Chapter Three

Problem 3.1

Using LASI to draw a basic PAD and Padframe according to Fig. 3.5 and 3.6.

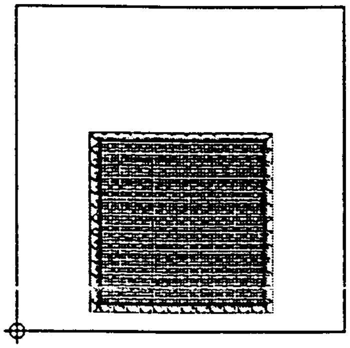


Fig P3.1. Layout a PAD using the outline layer (Cell name: Pad445)

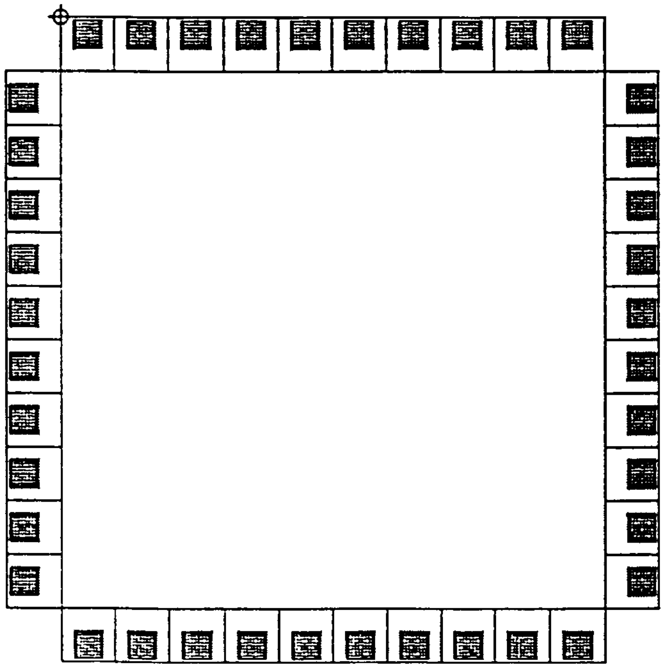
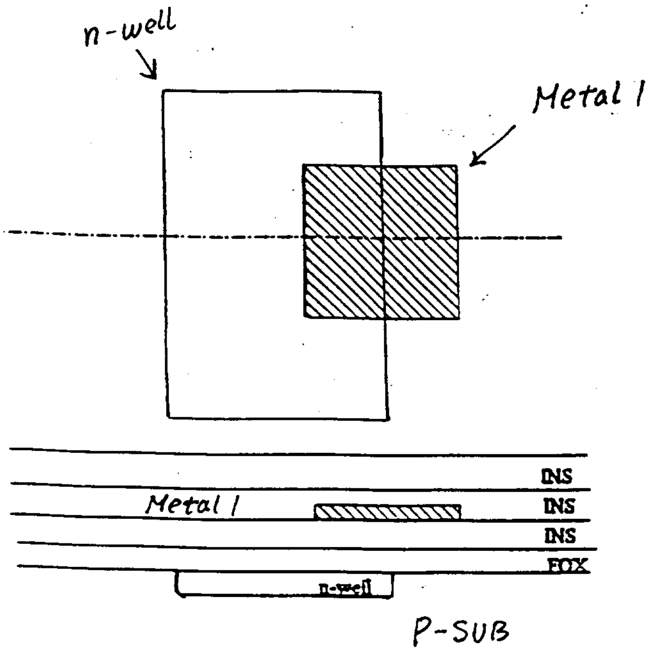


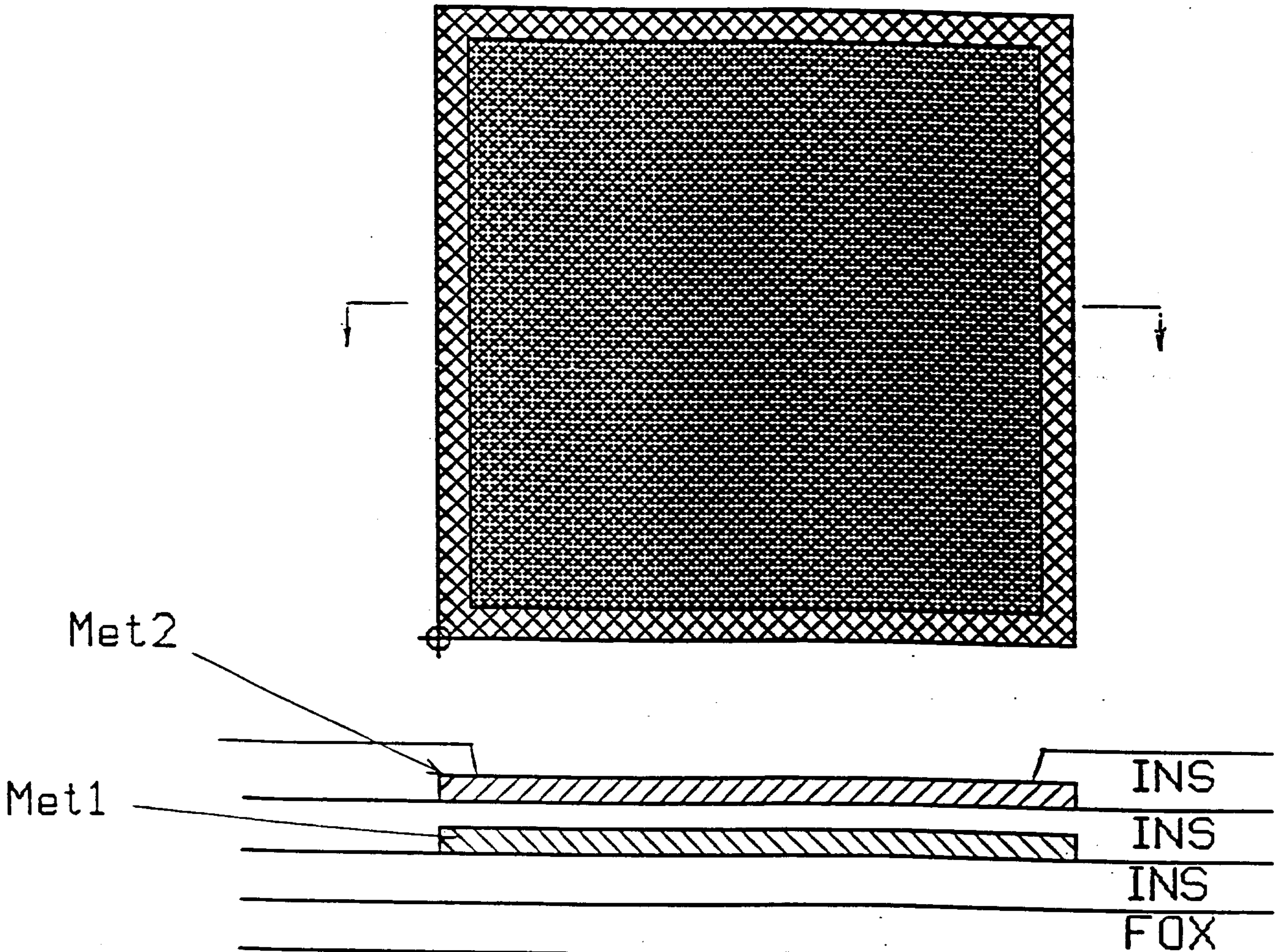
Fig P3.1b Layout of a 40-pad padframe. Cell name PADFM445.

P3.2



P3.3

The outline layer, layer 58, has no fabrication significance. It is used to help align the cells when we place them in a higher ranking cell.



Problem 3.4

As overglass layer is used to open a cut in the glass (the passivation on the top of the chip), without it, the pad cannot be bonded to a wire. In another word, the chip cannot be connected without these openings.

Problem 3.5

First select the pad cell, Pad445. Change the text size to 20μm using tSiz in LASI. Put the text reference point under the Pad bottom. Choose a proper place for this 20μm pin number. Using Text command, input a pin number. As the padframe PADFM445 use this pad cell, all the changes will be automatically made in padframe. Therefore, in padframe, use Text to change every pin number by putting the reference point exactly on the old text number.

Problem 3.6

Consider only the plate capacitance, assume the area of metal1 and metal 2 is Aμm^2. The capacitance between metal1 and metal2 is 38AaF, and capacitance between metal1 and substrate is 26AaF. The voltage change on metal1 = 1V × (38AaF/(38A+26A)aF) ≈ 0.594V

Problem 3.7

Ans: Taking Jal = 1mA/um. The maximum xurrent = 5 um x 1mA/um =5 mA. The limitation = 5 mA/(0.4 mA/contact) = 12.5 =>> 13 contact needed.

Problem 3.8

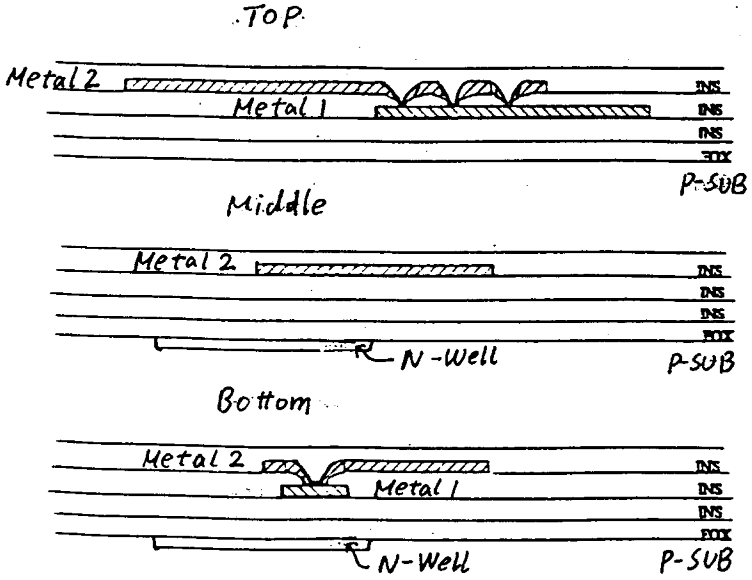
ANS: Taking Jal = 1mA/μm. To supply 20mA of current to a circuit, the minimum width of a metal2 wire = 20mA/1mA/μm = **20μm**. The limitation is 0.4mA/contact. Hence, the number of via = 20/0.4 = 50

Problem 3.9

The inductance of a 4μm wide piece of metal2 is

$$L(nH/mm) = 1.25 / (4/1.5 + 1.393 + 0.667\times\ln(4/1.5+1.44) \approx \mathbf{0.25nH/mm}$$

P3.10



Problem 3.11

From figure P3.11, the area between metal1 and metal 2 is 6μm ×12μm, and perimeter is 12μm+24μm = 36μm. The area between metal1 and substrate is 12μm×18μm, and perimeter is 60μm.

$C_{12} = (38 \times 6 \times 12 + 104 \times 36)\ \mathrm{aF} = 6480\mathrm{aF} = 6.48\mathrm{fF}$

$C_{1sub} = (26 \times 12 \times 18 + 82 \times 60)\mathrm{aF} = 10.536\mathrm{fF}$

Hence, voltage change on metal1 is

$\Delta V_{metal1} = 5\mathrm{V} \times C_{12}/(C_{12}+C_{1sub}) = 5\mathrm{V} \times 6.48 / (6.48+10.536) \approx \underline{1.9\mathrm{V}}$