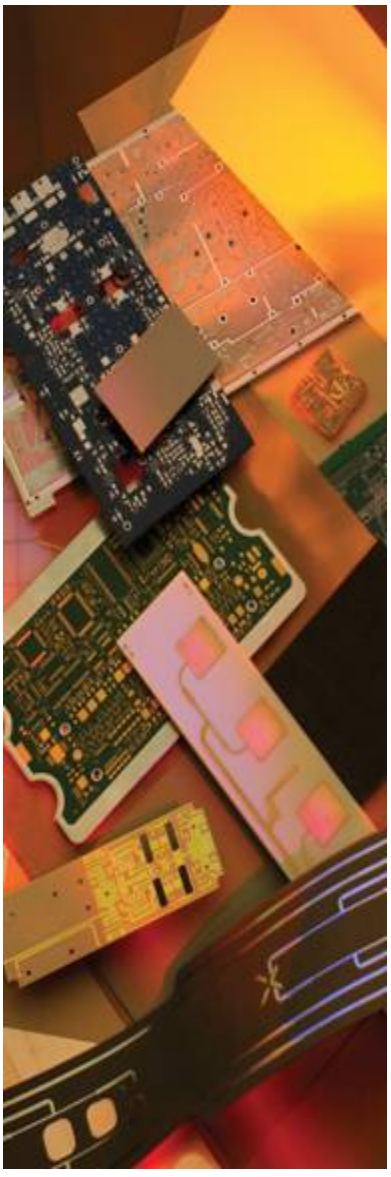
MULTICLAD™ HF

Halogen-Free Low-Loss Laminate And Prepreg System



ARLON's new halogen-free low-loss system represents the next generation low-loss thermoset and prepreg system for high-speed and high-frequency printed circuit boards. This new technology combines a low-loss, high reliability thermoset resin system with non-brominated flame retardant system to create a material that is unmatched in terms of electrical performance, durability and cost.

Features:

- First generation environmentally friendly laminate system with competitive Insertion Loss and Loss Tangent (Df<0.005) for High Frequency applications
- Non-PTFE Formulation meets standard lead-free process requirements, while maintaining low-halogen content per current industry standards
- Improved thermal robustness over competing low-loss Thermoset materials for better device reliability and performance consistency over time
- Low Thermal Expansion and High Glass Transition Temperature minimizes potential for PTH failures and improves operating reliability
- Low moisture absorption for improved processing and consistent performance
- Decomposition temperature >350°C is ideally suited for lead-free solder processing
- Low TCEr (temperature coefficient of the dielectric) minimizes electrical phase variation with temperature
- Certified to UL flammability requirements of UL-94 V0

Typical Applications:

- High-Speed Digital backplanes and server boards
- RF Power Amplifier motherboards
- Satellite receivers, LNB converters, and other Wireless devices
- Semiconductor burn-in-boards and other high speed, high reliability applications

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Typical Properties:

Property	Units	Value	Test Method
1. Electrical Properties			
Dielectric Constant *(may vary with Resin %)*			
@ 1 MHz	-	3.75	IPC TM-650 2.5.5.3
@ 10 GHz	-	3.70	IPC TM-650 2.5.5.5
Dissipation Factor			
@ 1 MHz	-	0.0040	IPC TM-650 2.5.5.3
@ 10 GHz	-	0.0045	IPC TM-650 2.5.5.5
Temperature Coefficient of Dielectric			
TCεr @ 10 GHz (0-140°C)	ppm/°C	+75	IPC TM-650 2.5.5.5
Volume Resistivity			
C96/35/90	MΩ-cm	$1.4x10^8$	IPC TM-650 2.5.17.1
E24/125	MΩ-cm	$5x10^8$	IPC TM-650 2.5.17.1
Surface Resistivity			
C96/35/90	MΩ	$3x10^7$	IPC TM-650 2.5.17.1
E24/125	MΩ	$6x10^7$	IPC TM-650 2.5.17.1
Electrical Strength	Volts/mil	1000	IPC TM-650 2.5.6.2
Dielectric Breakdown	kV	36.5	IPC TM-650 2.5.6
Arc Resistance	sec	190	IPC TM-650 2.5.1
2. Thermal Properties			
Glass Transition Temperature (Tg)			
TMA	°C	190	IPC TM-650 2.4.24
DSC	°C	205	IPC TM-650 2.4.25
Decomposition Temperature (Td)			
Initial	°C	390	IPC TM-650 2.3.41
5%	°C	432	IPC TM-650 2.3.41
T260	min	>60	IPC TM-650 2.4.24.1
T288	min	>60	IPC TM-650 2.4.24.1
T300	min	>60	IPC TM-650 2.4.24.1
CTE (x,y)	ppm/°C	14-16	IPC TM-650 2.4.41
CTE (z)			
< Tg	ppm/°C	20	IPC TM-650 2.4.24
> Tg	ppm/°C	150	IPC TM-650 2.4.24
z-axis Expansion (50-260°C)	%	1.2	IPC TM-650 2.4.24
3. Mechanical Properties			
Peel Strength to Copper (1 oz/35 micron)			
After Thermal Stress	lb/in (N/mm)	9.0	IPC TM-650 2.4.8
At Elevated Temperatures	lb/in (N/mm)	8.5	IPC TM-650 2.4.8.2
After Process Solutions	lb/in (N/mm)	8.0	IPC TM-650 2.4.8
Young's Modulus	Mpsi (GPa)	3.0	IPC TM-650 2.4.4
Flexural Strength (Machine / Cross)	kpsi (MPa)	39.6 / 32.3	IPC TM-650 2.4.18.3
Tensile Strength (Machine / Cross)	kpsi (MPa)	14.7 / 10.0	IPC TM-650 2.4.18.3
Compressive Modulus	kpsi (MPa)	424	ASTM D-3410
Poisson's Ratio (x, y)	-	0.28	ASTM D-3039
4. Physical Properties			
Water Absorption	%	0.1	IPC TM-650 2.6.2.1
Density, 23°C	g/cm^3	1.7	ASTM D792 Method A
Thermal Conductivity	W/mK	0.64	ASTM E1461
Flammability	class	V0	UL-94

Results listed above are typical properties, provided without warranty, expressed or implied, and without liability. Properties may vary, depending on design and application. Arlon reserves the right to change or update these values.

Prepreg Availability: refer to Arlon's process guide for fabrication recommendations

Key Electrical Properties:

Arlon Part Number	Glass Style	Scaled Flow Ho Hf
MCHF8084	1080	6.0 5.3
MCHF0690	106	5.2 4.5
MCHF0490	104	4.2 3.5

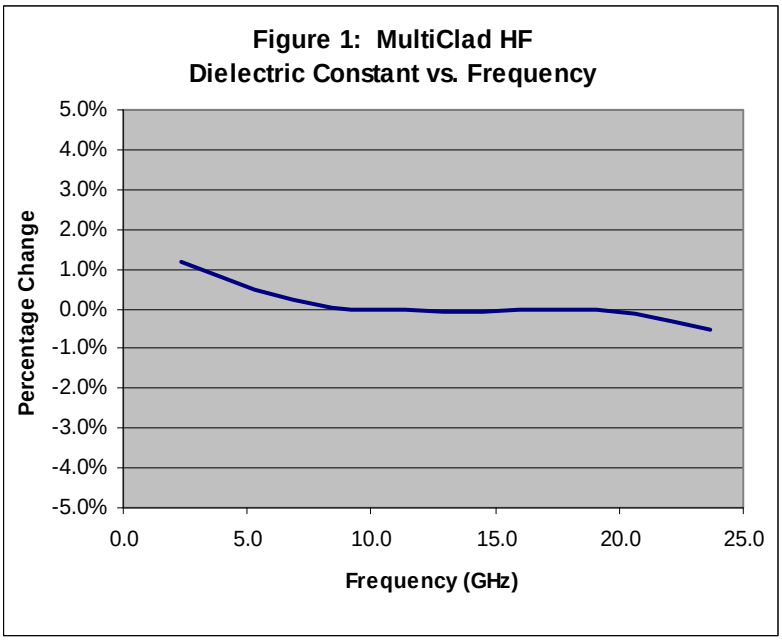

Figure 1 demonstrates the Stability of Dielectric Constant across Frequency. This information was correlated from data generated by using a free space and circular resonator cavity. This characteristic demonstrates the inherent robustness of Arlon Laminates across Frequency, thus simplifying the final design process when working across EM spectrum. When transitioning from FR-4 designs to higher frequency, the stability of the Dielectric Constant of MultiClad HF materials over frequency insures easy design transition and scalability of design.

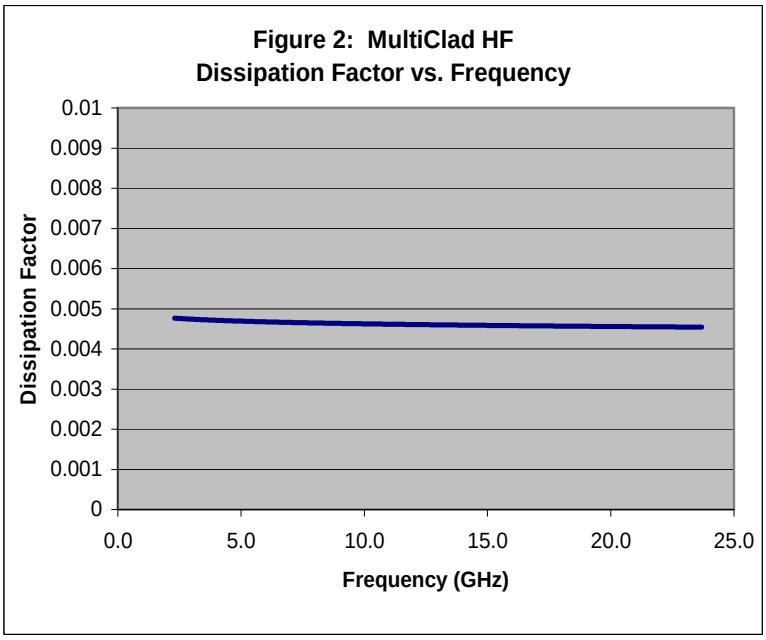

Figure 2 demonstrates the Stability of Dissipation Factor across Frequency. This characteristic demonstrates the inherent robustness of Arlon Laminates across Frequency, providing a stable platform for high frequency applications where signal integrity is critical to the overall performance of the application.

North America:
9433 Hyssop Drive, Rancho Cucamonga, California 91730
Tel: (909) 987-9533 • Fax: (909) 987-8541

1100 Governor Lea Road, Bear, Delaware, 19701
Tel: (302) 834-2100, (800) 635-9333
Fax: (302) 834-2574

Northern Europe:
44 Wilby Avenue, Little Lever, Bolton, Lancaster, BL31QE, UK
Tel/Fax: (44) 120-457-6068

Southern Europe:
1 Bis Rue de la Remarde, 91530 Saint Cheron, France
Tel: (33) 871-096-082 • Fax: (33) 164-566-489

Arlon Material Technologies
No. 20 Datong Road, Export Processing Zone, Suzhou New & High District, Jiangsu, China
Tel (86) 512-6269-6966
Fax: (86) 512-6269-6038

Arlon Electronic Materials (Suzhou) Co., Ltd.
Building 7, Da Xing Industrial Park of Suzhou New & High District
Jinangsu, China 21500
Tel: (86) 512-6672-1698
Fax: (86) 512-6672-1697

Eastern China:
Room 11/401, No. 8, Hong Gu Road, Shanghai, China, 200336
Tel/Fax: (86) 21-6209-0202

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