AD255C

PTFE/Woven Fiberglass/Micro-Dispersed Ceramic Filled Laminate for RF & Microwave Printed Circuit Boards

Arlon's AD255C is the third generation, commercial microwave and RF laminate material designed with low dielectric, low cost and excellent low loss characteristics. AD255C is built on a cost-effective combination of composite chemistry and construction to yield an uncompromising level of price-performance for today's telecommunication infrastructure.

AD255C combines the superior thermal properties of a fluoropolymer resin system with selected ceramic materials and fiberglass reinforcement to yield a laminate material with lower loss (Df=0.0014 at 10GHz), lower thermal expansion properties and lower passive intermodulation (PIM). AD255C also represents further improvements over Arlon's AD255A product in terms of cost.

Stability of PTFE over wide frequency and temperature ranges with low loss properties, makes AD255C ideal for a variety of microwave and RF applications in telecom infrastructure. The inclusion of micro-dispersed ceramic provides thermal stability to the laminate in the form of lower CTE values and greater phase stability across temperatures.

The net combination of properties of AD255C are highly desired in applications where higher frequency and expectations for longevity in material performance for high gain and broadband signals, which are typically beyond the performance capabilities offered by low loss thermosets.

AD255C is compatible with the processing used for standard PTFE based printed circuit board substrates. Its low Z-axis thermal expansion improves plated through-hole (PTH) reliability compared to typical PTFE based laminates. Low X-Y expansion improves BGA solder-joint reliability.

Features:

- Very Low Loss PTFE and Ceramic Filled Composite (0.0014 Loss Tangent at 10GHz and Base Station Frequencies)
- Dielectric Constant (2.55) with Tighter Tolerance
- Low Dielectric Loss (Loss Tangent)
- Low Profile Copper (lower conductive losses and lowest PIM)
- Low Z-Direction CTE
- Large Panel Sizes Available

Benefits:

- Higher Antenna Efficiencies
- Lower Insertion Loss
- Low PIM for Antenna Applications
- Excellent TCEr for Phase Stability
- Ceramic Provides Higher Degree of Dielectric Constant Stability as Temperatures Change or Cycle

Typical Applications:

- Base Station Antenna Applications
- Commercial Antennas
- Digital Audio Broadcasting (DAB) Antennas (Satellite Radio)
- Radar Manifolds and Feed Networks

Typical Properties:

AD255C

Property	Units	Value	Test Method
1. Electrical Properties			
Dielectric Constant (may vary by thickness)			
@1 MHz	-	2.55	IPC TM-650 2.5.5.3
@ 10 GHz	-	2.55	IPC TM-650 2.5.5.5
Dissipation Factor			
@ 1 MHz	-	0.0011	IPC TM-650 2.5.5.3
@ 10 GHz	-	0.0014	IPC TM-650 2.5.5.5
Temperature Coefficient of Dielectric	-		
TCεr @ 10 GHz (-40-150°C)	ppm/°C	-75	IPC TM-650 2.5.5.5
Volume Resistivity			
C96/35/90	MΩ-cm	$1.1x10^{9}$	IPC TM-650 2.5.17.1
E24/125	MΩ-cm		IPC TM-650 2.5.17.1
Surface Resistivity			
C96/35/90	MΩ	$4.5x10^{7}$	IPC TM-650 2.5.17.1
E24/125	MΩ		IPC TM-650 2.5.17.1
Electrical Strength	Volts/mil (kV/mm)		IPC TM-650 2.5.6.2
Dielectric Breakdown	kV	>45	IPC TM-650 2.5.6
Arc Resistance	sec	>180	IPC TM-650 2.5.1
2. Thermal Properties			
Decomposition Temperature (Td)			
Initial	°C	495	IPC TM-650 2.4.24.6
5%	°C	550	IPC TM-650 2.4.24.6
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
Thermal Expansion, CTE (x,y) 50-150°C	ppm/°C	16, 16	IPC TM-650 2.4.41
Thermal Expansion, CTE (z) 50-150°C	ppm/°C	50	IPC TM-650 2.4.24
% z-axis Expansion (50-260°C)	%		IPC TM-650 2.4.24
3. Mechanical Properties			
Peel Strength to Copper (1 oz/35 micron)			
After Thermal Stress	lb/in (N/mm)	12 (2.1)	IPC TM-650 2.4.8
At Elevated Temperatures (150°)	lb/in (N/mm)		IPC TM-650 2.4.8.2
After Process Solutions	lb/in (N/mm)		IPC TM-650 2.4.8
Young's Modulus	kpsi (MPa)	400 (2758)	IPC TM-650 2.4.18.3
Flexural Strength (Machine/Cross)	kpsi (MPa)	10.8/8.9 (74.5/61.4)	IPC TM-650 2.4.4
Tensile Strength (Machine/Cross)	kpsi (MPa)	4.0/3.1 (27.6/21.4)	IPC TM-650 2.4.18.3
Compressive Modulus	kpsi (MPa)	>350 (2413)	ASTM D-3410
Poisson's Ratio	-	0.27	ASTM D-3039
4. Physical Properties			
Water Absorption	%	0.04	IPC TM-650 2.6.2.1
Density, ambient 23°C	g/cm^3	2.30	ASTM D792 Method A
Thermal Conductivity	W/mK	0.30	ASTM E1461
Flammability	class	Meets V0	UL-94
NASA Outgassing, 125°C, ≤10^{-6} torr			
Total Mass Loss	%		NASA SP-R-0022A
Collected Volatiles	%		NASA SP-R-0022A
Water Vapor Recovered	%		NASA SP-R-0022A

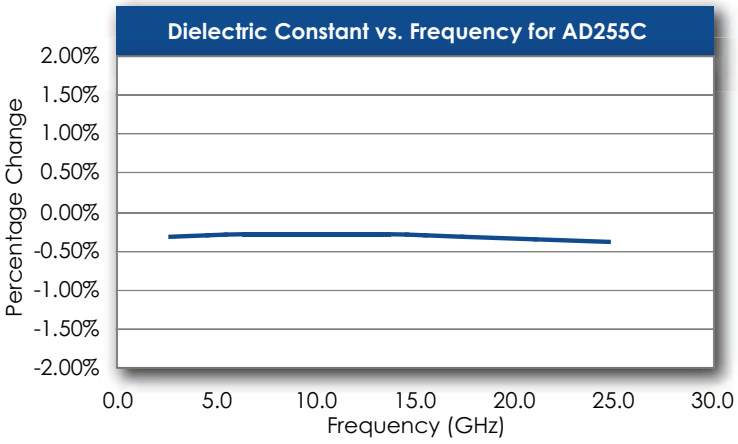

Figure 1
Demonstrates the Stability of Dielectric Constant across Frequency. This information was correlated from data generated by using a free space and circular resonator cavity. This characteristic demonstrates the inherent robustness of Arlon Laminates across Frequency, thus simplifying the final design process when working across EM spectrum. The stability of the Dielectric Constant of AD255C over frequency ensures easy design transition and scalability of design.

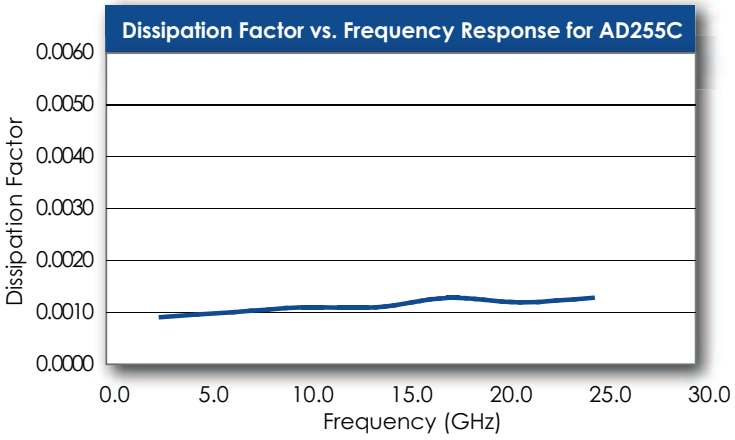

Figure 2
Demonstrates the Stability of Dissipation Factor across Frequency. This characteristic demonstrates the inherent robustness of Arlon Laminates across Frequency, providing a stable platform for high frequency applications where signal integrity is critical to the overall performance of the application.

Material Availability:

Current Standard Production is based on 0.030” and 0.060” thickness designs. Other thicknesses may be available upon request. Please contact Arlon Customer Service to discuss your application. AD255C is supplied with 1/2, 1 or 2 ounce electrodeposited copper on both sides. Reverse Treat ED Copper is recommended for Reduced PIM Performance. Inquire about PIM+ performance option.

When ordering AD255C, specify dielectric thickness, cladding, panel size and any other special considerations. Typical Panels are cut from a Master Sheet. The standard master sheet is 48" x 54". Typical panel sizes cut from a master sheet include: 12” x 18”, 18” X 24”, 16” X 18”. Contact Customer Service for larger master sheet or custom panel sizes.