



ECE 266 Lab2 Design Review

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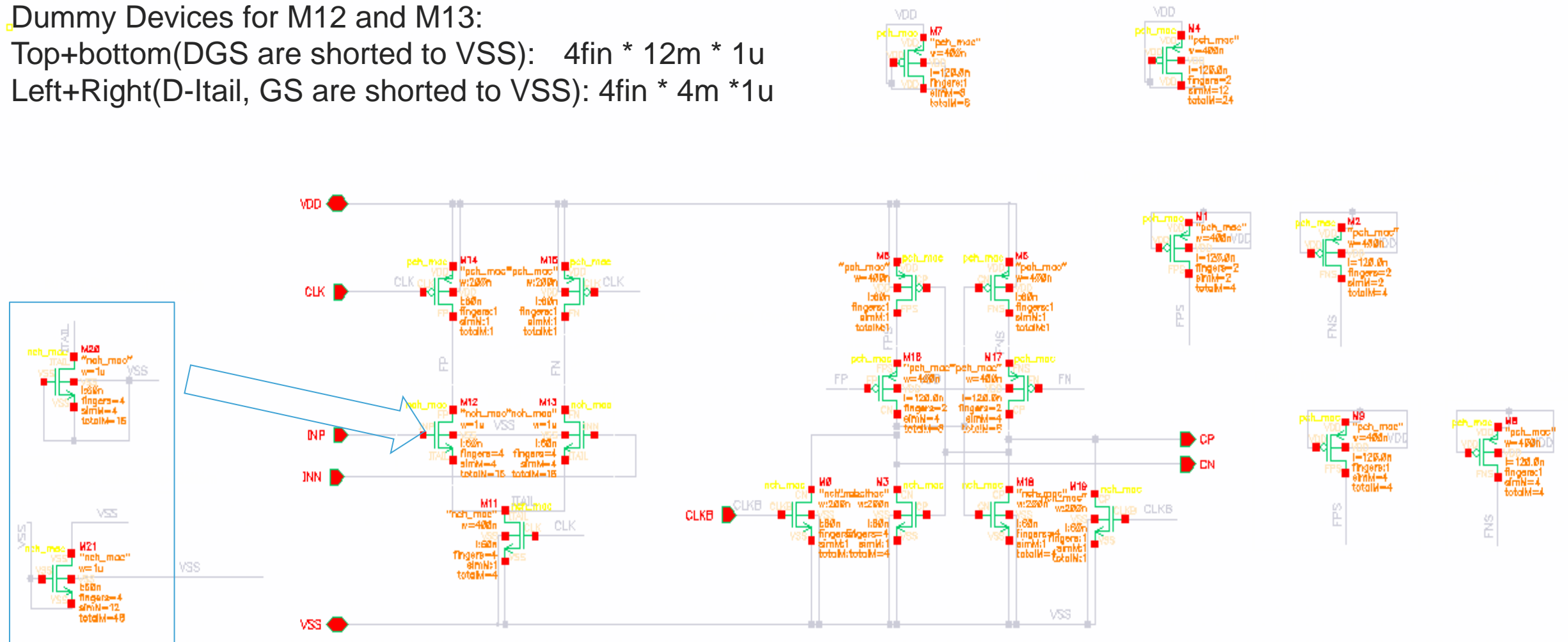


Schematic

■ Dummy Devices for M12 and M13:

Top+bottom(DGS are shorted to VSS): $4\text{fin} * 12\text{m} * 1\text{u}$

Left+Right(D-Itail, GS are shorted to VSS): $4\text{fin} * 4\text{m} * 1\text{u}$





Comparator Layout

Common Centroid Pattern

ABBA

BAAB

After dummy devices

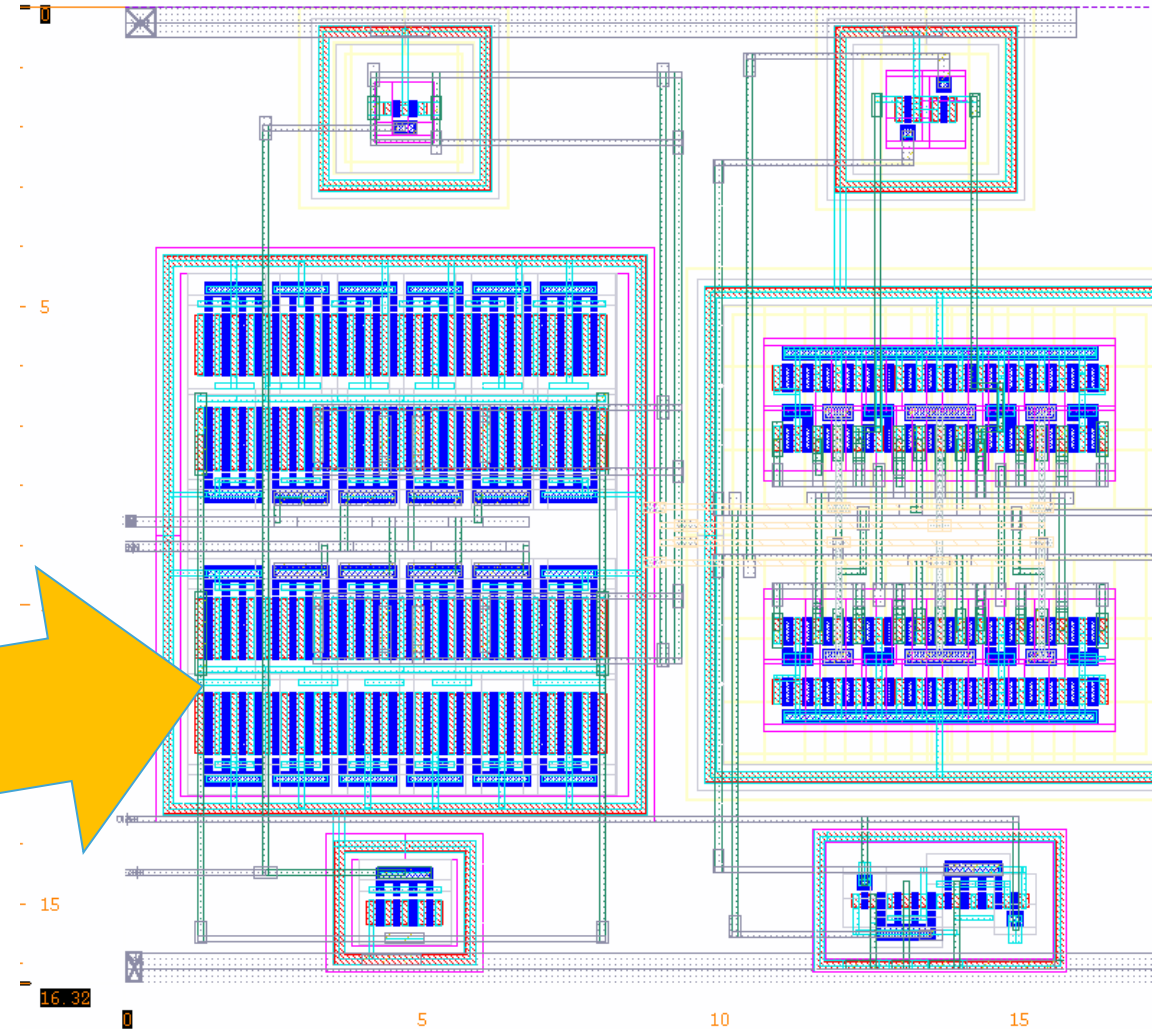
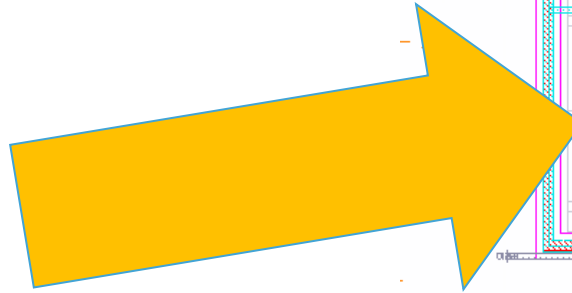
(D:2 fingers; d: 1fingers)

DDDDDD

DABBAD

DBAABD

DDDDDD





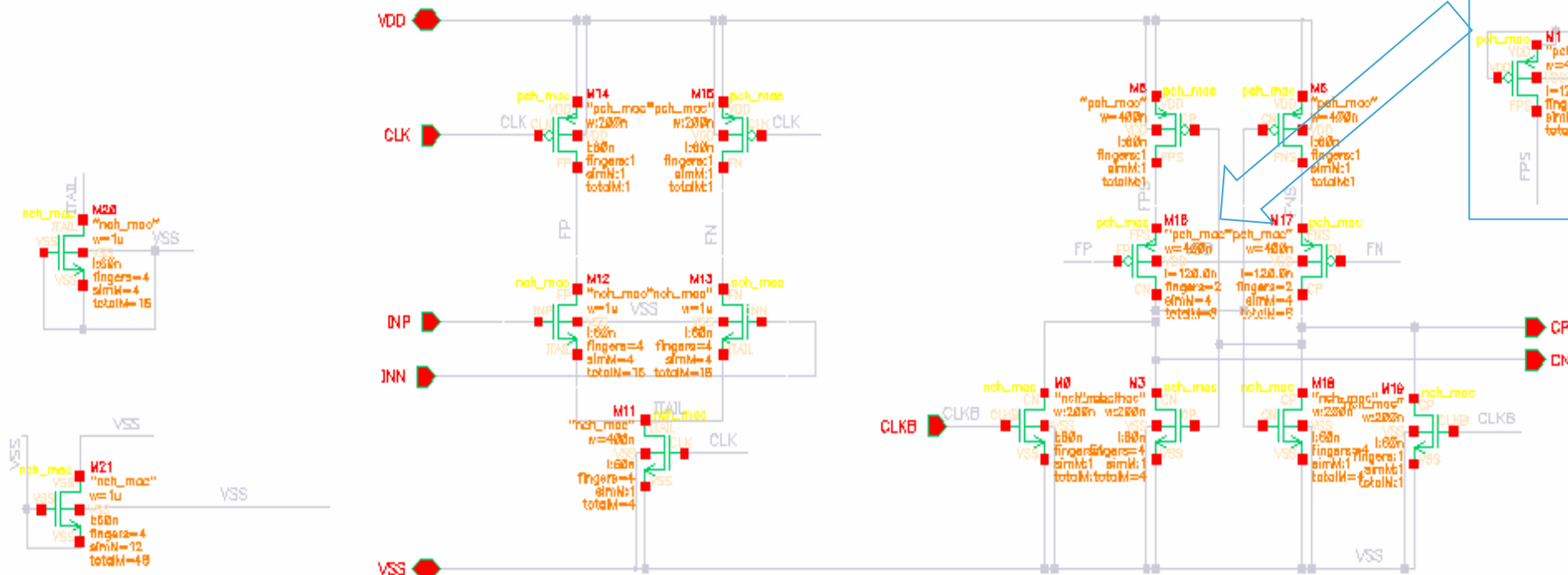
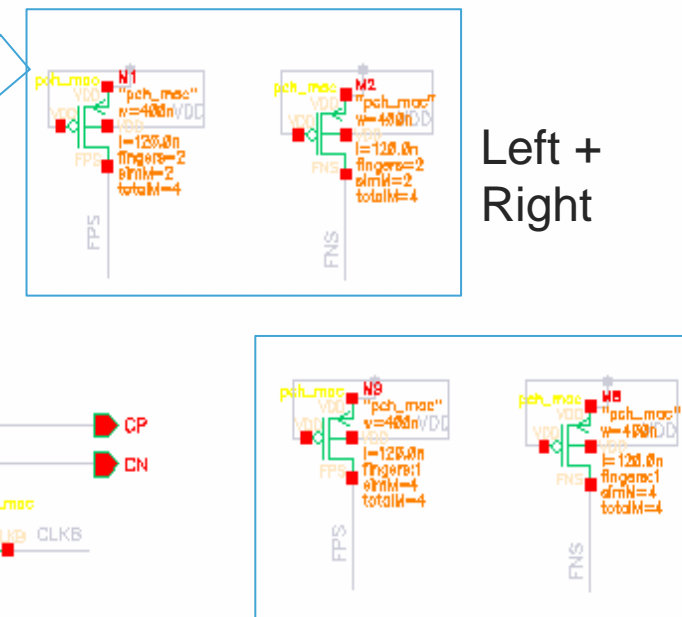
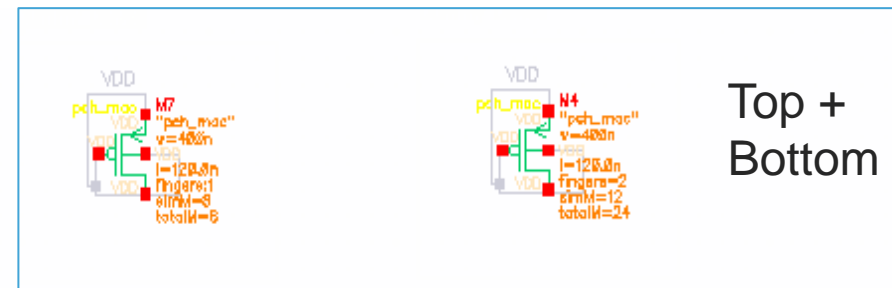
Schematic

Dummy Devices for M17 and M18:

Top Bottom(DGS - VDD): 1fin * 8m * 400n

2fin * 12m * 400n

Left+Right(GS- VDD, D- FNS/FPS): 1fin * 8m * 400n
2fin * 4m * 400n





Comparator Layout

Common Centroid Pattern

ABBA

BAAB

After dummy devices

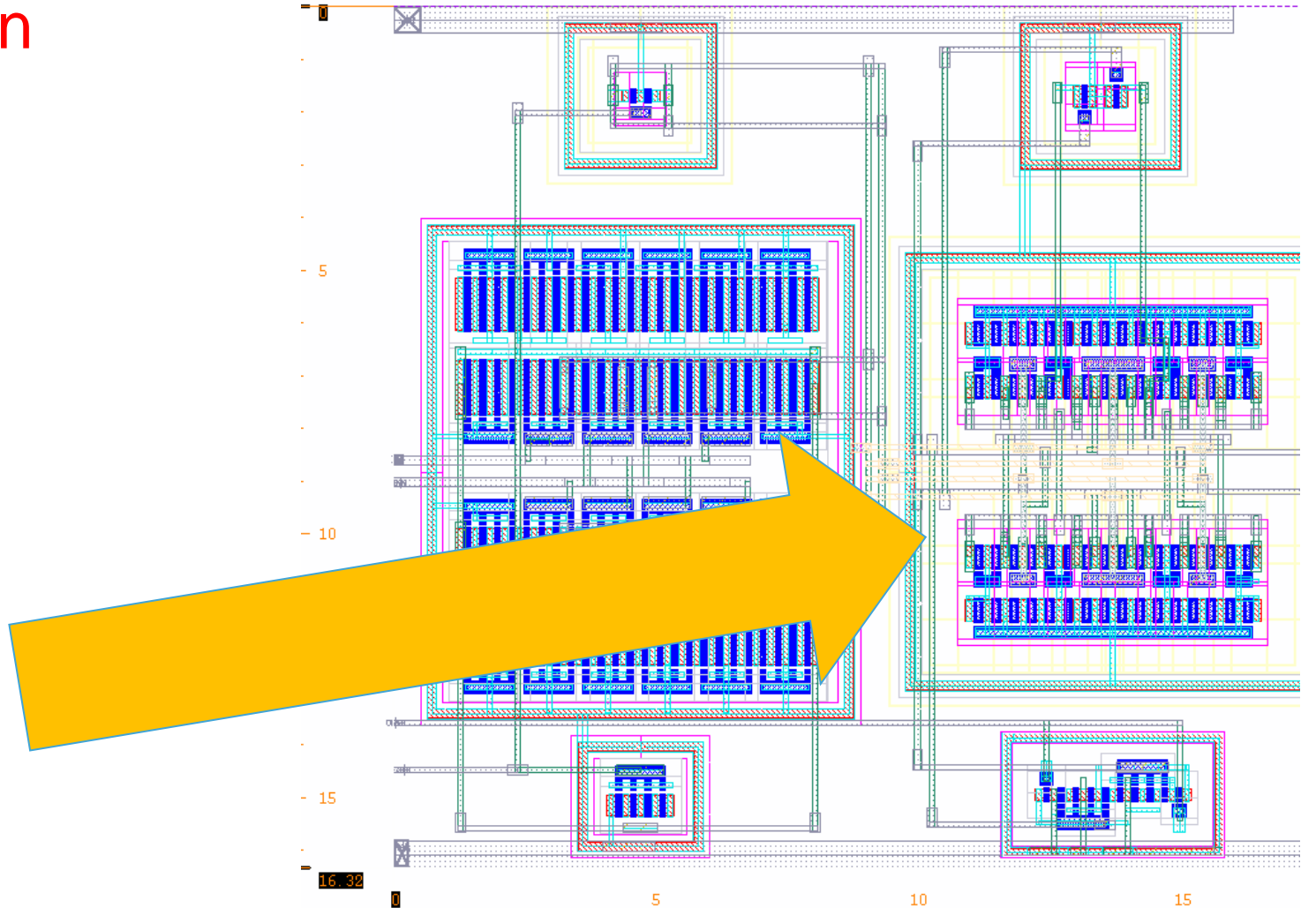
(D:2 fingers; d: 1fingers)

DDddDDddDD

DAddBBddAD

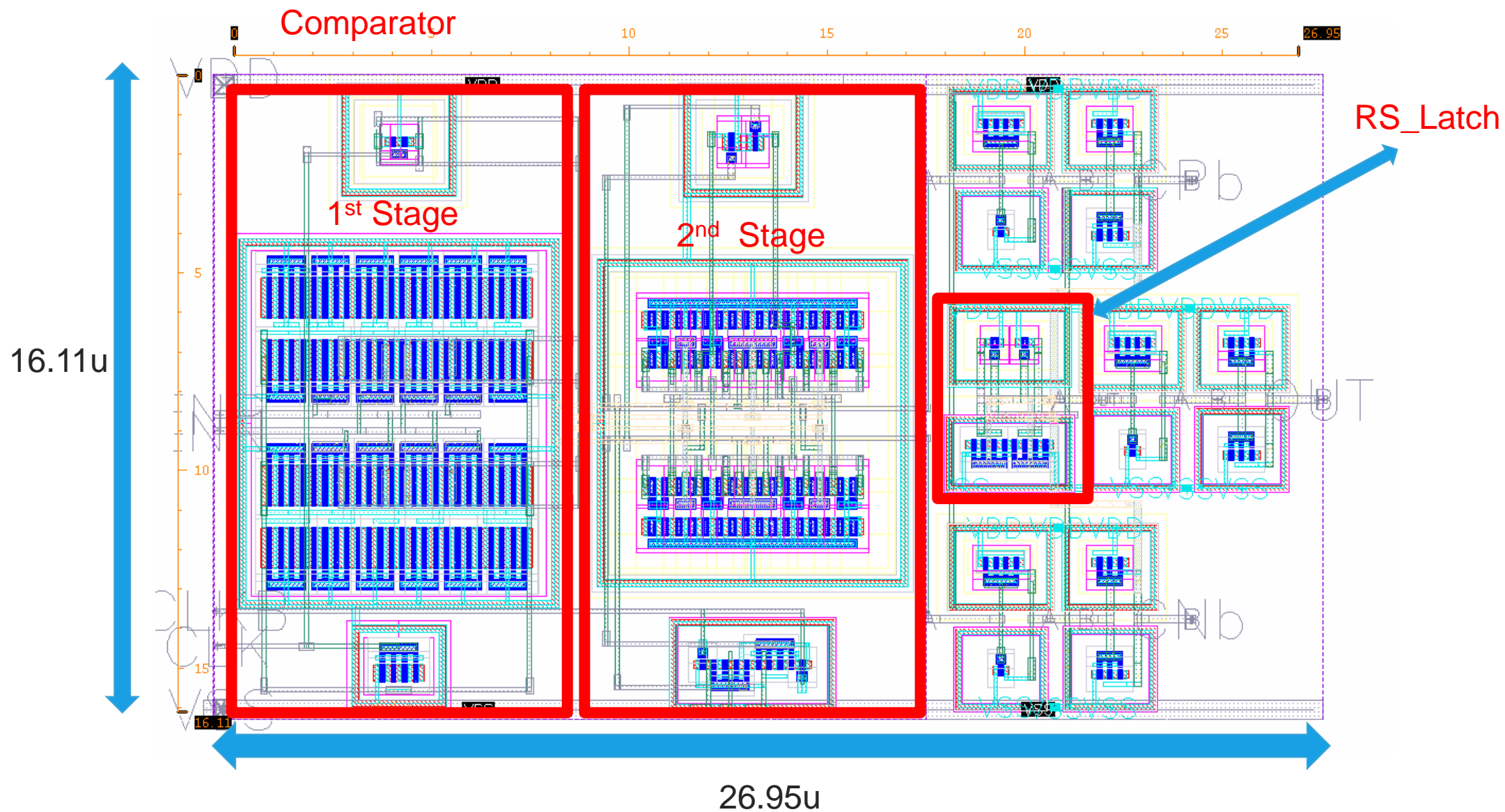
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DDddDDddDD



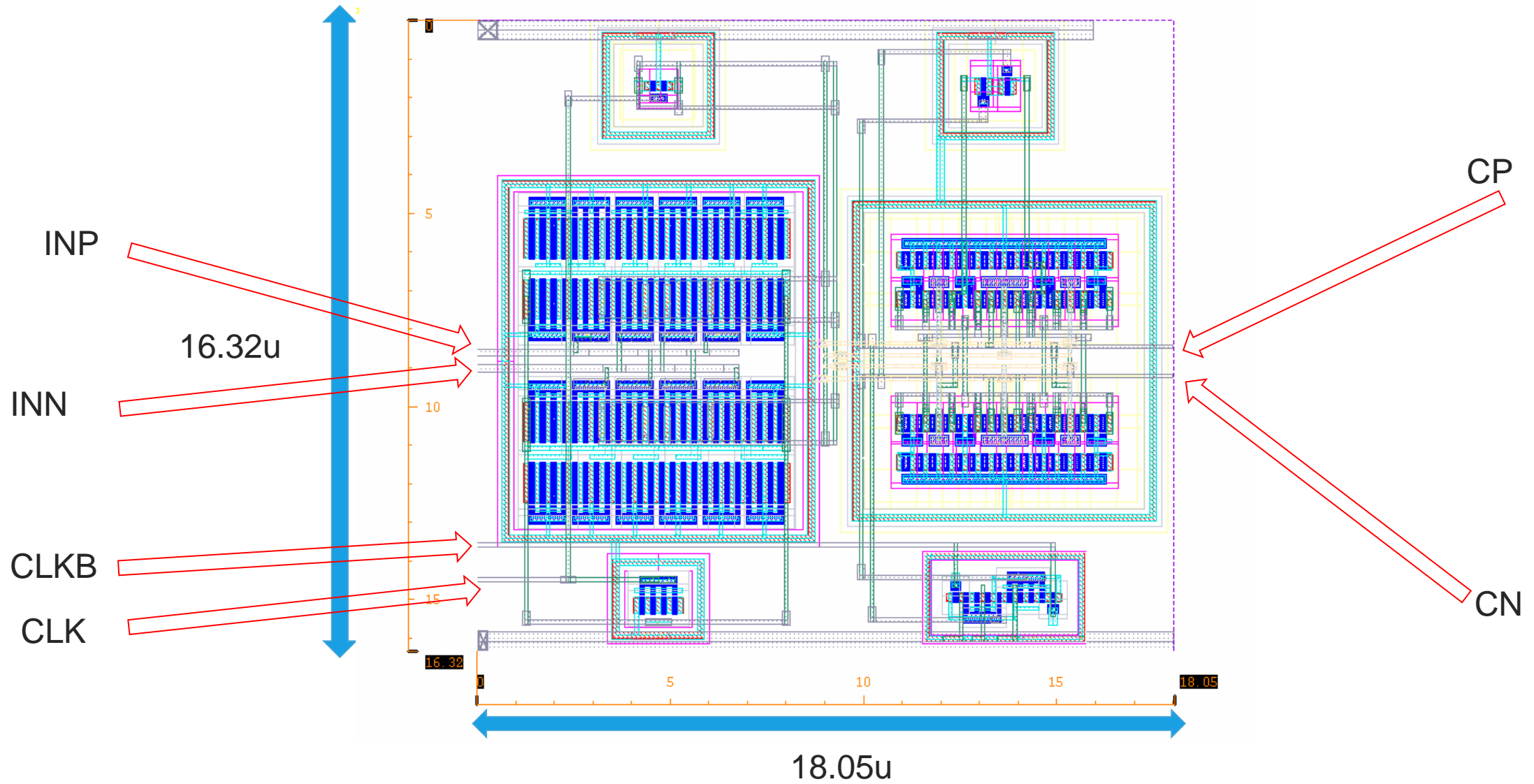


Top Level Layout





Comparator Layout





RCX Cap Table

| comparator_core x | | | | | |
|-------------------|------------|------------|-------------|--------------|----------------|
| No. | Layout Net | Source Net | C Total (F) | CC Total (F) | C+CC Total (F) |
| 1 | VSS | VSS | 5.99226E-15 | 9.00221E-15 | 1.49945E-14 |
| 2 | 2 | ITAIL | 1.12065E-15 | 1.24908E-14 | 1.36114E-14 |
| 3 | 3 | FN | 1.21612E-15 | 8.82237E-15 | 1.00385E-14 |
| 4 | VDD | VDD | 5.92345E-15 | 3.71678E-15 | 9.64023E-15 |
| 5 | 5 | FP | 1.31827E-15 | 8.70704E-15 | 1.00253E-14 |
| 6 | 6 | FNS | 6.53515E-16 | 4.29652E-15 | 4.95004E-15 |
| 7 | 7 | FPS | 6.66487E-16 | 3.85037E-15 | 4.51685E-15 |
| 8 | CP | CP | 1.01519E-15 | 5.83630E-15 | 6.85149E-15 |
| 9 | CN | CN | 1.01645E-15 | 5.74597E-15 | 6.76243E-15 |
| 10 | INN | INN | 7.40995E-16 | 4.71160E-15 | 5.45260E-15 |
| 11 | INP | INP | 7.11225E-16 | 4.76377E-15 | 5.47499E-15 |
| 12 | CLK | CLK | 6.39664E-16 | 1.82970E-15 | 2.46937E-15 |
| 13 | CLKB | CLKB | 6.13752E-16 | 9.68238E-16 | 1.58199E-15 |

| Source Net | C+CC (F) | Difference(%) |
|------------|----------|---------------|
| FP | 10.0253f | |
| FN | 10.0385f | 0.13 |
| CP | 6.85f | |
| CN | 6.76f | 1.31 |
| INP | 5.475f | |
| INN | 5.452f | 2.3 |



Extracted Simulation(Offset) – Process Corners

| Detail | | | | | | | | | |
|----------------------------|---------|------|--------|-----------|--------|--------|--------|--------|--------|
| Parameter | | | | | | | TT | FF | SS |
| crn65gplus_2d5... | | | | | | | tt_lvt | ff_lvt | ss_lvt |
| crn65gplus_2d5... | | | | | | | tt | ff | ss |
| temperature | | | | | | | 27 | 27 | 27 |
| Test | Output | Spec | Weight | Pass/Fail | Min | Max | TT | FF | SS |
| Lab2_combine:comp_off_TB:2 | /INN | | | | | | | | |
| Lab2_combine:comp_off_TB:2 | /INP | | | | | | | | |
| Lab2_combine:comp_off_TB:2 | /OUT | | | | | | | | |
| Lab2_combine:comp_off_TB:2 | /CLK | | | | | | | | |
| Lab2_combine:comp_off_TB:2 | /IO/CNb | | | | | | | | |
| Lab2_combine:comp_off_TB:2 | /IO/CPb | | | | | | | | |
| Lab2_combine:comp_off_TB:2 | /IO/VDD | | | | | | | | |
| Lab2_combine:comp_off_TB:2 | Pwr | | | | 1.218u | 3.017u | 1.512u | 3.017u | 1.218u |
| Lab2_combine:comp_off_TB:2 | /OFF | | | | | | | | |
| Lab2_combine:comp_off_TB:2 | offset | | | | 89.51u | 697u | 533.9u | 89.51u | 697u |

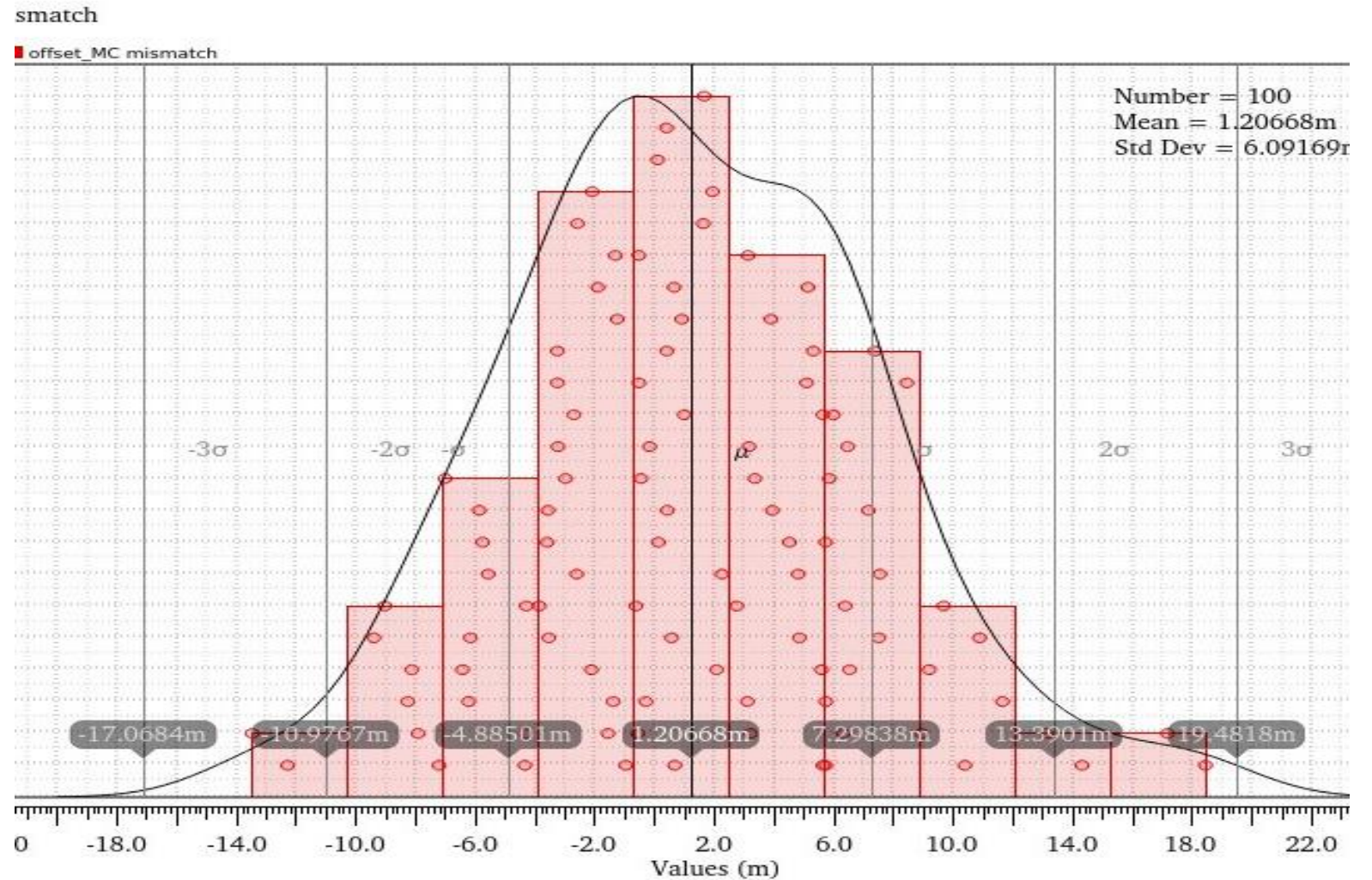
| Test Corners | TT | FF | SS |
|--------------|--------|--------|--------|
| #1 Iteration | 5.545m | 6.725m | 4.428m |
| #2 Iteration | 533.9u | 89.51u | 697u |

C+CC Extraction



Extracted Simulation(Offset) – Mismatch

- C+CC Extraction





Extracted Simulation(Tpd) – Process Corners

| | | | | | | | TT | FF | SS | |
|----------------------------|---------|------|--------|-----------|--------|--------|----------|----------|----------|--|
| Parameter | | | | | | | tt_lvt | ff_lvt | ss_lvt | |
| crn65gplus_2d5... | | | | | | | tt | ff | ss | |
| crn65gplus_2d5... | | | | | | | 27 | 27 | 27 | |
| temperature | | | | | | | | | | |
| Test | Output | Spec | Weight | Pass/Fail | Min | Max | TT | FF | SS | |
| Lab2_combine:comp_tpd_TB:4 | /INN | | | | | | | | | |
| Lab2_combine:comp_tpd_TB:4 | /INP | | | | | | | | | |
| Lab2_combine:comp_tpd_TB:4 | /OUT | | | | | | | | | |
| Lab2_combine:comp_tpd_TB:4 | /CLK | | | | | | | | | |
| Lab2_combine:comp_tpd_TB:4 | /IO/CNb | | | | | | | | | |
| Lab2_combine:comp_tpd_TB:4 | /IO/CPb | | | | | | | | | |
| Lab2_combine:comp_tpd_TB:4 | /IO/VDD | | | | | | | | | |
| Lab2_combine:comp_tpd_TB:4 | Pwr | | | | 1.056u | 2.921u | 1.273u | 2.921u | 1.056u | |
| Lab2_combine:comp_tpd_TB:4 | offset | | | | | | eval err | eval err | eval err | |
| Lab2_combine:comp_tpd_TB:4 | tpdr | | | | 270.5p | 457.6p | 322.4p | 270.5p | 457.6p | |

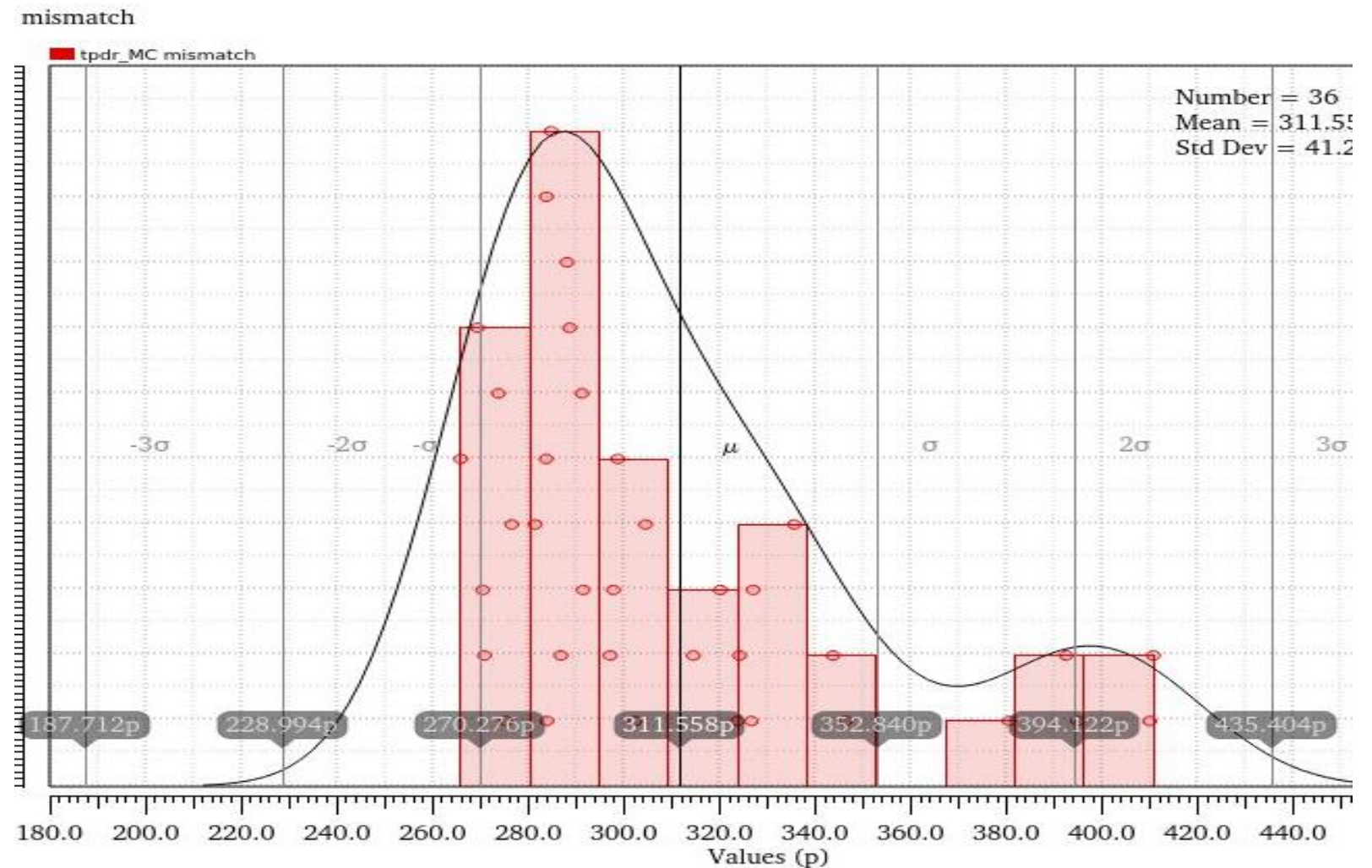
| Test Corners | TT | FF | SS |
|--------------|--------|--------|--------|
| Tpd(s) | 322.4p | 270.5p | 457.6p |

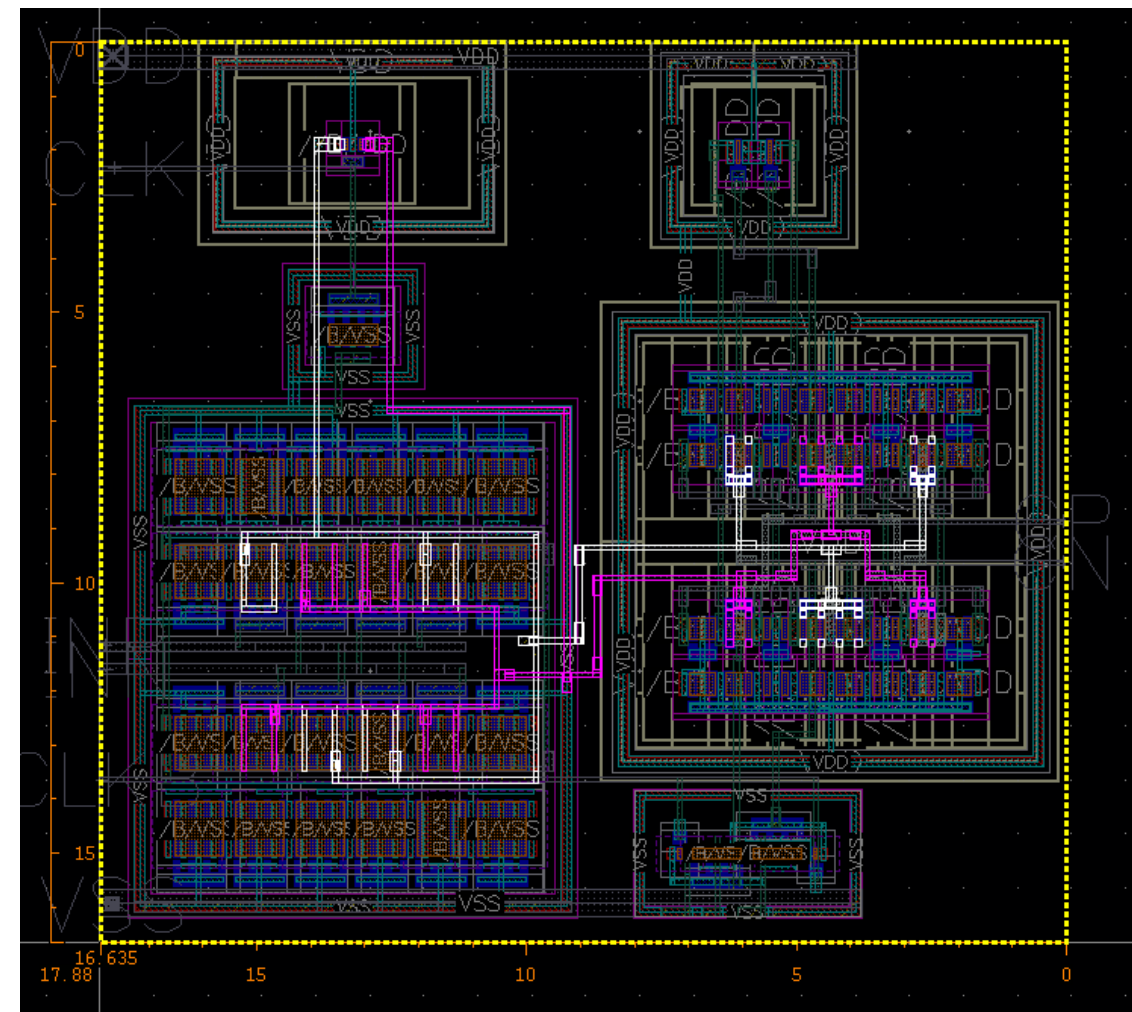
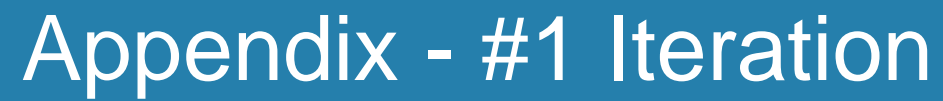
C+CC Extraction



Extracted Simulation(Tpd) – Mismatch

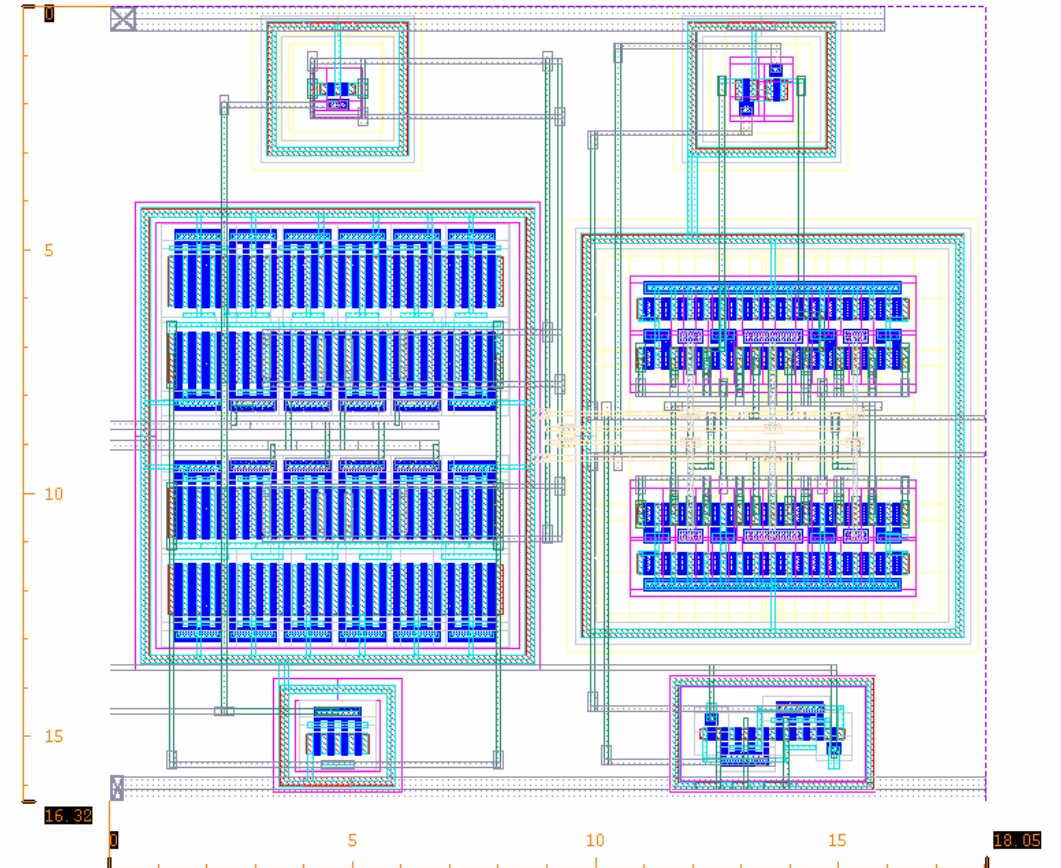
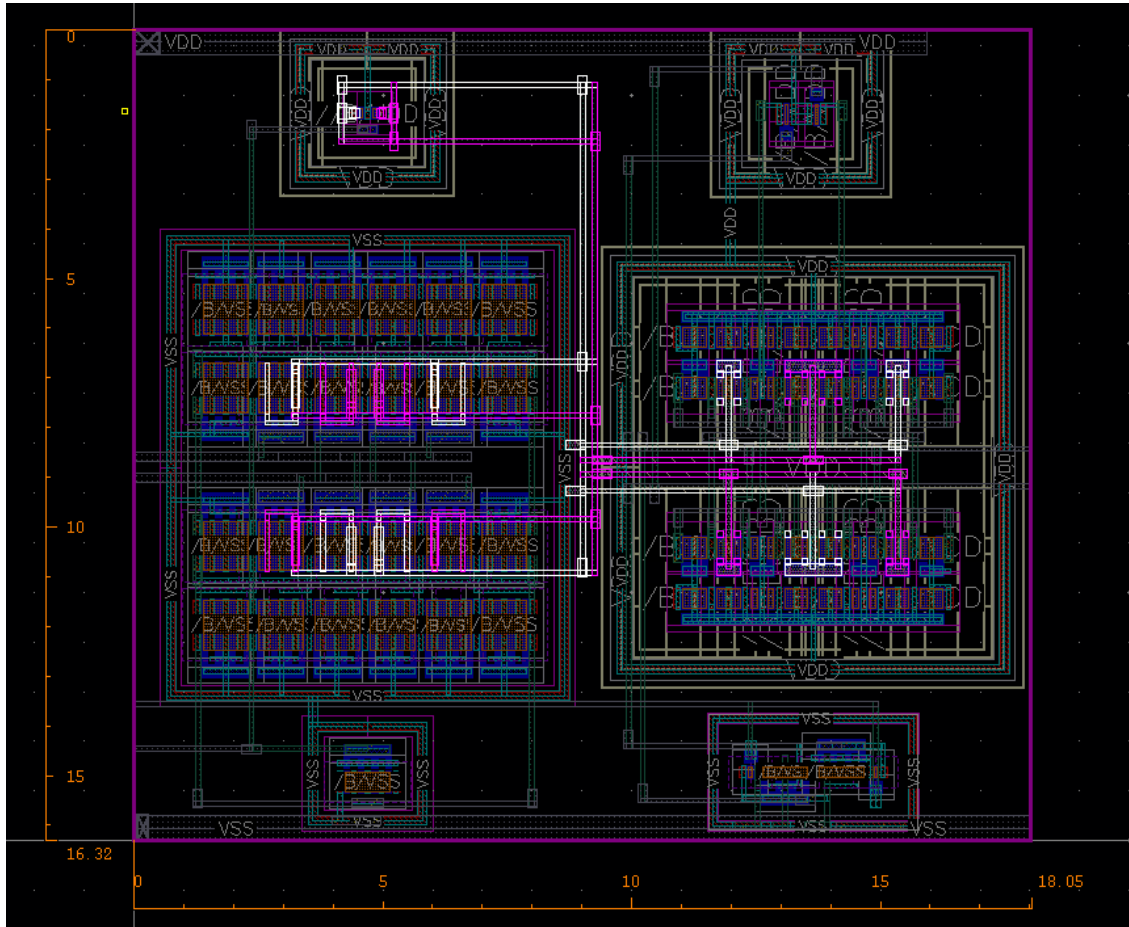
- C+CC Extraction














































Appendix - #2 Iteration





Appendix – Metal Color

| ▲ | Layer | Purpo... | V | S |
|---|-------|----------|---|---|
|  | P0 | drw |  |  |
|  | C0 | drw |  |  |
|  | M1 | drw |  |  |
|  | VIA1 | drw |  |  |
|  | M2 | drw |  |  |
|  | VIA2 | drw |  |  |
|  | M3 | drw |  |  |
|  | VIA3 | drw |  |  |
|  | M4 | drw |  |  |
|  | VIA4 | drw |  |  |
|  | M5 | drw |  |  |
|  | VIA5 | drw |  |  |
|  | M6 | drw |  |  |