

# Magic VLSI Cheatsheet

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This cheat sheet compiles useful commands (to be entered in the Tcl window) and bind keys (in the layout window) as well as a summary of the mouse operations for the different tool modes. This compilation relates to Magic 8.3 (see <https://github.com/RTimothyEdwards/magic>).

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Useful commands:	
<code>addpath [path]</code>	add search <i>path</i> of cells
<code>array xsize ysize</code>	array the selection <i>xsize</i> -times in X, <i>ysize</i> -times in Y, spacing by box
<code>contact type</code>	create contact inside box of intersecting layers
<code>corner dir1 dir2</code>	draws a corner inside box, first in <i>dir1</i> , then in <i>dir2</i> (cf. <code>fill</code> )
<code>drc find</code>	locate DRC error
<code>drc why</code>	explain DRC errors in box
<code>dump cell</code>	copy given <i>cell</i> into current layout cell
<code>erase layers</code>	erase comma-separated list of <i>layers</i> in box
<code>erase *</code>	all layers but not labels
<code>erase \$</code>	erase everything (like CTRL-D)
<code>erase labels</code>	erase selected label(s) in box
<code>fill dir</code>	extend layers from one side of box to the other in the given <i>direction</i> (cf. <code>corner</code> )
<code>findlabel label</code>	center the box on the <i>label</i>
<code>flatten cell</code>	flatten the current edit cell incl. hierarchy into a new <i>cell</i>
<code>flush</code>	revert edit cell to last state on disk
<code>get cell</code>	instantiate <i>cell</i> into current edit cell
<code>help [pattern]</code>	shows help for various commands
<code>identify cell-id</code>	name the selected cell as <i>cell-id</i>
<code>iroute</code>	interactive point-to-point router, from cursor to box
<code>label string [position [layer]]</code>	create a point, line or box label
<code>load cell</code>	open the <i>cell</i> in the layout window
<code>macro [window_type] [key [value]]</code>	new macro definition
<code>measure [hor ver auto]</code>	create a ruler in the box
<code>paint layers</code>	paint the comma-separated list of <i>layers</i> in box
<code>plow dir</code>	move layout structures incl. connectivity in <i>direction</i> , see manual
<code>port make</code>	create a port from selected label
<code>port index number</code>	assign a port index (must match the number from schematic)
<code>quit [-nocheck]</code>	exit magic (using <code>-nocheck</code> discards unsaved changes)
<code>see [no] layers</code>	show or hide comma-separated list of <i>layers</i>
<code>see [no] *</code>	show or hide all layers
<code>select save file</code>	Save selection as new <i>file.mag</i>
<code>straighten dir</code>	try to repair jogs by pulling in <i>direction</i>
<code>tool</code>	changes the currently used <code>tool</code> to (box, wiring, netlist, pick)
<code>redraw</code>	redraws the window
<code>unmeasure</code>	remove all rulers in box
<code>what</code>	print information about the current selection
<code>xload cell</code>	open the <i>cell</i> in the layout window unexpanded
<code>xview</code>	full view, with unexpanded cells

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Bind keys:	
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a	select everything in box
A	select additional objects in box
CTRL-A	deselect objects in box
b	print information about the box
B	center window on the box
c	<b>copy</b>
d	<b>delete</b> selection
CTRL-D	delete all layers and labels in box selected by cursor
e	makes the selected cell the new <b>edit</b> cell
f	flip the selection sideways
F	flip the selection upside-down
g	toggle <b>grid</b>
G	toggle <b>grid 2</b>
i	select instance under cursor
I	select additional instance under cursor
CTRL-I	deselect instance under cursor
m	<b>move</b> selection to cursor position
o	<b>openwindow</b> (with current selection)
r	<b>rotate 90</b>
R	<b>rotate -90</b>
s	<b>select</b> objects under cursor
S	<b>select</b> additional objects under cursor
CTRL-S	deselect objects under cursor
u	<b>undo</b> the last operation
U	<b>redo</b> the last undo
v	<b>view</b> , full view of layout
w	<b>writeall</b> changed cells to disk
x	<b>expand</b> cells (make visible) in box
X	<b>unexpand</b> cells (hide) inside the box
CTRL-X	toggle the visibility of cells in box
y	<b>drc why</b>
z	zoom out
Z	zoom in
CTRL-Z	zoom in on box
>	edit the selected cell in layout window (cf. <)
<	return from editing a cell (cf. >)
,	clear selection
:	directly jump to command window (like VI)
SPACE	change the tool
SHIFT + SPACE	change to the box tool
KEYPAD-2	move selection south, equivalent to 'move s 1'
SHIFT + KEYPAD-2	stretch selection south, equivalent to 'stretch s 1'
KEYPAD-4	move selection west, equivalent to 'move w 1'
SHIFT + KEYPAD-4	stretch selection west, equivalent to 'stretch w 1'
KEYPAD-6	move selection east, equivalent to 'move e 1'
SHIFT + KEYPAD-6	stretch selection east, equivalent to 'stretch e 1'
KEYPAD-8	move selection north, equivalent to 'move n 1'
SHIFT + KEYPAD-8	stretch selection north, equivalent to 'stretch n 1'

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Mouse operations:	
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Box tool:	
LEFT	set lower-left corner of box
RIGHT	set upper-right corner of box
MIDDLE	<b>paint</b> layer pointed with cursor in box
SHIFT + MIDDLE	<b>erase</b> layer pointed with cursor in box
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Layer selection tool:	
LEFT	show selected layer, cf. <b>see</b>
RIGHT	hide selected layer, cf. <b>see no</b>
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Wiring tool:	
LEFT	pick wire material and size from cursor
MIDDLE	place wire at cursor
RIGHT	cancel wire
SHIFT + LEFT	change to higher layer (e.g. m1 to m2)
SHIFT + RIGHT	change to lower layer (e.g. m2 to m1)
SHIFT + MIDDLE	place a contact at cursor and continue on higher layer
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Pick tool:	
LEFT	remove current selection and follow cursor
MIDDLE	place a copy and continue
RIGHT	cancel
SHIFT + MIDDLE	make a copy of selection and follow cursor

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