

# Photo Mask

## Outline of Photo Mask



Through the supply of "photo masks" which are used as original plates in "photolithography" [\*1], Mitani Micronics has contributed to the development of high-precision and high-definition products such as various kinds of electronic components which support the next generation applications, microdevices including semiconductors (semiconductor package, power device, etc. [\*2]), diverse substrates (multilayer substrate, device embedded substrate, bumped substrate, etc.) and displays (liquid crystal display, organic EL display, FPD, touch panel display, etc.).

\*1 : One of the microfabrication techniques. using a photo mask as an original plate, forms mainly an electronic circuit pattern by photosensitive resin application, exposure, development and etching.

\*2 : quartz crystal device, MEMS product, LED product, electronic paper, touch panel

The following three types of photo masks are available:

<b>1 CHROME MASK</b> Finest pattern of $1.0\mu\text{m}$ lines and spaces.	<b>2 EMULSION GLASS MASK</b> Low price suited for first trial and process check.	<b>3 FILM MASK</b> Easy handling. Low cost. Quick delivery.
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We offer a photo mask as a calibration [\*3], mask for exposure, measurement and alignment of a manufacturing equipment.

\*3 : "Calibration" means measurement adjustment • equipment adjustment.

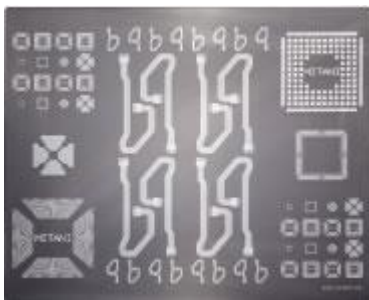
## Three Types of Photo Masks

### Plotting System Correspondence Table

Chrome fine pattern	New plotting system					
Chrome mask	Chrome mask plotting system					
Emulsion mask	Emulsion mask plotting system					
Film mask	Film mask plotting system					
Line/Space	1 $\mu$ m	5 $\mu$ m	10 $\mu$ m	30 $\mu$ m	50 $\mu$ m	100 $\mu$ m
Main uses	MEMS Semiconductor	Color filter OLED	Flip chip STN COF Sensor	BGA Touch panel TN TAB/FPC		PCB

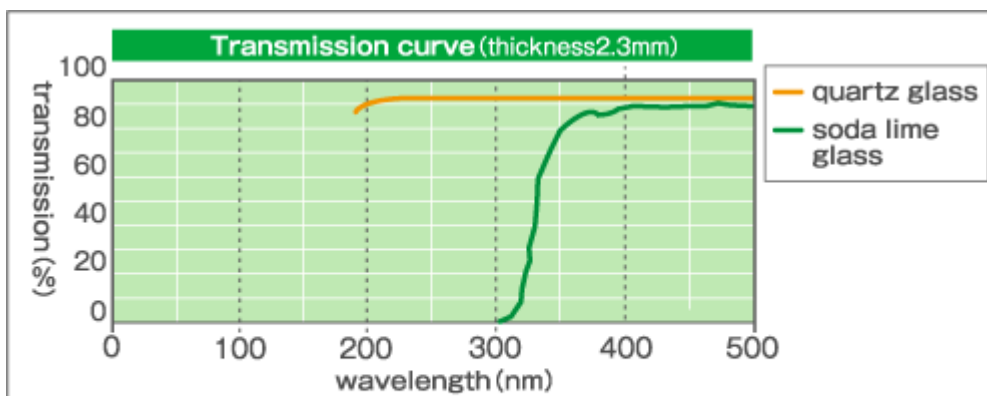
Chrome Fine Pattern: High-definition quality of 1~100  $\mu$  m achievable by our new plotting system.

## 1 CHROME MASK



Generally, a chrome mask has two main types of base materials: soda lime glass which is comparatively inexpensive and synthetic quartz which has low thermal expansion and high optical transmittance. Beside the above, there are masks with special base materials (Pyrex, BK7, Tempax, etc.).

### Chrome Mask Material Characteristics Graph



This chart shows relation between wavelength and transmission of materials of chrome masks: quartz glass and soda lime glass.

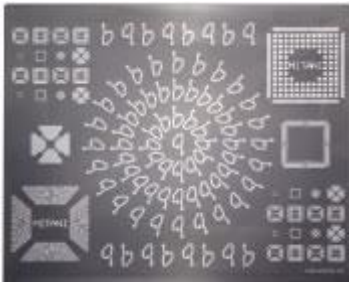
Quartz glass keeps transmission of approx. 90%, even at the wavelength lower than that of soda lime glass.

## Glass Characteristics Table

	Temperature characteristics		
	thermal expansion coefficient (50~200°C)	softening point	strain point
Soda lime glass	$81 \times 10^{-7}$	740°C	511°C
Quartz glass	$6 \times 10^{-7}$	1600°C	1000°C

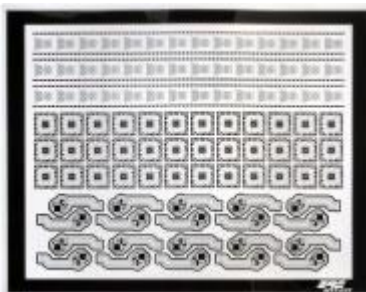
Thermal expansion coefficient of quartz glass is one digit smaller than that of soda lime glass.  
Transmittance greatly differs at a wavelength under 365nm.

## 2 EMULSION GLASS MASK



An emulsion glass mask is soda lime glass (base material) covered with a film mainly composed of gelatin and silver halide as photoreceptors. It is made in a similar manner to photographic negative film, or by exposure, development and fixing. More suitable for uses which require high definition and position accuracy than a film mask.

## 3 FILM MASK



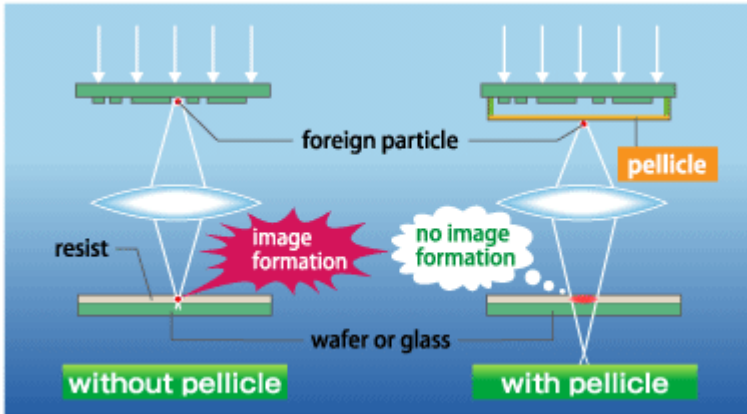
A film mask uses PET film as base material. The film composition and production process are almost the same as those of an emulsion glass mask. It is elastic depending on the usage environment (temperature and humidity) due to the nature of the base material. For uses which require fineness and position accuracy, or overlay accuracy, we recommend the use of a glass mask.

## The mask of special specification

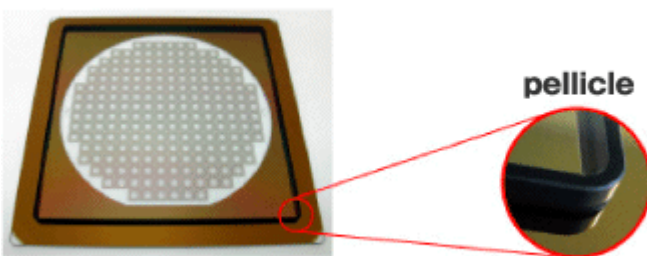
### 1. Pellicle-Covered Photo Mask (one side/both sides)

When introducing a projection exposure system, please consider using a pellicle-covered photo mask which reduces yield decrease due to foreign particles.

\*Please consult with us about pellicle (type, size, etc.).



With a pellicle, the focal distance from foreign particles to a lens changes, which prevents shadow formation of the particles on a substrate.



Masks can be protected from particle contamination by attaching a pellicle film set in a metal frame to a projection exposure mask (upper side of the left image).

### 2 . Photo Mask (glass) External Shape Machining

Please consult with us about machinable shape (concavity and convexity, groove, hole, etc.), size, etc.



The above is a specially-shaped (concavity and convexity) photo mask sample. Masks with various sizes and shapes you desire are available from Mitani.

### 3 . Clean Room (class 100, class 1000)

Temperature 22°C±1°C Humidity 50% RH±10%



### 4 . Photo Mask Material List

We can also make masks of size or material not listed below.

Size	Thickness	Remarks
2.5×2.5 (Inch)	0.06 (Inch)	————
3×3 (Inch)	0.06/0.09 (Inch)	Quartz glass 0.09inch correspondence is possible
4×4 (Inch)	0.06/0.09 (Inch)	Quartz glass correspondence is possible
5×5 (Inch)	0.06/0.09 (Inch)	Quartz glass correspondence is possible
6×6 (Inch)	0.09 (Inch)	Quartz glass 0.25inch correspondence is possible
7×7 (Inch)	0.09/0.12 (Inch)	Quartz glass 0.12inch correspondence is possible
203×203 (mm)	3.0 (mm)	Quartz glass correspondence is possible
228.6×228.6 (mm)	3.0 (mm)	Quartz glass correspondence is possible
254×254 (mm)	4.8 (mm)	Quartz glass correspondence is possible
355.6×431.8 (mm)	3.0 (mm)	Quartz glass correspondence is possible
370×450 (mm)	4.8 (mm)	Quartz glass correspondence is possible
400×450 (mm)	4.8 (mm)	Quartz glass correspondence is possible
609.6×609.6 (mm)	4.8 (mm)	Quartz glass correspondence is possible (Consultation)

5 . Pattern repeatability variation among different plotting machines and modes (in-house comparison).

