FOTOBOARD 2

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PROCESSING INSTRUCTIONS

The supplied material is capable of producing very high-resolution features (better than 0.050mm track and space) using high quality artwork and exposure equipment. However even on unsophisticated printing equipment some quite outstanding results can be obtained by adhering to a few simple rules and an understanding of how the process works. Therefore to obtain the best results from FOTOBOARD it is important to follow the recommended process as closely as possible.

ARTWORK PREPARATION.

To obtain maximum resolution it is important to have a good quality image in intimate contact with the resist surface of the board (phototool). Ideally this should be a high contrast photographic image with the image side (emulsion side) in contact with the resist.

However it is very common to produce artwork using PCB transfers applied to drafting film (tracing paper is not suitable). These should be as clean and with as little build up from overlapping taped tracks as possible. Dust and dirt may be imaged and may cause shorts between tracks and tape build up may cause a loss of contact of the image resulting in undercutting and poor definition. Pen plots are also quite commonly used as phototools, these need to be produced using special grade pens and ink onto drafting film for reliable results.

The use of photocopies on acetate film should be avoided as the image is usually not black enough to prevent the UV light from exposing the resist. If there is no alternative then the image should be traced over using drafting ink until the image is totally opaque.

It should be noted that the majority of problems occur due to the use of poor artwork, the key rules are:

1. **HIGH CONTRAST**, good solid black on a clear transparent background.

2. **CLEANLINESS**, remove all dust and dirt that may also be imaged

3. **FLAT ARTWORK**, free from creases etc. to ensure good contact during printing.

4. **CORRECT IMAGE ORIENTATION**, the image must be the correct way around to ensure good contact. If the image is not in contact with board, track widths will be reduced and small features will be lost.

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EXPOSURE

CAUTION: the exposure process involves the use of UV (ultra violet) light. This can cause permanent eye damage. Measures MUST be taken to ensure the print frame is light tight before the lamps are energised.

A wide range of exposure equipment is available, ranging from high power vacuum print frames used in industry of several kilowatts right down to simple light boxes with fluorescent tubes of only a few watts and foam lids to hold the artwork down.

Assuming the use of a single sided light box of approximately 100 W processing would be as follows:

If possible work under yellow safe light conditions. Otherwise subdued lighting to minimise exposing unprotected board to ambient light.

- Cut board to required size
- Remove protective tape
- Place artwork on glass, image side up
- Place board face down on artwork
- Close lid and expose for approximately 5 minutes.

(The required exposure time will depend on the nature of the artwork and the lamp intensity. Clear film is less dense than drafting film and will need correspondingly less exposure time)
Under exposure will result in slow and poor developing characteristics.
Over exposure may result in thinning of tracks etc. or break down of the image if the artwork is not completely opaque to the UV light.
Generally under exposure causes more problems, as it will not provide a developable image.

TESTING

To optimise exposure and also maintain consistency it is wise to perform a step wedge test as follows.

1. Tape a piece of board to an artwork to prevent them from moving relative to each other.
2. Using a piece of black film or opaque card cover 90% of the board and expose for 1 minute.
3. Slide the card back revealing another 10% strip of the board and expose for another minute.
4. Continue doing this until the entire board is revealed and the last area has been exposed for 1 minute
5. This gives a board with exposure times ranging from 1 minute to 10 minutes.
6. Develop the board as usual and note the area where the board is cleanly developed. This gives the recommended exposure time.
7. If the board either all develops or does not develop repeat the test using shorter or longer time intervals between steps.

NOTE: IT IS IMPORTANT TO INCLUDE A PIECE OF ARTWORK IN THE TEST TO COMPENSATE FOR THE FACT THAT FILM OR DRAFTING FILM CAN ABSORB SUBSTANTIAL AMOUNTS OF UV LIGHT.

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DEVELOPING

CAUTION. All developing solutions are caustic based. The use of protective gloves and goggles is essential. Spills and splashes should be washed with copious amounts of water and medical advice sought.

Development may be under taken using 6–10 g/l sodium or potassium hydroxide solution, 20 g/l sodium metasilicate based developer or other proprietary developers.

(The use of proprietary developers is preferred particularly on the grounds of health and safety as they are less caustic than either sodium or potassium hydroxide solutions.)

- Proprietary developer to be made up as per supplied instructions.
- Sodium or potassium hydroxide developing solution should be made up by slowly adding the chemical to cold water whilst stirring in a suitable plastic container or tray. Mixing the developer will generate heat so ensure the solution is not too hot before commencing developing.
  (ALUMINIUM CONTAINERS MUST NOT BE USED UNDER ANY CIRCUMSTANCES)
- The made up solution should be used between 20 and 25 °C for best results. Higher temperatures may cause the resist to strip.
- The exposed laminate should be immersed in the developer solution and gently agitated until the unwanted resist is fully removed. This should take between 20 seconds and two minutes depending on temperature and amount of resist in solution. The resist will slowly go dark purple, dissolve and wash away from the surface of the board. If a "stringy" appearance is noticed then the developer is most probably too strong or too hot.
- Once developed fully wash the board under running water to completely remove any residual traces of developer and then allow to dry.

NOTE; it is preferred to make up developer as required as exposure to air causes it to slowly degrade. If it needs to be kept it should be covered with a tight fitting lid or, preferably, be kept in a plastic bottle with as much air removed as possible.

INSPECTION

Once developed and dried the board should be carefully checked to detect any broken tracks, these can be readily repaired by using one of the many types of resist pens that are available. Shorted tracks or patches that have resulted from dirt on the artwork can be scraped off with a sharp knife etc.
Inspection may be aided by briefly dipping the board in etchant to enhance the contrast between the resist and the bare copper surface.

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ETCHING

CAUTION: Ferric chloride and many other etchants are acidic and strongly corrosive. The use of protective gloves and goggles is essential. Spills and splashes should be washed with copious amounts of water and medical advice sought.

Correct disposal methods should be used for spent chemistry. Contact your local water authority for advice if necessary.

This is performed mainly using ferric chloride, other etchants are available especially in industry.

- Using prepared ferric chloride solution in plastic tray or proprietary etching tank immerse the board until all the unwanted copper is dissolved.
- Once etched wash the board under running water to completely remove any residual traces of etchant and then allow to dry.

FINISHING OFF

There is no need to remove the resist prior to soldering as the heat of the soldering iron will melt the resist. The resist remaining on the tracks etc. will provide protection of the copper for the future.

If there is a need to remove the resist this can easily be done by exposing the board to UV light and then developing off the remaining resist.

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TROUBLE SHOOTING GUIDE

PROBLEM	CAUSE	SOLUTION
Image develops off	Poor density artwork	Check design is opaque
	Developer too strong	Dilute developer
	Developer too hot	Check temperature
	Resist fogged (been exposed to stray white light)	Ensure boards are protected between process stages
Image does not develop properly, leaving a scummy deposit	Underexposure	Check print frame is working correctly. Increase exposure time.
	Developer exhausted	Check and replace if necessary
Poor resolution	Emulsion on artwork on wrong side	Redo artwork
	Over exposure	Check exposing parameters
	Poor contact	Check vacuum on vacuum printers, Check pressure applied by foam inserts is sufficient to hold board and artwork firmly against glass in single sided printers
	Artwork beyond capability of print frame	Better quality printer required for fine detail
Pinholes in developed image	Poor artwork	Check and retouch any scratches etc. in opaque areas of artwork
	Handling damage to resist	Avoid scratching and putting board down on rough surfaces.
Resist spots and residue	Dirt on artwork or print frame	Check and clean if necessary.

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