

## FOTOBOARD...the photosensitive copper laminate system

### PRODUCT DESCRIPTION

FOTOBOARD is a high quality pre-sensitised laminate, ideal for producing small numbers of printed circuit boards (PCBs) for use by design engineers or for work in the classroom or laboratory. Its key benefits are that it enables the manufacturing process to be fast and consistent - for both single and double sided boards.

All materials used in the manufacture of FOTOBOARD are high quality. This, together with our technical expertise and stringent manufacturing controls, ensures the high standard of every product which is delivered to our customer.

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 exposure 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 daylight.

To ensure a uniform coating thickness, we have incorporated a roller coating system in our production line. This gives more stability, particularly in the final processes, and consistency from batch to batch.

The board's final coat is a low tack black film which affords mechanical and light protection.

### FOTOBOARD SPECIFICATION

Two basic substrates are used in the manufacture of FOTOBOARD. FR4 and CEM/1 are both rigid composite laminates - standard thickness 1/16" (1.6mm)  $\Omega/\Omega$ , 1/0, 1/1, copper.

**FR 4** is a material composed of class woven glass cloth and copper foil. It is flame retardant according to UL-94 grade V-O.

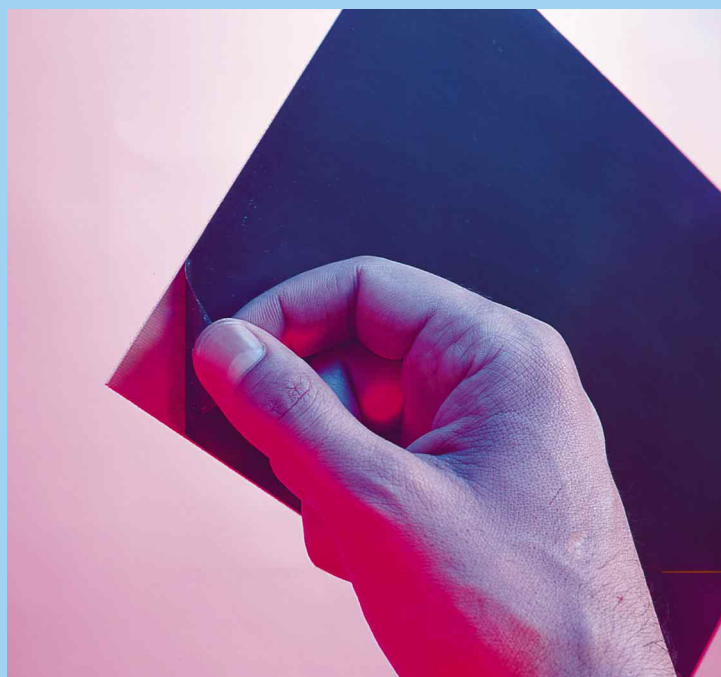
The laminate meets most commonly used specifications and

is tested according to NEMA, LI-1: MIL-P-13949 and IEC249-2-5.

- Thickness tolerances to MIL-P-13949H Glass II and IEC 249-2-5 (TAB II)
  - Copper surface aspect to MIL-P-13949H
  - Copper foil to IEC 249-3 Type A electrodeposited copper foils
  - Copper thickness to IEC 249-3A Class I (TABIII)
- Up to a maximum thickness of 3.2mm can be supplied on request.

**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. Like FR 4, it is flame retardant according to UL-94 grade V-O and meets most commonly used specifications. It is tested according to NEMA, LI-1: IEC249-2-9.

- Thickness tolerances to IEC 249-2-9 (TAB I)
  - Copper surface aspect to MIL-P-13949G
  - Copper foil to IEC 249-3
  - Copper thickness to IEC 249-3A Class I (TABII)
- Up to a maximum thickness of 3.2mm can be supplied on request.



## PROCESS SPECIFICATION

### Preparation of Artwork

The finished printed circuit pattern can only be as good as the artwork used to produce it, so great care must be taken in its preparation. The pattern required to remain as copper must be opaque and can be formed by applying opaque tape on to clear polyester film or by using drafting pens. This can be used to produce a positive - or directly to produce the PCB if only one is required. If a number of boards are required, it may be better to have the pattern reversed twice onto a professional, high contrasting film.

### Exposure

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.

To use, 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 six minutes. (This exposure time will vary depending on the size and type of light unit used). When removed from the exposing unit, the board should show a visible colour change when viewed in daylight.

### Developing

Mix FOTOBOARD Developer at the rate of 1:1 with water which should be at room temperature (20-23°C/ 68 - 41.4°F).

Place exposed boards into the 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 and then inspect again. When fully developed, rinse the board thoroughly in running water for two minutes. Allow to dry.

The final developing time will depend on the working temperature and the age of the developing solution. After use, the developing solution can be kept in an air-tight plastic container and re-used at a later date.

### Etching

Etching can be carried out using ferric chloride - a closed spray system produces the best results. The working temperature should not exceed 38°C (100°F). Etching will take longer using a dish.

**WARNING** - all chemicals can be dangerous and should be used with great care. Wear gloves, eye protection and a plastic apron at all times. In the event of a spillage (of ferric chloride??), neutralise with sodium bicarbonate and wash down with water. Keep away from children and animals. See separate Health & Safety Data Sheet.

### Stripping

To remove the photo resist, place the etched board into a dish or tray of FOTOBOARD stripper - again using a mixture of 1:1 stripper to water. 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

As previously stated, FOTOBOARD is by its nature, sensitive to light. After the protective film has been removed, the FOTOBOARD should be exposed as soon as possible. Work should be carried out in subdued light and boards should never be left unprotected in daylight.

The shelf-life of FOTOBOARD is approximately six months if stored in the correct environment (15 - 20°C 59 - 68°F).

FOTOBOARD is a very easy material to use and much thought has been given to the use and safety of the process. However, basic safety rules must be observed at all times.

Repeated or prolonged contact with the process chemicals should be avoided. The ultra violet light should never be switched on with the lid open - both skin and eyes could be harmed.

All processes must be carried out in a well-ventilated area. If you have any queries about FOTOBOARD or any of the processes involved in its use - please contact our Technical Department on

Tel: 0121 380 0100 Fax 0121 359 3313,  
E-mail sales@microponents.co.uk

## GENERAL TECHNICAL CHARACTERISTICS

	CHARACTERISTICS	CONDITIONING	UNIT	FR4	METHODOLOGY	CEM/1	METHODOLOGY
Non Electrical Tests Base Material	Flexural Strength	Lengthwise/Crosswise A	N/mm <sup>2</sup>	570/460	MIL.P 13949	370/250	NEMA L1-1
	Punchability	A		1	DIN 53488	1	DIH 53488
	Hardness	A	M Scale	112		105	
	Shear Strength	A	N/mm <sup>2</sup>	138.5		105	
	Flammability	A; E-168/170	S	20(V-0)	UL94	10(V-0)	UL 94
	Temperature Index	A	°C	130	UL746	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 + E-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 304 x 304 mm	A	%	≤0.5	MIL.P 13949	≤1.0	MIL.P.13949
Electrical Tests	Electrolytic Corrosion	C-96/40/92		A/1.4	1EC.249	A/1.0	1EC.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			1EC.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	22 x 10 <sup>12</sup>	MIL.P 13949		
	Surface Resistance	E24/125 (FR3:E-4/105)	Ω	5 x 10 <sup>11</sup>	MIL.P 13949	7 X 10 <sup>10</sup>	MIL.P.13949
	Volume Resistivity	Moisture resistance	Ω cm	27 x 10 <sup>12</sup>	MIL.P 13949		
	Volume Resistivity	E24/125 (FR3:E-4/105)	Ω cm	3 x 10 <sup>12</sup>	MIL.P 13949	8 X 10 <sup>9</sup>	MIL.P.13949
	Volume Resistivity	C-96-35-90	Ω cm	3 x 10 <sup>12</sup>	MIL.P 13949	40 X 10 <sup>12</sup>	NEMA L1-1