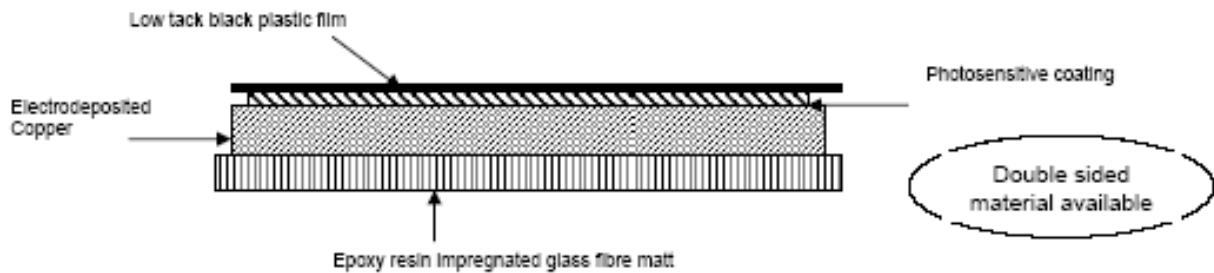


Fotoboard is a positive working, Photoresist coated, glass fibre printed circuit laminate to BS4584 and MILSPEC MIL-P-1394GE GRN. The resist is applied 5 microns thick using a specially developed roller coating process which ensures a particularly even layer. The resist is high temperature cured which, combined with its tough plastic film laminate covering, results in a durable board which can be handled, guillotines and processed with a high degree of safety. Inspection at the development stage is simplified by use of a green dye in the Photoresist. Fotoboard is 1/16" thick, 1oz copper. It has a minimum shelf life of one year and is available as both single and double sided. 2oz and other thickness' are available on request.



Thickness	1/16" (1.6mm)
Copper per square foot	1 oz (35 microns)
Water Absorption	0.12%
Dielectric Constant (1 MHz)	4.55
Dissipation Factor	0.0175
Flexural strength, Lengthways (N/mm ²)	530.00
Flexural strength Crosswise (N/mm ²)	425.00
Peel Strength (N/mm ²)	1.95

GENERAL TECHNICAL CHARACTERISTICS

	CHARACTERISTICS	CONDITIONING	UNIT	FOTOBARD (FR4)	METHODOLOGY	FPC-16	METHODOLOGY
Non Electrical Tests (See Material)	Flexural Strength	Lengthwise / Crosswise A	N/mm ²	570/ 460	MILP.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 ²	138.5		105	
	Flammability	A; E-158 / 170	S	20(V-O)	UL94	10(V-O)	UL-94
	Temperature Index	A	°C	130	UL746	130	UL 746
	Water Absorption	E-1 /105 + D- 24 /23	%	0.1	MILP.13949	0.25	NEMA I1-1
	Pressure Vessel Thermal Stress	C-1/2 /15 psi +E-20s /260		5	MILP.13949		
Non Electrical Tests (See on Verob Circuit Material)	Thermal Stress	E-6/150+E10s /288	S	>40	MILP.13949	>40	MIL.P.13949
	Peel Strength	As received	N/mm	2.2	MILP.13949	2.10	MIL.P.13949
	Peel Strength	After thermal stress	N/mm	1.9	MILP.13949	1.8	NEMA L1-1
	Peel Strength	E-1/125(FR3:E-1/105)	N/mm	1.7	MILP.13949	1.6	NEMA L1-1
	Peel Strength	After exposure to processing Sol	N/mm	1.85	MILP.13949	1.7	MIL.P.13949
	Warp on Panels 304x304mm	A	%	±0.5	MILP.13949	±1.0	MIL.P.13949
Electrical Tests	Electrolytic Corrosion	C-95/40/92		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/ml		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 ¹²	MIL.P.13949		
	Surface Resistance	E24/125 (FR3:E-4/105)	Ω	5 x 10 ¹¹	MIL.P.13949	7 x 10 ¹⁰	MIL.P.13949
	Volume Resistivity	Moisture resistance	Ω cm	27 x 10 ¹²	MIL.P.13949		
Volume Resistivity	E24/125 (FR3:E-4/105)	Ω cm	3 x 10 ¹²	MIL.P.13949	8 x 10 ¹¹	MIL.P.13949	
Volume Resistivity	C96-35-90	Ω cm	3 x 10 ¹²	MIL.P.13949	40 x 10 ¹¹	NEMA L1-1	

Fotoboard:

The first choice for the production of quality printed circuit boards. Fotoboard is positive working, photoresist coated, FR4 glass fibre printed circuit laminate to BS4584 and MILSPEC MIL-P-13949GE GRN. The resist is applied 5 microns thick using a specially developed roller coating process which ensures a particularly even layer. The resist is high temperature cured and covered in a protective black film to enable it to be handled and guillotined safely. A green dye is in the photoresist which simplifies inspection at the development stage. Fotoboard is 1/16" thick with 1oz copper. It has a minimum shelf life of 12 months and is available as single and double sided. 1 & 2oz copper and other thicknesses of laminate are available upon request.

FPC-16:

A fibre glass and paper composite laminate manufactured to the same high quality standards as Fotoboard but giving certain price and weight advantages. The base laminate of FPC-16 consists of two thin fibre glass outer layers with a paper composite in between making it light and easy to cut and drill. The 1oz copper thickness and high quality photoresist are the same as Fotoboard. FPC-16 is a popular choice with the educational and training sectors.

Associated Products

A range of associated products for use with these laminates are featured in our free catalogue. Products include PCB shears, UV exposure units, PCB processing chemistry, processing tanks and the associated chemistry.

Cutting

To avoid splinters and dust a band saw should not be used to cut these laminates. Use a purpose designed PCB shear – see Vero Technologies catalogue or on line shop.

[13-3005](#) 12" Desk top shears

UV Exposure

With a good quality artwork the correct exposure time with a table top UV will be between 2-3 minutes. The exact time will depend on the output of the UV unit.

[13-3001](#) Small desk top exposure unit

[13-3002](#) Medium desk top exposure unit

Processing

A range of PCB chemistry is offered in the Vero Technologies product catalogue. The following items are particularly recommended.

Developing:

[13-2001](#) makes 1 litres of developer solution

[13-2002](#) makes 10 litres of developer solution

Etching:

[13-2003](#) 500g of Ferric pellets to make 1 liter of etchant

[13-2004](#) 2.5kg Ferric Pellets for 5 litres of etchant

[13-2005](#) Clean Fine Etch Crystals for 1 litre of etchant

Photoresist Strip:

[13-2012](#) SN120 Photoresist Strip applicator

Tin:

[13-2006](#) 90g powder for 1 litre immerse tin

[13-2007](#) 450g powder for 5 litres immerse tin

Drilling

For good quality holes always use Tungsten Carbide drill bits. Where economy is important low cost reground Tungsten Carbide drill bits may be used.

THE INFORMATION AND RECOMMENDATIONS CONTAINED HEREIN ARE BELIEVED TO BE ACCURATE - HOWEVER NO GUARANTEE OR WARRANTY EXPRESSED OR IMPLIED IS GIVEN

SECTION 1 PRODUCT IDENTIFICATION AND MANUFACTURE

NAME: FOTOBOARD SUBSTRATE FR4 PART Nos:
VARIOUS
MICROTRAK

MANUFACTURER'S/SUPPLIERS NAME, REGISTERED ADDRESS

VERO TECHNOLOGIES LTD, UNIT25, SOLENT INDUSTRIAL ESTATE, SHAMBLEHURST LANE, HEDGE END, SOTHAMPTON, HANTS.SO30 2FY

AND EMERGENCY TEL NO:

01489 776930

SECTION 2 COMPOSITION/INFORMATION ON INGREDIENTS

COMPONENT %BY WT CAS & EEC Nos: HAZARD R PHRASE Nos
POLYMERISED 25068-38-6 IRRITANT 37 / 38, 43

EPOXY RESIN

BISPHENOL A – (EPICHLOROHYDRIN)

SECTION 3 HAZARDS IDENTIFICATION

EPOXY GLASS LAMINATE WITH COPPER FACING, COATING WITH A

POSITIVE RESIST - IRRITANT

SECTION 4 FIRST AID MEASURES

INHALATION:

REMOVE FROM EXPOSURE TO FRESH AIR. SEEK MEDICAL ATTENTION

SKIN CONTACT:

IRRIGATE THOROUGHLY WITH SOAP AND WATER.

EYE CONTACT:

IRRIGATE THOROUGHLY WITH WATER. SEEK MEDICAL ATTENTION.

INGESTION:

SEEK MEDICAL ATTENTION.

MEDICAL NOTES: N/A

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

NOT FLAMMABLE

COMBUSTION PRODUCTS

N/A

FIRE/EXPLOSION SCENARIOS

NONE USUAL

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTERS

SECTION 6 ACCIDENTAL RELEASE MEASURES

PERSONAL PROTECTION

WEAR SAFETY GOGGLES AND PROTECTIVE RUBBER OR VINYL GLOVES

ENVIRONMENTAL PRECAUTIONS . NOT KNOWN

WORKPLACE PRECAUTIONS NONE

METHODS FOR CLEARING UP: POSSIBLE TO SWEEP UP

SECTION 7 HANDLING AND STORAGE

HANDLING PRECAUTIONS

ALWAYS WEAR SUITABLE PROTECTIVE CLOTHES.

EXTRACTION IS

REQUIRED IF THE SUBSTRATE IS MACHINED.

STORAGE INCLUDING ANY SPECIAL REQUIREMENTS

(TEMPERATURE, VENTILATION, ETC)

STORE IN A COOL DRY ATMOSPHERE AT 19°C AT 50% RELATIVE

HUMIDITY

SECTION 8 EXPOSURE CONTROL/PERSONAL PROTECTION

ENGINEERING CONTROLS/ VENTILATION LOCAL EXHAUST VENTILATION

REQUIRED IF MACHINED

RESPIRATORY PROTECTION

USE EXTRACTORS OR RESPIRATORS WHEN MACHINING

EYE PROTECTION WEAR PROTECTIVE GOGGLES.

HAND PROTECTION WEAR PROTECTIVE RUBBER/ VINYL GLOVES

SKIN PROTECTION

NONE OTHER THAN EYE / HAND PROTECTIONS AS ABOVE

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: SOLID COLOUR:

ODOUR: ODOURLESS **ACIDITY/ALKALINITY pH:** 5₉LITRE H₂O

BOILING POINT N/A MELTING POINT N/A

FLASH POINT °C (Open/Closed Cup): N/A

AUTO IGNITION TEMP °C: N/A

THERMAL DECOMPOSITION TEMP °C: N/A

EXPLOSIVE PROPERTIES: N/A

EXPLOSIVE LIMITS AT 25°C (% VOL. IN AIR)

LOWER: UPPER:

RELATIVE DENSITY: LIQUID kg/m³ at °C 1.93 **SOLID CONTENT %:**

SOLUBILITY IN WATER: N/A **SOLUBILITY N/A**

VOLATILE CONTENT: STABLE

VAPOUR PRESSURE mm Hg at 20°C RELATIVE VAPOUR

DENSITY

(air = 1):

(of principle component and name):

EVAPORATION RATE CONDUCTIVITY:

(n-butyl acetate = 1):

SECTION 10 STABILITY AND REACTIVITY PROPERTIES

CONDITIONS TO AVOID:

NONE - STABLE

SECTION 11 TOXICOLOGICAL INFORMATION

HAZARDOUS DECOMPOSITION PRODUCTS: IRRITATING TO

THROAT AND

DIGESTIVE TUBES.

EFFECT OF EYE CONTACT: IRRITATING TO EYES

EFFECT OF SKIN CONTACT: IRRITATING TO SKIN

EFFECT OF INHALATION: IRRITATING TO RESPIRATORY TRACT

EFFECT OF INGESTION: N/A

SECTION 12 ECOLOGICAL INFORMATION

SECTION 13 DISPOSAL CONSIDERATIONS

POSSIBLE TO SWEEP UP

ALWAYS DISPOSE OF ACCORDING TO LOCAL GOVERNMENT

REGULATIONS.

SECTION 14 TRANSPORT INFORMATION

UN-Nt: N/A **IATA CLASS:** N/A **PACKING GROUP:** ADR/RID:

CLASS: CARRIAGE TEMP: 19°C

SECTION 15 REGULATORY INFORMATION

PRODUCT TRADE NAME / DESIGNATION: POLYMERISED EPOXY RESIN

CONTAINS: BISPHENOL A (EPICHLOROHYDRIN)

HAZARD SYMBOL: 0 - NOT CLASSIFIED

RISK PHRASE Nos. & Words:

37/38 IRRITATING TO RESPIRATORY SYSTEM AND SKIN

43 MAY CAUSE SENSITISATION BY SKIN CONTACT

SAFETY PHRASE Nos. & WORDS:

S28 AFTER CONTACT WITH SKIN WASH IMMEDIATELY WITH

PLENTRY OF SOAP AND WATER

S/37/39 WEAR SUITABLE PROTECTIVE CLOTHING AND GLOVES

OTHER INFORMATION

RECOMMENDED USES AND RESTRICTIONS:

Use only as directed.

SENSITISED PCB DATA SHEET.

Technical data

Dated 01/09/05

Property	Test Method	Specification	Units	Typical Value	
	IPC-TM-650 or as noted				
Glass Transition Temperature (Tg) by DSC.Spec Minimum	2.4.25	110-150	°C	150	
Decomposition Temperature (Td)	ASTM D3850	-	°C	320	
CTE, Z-Axis pre TG	2.4.24	AABUS	ppm/ °C	15	
CTE, Z-Axis post TG	2.4.24	-	ppm/ °C	250	
CTE, X-, Y-Axis pre TG	2.4.24	AABUS	ppm/ °C	15	
CTE, X-, Y-Axis post TG	2.4.24	-	ppm/ °C	17	
Thermal Conductivity	ASTM D5930	-	W/mK	0.36	
Thermal Stress 10s @ 288°C unetched/ Spec minimum etched	2.4.13.1 2.4.13.1	Pass visual Pass visual	Rating Rating	Pass Pass	
Permittivity, Spec maximum	A. @ 1MHz B. @ 100 MHz C. @ 1 GHz	2.5.5.3 2.5.5.9 2.5.5.5	5.4 - -	- - -	4.8 4.6 4.5
Loss tangent, Spec maximum	A. @ 1MHz B. @ 100 MHz C. @ 1 GHz	2.5.5.3 2.5.5.9 2.5.5.5	0.035 - -	- - -	0.015 0.015 0.015
Volume Resistivity Spec minimum	After moisture resistance At elevated temperatures	2.5.17.1 2.5.17.1	10 ⁶ 10 ³	MOhm cm MOhm cm	4.0x 10 ⁸ 7.0x 10 ⁷
Surface Resistivity Spec minimum	After moisture resistance At elevated temperatures	2.5.17.1 2.5.17.1	10 ⁴ 10 ³	MOhm MOhm	3.0x 10 ⁶ 6.0x 10 ⁶
Dielectric Breakdown	spec minimum	2.5.6	40	kV	60
Arc Resistance	spec minimum	2.5.1	60	Seconds	105
Comparative Tracking Index	CTI / ASTM D3638	UL-746A	-	Volts	205 (CL=3)
Peel Strength Spec minimum	After thermal stress At 125°C After process solutions	2.4.8 2.4.8 2.4.8	105 105 105	N/mm N/mm N/mm	145 145 145
Flexural strength, Minimum	lengthwise crosswise	2.4.4 2.4.4	415 345	G.Pa G.pa	442 435
Moisture absorption	spec maximum	2.6.2.1	0.80	%	0.20
UL approval		E 45456			
Flammability	spec minimum	UL-94	V-1	Rating	V-0
Thickness tolerance dielectric		Class II		mm	1.55 +/- 0.08
Thickness tolerance copper				µm	35 +/- 5
Deformation rel. to diagonal length			< 3	%	<3