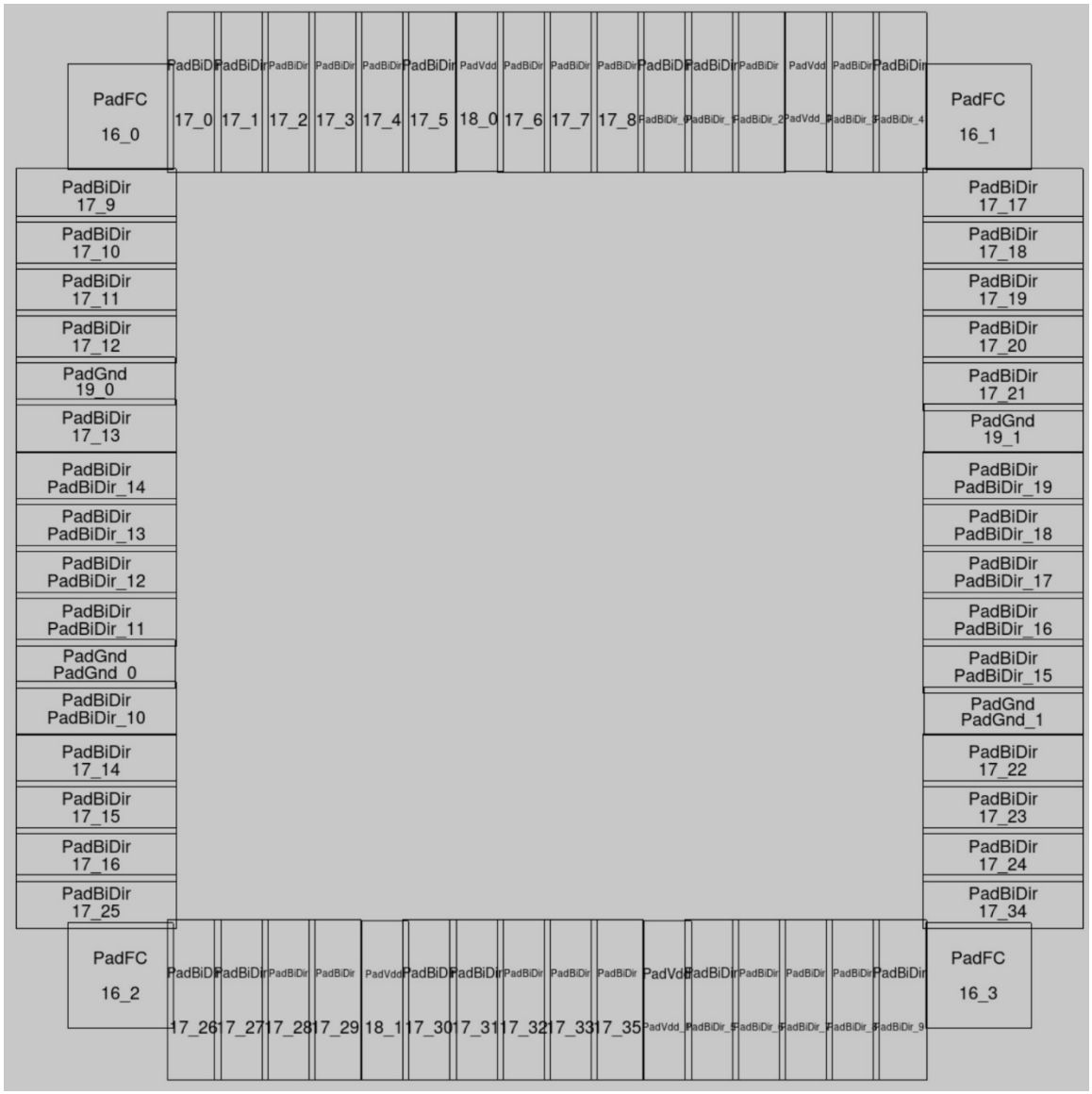
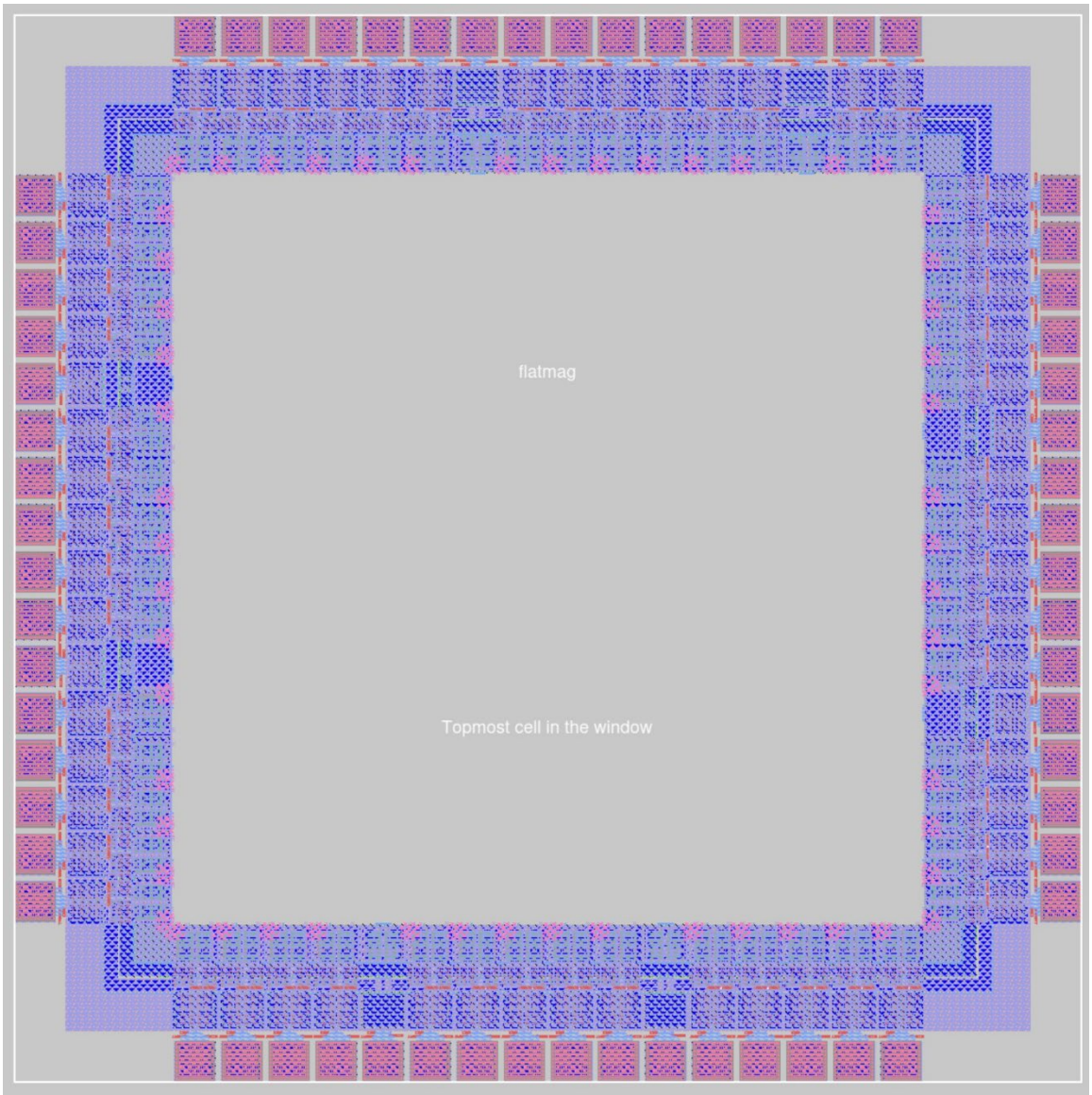
Elec 422 / 527: VLSI Systems Design
Notes on Layout Density Calculators
MOSIS AMI 0.5u Process
Update for 64 Pin Padframe

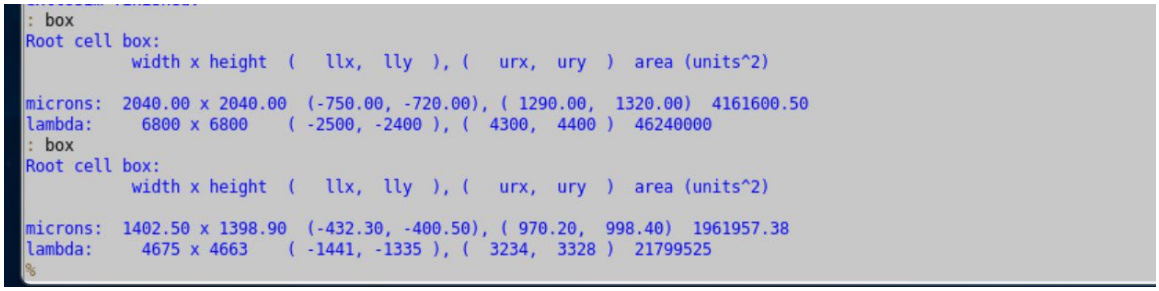
A 64 pin stuffed padframe has been created for use of projects that cannot fit in the standard 40 pin stuffed padframe. The same PadBiDir.mag cell is used and the 40 pin padframe was stretched so that there are 16 pads on each side instead of 10 on each side.



A flattened view of the padframe also shows the additional Vdd and GND pad added on each side. There are now 4 Vdd pad and 4 GND pads. Recall that large power and ground lines should be used to connect the core to the pads to prevent electro-migration and to provide sufficient current for the core. There are 5 new PadBiDir pads on each side or 14 time 4 or 56 total signal pads.



The bounding box or external size of the 64 pin padframe has increased and so also provides more space to connect the core.



The external bounding box is now 6800 by 6800 lambda. The internal useful area is now approximately 4600 by 4600 lambda.

On ssh.clear.rice.edu, there are density calculators for poly, metal1 and metal2.
They are all in /clear/courses/cavallar/pkg/magic/cad/bin/ which should be in your PATH based on the script for VLSI in your .bashrc or .cshrc and include
calc_poly_64.pl
calc_metal1_64.pl
calc_metal2_64.pl
for the stretched padframe that could potentially be used in a 64 pin package.

Poly should be at least 15 %, with Metal1 and Metal2 at least each 30%.

Typical usage on the 64 pin empty padframe is for example:

```
calc_poly_64.pl flatmag.mag
calculating total polysilicon area...
=====================================================
Total PolySilicon Area = 1284080 lambda squared
given 6800 x 6800 area, total poly density = 2.77699
percent
Local polysilicon density = 2.77699 percent
=====================================================
```

Recall that you need to **flatten** your magic file first, that is **no cell hierarchy** by making a copy by doing:

1) Start MAGIC
2) Load up hierarchical MAGIC file
3) :flatten flatmag
4) :load flatmag
5) :save flatmag

As an example, the blank empty 64 pin padframe is located on CLEAR and located at:
/clear/courses/elec422/2023_spring/pad_06_frame64 and called PadFrame64.mag.