

ARLON

MATERIALS FOR ELECTRONICS DIVISION



MICROWAVE & RF MATERIALS
GUIDE



RF & Microwave Materials Guide

This guide covers typical properties for a wide variety of Arlon’s microwave material products, ranging from our high performance PTFE laminates to our cost-optimized PTFE and non-PTFE based laminates and composites. Although a complete summary of Arlon’s capabilities and full product-line is not feasible, this guide provides a good overview of the core microwave material products that Arlon produces and covers typical properties as well as the wide variety of standard product options as far as laminate thicknesses and nominal dielectric constants. To reduce complexity and confusion, the following information represents the standard and common items.

Please contact Customer Service if you do not see your desired thickness or dielectric constant or require additional assistance. For more detail on a specific product, please refer to the product specific datasheet available on-line at www.arlon-med.com.

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Typical properties are listed in this guide are for reference purposes only; they are not to be used as specification limits. This information creates no expressed or implied warranties. The properties of Arlon laminates may vary depending on the design and application.



MICROWAVE MATERIALS

PRODUCT OVERVIEW

Product	Composition	Dielectric Constant @ 10 GHz	Dissipation Factor @ 10 GHz	Thermal Coefficient of Er ppm/°C	Coefficient of Thermal Expansion (ppm/°C)			Typical Peel Strength (lbs)	Water Absorption (%)	Specific Gravity (unitless) or Density (g/cm ³)	Thermal Conductivity (W/mK)	NASA Outgassing		Flammability UL Rating
					X	Y	Z					Total Mass Loss (%)	Collected Volatile (%)	

Traditional - Highest Performance. PTFE Coated Light Woven Glass Styles, interdispersed PTFE films

DiClad 522	Woven Fiberglass reinforced PTFE	2.40 - 2.60 *	0.0018	-153	14	21	173	14	0.03	2.31	0.254	0.02	0.00	UL94-V0
DiClad 527	Woven Fiberglass reinforced PTFE	2.40 - 2.60 *	0.0018	-153	14	21	173	14	0.03	2.31	0.254	0.02	0.00	UL94-V0
DiClad 870	Woven Fiberglass reinforced PTFE	2.33	0.0013	-161	17	29	217	14	0.02	2.26	0.257	0.02	0.00	UL94-V0
DiClad 880	Woven Fiberglass reinforced PTFE	2.17, 2.20	0.0009	-160	25	34	252	14	0.02	2.23	0.261	0.01	0.01	UL94-V0
CuClad 250GT	Cross Plied Woven Fiberglass reinforced PTFE	2.50	0.001	-170	18	19	177	14	0.03	2.31	0.254	0.01	0.00	UL94-V0
CuClad 250GX	Cross Plied Woven Fiberglass reinforced PTFE	2.40 - 2.60 *	0.0022	-170	18	19	177	14	0.03	2.31	0.254	0.01	0.00	UL94-V0
CuClad 233LX	Cross Plied Woven Fiberglass reinforced PTFE	2.33	0.0013	-171	23	24	194	14	0.02	2.26	0.258	0.01	0.01	UL94-V0
CuClad 217LX	Cross Plied Woven Fiberglass reinforced PTFE	2.17, 2.20	0.0009	-151	29	28	246	14	0.02	2.23	0.261	0.01	0.01	UL94-V0
IsoClad 933	Non-Woven Fiberglass reinforced PTFE	2.33	0.0016	-132	31	35	203	10	0.05	2.27	0.263	0.03	0.00	UL94-V0
IsoClad 917	Non-Woven Fiberglass reinforced PTFE	2.17	0.0013	-157	46	47	236	10	0.04	2.23	0.263	0.02	0.00	UL94-V0

CLTE & CLTE-LC High Performance PTFE/ Woven Glass / Microfine Ceramic

CLTE	Glass, PTFE and Micro-Dispersed Ceramic	2.98 *	0.0025	-8	10	12	40	7	0.04	2.38	0.50	0.02	0.00	UL94-V0
CLTE-LC	Glass, PTFE and Micro-Dispersed Ceramic	2.98 *	0.0025	-10	10	12	35	7	0.04	2.38	0.50	0.02	0.00	UL94-V0

AR Series

AR 1000	Glass, PTFE and Micro-Dispersed Ceramic	10.00 *	0.003	-233	14	16	37	5	0.08	2.84	0.645	0.02	0.00	UL94-V0
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AD Series - PTFE/Glass Designed for Low Cost Commercial Applications

AD250	Woven Glass and PTFE	2.50	0.0018	-110	12	15	95	14	0.07	2.40	0.235	NT	NT	UL94-V0
AD255	Woven Glass and PTFE	2.55	0.0018	-110	12	15	95	14	0.07	2.40	0.235	NT	NT	UL94-V0
AD270	Woven Glass and PTFE	2.70	0.003	-110	12	15	95	14	0.07	2.40	0.235	NT	NT	UL94-V0
AD300	Woven Glass and PTFE	3.00	0.003	-110	12	15	95	14	0.07	2.40	0.235	NT	NT	UL94-V0
AD320	Woven Glass and PTFE	3.20	0.003	-110	12	15	95	14	0.07	2.40	0.235	NT	NT	UL94-V0
AD350	Glass, PTFE and Micro-Dispersed Ceramic	3.50	0.003	-110	12	15	95	17	0.06	2.40	0.235	NT	NT	UL94-V0
AD350A	Glass, PTFE and Micro-Dispersed Ceramic	3.50	0.003	-55	5	9	35	17	0.1	2.10	0.45	0.02	0.02	UL94-V0
AD410	Glass, PTFE and Micro-Dispersed Ceramic	4.10	0.003	-55	9	9	40	17	0.06	2.10	0.46	NT	NT	UL94-V0
AD450	Glass, PTFE and Micro-Dispersed Ceramic	4.50	0.0035	-233	8	11	42	> 12	0.07	2.45	0.38	0.01	0.01	UL94-V0
AD5	Glass, PTFE and Micro-Dispersed Ceramic	5.10 *	0.003	-300	15	15	45	5	0.05	2.45	0.46	NT	NT	UL94-V0
AD600	Glass, PTFE and Micro-Dispersed Ceramic	6.15 *	0.003	-241	11	10	45	12	0.04	2.45	0.46	0.02	0.01	UL94-V0
AD1000	Glass, PTFE and Micro-Dispersed Ceramic	10.20 *	0.0023	-380	8	10	20	> 12	0.03	3.2	0.81	0.01	0.00	UL94-V0
AD10	Glass, PTFE and Micro-Dispersed Ceramic	10.20 *	0.005	-423	6	6	8	4	0.03	2.80	0.55	NT	NT	UL94-V0

Non PTFE Low Loss Thermoset Resin Systems

25N	Ceramic Hydrocarbon	3.38	0.0025	-87	15	15	52	5	0.09	1.70	0.45	0.17	0.24	N/A
25FR	Ceramic Hydrocarbon	3.58	0.0035	50	16	18	59	5	0.09	1.80	0.45	0.01	0.00	UL94-V0
11N	Reinforced High Performance Resin	3.73	0.01	-195	12	12	46	9	0.1	1.80	0.35	0.02	0.02	UL94-V0

Microporous, Closed Cell Foam Laminate

FoamClad	Foamed Composite	1.10 - 1.30 *	0.002 - 0.004	-88	25	25	N/A	7	0.5	0.35	0.1	N/A	N/A	N/A
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* Refer to Tables for Dielectric Constant and Thickness Options



DiClad® Series

Unidirectional woven fiberglass / PTFE laminates available in a range of Dk's (2.17 to 2.6) and low dielectric loss values (0.0009 to 0.0022).

Product	Standard Thickness		Available Nominal Dielectric Constant Options
	Inches	Millimeters	
DiClad 522 (Thicknesses represent overall laminate thickness, including copper foil) Master Sheet Size** : 36"x72", 36"x48", 36"x36"	0.015"	0.381	2.50, 2.55
	0.020"	0.508	2.50
	0.024"	0.610	2.50, 2.60
	0.031"	0.787	2.45, 2.50, 2.55, 2.60
	0.047"	1.194	2.50, 2.55, 2.60
	0.062"	1.575	2.45, 2.50, 2.55, 2.60
	0.093"	2.363	2.55
	0.125"	3.175	2.50, 2.55, 2.60
	0.187"	4.750	2.50
DiClad 527 Master Sheet Size** : 36"x72", 36"x48", 36"x36"	0.005"	0.127	2.50, 2.55
	0.010"	0.254	2.45, 2.50, 2.55, 2.60
	0.015"	0.381	2.45, 2.50, 2.55
	0.020"	0.508	2.40, 2.45, 2.50, 2.55
	0.031"	0.787	2.40, 2.45, 2.50, 2.55, 2.60
	0.040"	1.016	2.40, 2.45, 2.50, 2.55, 2.60
	0.047"	1.194	2.50
	0.060"	1.524	2.50, 2.55
	0.062"	1.575	2.40, 2.45, 2.50, 2.55, 2.60
DiClad 870 Master Sheet Size** : 36"x72", 36"x48", 36"x36"	0.005"	0.127	2.33
	0.010"	0.254	2.33
	0.015"	0.381	2.33
	0.020"	0.508	2.33
	0.030"	0.762	2.33
	0.040"	1.016	2.33
	0.060"	1.524	2.33
	0.125"	3.175	2.33
DiClad 880 Master Sheet Size** : 36"x72", 36"x48", 36"x36"	0.005"	0.127	2.17, 2.20
	0.010"	0.254	2.17, 2.20
	0.015"	0.381	2.17, 2.20
	0.020"	0.508	2.17, 2.20
	0.030"	0.762	2.17, 2.20
	0.050"	1.270	2.17, 2.20
	0.060"	1.524	2.17, 2.20
	0.125"	3.175	2.17, 2.20



MICROWAVE MATERIALS

CuClad® Series

Cross-plyed woven fiberglass / PTFE laminates available in a range of Dk's (2.17 to 2.6) and loss (0.0009 to 0.0022). The sequential layers of fabric are cross-plyed to insure in-plane isotropy for applications requiring matched electrical properties in the X-Y plane.

Product	Standard Thickness		Available Nominal Dielectric Constant Options
	Inches	Millimeters	
CuClad 250GX Master Sheet Size** : 36"x48" (non-cross-plyed), 36"x36" (cross-plyed)	0.004"	0.102	2.4
	0.010"	0.254	2.48, 2.55
	0.015"	0.381	2.44, 2.48, 2.55
	0.020"	0.508	2.45, 2.48, 2.50, 2.55
	0.030"	0.762	2.40, 2.45, 2.50, 2.55
	0.031"	0.787	2.45, 2.50, 2.55
	0.047"	1.194	2.50
	0.060"	1.524	2.40, 2.45, 2.50, 2.55
	0.062"	1.575	2.45, 2.50, 2.55
	0.093"	2.362	2.48
	0.120"	3.048	2.45, 2.50, 2.55
	0.125"	3.175	2.45, 2.50, 2.55
CuClad 250GT (Thicknesses represent overall laminate thickness, including copper foil) Master Sheet Size** : 36"x48" (non-cross-plyed), 36"x36" (cross-plyed)	0.010"	0.254	2.50
	0.015"	0.381	2.50
	0.020"	0.508	2.50
	0.031"	0.787	2.50
	0.047"	1.194	2.50
	0.062"	1.575	2.50
	0.094"	2.388	2.50
	0.125"	3.175	2.50
	0.187"	4.750	2.50
	0.250"	6.350	2.50
CuClad 233GY & 233LX Master Sheet Size** : GY - 36"x48" (non-cross plyed), 36"x36" (cross-plyed) LX - 34"x48" (non-cross plyed), 34"x36" (cross-plyed) (LX represents a premium grade with additional testing and certificate of analysis)	0.005"	0.127	2.33
	0.010"	0.254	2.33
	0.015"	0.381	2.33
	0.020"	0.508	2.33
	0.031"	0.787	2.33
	0.045"	1.143	2.33
	0.062"	1.575	2.33
	0.125"	3.175	2.33
CuClad 217GY & 217LX Master Sheet Size** : GY - 36"x48" (non-cross plyed), 36"x36" (cross-plyed) LX - 34"x48" (non-cross plyed), 34"x36" (cross-plyed) (LX represents a premium grade with additional testing and certificate of analysis)	0.005"	0.127	2.17
	0.010"	0.254	2.17
	0.015"	0.381	2.17
	0.020"	0.508	2.17
	0.025"	0.635	2.17
	0.031"	0.787	2.17
	0.040"	1.016	2.17, 2.20
	0.045"	1.143	2.17
	0.060"	1.524	2.17
	0.062"	1.575	2.17
	0.125"	3.175	2.17



CuClad® Series

Cross-plyed woven fiberglass / PTFE laminates available in a range of Dk's (2.17 to 2.6) and loss (0.0009 to 0.0022). The sequential layers of fabric are cross-plyed to insure in-plane isotropy for applications requiring matched electrical properties in the X-Y plane.

Product	Standard Thickness		Available Nominal Dielectric Constant Options
	Inches	Millimeters	
CuClad 250LX Master Sheet Size** : 34"x48" (non-cross-plyed), 34"x36" (cross-plyed) (LX represents a premium grade with additional testing and certificate of analysis)	0.0053"	0.135	2.53
	0.0101"	0.257	2.48, 2.55
	0.0147"	0.373	2.44, 2.55
	0.0193"	0.490	2.43
	0.030"	0.762	2.45, 2.50, 2.55
	0.031"	0.787	2.45
	0.060"	1.524	2.41, 2.42, 2.43, 2.45, 2.50, 2.55
	0.0625"	1.588	2.50, 2.55
	0.090"	2.286	2.50
	0.125"	3.175	2.45, 2.50, 2.55

IsoClad® Series

Non-woven fiberglass / PTFE laminates available in a of Dk's of either 2.17 or 2.33 with a loss tangent of 0.0013 or 0.0016 respectively. These materials offer lower modulus permitting a more flexible thin laminate than is typical with a woven glass reinforced product.

Product	Standard Thickness		Available Nominal Dielectric Constant Options
	Inches	Millimeters	
IsoClad 933 Master Sheet Size** : 36"x48" & 36"x72"	0.005"	0.127	2.33
	0.010"	0.254	2.33
	0.015"	0.381	2.33
	0.020"	0.508	2.33
	0.031"	0.787	2.33
	0.045"	1.143	2.33
	0.060"	1.524	2.33
IsoClad 917 Master Sheet Size : 36"x48" & 36"x72"	0.005"	0.127	2.17
	0.010"	0.254	2.17
	0.015"	0.381	2.17
	0.020"	0.508	2.17
	0.031"	0.787	2.17
	0.045"	1.143	2.17
	0.062"	1.575	2.17



CLTE and CLTE-LC

Glass / PTFE / micro-dispersed ceramic laminates. Offers superior thermomechanical (CTE) stability and Dk over temperature with best-in-class processibility for a PTFE-based laminate.

Product	Standard Thickness		Available Nominal Dielectric Constant Options
	Inches	Millimeters	
CLTE Master Sheet Size** : 36"x48"	0.003"	0.076	2.75
	0.0053"	0.135	2.85
	0.010"	0.254	2.94
	0.015"	0.381	2.95
	0.020"	0.508	2.96
	0.024"	0.610	2.97
	0.031"	0.787	2.98
	0.040"	1.016	2.98
	0.047"	1.194	2.98
	0.062"	1.575	2.98
	0.093"	2.362	2.98
	0.125"	3.175	2.98
	0.150"	3.810	2.98
CLTE-LC Master Sheet Size** : 36"x48"	0.010"	0.254	2.94
	0.020"	0.508	2.96
	0.030"	0.762	2.98
	0.047"	1.194	2.98
	0.062"	1.575	2.98
	0.093"	2.362	2.98

AR Series

Glass / PTFE laminates with or without micro-dispersed ceramic fillers.

Product	Standard Thickness		Nominal Dielectric Constant		
	Inches	Millimeters	AR300	AR320	AR1000
AR SERIES Master Sheet Size** : 36"x48" for AR1000 36"x72" & 36"x48" for AR300 and AR320	0.015"	0.381	--	--	9.6
	0.020"	0.508	3.00	--	9.6
	0.024"	0.610	--	3.20	9.7
	0.031"	0.787	3.00	3.20	9.7
	0.047"	1.194	--	3.20	9.7
	0.050"	1.270	--	--	9.8
	0.062"	1.575	3.00	3.20	9.8
	0.093"	2.362	--	3.20	9.8
	0.100"	2.540	--	--	9.8
	0.125"	3.175	--	3.20	--

AD Series

Cost-optimized Glass / PTFE or Glass / PTFE / micro-dispersed ceramic laminates.

	Standard Thickness		Nominal Dielectric Constant													
	Inches	Millimeters	AD250	AD255	AD270	AD295	AD300	AD320	AD350	AD350A	AD360	AD410	AD450	AD600	AD1000	
AD SERIES	0.005"	0.127	--	--	--	--	--	--	--	--	--	--	--	--	--	
	0.010"	0.025	--	--	--	--	--	--	--	--	--	--	4.50	6.00	--	
	0.015"	0.381	--	--	2.70	--	--	--	--	--	--	--	--	--	--	
	0.020"	0.508	2.50	2.55	2.70	--	3.00	3.20	3.50	3.50	--	4.50	4.50	--	10.00	
	0.024"	0.610	--	--	--	--	--	--	--	--	--	--	--	6.15	--	
	0.025"	0.635	--	--	--	--	--	--	--	--	--	--	--	--	10.20	
	0.030"	0.762	--	--	--	--	--	--	3.50	3.50	--	4.50	4.50	--	10.35	
	0.031"	0.787	2.50	2.55	2.70	--	3.00	3.20	--	--	--	--	4.50	6.15	--	
	0.050"	1.270	--	--	--	--	--	--	--	--	--	--	--	--	10.60	
	0.059"	1.499	--	--	--	--	--	--	--	--	--	--	--	--	10.70	
	0.060"	1.524	--	--	--	--	--	--	3.50	3.50	--	--	4.50	--	--	
	0.062"	1.575	2.50	2.55	2.70	2.95	3.00	3.20	--	--	3.60	4.10	--	6.15	--	
	0.090"	2.286	--	--	--	--	--	--	--	--	--	--	4.50	--	--	
	0.093"	2.362	--	--	2.70	--	--	--	--	--	--	--	--	--	--	
	0.120"	3.048	--	--	--	--	--	--	--	--	--	--	4.50	--	--	
	0.125"	3.175	--	--	--	--	--	--	--	--	4.10	--	--	--	--	
	0.200"	5.080	--	--	--	--	--	--	--	--	--	--	4.50	--	--	

Master Sheet Size** :
36"x48"

AD5 & AD10

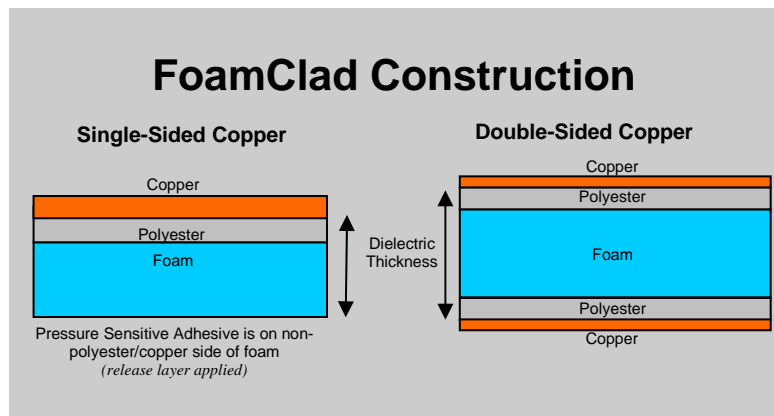
Ultra-thin, high dielectric, glass / PTFE / micro-dispersed ceramic laminates, ideal for miniaturization of microwave components.

Product	Standard Thickness		Available Nominal Dielectric Constant Options
	Inches	Millimeters	
AD5 (18"x24" panels only)	0.003"	0.076	5.1
AD10 (18"x24" panels only)	0.0024"	0.061	10.2

FoamClad

Low-cost, light weight, foam-based laminate for antenna applications.

Product	Standard Thickness		Available Nominal Dielectric Constant Options
	Inches	Millimeters	
FoamClad^{R/F} 100 Double-sided Master Sheet Size : up to 24"x78" standard (*118" length with conditions)	0.043"	1.092	1.35
	0.074"	1.880	1.25
	0.106"	2.692	1.20
	0.137"	3.480	1.16
	0.200"	5.080	1.10
	0.266"	6.756	1.10
FoamClad^{R/F} 100 Single-sided Master Sheet Size : up to 24"x78" standard (*118" length with conditions)	0.039"	0.991	1.30
	0.070"	1.778	1.20
	0.102"	2.591	1.18
	0.133"	3.378	1.16
	0.196"	4.978	1.10
	0.258"	6.553	1.10





MATERIALS FOR ELECTRONICS

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