Arlon FoamClad$^{R/F}$ ™ 100

Microwave Materials

Low Dielectric Constant Lightweight Laminate

Description

FoamClad$^{R/F}$ **100** is a novel family of laminate composites consisting of a low permittivity microporous polymeric core bonded to an impermeable copper-clad polymer film coverlay that provides a low composite dielectric constant. FoamClad$^{R/F}$ **100** is a conveniently processable material for the manufacture of low cost, lightweight printed circuit antennas for cellular infrastructure, automotive radar and other microwave and R/F applications.

Features

- Low Dielectric Constant
- Multiple Foam Thicknesses
- Low Loss
- Smooth Film Surface
- Low PIM Interference (at 3rd Harmonic)
- Lightweight
- Available to 120+" Length x 24" Width

Benefits

⇒ Low Propagation Delay

⇒ Design Flexibility

⇒ Signal Integrity

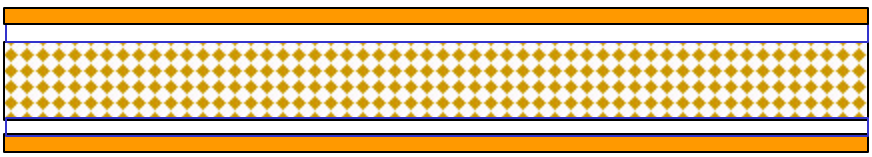
⇒ Reliable Repeatable Print and Etch

⇒ <-155 dBc

⇒ Easier Handling in Assemblies

⇒ High Gain Base Station Antennas

Copper Foil
Polymer Film
Microporous Core
Polymer Film
Copper Foil



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MATERIALS FOR ELECTRONICS

Product Data		
Property	Method	Value
Permittivity (1 MHz)	IPC-TM-650 2.5.5.3	1.15-1.35[1]
Loss Tangent (1 MHz)	IPC-TM-650 2.5.5.3	0.002 to 0.005[1]
CTE – Z axis (%)	50 to 100°C	7.5%
CTE – (X,Y Axes) – ppm/°C	50 to 100°C	25 ppm/°C
Nominal Etch Shrinkage (mils/inch) – Warp/Fill	IPC TM-650 2.4.39	W=0.2 / F=0.0
Specific Gravity g/cc (as 0.043" product)	ASTM-D-972 A	0.35 nominal
Compressive Strength at 50% Compression	ASTM D-3575	33 psi
Copper Peel Strength (1 oz)	IPC TM-650 2.4.9	7
Typical PIM Performance (at 3rd Harmonic)	Summitek Analyzer	-155 dBc or better
Surface Resistivity (of polymer film) – typical	IPC-TM-650 2.5.17	10^4 meg-ohm
Dielectric Strength (of polymer film)	ASTM-D-149	3000 V/mil
Water Absorption (%)	IPC TM-650 2.6.2.2	<0.5%

Note 1 – Laminate thickness and Cu cladding (1 or 2 sided) dependent. See table below Values approximate and depend on test method.

Single Sided Copper			Double-Sided Copper		
Thickness	Dk	Df	Thickness	Dk	Df
0.036	1.30	.0025	0.040	1.35	.005
0.068	1.20	.0023	0.072	1.25	.0045
0.092	1.15	.002	0.096	1.20	.004

AVAILABILITY

FoamClad$^{R/F}$ 100 is available in 24" width and lengths from 12" to 120". Nominal base thicknesses available are: 0.040", 0.072" and 0.096" for double - sided Cu laminate, and 0.036", 0.068", and 0.092" for single- sided Cu laminate. (Nominal dielectric thicknesses do not include copper or release she et.)

FoamClad$^{R/F}$ 100 -- PROCESSING RECOMMENDATIONS

Arlon's FoamClad$^{R/F}$ 100 is a novel laminate constructed from a low dielectric constant microporous polymeric core. Impermeable copper clad polymeric membranes are bonded to the core on one or both sides to prevent contamination of the core by PCB process chemistry.

FoamClad$^{R/F}$ 100 is designed to be fabricated through a normal PWB photo-process, print and etch cycle. The polyester film on the surface protects the core of foam from process chemistries. Edges must be well rinsed and depending on the time of exposure, may require trimming. Avoid putting excessive pressure on the product during exposure or distortion may result.

FoamClad$^{R/F}$ 100 is based on a customized temperature resistant foam but nonetheless can be distorted by excessive heat. Low melt point solder with short exposures can be used successfully.

Conventional solder techniques may cause the material to shrink or distort excessively and care must be taken with thermal excursions above 212°F (100°C).

For the most part, processing of this material represents no significant departure from conventional print and etch techniques. However, because of the unique nature of the product there are some precautions that need to be observed in handling Arlon FoamClad$^{R/F}$ 100 that would not be necessary with standard FR-4.

The principal areas of concern are due to the characteristics of the dielectric core, a semi-rigid microporous polymeric material.

- Firstly, this is a low density core and it is easily bent or compressed, which means the warning "Handle With Care" is always applicable to avoid creasing or wrinkling the copper surface or causing other distortion to the product.

- Second, because the basic polymer of the foam core is NOT a high temperature material, it will shrink from excessive temperature, resulting in distortion if care is not taken to minimize heat exposure during processing and/or subsequent soldering operations.

Transport and Handling

Handling Arlon FoamClad$^{R/F}$ 100 requires some planning and care. Two people should handle sheets from opposite sides, exerting a slight tension to prevent bending dents or surface deformation.

Transporting the panel should utilize a dedicated flat bed trolley to fully support the panel – the panel can be lifted by the longest edge but will crease from being lifted at the edges of the width if precaution is not observed as indicated above. Any dents or imperfections could cause problems when printing. Handling precautions should be observed throughout the process.

Preclean Prior to Laminating

The panel can be Microetched in a normal process. The process must be adjusted as necessary to ensure that the panel does not bend as it enters a set of drag rollers. Achieve removal of 30 to 40 millionths to ensure that anti-tarnish has been stripped and sufficient tooth established to adhere the photoresist. Solution soaks into the cut edges of the panel so care has to be taken to check that the panel rinsed well and is fully dry before dry film lamination.

Mechanical surface preparation should be avoided. If necessary a fine composite should be used with minimal surface contact, 7 to 15 psi as a start point. Maintain a water break of 30 seconds minimum.

Dry Film Photoresist Laminating

Dry film hot roll laminators control bond of the film to substrate by measuring exit temperature and roll pressure. Consult the manufacturer's specifications to set exit temperature at the lowest level consistent with achieving acceptable lamination. Pressure should be reduced as much as possible consistent with getting a good bond to avoid excessive compression of the microporous core. Adjust speed and roll temperature to maintain exit temperature.

Exposure

To properly expose this laminate it must be compressed within the glass-to-glass exposure unit. (Some users have found that a Mylar to Glass exposure is preferred.) A packing material of at least 0.2 mm thinner has been found desirable to pack the rest of the exposure surface. Preferably the packing would be of the same degree of compressibility but slightly thinner than the Arlon FoamClad$^{R/F}$ 100. Application of excessive pressure during exposure may result in image distortion.

Etching / Film Strip

During etch processing, equipment utilizing upper pinch rolls and thin core wires will ensure that smaller panels will not float during processing. Processing of long boards such as standard antennas will be achieved using standard processes.

Film strip and final rinse jets may need to be slightly reduced in pressure. Solution soaks into the exposed edges slightly so the rinsing and drying need to be carefully monitored. Holes slots etc. should not be put into this style of substrate before etch as there could be problems with solutions soaking into the hole walls.

Drill

Drilling will result in slightly rough holes due to the cutting of the closed cell foam. Drill parameters will need to be optimized for each specific application and design. Infeed speed is the most critical parameter, as if infeed is too fast the hole will tend to be ragged.

It is assumed that most holes that will be drilled in foam will be relatively large diameter, which is the basis for the following starting point recommendations. Note that the infeed is quite slow compared to a standard FR-4.

Surface Speed: 450 sfm (surface feet per minute)
Infeed Rate: 40 inches/minute (1 meter/min) (or as chipload, about 1.5 mils/revolution)
Retract Rate: 60 inches/minute (1.5 meter per minute)

Routing

Final PCB's can be cut out of panels by routing using a 2 flute down-cut tool. Rates will usually need to be reduced from standard to minimize adhesive buildup. Router bits may be cleaned easily with IPA (isopropyl alcohol). Rigid entry and backer material will help prevent unnecessary roughness of the cut. As a starting point recommendation: For a 0.062" (1.6 mm) tool, start around 40,000 rpm with a feed rate of about 25 inches/minute (0.6 m/min)

9433 Hyssop Drive, Rancho Cucamonga, California 91730 • Telephone: (909) 987-9533 • Fax: (909) 987-8541
1100 Governor Lea Road, Bear, Delaware, 19701 • Telephone: (302) 834-2100, (800) 635-9333 • Fax: (302) 834-2574
37 Rue Collange, 92300 LeVallois, Perret, France • Telephone: (33) 1-427-02642 • Fax: (33) 1-427-02798
44 Wilby Avenue, Little Lever, Bolton, Lancashire, BL31QE, UK • Telephone: (44) 120-457-6068 • Fax: (44) 1204 579615
Website: www.arlon-med.com

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