

ARLON

TECHNOLOGY ENABLING INNOVATION

Microwave & RF Materials Guide



Advanced Materials for the Designs of Tomorrow

RF & Microwave Materials Guide

Arlon Microwave Materials specializes in products made from fluoropolymers (i.e. PTFE), ceramic filled fluoropolymers, ceramic-filled hydrocarbon thermosets, and other materials that deliver the electrical performance needed in frequency-dependent circuit applications. These products are supplied as copper-clad laminates with bonding plies, or prepregs, for production of multilayer printed circuits. Arlon has over 55 years of experience in microwave materials, today providing products that are used to make combiner boards and feed networks for microwave applications as well as base station antennas and power amplifier boards for the wireless telecommunications infrastructure market.

Our facilities in California, Delaware and China employ state-of-the-art production equipment, engineered to provide cost-effective, flexible manufacturing capacity to permit quick response to customer requirements while meeting the most stringent quality and tolerance demands. All of our manufacturing sites are ISO 9001: 2008 registered, and through rigorous quality control practices and commitment to continuous improvement, we are dedicated to meeting and exceeding our customer's requirements.

To better service our global customer base, Arlon created the venture, Arlon Material Technologies Co, Ltd. in Suzhou, Jiangsu Province, China. This venture includes both a Finishing Center and a manufacturing facility. The finishing center is located in Suzhou and has been operational since mid-2004. The Manufacturing Facility opened in October 2006. This facility contains a new, State-of-the-art vacuum press that has capability to laminate both High Temperature PTFE Microwave Laminates, High Performance Polyimide, and Low-loss Thermoset Based Substrates. This facility is equipped with the highest degree of process control in the industry.

A lower cost, higher performance, series of products lower loss have been launched in the 2.50 to 3.50 range. The AD "A" Series includes AD255A, AD260A, AD300A and others. These microwave Laminates utilize ceramic technologies to reduce loss and tighten tolerances. They are well suited for Base Station Antennas, Satellite Radio Antennas and Power Amplifiers where low loss is critical. These products are a significant improvement in cost/performance over traditional PTFE/Glass based laminates, As further cost/performance improvement over AD "A" products, AD "C" series are the third generation commercial laminate materials, designed with enhanced mechanical and electrical performance for today's telecommunication infrastructure.

One of our most exciting products is a lower loss version of CLTE, called CLTE-XT. CLTE-XT has the lowest loss, lowest thermal expansion, highest phase stability, and lowest moisture absorption of any product in its class. It is truly "Best-in-Class." Further innovations in new low loss materials are also targeted in the near future and Arlon remains committed to the development of advanced materials targeted for high performance circuit boards and electronics.

Arlon maintains a significant commitment to research & development. Exciting recent products include the Thermally Conductive PTFE-based laminates, TC600 and TC350. These materials provide "Best-in-Class" Thermal Conductivity (W/mk) for applications where temperature extremes are normal and Heat Rejection is a Primary Consideration. These materials lower junction temperatures for Improved Power Amplifier Reliability and pull heat away from critical solder joints that can fatigue through cycling. TC600 and TC350 also offer greater Thermal Phase Stability for applications that are cycled and still need to maintain tight dielectric constant tolerances for phase sensitive circuitry.

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 RF laminates and composites. Although a comprehensive 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 in 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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Properties listed in this guide are for reference purposes only and are subject to change without notice; 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.

Product Overview

Product	Composition	Dielectric Constant @ 10 GHz	Dissipation Factor @ 10 GHz	Thermal Coefficient of Er ppm/°C	Coefficient of Thermal (ppm/°C)	
					X	Y

NEXT GENERATION MICROWAVE MATERIALS	CLTE-XT, CLTE-AT and CLTE High Performance, Excellent Dielectric Constant Control and Phase Stability with Temperature						
	CLTE-XT	Glass, PTFE and Micro-Dispersed Ceramic	2.94*	0.0012	-9	8	8
	CLTE-AT	Glass, PTFE and Micro-Dispersed Ceramic	3.00	0.0013	-10	8	8
	CLTE	Glass, PTFE and Micro-Dispersed Ceramic	2.98*	0.0023*	-9	10	12
	High Thermal Conductivity, Excellent Dielectric Constant Control and Phase Stability with Temperature						
	TC350	Glass, PTFE and Micro-Dispersed Ceramic	3.50	0.0020	-9	7	7
	TC600	Glass, PTFE and Micro-Dispersed Ceramic	6.15	0.0020	-75	9	9
	AD "C" Series - Enhanced next generation of AD "A" Series. Woven Glass, PTFE and Micro-Dispersed Ceramic						
	AD255C	Glass, PTFE and Micro-Dispersed Ceramic	2.55	0.0014	-75	16	16
	AD300C	Glass, PTFE and Micro-Dispersed Ceramic	2.97	0.0020	-25	12	12
AD "A" Series - Lower Loss and Improved Performance over Traditional AD Series. Woven Glass, PTFE and Micro-Dispersed Ceramic							
AD250A	Glass, PTFE and Micro-Dispersed Ceramic	2.50	0.0015	-140	12	15	
AD255A	Glass, PTFE and Micro-Dispersed Ceramic	2.55	0.0015	-138	16	16	
AD260A	Glass, PTFE and Micro-Dispersed Ceramic	2.60	0.0017	-80	16	16	
AD300A	Glass, PTFE and Micro-Dispersed Ceramic	3.00	0.0020	-110	12	12	
AD320A	Glass, PTFE and Micro-Dispersed Ceramic	3.20	0.0032	-125	14	14	
AD350A	Glass, PTFE and Micro-Dispersed Ceramic	3.50	0.0030	-55	5	9	
High Dielectric Constant for Circuit Militarization & Patch Antenna Applications							
AD410	Glass, PTFE and Micro-Dispersed Ceramic	4.10	0.0030	-55	9	9	
AD430	Glass, PTFE and Micro-Dispersed Ceramic	4.30	0.0030	-55	9	9	
AD450	Glass, PTFE and Micro-Dispersed Ceramic	4.50	0.0035	-233	8	11	
AD450A	Glass, PTFE & Ceramic, 0.120" Thick	4.50	0.0030	-200	10	10	
AD600	Glass, PTFE and Micro-Dispersed Ceramic	6.15*	0.0030	-241	11	10	
AD1000	Glass, PTFE and Micro-Dispersed Ceramic	10.20*	0.0023	-380	8	10	
LEGACY AND ORIGINAL MICROWAVE MATERIALS	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
	DiClad 527	Woven Fiberglass reinforced PTFE	2.40 - 2.60*	0.0018	-153	14	21
	DiClad 870	Woven Fiberglass reinforced PTFE	2.33	0.0013	-161	17	29
	DiClad 880	Woven Fiberglass reinforced PTFE	2.17, 2.20	0.0009	-160	25	34
	CuClad 250GT	Cross Plied Woven Fiberglass reinforced PTFE	2.50	0.0018	-170	18	19
	CuClad 250GX	Cross Plied Woven Fiberglass reinforced PTFE	2.40 - 2.55*	0.0018	-170	18	19
	CuClad 233LX	Cross Plied Woven Fiberglass reinforced PTFE	2.33	0.0013	-171	23	24
	CuClad 217LX	Cross Plied Woven Fiberglass reinforced PTFE	2.17, 2.20	0.0009	-151	29	28
	IsoClad 933	Non-Woven Fiberglass reinforced PTFE	2.33	0.0016	-132	31	35
	IsoClad 917	Non-Woven Fiberglass reinforced PTFE	2.17	0.0013	-157	46	47
	Original AD Series - Woven Glass and PTFE or Woven Glass, PTFE and Micro-Dispersed Ceramic						
	AD250	Woven Glass and PTFE	2.50	0.0018	-110	12	15
	AD255	Woven Glass and PTFE	2.55	0.0018	-110	12	15
	AD270	Woven Glass and PTFE	2.70	0.0023	-110	12	15
AD320	Glass, PTFE and Micro-Dispersed Ceramic	3.20	0.0038	-110	12	15	
AR Series - Legacy Product. Reference AD1000 as a Next Generation Product							
AR1000	Glass, PTFE and Micro-Dispersed Ceramic	10.00*	0.0030	-233	14	16	
Low Loss Thermoset Resin Systems - Multilayer Capable, non-PTFE							
25N	Ceramin Hydrocarbon	3.38	0.0025	-87	15	15	
25FR	Ceramin Hydrocarbon	3.58	0.0035	50	16	18	

* Refer to Tables for Dielectric Constant and Thickness Options.

Expansion	Typical Peel Strength (lbs)	Water Absorption (%)	Specific Gravity	Thermal Conductivity (W/mK)	NASA Outgassing		Flammability UL Rating
					Total Mass Loss (%)	Collected Volatile (%)	
Z							
20	7.2	0.02	2.02	0.56	0.02	0.00	UL94-V0
20	6.5	0.03	2.06	0.64	0.02	0.00	UL94-V0
34	7	0.04	2.38	0.50	0.02	0.00	UL94-V0
23	7	0.05	2.30	1.03	0.02	0.01	UL94-V0
35	8	0.03	3.20	1.1(z), 1.4(x,y)	0.02	0.00	UL94-V0
50	12	0.04	2.30	0.30	NT	NT	UL94-V0
50	13	0.05	2.10	0.45	NT	NT	UL94-V0
95	14	0.04	2.25	0.28	NT	NT	UL94-V0
80	12	0.04	2.30	0.30	NT	NT	UL94-V0
80	17	0.04	2.30	0.32	NT	NT	UL94-V0
125	13	0.02	2.10	0.49	NT	NT	UL94-V0
128	14	0.02	2.09	0.45	NT	NT	UL94-V0
35	17	0.1	2.10	0.45	0.02	0.02	UL94-V0
40	17	0.06	2.10	0.46	NT	NT	UL94-V0
40	17	0.06	2.10	0.46	NT	NT	UL94-V0
42	> 12	0.07	2.45	0.38	0.01	NT	UL94-V0
40	12	0.06	2.50	0.40	NT	NT	UL94-V0
45	12	0.04	2.45	0.46	0.02	0.01	UL94-V0
20	> 12	0.03	3.2	0.81	0.01	0.00	UL94-V0
173	14	0.03	2.31	0.254	0.02	0.00	UL94-V0
173	14	0.03	2.31	0.254	0.02	0.00	UL94-V0
217	14	0.02	2.26	0.257	0.02	0.00	UL94-V0
252	14	0.02	2.23	0.261	0.01	0.01	UL94-V0
177	14	0.03	2.31	0.254	0.01	0.00	UL94-V0
177	14	0.03	2.31	0.254	0.01	0.00	UL94-V0
194	14	0.02	2.26	0.258	0.01	0.01	UL94-V0
246	14	0.02	2.23	0.261	0.01	0.01	UL94-V0
203	10	0.05	2.27	0.263	0.03	0.00	UL94-V0
236	10	0.04	2.23	0.263	0.02	0.00	UL94-V0
95	14	0.07	2.40	0.235	NT	NT	UL94-V0
95	14	0.07	2.40	0.235	NT	NT	UL94-V0
95	14	0.07	2.40	0.235	NT	NT	UL94-V0
95	17	0.06	2.40	0.235	NT	NT	UL94-V0
37	5	0.08	2.84	0.645	0.02	0.00	UL94-V0
52	5	0.09	1.70	0.45	0.17	0.01	N/A
59	5	0.09	1.80	0.45	0.24	0.00	UL94-V0

CLTE-XT, CLTE-AT and CLTE

CLTE-XT is the next generation of CLTE with “Best-In-Class” Loss Tangent and Lowest Insertion loss in its class. Excellent dimensional stability, Phase Stability and CTE performance.

CLTE-AT is commercially priced product. It uses common technologies developed for CLTE-XT, and with some changes to make the product more affordable, but with less stringent tolerances. To maintain its lower cost base, CLTE-AT has less options for copper style and panel sizes.

CLTE is 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			Dielectric Constant	
	Inches	Millimeters	Tolerance (Inches)	Nominal	Tolerance
CLTE-XT Master Sheet Size** 36" x 48"	0.0051	0.130	±0.0005	2.79	±0.03
	0.0094	0.239	±0.0007	2.89	±0.03
	0.0145	0.369	±0.001	2.94	±0.03
	0.020	0.508	±0.001	2.92	±0.03
	0.025	0.635	±0.001	2.94	±0.03
	0.030	0.762	±0.001	2.94	±0.03
	0.040	1.016	±0.002	2.94	±0.03
	0.045	1.143	±0.002	2.94	±0.03
	0.048	1.219	±0.0024	2.95	±0.03
	0.059	1.499	±0.002	2.95	±0.03
	0.060	1.524	±0.002	2.94	±0.03
	0.070	1.778	±0.003	2.95	±0.03
	0.090	2.286	±0.003	2.98	±0.03
	0.100	2.540	±0.003	3.01	±0.03
0.120	3.048	±0.003	3.01	±0.03	
CLTE-AT Master Sheet Size** 36" x 48"	0.005	0.127	±0.0005	3.00	±0.04
	0.010	0.254	±0.0007	3.00	±0.04
	0.015	0.381	±0.001	3.00	±0.04
	0.020	0.508	±0.0015	3.00	±0.04
	0.025	0.635	±0.002	3.00	±0.04
	0.030	0.762	±0.002	3.00	±0.04
	0.040	1.016	±0.0025	3.00	±0.04
	0.050	1.270	±0.0025	3.00	±0.04
	0.060	1.524	±0.003	3.00	±0.04
	0.090	2.286	±0.005	3.02	±0.04
0.125	3.175	±0.006	3.02	±0.04	
CLTE Master Sheet Size** 36" x 48"	0.003	0.076	±0.0005	2.75	±0.08
	0.0053	0.135	±0.0005	2.85	±0.06
	0.010	0.254	±0.001	2.94	±0.06
	0.015	0.381	±0.0015	2.95	±0.04
	0.020	0.508	±0.002	2.96	±0.04
	0.024	0.610	±0.002	2.97	±0.04
	0.031	0.787	±0.002	2.98	±0.04
	0.040	1.016	±0.003	2.98	±0.04
	0.047	1.194	±0.003	2.98	±0.04
	0.062	1.575	±0.004	2.98	±0.04
	0.093	2.362	±0.005	2.98	±0.04

**Master Sheet Sizes are not available on all products or thicknesses. Tolerances are subject to change and custom tolerances may be available. Please contact Arlon Customer Service with questions about material availability.

TC Series

TC350 and TC600 offer “Best-In-Class” Thermal Conductivity and Dielectric Constant Stability with Temperature leading to excellent impedance control and electrical phase stability. Excellent thermomechanical (CTE) stability for highly reliability plated thru holes and component attachment.

Product	Standard Thickness			Dielectric Constant	
	Inches	Millimeters	Tolerance (Inches)	Nominal	Tolerance
TC350 Master Sheet Size** 36" x 48"	0.005	0.127	±0.0005	3.50	±0.05
	0.010	0.254	±0.0007	3.50	±0.05
	0.015	0.381	±0.001	3.50	±0.05
	0.020	0.508	±0.0015	3.50	±0.05
	0.025	0.635	±0.002	3.50	±0.05
	0.030	0.762	±0.002	3.50	±0.05
	0.040	1.016	±0.003	3.50	±0.05
	0.050	1.270	±0.003	3.50	±0.05
	0.060	1.524	±0.003	3.50	±0.05
	0.090	2.286	±0.004	3.50	±0.05
	0.100	2.540	±0.005	3.50	±0.05
	0.120	3.048	±0.008	3.50	±0.05
	0.125	3.175	±0.008	3.50	±0.05
	0.250	6.350	±0.012	3.50	±0.05
TC600 Master Sheet Size** 36" x 48"	0.010	0.254	±0.0007	6.15	±0.15
	0.015	0.381	±0.001	6.15	±0.15
	0.020	0.508	±0.001	6.15	±0.15
	0.025	0.635	±0.0015	6.15	±0.15
	0.030	0.162	±0.002	6.15	±0.15
	0.035	0.889	±0.002	6.15	±0.15
	0.040	1.016	±0.002	6.15	±0.15
	0.050	1.270	±0.002	6.15	±0.15
	0.060	1.524	±0.003	6.15	±0.15
	0.090	2.286	±0.004	6.15	±0.15
	0.125	3.175	±0.004	6.15	±0.15
0.250	6.350	±0.008	6.15	±0.15	

*Master Sheet Sizes are not available on all products or thicknesses. Tolerances are subject to change and custom tolerances may be available. Please contact Arlon Customer Service with questions about material availability.

AD “C” Series

Enhanced next generation products of AD “A” Series in terms of cost, mechanical and electrical performances, such as lower loss tangent, lower thermal expansion (CTE) and lower TCER (for better phase stability), and improved passive intermodulation (PIM) performance.

Product**	Standard Thickness			Dielectric Constant	
	Inches	Millimeters	Tolerance (Inches)	Nominal	Tolerance
AD255C	0.030	0.762	±0.002	2.55	±0.04
	0.060	1.524	±0.003	2.55	±0.04
AD300C	0.030	0.762	±0.002	2.97	±0.05
	0.060	1.524	±0.002	2.97	±0.05

**Master Sheet Size of 48" x 54" , other DK, thickness options available. Tolerances are subject to change and custom tolerances may be available. Please contact Arlon Customer Service with questions about material availability.

AD “A” Series

Advancements and improvements to the original AD Series, low cost commercial laminates. Lower loss tangent, tighter dielectric and thickness tolerances, and PIM+ design offerings.

Product**	Standard Thickness			Dielectric Constant	
	Inches	Millimeters	Tolerance (Inches)	Nominal	Tolerance
AD250A	0.030	0.762	±0.002	2.50	±0.04
	0.060	1.524	±0.003	2.50	±0.04
	0.080	2.032	±0.004	2.50	±0.04
	0.250	6.350	±0.012	2.50	±0.04
AD255A (AD255C provides lower cost and better performance)	0.030	0.762	±0.002	2.55	±0.04
	0.031	0.787	±0.003	2.55	±0.04
	0.040	1.016	±0.003	2.55	±0.04
	0.060	1.524	±0.003	2.55	±0.04
	0.062	1.575	±0.003	2.55	±0.04
	0.080	2.032	±0.003	2.55	±0.04
AD260A	0.040	1.016	±0.002	2.60	±0.04
	0.060	1.524	±0.002	2.60	±0.04
	0.090	2.286	±0.003	2.60	±0.04
	0.125	3.175	±0.006	2.60	±0.04
AD300A (AD300C provides lower cost and better performance)	0.020	0.508	±0.002	3.00	±0.04
	0.030	0.762	±0.002	3.00	±0.04
	0.040	1.016	±0.002	3.00	±0.04
	0.060	1.524	±0.002	3.00	±0.04
	0.090	2.286	±0.005	3.00	±0.04
	0.120	3.048	±0.006	3.00	±0.04
	0.125	3.175	±0.006	3.00	±0.04
AD320A	0.030	0.762	±0.002	3.20	±0.04
	0.040	1.016	±0.002	3.20	±0.04
	0.045	1.143	±0.003	3.20	±0.04
	0.062	1.575	±0.003	3.20	±0.04
	0.125	3.175	±0.006	3.20	±0.04
AD350A	0.020	0.508	±0.015	3.50	±0.05
	0.030	0.762	±0.002	3.50	±0.05
	0.040	1.016	±0.003	3.50	±0.05
	0.060	1.524	±0.003	3.50	±0.05
	0.090	2.286	±0.004	3.50	±0.05
	0.120	3.048	±0.008	3.50	±0.05
	0.125	3.175	±0.008	3.50	±0.05
	0.200	5.080	±0.012	3.50	±0.05

** Master Sheet Size of 36" x 48" is standard. Other DK or thickness options available. Tolerances are subject to change and custom tolerances may be available. Please contact Arlon Customer Service with questions about material availability.

High Dielectric Constant

For Circuit Miniaturization & High Gain Patch Antenna Applications. Excellent for applications requiring low loss, a higher dielectric constant, as well as mechanical robustness capable of handling stress, vibration or drop tests. Much more durable than either Alumina or Ceramic loaded Hydrocarbons.

Product**	Standard Thickness			Dielectric Constant	
	Inches	Millimeters	Tolerance (Inches)	Nominal	Tolerance
AD410	0.030	0.762	±0.002	4.10	±0.12
	0.062	1.575	±0.003	4.10	±0.12
	0.075	1.905	±0.004	4.10	±0.12
	0.120	3.048	±0.006	4.10	±0.12
	0.125	3.075	±0.006	4.06	±0.06
	0.250	6.350	±0.008	4.10	±0.12
AD430	0.030	0.762	±0.002	4.30	±0.06
	0.125	3.175	±0.006	4.23	±0.06
AD450	0.010	0.254	±0.001	4.50	±0.25
	0.020	0.508	±0.0015	4.50	±0.25
	0.030	0.762	±0.002	4.50	±0.25
	0.040	1.016	±0.003	4.50	±0.25
	0.050	1.270	±0.003	4.50	±0.25
	0.060	1.524	±0.003	4.50	±0.25
	0.070	1.778	±0.004	4.50	±0.25
	0.090	2.286	±0.005	4.50	±0.25
	0.180	4.572	±0.009	4.50	±0.25
	0.200	5.080	±0.010	4.50	±0.25
AD450A	0.230	5.842	±0.010	4.50	±0.25
AD600	0.120	3.048	±0.006	4.50	±0.06
	0.010	0.254	±0.001	6.15	±0.40
	0.020	0.508	±0.0015	6.15	±0.40
	0.031	0.787	±0.002	6.15	±0.40, ±0.15
	0.062	1.575	±0.003	6.15	±0.40
AD600A	0.090	2.286	±0.005	6.15	±0.40
AD1000	0.250	6.350	±0.012	6.15	±0.15
	0.006	0.152	±0.0005	7.80	±0.35
	0.0105	0.267	±0.001	9.10	±0.35, ±0.25
	0.015	0.381	±0.0015	9.70	±0.35, ±0.25
	0.020	0.508	±0.002	10.0	±0.35, ±0.25
	0.025	0.635	±0.002	10.2	±0.35, ±0.25
	0.030	0.762	±0.002	10.35	±0.35
	0.050	1.270	±0.002	10.6	±0.35, ±0.25
	0.059	1.499	±0.003	10.7	±0.35
AD1000X	0.127	3.226	±0.006	10.9	±0.35
AD1000X	0.050	1.270	±0.002	10.2	±0.35
	0.098	2.489	±0.005	10.2	±0.35
	0.125	3.175	±0.006	10.2	±0.35

**Master Sheet Size of 36" x 48" is standard. Other thicknesses available. Tolerances are subject to change and custom tolerances may be available. Please contact Arlon Customer Service with questions about material availability.

AD Series

The original AD Series is designed for commercial applications relying on a thicker laminate that are driven by low cost. PIM design offerings. Typical applications include base station antennas and BSA feed networks. Through the use of thicker building blocks and thicker glass styles, lower costs are achieved through less labor and machine time.

Product**	Standard Thickness			Dielectric Constant	
	Inches	Millimeters	Tolerance (Inches)	Nominal	Tolerance
AD250	0.010	0.254	±0.001	2.50	±0.05
	0.015	0.381	±0.0015	2.50	±0.05
	0.020	0.508	±0.002	2.50	±0.05
	0.031	0.787	±0.003	2.50	±0.05
	0.062	1.575	±0.003	2.50	±0.05
	0.090	2.286	±0.007	2.50	±0.05
	0.125	3.175	±0.009	2.50	±0.05
AD255 (check options with AD255A and AD255C for lower loss tangent and tighter tolerances)	0.010	0.254	±0.001	2.55	±0.05
	0.020	0.508	±0.002	2.55	±0.05
	0.030	0.762	±0.003	2.55	±0.05
	0.031	0.787	±0.003	2.55	±0.05
	0.040	1.016	±0.003	2.55	±0.05
	0.060	1.524	±0.003	2.55	±0.05
	0.062	1.575	±0.003	2.55	±0.05
	0.080	2.032	±0.004	2.55	±0.05
	0.120	3.048	±0.009	2.55	±0.05
	0.125	3.175	±0.009	2.55	±0.05
AD270	0.015	0.381	±0.0015	2.70	±0.05
	0.020	0.508	±0.002	2.70	±0.05
	0.031	0.787	±0.003	2.70	±0.05
	0.040	1.016	±0.003	2.70	±0.05
	0.062	1.575	±0.003	2.70	±0.05
	0.093	2.362	±0.007	2.70	±0.05
AD320 (AD320A offers lower loss tangent and tighter tolerances)	0.015	0.381	±0.002	3.20	±0.10
	0.020	0.508	±0.002	3.20	±0.10
	0.031	0.787	±0.002	3.20	±0.10
	0.062	1.575	±0.003	3.20	±0.10
	0.093	2.362	±0.007	3.20	±0.10

**Master Sheet Size of 36" x 48" is standard. Tolerances are subject to change and custom tolerances may be available. Please contact Arlon Customer Service with questions about material availability.

DiClad® Series

Unidirectional woven fiberglass / PTFE laminates available in a range of Dk's (2.17 to 2.60) and low dielectric loss values (0.0009 to 0.0018). These products use finer glass styles for precision and have a very high degree of low loss PTFE.

Product	Standard Thickness			Dielectric Constant	
	Inches	Millimeters	Tolerance (Inches)	Nominal	Tolerance
DiClad 522 (Thickness listed includes copper cladding) Master Sheet Size** : 36"x72", 36"x48", 36"x36"	0.015	0.381	±0.0015	2.50, 2.55	±0.05
	0.020	0.508	±0.002	2.50	±0.05
	0.024	0.610	±0.002	2.50, 2.60	±0.05
	0.031	0.787	±0.002	2.45, 2.50, 2.55, 2.60	±0.05
	0.047	1.194	±0.002	2.50, 2.55, 2.60	±0.05
	0.062	1.575	±0.003	2.45, 2.50, 2.55, 2.60	±0.05
	0.093	2.363	±0.004	2.55	±0.05
	0.125	3.175	±0.004, ±0.005	2.50, 2.55, 2.60	±0.05
	0.187	4.750	±0.006	2.50	±0.05
	0.250	6.350	±0.005	2.50, 2.55, 2.60	±0.05
DiClad 527 Master Sheet Size** : 36"x72", 36"x48", 36"x36"	0.005	0.127	±0.005	2.50, 2.55	±0.04
	0.010	0.254	±0.001	2.45, 2.50, 2.55, 2.60	±0.04
	0.015	0.381	±0.0015	2.45, 2.50, 2.55	±0.04
	0.020	0.508	±0.002	2.40, 2.45, 2.50, 2.55	±0.04
	0.031	0.787	±0.002	2.40, 2.45, 2.50, 2.55, 2.60	±0.04
	0.040	1.016	±0.002	2.40, 2.45, 2.50, 2.55, 2.60	±0.04
	0.047	1.194	±0.002	2.50, 2.55	±0.04
	0.060	1.524	±0.003	2.45, 2.50, 2.55	±0.04
	0.062	1.575	±0.003	2.40, 2.45, 2.50, 2.55, 2.60	±0.04
	0.093	2.363	±0.004	2.45, 2.55	±0.04
	0.125	3.175	±0.005	2.45, 2.50, 2.55	±0.04
DiClad 870 Master Sheet Size** : 36"x72", 36"x48", 36"x36"	0.005	0.127	±0.0005	2.33	±0.02
	0.010	0.254	±0.001	2.33	±0.02
	0.015	0.381	±0.001	2.33	±0.02
	0.020	0.508	±0.0015	2.33	±0.02
	0.030	0.861	±0.002	2.33	±0.02
	0.040	1.016	±0.002	2.33	±0.02
	0.060	1.524	±0.002	2.33	±0.02
	0.125	3.175	±0.004	2.33	±0.02
DiClad 880 Master Sheet Size** : 36"x72", 36"x48", 36"x36"	0.005	0.127	±0.0005	2.17, 2.20	±0.02
	0.010	0.254	±0.001	2.17, 2.20	±0.02
	0.015	0.381	±0.001	2.17, 2.20	±0.02
	0.020	0.508	±0.0015	2.17, 2.20	±0.02
	0.030	0.762	±0.002	2.17, 2.20	±0.02
	0.050	1.270	±0.002	2.17, 2.20	±0.02
	0.060	1.524	±0.002	2.17, 2.20	±0.02
	0.125	3.175	±0.004	2.17, 2.20	±0.02

**Master Sheet Sizes are not available on all products or thicknesses. Other thickness options available. Tolerances are subject to change and custom tolerances may be available. Please contact Arlon Customer Service with questions about material availability.

CuClad® Series

Cross-plyed woven fiberglass / PTFE laminates available in a range of Dk's (2.17 to 2.55) and loss (0.0009 to 0.0018). The sequential layers of fabric are cross-plyed to ensure in-plane isotropy for applications requiring matched electrical properties in the X-Y plane.

Product	Standard Thickness			Dielectric Constant	
	Inches	Millimeters	Tolerance (Inches)	Nominal	Tolerance
CuClad 250GX Master Sheet Size** 36"x48" (non-cross-plyed), 36"x36" (cross-plyed)	0.004	0.102	±0.0005	2.40	±0.10
	0.010	0.245	±0.0009	2.48, 2.55	±0.04
	0.015	0.381	±0.0015	2.44, 2.48, 2.55	±0.04
	0.020	0.508	±0.002	2.45, 2.48, 2.50, 2.55	±0.04
	0.030	0.762	±0.002	2.40, 2.45, 2.50, 2.55	±0.04
	0.031	0.787	±0.002	2.45, 2.50, 2.55	±0.04
	0.047	1.194	±0.002	2.50	±0.04
	0.060	1.524	±0.002	2.40, 2.45, 2.50, 2.55	±0.04
	0.062	1.575	±0.002	2.45, 2.50, 2.55	±0.04
	0.093	2.362	±0.002	2.48	±0.04
	0.120	3.048	±0.004	2.45, 2.50, 2.55	±0.04
0.125	3.175	±0.004	2.45, 2.50, 2.55	±0.04	
CuClad 250GT (Thickness listed includes copper cladding) Master Sheet Size** : 36"x48" (non-cross-plyed), 36"x36" (cross-plyed)	0.010	0.254	±0.001	2.50	±0.05
	0.015	0.381	±0.0015, ±0.002	2.50	±0.05
	0.020	0.508	±0.002	2.50	±0.05
	0.031	0.787	±0.002	2.50	±0.05
	0.047	1.194	±0.002	2.50	±0.05
	0.062	1.575	±0.003	2.50	±0.05
	0.094	2.388	±0.004	2.50	±0.05
	0.125	3.175	±0.005	2.50	±0.05
	0.187	4.750	±0.006	2.50	±0.05
0.250	6.350	±0.006	2.50	±0.05	
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)	0.005	0.127	±0.0005	2.33	±0.04
	0.010	0.254	±0.001	2.33	±0.04
	0.015	0.381	0.0015	2.33	±0.02
	0.020	0.508	0.0015	2.33	±0.02
	0.031	0.787	0.002	2.33	±0.02
	0.045	1.143	0.002	2.33	±0.02
	0.062	1.575	0.002	2.33	±0.02
	0.125	3.175	0.004	2.33	±0.02
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	0.0005	2.17	±0.04
	0.010	0.254	0.001	2.17, 2.20	±0.04
	0.015	0.381	0.0015	2.17	±0.02
	0.020	0.508	0.002	2.17	±0.02
	0.025	0.635	0.002	2.17	±0.02
	0.031	0.787	0.002	2.17	±0.02
	0.040	1.016	0.002	2.17, 2.20	±0.02
	0.045	1.143	0.002	2.17	±0.02
	0.060	1.524	0.002	2.17	±0.02
	0.062	1.575	0.002	2.17	±0.02
	0.125	3.175	0.004	2.17	±0.02

**Master Sheet Sizes are not available on all products or thicknesses. Other thickness options available. Tolerances are subject to change and custom tolerances may be available. Please contact Arlon Customer Service with questions about material availability.

CuClad® Series

Cross-plyed woven fiberglass / PTFE laminates available in a range of Dk's (2.17 to 2.55) and loss (0.0009 to 0.0018). The sequential layers of fabric are cross-plyed to ensure in-plane isotropy for applications requiring matched electrical properties in the X-Y plane.

Product	Standard Thickness			Dielectric Constant	
	Inches	Millimeters	Tolerance (Inches)	Nominal	Tolerance
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	±0.0005	2.53	±0.10
	0.0101	0.257	±0.0009	2.48, 2.55	±0.04
	0.0147	0.373	±0.0015	2.44, 2.55	±0.04
	0.0193	0.490	±0.002	2.43	±0.04
	0.030	0.762	±0.002	2.45, 2.50, 2.55	±0.04
	0.031	0.787	±0.002	2.45	±0.04
	0.060	1.524	±0.002	2.41, 2.42, 2.43, 2.45, 2.50, 2.55	±0.04
	0.0625	1.588	±0.002	2.50, 2.55	±0.04
	0.090	2.286	±0.003	2.50	±0.04
0.125	3.175	±0.004	2.45, 2.50, 2.55	±0.04	

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			Dielectric Constant	
	Inches	Millimeters	Tolerance (Inches)	Nominal	Tolerance
IsoClad 933 Master Sheet Size** 36"x48" & 36"x72"	0.005	0.127	±0.0007	2.33	±0.04
	0.010	0.254	±0.001	2.33	±0.04
	0.015	0.381	±0.0015	2.33	±0.04
	0.020	0.508	±0.002	2.33	±0.04
	0.031	0.787	±0.002	2.33	±0.04
	0.045	1.143	±0.003	2.33	±0.04
	0.060	1.524	±0.004	2.33	±0.04
IsoClad 917 Master Sheet Size** 36"x48" & 36"x72"	0.005	0.127	±0.0005	2.17	±0.02
	0.010	0.254	±0.001	2.17	±0.02
	0.015	0.381	±0.0015	2.17	±0.02
	0.020	0.508	±0.002	2.17	±0.02
	0.031	0.787	±0.002	2.17	±0.02
	0.045	1.143	±0.003	2.17	±0.02
	0.062	1.575	±0.003	2.17	±0.02

AR Series (Legacy Material)

Glass / PTFE laminates with or without micro-dispersed ceramic fillers. These Legacy products continue to be manufactured to support legacy customer designs. Arlon encourages new designs and inquiries towards AD320A (for AR320) and AD1000 (for AR1000). The newer designs offer both lower price as well as higher performance to provide more Customer Value.

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

25 Series, Non-PTFE, Low Loss Thermoset Resin Systems

The 25 Series Products are Ceramic Hydrocarbon, Low Loss Thermoset material family with matching Pre-pregs. Excellent for multi-layer applications. 25FR contains a Flame Retardant and UL94 V0.

Standard Laminate Thickness (inches)		
25N	25FR	Tolerance
0.006	0.006	0.0007
0.008	0.008	0.0010
0.010	0.010	0.0010
0.012	0.012	0.0015
0.018	0.018	0.0020
0.020	0.020	0.0020
0.024	0.024	0.0020
0.030	0.030	0.0030
0.060	0.058	0.0040

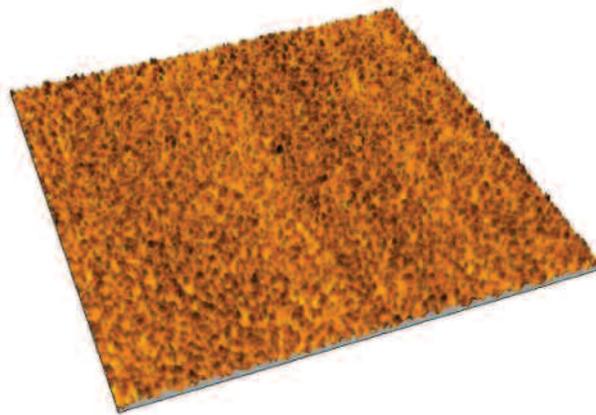
Prepreg Thickness (inches)		
Glass Style	25N	Tolerance
1080	0.0039	0.0039
2112	0.0058	0.0058
2113	0.0067	0.0067

Copper Cladding

Arlon offers a variety of copper foil cladding for high performance laminates to insure the optimal balance of low insertion loss, excellent mechanical properties and cost. Below is a list of typical copper foil options.

Copper Foil	Typical Surface Roughness		Thickness mil (mm)
	Treated Side μin (μm)	Untreated Side μin (μm)	
½ oz Electrodeposited (ED) Copper	31 (0.78)	10-15 (0.3-0.4)	0.7 (0.018)
1 oz Electrodeposited (ED) Copper	46 (1.2)	10-15 (0.3-0.4)	1.4 (0.036)
2 oz Electrodeposited (ED) Copper	82 (2.1)	10-15 (0.3-0.4)	2.8 (0.072)
½ oz Reverse Treat Electrodeposited (RT)	13 (0.3)	20-40 (0.5-1.1)	0.7 (0.018)
1 oz Reverse Treat Electrodeposited (RT)	17 (0.43)	20-40 (0.5-1.1)	1.4 (0.036)
½ oz Rolled Copper (RA)	30 (0.78)	5-12 (0.13-0.3)	0.7 (0.018)
1 oz Rolled Copper (RA)	30 (0.78)	5-12 (0.13-0.3)	1.4 (0.036)

PIM Grade Copper available on certain products. Additional copper foils, heavy metal plate or specialty foils such as Ohmega Technologies Ohmega-Ply® or TIGER TCR® Resist foils are available upon request. Not all copper foil options are available on all products or thicknesses. Please contact Arlon Customer Service with questions about material availability.



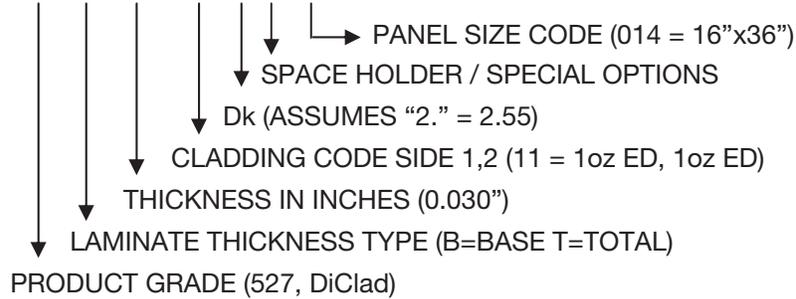
Surface Roughness Profile of Arlon 0.5 Ounce, Electrodeposited (ED) Copper via Non-Contact Optical Aberration Technique

Arlon Part Numbers

FOR REFERENCE ONLY. PLEASE CONTACT YOUR ARLON REPRESENTATIVE FOR ADDITIONAL PRODUCT OPTIONS, SPECIFIC DIELECTRIC DESIGNS OR REQUIREMENTS & AVAILABILITY.

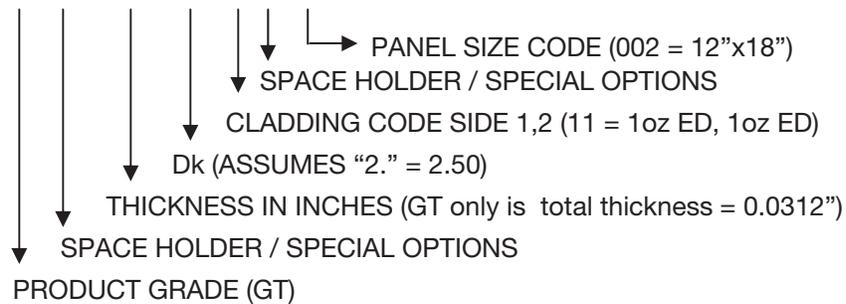
DiClad & IsoClad Series: 522, 527, 870, 880, 917 & 933

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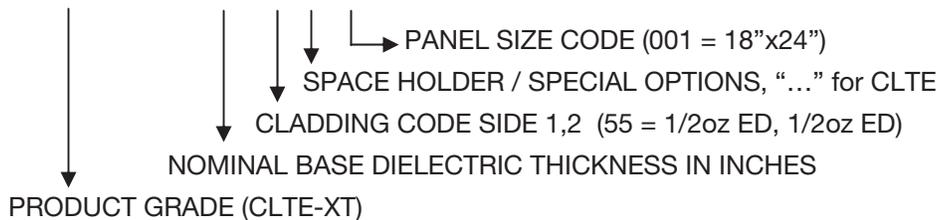
CuClad Series: 250, 233 & 217 (GX, LX, GY, GT)

GT-03125011.002



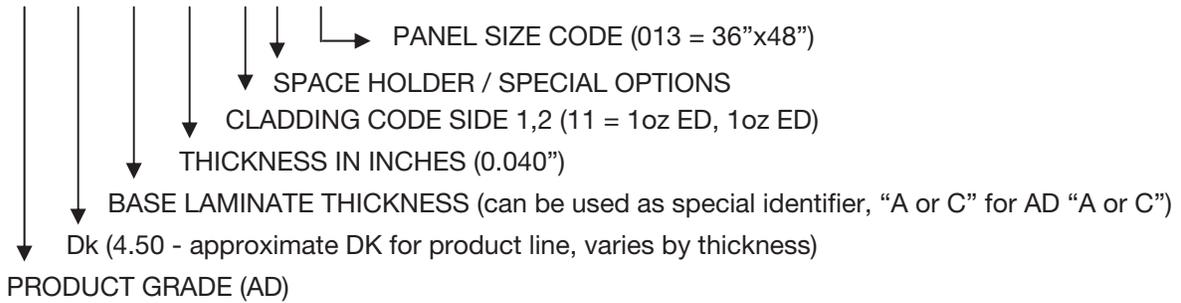
CLTE-XT, CLTE-AT & CLTE Series:

CLTEXT01055.001



AD, AR & TC Series: (including AD "A" or "C")

AD450L04011.013



Codes for Typical Copper Cladding and Panel Size

Metal Cladding Codes*	
Code	Copper Type & Weight
1	1 oz ED
2	2 oz ED
3	½ oz Rolled
4	1 oz Rolled
5	½ oz ED
7	½ oz Reverse Treated ED
8	2 oz Reverse Treated ED
9	1 oz Reverse Treated ED
0	Unclad

Panel Size Codes*		
Panel Size (Inches)	Panel Size (Millimeters)	Code
18 x 24	547 x 610	001
12 x 18	305 x 457	002
18 x 36	457 x 915	004
36 x 48	915 x 1220	013
16 x 36	407 x 915	014
24 x 36	610 x 915	057
18 x 48	457 x 1220	072
48 x 54	1220 x 1372	615
24 x 54	610 x 1372	825

* Other metal cladding types and thicknesses, and panel size options are available for various products. Please contact Arlon Customer Service with questions about material availability.



TECHNOLOGY ENABLING INNOVATION

Arlon Microwave Materials... Challenge Us

For samples, technical assistance, customer service or for more information, please contact Arlon Materials for Electronics Division at the following locations:

NORTH AMERICA:

Arlon, Inc.
Electronic Substrates
9433 Hyssop Drive
Rancho Cucamonga, CA 91730
Tel: (909) 987-9533
Fax: (909) 987-8541

Arlon, Inc.
Microwave Materials
1100 Governor Lea Road
Bear, DE 19701
Tel: (800) 635-9333
Outside U.S. & Canada: (302) 834-2100
Fax: (302) 834-2574

NORTHERN EUROPE:

Arlon, Inc.
44 Wilby Avenue
Little Lever
Bolton, Lancashire BL31QE
United Kingdom
Tel: (44) 120-457-6068
Fax: (44) 120-479-6463

SOUTHERN CHINA:

Arlon, Inc.
Room 601, Unit 1, Bldg 6
Liyuan, Xincun Shahe
Shenzhen, China 518053
Tel: (86) 755-269-066-12
Fax: (86) 755-269-104-75

NORTHERN CHINA:

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

SOUTHERN EUROPE:

Arlon, Inc.
1 Bis Rue de la Remarde
91530 Saint Cheron, France
Tel: (33) 951-096-082
Fax: (33) 164-566-489