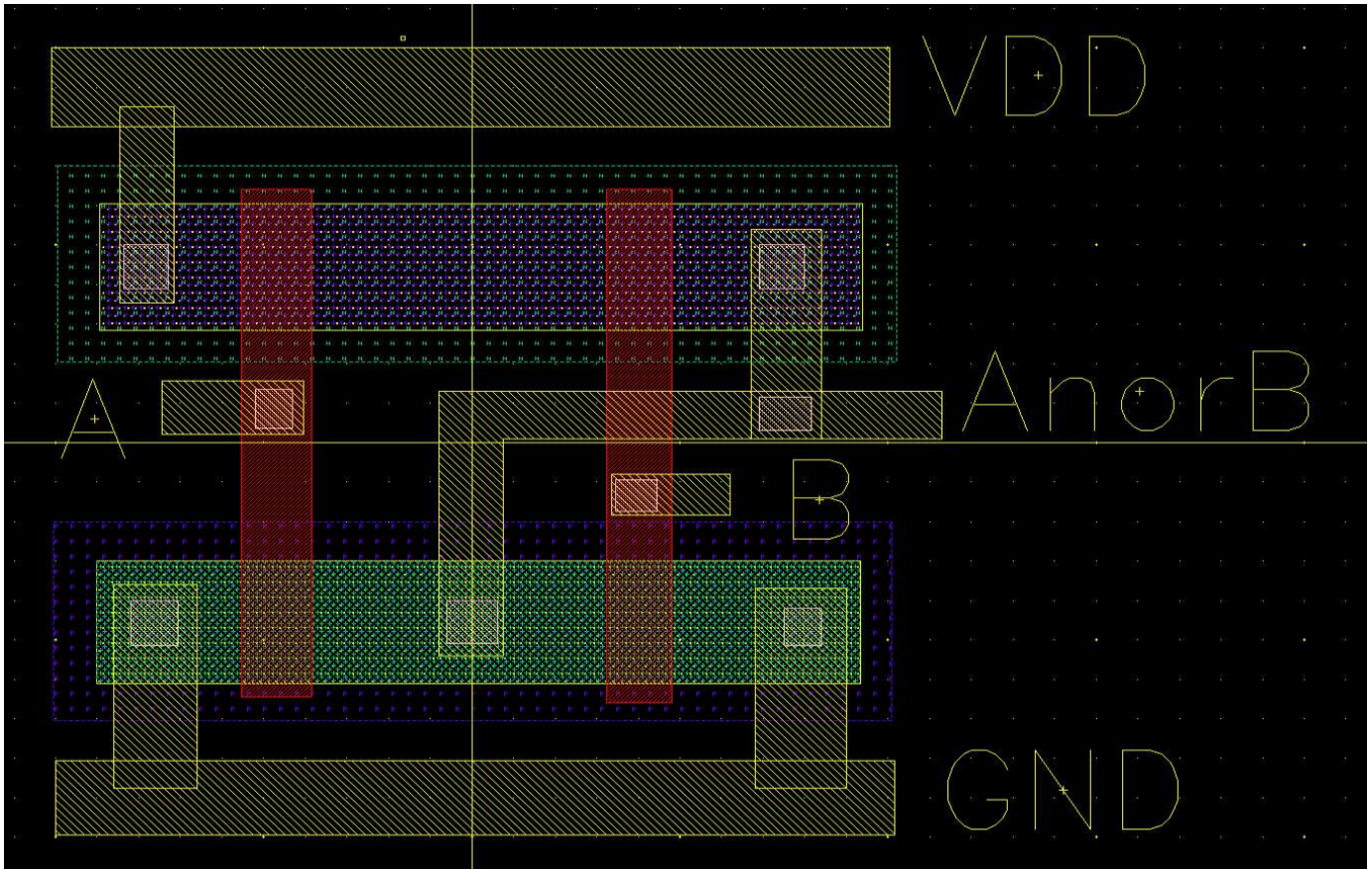
Inv 4



Nand 2 to 1



Nor 2 to 1



DRC / LVS

Inv

```
DRC Summary Report - inv.drc.summary
File Edit Options Windows

RULECHECK Grid.14 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.15 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.16 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.17 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.18 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.19 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.20 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.21 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.22 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.23 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.24 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.25 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid.26 ..... TOTAL Result Count = 0 (0)

--- RULECHECK RESULTS STATISTICS (BY CELL)
---
CELL inv ..... TOTAL Result Count = 5 (5)
    RULECHECK Poly.3 ..... TOTAL Result Count = 1 (1)
    RULECHECK Contact.3 ... TOTAL Result Count = 1 (1)
    RULECHECK Metal1.3 .... TOTAL Result Count = 3 (3)

--- SUMMARY
---
TOTAL CPU Time:          0
TOTAL REAL Time:         0
TOTAL Original Layer Geometries: 20 (20)
TOTAL DRC RuleChecks Executed: 156
TOTAL DRC Results Generated: 5 (5)

#####
##                      ##
##      CALIBRE SYSTEM  ##
##                      ##
##  CIRCUIT EXTRACTION REPORT  ##
##                      ##
#####

REPORT FILE NAME:      inv.lvs.report.ext
LAYOUT NAME:           inv.calibre.db ('inv')
CREATION TIME:         Sun Oct 8 20:18:50 2017
CURRENT DIRECTORY:     /home/zpfravel/Documents/AdvancedDigitalDesign/Lab2/virtuoso/rundir
USER NAME:              zpfravel@uark.edu
CALIBRE VERSION:       v2017.2_28.22   Tue Jun 6 14:38:29 PDT 2017

Extraction Errors and Warnings for cell "inv"
-----
WARNING: Unattached label:
        Name "_" at location (-1.1,0.16) on layer 11 "metal1"

WARNING: Unattached label:
        Name "A" at location (-1.11,0) on layer 11 "metal1"

WARNING: Unattached label:
        Name "A" at location (0.675,0.01) on layer 11 "metal1"

WARNING: Unattached label:
        Name "GND" at location (1.42,-0.88) on layer 11 "metal1"

WARNING: Unattached label:
        Name "VDD" at location (1.36,0.93) on layer 11 "metal1"

WARNING: Unattached port "A" at location (-1.11,0) in cell "inv"
WARNING: Unattached port "_" at location (-1.1,0.16) in cell "inv"
WARNING: Unattached port "A" at location (0.675,0.01) in cell "inv"
WARNING: Unattached port "VDD" at location (1.36,0.93) in cell "inv"
WARNING: Unattached port "GND" at location (1.42,-0.88) in cell "inv"
```

Inv 4

```
DRC Summary Report - inv4.drc.summary
File Edit Options Windows

RULECHECK Grid,13 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,14 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,15 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,16 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,17 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,18 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,19 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,20 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,21 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,22 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,23 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,24 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,25 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,26 ..... TOTAL Result Count = 0 (0)

--- RULECHECK RESULTS STATISTICS (BY CELL)
---
CELL inv4 ..... TOTAL Result Count = 3 (3)
    RULECHECK Contact,3 ... TOTAL Result Count = 1 (1)
    RULECHECK Metal1,3 .... TOTAL Result Count = 2 (2)

--- SUMMARY
---
TOTAL CPU Time:          0
TOTAL REAL Time:         0
TOTAL Original Layer Geometries: 20 (20)
TOTAL DRC RuleChecks Executed: 156
TOTAL DRC Results Generated: 3 (3)
```

```
inv4.lvs.report.ext - Mousepad
File Edit Search View Document Help

#####
##                                ##
##          CALIBRE SYSTEM        ##
##                                ##
##    CIRCUIT EXTRACTION REPORT   ##
##                                ##
#####

REPORT FILE NAME:      inv4.lvs.report.ext
LAYOUT NAME:          inv4.calibre.db ('inv4')
CREATION TIME:         Sun Oct 8 20:22:28 2017
CURRENT DIRECTORY:    /home/zpfravel/Documents/AdvancedDigitalDesign/Lab2/virtuoso/rundir
USER NAME:            zpfravel@uark.edu
CALIBRE VERSION:      v2017.2_28.22   Tue Jun 6 14:38:29 PDT 2017

Extraction Errors and Warnings for cell "inv4"
-----

WARNING: Unattached label:
Name "_" at location (-1.1,0.16) on layer 11 "metal1"

WARNING: Unattached label:
Name "A" at location (-1.11,0) on layer 11 "metal1"

WARNING: Unattached label:
Name "A" at location (1.21,0.02) on layer 11 "metal1"

WARNING: Unattached label:
Name "GND" at location (1.42,-0.88) on layer 11 "metal1"

WARNING: Unattached label:
Name "VDD" at location (1.36,0.93) on layer 11 "metal1"

WARNING: Unattached port "A" at location (-1.11,0) in cell "inv4"
WARNING: Unattached port "_" at location (-1.1,0.16) in cell "inv4"
WARNING: Unattached port "A" at location (1.21,0.02) in cell "inv4"
WARNING: Unattached port "VDD" at location (1.36,0.93) in cell "inv4"
WARNING: Unattached port "GND" at location (1.42,-0.88) in cell "inv4"
```


Nand 2 to 1

```
DRC Summary Report - nand2.drc.summary
File Edit Options Windows

RULECHECK Grid,15 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,16 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,17 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,18 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,19 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,20 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,21 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,22 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,23 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,24 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,25 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,26 ..... TOTAL Result Count = 0 (0)

---- RULECHECK RESULTS STATISTICS (BY CELL)
----
CELL nand2 ..... TOTAL Result Count = 8 (8)
    RULECHECK Poly,3 ..... TOTAL Result Count = 3 (3)
    RULECHECK Contact,3 ... TOTAL Result Count = 1 (1)
    RULECHECK Metal1,2 .... TOTAL Result Count = 1 (1)
    RULECHECK Metal1,3 .... TOTAL Result Count = 3 (3)

---- SUMMARY
----
TOTAL CPU Time:          0
TOTAL REAL Time:         0
TOTAL Original Layer Geometries: 25 (25)
TOTAL DRC RuleChecks Executed: 156
TOTAL DRC Results Generated: 8 (8)
```

```
nand2.lvs.report.ext - Mousepad
File Edit Search View Document Help

#####
##                               ##
##          CALIBRE SYSTEM      ##
##                               ##
##    CIRCUIT EXTRACTION REPORT  ##
##                               ##
#####

REPORT FILE NAME:      nand2.lvs.report.ext
LAYOUT NAME:           nand2.calibre.db ('nand2')
CREATION TIME:         Sun Oct  8 20:07:49 2017
CURRENT DIRECTORY:     /home/zpfravel/Documents/AdvancedDigitalDesign/Lab2/virtuoso/rundir
USER NAME:             zpfravel@uark.edu
CALIBRE VERSION:       v2017.2_28.22   Tue Jun 6 14:38:29 PDT 2017

Extraction Errors and Warnings for cell "nand2"
-----
WARNING: Unattached label:
        Name "A" at location (-0.78,0.115) on layer 11 "metal1"

WARNING: Unattached label:
        Name "AnandB" at location (-1.73,-0.095) on layer 11 "metal1"

WARNING: Unattached label:
        Name "B" at location (0.73,-0.19) on layer 11 "metal1"

WARNING: Unattached label:
        Name "GND" at location (1.42,-0.88) on layer 11 "metal1"

WARNING: Unattached label:
        Name "VDD" at location (1.36,0.93) on layer 11 "metal1"

WARNING: Unattached port "AnandB" at location (-1.73,-0.095) in cell "nand2"
WARNING: Unattached port "A" at location (-0.78,0.115) in cell "nand2"
WARNING: Unattached port "B" at location (0.73,-0.19) in cell "nand2"
WARNING: Unattached port "VDD" at location (1.36,0.93) in cell "nand2"
WARNING: Unattached port "GND" at location (1.42,-0.88) in cell "nand2"
```

Nor 2 to 1

```
DRC Summary Report - nor2.drc.summary
File Edit Options Windows

RULECHECK Grid,14 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,15 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,16 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,17 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,18 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,19 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,20 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,21 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,22 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,23 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,24 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,25 ..... TOTAL Result Count = 0 (0)
RULECHECK Grid,26 ..... TOTAL Result Count = 0 (0)

--- RULECHECK RESULTS STATISTICS (BY CELL)
---
CELL nor2 ..... TOTAL Result Count = 7 (7)
    RULECHECK Poly,3 ..... TOTAL Result Count = 3 (3)
    RULECHECK Contact,3 ... TOTAL Result Count = 1 (1)
    RULECHECK Metal1,3 .... TOTAL Result Count = 3 (3)

--- SUMMARY
---
TOTAL CPU Time:          0
TOTAL REAL Time:         0
TOTAL Original Layer Geometries: 25 (25)
TOTAL DRC RuleChecks Executed: 156
TOTAL DRC Results Generated: 7 (7)
```

```
nor2.lvs.report.ext - Mousepad
File Edit Search View Document Help

#####
##                                ##
##          CALIBRE SYSTEM        ##
##                                ##
##    CIRCUIT EXTRACTION REPORT   ##
##                                ##
#####

REPORT FILE NAME:      nor2.lvs.report.ext
LAYOUT NAME:           nor2.calibre.db ('nor2')
CREATION TIME:         Sun Oct 8 20:25:48 2017
CURRENT DIRECTORY:     /home/zpfravel/Documents/AdvancedDigitalDesign/Lab2/virtuoso/rundir
USER NAME:             zpfravel@uark.edu
CALIBRE VERSION:       v2017.2_28.22   Tue Jun 6 14:38:29 PDT 2017

Extraction Errors and Warnings for cell "nor2"
-----
WARNING: Unattached label:
        Name "A" at location (-0.905,0.06) on layer 11 "metal1"

WARNING: Unattached label:
        Name "AnorB" at location (1.605,0.13) on layer 11 "metal1"

WARNING: Unattached label:
        Name "B" at location (0.835,-0.145) on layer 11 "metal1"

WARNING: Unattached label:
        Name "GND" at location (1.42,-0.88) on layer 11 "metal1"

WARNING: Unattached label:
        Name "VDD" at location (1.36,0.93) on layer 11 "metal1"

WARNING: Unattached port "A" at location (-0.905,0.06) in cell "nor2"
WARNING: Unattached port "B" at location (0.835,-0.145) in cell "nor2"
WARNING: Unattached port "VDD" at location (1.36,0.93) in cell "nor2"
WARNING: Unattached port "GND" at location (1.42,-0.88) in cell "nor2"
WARNING: Unattached port "AnorB" at location (1.605,0.13) in cell "nor2"
```