

fotomechanix ltd

fotoboard

**The
Photosensitive
Copper Laminate
System**

**Product
Specification**

Product Description

FOTOBOARD is a high quality pre-sensitised laminate, designed to meet the needs of the development engineer, laboratories, universities, schools etc., where a small quantity of P.C.B. are required, or as a teaching aid. It provides a fast consistent method of manufacturing both single and double sided boards.

All materials used in the manufacture of FOTOBOARD are of the highest quality, thus ensuring that only the very best product reaches our customer. This is backed up by our extensive technical service.

FOTOBOARD is coated with a positive working photo resist which is inherently capable of reducing defects caused by dust and dirt on the photowork and printing frame. The unexposed photo resist remains hard after exposing, to form the image or circuit pattern and remains unaffected by the developing process.

The unexposed resist is a blue/green in colour and when exposed tends to go a shade lighter, the change can be seen in day light.

To ensure a uniform coating thickness we have incorporated a roller coating system in our production line. We feel that this gives more stability in the final processing of exposing and developing, and gives consistency from batch to batch.

The coated board is finally coated with a low tack black film which affords mechanical and light protection.

Fotoboard Specification

Two basis substrates are used in the manufacture of FOTOBOARD, FR4 and CEM/1 both are a rigid composite laminate standard thickness 1/16" (1.6 mm) 1/2, 1/0, 1/1, copper.

FR 4; is a material composed of glass cloth epoxy resin and copper foil, it is flame retardant according to UL-94 grade V-O.

The laminate meets most commonly used specifications and are tested according to NEMA, LI-1; MIL-P-13949; IEC249-2-5.

Laminate up to a maximum thickness of 3.2 mm can be supplied on request.

Thickness tolerances according to MIL-P-13949G Glass II and IEC 249-2-5 (TAB II).

Copper surface aspect according to MIL-P-13949G Copper foil according to IEC 249-3 Type A electrodeposited copper foils.

Copper thickness according to IEC 249-3A Class I (TAB III).

~~CEM/1 is a material composed of a paper based core impregnated with epoxy resin, glass woven face sheets impregnated with epoxy resin, and copper foil. The laminate is flame retardant according to UL-94 grade V-O and will meet most commonly used specifications and tested according to NEMA LI-1 and IEC 249-2-9.~~

~~Maximum thickness of laminate is 3.2 mm upon request. Thickness tolerances according to IEC 249-2-9 (TAB I). Copper surface aspect according to MIL-P-13949G. Copper foil according to IEC 249-3 specifications. Copper thickness according to IEC 249-3 A Class I (TAB II).~~

Process Specification

Preparation of Artwork

The finished printed circuit pattern will only be as good as the artwork used to produce it, so care should be taken in preparing it. The required pattern can be formed by applying opaque tape on to clear polyester film, or by using drafting pens, the pattern must be opaque.

The pattern that is required to remain as copper on the finished board must be drawn or taped as described, thus a positive is produced. If only a single circuit board is required then the drawing can be directly used to produce the P.C.B. If a number of boards should be required of the same pattern it may be desirable to have the printed circuit drawn pattern reversed twice onto a professional high contrasting film.

Exposure

Remove the black protective film from the FOTOBOARD and place the positive artwork onto the board. The circuit should be the correct way round when placed on the surface of the board. Place into an ultra violet exposing unit and expose for approximately 6 minutes. (This exposure time will vary with size and type of light unit used). Remove from the exposing unit, there should be a visible colour change when viewed in daylight.

While the unprotected FOTOBOARD will operate in daylight it is advisable to carry out the exposure operation in subdued, or under yellow light conditions. Do not leave unprotected FOTOBOARD in direct daylight.

Developing

Mix FOTOBOARD Developer at the rate of 1:1 with water which should be used at room temperature 20-23°C.

Place exposed boards into the mixed developer solution for two minutes then inspect the exposed part, the photo resist should have dissolved into the solution, if not replace into the developer for a further one minute, again inspect. When fully developed rinse thoroughly in running water for two minutes. Then allow to dry.

The final developing time will depend on the working temperature and age of the developer. After use the developer can be put back into an air tight plastic container and re-used at a later date.

Etching

The etching can be carried out using ferric chloride. For the best results a closed spray system should be used, the etchant working temperature should not exceed 38°C (100°F). When etching using a dish, the etching time will be extended.

Warning

All chemicals can be dangerous and should be used with great care, at all times wear gloves, eye protection and plastic apron. In the event of a spillage neutralised with sodium bicarbonate and wash down with water. Keep away from children and animals.

See our Health & Safety Data Sheet.

Stripping

To remove the photo resist place etched board into a dish or tray of FOTOBOARD Stripper, again a mixture of 1:1 water to stripper, leave for three minutes, then rinse for two minutes.

The unexposed resist can be left on the board to act as a protecting film if required. If a solder joint is to be made it can be done without removing the resist.

Precautions when using Fotoboard

After the protective film has been removed the FOTOBOARD should be exposed as soon as possible. If working in daylight then the unprotected board should be covered or placed in a subdued light situation. Never leave the unprotected board in daylight.

The shelf life of FOTOBOARD is approximately six months if stored in the correct environment 15-20°C.

FOTOBOARD is a very easy material to use and much thought has been given to the use and safety of the process. Basic safety rules must be observed at all times. Repeated or prolonged contact with the process chemicals should be avoided. At no time should the ultra violet light be switched on with the lid open, both skin and eyes may be harmed by exposure to ultra violet light.

All processes must be carried out in a well ventilated area.

If in doubt please contact our Technical Department.

General Technical Characteristics

	CHARACTERISTICS	CONDITIONING	UNIT	FR4	METHODOLOGY	CEM/1	METHODOLOGY
Non Electrical Tests Base Material	Flexural Strength	Lengthwise/Crosswise A	N/mm ²	570/460	MIL.P 13949	70/250	NEMA L1-1
	Punchability	A		1	DIN 53488	1	DIN 53488
	Hardness	A	M Scale	112		105	
	Shear Strength	A	N/mm ²	138.5		105	
	Flammability	A;E-168/70	S	20(V-Q)	UL 94	10 (V-0)	UL 94
	Temperature Index	A	°C	130	UL 746	130	UL 746
	Water Absorption	E-1/105+ D- 24/23	%	0.1	MIL.P 13949	0.25	NEMA L1-1
	Pressure Vessel Thermal Stress	C-1/2 /15 psi + F-20s/260		5	MIL.P 13949		
Non Electrical Tests on Metal Clad Material	Thermal Stress	E-6/150+ E-10s/288	S	>40	MIL.P 13949	>40	MIL.P 13949
	Peel Strength	As received	N/mm	2.2	MIL.P 13949	2.10	MIL.P 13949
	Peel Strength	After thermal stress	N/mm	1.9	MIL.P 13949	1.8	NEMA L1-1
	Peel Strength	E-1/125 (FR3:E-1/105)	N/mm	1.7	MIL.P 13949	1.6	NEMA L1-1
	Peel Strength	After exposure to processing Sol.	N/mm	1.85	MIL.P 13949	1.7	MIL.P 13949
	Warp on Panels 304x304mm	A	%	≤0.5	MIL.P 13949	≤1.0	MIL.P 13949
Electrical Tests	Electrolytic Corrosion	C-96/40/92		A/1.4	IEC.249	A/1.0	IEC.249
	Dielectric Breakdown	To lamination D48/50+D-1/2 /23	KV	70	MIL.P 13949	65	NEMA L1-1
	Electric Strength	D-48/50+D-1/2 /23	V/mil		MIL.P 13949		
	Permittivity	1 MHZ C-40/23/50		4.5	MIL.P 13949		
	Permittivity	1 MHZ D-24/23			IEC. 249	4.2	NEMA L1-1
	Dissipation Factor	1 MHZ C-40/23/50		0.017	MIL.P 13949		
	Dissipation Factor	1 MHZ D-24/23				0.03	NEMA L1-1
	Surface Resistance	Moisture resistance	Ω	22x10 ¹²	MIL.P 13949		
	Surface Resistance	E24/125 (FR3: E-4/105)	Ω	5x10 ¹¹	MIL.P 13949	7x10 ¹⁰	MIL.P 13949
	Volume Resistivity	Moisture resistance	Ω cm	27x10 ¹²	MIL.P 13949		
	Volume Resistivity	E24/125 (FR3: E-4/105)	Ω cm	3x10 ¹²	MIL.P 13949	3x10 ¹⁰	MIL.P 13949
	Volume Resistivity	C-96-35-90	Ω cm	3x10 ¹²	MIL.P 13949	40x10 ¹²	NEMA L1-1