FlashPOM Designer

Users manual

Project MATEO

http://FlashPoM.zcu.cz

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1 Introduction

FlashPOM Designer is an application that enables user to design the chip layer by layer. Each layer has properties, like thickness, and contains set of geometrical shapes. One device can have multiple layers stacked upon the substrate layer.

Software provides output in FPSVG file that is ready for chip fabricating process. Tools that helps user to design and visualize what she is designing are included. Key features are Cost functions that estimates cost of designed device, Check constraints, that checks whether chip is manufacturable, Cut View and 3D View, that visualize designed chip.

This document guides potential user throughout the application, shows available tools and on a simple tutorial demonstrates typical use of the application.

2 Installation

2.1 Prerequisites

To run the application it is necessary to have correctly installed *Microsoft .NET Framework Version 2.0*. For 3D View visualization function is required *Microsoft DirectX 9.0 with Managed Extensions Library*.

Installation files for both libraries can be found at

http://download.microsoft.com

For .NET Framework version 2.0 search for **.NET Framework version 2.0 Redistributable Package**, for DirectX look for **DirectX 9.0 Redistributable Package**.

2.2 Setup Wizard

Program is distributed as a standard Microsoft Installation Package together with Setup program. Execute **setup.exe** to start the installation process.

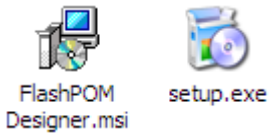

Figure 2-1: Installation files

If previous version of the program is already installed warning window appears. It is necessary to uninstall old version using *Add/Remove Programs* from the *Control Panel* before installing new one.

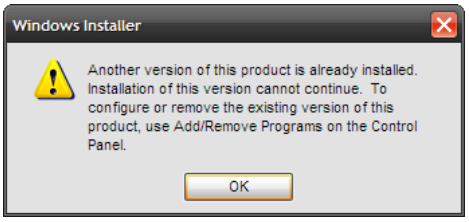

Figure 2-2: Program already installed

The Setup Wizard will guide you through the installation process. After successful installation program shortcut is placed in the Windows Start menu (*Start->Programs->FlashPOM Designer*).

Figure 2-3: Setup wizard

3 Application overview

Screen of typical working environment is shown on figure. Window of the application consists of menu bar, tool bars, and tool windows, tabbed windows for chip design and status bar. All these parts can be moved or turned off to meet user requirements on their placement. Most of the commands are accessible from menu, toolbars and are also reachable using keyboard shortcuts.

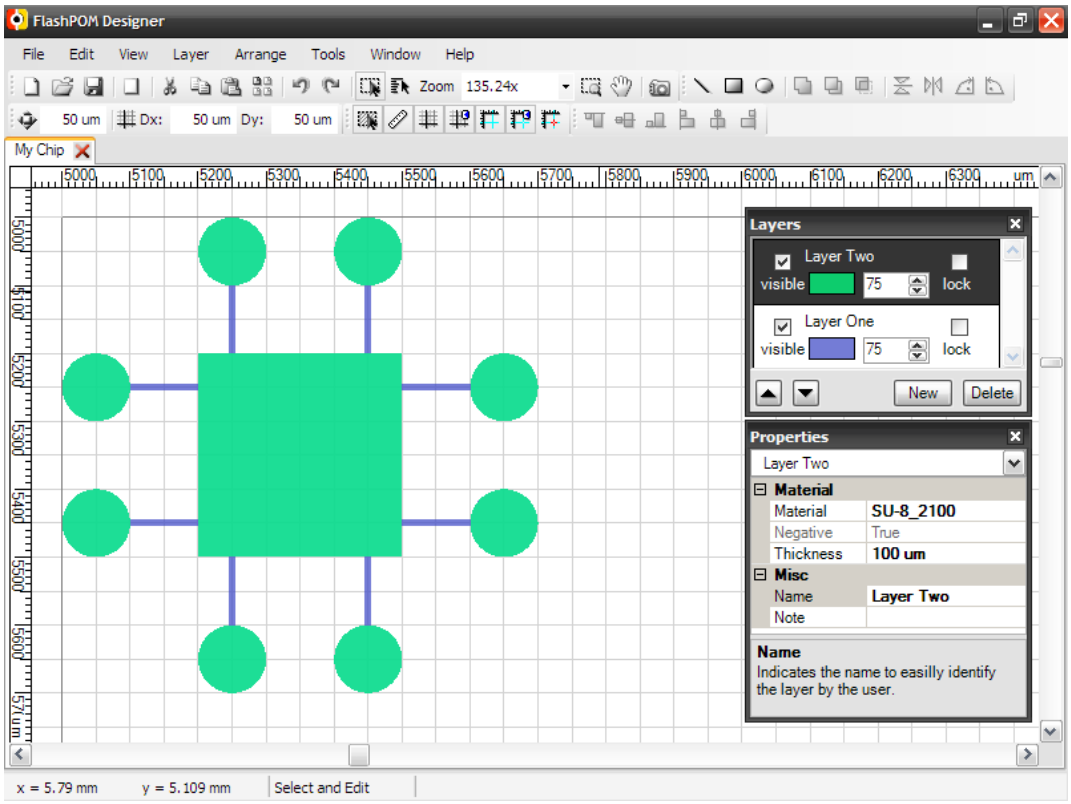

Figure 3-1: FlashPOM editor

3.1 Main Menu

Main Menu is a text menu with shortcuts to most functions of the application. Command shortcuts are placed to appropriate groups.

Figure 3-2: Main Menu

3.1.1 File

New	Ctrl N	Creates a new empty chip design. Wizard that will guide user thorough entering necessary chip properties will pop-up. These include selection from available substrate materials and available layer materials. List of available materials is stored in configuration file that can be regularly updated over the internet.
Open	Ctrl O	Opens an existing chip design from a previously saved file.
Save	Ctrl S	Saves the currently active chip design on the file from which it was opened or on a new file if it was created from New.

Save As	Ctrl Shift S	Saves current chip design to different file than from which it was opened or most recently saved.
Close	Ctrl Q	Closes active chip design project.
Import from FPSVG		Imports chip design from the SVG like file.
Export to FPSVG		Exports chip design to SVG like file which is to be loaded to laser device for chip fabricating.
Recent Files		Contains files that were recently opened.
Print	Ctrl P	Shows dialog for printing current chip design
Exit	Alt F4	Ends the application.

3.1.2 Edit

Undo	Ctrl Z	Undoes the most recently completed undoable command
Redo	Ctrl Y	Redoes the most recently completed undoable command
Cut	Ctrl X	Removes and copies currently selected element to windows clipboard.
Copy	Ctrl C	Copies currently selected element to windows clipboard.
Paste	Ctrl V	Inserts most recently cut or copied element from windows clipboard to active layer.
Delete	Del	Removes currently selected element.
Snap to Grid		Enables or disables snapping to Grid.
Snap to Guidelines		Enables or disables snapping to Guidelines.

3.1.3 View

Rulers		Shows or hides Rulers in the chip design window.
Grid		Shows or hides Grid in the chip design window.
Guidelines		Shows or hides Guidelines in the chip design window.
Zoom In	Ctrl +	Zooms in view on chip design window.
Zoom Out	Ctrl -	Zooms out view on chip design window.
Fit to Substrate	Ctrl *	Fits zoom such that whole substrate is visible.
Zoom to Height		Zooms such that substrate fits the window on height.
Zoom to Width		Zooms such that substrate fits the window on width.

3.1.4 Layer

New Layer		Shows dialog window that guides user in adding new layer to active chip
Delete Layer		Deletes active layer from the current chip design.

3.1.5 Arrange

Group	Ctrl G	Groups selected elements such they behave as a one unit.
Ungroup	Ctrl U	Ungroup group to former elements.
Ungroup All		Divides group tree to former elements, does not matter how many group commands were applied before (i.e. this is particularly helpful if user wants to break apart the group that was made of a group and element)
Weld	Ctrl W	Combines selected elements to new one.
Trim	Ctrl T	Trims selected element by another one.
Intersect	Ctrl I	Produce new element that is a result of intersection of selected objects.
Align Left		Aligns two elements such that left sides of respective bounding boxes coalesce.
Align Right		Aligns two elements such that right sides of respective bounding boxes coalesce.
Align Top		Aligns two elements such that top sides of respective bounding boxes coalesce.
Align Bottom		Aligns two elements such that bottom sides of respective bounding boxes coalesce.
Align Centers Horizontally		Aligns two elements such that centers of respective bounding boxes coalesce in horizontal direction.
Align Centers Vertically		Aligns two elements such that centers of respective bounding boxes coalesce in vertical direction.

3.1.6 Layer

New Layer	Shows dialog window that guides user in adding new layer to active chip
Delete Layer	Deletes active layer from the current chip design.

3.1.7 Tools

Settings		Shows settings dialog where is possible to set working environment settings, such as color, length of history, default directories and settings of particular functions.
Cut View	Ctrl Shift C	Shows window with visualization of the cut thorough the chip design.
3D View	Ctrl Shift 3	Shows window with 3D visualization of the chips design.
Check Constraints		Checks current chip design whether it is ready for manufacturing.
Estimate Chip Cost		Estimates price for current chip design.
Update Production Settings File		Checks if there is new file with material definitions and laser device parameters available and offers the download of the file.
Update the FlashPOM Editor		Checks whether new version of the software is available and offers the download.

3.1.8 Window

Library	Ctrl Shift B	Shows or hides Library tool window.
Layers	Ctrl Shift L	Shows or hides Layers tool window,
Properties	Ctrl Shift P	Shows or hides properties tool window.
Standard		Shows or hides Standard toolbar.
Creation Tools		Shows or hides Creation tools toolbar.
Helpers		Shows or hides Helpers toolbar.
Fast Settings		Shows or hides Fast Settings toolbar.
Align		Shows or hides Align toolbar.
Status bar		Shows or hides Status bar.
Reset Window Positions		Sets tool window positions to default values.

3.1.9 Help

About	Shows dialog window with common information about the application,
User Reference	Opens this document.

3.2 Tool windows

3.2.1 Layers

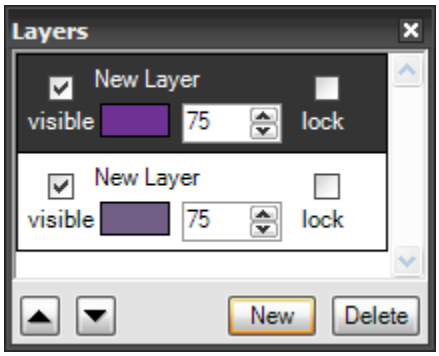

Figure 3-3: Layers tool window

The Layers tool window provides view on all chip layers. Appearance of each layer (color, transparency, visibility) in chip design window can be set there. There is also possibility to lock layer to avoid unwanted element manipulation.

Order of layers can be changed by **Up/Down** buttons or by drag and drop.

New layer can be added or deleted by **New/Delete** button.

3.2.2 Properties

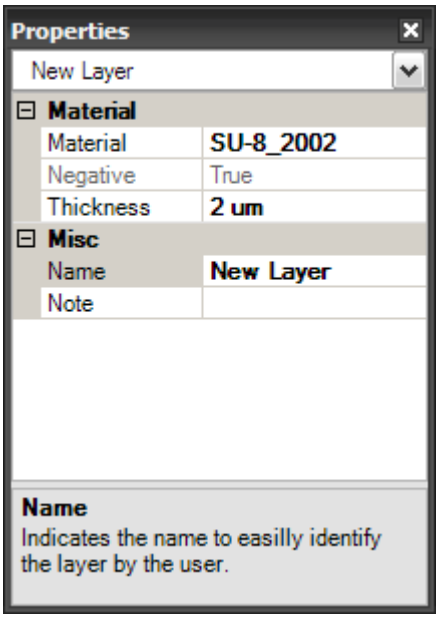

Figure 3-4: Properties tool window

Purpose of the properties window is to show and allow user to modify properties of selected object (chip, layer, element, grid, guide line). List box is filled with flatten list of all objects which properties can be changed.

3.2.3 Library

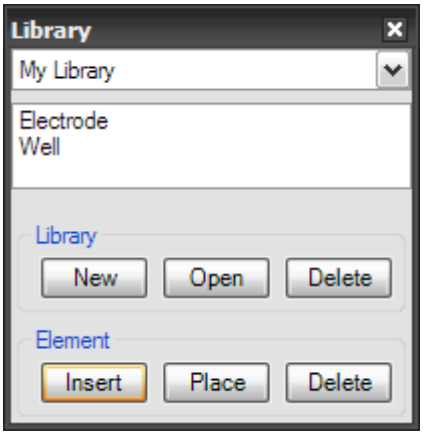

Figure 3-5: Library tool window

The Library tool window manages user element libraries. New library is created by **New** button. Existing library stored on different than default location can be loaded by **Open** button. Created library is deleted by **Delete** button.

Any element can be inserted into created library by selecting element and pressing **Insert** button. Element can be placed to chip layer by **Place** button or by drag and drop. Elements can be also deleted from the library by **Delete** button.

3.3 Toolbars

3.3.1 Standard

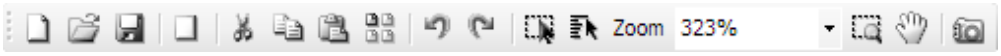

Figure 3-6: Standard toolbar

Standard toolbar provides fast access to key functions of the application.

3.3.1.1 File tools

Figure 3-7: New project

Figure 3-8: Open project

Figure 3-9: Save project

New project runs new project wizard that guides user to create new chip design with one layer.

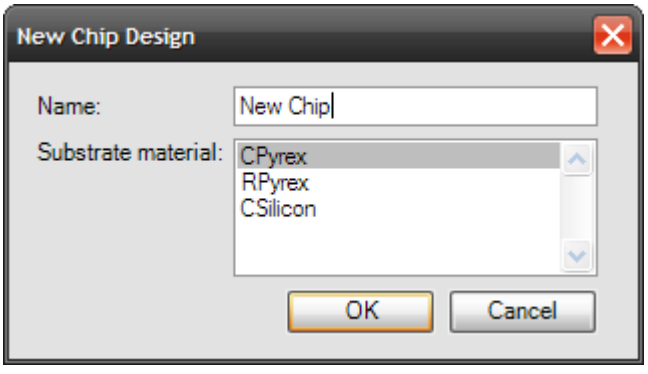

Figure 3-10: New chip design

Name of new chip design is arbitrary and when saving is used as a default file name. Substrate material is used as a base of the chip. In the next step user is forced to enter parameters of the first layer.

Open project and Save project opens dialog window for opening/saving chip design.

3.3.1.2 New Layer

Figure 3-11: New layer

New layer command opens dialog for adding new layer to chip design. User can enter arbitrary name. Layer thickness must fall within the range of available thicknesses for selected material.

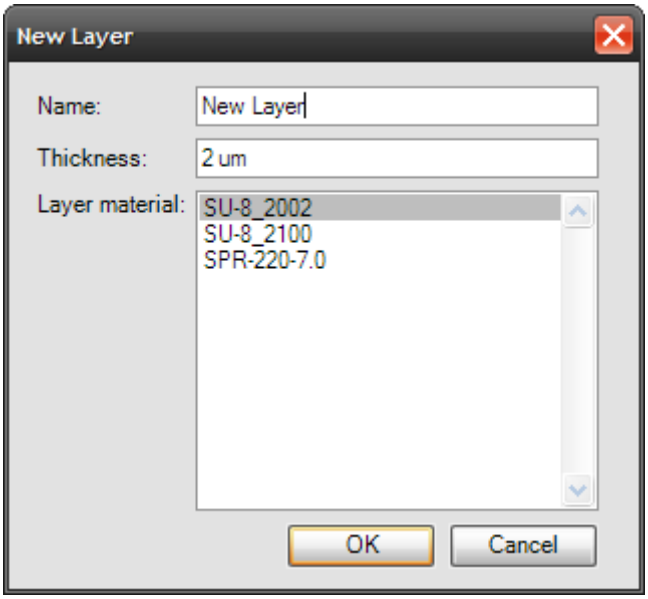

Figure 3-12: New layer dialog

3.3.1.3 Clipboard tools

Figure 3-13: Cut

Figure 3-14: Copy

Figure 3-15: Paste

Figure 3-16: Distribute

Clipboard tools are standard functions working with clipboard. Cut moves selected element to windows clipboard. Copy makes copy of selected element and this copy is inserted to the clipboard. Paste puts element in the clipboard to selected layer.

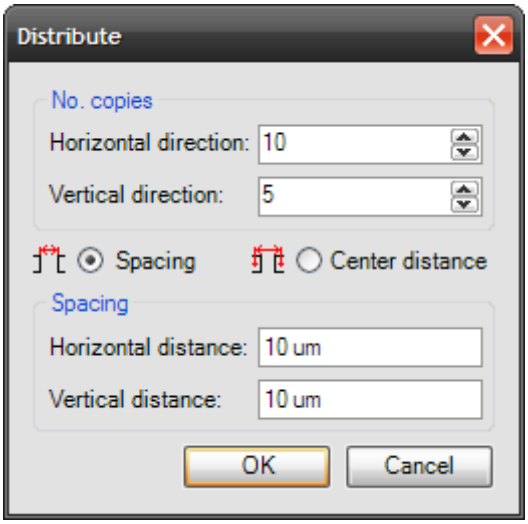

Figure 3-17: Distribute dialog

Distribute function helps user to make copies of selected element placed into rectangular array. Number of copies in horizontal/vertical direction is to be set in distribute dialog. Horizontal/vertical distance between respective copies can be set there as well. User can choose whether the distance is measured as a distance between element centers or as a distance between element bounding box borders.

3.3.1.4 Undo/redo

Figure 3-18: Undo

Figure 3-19: Redo

Undo/redo commands undoes/redoes performed action. Number of undo/redo steps can be set in Settings (*Tools->Settings->Project->History->Length*).

3.3.1.5 Select element

Figure 3-20: Select and edit

Figure 3-21: Select by name

When user wants to move or edit element it has to be selected first. To select element or group of elements by pointing at them by mouse use the select and edit tool.

Actions to be done to select one element:

- Activate **Select and edit tool**
- Move mouse cursor on the element
- Click mouse left button

Other elements can be added to selection. If selection contains more than one element it is considered as a temporary group.

Actions to be done to add element to selection:

- Move mouse cursor on the element to be added to selection
- Press shift key and click mouse left button together

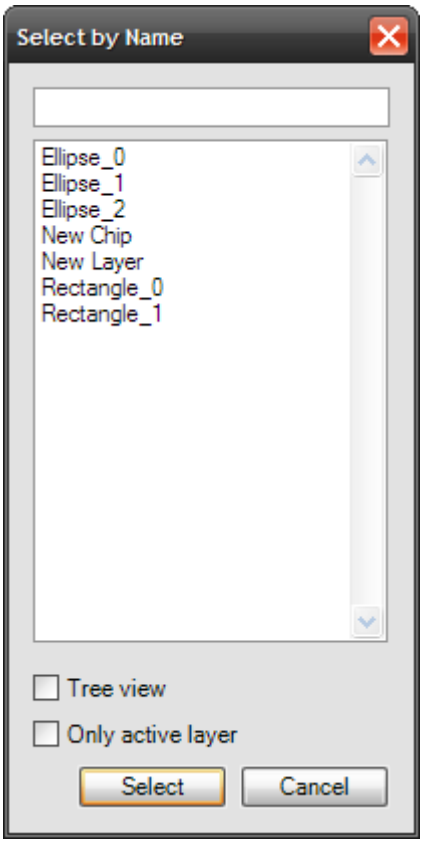

Figure 3-22: Select by name dialog

Another approach to select more elements is to use selection rectangle.

Actions to be done to select group of elements by selection rectangle:

- Activate **Select and edit tool**
- Select selection rectangle start point, hold left mouse button
- Select selection rectangle end point, release mouse button

Another approach to select elements is to use **Select by name** dialog box. Start typing element name into the text box or click on the name in list box. Amount of displayed element names can be restricted to elements on selected layer by checking Only active layer checkbox.

3.3.1.6 Zoom

Figure 3-23: Zoom area

In many cases it is useful to magnify some detail of the design. Zoom ratio can be chosen from predefined values in the zoom combo box. At the same place zoom value can be entered directly.

Another option is to magnify selected rectangular area.

Actions to be done:

- Activate **Zoom area tool**
- Select zoom rectangle start point, hold mouse left button
- Select zoom rectangle end point, release mouse button

3.3.1.7 Move working area

Figure 3-24: Move working area

This function moves working area.

Actions to be done:

- Activate **Move working area** function
- Locate mouse cursor on any position on the workspace
- Hold mouse left button and move the mouse
- When the workspace is on the intended position, release mouse button

3.3.1.8 Take snapshot

Figure 3-25: Take snapshot

Take snapshot command saves current workspace as a picture.

3.3.2 Creation tools

Figure 3-26: Creation tools toolbar

Creation tools toolbar contains functions for creating new elements, combining new elements and rotating them.

3.3.2.1 New element

Figure 3-27: New line

Figure 3-28: New rectangle

Figure 3-29: New ellipse

New element tools add line, rectangle or ellipse to selected layer.

Actions to be done:

- Activate **New element** tool from the toolbar
- Select element start point, hold mouse left button
- Select element end point, release mouse button

3.3.2.2 Boolean operations

Figure 3-30: Weld

Figure 3-31: Trim

Figure 3-32: Intersect

Boolean operation tools combine two objects to new one. Resulting element is of type path.

Actions to be done:

- Select first element
- Activate **Boolean operation** tool from the toolbar
- Select second element

Boolean operations	
Ctrl W	Weld
Ctrl T	Trim
Ctrl I	Intersect

3.3.2.3 Flip

Figure 3-33: Flip horizontally

Figure 3-34: Flip vertically

Flip tools flips the selected object around the element centre horizontally/vertically.

3.3.2.4 Rotate 90°

Figure 3-35: Rotate 90° clockwise

Figure 3-36: Rotate 90° counter-clockwise

Rotate tools rotates the selected object 90° clockwise/counter-clockwise around the element center.

3.3.3 Fast settings

Figure 3-37: Fast settings toolbar

Fast settings toolbar allows user to enter nudge distance and grid distance parameters directly what is faster than entering them in the Settings (*Tools->Settings dialog*).

3.3.3.1 Nudge distance

Figure 3-38: Nudge distance

When element is selected user can move it by pressing cursor keys. The distance object is moved is called nudge distance and can be entered directly using fast setting toolbar.

3.3.3.2 Grid distance

Figure 3-39: Grid distance

Grid distance is the interval between respective horizontal and vertical grid lines.

3.3.4 Align

Figure 3-40: Align toolbar

Align toolbar contains functions to align one element to another.

Actions to be done:

- Select object to be aligned
- Activate **Align** function either from toolbar or by pressing keyboard shortcut
- Select the reference object you are aligning to

Align	
Ctrl Alt L	Align Left
Ctrl Alt R	Align Right
Ctrl Alt T	Align Top
Ctrl Alt B	Align Bottom
Ctrl Alt H	Align Centers Horizontally
Ctrl Alt V	Align Centers Vertically

3.3.5 Helpers

Helpers are tools that helps user with precise element selection and positioning tasks. They can be found in Helpers toolbar.

Figure 3-41: Helpers toolbar

3.3.5.1 Select elements inside selection rectangle only

Figure 3-42: Select elements inside selection rectangle only

Using rectangular selection user can select objects that are intersected by the selection rectangle as well as objects that are inside. While this option is turned on only objects inside rectangular selection are selected.

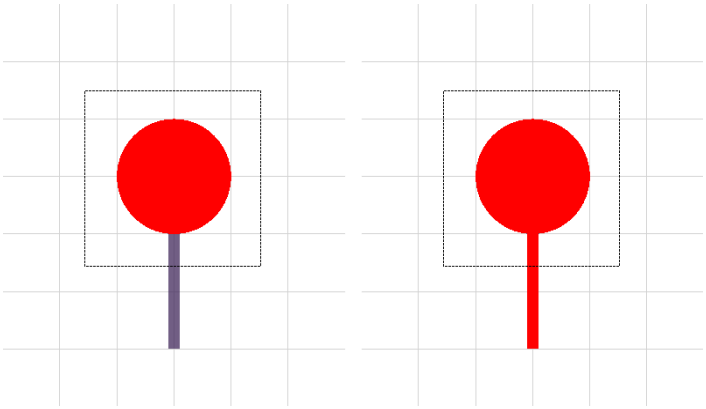

Figure 3-43: Distinction between Select elements inside selection rectangle only turned on (left) and off (right)

3.3.5.2 Rulers

Figure 3-44: Show/hide rulers

Rulers are handy tool that is displayed along the workspace by default. It gives user better feeling about size and distances between elements.

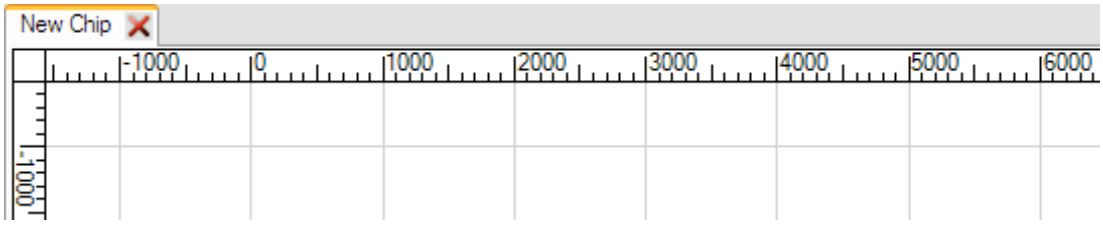

Figure 3-45: Rulers

3.3.5.3 Grid

Figure 3-46: Show/hide grid

Figure 3-47: Snap to grid

Another helper that gives user better feeling about distances is grid. It draws rectangular grid on the workspace. Grid distance can be adjusted by user in the **Fast Settings** toolbar or in the Settings (*Tools->Settings->Project*).

What makes grid useful is function of snapping to grid. Mouse cursor is snapped to grid lines while creating or editing elements thus user can perform these actions precisely. Snapping points of element are at corners and in the centre of the element. These are used during translation.

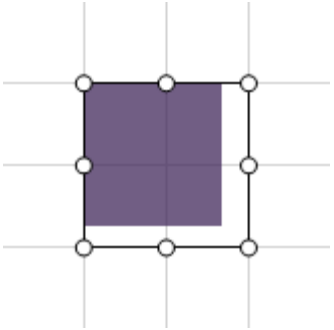

Figure 3-48: Bottom right corner is snapped to grid while resizing the rectangle

3.3.5.4 Guidelines

Figure 3-49: Show/hide guidelines

Figure 3-50: Snap to guidelines

Guidelines are lines that can be placed by user on any position on the workspace. To insert new horizontal or vertical guideline on workspace click mouse right button on horizontal or vertical ruler, move the mouse to appropriate position then release the mouse button.

User can select guideline by right mouse click. Selected guideline is displayed in properties window where precise position can be set as well as orientation and its name.

To delete a guideline right click mouse on it, move back above the ruler and release the mouse button.

Similarly to grid, mouse cursor is snapped to guidelines while creating or editing elements what enables user to perform these actions precisely.

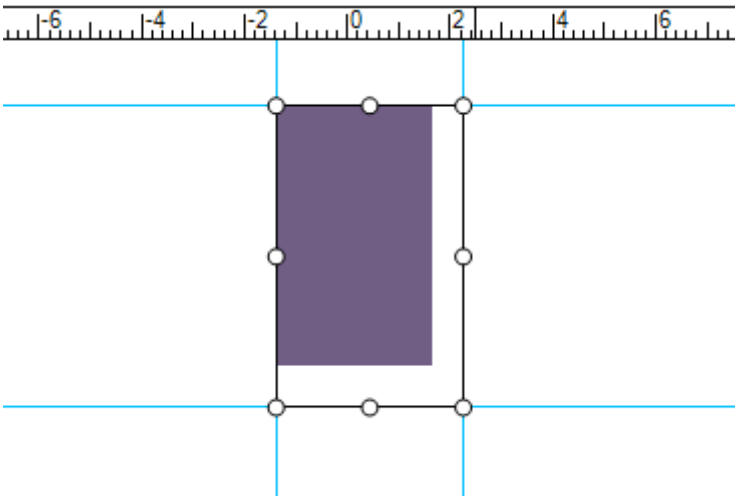

Figure 3-51: Bottom right corner is snapped to guidelines while resizing the rectangle

3.3.5.5 Cross cursor

Figure 3-52: Show/hide cross cursor

Cross cursor is another tool that can help user in certain situations. It draws cursor horizontal and vertical line above the whole workspace.

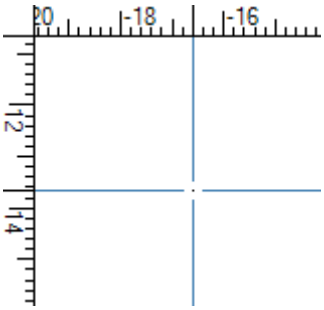

Figure 3-53: Cross cursor

4 Tutorial: First chip design

This tutorial guides user step by step when creating new chip design. Desired chip contains of substrate RPyrex layer and two SU-8_2100 layers.

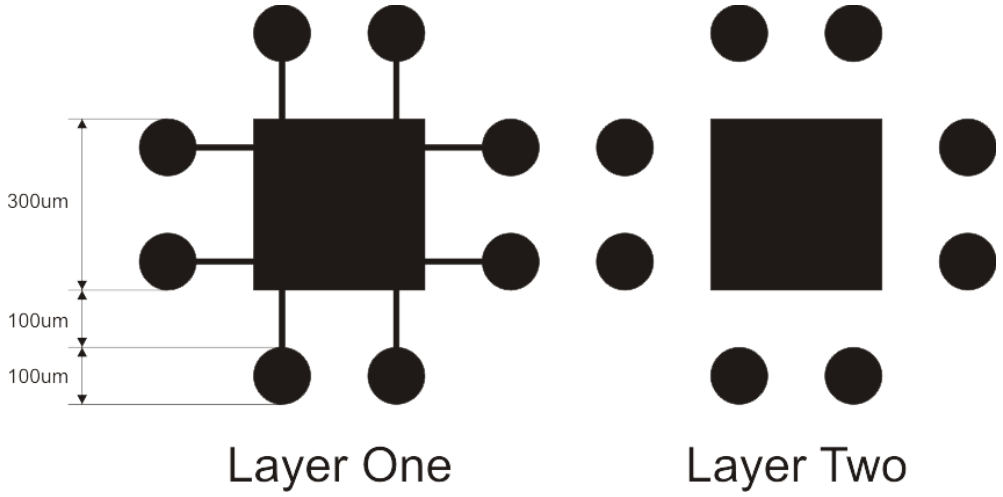

Figure 4-1: Sketch of the chip

Start up with creating New chip design/project. There are three possible ways to do that. First one is New (*File->New*) command in the main menu. Second is keyboard shortcut (*Ctrl N)* and the last one is (*New Project*) button in the **Standard** toolbar.

Figure 4-2: New project

New chip design wizard appears. In the first step enter chip name, in this case My Chip, and select appropriate substrate material, here RPyrex. Finally pres **OK** button to continue.

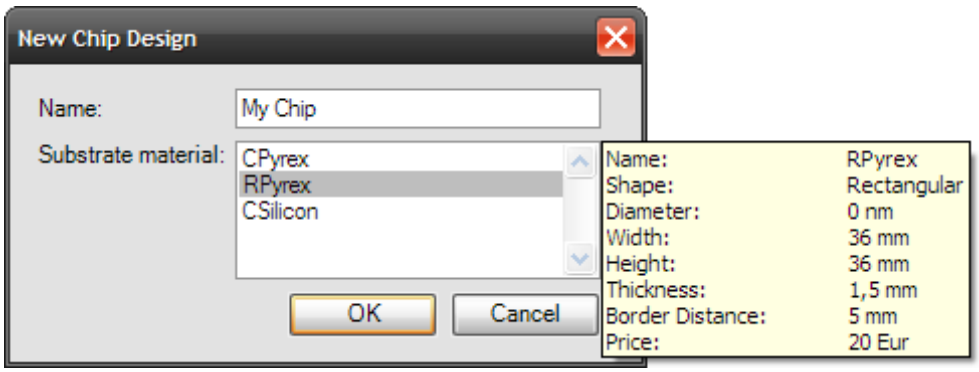

Figure 4-3: New chip design dialog

In the second step parameters of first chip layer are to be entered. Enter first layer name, in this case Layer One. Then select material of the layer, here SU-8_2100, and enter thickness which value must fall in range of Minimum-Maximum thickness defined by selected material, here 100um.

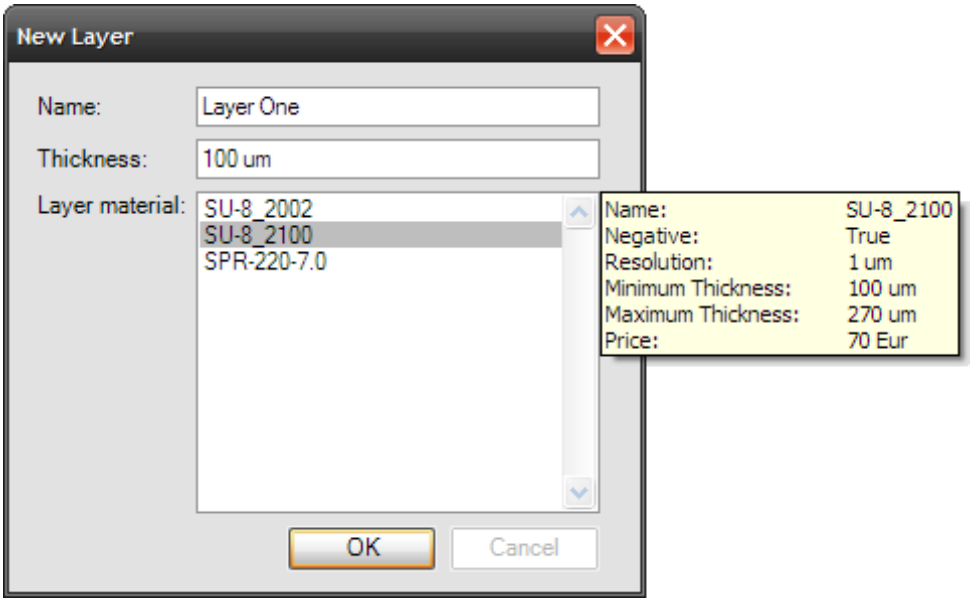

Figure 4-4: New layer dialog

Prepare your workspace. Desired chip design has smallest parts of size 100um thus appropriate grid distances should be 50um. Fastest way to set grid distance is in **Fast Settings** toolbar. Then magnify the workspace using zoom area tool so you can see enough detail while designing the chip. Recommended zoom value is about 150x for chip of the size 700um, however zoom value depends on the size of monitor you are using.

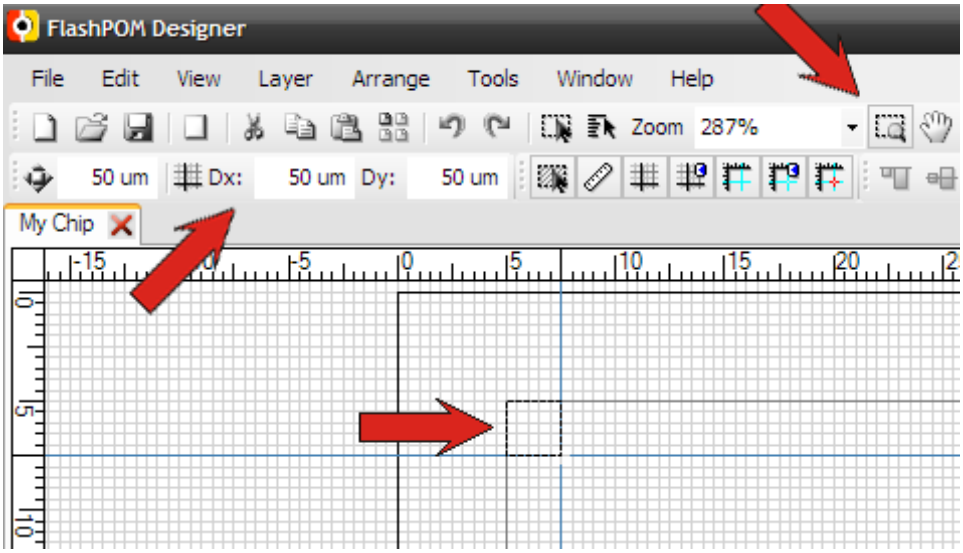

Figure 4-5: Setting the workspace

Finally move the workspace such the top left corner of substrate active border will be in the top left of the workspace.

Figure 4-6: Move working area

Draw rectangle of size 300um x 300um at position 5.2mm; 5.2mm using **New Rectangle** tool.

Figure 4-7: New rectangle

Snap to grid function snaps your mouse cursor that helps you enter the rectangle at proper position of exact size. As well, you can draw rectangle of any size at any position and then enter the proper values at the properties tool window.

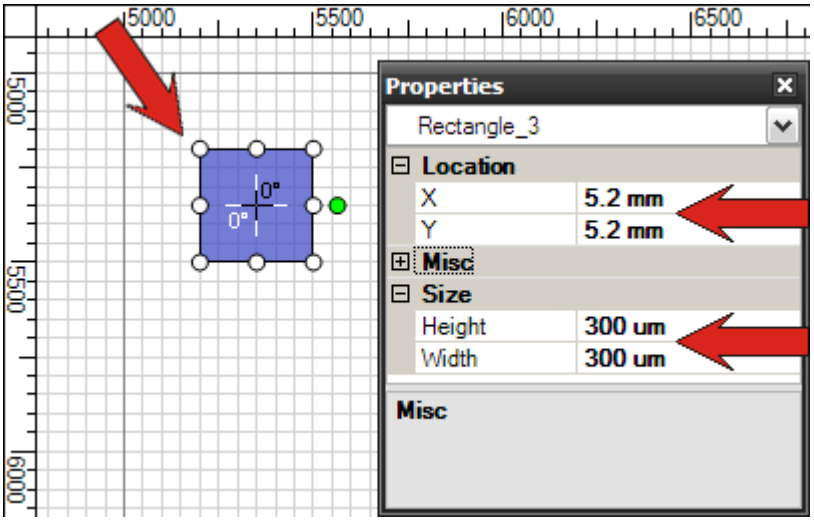

Figure 4-8: Draw rectangle, size: 300um x 300um, location: 5.2mm; 5.2mm

Draw circle with radius 50um at position 5.2mm; 5mm using **New Ellipse** tool.

Figure 4-9: New ellipse

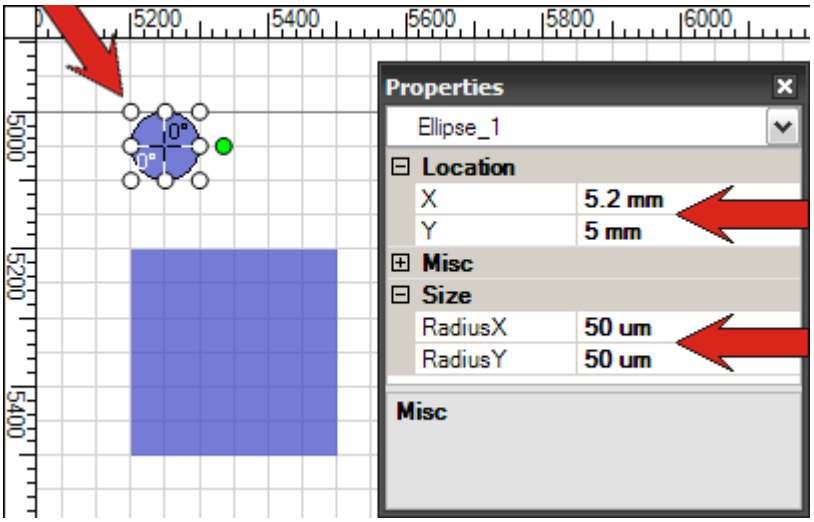

Figure 4-10: Draw ellipse, radius: 50um x 50um, location: 5.2mm; 5.2mm

We want to create path element that will arise from welding the rectangle and ellipse together. Draw rectangle of size 150um x 10um at any position 5.45mm; 5.05mm, using **New Rectangle** tool.

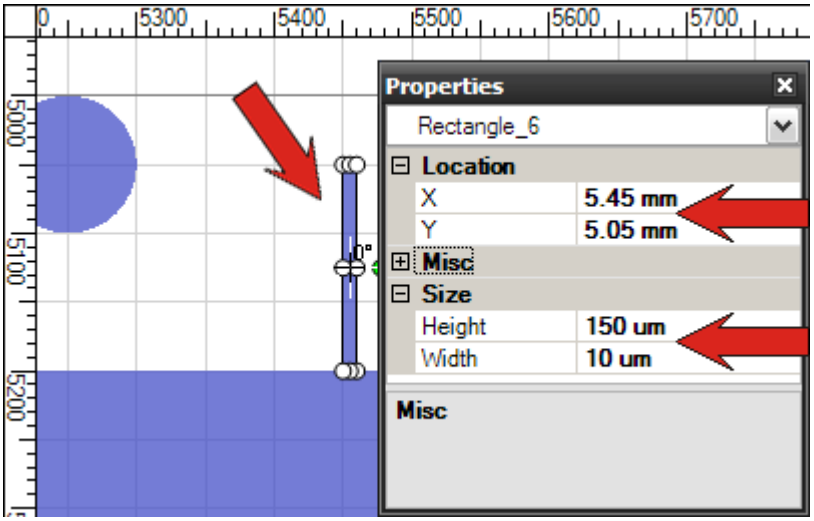

Figure 4-11: Draw rectangle, size: 150um x 10um, location: 5.45mm; 5.05mm

Align rectangle to ellipse such that centers will be vertically aligned. Select the rectangle, activate **Align Centers Vertically** function by button on **Align** toolbar, or press (*Ctrl Alt V*) keyboard shortcut, and select the ellipse.

Figure 4-12: Align centers vertically

When object are aligned weld them together. Select the rectangle then activate **Weld** tool by button on **Creation Tools** toolbar, or press (*Ctrl W*) keyboard shortcut, and select the ellipse.

Figure 4-13: Weld

By welding new element of type path will arise.

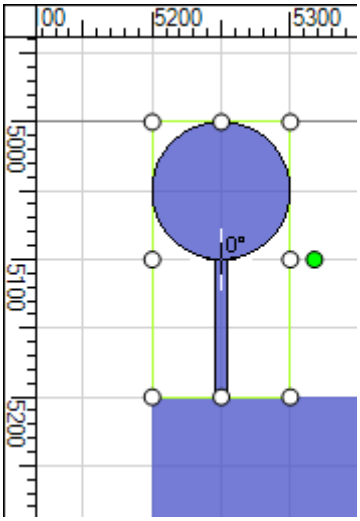

Figure 4-14: Ellipse and rectangle welded together

Copy the path object, keyboard shortcut (*Ctrl C*), and paste it, keyboard shortcut (*Ctrl V*). Move path to position 5.4mm 5mm by mouse, it should snap to grid, or set the location value directly in the properties.

Another possible solution is to select the path and perform **Align Right** function.

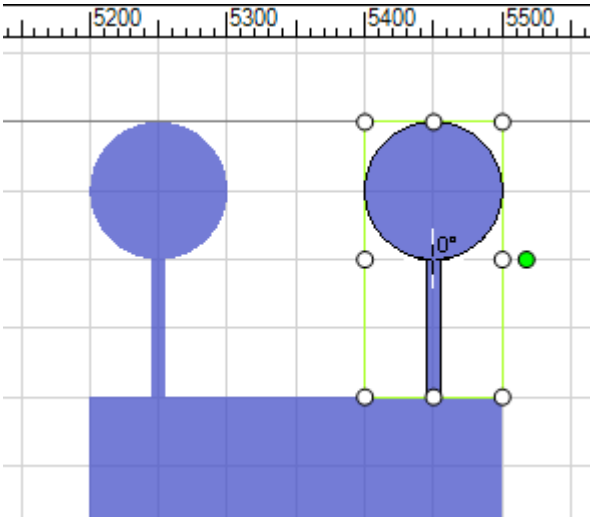

Figure 4-15: Paste path at position: 5.4mm; 5mm

Select both paths, copy them, rotate 180 degrees and move under the main rectangle. Enable **Select and edit** tool from standard toolbar. Now you can select multiple objects by selection rectangle or by clicking each element you want to select with shift key pressed.

Perform copy and paste, (*Ctrl C*) and (*Ctrl V*) keyboard shortcut.

Rotate two pasted object 180 degrees. Rotation of selected elements can be done by left click on green filled glyph and moving the mouse, while Ctrl key is pressed value is added/subtracted in 15 degrees step. As well you can enter rotation value directly in the properties tool window.

Move rotated paths to position 5.2mm; 5.5mm.

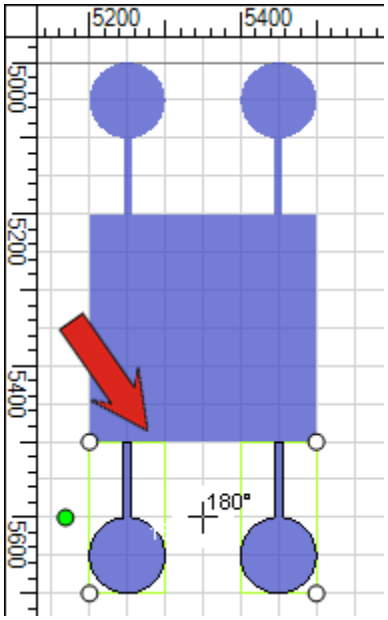

Figure 4-16: Selection pasted, rotated 180 degrees and moved to position 5.2mm; 5.5mm

Select all paths. Perform copy and paste. Rotate selection 90 degrees.

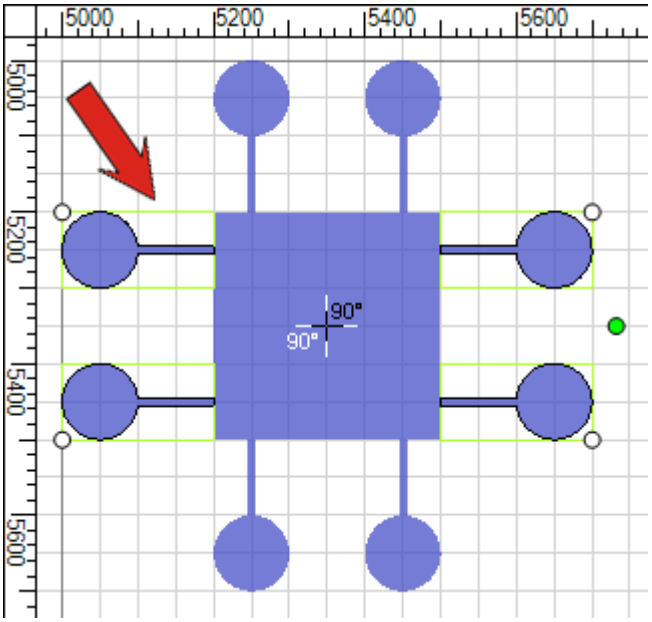

Figure 4-17: Paths copy pasted and rotated 90 degrees

For all paths select main rectangle, activate **Weld** tool, and select the path. This way you will get all elements welded together to one element of type path.

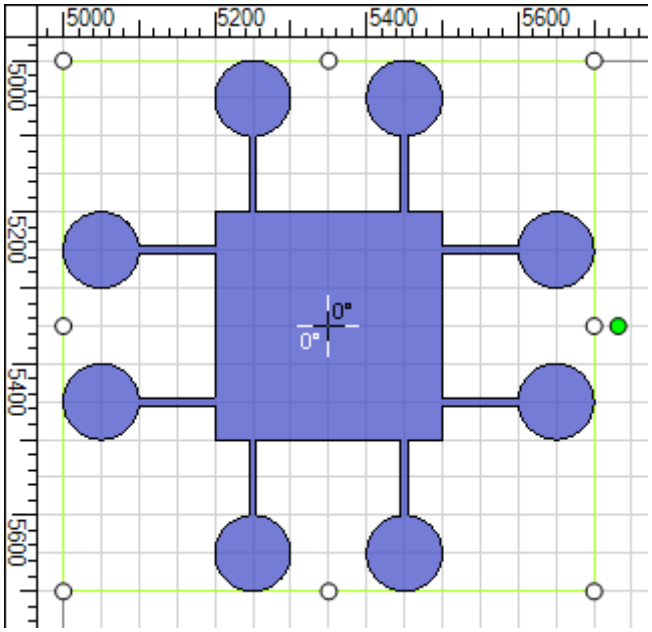

Figure 4-18: Weld all elements together

Add layer two by pressing **New Layer** button on **Standard** toolbar, on **Layers** tool window or by command (*Layer->Add*) in the Main menu. New layer dialog appears. Enter the name Layer Two and thickness and material the same as for Layer One.

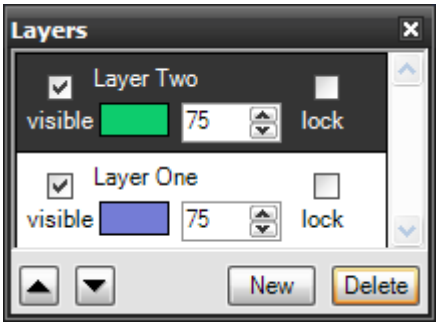

Figure 4-19: Layers tool window

In **Layers** tool window current chip layers are displayed. By left mouse click you can select active layer, the one where elements can be created and edited.

Finally draw rectangle of size 300um x 300um at position 5.2mm; 5.2mm and four ellipses of radius 50um at positions: 5.2mm; 5mm, 5.4mm; 5mm, 5mm; 5.2mm, 5.6mm; 5.2mm, 5mm; 5.4mm, 5.6mm; 5.4mm, 5.2mm; 5.6mm, 5.4mm; 5.6mm.

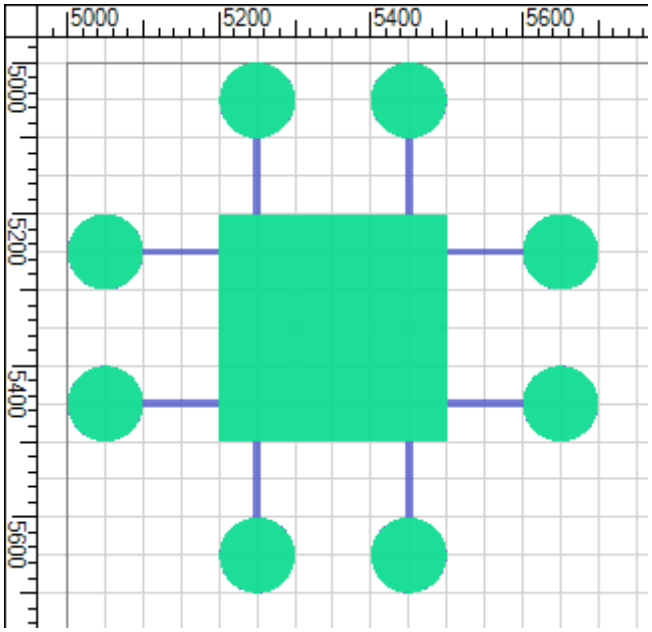

Figure 4-20: Finished chip

Finished device can be saved by (*File->Save*) command in Main menu, keyboard shortcut (*Ctrl S*) or exported to FPSVG file for manufacturing by (*File->Export to FPSVG*) command in Main menu.

But maybe it is better to check whether designed chip does not contain any errors using **Check Constraints** function or to see what we designed using **3D View** or **Cut View** visualization.

5 Program tools/functions

5.1 Edit element

Selected element can be moved, resized or rotated. These element edit tasks can be performed by mouse or user can select exact values for respective transforms in the properties tool window.

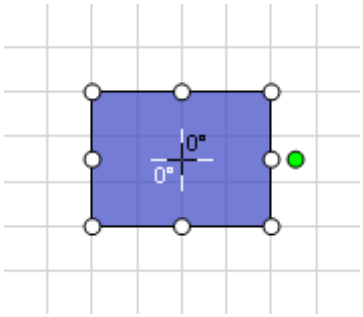

Figure 5-1: Selected element

To move element hold left mouse key and move the mouse. If you want to move element in horizontal or vertical direction only, hold Ctrl key. Resize the element by holding left mouse button on one of the white filled ellipse glyphs and move the mouse. If Ctrl key is pressed size of the element is changed proportionally. Hold left mouse button on the green filled ellipse glyph to rotate the object. Holding Ctrl key means rotation angle change in 15 degrees steps.

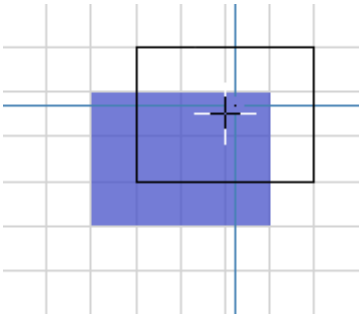

Figure 5-2: Move

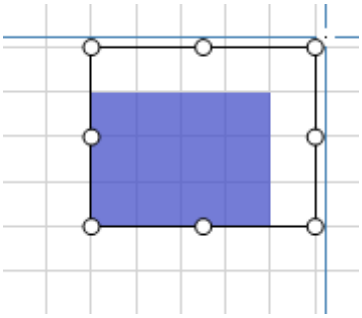

Figure 5-3: Resize

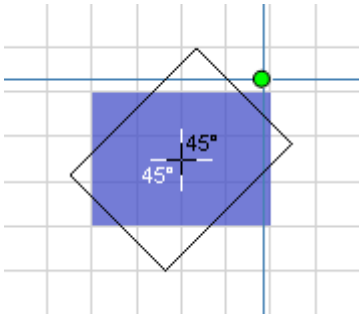

Figure 5-4: Transform

5.2 Cut view

Cut view is a visualization function that gives user better feeling about how layers are stacked on each other. When Cut View window is enabled in menu (*Tools->Cut View*) or by keyboard shortcut (*Ctrl Shift C*) cutline appears on the workspace area. By **Select and edit** tool cutline can be selected and moved. In the **Properties** tool window exact position can be entered and orientation selected. Cut view window dynamically reacts to cut line position change and shows cut thorough the layers of the chip.

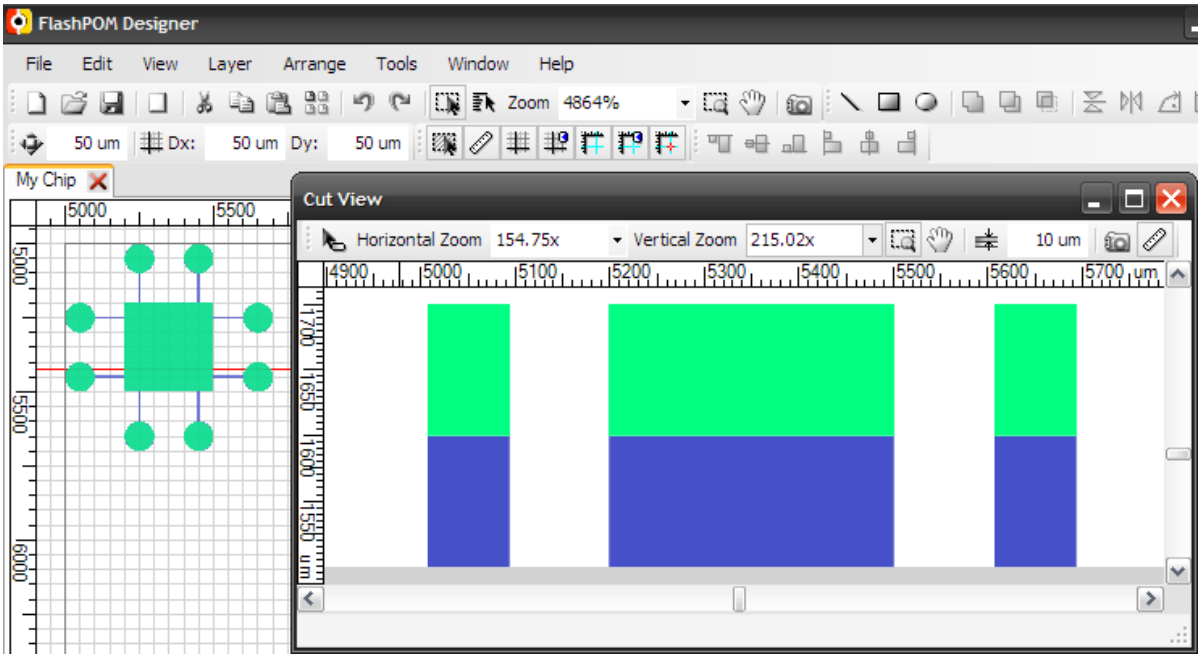

Figure 5-5: Cut View window

Cut View provides following tools:

	Show Details	When turned on in attached tooltip shows information about element under mouse cursor.
Horizontal Zoom 100%	Horizontal Zoom	Zoom in horizontal direction.
Vertical Zoom 100%	Vertical Zoom	Zoom in vertical direction.
	Zoom Area	Magnify selected rectangular area.
	Move Working Area	Moves working area.
	Constant Layer Thickness	Sets thickness of all layers to entered one.
	Take Snapshot	Takes snapshot of current working area.
	Show/Hide Rulers	Shows or hides rulers.

5.3 3D View

3D View is a visualization function that offers three-dimensional view on designed chip. Visualization can be started from menu (*Tools->3D View*) or by keyboard shortcut (*Ctrl Shift 3*). On startup, dialog that informs that you need to have most recent Direct3D library with Managed extensions installed appears. You can also opt if all chip layers should have the same thickness a select whether you want to show this dialog again.

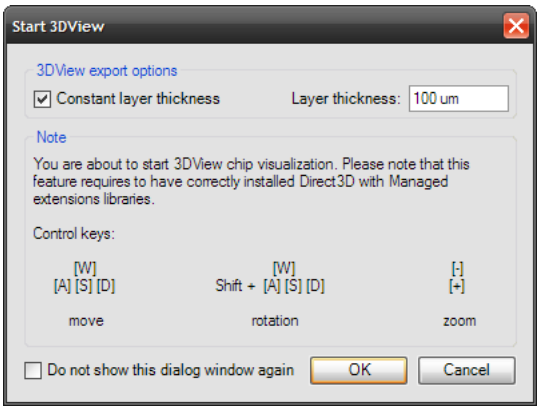

Figure 5-6: 3D View start up dialog

When you confirm the dialog window **3D View** visualization starts. This can take some time for more complex designs.

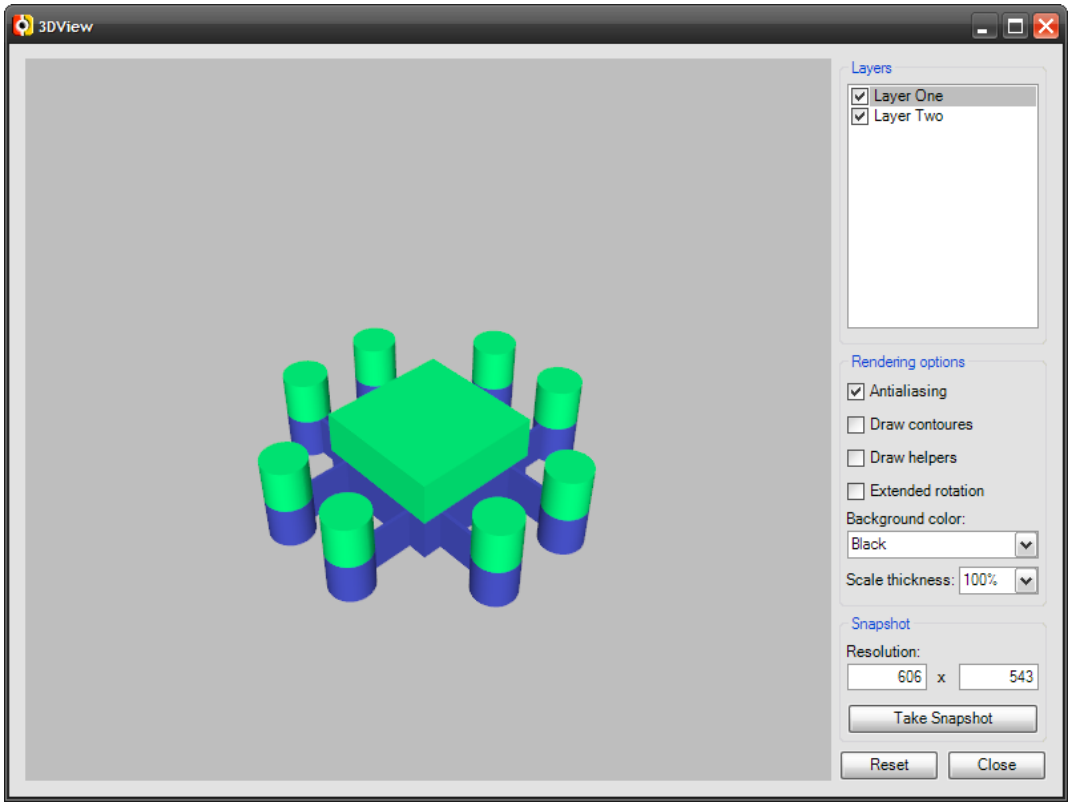

Figure 5-7: 3D View window

On the right side bar user is encouraged to select which layer should be visualized, can customize rendering options and take snapshot and save it to the file.

View control:

Hold left mouse button + mouse move	Rotate
Hold right mouse button + mouse move	Move
Mouse Wheel	Zoom

Move	
W	Move Up
S	Move Down
A	Move Left
D	Move Right

Rotate	
Shift W	Rotate Up
Shift S	Rotate Down
Shift A	Rotate Left
Shift D	Rotate Right

Zoom	
+	Zoom In
-	Zoom Out

5.4 Check constraints

Check constraints function helps user to identify cases that should cause problems during chip manufacture. Tool can be started from menu (*Tools->Check constraints*). Following situations can be tested.

5.4.1 Layer compatibility

Checks whether only layers made of compatible materials are stacked on each other.

5.4.2 Element is placed out of layer boundary

Test whether elements are placed inside active substrate/layer boundary. These elements will not be manufactured.

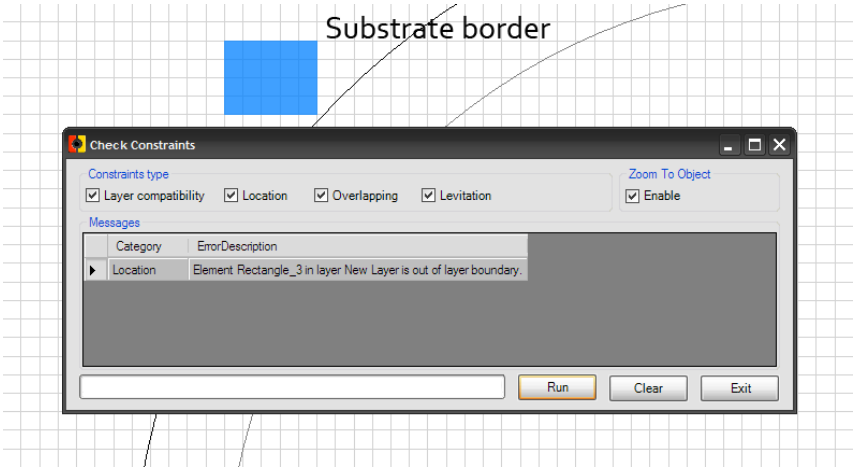

Figure 5-8: Element out of layer boundary

5.4.3 Element overlaps layer boundary

Test whether elements are lay on active substrate/layer boundary. Only part of these elements should be manufactured.

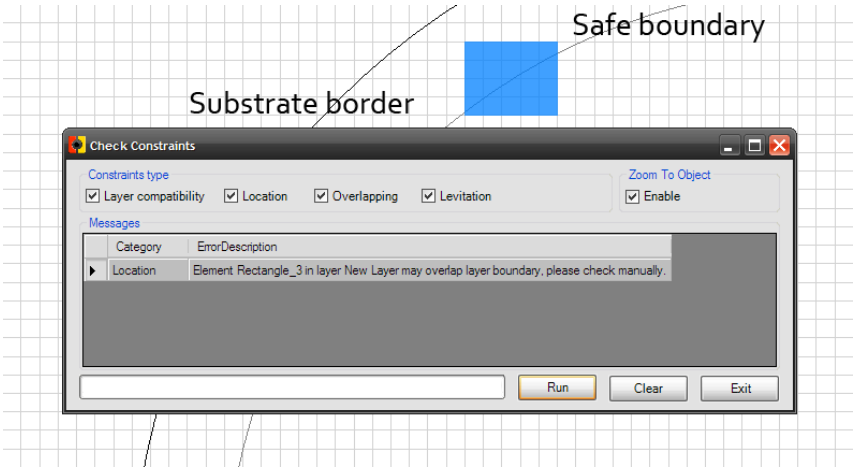

Figure 5-9: Element overlaps layer boundary

5.4.4 Elements are overlapping within one layer

Check whether two elements are overlapping within one layer. This should prevent laser device to shot one place more times in manufacturing process.

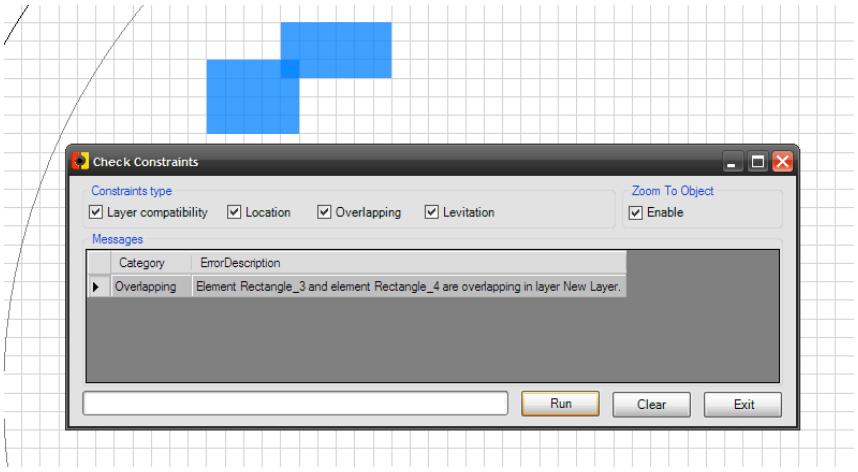

Figure 5-10: Elements are overlapping within one layer

5.4.5 Element in upper layer is without support in lower layer

Test whether element in upper layer has support in lower layer. If not such an element wil most probably flow away.

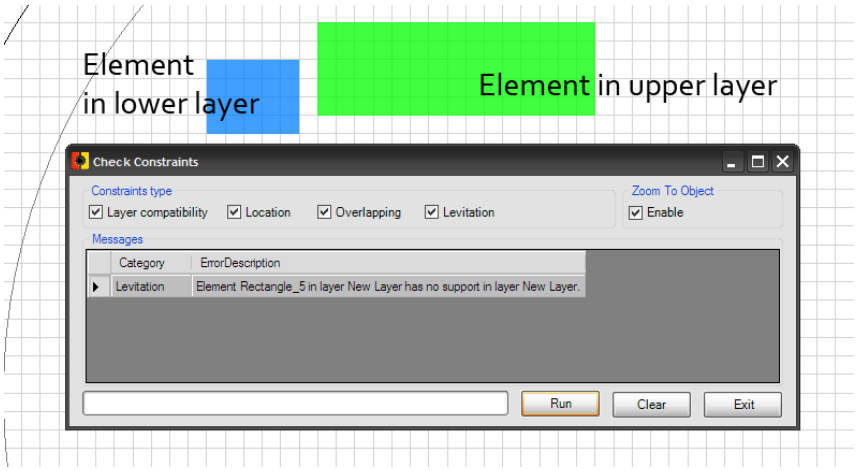

Figure 5-11: Element in lower layer is without support in lower layer

5.4.6 Element in upper layer has only particular support in lower layer

This warning means that layer in upper layer has only particular support in lower layer. This should catch user attention.

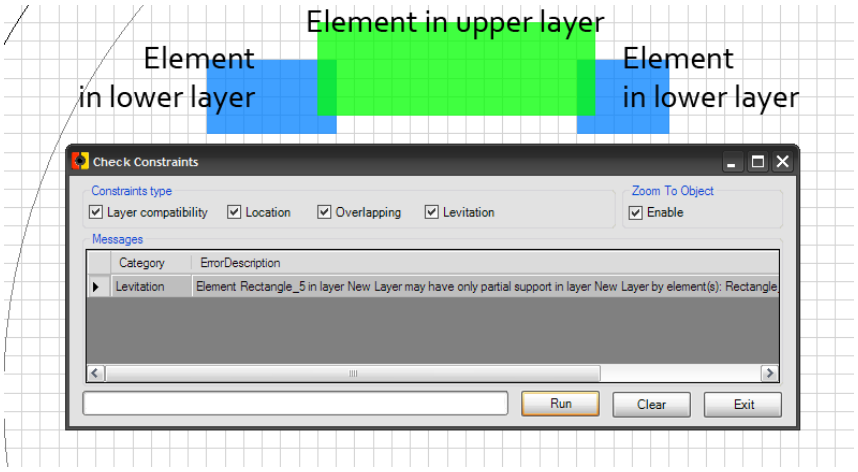

Figure 5-12: Element in lower layer has only particular support in upper layer

5.5 Settings

Settings tool window can be opened by (*Tools-Settings*) command from Main menu. It provides possibility to change settings that are unique to project and saved together with chip design as well as settings that are global for the application.

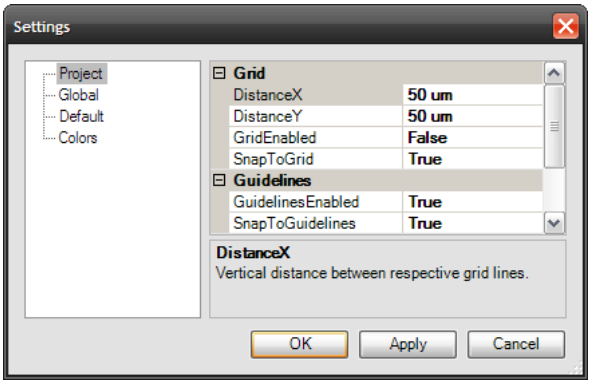

Figure 5-13: Settings dialog

5.6 Estimate Chip cost

Estimate chip cost function computes chip manufacturing price for designed chip. Tool can be started by (*Tools->Estimate Chip Cost*) command from Main menu.

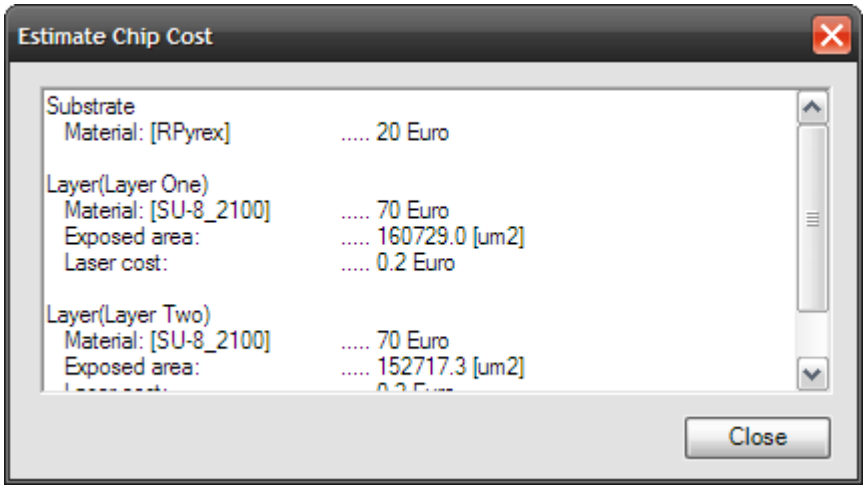

Figure 5-14: Estimate chip cost

Equations for computing cost of the chip are the following:

$$chipprice = substrateprice + \sum_{layers} layerprice + \sum_{layers} unitsurfaceprice * elementssurface$$

Figure 5-15: Equation for cheap price with negative layers

$$chipprice = substrateprice + \sum_{layers} layerprice + \sum_{layers} wholesurfaceprice - (unitsurfaceprice * elementssurface)$$

Figure 5-16: Equation for chip price with positive layers.

5.7 Update

(*Tools->Update Production Settings File*) and (*Tools->Update the FlashPOM*) editor are tools that checks whether new version of the production settings file or application is available.

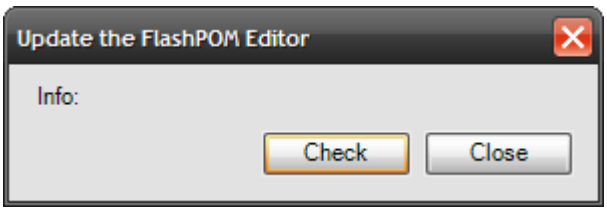

Figure 5-17: Update the application

5.8 Print

Print dialog can be invoked by (*File->Print*) command in Main menu or by (*Ctrl P*) keyboard shortcut. It provides settings for appearance of pages to be printed. User can select margins of the page, zoom of the chip, whether only one chip layer should be printed on one page and opt to print layer info.

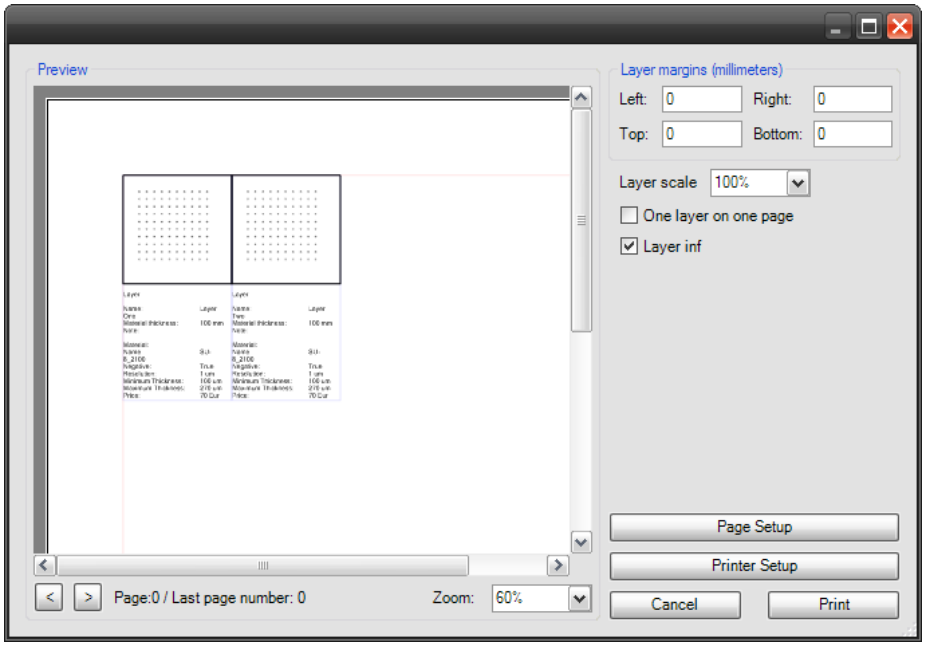

Figure 5-18: Print dialog

It is also possible to invoke standard Windows dialogs to choose he printer and select paper size.

6 Appendix

6.1 Keyboard Shortcuts

File	
Ctrl N	New
Ctrl O	Open
Ctrl S	Save
Ctrl Shift S	Save As
Ctrl Q	Close
Ctrl P	Print
Alt F4	Exit

Edit	
Ctrl Z	Undo
Ctrl Y	Redo
Ctrl X	Cut
Ctrl C	Copy
Ctrl V	Paste
Del	Delete

View	
Ctrl +	Zoom In
Ctrl -	Zoom Out
Ctrl *	Fit to Substrate

Arrange	
Ctrl G	Group
Ctrl U	Ungroup
Ctrl W	Weld
Ctrl T	Trim
Ctrl I	Intersect

Align	
Ctrl Alt L	Align Left
Ctrl Alt R	Align Right
Ctrl Alt T	Align Top
Ctrl Alt B	Align Bottom
Ctrl Alt H	Align Centers Horizontally
Ctrl Alt V	Align Centers Vertically

Tools	
Ctrl Shift C	Cut View
Ctrl Shift 3	3D View

Window	
Ctrl Shift B	Library
Ctrl Shift L	Layers
Ctrl Shift P	Properties

New Element		
Ctrl	Rectangle	Proportional size (Square)
	Ellipse	Proportional size (Circle)

Edit Element		
Ctrl	Rotation	Step 15 degrees
	Size	Proportional size change
	Move	Move in vertical or horizontal direction only

6.2 Files Location

6.2.1 Program Files

Program files location is selected by user during installation process. By default it is:

c:\Progam Files\FlashPOM Designer

6.2.2 FlashPOM Designer Settings

The **FlashPOM.exe.config** file that contains default program settings is located in the same folder as program files.

Settings modified by user are stored in:

C:\Documents and Settings\[user name]\Local Settings \ApplicationData\UWB\FlashPOM.exe_Url_[id]\[version]\user.config

6.2.3 Production Settings File

The ProductionSettings.xml file that contains information about laser device capabilities and available materials is stored in the isolated storage at:

C:\Documents and Settings\All Users\Application Data\Isolated Storage\[id]\Url.[id]\AssemFiles

This file can be updated over the internet directly from the application.

6.2.4 Library files

Library files are stored in:

C:\Documents and Settings\All Users\Application Data\FlashPOM\Library