

Customer Information

Name
Company
SNL Project Code **Set up an account with the SNL for this code – All orders must have this**
Email Address

Order Date **When the order is actually submitted**
Order Due Date **When you would like to receive the order – ASAP is not a date**
Typical turnaround time is ~1 week for the first levels of your design.

Mask Information

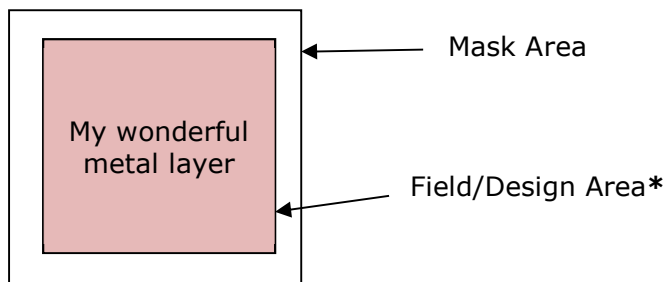
Design File Name (.gds)	Name of the .gds file you are submitting		
Number of Mask Levels to be Written	How many levels are being ordered		
Cell Layout Size	X: um	Y: um	The size of your overall design in um, X and Y
Name of Cell in Design File to be used	What is the name of the structure/top level cell that your design is in. This is typically chosen when the gds is exported.		

Mask Type Needed – Choose either Contact, GCA or ASML Stepper Mask – defaults are listed – changes to the defaults should be listed on the next page per mask			
			Defaults
<input type="checkbox"/> Contact Aligner		Scale:	1X
• Max field size – 105mm x 105mm		Mask Size:	5" x 5" x 0.09" Soda Lime
		Orientation:	Mirror Y Axis
<input type="checkbox"/> GCA Stepper		Scale:	5X
• Max field size – 20mm x 20mm		Mask Size:	5" x 5" x 0.09" Soda Lime
		Orientation:	Mirror Y Axis
		Rotation:	270 deg
<input type="checkbox"/> ASML Stepper		Scale:	5X
• Max field size – 22mm x 22mm		Mask Size:	6" x 6" x 0.12" Quartz
		Orientation:	Mirror Y Axis

Single Field Array Plate	– see discussion on following pages		
	<input type="checkbox"/> Array with	columns (x) and	rows (y) How many rows and columns in your array
Array element size	X: um	Y: um	
If multiple design files are to be incorporated into your array – please specify the array layout separately			
Multiple Field Array Plate	<input type="checkbox"/> Yes – see discussion on following pages		
Numbers of Levels on Plate			
Please specify which levels are to be grouped together on which plate on the Details Sheet			

Arrays

Most of the time, a design is submitted and written one level to a plate. Any repetition in the design is incorporated in that design by the user.

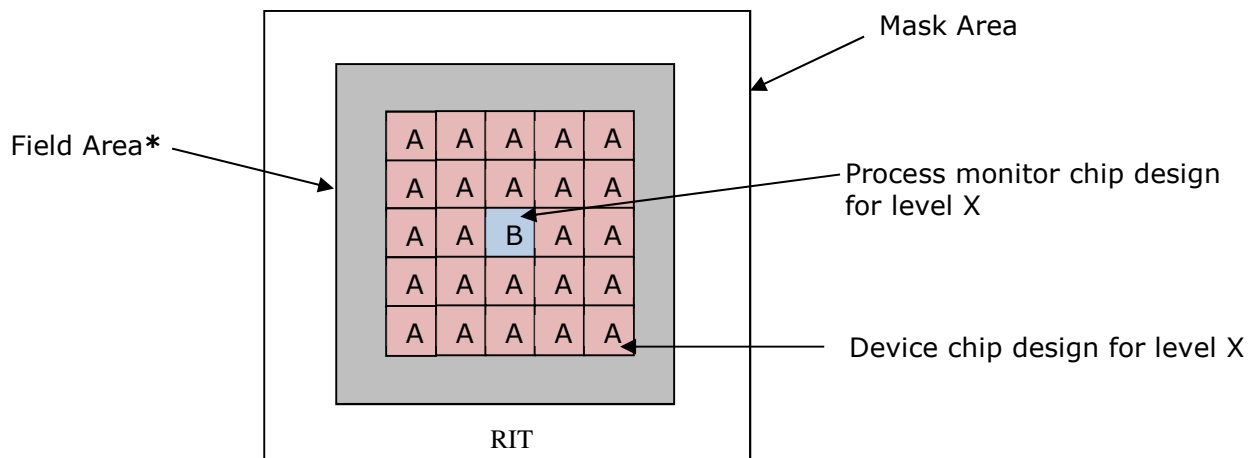


The Heidelberg is capable of writing blocks of information (design files) at various x,y locations on the mask. It is possible to put an array of designs on your mask. There are two types of arrays – single field arrays and multiple field arrays. They are used for different purposes

Single Field Array

A single field means that the mask will be used to expose one level of your design. This mask typically has one design arrayed into rows and columns. Your designs will be butted together unless otherwise specified.

Example – A single field (one level) mask with multiple designs in a five by five array with design A and design B at the center.



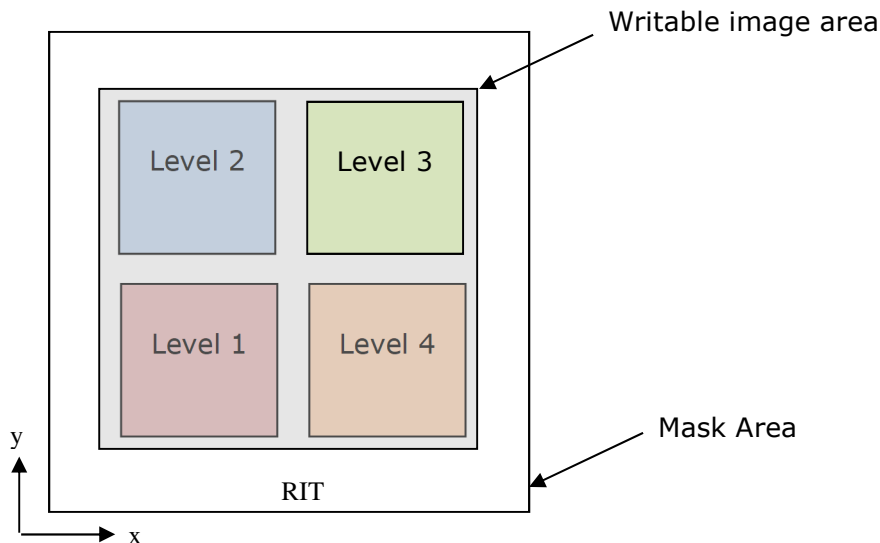
*The total array size can't exceed the following field sizes

- Contact aligner - roughly 105,000um by 105,000um anything over this starts to run into mask labels
- GCA Stepper – 20,000um by 20,000um – at the design level
- ASML Stepper – 27,400um by 22,000um – at the design level

Remember – Create your design at the 1x level – just as it will be written on the wafer. The SMFL will take care of the 5x scaling for the ASML and GCA steppers

Multiple Field Array – ASML

A multiple field mask is one where several (typically 3 to 4) levels of your design are written onto a single plate. This has the advantage of reducing the number (and expense) of masks. It does mean that your stepper job becomes slightly more complicated as you now need to incorporate blading into your stepper job to mask off the fields you are not exposing. In addition, the maximum field size is reduced as detailed below.



6" ASML Mask

- Mask size is 152,000um x 152,000um
- Writable image area is 110,000um by 110,000um
 - Each level can be 52,000 by 52,000 written at 5x which translates to a maximum 10,400um by 10,400um design for each level.

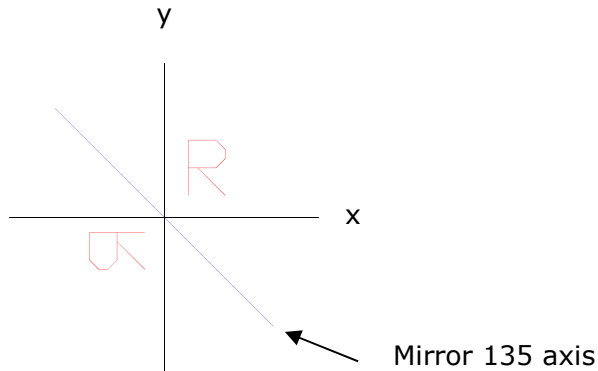
Location of levels in Multiple Field Array Mask (x,y)um. Center of plate is (0,0).

Mask Size	Level 1 Center	Level 2 Center	Level 3 Center	Level 4 Center
6"	-27,500 / -27,500	-27,500 / 27,500	27,500 / 27,500	27,500 / -27,500

Orientation/Rotation

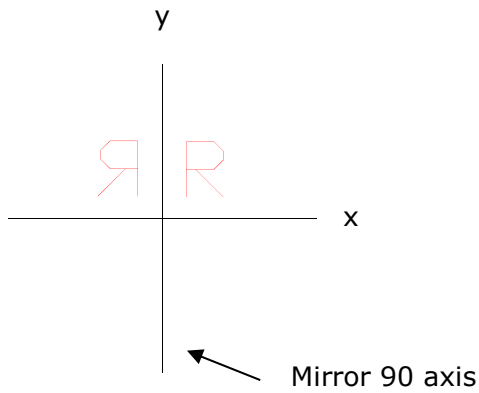
Mirror Y axis and 270 Rotation

- Standard for GCA 5x reduction stepper
- Design is mirrored so writing on mask reads correctly when printed



Mirror 90

- Standard for 1x contact aligners and the ASML 5x Stepper.
- Mirror is so writing on mask reads correctly when printed



No mirror

- Typically used for alignment for backside layers

Field Type or Mask Tone

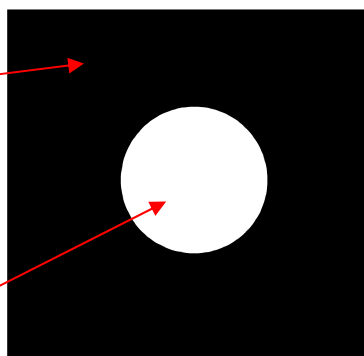
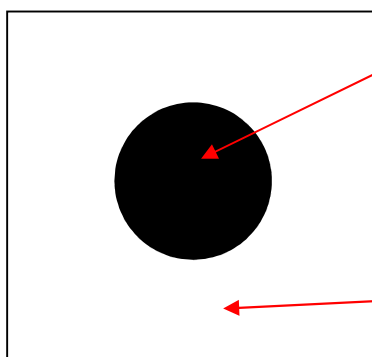
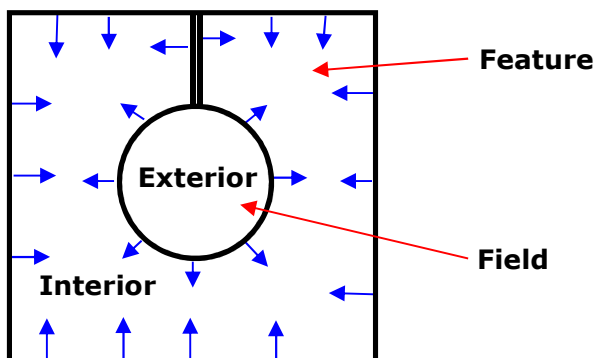
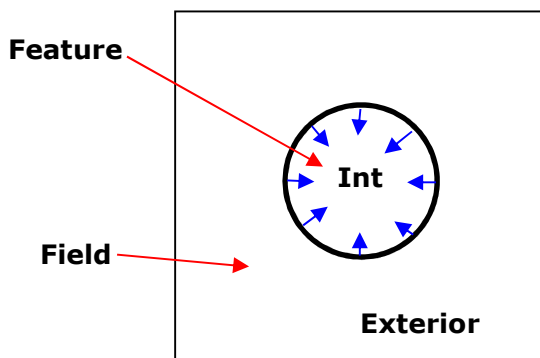
Masks are defined by two field types, clear and dark. On the mask there are defined features. Outside the feature is the field. Some define clear and dark field as how much chrome is left on the mask – this is the wrong way to think about it.

When defining features in your layout software program, a normal vector is assigned to the feature that defines the closed, interior portion of the feature as shown below. The interior portion is the feature; the exterior portion is the field. Remember, you are drawing the features.

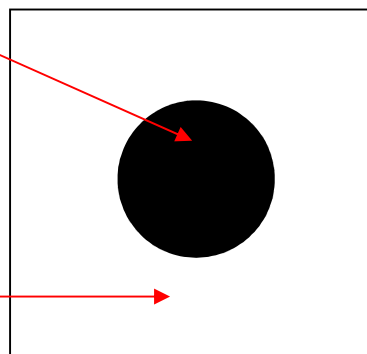
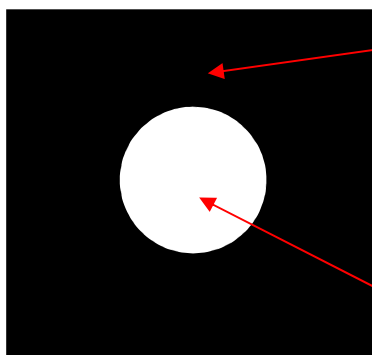
In this example, a circular feature is defined two ways.

Feature is a circle – most commonly used method

Feature is the outer area with a hole – not as common, generally harder to draw.



These are both **clear field masks**. The feature is defined as being chrome, the field as no chrome



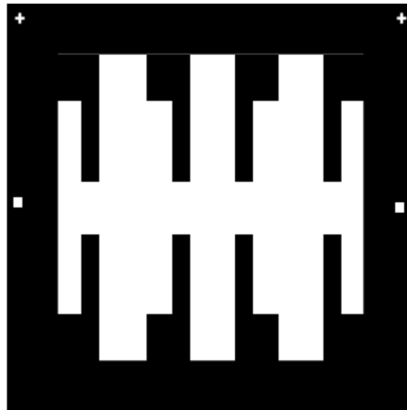
These are both **dark field masks**. The feature is defined as being no chrome, the field is chrome

Corner Boxes

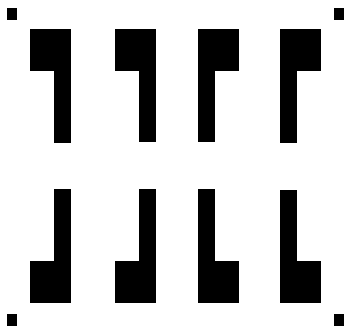
Each layer is automatically centered when converting gds files on the Heidelberg. When layers are not symmetrical, the software may center them differently, leading to misalignment on the stepper. Corner boxes are used to define the borders of each layer and ensure alignment between layers on the stepper. Additionally they can help prevent chrome features on a mask from merging with the chrome border. Corner boxes should be included on all layers, in exactly the same spots, and do not need to be very large.



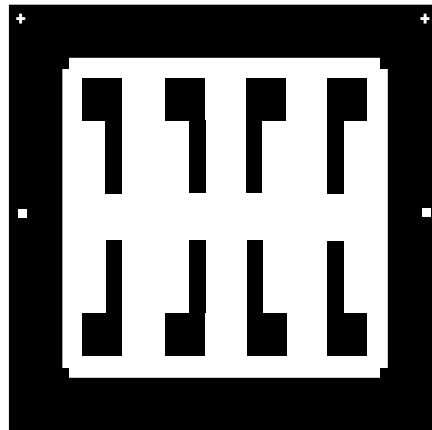
GDS design with no corner boxes.



Final mask with shorting to edge chrome.



GDS design with corner boxes.



Final mask with no shorting.

Minimum Feature Size

The Heidelberg uses either a 4mm write head with 0.8um resolution or a 20mm write head with 4um resolution. Stepper reticles are written at 5x actual size. Your smallest feature size will determine which write head is used. Remember – Create your design at the 1x level – just as it will be written on the wafer. The SMFL will take care of the 5x scaling for the ASML and GCA steppers.

	4mm Write Head	20mm Write Head
ASML Stepper	<0.35um resolution	0.8um resolution
GCA Stepper	<1um resolution	<1um resolution
Contact Aligner	<1um resolution	4um resolution