

# Ordering Mask Sets

## 1. Mask Fabricators' Contact Information

### a. Photo Sciences Inc.

2542 West 237<sup>th</sup> Street  
Torrance, CA 90505  
Phone # (310) 784-7460  
Fax # (310) 539-6740  
Web page: [www.photo-sciences.com](http://www.photo-sciences.com)

### b. Advanced Reproductions Corp.

100 Flagship Drive  
North Andover, MA 01845  
Phone # (978) 685-2911  
Fax # (978) 685-1771  
Web page: [www.advancerepro.com](http://www.advancerepro.com)

Comment: **Adtek Photomask** went out of business.

## 2. Brief Introduction of Masks

### 2.1. Mask Fabrication Steps

The following is a process flow for typical mask manufacturing. After a mask file is received by a mask company, it uses either *E-Beam lithography* or *Pattern Generator* to make a mask prototype with one magnified die (normally from 5X to 10X), which is called *reticle*. Photolithography is then used to make an 1X original mask by repeat-stepping the reticle. The original mask is named as *master*. Using masters, *prints* can be easily obtained by simple photolithography. Hence, prints are much less expensive than masters, but with compromised quality. In that prints are produced from masters by photolithography, they are mirrored images to each other. In other words, one can't get both masters and prints in right images. One needs to specify the final product, which will have the right image.

### 2.2. Mask Material Issue

Mask substrates can be made from a variety of materials, depending on application. If one is worried about mask thermal expansion, *quartz* can be used. Otherwise, *soda lime* is fine and also much cheaper. Typically, chrome is chosen for the mask coating.

### 2.3. Mask Image Specification

Usually one mask contains many dies. One has to specify *die size* and *step size* for the die repeating, that is *die array* on the mask. There are two options for the array shape: *square* or *truncated*. If one chooses truncated, the die array will be cut according to the wafer shape, namely sphere. Otherwise, the die array will be a simple square. In case one mask has several layers, one has to provide name for each layer and number them. Depending on positive or negative photoresist one intends to use with the mask, he/she should specify the digitized area to be either CL(clear) or DK(dark). Digitized area normally represents the patterns on a mask. Field, where there is no pattern, is normally

but not always complementary to the digitized area. For example, if you want a square pattern on the mask and define the digitized area to be DK, you will see the final mask with a black square with all other area transparent.

Mask companies should also be informed of the smallest feature on the mask. This is defined by parameter *critical dimension* (CD). Sometimes, CD is categorized to *data CD* and *mask CD*. Data CD is the smallest pattern size, whereas mask CD is the smallest spacing between patterns. In the meantime, CD tolerance should be given. If the smallest feature is two micron, the CD tolerance will typically be +/- 0.25 micron for masters and +/- 0.5 micron for prints.

If contact photolithography is used for the mask, the mask coating will have a mirrored image. It is called *chrome down*, *wrong reading with chrome up*, or *right reading with chrome down* (RRCD).

#### **2.4. Procedure of Ordering**

The basic procedure consists of the following:

- a. Request a job information form from a mask company.
- b. Return the filled form by fax and provide mask files either by e-mail or ftp site.
- c. Receive a quota about the mask set from the company
- d. Make a choice of mask company
- e. Get a PO # and notify the company
- f. Typically, the mask set will be shipped one week after you approve it.

*Note: One should pay special attention when filling out the job information form. The forms should ask for or include specifications of the mask set such as plate size & thickness, smallest feature size, critical dimension tolerance and so on. In case you have any question, be sure to contact technical support team at the corresponding mask company.*