

# Submit a file for photomask fabrication

**i** At this time the only supported file format for photomask fabrication is GDSII. Before you can submit a GDSII file for fabrication, ensure that you have been [authorized to submit photomasks for fabrication](#) under your desired project. You may also want to refer to the [photomask fabrication & shipping policies](#).

## Step-by-step guide

1. Login to [LMACS](#).
2. Click **Photomasks** from the main menu bar.

**!** If the warning "You do not have any available projects with Mask Authorization" is displayed, contact your group or project manager to [authorize you to submit photomasks](#).

3. Enter the appropriate information in the **Mask Details** section (project, name of cell to be printed, GDSII file, mask type, lens type, etc.).
  - Additional information can be found by expanding the grey info boxes at the right side of the screen (General Instructions, Project, GDSII File, ...), and in the [Photomask submission parameters](#) section below.
4. Enter the information for the layer(s) to be printed in the **Layer Information > Layer [N] Details** section.
  - Of particular importance is the polarity (inverted/non-inverted) and orientation (RRCU /RRCD).
  - You can add additional layers to be printed (each layer represents a physical mask) by pressing the **Add Layer** button and entering the corresponding data for that layer.
5. When finished, click **Submit Request**. You will receive a confirmation email.
6. Wait for notification that your mask is complete and ready for pick-up / shipping.

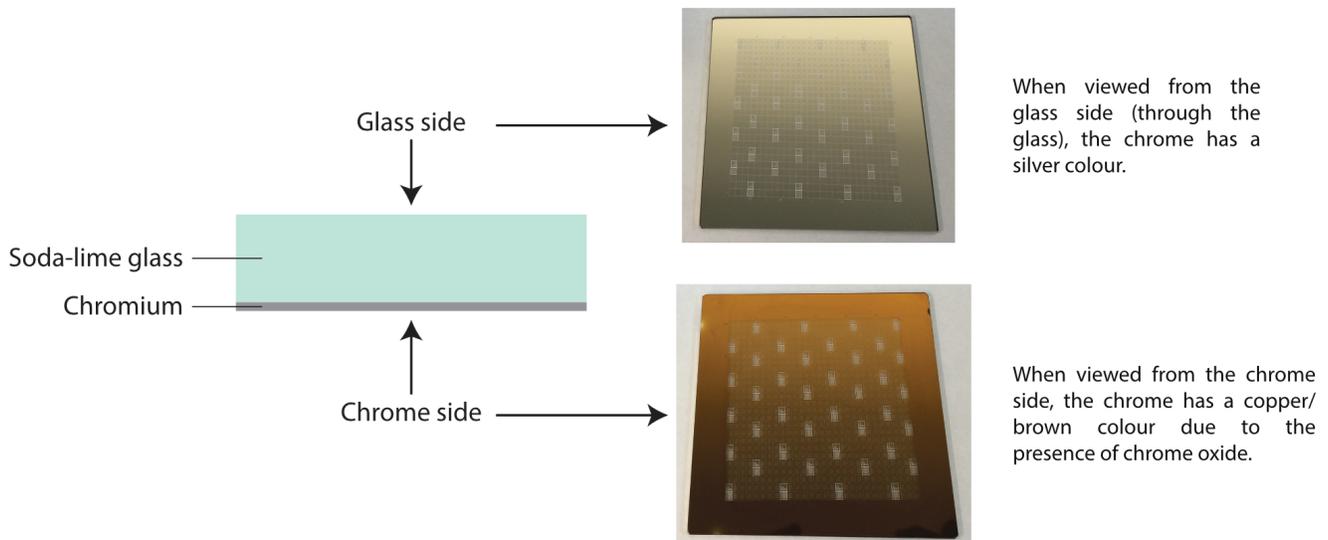
## **!** Files larger than 50 MB

If your GDSII file is larger than 50 MB, [follow these instructions](#).

**!** You can monitor the status of the fabrication online (Photomasks Queue) and you will also receive email notifications as your mask moves through the process (Submitted Compiled Exposing Exposed Done). Please note that a status of "Exposed" only means that the exposure step has been completed: developing, Cr etching, and resist stripping steps still remain. The mask is not ready for pick-up /shipping until its status is "Done".

## Photomask submission parameters

Please refer to the following explanation of photomask geometry and the effect of each of the submission parameters in the LMACS photomask submission form.



## Mask Details

Information in this section refers to the overall mask (or maskset) being fabricated.

### Select Project

Select the LMACS project that this mask will be charged to. If the warning "You do not have any available projects with Mask Authorization" is displayed, contact your group or project manager to [authorize you to submit photomasks](#).

### Cell Name

The name of the GDSII cell/structure to be printed on the photomask; this is typically the highest-level cell in your design hierarchy. Only a single cell is printed per photomask.

### GDSII File

Your design file in GDSII format (50 MB max)—this is the only file format we accept. Your GDSII file should include all the layers you wish to fabricate for a given maskset. The filename has a 20-character limit, and must not include any spaces or any of the following characters:

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!@#%&^*( )<>":;?/'~{}|+=-.,[]
```

### Mask Type

Select the type of mask you wish to fabricate. We currently offer two mask types:

- 5" x 5" x 0.090" soda-lime glass with ~100 nm Cr, suitable for patterning on 100 mm / 4" substrates
- 7" x 7" x 0.090" soda-lime glass with ~100 nm Cr, suitable for patterning on 150 mm / 6" substrates

### Lens Type

Select the writehead lens type used to expose your pattern in the maskwriter. There are two options:

- 10 mm - This is the standard lens and is suitable for all masks with a CD of 2  $\mu$ m or greater.
- 4 mm - This lens should only be used for masks with a CD less than 2  $\mu$ m. It results in an increased write time and is billed at factor of 2.05x of a standard mask.
  - **N.B.** There is no benefit to using the 4 mm lens for masks with CD 2  $\mu$ m.

### Comments

Additional comments may be added in this text field, for information you wish to bring to the attention of nanoFAB staff.

## Layer Information

The information in this section can vary from layer to layer: each layer represents one physical mask. To submit multiple layers (i.e., to print multiple masks in a maskset) from the same GDSII file, use the **Add Layer** button and fill out the information for each additional layer.

### GDSII Layer Number

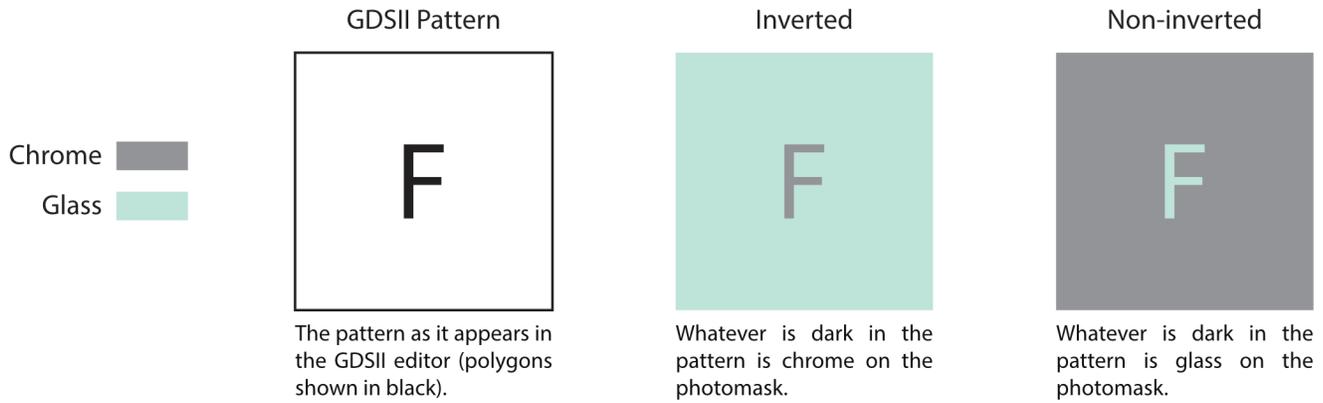
The GDSII layer number to be printed on this photomask.

- **N.B.** In some GDSII viewers/editors, such as KLayout, elements with the same Layer number may be further segregated by Datatype, if different Datatype values exist. However, Datatype information is ignored by the maskwriter: all elements with the same Layer will be printed on the photomask, irrespective of Datatype.

### Polarity

This determines how the polygons in the GDSII file are interpreted when exposing the mask. There are two options:

- Select **Inverted** for a light/clear field mask: polygons in the GDSII file will be chrome on the mask (*polygons = chrome*).
- Select **Non-inverted** for a dark field mask: polygons in the GDSII file will be glass on the mask (*polygons = glass*).



### Critical Dimension ( $\mu\text{m}$ )

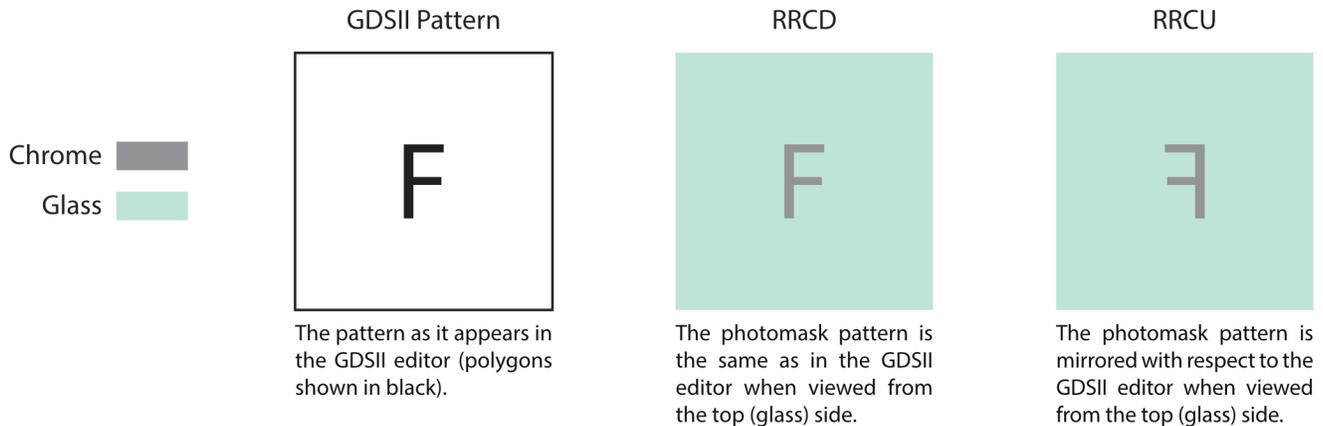
The smallest lateral feature size, or critical dimension (CD) in your design, in  $\mu\text{m}$ . This need not be exact: it is used by our processing staff to inform inspection after the development and chrome etch steps.

### Orientation

This parameter determines whether the GDSII design will be flipped across the y-axis (mirrored) when printing, and is especially important for non-symmetrical designs. There are two options:

- **RRCD** (*Read Right Chrome Down*) - This is the typical choice for topside litho. The design will appear the same as in the GDSII file when viewed through the glass (chrome facing down). A wafer exposed using this mask will have a pattern with the same orientation as in the GDSII file, when viewed from the patterned side.
- **RRCU** (*Read Right Chrome Up*) - This is typically used for backside litho. The design is flipped on the y-axis and will appear reversed (mirrored) when viewed through the glass (chrome facing down). A wafer exposed using this mask will have a pattern which is mirrored with respect to the GDSII design, when viewed from the patterned side.

The following diagrams assume a mask printed with inverted polarity:



### Related content

- [Photomask Fabrication Pricing & Shipping Policies](#)
- [Terms of Use Policies](#)
- [Request access for a guest](#)
- [GDSII design suites](#)
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