Magic usage Guidelines

Starting magic - magic -T scmos filename (in the working directory)
drawing a layer - point the mouse on a desired layer on the toolbar or an existing layer in the layout and middle click on mouse

Layers on toolbar:

polysilicon - gate
ndiffusion - nmos source/drain
pdiffusion - pmos source/drain
ndcontact - ndiffusion to metal 1 contact
pdcontact - pdiffusion to metal 1 contact
polycontact - polysilicon to metal 1 contact
m2contact - metal 1 to metal 2 via
m3contact - metal 2 to metal 3 via
psubstratepcontact - psubstrate (nmos bulk) to metal 1 contact
nsubstratencontact - nsubstrate (pmos bulk) to metal 1 contact

Keyboard Shortcuts:

g - grid on/off
z, Shift+z - zoom in/out
u - undo
c - copy **(point cursor at the desired bottom-left position)**
m - move **(point cursor at the desired bottom-left position)**
r - rotate
v - fit screen
s - selects a layer on which the cursor is pointing (double press: shows all the connections to that layer; **very handy**)
a - selects all the layers in the selected rectectangle
i - selects the visible cell
mouse left click - moves the position of selection rectangle
mouse right click - change the shape of selection rectangle
x, Shift+x - show/hide the contents of imported cell
stretch - use 2,4,6,8 to stretch it down,left, up, right respectively (after selecting layers using keyboard shortcut **'a'**)
label labelname - assigning node names **(left and right click at the same place on a desired layer)**
erase label - erases the label **(select the rectangle with the label)**

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importing a cell - **1) getcell filename** in magic's terminal/konsole **(cursor should be pointed at the desired bottom-left position)**
2) dump filename in magic's terminal/konsole **(cursor should be pointed at the desired bottom-left position)**

Note: An imported cell cannot be edited if it is imported using getcell command.

array xdir ydir - create **xdir** copies of a selected cell in x direction and **ydir** copies in y direction

Important Points:

* the whole layout area is a psubstrate (substrate/bulk for nmos)
* use nwell to cover the whole pmos region
* place substrate/bulk contacts and connect them to Vdd/Gnd

Design Rule Check:

drc find S.No (of the error) - displays the reason for error

Steps to extract:

save	-	saves with .mag extension
extract	-	creates a .ext file (contains co-ordinate information)
ext2spice	-	converts the .ext file to .spice file (a spice suited netlist is created)
ext2sim	-	converts the .ext file to .sim file (For IRSIM usage)

IRSIM usage Guidelines

Starting IRSIM - irsim filename.sim (in the working directory)

Steps:

h nodename1 nodename2 . . . . - assigns logic high (1) to those nodes
eg: h a b

l nodename1 nodename2 . . . . - assigns logic low (0) to those nodes
eg: l a b

w nodename1 nodename2 . . . . - nodes to be observed/plotted
eg: w a b out

s - simulate
d - displays the results of nodes specified in **w command**

analyzer nodename1 nodename2 . . . . - plots them in the analyser window
eg: analyzer a b out

Some handy comands:

vector vectorname nodename1 nodename2 . . . . - grouping the nodes
eg; vector in a b c

setvector vectorname value1value2 . . . - assigning values to the vector
eg; setvector in 000

Note: Each input set should be simulated individually (timestep b/w two simulations is 10ns by default; can be changed by **stepsize tstep** comand)

eg:
```
setvector in 000
s
setvector in 001
s
```

Very handy way of assigning value to a vector and simulating

```
set vlist {000 001 010 011 100 101 110 111}
foreach vec $vlist {setvector in $vec ; s}
```

Using Standard Cells from vlsitechnology.org

Pre-requisite: technology file (**pharosc.tech)** has to be copied into the working directory. (this technology has to be used when starting magic)

tech file is available @ **pharosc-8.5/magic/etc**

all the standard cell libraries are available @ **pharosc-8.5/magic/cells**

Choose a standard cell library and copy the necessary standard cells into your working directory.

Starting magic - magic -T pharosc filename
(**open Konsole/Terminal @ your working directory**)

These standard cells can be imported using **getcell or dump** command

IRSIM usage: Dont exit the tkcon of magic. Just invoke irsim without the file name in the same tkcon of magic (**after generating the .sim file**). And then you can use it as usual.

References:

opencircuitdesign.com - tutorials (magic, irsim etc)
vlsitechnology.org - Std. Libraries (examples)